Activation of CD161-expressing T Cells in Human Blood and Gut



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献给我的妈妈，爸爸和我的外公

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Abstract

Human mucosal associated invariant T (MAIT) cells are an important T cell population present in circulation as well as immune privileged sites such as the liver and the gut. They are characterised by a semi-invariant T cell receptor (TCR) and high surface expression levels of CD161 and IL-18Rα, and restriction by the MHC class I-related protein 1 (MR1). Studies have described a broad range of MAIT cell effector functions, including MR1-mediated antibacterial responses and TCR-independent, cytokine-mediated proinflammatory and antiviral properties. How human MAIT cells integrate these signals to exert their effector functions in the gut and in autoimmune and immune-mediated diseases such as inflammatory bowel diseases (IBD) has not been fully described.

In this study, an *in vitro* approach was used to probe MAIT cell activation, and the roles of the TCR, IL-12/-15/-18, TL1A and type I interferons (IFNs). MAIT cells were shown here to achieve certain effector and antimicrobial functions – measured by IFN-γ / tumour necrosis factor-α release and granzyme B expression – with specific innate cytokine signals. These features were reproduced in gut-derived CD8+ MAIT cells and CD161-expressing CD4+ T cells, whose phenotypes and effector functions may not only be mediated by exogenous TCR/cytokine signals, but also tuned by the gut microenvironment and various cues from IBD.

Furthermore, while TCR triggering was insufficient to drive full activation, gene expression signatures of TCR-triggered MAIT cells showed specific enrichment of tissue-repair functions, and genome-wide comparison of functional responses to TCR-dependent and -independent signals defined novel functions of MAIT cells relevant not only to host defence but also tissue homeostasis.

Overall, these findings indicate the importance of both TCR and inflammatory cytokine signals in promoting effector functions of human CD161-expressing T cells. Further *in vitro* and *in vivo* investigations on these gut-derived innate-like CD161+ T cells will be useful to understand their tissue-specific and signal-specific effector functions, as well as their role in various diseases.

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THESIS CONTRIBUTIONS

All work presented in this thesis is my own, except as follows:

Chapter 1/6

Lucy Garner, Nicholas Provine

Provided graphical elements for Figure 1-1 – 1-3, and Figure 6-1.

Chapter 3

Chan Phetsouphanh, Christian Willberg

Sorted MAIT cells by FACS for the RNAseq work

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ABBREVIATIONS

5-A-RU		5-amino-6-D-ribitylaminouracil
5-OP-RU		5-(2-oxopropylideneamino)-6-D-ribitylaminouracil
6-FP		6-formylpterin
αGalCer		α-Galactosyl Ceramide
Ac-6-FP		Acetyl-6-formylpterin
ALD		Alcoholic liver disease
APC		Antigen presenting cell
BEC		Biliary epithelial cell
CCL		Chemokine (C-C motif) ligand
CCR		C-C chemokine receptor
CD		Cluster of differentiation (followed by numbers)
	OR	Crohn's Disease (used alone)
cDNA		complementary deoxyribonucleic acid (DNA)
CNS		Central nervous system
CRC		Colorectal cancer
CRTAM		Class I-restricted T cell-associated molecule
CTL		Cytotoxic T lymphocyte
CXCL		Chemokine (C-X-C motif) ligand
CXCR		C-X-C chemokine receptorDN
DC		Dendritic cell
DN		Double negative
DP		Double positive
DR3		Death receptor 3
EAE		Experimental autoimmune encephalomyelitis
Eomes		Eomesodermin

FACS	Fluorescence-activated cell sorting
FcγRs	Fcγ receptors
FCS	Fetal calf serum
FDR	False discovery rate
FMO	Fluorescence minus one
GADD45β	Growth arrest and DNA-damage-inducible β
GM-CSF	Granulocyte-macrophage colony-stimulating factor
Gr	Granzyme
GWAS	Genome-wide association study
HBV	Hepatitis B virus
HBEGF	Heparin-binding EGF-like growth factor
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
IBD	Inflammatory bowel disease
IEL	Intraepithelial lymphocytes
IFN	Interferon
IFNAR	Interferon-alpha/beta receptor
Ig	Immunoglobulin
IL- (XR)	Interleukin- (X receptor)
iNKT	Invariant natural killer T
iTCRα	Invariant TCRα-chain
JAK	Janus kinase
JIA	Juvenile idiopathic arthritis
LLT1	Lectin-like transcript 1
LFA-1	Lymphocyte function-associated antigen 1
LP	Lamina propria

LPMC	Lamina Proprial Mononuclear Cell
LPS	Lipopolysaccharide
mAb	Monoclonal antibody
MAdCAM1	Mucosal vascular addressin cell adhesion molecule 1
MAIT cells	Mucosal associated invariant T cells
MAPK	Mitogen-activated protein kinase
MDR1	Multi-Drug Resistance Gene
MHC	Major histocompatibility complex
MIC	MHC class I chain-related sequence
min	Minutes
MIP	Macrophage inflammatory protein
miRNA	MicroRNA
MR1	Major histocompatibility complex, class I-related protein
MS	Multiple sclerosis
Mtb	Mycobacterium tuberculosis
MyD88	Myeloid differentiation primary response 88
NOD2	Nucleotide-binding oligomerization domain-containing protein 2
NK	Natural killer
NKG2D	Natural killer group 2 member D
OSM	Oncostatin M
PAMP	Pathogen-associated molecular pattern
PBMC	Peripheral blood mononuclear cell
PBS	Phosphate-buffered saline
PCA	Principle component analysis
PLZF	Promyelocytic leukaemia zinc finger protein

PRR	Pattern recognition receptor
RNase	Ribonuclease
RNASeq	ribonucleic acid (RNA) sequencing
RORγt	RAR-related orphan receptor gamma
RPM	Revolutions per minute
rRL-6-CH2OH	Reduced 6-(hydroxymethyl)-8-(1-D-ribityl)lumazine
RUNX3	Runt-related transcription factor 3
SD1	*Shigella dysenteriae* 1
SNP	Single-nucleotide polymorphism
SP	Single positive
STAT	Signal transducers and activator of transcription
Tcm	Central memory T cells
TCR	T-cell receptor
Tem	Effector memory T cells
Temra	Effector memory RA T cells
TF	Transcription factor
TGF	Transforming growth factor
Th	T helper
TL1A	TNF-like ligand 1A
TLR	Toll-like receptor
TNF	Tumor necrosis factor
TRAJ	T cell receptor alpha joining genes
TRA/BV	T cell receptor alpha/beta variable genes
Treg	Regulatory T cells
UC	Ulcerative colitis
WT	Wild type

1. INTRODUCTION

1.1. Innate and adaptive immunity

The innate and adaptive immune responses integrate and form a highly effective arsenal of weapons to detect and destroy invading pathogens. The mechanisms by which innate and adaptive cells function differ, yet they are both indispensable components of the immune system.

The cellular components of innate immunity include macrophages, neutrophils, and natural killer (NK) cells. They recognise conserved structural components of infectious agents, known as pathogen-associated molecular patterns (PAMPs), by a fixed number of germ-line-encoded receptors, called pattern recognition receptors (PRRs), with the most well-characterised PRR being toll-like receptors (TLRs) first identified in drosophilia (Medzhitov and Janeway, 1998; Lemaitre et al., 1996). Upon detection of infection, innate cells become promptly activated to provide the first lines of host defence, which involves the release of inflammatory cytokines and anti-microbial peptides, macrophage/neutrophil-induced phagocytosis, as well as direct cytotoxicity by NK cells.

On the other hand, T or B cells – main components of the adaptive immunity – recognise a wide range of pathogens with their somatically rearranged receptors. Adaptive immunity is also marked by the cells' remarkable ability to expand during a primary infection, which subsequently gives rise to a large number of effector cells and memory cells that render long-term protection. Effector functions of T and B cells following clonal expansion include the production of antibodies, secretion of inflammatory and regulatory cytokines, and enhanced cytotoxicity.

Despite pronounced differences between these two pillars of the immune system, they function synergistically following pathogen invasion to achieve optimal immune response. For example, antigens are processed by the innate immune system and presented to major histocompatibility complex (MHC) molecules expressed by dendritic cells (DCs) – the key mediator linking innate and adaptive immunity. This antigen presenting process is the primary source, and the hallmark feature of activated adaptive immune responses. Additionally, the innate responses further lead to development of the adaptive immune responses by the release of chemokines, cytokines, and interferons (IFNs). These signals lead to the recruitment of lymphocytes and are thus, critical for the activation of the adaptive immune system.

The recent discovery of subsets of T cells, however, blurred the dichotomy of innate and adaptive immunity. They possess both innate and adaptive properties, and thus are termed innate-like T cells. There is already a wealth of data on these innate-like T cells yet many questions remain to be answered. In the advent of “the end of the beginning” for defining their significance (Pellicci and Klenerman, 2018), this thesis examines in detail the phenotypical and functional characteristics of a specific subset of these T cells that express Cluster of Differentiation (CD)161 in human blood and gut.

1.2. T cells

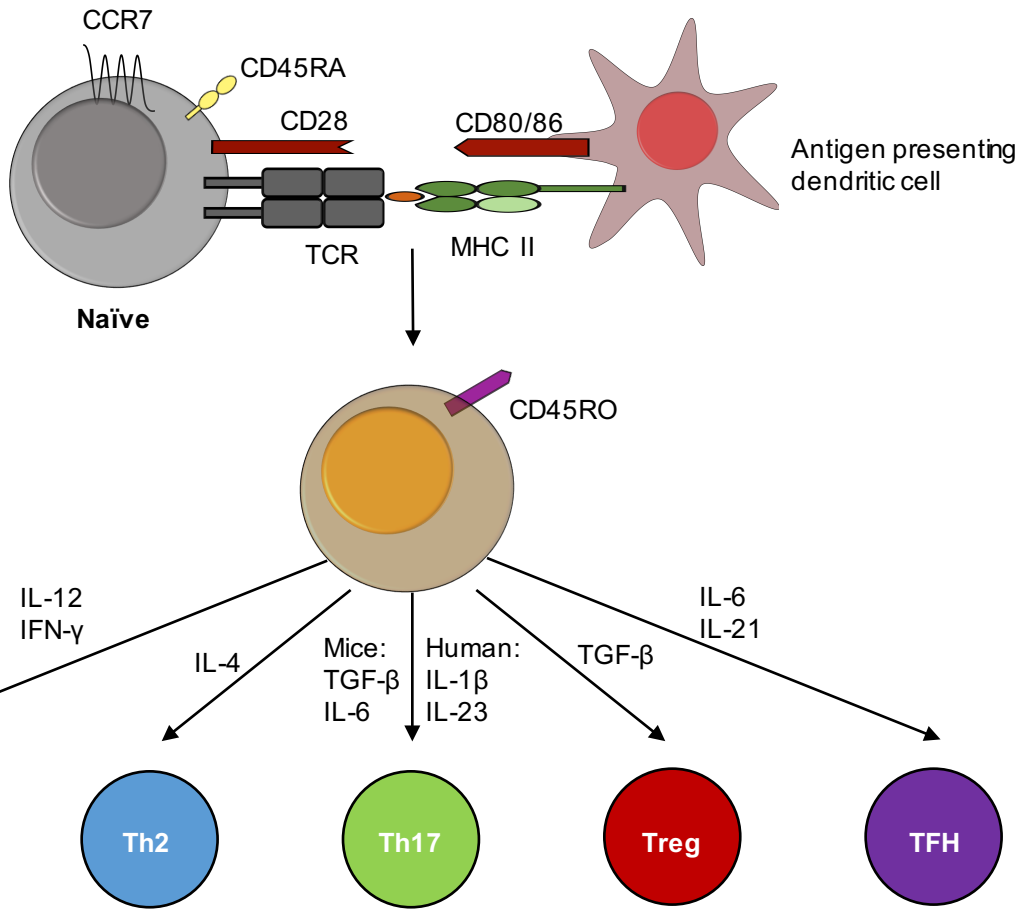
1.2.1. Conventional T cells

T cells are categorised by the CD4 and CD8 coreceptor expression on their surface. In the periphery and tissues of humans and mice, there exist CD4 single positive (SP) cells, CD8 SP cells, CD4+CD8+ double positive (DP) cells, and CD4-CD8-

double negative (DN) cells. T cells acquire their coreceptor expression in the thymus. How T cells are committed to their different lineages is governed by a few fate-determining transcription factors (TFs). For example, T helper (Th)-inducing POK-Kruppel factor (ThPOK) is the master regulator of the CD4 lineage choice, whereas runt-related TF3 (RUNX3) promotes CD8+ T cell differentiation (He et al., 2005; Singer et al., 2008).

T cells arise and develop in the thymus. Due to somatic recombination of variable (V), diversity (D), and joining (J) gene segements, mature T cells are a heterogeneous population with diverse T cell receptor (TCR) repertoire (Schatz and Ji, 2011). T cells remain naïve and do not exhibit effector functions until they encounter their cognate antigens in secondary lymphoid organs. Following recognition of antigens presented by antigen presenting cells (APCs), naïve T cells then differentiate into effector T cells with a multitude of specialised functions, and expand clonally (Butz and Bevan, 1998).

CD4+ T cells are called Th cells due to their ability to secrete immune modulatory cytokines upon activation by peptides presented by MHC class I molecules on APCs such as DCs, macrophages, and B cells. Depending on the cytokines and co-stimulatory/co-inhibitory cues that naïve CD4+ T cells receive during MHC/TCR priming, they further can induce distinct TFs, and differentiate into several lineages, such as Th1, Th2, Th9, Th17, Th22, T follicular helper cells, and regulatory T cells (Tregs). The cytokine milieu required for the differentiation into each subset, the key TFs, as well as cytokine signatures of each subset are depicted in Figure 1-1. (Josefowicz et al., 2012; Zhu and Paul, 2008; Zhu et al., 2010). It is commonly accepted that Th1 cells are responsible for intracellular pathogen clearance, Th2 for clearing helminth infections and aiding B cell antibody production, Th17 for



Key TFs	STAT4 T-bet	STAT3 GATA3	RORγt	Foxp3	Bcl-6 Blimp-1
Chemokine receptors	CCR5 CXCR3	CCR4 CCR4 CCR8	CCR6	CCR9	CXCR5
Cytokine signatures	IL-2 IFN-γ TNF-α	IL-4 IL-5 IL-13	IL-17A IL-17F IL-22	IL-10 TGF-β	IL-6 IL-21
Functions	Intracellular pathogen control; cell-mediated immunity	Humoral immunity; parasite control	Cell-mediated immunity; autoimmunity; extracellular pathogen control	Proliferation/maturation of neutrophils; immunosuppression; peripheral tolerance	T cell help for B cells

Figure 1-1. Differentiation of CD4+ T cell subsets. T helper cells and regulatory T cells differentiate from naïve CD4+ T cells in the presence of indicated cytokines. Differentiated helper cells and Tregs express chemokine receptors and secrete cytokines upon TCR stimulation and home to inflamed tissues through the expression of different chemokine receptors as indicated. Modified from Cant et al., 2013.

recruitment of neutrophils and various inflammatory diseases, and Tregs for suppressing immune responsiveness and maintaining homeostasis and tolerance, although studies are on the way to uncovering novel functions of these subsets.

CD8+ T cells are reactive to peptides presented on MHC class I molecules expressed on APCs. The hallmark feature of activated CD8+ T cells is their cytotoxic effector function that mediates the killing and lysis of infected or transformed cells. Thus, CD8+ T cells are also known as cytotoxic T lymphocytes (CTLs). Preformed granules containing granzymes and perforin orchestrate the cytotoxicity of CD8+ T cells following exocytosis by inducing apoptosis in target cells through caspase –dependent and –independent mechanisms (Chowdhury and Lieberman, 2008). In addition to cytotoxicity, a subset of CD8+ T cells also release Th1 cytokines such as IFN-γ and TNF-α, or Th17 cytokines such as interleukin (IL)-17A and IL-22; thus, are termed Tc1 cells and Tc17 cells, respectively.

1.2.2. Innate like T cells

The discovery of unconventional T cells with features of innate immunity has disrupted the segregation between innate and adaptive immune responses. These unconventional cells express somatically recombined TCRs – thus, by definition, a component of adaptive immunity. However, they have a limited TCR repertoire and are only responsive to a small number of evolutionarily conserved antigens. This, nonetheless, does not limit the functional potential of these T cells. In fact, they respond rapidly and robustly to infection or tissue dysregulation in synchrony with the innate response. Furthermore, the functionality of these T cells – similar to cells of innate immunity – is developmentally pre-programmed. They display an effector memory phenotype – acquired within the thymus prior to antigenic exposure. Given that these innate-like T cells often preferentially home to tissues, and bridge innate

and adaptive immune responses, they may have a profound role in lymphoid stress surveillance, with implications for tumour immunology, allergy and inflammation (Wencker et al., 2014).

Three major groups of innate-like T cells include γδ T cells, invariant NK T (iNKT) cells, and mucosal associated invariant T (MAIT) cells (see ***1.3.*** for detailed introduction).

γδ T cells are defined by their TCR encoded by the γ loci (Saito et al., 1984) and the δ loci (Elliott et al., 1988). Two major subsets of γδ T cells have been identified by their Vδ chain. Vδ1+ γδ T cells are enriched in the thymus and epithelial tissues, to a large extent the intestine (Hayday et al., 2001). By contrast, Vδ2+ γδ T cells mainly populate peripheral blood (Constant et al., 1994). The TCR of γδ T cells enables them to recognise dysregulated cellular components of infected or transformed cells, in a manner similar to PRRs. The Vδ1+ and Vδ2+ subsets recognise distinct antigens. Vδ2+ γδ T cells mainly recognize non-peptidic phosphoantigens, intermediates of the isoprenoid biosynthesis (Tanaka et al., 1995). Vδ1+ γδ T cells can recognise endogenous lipids presented by several non-classical MHC-related molecules, such as CD1c (Porcelli et al., 1989) and CD1d (Agea et al., 2005; Russano et al., 2006). Furthermore, the Vδ1+ subset can recognise stress-induced MHC-like molecules, such as ligand MHC class I chain-related sequence (MIC) A and MICB, through their TCR as well as their NK group 2D (NKG2D) receptor (Das et al., 2001; Groh et al., 1998; Rincon-Orozco et al., 2005).

Both human γδ T cells display a broad range of effector phenotypes, secreting type 1, 2, and 17 cytokines, as well as exhibiting a cytotoxic potential through the release

of perforin and granzymes (Todaro et al., 2009; Wrobel et al., 2007). In addition to their direct killing capacity, γδ T cells can induce DC maturation through TNF-α production (Ismaili et al., 2002), and also are able to cross-present antigens to prime T cells in a cancer or infectious setting (Brandes et al., 2005). These effector functions of γδ T cells inspire the design of new strategies to improve clinical response of human γδ T cell-based immunotherapy.

iNKT cells, also known as type I NKT cells, in mice express the NK cell marker NK1.1 in mice (Sykes, 1990), and CD161 in humans (Exley et al., 1997). They were first described in mice as a subset of DN thymocytes with low levels of TCR and biased Vβ8 chain expression (Budd et al., 1987; Fowlkes et al., 1987). In addition to restricted Vβ repertoire, these cells use an invariant TCRα chain rearrangement of Vα14-Jα18 in mice (Lantz and Bendelac, 1994), and Vα24-Jα18 in humans (Porcelli et al., 1993). CD1 was the first characterised MHC class I-like molecule to present ligands to iNKT cells (Bendelac et al., 1995). Several conserved lipid ligands were subsequently discovered, including α-galactosylceramide (αGalCer) (Beckman et al., 1994; Kawano et al., 1997), α-galacturonsylceramide (Mattner et al., 2005), and isoglobotrihexosylceramide (Zhou et al., 2004). Studies have also found type II NKT cells that cannot be detected by the αGalCer-loaded CD1d tetramers, due to their recognition of other hydrophobic antigens such as sulfatide and lysophosphatidylcholine (Stax et al., 2017). In humans, the NKT cell family is even more diverse, consisting of both αβ and γδ T cells restricted by CD1a, b, c, d, and e (Cohen et al., 2009). Each iNKT subset recognises different antigens and also can additionally be activated in the TCR-independent manner. For example, microbial activation of iNKT cells is dominated by IL-12 signalling rather than CD1d-mediated TCR signalling (Brigl et al., 2011).

All iNKT cells express CXCR3 and CXCR4 and typically exhibit an effector/memory phenotype (D'Andrea et al., 2000; Motsinger et al., 2002). iNKT cells can be further divided into CD4+ and CD4- subsets with differential tissue homing and cytokine production capacity. CD4- iNKT cells express low levels of CD62L but higher levels of CD11a, suggesting a tissue-infiltrating phenotype, while their CD4+ counterparts express CD62L; thus, preferentially home to lymph nodes (Juno et al., 2012). Upon activation, CD4+ iNKT cells produce large quantities of Th2 cytokines including IL-4, IL-13, and IL-10, while CD4- iNKTs generally produce only Th1 cytokines, and are the dominant cytotoxic subset (Gumperz et al., 2002; Lee et al., 2002). Activated iNKT cells can also secrete IL-17, as well as transforming growth factor (TGF)-β, Granulocyte-macrophage colony-stimulating factor (GM-CSF), macrophage inflammatory protein (MIP)-1α, and MIP-1β (Matsuda et al., 2008; Tessmer et al., 2009). iNKT cells can play an important role in the activation and regulation of multiple immune cells, including NK cells, Th cells, Tregss, and B cells (Carnaud et al., 1999). The number and frequency of iNKT cells in humans can be low, yet evidence has suggested their involvement in viral infections. For example, murine and human iNKT cells function to reduce the suppressive capacity of myeloid-derived suppressor cells, which contributes to improved increased viral titres and survival (De Santo et al., 2008; Ho et al., 2008). Furthermore, iNKT cells may be implicated in natural immunity against tumours (Terabe and Berzofsky, 2008), as well as variety of autoimmune and inflammatory conditions (Wu and Van Kaer, 2009).

1.3. MAIT cells

1.3.1. MAIT cells and their invariant T cell receptor

MAIT cells are the most recently discovered innate-like T cells that recognise non-peptidic ligands. The first important discovery directly related to MAIT cells was made by Porcelli et al., who reported the enrichment of the TRAV1-TRAJ33 (Vα7.2-Jα33) TCRα chain with limited complementarity-determining regions (CDR) 3 variability in the CD4-CD8- T cells in healthy donors' blood (Porcelli et al., 1993). Lantz et al. later quantified the TRAV1-TRAJ33 invariant TCRα (iTCRα) usage in human blood, and furthermore discovered the abundance of this iTCRα transcript in the CD8 subset in comparison with CD4 T+ cells (Tilloy et al., 1999). Other TRAV/J combinations, including TRAV1-TRAJ12 and -TRAJ20 are also present in human MAIT cells, albeit to a much lesser extent than the dominant TRAV1-TRAJ33 usage (Lepore et al., 2014; Reantragoon et al., 2013). Interestingly, T cells that bear this invariant TCRα chain also preferentially express certain TCRβ chain segments, with the repertoire being dominated by TRBV6 and TRBV20 in humans, and the orthologous segment of TRBV6 in mice, despite their low frequency in wild type (WT) mice (Lepore et al., 2014; Tilloy et al., 1999). Homologous iTCRα chains were also found in DN T cells in cows and sheep (Goldfinch et al., 2010). The preferential location at mucosal sites in mice and humans later led to this subset being called mucosal associated invariant T (MAIT) cells (Treiner et al., 2003). Despite their name, MAIT cells are present at other non-mucosal sites such as the liver, as well as in circulation, suggesting their diverse functions in various immunological sittings (Dusseaux et al., 2011; Tang et al., 2013).

1.3.2. MR1-restricted antigen presentation and MAIT cell antigens

The limited variance in the TCR repertoire of MAIT cells suggested that they may be restricted to a non-classical MHC molecule. Lantz's team has thus proposed, and confirmed that T cells bearing the invariant Vα7.2-Jα33 TCR are restricted to a monopolymorphic, and highly evolutionarily conversed MHC class Ib molecule, termed MHC class I-related protein 1 (MR1) (Tilloy et al., 1999; Treiner et al., 2003). MR1 is an antigen-presenting molecule first characterised in 1995, and is the most highly conserved MHC-1 like gene across mammalian species, with the α1-α2 domains of mouse and human MR1 molecules being ~90% identical (Riegert et al., 1998; Yamaguchi et al., 1998). The phylogenetically conserved MAIT-MR1 interaction indicates an important physiological function.

Two seminal studies in 2010 by Le Bourhis et al. and Gold et al. demonstrate that MAIT cells are reactive to various species of bacteria and yeast, but not viruses, a process that is dependent on MR1 (Gold et al., 2010; Le Bourhis et al., 2010). The antigen was unknown at that time, but a highly conserved compound amongst microbes was most likely. 12 years later Kjer-Nielsen et al. finally discovered that the MR1 ligand is a derivative of the riboflavin and folic acid synthesis pathways (Kjer-Nielsen et al., 2012). The first MR1 ligand discovered was 6-formyl pterin (6-FP). Importantly, while 6-FP binds to MR1 by sequestering deep within the base of the MR1 antigen binding cleft, and upregulates cell surface MR1 expression, whose levels are low under basal conditions (Chua et al., 2011), Kjer-Nielsen et al. did not find evidence that it activated MAIT cells, neither did other folate pathway-associated ligands in their study (Kjer-Nielsen et al., 2012). Instead, their data suggest that 6-FP, as well as its analogue, N-acetyl-6-FP (Ac-6-FP), inhibits MAIT cell activation by *Salmonella Typhimurium*. Nonetheless, a more recent study shows

that 6-FP and Ac-6-FP can activate unconventional TRAV1-2-, folate-reactive MAIT cells (Gherardin et al., 2016).

Conversely, the MAIT cell-activating antigens derive from the riboflavin synthesis pathway, and the potency varies markedly between these ribityllumazines (Reantragoon et al., 2013). Synthetic reduced 6-hydroxymethyl-8-d-ribityllumazine (rRL-6-CH_2OH) is much more potent than the weak agonists 7-hydroxy-6-methyl- 8-D-ribityllumazine (RL-6-Me-7-OH) and 6,7-dimethyl-8-D-ribityllumazine (RL-6,7-diMe) (Kjer-Nielsen et al., 2018). To date, the most potent activating antigen is 5-2-oxopropylideneamino-6-D-ribitylaminouracil (5-OP-RU), an unstable transitory derivative generated from an early intermediate of the riboflavin pathway (Corbett et al., 2014). MR1-tetramers such as the MR1-5-OP-RU tetramer were subsequently developed with the use of these folate and riboflavin intermediates, and have facilitated specific detection and characterisation of human and murine MAIT cells (Corbett et al., 2014; Gherardin et al., 2016; Rahimpour et al., 2015; Reantragoon et al., 2013).

1.3.3. MAIT cell development

A number of studies have recently cast light on the biology of MAIT cell development. In short, MAIT cells are positively selected, then undergo a three-stage differentiation pathway within the thymus, and continue to expand and mature phenotypically and functionally after they enter the periphery, both in mice and humans (Figure 1-2). Each step marks distinct MAIT cell phenotypes, and is governed by signals unique to and/or shared with other innate T cell subsets, including the iNKT cells.

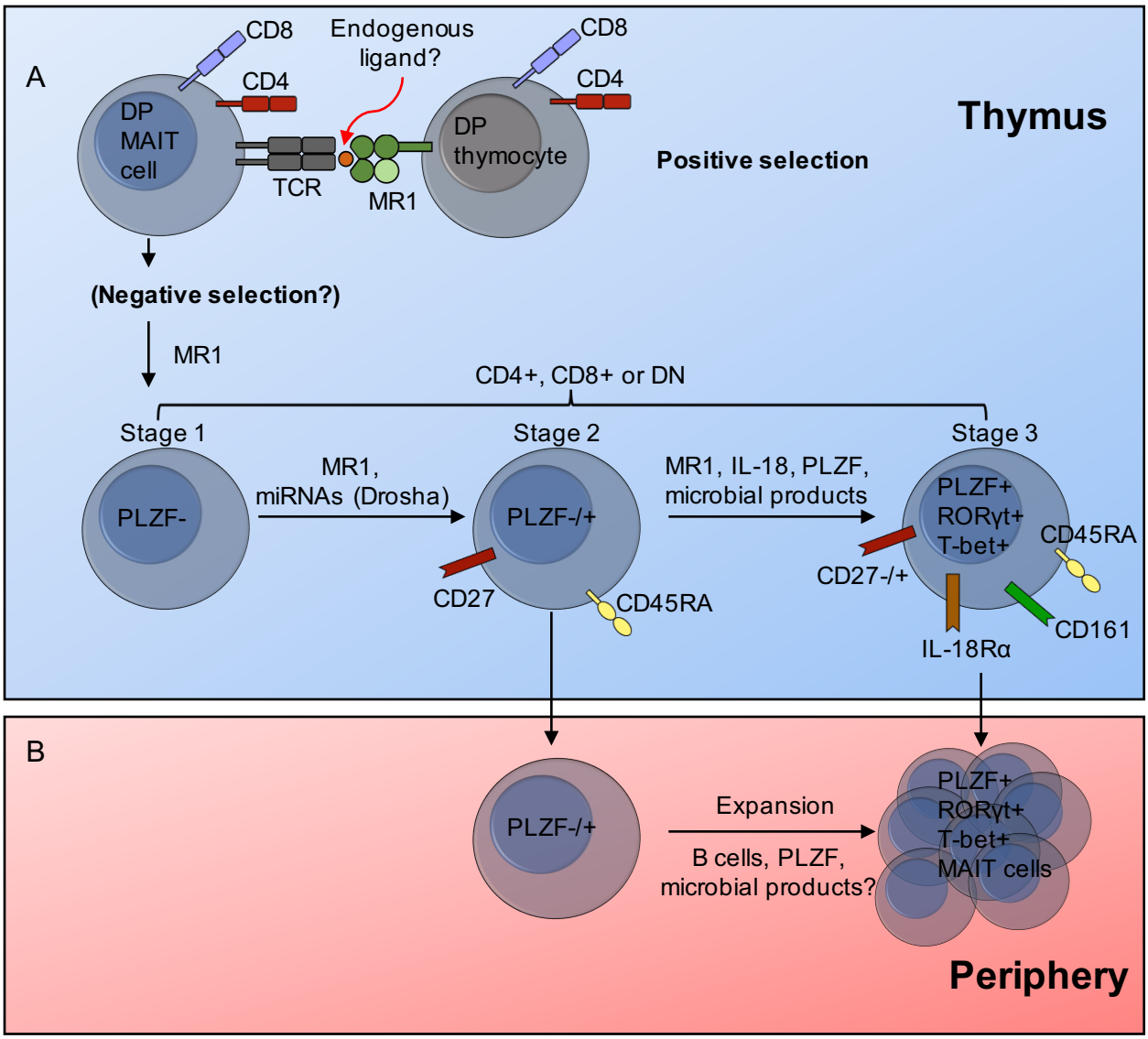


Figure 1-2. The development and expansion of human MAIT cells. A) Human MAIT cells in the thymus: MAIT cells are positively selected by MR1-expressing DP thymocytes, after which they undergo putative negative selection, followed by a three-stage development. Human MAIT cells acquire CD27 and PLZF at stage 2, and IL-18Rα, CD161, RORγt, and T-bet at stage 3. Key mediators governing the transition are shown. B) Human MAIT cells in the periphery. MAIT cells exit the thymus at stage 2/3 with a pre-programmed memory phenotype. In the periphery, they undergo expansion, driven by B cells, PLZF and possibly with the presentation of exogenous ligands. Adapted from Koay et al., Garner et al., 2018.

Similar to conventional T cells, MAIT cells also arise intrathymically, and are selected by MR1-expressing DP cortical thymocytes. This is in contrast to conventional T cells that are reactive to epithelial DP thymocytes that present self-peptides on MHC (Seach et al., 2013; Tilloy et al., 1999; Treiner et al., 2003). The semi-invariant MAIT TCR is also generated via V-J recombination, with Vα19/7.2 being the most distal segment in the Vα locus in mice and humans, respectively. Thus, formation of the MAIT cell TCR is more likely to occur at the late DP stage (Huang and Kanagawa, 2001; Jouvin-Marche et al., 2009), given that the V-J recombination proceeds sequentially from the 3' end (proximal) to the 5' end (distal) of the Vα locus, termed proximal to distal rearrangement (Guo et al., 2002). This is consistent with findings that altering survival signals of DP thymocytes significantly impacts on rearrangement of the Vα19 segment (Guo et al., 2002; Hu et al., 2010). iNKT cells are selected by CD1d presented endogenous lipid antigens (Bendelac et al., 2007), yet whether the MAIT cells require a similar antigen is unknown. Indeed, MAIT cells are not detectable by RT-PCR approaches in germ-free (GF) mice (Treiner et al., 2003); thus, it is plausible that a bacterial ligand might be present along with MR1-mediated intrathymic selection. Another question that needs addressing is whether they undergo negative selection. Studies on iNKT cells have indirectly suggested that DCs might play a role in the negative selection of overly autoreactive iNKT cells (Chun et al., 2003), and the addition of iNKT agonist αGalCer *in vivo* and *in vitro* has both significantly hindered the development of murine iNKT cells (Pellicci et al., 2003). This indicates that MAIT cells are also likely to undergo negative selection following positive selection on DP thymocytes.

Furthermore, Koay et al. identified a three-stage intrathymic pathway for MAIT cell development with a murine model (Koay et al., 2016). They describe the stage 1

CD24+CD44- population to be the least mature, which develop into CD24-CD44+ stage 2 cells, and ultimately into CD24-CD44+ stage 3 cells, with the largest phenotypic and functional overlap with circulating MAIT cells. In humans, stage 1/2/3 MAIT cells are CD27-CD161-, CD27+CD161-, and $CD27^{lo/+}$CD161+, respectively. Thus, CD161 – the common surrogate marker for MAIT cell identification in the blood and tissue – is not suitable for the investigation of human intrathymic MAIT cells. Of note, IL-18R is expressed by stage 3 MAIT cells both in human and mice. Preliminary findings show that stage 3 murine MAIT cells are of higher abundance than their stage 1 and 2 counterparts, suggesting that they are a proliferating population (Koay et al., 2016). Human MAIT cells, by contrast, are present in the thymus with low frequency irrespective of age (Gold et al., 2013; Martin et al., 2009) and their proliferative capacity in the thymus is yet to be thoroughly investigated.

Several factors are key to MAIT cell development. MR1 expression is a critical component in all three stages of MAIT cell intrathymic development, as the blockade of MR1 impairs the progression from stage 1 to stage 3 *in vitro* (Koay et al., 2016). The role of MR1 is further highlighted with evidence showing that peripheral MAIT cells are almost depleted in MR1-deficient mice (Rahimpour et al., 2015; Treiner et al., 2003). The promyelocytic leukaemia zinc finger protein (PLZF) is another key mediator in the process, governing the transition from stage 2 to stage 3 (Gold et al., 2013; Martin et al., 2009). The gradual acquisition of the PLZF phenotype in MAIT cells contrasts with iNKT cells, which also undergo a 3-step developmental programme (Griewank et al., 2007). Early iNKT progenitors in the thymus readily express high levels of PLZF, and expression levels rapidly decline as iNKT cells mature (Savage et al., 2008). Other critical factors in this process include

microRNAs (miRNAs), as well as IL-18 and commensal microbiota. Drosha, a member of the Ribonuclease (RNase) III superfamily, facilitates the progression from stage 1 to stage 2, as a murine drosha-deficient model shows accumulation of stage 1 MAIT cells in the thymus, as well as a reduction in the number of MAIT cells (Koay et al., 2016). IL-18 and commensally derived ligands are shown to drive MAIT cell to progress to stage 3, as germ free mice harbouring neither element show impeded MAIT cell development and reduced cell number (Koay et al., 2016). Stage 3 mature MAIT cells in human thymus coexpress the retinoic acid-related orphan receptor (ROR)γt and PLZF (Dias et al., 2016; Walker et al., 2012). This contrasts with stage 3 murine MAIT cells, which are divided into 2 subsets with mutually exclusive expression of RORγt and PLZF (Koay et al., 2016). It is unclear whether these two mouse subsets derived from the same progenitor or represent different developmental stages. Interestingly, mouse thymic iNKT cells are a heterogeneous population comprising of at least 3 characterised subsets, namely NKT1, NKT2 and NKT3 (Engel et al., 2016). It is worth investigating the specific signals required for commitment to the different iNKT cell subsets, and whether these signals are reminiscent of those underpinning the development of different intrathymic MAIT cell subsets.

PLZF is not only a critical component in stage 2 to stage 3 developments, but also necessary and sufficient to drive innate-like effector differentiation (Kovalovsky et al., 2008; Savage et al., 2008). Stage 3 mature MAIT cells acquire innate-like effector function in the thymus, and secrete IFN-γ and TNF-α upon activation, similar to MAIT cells in the periphery, although their functional potential is further boosted after peripheral expansion (Dias et al., 2017; Gibbs et al., 2017; Walker et al., 2012). This coincides with their enhanced expression of PLZF at stage 3. By

contrast, thymic stage 1 iNKT cells ($CD24^{lo}CD44^{lo}$) readily secrete cytokines upon stimulation, whose PLZF expression is at the peak level in all stages of iNKT cell development (Benlagha et al., 2002; Pellicci et al., 2002). In further support of the non-redundant role of PLZF in acquiring MAIT cell effector function, PLZF-deficient mice show almost completely abrogated MAIT cell development. The residual MAIT cells also exhibit reduced expression of characteristic and impaired cytokine secretion (Koay et al., 2016; Rahimpour et al., 2015).

Although MAIT cells can acquire effector function in the thymus in stage 3 and further enter the periphery, growing bodies of evidence suggest that stage 2 MAIT cells are the major progenitor for MAIT cells in circulation. This is supported by the fact that MAIT cells in humans typically exit the thymus as naïve cells and further mature in the periphery marked by a late increase in expression of CD161, IL-18R, and CD45RO (Ben Youssef et al., 2018; Dusseaux et al., 2011; Martin et al., 2009). Furthermore, stage 2 MAIT cells could be detected in the human cord blood and PBMCs from young donors, as well as the periphery of PLZF null mice, which lack stage 3 MAIT cells in the thymus (Koay et al., 2016). We still thus far lack critical understanding of the signals driving extrathymic development of MAIT cells, but studies have suggested that microbial antigen exposure (Chen et al., 2017) and/or other cytokine signals, e.g. IL-18, maybe linked to this process (Koay et al., 2018).

MAIT cells expand in the periphery in humans, albeit their relatively constant frequency in the thymus (Ben Youssef et al., 2018; Reantragoon et al., 2013; Walker et al., 2014). This is reminiscent of intrathymic iNKT cell expansion in mice. Interestingly, studies in humans and mice have found an inverse correlation between the number of MAIT and iNKT cells, such that humans have higher numbers of MAIT cells and lower iNKTs, and the reverse is true in mice (Godfrey et

al., 2015). This might be due to the competition for IL-7 between the innate lymphoid subsets (Martin et al., 2017), as IL-7 is required for the homeostasis and survival of mouse NKT17 cells (Webster et al., 2014). B cells are required for murine MAIT cell expansion in the periphery, as demonstrated by the absence of MAIT cells in B cell-deficient mice, and the induction of which following B cell transfer in iVα19/Vb6RAG$^{-/-}$ mice (Martin et al., 2009; Treiner et al., 2003). However, the role of B cells in human MAIT cell expansion requires further validation. Indeed, Treiner et al. observed a reduced frequency of MAIT cells in the periphery of 4 patients lacking B cells (Treiner et al., 2003). The reduction can nonetheless be due to the small sampling pool, as well as other confounding factors. For example, B cell-deficient patients are more prone to infections that can independently reduce MAIT cell frequency in the blood. The high abundance of MAIT cells in humans may be attributed to ongoing exposure to bacterial stimuli presented by MR1 (Lepore et al., 2014; Tilloy et al., 1999). This is supported by MR1-dependent MAIT cell proliferation of *in vitro* and *in vivo* following bacterial encounter, for example, in the lungs of mice infected with *S. Typhimurium* or *Francisella tularensis* (Chen et al., 2017; Meierovics et al., 2013). Furthermore, the restricted TCR repertoire in the adult blood, in contrast to the polyclonal MAIT cell population in the cord blood, may indicate their expansion in response to specific bacterial antigens.

B cells may be involved in the expansion of MAIT cells, yet the induction of MAIT specific phenotypes are likely to require other signals than the MAIT-B cell interaction, as mouse MAIT cells in the periphery remain mostly naïve (Martin et al., 2009). MAIT cells are dynamically regulated in humans, and demonstrate spatial and temporal-specific traits, indicative of robust post-thymic modulation. For example, coreceptor usage by MAIT cells within the thymus and adult blood is

different. DP or CD4+ MAIT cells are prevalent in the thymus, whereas adult blood MAIT cells are predominantly CD8+ and DN (Koay et al., 2018; Reantragoon et al., 2013). In addition, CD8+ MAIT cells in the thymus are mostly CD8αβ+, whereas in adult blood more than 50% are CD8αα+ which are thought to develop from peripheral CD8αβ+ cells (Walker et al., 2012). MAIT cells gradually acquire the memory phenotype (marked by CD45RO) and innate-like properties (marked by CD161 and IL-18R) shown by ontogenic studies comparing cord blood, young blood, and adult blood (Ben Youssef et al., 2018; Gold et al., 2013; Leeansyah et al., 2014). Meanwhile, MAIT cell gradually downregulate lymph node homing receptors including CD62L and CC chemokine receptor (CCR)7 (Dusseaux et al., 2011; Koay et al., 2018). The signals required for developing MAIT cells in the periphery are currently unknown.

1.3.4. MAIT cell tissue distribution

Following their peripheral expansion, human MAIT cells preferentially home to peripheral tissues (Koay et al., 2016). This is supported by their expression of chemokine receptors CCR6, CCR9, CXC chemokine receptor (CXCR)6, as well as tissue-resident markers, including integrin α4β7 (Kurioka et al., 2016), CD69, CD103 (Booth et al., 2015), and the cell adhesion molecule class I-restricted T cell-associated molecule (CRTAM) in the gut (Slichter et al., 2016), and Lymphocyte function-associated antigen 1 (LFA-1) in the liver (Jeffery et al., 2016). PLZF, expressed by the majority of the MAIT cells, may also play a role in acquiring tissue residency as it has been shown that murine CD4+ PLZF+ conventional T cells are more prone to liver accumulation (Thomas et al., 2011). MR1 tetramer studies have confirmed MAIT cell enrichment in the gut, although their frequencies were found to vary at different anatomical sites within the gastrointestinal tract. MAIT cells are of

the highest frequency in the jejunum (~60% of CD4- T cells) (Reantragoon et al., 2013), and comprise 2-10% of the T cell population in healthy ileum (Serriari et al., 2014), colon (Cosgrove et al., 2013) and rectum (Leeansyah et al., 2013). MAIT cells are also remarkably enriched in the liver (5-50% of T cells) (Dusseaux et al., 2011), and are abundant in the peripheral blood, representing up to 10% of peripheral blood T cells (Dusseaux et al., 2011). In addition, MAIT cells are also present in adipose tissues (Carolan et al., 2015), in the lung (Loh et al., 2016), and the female genital tract (Gibbs et al., 2017) to varying degrees, and the MAIT cell TCR transcripts have also been detected in tissues such as the prostate, kidneys and ovaries (Lepore et al., 2014). MAIT cells, in contrast, are rare in lymphoid tissues. This is in line with their lack of expression of the lymph node homing receptors CD62L and CCR7 (Billerbeck et al., 2010; Dusseaux et al., 2011). However, MAIT cells are also found in the lymph and may also be capable of recirculation – Voillet et al. suggest that those found in the lymph are more likely to have exited from non-lymphoid tissues (Voillet et al., 2018).

MAIT cells are rare in common WT lab strains of mice, in contrast to the abundance of their human counterparts (Tilloy et al., 1999; Kawachi et al., 2006). Using MR1 tetramers, the frequency of murine MAIT cells is found to vary between tissues, and also between different lab strains. For example, MAIT cells are the most enriched in the lung of B6 mice (mean 5% of T cells), whereas they are the most prevalent in the liver of BALB/c mice, accounting for up to 0.6% of total T cells. MAIT cells are also found in other murine organs including intestine, spleen, liver, lymph nodes, and thymus (Rahimpour et al., 2015). Interestingly, a wild-derived inbred CAST/EiJ mouse strain harbours 20 times more MAIT cells than the B6 mice (Cui et al., 2015), and MAIT cell frequency can additionally be boosted in WT mice following *S.*

Typhimurium infection, or by intranasal administration of 5-OP-RU with TLR2, TLR3, or TLR9 agonists (Chen et al., 2017).

1.3.5. MAIT cell phenotype and effector functions

The majority of MAIT cells are CD8+ T cells, a smaller fraction are DN, and very rarely are CD4+ (Reantragoon et al., 2013). This is different in mice, hence, the expression of CD4 and CD8 on MAIT cells are species- and tissue-specific (Rahimpour et al., 2015). Interestingly, more than 50% human CD8+ MAIT cells express the CD8αα homodimer – a characteristic unique to this subset as conventional CD8+ T cells express the CD8αβ heterodimer (Reantragoon et al., 2013; Walker et al., 2013). MAIT cells express chemokine receptors to home to tissues, and importantly possess a phenotypic signature that links them to functional versatility. MAIT cells acquire the memory phenotype and high surface expression of CD161 as well as IL-18R upon existing the thymus. High surface expression of CD161 is a shared phenotype of innate-like T lymphocytes irrespective of their lineages (Fergusson et al., 2014). CD161 is also a commonly used surrogate marker for the identification of adult MAIT cells, in combination with Vα7.2 (Kurioka et al., 2016). This accurately identifies MAIT cells because cells positive for these two markers largely overlap with those stained by MR1-tetramers (Magalhaes et al., 2015; Reantragoon et al., 2013).

Furthermore, the expression of IL-18R enables MAIT cells to rapidly secrete IFN-γ and TNF-α in response to innate triggers such as IL-12/-18 (Jo et al., 2014; Ussher et al., 2013). Recent studies have furthermore identified type I IFNs and IL-15 to be potent activator of MAIT cell effector functions (Sattler et al., 2015; van Wilgenburg et al., 2016). Cytokine-mediated MAIT cell activation complements the cognate TCR-MR1 interaction, and functions as another major component of host defence

when the bacterially derived riboflavin metabolite ligands are absent. For example, studies have shown that *E. faecalis* – which lacks the riboflavin synthesis pathway, and TLR agonists are able to activate MAIT cells *in vitro* in an IL-12/-18-dependent manner (Jo et al., 2014; Ussher et al., 2013). In keeping with this, murine MAIT cells control intracellular *M. bovis* bacillus Calmette-Guérrin (BCG) through IL-12 but independent of MR1 signalling (Chua et al., 2012). Furthermore, viral infections such as Dengue virus, influenza virus, and hepatitis C virus can induce cytokines capable of invoking MAIT cell functional responses in a cytokine-mediated, MR1-independent manner (Ussher et al., 2018). This robust cytokine responsiveness is indeed a shared feature of all innate-like T cells, which are so called due to their similar functional characteristics to NK cells (Cohen et al., 2013; Tomura et al., 1998). PLZF, the TF critical in human and mouse MAIT cell development *in vivo*, also drives to shape their innate-like functional response (Rahimpour et al., 2015; Savage et al., 2008). Along with expression of IFN-γ and TNF-α, MAIT cells are capable of IL-17A secretion, as indicated by their constitutively expression of type 17-associated molecules such as RORγt, IL-23R and CCR6 (Billerbeck et al., 2010; Dusseaux et al., 2011). However, human MAIT cells preferentially secrete type 1 cytokines as opposed to IL-17, as IL-17 production *ex vivo* is not detected upon TCR or cytokine stimulation alone (Slichter et al., 2016; Tang et al., 2013; Turtle et al., 2011). Instead, certain cytokines, including IL7 or IL-23/-1β, can induced IL-17 production in the presence of a TCR stimulus (Tang et al., 2013). Studies of MAIT cells in the tissue have also identified IL-17A expressing MAIT cells following PMA and ionomycin stimulation (Gao et al., 2016; Menon et al., 2014; Serriari et al., 2014).

In addition to cytokine secretion, MAIT cells display direct cytotoxic activity. This is shown by their ability to degranulate and kill/lyse cells infected by bacteria such as *BCG* and *Shigella* (Le Bourhis et al., 2013; Lepore et al., 2014). Resting MAIT cells are not efficient at killing because of their low cytotoxicity capacity – determined by their low GrB and perforin levels, in contrast to conventional CD8+ T cells (Kurioka et al., 2015). However, their cytotoxic capacity is greatly enhanced by a TCR stimulus and/or cytokine stimulation, and MAIT cells kill in an MR1-dependent manner (Dusseaux et al., 2011; Kurioka et al., 2015; Leeansyah et al., 2015; Sattler et al., 2015). Of note, GrB has been frequently used as an activation marker of MAIT cells after the description of the robust regulation of GrB expression by activated MAIT cells (Kurioka et al., 2015).

1.3.6. MAIT cell heterogeneity and subsets

Human MAIT cells appear a homogenous T cell subset, with highly conserved functions and phenotypes imprinted by the master TFs including PLZF, RORγt, and/or T-bet. This view has been challenged by the discovery of heterogeneous TCR Vα usage and differential ligand preference in mice (Meermeier et al., 2016; Reantragoon et al., 2013). Furthermore, a recent *in vivo* study on healthy human volunteers challenged with *S. Paratyphi* A examined the alteration of the MAIT cell clonotype composition during salmonella-induced enteric fever, and demonstrated that those expanded MAIT cell TCRβ clonotypes exhibit higher levels of activation (Howson et al., 2018). Recent findings also suggest that MAIT cells exhibit diverse, and tissue-specific cytokine release patterns. Lepore et al. characterised another subset of human MAIT cells with a functional Vα7.2-Jα12 (TRAV1-2-TRAJ12) rearrangement, and they identified MAIT cell subpopulations with differential cytokine secreting potentials both within in the same individual and when comparing

between different donors (Lepore et al., 2014). Furthermore, MAIT cells in the adipose tissue highly express IL-10, indicative of an immune suppressive function (Carolan et al., 2015). MAIT cells in IBD patients' blood, as well as from the female genital trait are more skewed to the Tc17 phenotype with increased IL-17 and IL-22 expression compared with blood MAIT cells (Gibbs et al., 2017; Haga et al., 2016). It is thus tempting to speculate that MAIT cell can also be further divided into various subsets with specific functions just like iNKT cells (Lee et al., 2015).

Human CD4+, CD8+ and DN MAIT cells have been recently investigated for their phenotypes and functions (Kurioka et al., 2017). Prior to this, MAIT cell coreceptor expression was considered minimally relevant to MAIT cells biology (Gherardin et al., 2018). This may be true for DN and CD8+ MAIT cells, as detailed phenotypical and functional analyses by Kurioka et al. revealed little disparity between these two subsets (Kurioka et al., 2017). However, the less abundant CD4+ MAIT cells in the periphery – stained either positive by CD161 and Vα7.2, or the MR1/5-OP-RU tetramer, display a remarkably altered phenotype marked by reduced Th1 cytokine production, low Eomesodermin (Eomes)/PLZF level and cytotoxic potential, and increased expression of CD62L (Kurioka et al., 2017). This suggests that CD4+ MAIT cells may comprise a functionally distinct population in the circulation and perhaps in tissues, although this hypothesis requires further validation. Interestingly, the CD4 MAIT subset seems to be inherently more heterogeneous compared to the CD8 and DN subsets. Some CD4+ CD161++Vα7.2+ T cells were not detected by the MR1 tetramer, suggesting they may possess a different antigen specificity (Kurioka et al., 2017).

1.3.7. MAIT cells in disease

1.3.7.1. MAIT cells in bacterial infections

The conserved MR1 molecule presents intermediates and derivatives of riboflavin synthesis in bacteria and fungi to the invariant MAIT cell TCR, with the most potent ligands being 5-OP-RU and 5-OE-RU (5-(2-oxoethylideneamino)-6-D-ribitylaminouracil) (Kjer-Nielsen et al., 2012). The specific recognition of riboflavin metabolites subsequently elicits a cascade of inflammatory and cytotoxic responses by MAIT cells, and could ultimately leads to pathogen clearance.

Indeed, a number of studies have suggested the protective role of murine and human MAIT cells in bacterial infections. Le Bourhis et al. first demonstrated that mouse MAIT cells are reactive to ligand-bound MR1, and were activated by a broad range of microbes including *Pseudomonas aeroginosa*, *Klebsiella pneumonia* (both Gram-negative), *Lactobacillus acidophilus*, *Staphylococcus aureus*, and *S. epidermidis* (all Gram-positive), as well as the fungal species including *Saccharomyces cerevisiae*, *Candida glabrata*, and *Candida albicans* (Le Bourhis et al., 2010). Furthermore, MR1-/- mice show greater susceptibility to bacterial infections. These MAIT cell-lacking mice have higher bacterial burden in the first following days following *Escherichia coli* (*E. coli*) or *M. abscessu*s challenge (Le Bourhis et al., 2010). MR1-/- mice were also overwhelmed by a fatal bacterial burden induced by intraperitonially injected *K. pneumonia* or *Francisella tularensis* (Georgel et al., 2011; Meierovics et al., 2013), in comparison to WT mice which were protected from the same challenges. Interestingly, mice that lack conventional αβ T cells were also protected from *in vivo F. tularensis* infection (Meierovics et al., 2013), suggesting the non-redundant role of MAIT cells in microbial control.

In parallel, *Mycobacterium tuberlulosis* (Mtb) was first identified to elicit immune responses by human MAIT cells (Gold et al., 2010), following which other microbes, including Candida (Dias et al., 2017; Gold et al., 2010, 2014; Le Bourhis et al., 2010; Meermeier et al., 2016), Lactobacillus (Corbett et al., 2014; Le Bourhis et al., 2010), Neisseria, Nocardia (Meermeier et al., 2016), Staphylococcus (Gold et al., 2010; Le Bourhis et al., 2010) and Streptococcus (Hartmann et al., 2018; Kurioka et al., 2018a; Meermeier et al., 2016) species were also found to trigger MAIT cell activation. The field is still expanding, and unpublished data from the Dunachie group demonstrate that human MAIT cells are also reactive to *Burkholderia pseudomallei*, a Gram-negative pathogen causing melioidosis in endemic areas (Dunachie et al., 2017). It is also not surprising to find that a number of these pathogens synthesise riboflavin through functional Rib enzymes (Chen et al., 2017; Corbett et al., 2014; Kurioka et al., 2018a; Soudais et al., 2015) and produce 5-A-RU which is a riboflavin precursor that can form the potent MAIT cell activating agonist 5-OP-RU (Corbett et al., 2014). The change of MAIT cell frequency in the tissue and blood further suggests their role in bacterial infections. For example, the frequency of MAIT cells is higher in the lungs of Mtb patients, and is lower in the blood (Gold et al., 2010; Le Bourhis et al., 2010), suggesting an active MAIT cell trafficking to the tissue during active infection. Patients with severe sepsis and septic shock displayed an early decrease in MAIT cell count, and patients with persistent MAIT cell depletion have higher incidence of further infections acquired in the intensive care unit, as compared to healthy controls, as well to as non-septic critically ill patients (Grimaldi et al., 2014). Furthermore, peripheral MAIT cells undergo phenotypic changes in Mtb with increased expression of PD-1 – an exhaustion marker indicative of chronic activation (Saeidi et al., 2015), and the blockade of which can enhance their responsiveness to BCG (Jiang et al., 2014).

In addition to direct anti-microbial responses, MAIT cells can contribute to microbial control via crosstalk with other immune cell subsets. MAIT cells may be a natural adjuvant to boosting protective antibody responses by B cells (Bennett et al., 2017). Peripheral human MAIT cells response to *Shigella dysenteriae* 1 (SD1) is concomitant with a immunoglobulin (Ig)A response specific to the Lipopolysaccharide (LPS) compartment of SD1 (Le Bourhis et al., 2013), and also correlated to protective IgA and IgG antibody responses induced by *Vibro cholera* O1- LPSs (Leung et al., 2014). Moreover, MAIT cells appear to be actively driving the differentiation and activation of myeloid cells. MAIT cells promote GM-CSF production in the lungs of *F. tularensis*-infected mice, leading to the differentiation of monocytes into DCs (Meierovics and Cowley, 2016; Meierovics et al., 2013). Furthermore, in another setting, MAIT cells upregulate CD40L and induce CD40-dependent DC maturation in the presence of 5-A-RU, which in turn promote the secretion of IL-12 in synergy with TLR ligands (Salio et al., 2017).

Thus, given their abundance in humans, their broad reactivity to a range of exogenous microbes, and their contribution to other adaptive and innate immune responses, MAIT cells are key orchestrators of anti-bacterial defence.

1.3.7.2. MAIT cells in viral infections

Early studies examining viruses, including herpes simplex virus, parainfluenza 3 virus, and an adenoviral vector or vaccinia virus, did not find evidence supporting viral activation of murine and human MAIT cells (Gold et al., 2010; Le Bourhis et al., 2010). This was perhaps because transgenic murine MAIT cells and human MAIT cell clones used by Gold et al. and Le Bourhis et al. lacked IL-18R expression, which is important in cytokine-mediated MAIT cell activation (Ussher et al., 2013).

Despite this, it is now clear that MAIT cells are also activated by viruses through cytokines released typically by APCs downstream of TLR ligation. Van Wilgenburg et al. were the first to demonstrate that viruses, including dengue virus, influenza virus, and hepatitis C virus (HCV) all activate MAIT cells to produce IFN-γ, TNF-α, and upregulate expression of CD69 and GrB in an IL-18-dependent manner (van Wilgenburg et al., 2016). This is corroborated by Loh et al. who found that monocyte-derived IL-18 is the critical mediator for MAIT cell activation by epithelial cells infected with the influenza virus (Loh et al., 2016). Other cytokines, for example, IL-12, IL-15, and type I IFNs are also involved in tuning effector functions of MAIT cells in the context of viral infections (Ussher et al., 2018).

It is not only the activation of MAIT cells that ensue from encounters with virally infection cells; MAIT cell frequencies are also markedly affected in human viral infections. There is now a wealth of data describing the depletion of peripheral and tissue-resident MAIT cells in various chronic infections, such as HCV (Beudeker et al., 2018; Bolte et al., 2017; Eberhard et al., 2016; Hengst et al., 2016; Saeidi et al., 2015), hepatitis B virus (HBV) (Yong et al., 2017), and human immunodeficiency virus (HIV) (Cosgrove et al., 2013; Leeansyah et al., 2013). In addition, observational data on acute infections caused by the pandemic H1N1 and H7N9 influenza strains show inverse correlation between MAIT frequencies and severity of disease (Loh et al., 2016; van Wilgenburg et al., 2016), similar to the relationship observed between MAIT frequencies and the degree of liver fibrosis in HCV infection (Bolte et al., 2017). This is important, since the loss of MAIT cells in viral infections may profoundly impact on microbial protection in patients, as illustrated by a study on macaques infected with simian immunodeficiency virus (Raffatellu et al.,

2008), and evidenced by the susceptibility of HIV-infected patients to other opportunistic infections such as TB (Corbett et al., 2003).

MAIT cells in virally infected patients also present enhanced expression of activation and/or exhaustion markers in the periphery and tissues (Barathan et al., 2016; Beudeker et al., 2018; Eberhard et al., 2016; Hengst et al., 2016). This is accompanied by loss of response to *E. coli* for blood and liver MAIT cells from patients with chronic HCV infection (Bolte et al., 2017; Hengst et al., 2016). Anti-viral therapies are proven useful in some cases to rescue certain MAIT cell effector functions. For example, Leeansyah et al. demonstrated the role of IL-7 to restore cytotoxicity and cytokine responses of MAIT cells in HIV patients (Leeansyah et al., 2015), and the frequency of CD38+ MAIT cells reduced in HBV patients to the normal level following Entecavir treatment (Boeijen et al., 2017). Some studies even found that MAIT cell numbers in HIV patients can be recovered following anti-retroviral therapy (Greathead et al., 2014; Khaitan et al., 2016). Thus, the acquisition of effector functions, change in the number and frequency, as well as dynamic regulation of phenotypes in infection and post treatment all points MAIT cells to a significant role in the immune system.

1.3.7.3. MAIT cells and autoimmune and inflammatory diseases

Genetic and environmental factors combine to contribute to the increased incidence of autoimmune and inflammatory diseases in the past 50 years. Autoimmune diseases seem to link to changes in the microbiota, particularly that in the gut, as reported in multiple diseases such as type 1 diabetes (Kostic et al., 2015), as well as inflammatory bowel diseases (IBD) (Round and Mazmanian, 2009; Swidsinski et al., 2002). Indeed, MAIT cells have thus far been shown to be implicated in a range of autoimmune and inflammatory diseases, likely due to their invariant TCR capable

of interaction with the microbiota (Meermeier et al., 2018), and high expression levels of tissue-homing markers indicative of their specific accumulation at inflammatory sites (Billerbeck et al., 2010; Dusseaux et al., 2011).

A number of studies have interrogated the role of MAIT cells in multiple sclerosis (MS). MS affects the central nervous system (CNS) and clinical manifestations include immunity deregulation, inflammation, and nerve degeneration (Compston and Coles, 2008; Ebers, 2008). A range of cells forming the innate and adaptive immunity can contribute to MS pathogenesis, but growing evidence highlights IL-17-secreting T cells (Tzartos et al., 2008), including MAIT cells. Despite conflicting findings about the change of MAIT cell frequency in the blood of MS patients (Annibali et al., 2011; Illés et al., 2004), multiple studies have shown that MAIT cells accumulate in inflammatory CNS lesions (Salou et al., 2016; Willing et al., 2014). Blood MAIT cells are a migratory subset that readily express CCR5, CD49d, and LFA-3, and their expression of LFA-1 and P-selectin glycoprotein ligand-1 (PSGL-1) was even more enhanced in MS patients (Rouxel and Lehuen, 2018). Another piece of evidence suggesting MAIT cell involvement in MS is the accumulation of MAIT cell-specific signals, such as IL-18, IL-23 (Li et al., 2007; Losy and Niezgoda, 2001), as well as MR1 transcript in the CNS lesions (Illés et al., 2004). MAIT cells, thus, can be activated *in situ* and given their enriched presence in MS lesions, they might exacerbate the disease by excessive production of proinflamatory cytokines such as IFN-γ and IL-17.

Other autoimmune and inflammatory diseases that may involve MAIT cells have recently been thoroughly reviewed by Rouxel et al. (Rouxel and Lehuen, 2018) and T Hinks (Hinks, 2016). These diseases include coeliac disease (Dunne et al., 2013), IBD (Haga et al., 2016; Hiejima et al., 2015; Serriari et al., 2014), systemic lupus

erythematosus (SLE), arthritis (Chiba et al., 2017; Hayashi et al., 2016), asthma (Ishimori et al., 2017), psoriasis (Li et al., 2017), Sjögren's syndrome (Wang et al., 2016), and type 1/2 diabetes (Magalhaes et al., 2015; Petersone and Walker, 2017). Interestingly, in many of these diseases, MAIT cells frequencies are reduced in the blood, increased in the inflamed tissues, and exhibit highly activated and exhausted status (Hinks, 2016; Rouxel and Lehuen, 2018). Most of the studies also describe MAIT cells as a key attribute to tissue damage in autoimmune disorders due to their cytotoxic and proinflammatory disorders (Kumar and Ahmad, 2018). However, recent studies have shed light on the potential protective role of type 17-asociated cytokines, IL-17A and IL-22 in the gut (O'Connor et al., 2009; Serriari et al., 2014). Studies on MAIT cell effector functions in various diseases suggest that they are a polyfunctional and even perhaps heterogeneous subset of cells, whose diverse functions are tissue-specific. This should be further determined by investigating the respective role of MR1 signalling and the local microenvironment with cytokine diversity. Furthermore, studies need to address whether these MAIT cells are directly participating in the disease, or rather simply bystanders that are affected by the disease.

The implications of MAIT cells in IBD are separately introduced due to their high relevance to this thesis.

1.3.7.4. MAIT cells in cancer

The role MAIT cells play in cancer is relatively less characterised compared with other infectious and autoimmune diseases. Peterfalvi et al. were the first to show that TRAV1-2-TRAJ33 transcripts enrich in brain and kidney tumours, thus confirming the presence of MAIT cells in human cancers (Peterfalvi et al., 2008). Recent studies suggest that MAIT cells may be more involved in mucosal-

associated cancers than non-mucosal cancers. Won et al. discovered that MAIT cells, defined by TRAV1-2 and CD161/CD281, are diminished in the periphery of patients with gastric, colon and lung cancers, and increased MAIT cell frequencies were observed in the tumour infiltrate. This suggests that MAIT cells are actively recruited from the blood to the tumour sites in these cancers (Won et al., 2016). These findings were further corroborated by other studies examining colorectal cancer (CRC) patients (Ling et al., 2016; Sundström et al., 2015; Zabijak et al., 2015). In CRC patients, increased degree of MAIT cell infiltration into tumours is also correlated with less favourable clinical outcomes marked by poor survival (Zabijak et al., 2015). Indeed, the composition of tumour infiltrating lymphocytes profoundly influence prognosis (Galon et al., 2006). A preponderance of cytotoxic T cells and Th1 CD4+ T cells independently shape better clinical outcome (Tosolini et al., 2011), whereas a type 17 response, which can lead to the expansion and accumulation of immunosuppressive myeloid-derived cells (Grivennikov et al., 2012; Wu et al., 2014), is a marker of bad prognosis in CRC (Kryczek et al., 2009). MAIT cells can both secrete IFN-γ and IL-17A, yet studies have suggested that they may undergo further function Tc17 differentiation in the gut environment and chronic inflammatory diseases (Serriari et al., 2014; Teunissen et al., 2014). These studies uniformly present the hypothesis that MAIT cells are indicators of poor clinical outcome due to their upregulated secretion of IL-17 in tumour tissues. Consistent with these ideas, tissue-resident MAIT cells, which are more poised to a type 17 function in inflammation, are one potential reason why IBD patients exhibit increased risk of CRC development (Jess et al., 2005). Interestingly, MAIT cells may also be a marker for better clinical outcome in cancers. A recent meta-analysis of expression signatures from ~18,000 human tumours found *KLRB1*, which encodes CD161 – a marker universally expressed by human MAIT cells; is the most

favourably prognostic gene (Gentles et al., 2015), and the expression of CD161 and its receptor Lectin-like Transcript 1 (LLT1) is associated with better clinical outcome in lung cancer (Braud et al., 2018). Thus, the role of MAIT cells in tumours may depend on the tumour microenvironment and the ratio between IFN-γ- and IL-17-expressing subsets, and it is a highly relevant field to further probe in for the development of MAIT cell-related cancer immunotherapy.

1.3.8. MAIT cells and the liver

The liver faces continuous exposure to the intestinal flora from portal venous blood and biliary reflux (Oo and Adams, 2010). However, in the presence of a healthy intestinal mucosa, the liver remains a sterile organ thanks to mesenteric lymph nodes that contains intestinal mucosal immune responses to the intestinal mucosal immune system (Balmer et al., 2014). The liver functions as a second firewall to prevent the systemic spread of gut-derived pathogens when the intestinal mucosal defences are breached (Balmer et al., 2014). The liver is a complex immunological organ that hosts a range of cells whose diverse functions are only just beginning to unravel. The presence of rapidly activated innate-like cells such as NK, iNKT, and MAIT cells in the liver are important to note (Kurioka et al., 2016).

The human liver has the highest frequency of MAIT cells amongst all organs and tissue investigated, with up to 50% intrahepatic T cells being MAIT cells (Dusseaux et al., 2011; Tang et al., 2013). This is in keeping with high expression of CXCR6, CCR6, and integrin αEβ7 by MAIT cells, which allows them to bind molecules constitutively expressed in the liver, chemokines CXCL16 and Chemokine (C-C motif) ligand (CCL)20, and E-caderin, respectively (Hieshima et al., 1997; Jeffery et al., 2016; Wilbanks et al., 2001). CCL20 is also upregulated in the inflamed liver and is responsible for the recruitment of CCR6+ T cells to the biliary epithelium (Bilzer et

al., 2006). Consistent with this finding, immunohistochemistry and confocal microscopy approaches confirmed concentrated MAIT cell presence in the peri-biliary region in portal tracts in both healthy and diseased livers (Jeffery et al., 2016). Moreover, Jeffery et al. also found that these MAIT cells were activated by *E. coli*-loaded biliary epithelial cells (BECs); thus, suggesting that MAIT cells can provide protection against bacterial infection ascending from the gut (Grant et al., 2002; Heydtmann et al., 2005; Jeffery et al., 2016). In addition to BECs, hepatic sinusoids are also key defenders against pathogens of the intestinal origin (Oo and Adams, 2010). To further support this, MAIT cells are shown to further home to human hepatic sinusoids (Tang et al., 2013), a process that is enhanced in inflammation, and likely to be mediated through CXCR3 and integrins LFA-1 and integrin α4β1expressed by MAIT cells (Jeffery et al., 2016).

Along with their enriched presence in the liver, intrahepatic MAIT cells possess distinct physiological features that underpin their critical contribution to liver immunosurvaillance. Liver MAIT cells and $CD56^{bright}$ NK cells are the major IFN-γ producers in the presence of TLR8 agonist single-stranded RNA (ssRNA)40 in an IL-12/-18-dependent manner (Jo et al., 2014), indicating that MAIT cells are one of the major subsets in the liver that provide protection against liver-invading viruses and bacteria. MAIT cells have also been studied in the context of several liver diseases. In alcoholic liver diseases (ALD), MAIT cells are depleted from the blood of ALD patients, with disrupted functional properties, including low cytokine production and responsiveness to *E. coli*. Intrahepatic MAIT cells also display defective expression of key innate-like/type-17 TFs, such as RORγt, PLZF, and Eomes (Riva et al., 2018). Similarly, blood MAIT cells are reduced in nonalcoholic steatohepatitis, primary sclerosing cholangitis and primary biliary cirrhosis (Jeffery et

al., 2016; Riva et al., 2018). Studies on chronic HCV patients, as discussed above, have also provided indirect evidence suggesting MAIT cells may play a role in HCV control and clearance (Barathan et al., 2016; Hengst et al., 2016; Saeidi et al., 2015). In these studies, MAIT cell dysfunction and local depletion is linked to susceptibility to infection, suggesting that they may be key contributors to maintaining homeostasis and providing pathogen protection. Conversely, the effector function of intrahepatic MAIT cells may be deleterious in liver diseases. MAIT cells are also the main source of IL-17 amongst intrahepatic T cells in response to PMA/ionomycin stimulation (Tang et al., 2018). Given that IL-17 induces liver cells, including Kupffer cells and BECs, to produce proinflammatory cytokines (Harada et al., 2009), MAIT cells may be pathogenic during hepatic inflammation and fibrosis. Furthermore, given the enrichment of MAIT cells in the peri-bilary region, as well as their upregulated expression of CD40L in response to their MR1-bound ligands (Salio et al., 2017), the interaction between MAIT cells and CD40-expressing BECs may lead to Fas-dependent apoptosis (Afford et al., 2001), and could potentially result in bile duct damage, and furthermore, biliary disease.

1.4. Cytokines in immune activation

IL-12, also known as NK cell stimulatory factor, is a heterodimeric cytokine composed of two subunits, IL-12p35 and p40 (Stark et al., 2013). Primarily produced by APCs, IL-12 stimulates T cell and NK cell proliferation, induces CD8+ T cell memory population, enhances T/NK lymphocyte lytic activity, induces production of IFN-γ by binding its specific receptor by activating signal transducer and activator of transcription (STAT) 4 which leads to c-Jun activation (Azzoni et al., 2014; Cho et al.). IL-12 plays a role in initiating and controlling cell-mediated Th1

cytokine production, and bridges early innate immune response and antigen-specific adaptive immunity (Zhang et al., 2014).

IL-18, also known as IFN-γ producing factor, belongs to IL-1 family, and is primarily produced by macrophages (Dinarello et al., 2013; Smith, 2011). IL-18 binds to IL-18R complex, a heterodimeric receptor consisting of IL-18Rα and IL-18Rβ, whose expression level is highly associated with CD161 expression on NK cells, B cells (Kunikata et al., 1998), as well as T cells (Lee et al., 2004; Nakanishi et al., 2001). IL-18 plays distinct roles in tuning cellular functions and phenotypes through activating mitogen-activated protein kinases (MAPKs) and NF-κB. In combination with IL-12, IL-18 induces IFN-γ production by B/T lymphocytes, dendritic cells and NK cells (Malmgaard and Paludan, 2003; Yang et al., 1999), yet it skews a variety of cell types, including T cells, NK cell and mast cells to the Th2 phenotype in the absence of IL-12 (Nakanishi et al., 2001). Growth arrest and DNA-damage-inducible (GADD) 45β might account for IL-12/-18 synergy. As an innate TCR-independent factor induced by IL-18 and augmented by IL-12, GADD45β expression triggers STAT4 phosphorylation, therefore leads to T cell IFN-γ secretion (Yang et al., 2001). Additionally, IL-12/-18 reciprocally augment each other's receptor expression on the cell surface (Yoshimoto et al., 2015), thus can synergistically enhance IFN-γ production by NK cells, B cells and T cells, including Th1 cells, and notably, human MAIT cells (Ussher et al., 2013; Yoshimoto et al., 2015).

The heterodimeric cytokine IL-23 belongs to IL-12 family, and is composed of IL-12p40, shared with IL-12, and a unique IL-23p19 subunit (Chen et al., 2015; Watford et al., 2004). IL-23 signals through IL-12Rβ1 and the specific IL-23R, and is associated with a variety of autoimmune diseases and inflammation disorders by induction of Th and Tc17 cells (Bellemare et al., 2014; Chen et al., 2015; Hoeve et

al., 2006; Kopp et al., 2015; Watford et al., 2004). Clinical data demonstrate increased IL-23 level and IL-23R mRNA upregulation at inflamed sites, and increased production of IL-17 by IL-23-stimulated patient PBMCs, suggesting that the IL-23/IL-17 axis plays a central role in disease pathology (Abbas et al., 2015). It has also been shown that IL-23 in synergy with TCR signalling, induces neonatal Vγ9Vδ2 T cells to produce IL-17 and IFN-γ (Moens et al., 2011).

IL-15 is a proinflammatory cytokine produced by macrophages (Grabstein et al., 1994), T cells (Branch, 1998), and mucosal epithelial cells (Budagian et al., 2006; Ma et al., 2006, 2015). IL-15 binds to the γ (CD132)/IL-2Rβ heterodimer, and a unique IL-15Rα chain, initiating intracellular signals, including Janus kinase (JAK)1/ STAT3 and JAK3/STAT5 pathways, leadings to cell activation (Mishra et al., 2014). Both bacterial and viral infection trigger IL-15 production, and it plays a critical role in NK cell differentiation and CD8+ memory T cell homeostasis (Liu et al., 2002), and augments TCR-induced $CD4^+$ T cell expansion in an IL-2-dependent manner (Cells et al., 2012). More recently and relevantly, IL-15 is shown to control human MAIT cell effector functions and induce Granzyme B (GrB) expression with concomitant IL-18 production by APCs (Sattler et al., 2015).

TNF-like ligand 1A (TL1A) was identified and first characterised by Migone et al. in 2002 as the ligand for Death Domain Receptor 3 (DR3), where it was described to induce NF-κB activation and apoptosis in DR3-expressing cell lines, and increase IL-2 responsiveness and secretion of proinflammatory cytokines both *in vitro* and *in vivo* (Migone et al., 2002). Further investigations have then shown that in humans, expression of TL1A and DR3 is present and strongly related to activated cells of the immune system. TL1A is commonly expressed by monocytes, dendritic cells (Prehn et al., 2007), and T cells (Bamias et al., 2003a), whereas its activating receptor DR3

is found on T (Prehn et al., 2004) and B cells (Cavallini et al., 2013), respectively. The diverse physiological functions of TL1A have also been extensively studied. For example, TL1A augments the IL-12/-18 trigger and enhance IFN-γ production in a range of human blood and mucosal T subsets and NK cells (Cohavy et al., 2011; Holmkvist et al., 2015; Papadakis et al., 2004, 2005). Further studies revealed that TL1A initiates and promotes the Th1, Th2, and Th17 effector functions *in vitro* and *in vivo*, also is involved in promoting tissue fibrosis (Jacob et al., 2018) and inhibiting Treg expansion (Sidhu-Varma et al., 2016). Thus, it is commonly believed that TL1A plays a pathogenic role in the IBD (Jacob et al., 2018; Jin et al., 2013), and other diseases such as experimental autoimmune encephalomyelitis (EAE) (Pappu et al., 2008), IBD-related CRC (Niu et al., 2018), asthma (Clarke et al., 2018), pulmonary sarcoidosis (Facco et al., 2015). Interestingly, the stimulatory function of TL1A can be beneficial for the proliferation and accumulation of antigen-specific CD8+ T cells, and may inform new anti-cancer therapies by promoting the differentiation of human anti-tumour CD8+ CTLs (Slebioda et al., 2011).

IFN-α/β binds to IFN-α/β receptor (IFNAR) complex that consists of IFNAR1 and IFNAR2 chains (Cho et al.; Sareneva et al., 2015), and the production of which by virus-infected macrophages is central to innate immunity (Sareneva et al., 2000; Tan et al., 2009). IFN-α/β signals through JAK-STAT pathway, and STAT1 is required to induce IFN-α/β-induced NK cell cytotoxicity. Similar to IL-12 signalling, IFN-α/β induces tyrosine phosphorylation and DNA binding of STAT4 to produce IFN-γ, however the upregulation of IFN-γ mRNA by IFN-α/β is earlier and more short-lived than by IL-12 in both T cells and NK cells (Deusen et al., 2015; Matikainen et al., 2001). Additionally, IFN-α/β synergises with IL-18 by enhancing IL-18R and myeloid differentiation primary response 88 (MyD88) expression by T

cells and NK cells. IFN-α/β is also believed to indirectly contribute to NK and T cell proliferation, possibly through IL-15 (Deusen et al., 2015).

Current knowledge on these cytokines regarding their signalling pathway and functions are summarised in the table blow:

Table 1-1. Summary of cytokines to be used for probing the activation of CD161-expressing cells.

Cytokine	Receptor	JAK/STAT	Other key mediators	Functions
IL-12	IL12RB1/ RB2	JAK2/STAT4	c-Jun	Th1 differentiation, proliferation, proinflammatory
IL-18	IL18R1/ RAP		IRAK,MyD88, MAPK, NF-κB	Proinflammatory
IL-15	IL15RA/ IL2RB/ IL2RG	JAK1,3/STAT 5		Proliferation, survival, differentiation, acquisition of cytotoxic potential
IL-23	IL12RB1/ IL23R	JAK2/STAT3		IL-17 production
Type I IFNs	IFNAR 1/2	JAK1/ STAT1,2		Antiviral response, regulation of immune responses, IFN-stimulating
TL1A	DR3	na	MAPK, NF-κB Caspase 8	Apoptosis, cytokine secretion, cell activation and proliferation

1.5. CD161 expression by innate-like T cells and NK cells

The increased understanding of both innate-like T cells and NK cells has clarified some of their shared phenotypes and functions, and at the same time, blurred the division between those previously considered distinct subsets based on their lineage markers. The key molecule shared by these subsets is the C-type lectin receptor CD161. Human NKRP1A, or CD161, is composed of a homodimer of ~40kDa subunits, and was originally found expressed by the majority of NK cells (Lanier et al., 1994). CD161 is also expressed by 20~30% of human T cells, on both CD4+ and CD8+ cells (Lanier et al., 1994), and also on TCRγδ+ T cells (Battistini et

al., 1997). Interestingly, two CD161-expressing subsets, CD161$^{high/++}$ and CD161$^{intermediate/+}$, respectively, are present within CD8+ T cells (Billerbeck et al., 2010). Studies have confirmed that the former subset consists mainly of MAIT cells in human adult blood (Fergusson et al., 2016; Ussher et al., 2013), and have furthermore characterised this distinct subset in various tissue, organs, and diseases, as introduced in previous sections of this chapter. The CD161 expression on CD4+ T cells is much more enriched in type 17 Th cells than Th1 or Th2 cells (Cosmi et al., 2008). These Th17 cells were shown to have the capacity to secrete IL-17A and IL-17F, and express RORγt (Ivanov et al., 2006). A recent study also characterised CD161 expression on human blood TCRγδ+ subsets, and described a higher expression of CD161 on Vδ1+ cells than Vδ2+ cells (~80% versus ~30%) (Provine et al., 2018).

The recent study by Fergusson *et al.* investigated a range of CD161-expressing T cells, including CD8+CD161++Vα7.2+ (MAIT), CD8+CD161++Vα7.2-, CD8+CD161+, CD4+CD161+, and TCRγδ+CD161+ subsets (Fergusson et al., 2014). This study probes genome-wide RNA expression of these T cell populations by microarray, which enabled them to define core transcriptional signature of CD161-expressing cells. Genes such as *ABCB1* (MDR1), *RORC* (RORγt), *ZBTB16* (PLZF), *IL12RB2* (IL-12 receptor subunit β2), and *IL18R1* (IL-18Rα) were significantly upregulated in these CD161-expressing subsets than their CD161- counterparts. This shared phenotypic feature, especially the elevated expression of IL-18R, is furthermore linked to their shared ability to secrete IFN-γ as an innate response to IL-12/-18 stimulation, independent of the TCR yet associated with CD161. Indeed, other studies have confirmed the common functional correlate of these CD161-expressing T cells subsets. Studies have confirmed the cytokine

response of CD4+ (Cohavy et al., 2011; Holmkvist et al., 2015) and TCRγδ+ T cells (Provine et al., 2018) with high CD161 expression. This shared transcriptional and functional feature has been extended to the world of NK cells (Kurioka et al., 2018b), and the role of CD8+ T cells with intermediate CD161 expression levels are beginning to be appreciated in human gut (Fergusson et al., 2016), as well as in diseases such as MS (Nicol et al., 2018).

The future studies should be focused on investigating tissue-specific and disease-specific roles of these CD161-expressing T cell subsets. Another active area is to investigate the physiological implications of CD161 expression on these interesting cells. Although CD161 ligation with its ligand LLT1 is generally believed to be inhibitory (Aldemir et al., 2005, Rosen et al., 2008, Le Bourhis et al., 2013), conflicting data also suggest a costimulatory role of the interaction (Aldemir et al., 2005; Exley et al., 1998; Fergusson et al., 2014). Furthermore, a recent report demonstrates that innate T cells and NK cells align along a continuous innate gradient, after investigating 19,931 genes from a genome-wide RNA expression analysis (Gutierrez-Arcelus et al., 2018). This sheds light on the degree of trade-off between effector (innate) and proliferative (adaptive) function, and may inform further research on key pathways that shape the innate landscape of these CD161-expressing subsets.

1.6. Inflammatory bowel diseases (IBD)

1.6.1. IBD: pathogenesis and susceptibility

IBD is represented mainly by ulcerative colitis (UC) and Crohn's disease (CD), and affects over 1 million residents in the US and 2.5 million in Europe (Kaplan, 2015). IBD features chronic remittent disorders in the gastrointestinal tract driven by a

robust cytokine-mediated inflammation of the gut (Strober et al., 2007). CD patients can present with inflammation in the whole digestive tract, from the mouth to anus, commonly with discontinuous ulceration and thickened bowel wall. In comparison, UC is diagnosed by a continuous inflammation of the colonic mucosa that nearly always involves the rectum (Fuss et al., 2004).

The pathogenesis of IBD is still incompletely understood. It is commonly thought that this disease is caused by a dysfunctional interaction between the mucosal immune system and the commensal bacteria in the gut (Duchmann et al., 2008; Wehkamp et al., 2005, 2018). Studies have further investigated the impact of a mucosal immune defect (for example, an over-reactive effector T cell population and an underreactive Treg cell population in the mucosae) (Darfeuille-Michaud et al., 1998; Fuss et al., 2004; Martin et al., 2004), as well as a profound abnormality in the gut microflora (drastic alterations in the number or type of the gut-resident bacteria) on the onset and progress of IBD using primary human tissue specimens and various mouse models (Swidsinski et al., 2002).

It is generally accepted that IBD is caused by both genetic and environmental factors. Several IBD susceptibility genes have been identified, including Nucleotide-binding oligomerization domain-containing protein 2 (NOD2) (Ogura et al., 2001) and IL-23R (Duerr et al., 2006). NOD2 is expressed on APCs and Paneth cells, and acts as a negative regulator of the key proinflammatory TF, NF-κB in musosal immunology (Podolsky, 2002). The intestine of IBD patients with impaired NOD2 modulation is more likely to excessively produce proinflammatory cytokines, leading to inflammation and disease (Uehara et al., 2004). IL-23 activity is present in the intestinal tract including terminal ileum (Becker et al., 2003) and colon (Fuss et al., 2006). A genome-wide association (GWAS) study on 308,332 single nucleotide

polymorphisms (SNPs) pooled from an American CD cohort identified a nonsynonymous SNP in the IL-23R gene that is related to IBD susceptibility (Duerr et al., 2006). Indeed, blocking the p40 subunit of the receptor – the shared subunit for IL-23 and IL-12 signalling – showed effective results in an IBD clinical trial by an anti-IL-12 antibody ABT-874/J695 (Mannon et al., 2004).

1.6.2. Innate and adaptive immune responses in IBD

Various immune cells are implicated in IBD immunopathology. DCs, due to their expression of a broad range of PRRs, are considered key to the initiation of inflammation in IBD. Myeloid DCs from UC and CD patients are hyper-responsive to LPS, and are the main producers of inflammatory cytokines such as IL-1, IL-6, IL-8, TNF-α, and nitric oxide, both in the blood (Baumgart et al., 2009; Ikeda et al., 2001; Murakami et al., 2002) and in the inflamed tissues (de Baey et al., 2003; Hart et al., 2005; Sakuraba et al., 2009). Colonic myeloid DCs are also strong drivers of Th17 differentiation of naïve T-cells in CD due to their enhanced expression of IL-17 and IL-23 (Ogino et al., 2013). DCs are depleted from the peripheral and accumulate at the sites of inflammation, indicating recruitment of DCs to the inflamed gut (Baumgart et al., 2005; Middel et al., 2006; Watanabe et al., 2007). This hypothesis is further supported by their expression of gut homing and chemokine or chemoattractant receptors such as integrin α4β7 (Baumgart et al., 2005), CCR6 (Watanabe et al., 2007), CCR7 (Middel et al., 2006), and CCR8 (Bernardo et al., 2012). The composition of the commensal microbiota may also influence DC immune modulatory functions. This finding potentially opens up novel avenues to harness the therapeutic potential of probiotic microbial species for IBD treatment (Bengtson et al., 2009).

The adaptive immune system plays a central role in the pathogenesis of IBD. Intestinal B cells are primarily located in the lymphoid follicles and as plasma cells in the lamina propria (LP) (Brandtzaeg and Johansen, 2005). The histological evidence of abundant lymphoid follicles and lymphoplasmacytic infiltrate in the inflamed gut supports the hypothesis that B cells are involved in IBD pathogenesis (Noronha et al., 2009). The normal IgA response of B cells at the mucosal sites is skewed towards IgG in chronically inflamed mucosa of IBD (Brandtzaeg et al., 2006), and this altered Ig response may be both deleterious and protective in IBD. The Fc fragments of IgG bind to Fcγ receptors (FcγRs) which could lead to immunoreceptor tyrosine-based activation motif (ITAM)-dependent activation of immune responses, resulting in tissue damage (Smith and Clatworthy, 2010). On the other hand, IgG antibodies enhance phagocytosis and are efficient in removing invading microbes, and, thus, may compensate for the abnormal IgA response in IBD and play a protective role (Brandtzaeg et al., 2006). B cells can further protect the host against IBD progression by serving as secondary APCs to condition the effector functions of T cells that have already been primed with professional APCs such as DCs (Knoechel et al., 2005; Wolf et al., 1996). B cells are shown to suppress proliferation of effector CD4+ T cells in a contact-dependent manner (Mizoguchi et al., 2000), induce the differentiation of regulatory CD8+ intraepithelial T cells in the presence of MHC class I antigen presentation (McPherson et al., 2008), and enhance the expansion of Tregs (Mizoguchi et al., 2000; Rafei et al., 2009).

The homeostatic gut environment is in part maintained by the orchestrated activities of regulatory and effector T cells, the aberrant activity of either arm of the equilibrium could result in inflammation. Most IBD studies have predominantly

centred on the CD4+ T cell subset – CD has been classified as a mixed Th1/17 disease (Fujino, 2003). On the other hand, UC was originally described to be a Th2-associated disease with elevated levels of IL-5 and IL-13 in diseased mucosae (Fujino, 2003; Fuss et al., 2004). Recent studies have furthermore reported the presence of IL-17 in UC tissues, making UC a Th2/17 disease (Fujino, 2003). Tregs possess suppressive capacity to inhibit proliferation and activation of effector T cells, and by origin there are naturally occurring Tregs generated in the thymus, and "induced" regulatory T cells arising in peripheral tissues in the presence of certain anti-inflammatory cytokines. (Harrison and Powrie, 2013; Mayne and Williams, 2013). Studies have suggested both populations are essential and non-redundant in IBD control.

Thus, key players in innate and adaptive immunity may contribute to IBD pathogenesis, and warrant further investigation for the development of novel IBD therapies.

1.6.3. MAIT cells and IBD

Multiple studies have discussed the pivotal role of Th17 cells in IBD pathogenesis, and they are a group of cells believed to exclusively originate from a small subset of naive T cells expressing CD161 (CD161+CD4+ T cell progenitors) (Cosmi et al., 2008). The overlapping signatures of MAIT cells and CD161+ Th17 cells – the abundance of MAIT cells in mucosal tissues, together with their Tc1/17 phenotype, tissue homing property, expression of CD161, IL-23R, and RORγt (Billerbeck et al., 2010; Dusseaux et al., 2011), collectively have made MAIT cells a potential new player in the quest for new therapeutics for IBD (Kumar and Ahmad, 2018; McGovern and Powrie, 2007; Treiner, 2015).

Both CD and UC patients display a decreased number of blood MAIT cells, accompanied by their accumulation at the inflamed sites of the gut (Haga et al., 2016; Serriari et al., 2014). Several studies on altered functional responses of MAIT cells in IBD have later indicated their relevant roles in IBD pathogenesis. Haga et al. demonstrated that IL-17 producing MAIT cells were significantly enriched in the blood of UC patients compared to healthy controls (Haga et al., 2016), consistent with findings made by Serriari et al in UC and CD patients (Serriari et al., 2014). Serriari et al. have also described decreased IFN-γ secretion in CD patients, suggesting a further change of MAIT cell cytokine secretion pattern in IBD. In the same study, MAIT cells also showed enhanced proliferative capacity as well as the level of activation marked by increased NKG2D and herpes virus entry mediator (HVEM) expression (Serriari et al., 2014), providing more evidence towards their involvement in IBD physiopathology. Interestingly, the study by Hiejima et al. provided contrasting evidence that the number of MAIT cells not only decreased in the blood of IBD patients, but also in inflamed intestinal mucosae (Hiejima et al., 2015) and this is mostly likely due to enhanced proapoptotic features of MAIT cells in peripheral blood and inflamed mucosa of IBD patients.

Given the enhanced IL-17A secretion in the peripheral blood of IBD patients, it is thus believed that MAIT cells with a strong proinflammatory response in IBD are deleterious. However, IL-17A can also confer protection against microorganisms, according to a number of studies. Furthermore, MAIT cells, when stimulated by bacteria, TCR beads or innate cytokine cues, expressed minimal amount of IL-17A. Thus, the role that MAIT cells play in IBD requires further investigation.

1.7. Aims and hypotheses of thesis

Key questions of interest are marked in red in Figure 1-3. To clarify, this thesis will address the differential impact of TCR-dependent and -independent signalling on the activation of human blood MAIT cells. Functional properties of gut- derived human CD8+CD161++/MAIT cells in response to integrated cytokine and/or TCR stimuli will also be examined. MAIT cells from the blood and tissues of IBD patients will be furthermore characterised for their phenotype and effector functions upon activation. Finally, whether CD161-expressing CD4+ T cells share phenotypical and functional features with MAIT cells in human gut and blood, will be investigated.

Therefore, in this thesis, I seek to test the following hypotheses:

1. Blood CD8+ MAIT cells are broadly responsive to a range of cytokines other than IL-12/-18, such as type I IFNs, IL-15, and TL1A;
2. The TCR signal and cytokine cues differentially impact on the outcome of MAIT cell activation;
3. MAIT cells possess novel physiological functions at barrier sites;
4. The functionality of MAIT cells is altered in the gut compared with in the blood, and is further modulated in IBD;
5. CD161-expressing CD4+ T cells retain the innate-like phenotype and are a phenotypically and functionally distinct subset in the gut.

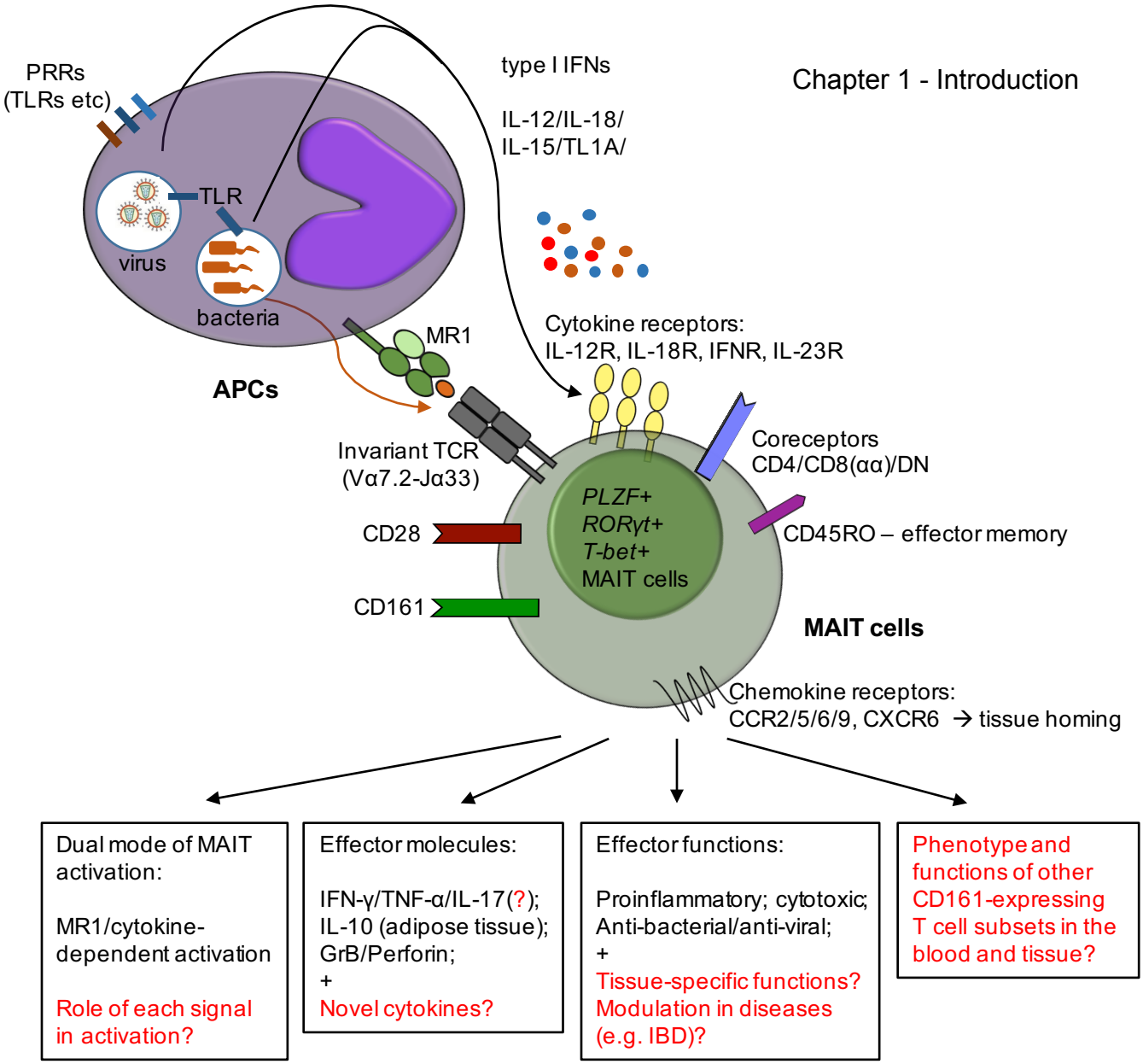


Figure 1-3. Main characteristics of MAIT cells and mechanisms of MAIT cell activation. MAIT cells express a semi-invariant TCRα chain, CD161, and a range of cytokine and chemokine receptors. These features enable MAIT cells to be activated by their cognate bacterial antigen presented MR1, as well as cytokines released by APCs in a TCR-independent manner. This thesis discusses the contribution of each pathway to MAIT cell activation. MAIT cells express T-bet and RORγt which orchestrate IL-17 and IFN-γ production upon activation. Other effector functions of MAIT cells include rapid release of GrB and perforin. This thesis explores novel effector molecules released by activation MAIT cells using transcriptome approaches. Furthermore, given their specific enrichment at mucosal sites, this study describes the modulation of MAIT cell phenotype and effector functions in healthy and inflamed gut. Lastly, this thesis characterises other CD161-expressing T cells in humans regarding their distribution, phenotype and functions.

2. MATERIALS AND METHODS

2.1. Media and buffers

R10

RPMI 1640 (Sigma Aldrich) + 10% heat-inactivated fetal calf serum (FCS; Gibco) + 2mM L-Glutamine (Gibco) + 1X Penicillin-Streptomicin solution (Gibco)

Complete media

R10 + 40 μg/ml Gentamicin + 25 ng/ml Amphotericin B + 10 μg/ml Ciprofloxacin (all from Sigma Aldrich)

THP1 media

R10 + 50 μM β-mercaptoethanol (Sigma Aldrich)

Freezing mix

90% heat-inactivated FCS (Gibco) + 10% dimethyl sulfoxide (DMSO; Sigma Aldrich)

MACS buffer

Phosphate buffered saline (PBS) + 2mM ethylenediaminetetraacetic acid (EDTA; Sigma Aldrich) + 0.5% heat-inactivated FCS (Gibco)

2.2. Cells

2.2.1. Human peripheral blood samples

Adult peripheral blood mononuclear cells (PBMCs) were separated from whole blood leukocyte cones (NHS Blood and Transplant, UK) with the blood of healthy donors, or from healthy volunteers in the department. Information regarding patients blood and tissue samples were listed in thesis section **4.2.**

2.2.2. THP1 cells

THP1 cells (ECACC, UK) were maintained in THP1 media at between 2 x 10^5 and 1 x 10^6 cells/ml for maximum viability.

2.2.3. Fixed E. coli cells

Single colonies of *E. coli* (DH5l, invitrogen) were picked, added to LB broth (5 ml) and cultured at 37°C overnight in a shaker incubator (225 revolutions per minute, rpm) alongside a sterility control (5ml LB with no *E. coli*). *E. coli* were then pelleted by centrifugation (4,000 rpm; 5 minutes (mins)), washed extensively with filter-sterilised PBS, and fixed in 1% formaldehyde solution for 20mins at room temperature. *E. coli* were washed twice with PBS (4,000 rpm; 5 mins), and resuspened in 1ml PBS. The sterility control was processed identically. *E. coli* cell counts were estimated by flow cytometry (MACSQuant). *E. coli* were added to experimental wells at 25 bacteria per cell (BpC) unless otherwise indicated.

2.3. Isolation of cells

2.3.1. PBMC separation

Concentrated leukocytes and red blood cells, collected as a by-product during plateletpheresis, were diluted with PBS to a final volume of 50ml. The suspension was then layered over Lymphoprep^{TM} separation medium (STEMCELL Technologies), then centrifuged for 22 mins at 22°C (2222 rpm, with no brake). The PBMC layer – in between the Lymphoprep and PBS-diluted plasma layers – was then collected with a Pasteur pipette and washed twice with RPMI at 1500 rpm for 10 mins. Cells were further diluted 100 times and counted by MACSQuant prior to further use or freezing.

Frozen PBMCs were stored in a liquid nitrogen tank. For thawing, they were partially thawed in a 37°C water bath, then slowly transferred by a Pasteur pipette into warm R10 supplemented with 0.1% deoxyribonuclease (DNase I; Sigma Aldrich). Cells were then washed and resuspended in R10 for further use.

2.3.2. CD8+ T cell isolation

CD8+ T cells were isolated from PBMCs by positive selection using CD8 MicroBeads (Miltenyi Biotec), following the manufacturer's protocol. Purity was consistently > 90%.

2.3.3. CD8+ MAIT cell sorting

MAIT cells were sorted from pre-enriched CD8+ T cells. CD8+ T cells were counted (MACSQuant) and resuspended in 100µl antibody cocktail. Cells were stained for CD161-PE and Vα7.2-FITC (10 mins; 4°C), washed twice and resuspended in MACS buffer for sorting. SYTOX blue – a nucleic acid binding viability dye – was added prior to MAIT cell Fluorescence-activated cell sorting (FACS) kindly performed by Christian Willberg and Chan Phetsouphanh on a Beckman Coulter MoFlo XDP cell sorter. Purity was consistently > 95% according to gating of live cells, lymphocytes, Vα7.2+ and CD161++. A representative sorting plot is included (Figure 2-1).

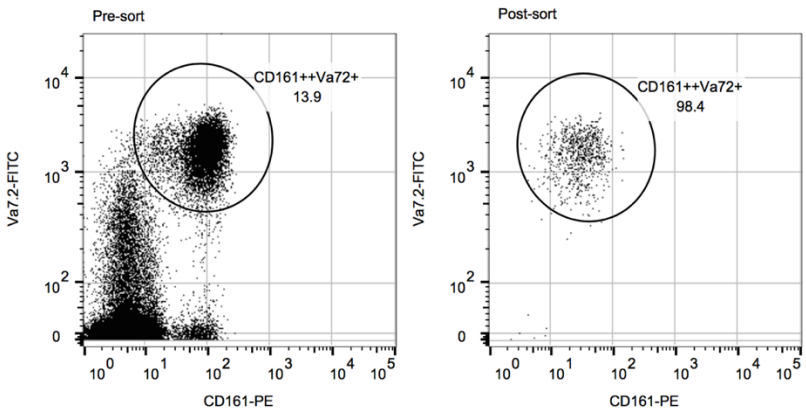


Figure 2-1. CD8+ T cell populations (including MAIT cells) pre- and post- sort.

2.4. Cell culture

2.4.1. TCR beads activation of T cells

Anti-CD3/28 beads (also called in this thesis TCR beads) were prepared using the T cell Activation/Expansion kit (Miltenyi Biotec). The anti-biotin MACSiBead particles were coated with CD3-biotin and CD28-biotin at 10μg/ml following the manufacturer's protocol. Blood and tissue-derived cells were incubated with anti-CD3/28 beads at a bead-to-cell ratio of 1:1 for 6 or 20 hours prior to further investigation.

2.4.2. Cytokine stimulation

Information regarding the human recombinant cytokines used to stimulate lymphocytes is listed in the table below. Concentrations were used as follows except for dose-dependent assays performed in ***Chapter 3***.

Table 2-1. List of cytokines used.

Cytokine	Concentration	Incubation time	Manufacturer
IL-12	2 ng/ml	20 hours	Miltenyi Biotec
	50 ng/ml	6/20 hours	
IL-18	50 ng/ml	6/20 hours	MBL International
IL-15	25 ng/ml	20 hours	Miltenyi Biotec
TL1A	100 ng/ml	20 hours	R&D
IL-23	50 ng/ml	6/20 hours	Miltenyi Biotec
IFN-α	2,000 unit/ml	6/20 hours	Miltenyi Biotec
IFN-β	50 ng/ml	6/20 hours	R&D

2.4.3. *E. coli* activation of MAIT cells

$8x10^4$ THP1 cells, $2x10^6$ fixed *E. coli*, 10^5 enriched CD8+ T cells or 10^6 lymphocytes, in the presence or absence of blocking agents, or their corresponding isotype controls, were incubated for the indicated incubation length (between 5 and 28 hours), as described in the thesis. The 25 BpC ratio was maintained except in the dose-dependent study described in Figure 3-13. Information regarding the blocking agents is listed in the table below.

Table 2-2. List of blocking agents used.

Pathway blocked	Type of reagent	Clone	Isotype control	Working concentration	Manufacturer
MR1	mAb*	26.5	Mouse IgG2a, κ	5 µg/ml	BioLegend
IFN-α/β	SR**	NA	NA	1 µg/ml	eBioscience
IL-12/-23 p40	mAb**	C8.6	Mouse IgG1, κ	5 µg/ml	BioLegend
IL-18	mAb	125-2H	Mouse IgG1	5 µg/ml	MBL
IL-15	mAb	34593	Mouse IgG1	5 µg/ml	R&D
TL1A	mAb	293327l	Rat IgG1	5 µg/ml	R&D

* mAb: monoclonal antibody; ** SR: soluble type I IFN receptor

2.5. Flow cytometry

2.5.1. List of human fluorochrome-conjugated antibodies

Table 2-3. List of human fluorochrome-conjugated antibodies.

Antibody	Colour	Clone	Dilution	Manufacturer
Surface markers				
CD3	eFluor 450	OKT3	1 : 100	Invitrogen
	PE-Cy7	UCHT1	1 : 50	eBioscience
	PerCp-Cy5.5	UCHT1	1 : 50	eBioscience
CD4	VioGreen	M-T466	1 : 25	Miltenyi Biotec
	PerCp-Cy5.5	OKT4	1 : 50	eBioscience

CD8	VioGreen	REA734	1 : 50	Miltenyi Biotec
	eFluor 450	OKT8	1 : 100	eBioscience
	PE-Cy7	REA734	1 : 50	Miltenyi Biotec
CD161	PE	191B8	1 : 50	Miltenyi Biotec
	PE-Cy7	191B8	1 : 50	Miltenyi Biotec
	APC	191B8	1 : 50	Miltenyi Biotec
Vα7.2	FITC	3C10	1 : 50	BioLegend
	APC	3C10	1 : 50	BioLegend
	PE-Cy7	3C10	1 : 50	BioLegend
	PerCp-Cy5.5	3C10	1 : 50	BioLegend
TCR Pan γ/δ	FITC	IM1571U	1 : 50	Beckman Coulter
	APC-Cy7	11F2	1 : 50	Miltenyi
IL-18Rα	PE	NA	1 : 50	R&D
Antibody	**Colour**	**Clone**	**Dilution**	**Manufacturer**
CD39	PE	A1	1 : 50	BioLegend
PD-1	BV421	EH12.2H7	1 : 50	BioLegend
CD45RA	PE-Cy7	HI100	1 : 50	BioLegend
CCR7	FITC	G043H7	1 : 50	BioLegend
CD69	FITC	FN50	1 : 40	eBioscience
Integrin β7	APC	FIB504	1 : 50	BioLegend
CD103	APC	B-Ly7	1:50	eBioscience
Transcription factors				
RORγt	PE	Q21-559	1 : 100	Becton Dickinson
PLZF	APC	IC2944A	1 : 25	R&D
Intracellular markers				
IFN-γ	FITC	45-15	1 : 50	Miltenyi Biotec
	PE-Cy7	4S.B3	1 : 50	BioLegend
TNF-α	PerCp-Cy5.5	MAb11	1 : 50	BioLegend
	PE-Cy7	MAb11	1 : 50	BioLegend
GrB	APC	GB12	1 : 100	Invitrogen
IL-17A	PE	eBio64CAP17	1 : 25	eBioscience

2.5.2. Surface staining

Cells were first washed in PBS and pelleted in a well of a 96-well U-bottom plate by centrifugation (1,800 rpm, 4mins). Cell pellets were broken up and stained by a master mix containing fluorochrome-conjugated antibodies at optimised dilutions (Table 2-3) and LIVE/DEAD™ Fixable Near-IR Stain (Invitrogen), an amine reactive

dye to exclude dead cells, diluted 1,000 times. Cells were incubated at 4°C for 15mins, and subsequently fixed by 2% formaldehyde (Sigma Aldrich) at 4°C for 15 mins. Cells were then washed and resuspended with PBS for flow cytometer acquisition or further intracellular staining.

2.5.3. Intracellular cytokine/GrB staining

For intracellular staining, Brefeldin A (BioLegend) was added at 1:1000 dilution for the final 4 hours of the stimulation before the surface staining was performed. Cells were further washed with 1X Permeabilisation buffer (diluted from 10X Permeabilisation buffer with water, eBioscience), and resuspended with antibodies diluted in 1X Permeabilisation buffer. Following 25-min incubation with antibodies at room temperature, cells were washed and resuspended with PBS for flow cytometer acquisition.

2.5.4. Transcription factor staining

TFs were stained using the Foxp3/TF Staining Buffer Set (eBioscience). Cells were surface stained, washed with PBS, and resuspended in 1X Fixation/Permeabilisation buffer for 60 mins at room temperature. After washing with 1X Permeabilisation buffer (eBioscience), cells were further stained in 1X Permeabilisation buffer with antibodies that detect the TFs of interest at optimised dilutions for 45 mins at room temperature. The cells were subsequently washed and resuspended in PBS.

2.5.5. Data acquisition and analysis

Data were acquired on a MACSQuant Analyser (Miltenyi Biotec) and analysed using FlowJo software (Tree Star, Inc.). The expression of markers was determined

according to the appropriate isotype control or fluorescence minus one (FMO) sample.

2.6. Statistical analysis

All statistical analyses were performed using Prism software version 7 (GraphPad). Data presented in the text and figures are means with standard error of the mean (S.E.M.). * $p<0.05$, ** $p<0.01$, *** $p<0.001$, **** $p<0.0001$, ns = non-significant, by the indicated statistical test in each figure legend.

3. CYTOKINE AND TCR -MEDIATED ACTIVATION OF BLOOD-DERIVED MAIT CELLS

3.1. Introduction

3.1.1. Various MAIT cell subsets defined by their coreceptor expression

CD4 and CD8 coreceptor molecules can enhance conventional T cell signalling by binding their MHC molecules on APCs (Janeway, 1992). However, the mechanisms for CD4 and CD8 expression on unconventional T cells whose antigen recognition process do not require interacting with the MHC molecules is unknown. There is evidence supporting that an efficient CD8 coreceptor function requires the cooperation of the CD8β chain (Arcaro et al., 2001). However, this pathway is unlikely to impact on MAIT cell activation, given a large proportion of polyfunctional CD8+ MAIT cells express the CD8αα homodimer (Walker et al., 2012, 2013). In fact, the CD8αα homodimer is thought to have an inhibitory role in T cell activation due to its ability to decreases antigen sensitivity by hindering the interaction between $p56^{lck}$ and the TCR (Cheroutre and Lambolez, 2008). The robust functional properties of MAIT cells suggest a limited role of coreceptors in MAIT cell activation (Kawachi et al., 2006; Meierovics et al., 2013). Of course, these coreceptors may still impact on MAIT cell function, as human CD4+ MAIT cells constitute a functionally and phenotypically distinct subset in comparison to CD8+ and DN MAIT cells (Kurioka et al., 2017).

Given that the majority of MAIT cells in human blood are CD8+ T cells, this thesis specifically studies CD8+ MAIT cells.

3.1.2. MR1-mediated MAIT cell activation

Mechanisms underlying MR1 presentation of antigen and activation of human MAIT cells have been extensively explored. MR1 adopts a standard MHC-I fold, and is very homologous with HLA-A2 and CD-1d (Godfrey et al., 2008; Kjer-Nielsen et al., 2012c; López-Sagaseta et al., 2013; Lopez-Sagaseta et al., 2013; Reiser et al., 2002). However, different from the open-structured, peptide/lipid favouring CD1d and MHC, two α helices (α1 and α2) of the MR1 structure form a tight and closed antigen binding cleft, which consists of a mixture of charged and hydrophobic residues, thus, antigens with aromatic residues are preferred (Kjer-Nielsen et al., 2012c). 6-FP, a derivative from folic acid metabolism, as well as derivatives of riboflavin (vitamin B2) are known MR1 ligands, with rRL-6-CH2OH being a potent activating ligand (Kjer-Nielsen et al., 2012c). Modified human/mouse MR1 tetramers loaded with rRL-6-CH2OH or 5-OP- RU (Rahimpour et al., 2015) have been developed and used for MAIT cell detection (Gold et al., 2014; Rahimpour et al., 2015; Reantragoon et al., 2013c).

The conserved antigen presenting pathway is key to detecting and killing invading microbes for MAIT cells (Chen et al., 2017; Dias et al., 2016; Le Bourhis et al., 2010). Despite this specific antigen recognition as an effector T cell, the MR1-TCR signaling alone is insufficient to fully activate MAIT cells. In order to achieve sufficient activation, TCR signaling is supported by other co-stimulatory signals such as CD28 and notably by cytokines, for example, IL-18 and IL-12 (Turtle et al., 2015). This is true in mouse cells examined *in vivo*, where normal expansion is only seen if ligand is delivered with a TLR-stimulus (Chen et al., 2017).

3.1.3. Cytokine-mediated MAIT cell activation

The expression of IL-18R enables MAIT cells to rapidly secrete IFN-γ and TNF-α in response to innate triggers such as IL-12/-18 (Jo et al., 2014; Ussher et al., 2013). Recent studies have furthermore identified type I IFNs and IL-15 to be potent activator of MAIT cell effector functions (Sattler et al., 2015; van Wilgenburg et al., 2016). Cytokine-mediated MAIT cell activation complements the cognate TCR-MR1 interaction, and functions as another major component of host defence when the bacterially derived riboflavin metabolite ligands are absent. For example, studies have shown that *E. faecalis* – which lacks the riboflavin synthesis pathway, and TLR agonists are able to activate MAIT cells *in vitro* in an IL-12/-18-dependent manner (Jo et al., 2014; Ussher et al., 2013). In keeping with this, murine MAIT cells control intracellular BCG through IL-12 but independent of MR1 signalling (Chua et al., 2012). Furthermore, viral infections such as Dengue virus, influenza virus, and hepatitis C virus can be sensed by MAIT cells and subsequently invoke function response in a cytokine-mediated, MR1-independent manner (van Wilgenburg et al., 2016). This robust cytokine responsiveness is indeed a shared feature of all innate-like T cells, which are so called due to their similar functional characteristics to NK cells (Cohen et al., 2013; Tomura et al., 1998). PLZF, the TF critical in human and mouse MAIT cell development *in vivo*, also drives to shape their innate-like functional response (Rahimpour et al., 2015; Savage et al., 2008).

3.2. Aims

1. Investigate the individual and combinatory effect of TCR signalling and cytokines on promoting MAIT cell activation;
2. Study the timing of MAIT cell activation induced by different signals;

3. Study whether MAIT cell effector function can be further enhanced by other cytokines;
4. Analyse the role of MAIT cell-related cytokine and MR1 signals in orchestrating *E. coli*-induced MAIT cell activation;
5. Investigate and compare the impact of innate and adaptive signals on MAIT cell activation on the transcriptional level.

3.3. Chapter-specific materials and methods

3.3.1. RNA samples

CD8+ MAIT cells were sorted and for each stimulation (cytokines and/or TCR beads) 10^5 MAIT cells were used. Cells were lysed after a 20-hour incubation, and RNA was then extracted with an RNeasy Micro kit (Qiagen) following the manufacturer's protocol.

3.3.2. Quantitative polymerase chain reaction (qPCR)

3.3.2.1. Reverse-transcription using Superscript III for cDNA synthesis

For each RNA sample, the following reaction mix was made:

Reagent	Manufacturer	Volume/reaction
RNA	extracted	2µl
Hexamer (random primers)	Invitrogen	1µl
OligodT	Invitrogen	1µl
dNTP	Invitrogen	1µl
dH_2O	NA	8µl

The mix was then incubated at 65°C for 5mins, kept on ice for 1min, the following reagents were then added to the reaction mix:

Reagent	Manufacturer	Volume/reaction
5X First Strand Buffer	Invitrogen	4µl
0.1M dithiothreitol (DTT)	Invitrogen	1µl
RNase Out	Invitrogen	1µl
Superscript III	Invitrogen	1µl

The reaction mix, at a final volume of 20µl per reaction, was first incubated at 25°C for 5mins, then 50°C for 60mins, and 70°C for 15mins. 1µl RNase H (Invitrogen) was added to each reaction following a 20min 37°C incubation. cDNA was subsequently used for real-time PCR or stored in -20°C for future use.

3.3.2.2. Real-time PCR (RT PCR)

Technical triplicates were performed for each sample on a white LightCycler 480 96 -well plate (Roche). The reaction mix for OSM and HEBGF cDNA quantification was prepared as follows:

Reagent	Manufacturer	Volume/reaction
cDNA	NA	2µl
Universal Probe #N	Roche	0.3µl
10µM forward primer	Eurofins	1µl
10µM forward primer	Eurofins	1µl
LightCycler® 480 Probes Master	Roche	10µl
dH_2O	NA	5.7µl

For detection of IL-26 mRNA, a 20X IL-26 human TaqMan® probe was used (Hs00218189_m1) with 2X TaqMan® Fast Advanced Master Mix (both from ThermoFisher Scientific). The reaction mix for each well was prepared as follows:

Reagent	Manufacturer	Volume/reaction
cDNA	NA	2µl
IL-26 Taqman probe	Life Technologies	1µl
Taqman Fast Advanced Master Mix	Life Technologies	10µl
dH_2O	NA	7µl

All RT PCR reactions were performed in a LightCycler® 480 (Roche). Human GAPDH mRNA levels were quantified and used for normalization for each sample.

The programme for RT PCR with a LightCycler 480 hydrolysis probe is shown below:

	Pre-incubation	Amplification (40 cycles)			Cooling	Hold
Temperature (°C)	95	94	58	72	40	4
Time	5mins	10s	30s	10s	10s	Until use

The programme for RT PCR with an IL-26 Taqman probe is shown below:

	Pre-incubation	Polymerase activation	Amplification (40 cycles)		Cooling	Hold
Temperature (°C)	50	95	95	60	40	4
Time	2mins	10mins	15s	1min	10s	Until use

3.3.2.3. List of RT PCR primers and their corresponding Universal Probe number

Gene	**Probe number**	**For/Rev**	**Sequence (5'-3')**
GAPDH	63	For	ccccggtttctataaattgagc
		Rev	cttccccatggtgtctgag
HBEGF	55	For	tggggcttctcatgtttagg
		Rev	catgcccaacttcactttctc
OSM	4	For	cttccccagtgaggagacc
		Rev	ctgctctaagtcggccagtc

3.3.2.4. Data analysis

Absolute quantification in conjunction with the second derivative method was performed in the LightCycler 480 software to obtain the threshold cycle (Ct) value for each gene in the samples. For one specific sample, the relative expression value for a gene of interest (A) was calculated as follows:

Relative mRNA level = $2^{-\Delta Ct}$, where Δ Ct = average Ct value of GAPDH - average Ct value of gene A. The average Ct value was the arithmetic mean of Ct values derived from technical triplicates.

3.3.2. RNA sequencing (RNAseq)

The quantity and quality of extracted RNA was first evaluated using both a nanodrop spectrophotometer and the Agilent 2100 bioanalyzer. All samples had RNA integrity values greater than 9 and were free from contaminating protein and organic compounds. RNAseq was performed by Wellcome Trust Centre for Human

Genetics (University of Oxford) on a HiSeq4000v platform. Gene lists that were differentially expressed (>4 fold, P<0.01, false discovery rate FDR<0.05) between various conditions and their normalised expression values, as well as the principle component analysis (PCA) plots, were generated with Partek® Flow®, an online analysis platform for Next Generation Sequencing data (http://www.partek.com/partek-flow/), following the user's guide. Volcano plots were generated with Prism software. Heat maps were generated using normalised counts with Heat Mapper (http://www.heatmapper.ca/expression/) with the averaged linkage clustering method and Pearson distance measurement method. Venn diagrams were drawn with an online diagram drawing platform developed by Ghent University, Belgium (http://bioinformatics.psb.ugent.be/webtools/Venn/). Gene set enrichment analysis (GSEA) was performed using GSEA version 3.0 (Subramanian et al., 2005), comparing gene expression data as a whole with the reference gene list (Appendix Table 8) obtained from the publication by Linehan et al. (Linehan et al., 2018).

3.4. Results

3.4.1. MAIT cells are present in the blood

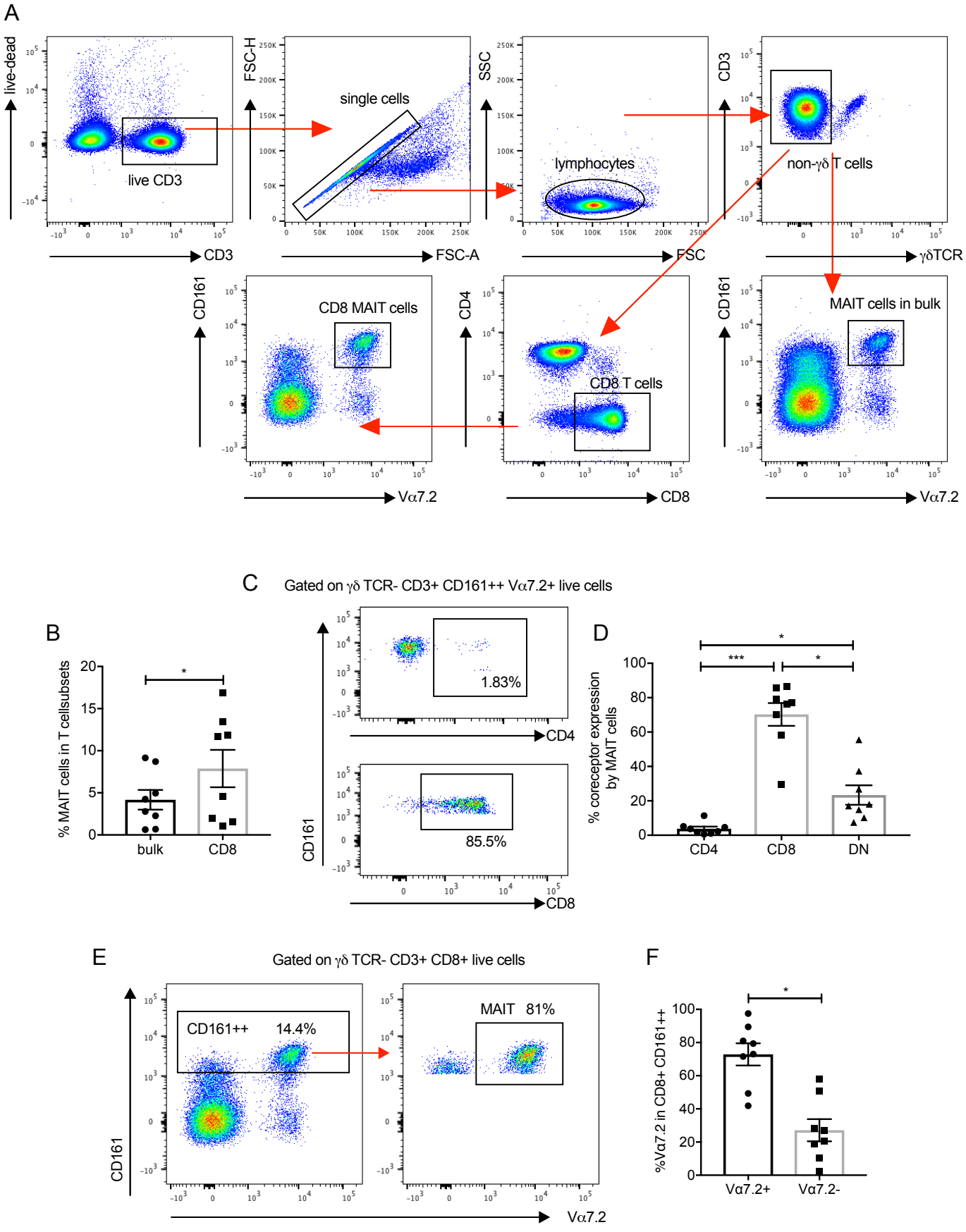
MAIT cells are identified by the MR1-5-OP-RU tetramer in human and mouse (Rahimpour et al., 2015; Reantragoon et al., 2013). However, studies have confirmed that staining human T cells for CD161 and the canonical Vα 7.2 TCR segment includes the majority of tetramer-positive MAIT cells (Martin et al., 2009; Reantragoon et al., 2013; van Wilgenburg et al., 2016). Therefore, CD161 and Vα 7.2 were routinely used as surrogate markers to identify human MAIT cells in this thesis. This chapter presents findings on blood MAIT cells from healthy individuals.

To investigate the prevalence of MAIT cells in the blood, the expression of CD161 and Vα7.2 was analysed on PBMCs separated from healthy human blood. MAIT cells, identified by the co-expression of CD161 and Vα7.2, were found amongst *ex vivo* bulk CD3+ T cells, as well as in the CD8+ T cell compartment (Figure 3-1A). Cumulative data of 8 donors show that MAIT cells accounted for on average 4.2 ± 1.2% of bulk γδ- CD3+ T cells, and were significantly more enriched within the CD8 T cell subset, where MAIT cells acaccounted for 7.9 ± 2.2% of the population (Figure 3-1B). The majority (mean 70.3 ± 6.6%) of MAIT cells in the blood were CD8+, 24.53 ± 5.7% of them were double negative, and a very small proportion of them expressed CD4 (mean 3.8 ± 1.2%), in line with previous reports (Kurioka et al., 2017) (Figure3-1C, D).

A large proportion (mean 72.9 ± 6.7%) of CD161++ CD8+ T cells at rest expressed the Vα7.2 TCR, *i.e.* are MAIT cells (Figure 3-1E, F). The remaining Vα7.2- T cells are less often investigated, yet evidence supports that that they demonstrate a comparable response to a range of *ex vivo* stimulatory conditions (Fergusson et al., 2014; Ussher et al., 2013).

Figure 3-1. MAIT cells are present in the blood of healthy donors. Enriched in the CD8 compartment, they are a major component of CD161++ CD8+ T cells. Fresh blood samples were taken from 8 healthy donors, and PBMCs were subsequently isolated. γδ T cells were excluded from analysis. A) Gating strategy demonstrating identification of MAIT cells from the bulk γδ TCR- CD3+ T cells, as well as γδ TCR- CD3+ CD8+ T cells. B) % MAIT cells in either bulk CD3+ cells or the CD8+ T cell compartment. C) Representative plots demonstrating the co-receptor expression (e.g. CD4/CD8) on MAIT cells. D) % MAIT cells that were CD4+, CD8+, or DN. * $p<0.05$, *** $p<0.001$ by repeated measures one-way ANOVA, with Turkey's multiple comparisons test. E) Representative plots demonstrating the usage of the canonical Vα7.2 TCR segment amongst CD161++ CD8+ T cells. * $p<0.05$ by paired student t test. F) % CD161++ CD8+ cells that were either stained positive or negative for the Vα7.2 TCR. * $p<0.05$ by paired student t test. N = 8. Results shown as mean ± S.E.M.

Figure 3-1


A
live-dead
live CD3
CD3
FSC-H
single cells
FSC-A
SSC
lymphocytes
FSC
CD3
non-γδ T cells
γδTCR
CD161
CD8 MAIT cells
Vα7.2
CD4
CD8 T cells
CD8
CD161
MAIT cells in bulk
Vα7.2
B
% MAIT cells in T cellsubsets
bulk
CD8
C
Gated on γδ TCR- CD3+ CD161++ Vα7.2+ live cells
1.83%
CD4
CD161
85.5%
CD8
D
% coreceptor expression by MAIT cells
CD4
CD8
DN
E
Gated on γδ TCR- CD3+ CD8+ live cells
CD161++ 14.4%
MAIT 81%
CD161
Vα7.2
F
%Vα7.2 in CD8+ CD161++
Vα7.2+
Vα7.2-

3.4.2. MAIT cells are transiently activated following TCR ligation

MAIT cells, as demonstrated in Figure 3-1, bear the canonical Vα7.2 TCR segment, which restricts MAIT cells to antigens presented by MR1 on APCs. Next we sought to understand the responses of MAIT cells to TCR triggering, and relevant changes in MAIT cell effector functions and cytotoxic phenotype.

We first examined the responsiveness of MAIT cells to anti-CD3/CD28 beads. CD8+ T cells were enriched from PBMCs prior to stimulation to reduce impact of cytokines released from Th cells. Each sample had a > 90% post-enrichment purity (Figure 3-2A). The percentage of MAIT cells expressing IFN-γ, TNF-α, GrB, and CD69 (Figure 3-2B) was measured by flow cytometry. The production of IFN-γ was greatly elevated 6 hours after co-incubation with anti-CD3/CD28 beads, where on average 13.3 ± 1.6% of MAIT cells released IFN-γ. By contrast, IFN-γ production in MAIT cells was significantly reduced to the baseline level (mean 1.12 ± 0.34%) at 20 hours. In a similar fashion, at 6 hours the percentage of TNF-α producing MAIT cells rapidly rose to 13.0 ± 2.9%, and significantly reduced to the baseline level (mean 3.89 ± 1.1%) at 20 hours. The observed reduction in the responsiveness of MAIT cells is in line with previous reports, and the rapid yet transient response to TCR triggering is a distinct feature of CD8+ MAIT cells (Slichter et al., 2016; Turtle et al., 2011). The kinetics of GrB upregulation was different from that of IFN-γ or TNF-α. MAIT cells were unable to upregulate the cytotoxic marker within 6 hours, but the percentage of MAIT cells expressing GrB rose to 74.3 ± 8.3% at 20 hours. MAIT cells also increased their expression of CD69 in a time-dependent manner. 63.0 ± 3.8% of MAIT cells were positive for the tissue resident/activation marker at 6 hours, and at 20 hour the percentage significantly elevated to 92.1 ± 1.8% (Figure 3-2C). CD161- CD8+ T cells were also studied as a control population (Figure 3-2D),

Figure 3-2

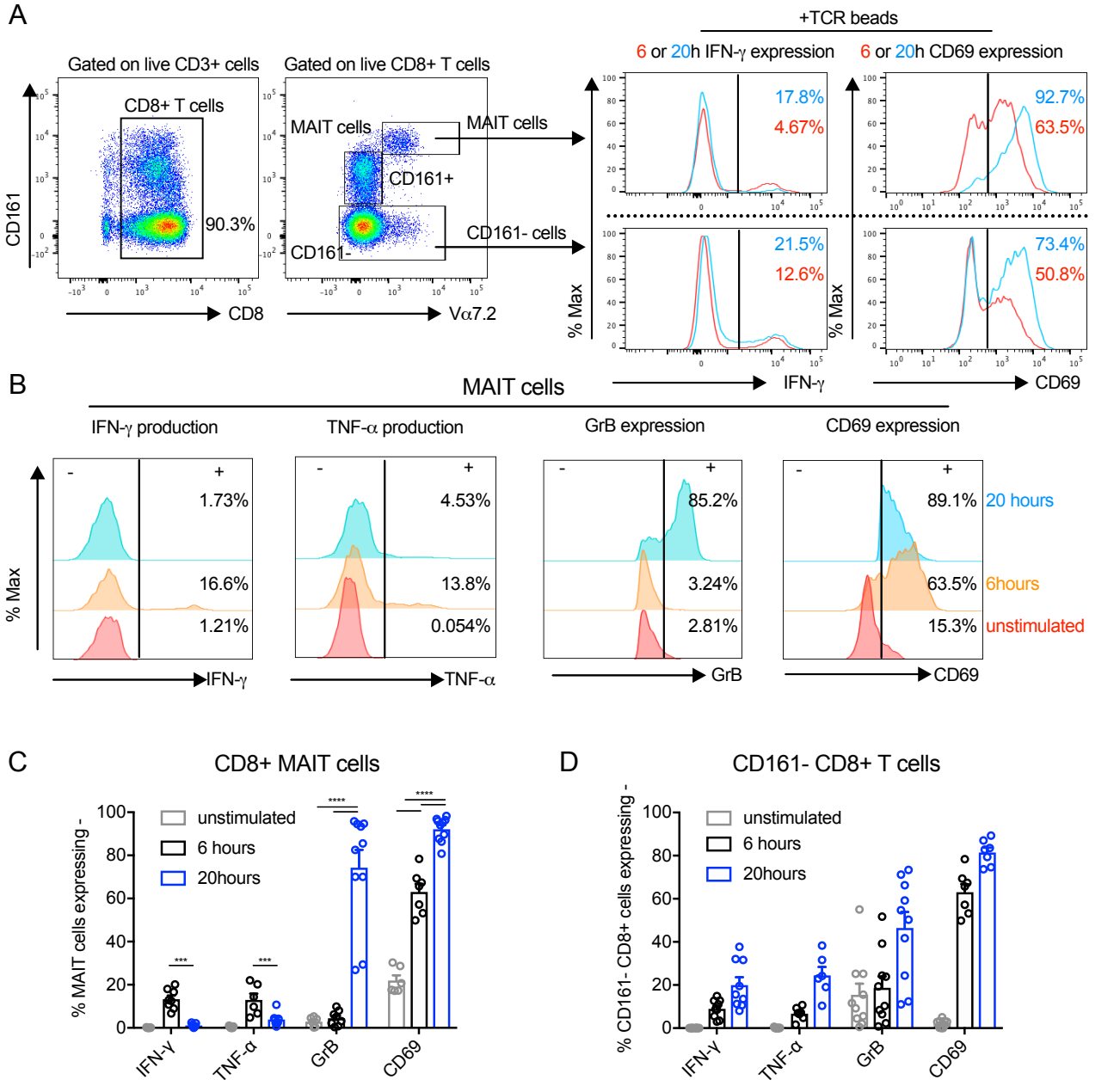


Figure 3-2. The activation of MAIT cells at early (6 hours) and late (20 hours) time points. A) Representative FACS plot demonstrating post-enrichment purity of CD8+ T cells, the expression of IFN-γ and CD69 in CD8+ T cell subsets divided by their surface CD161 expression. B) Representative histograms showing the kinetics of IFN-γ, TNF-α, GrB, and CD69 expression following anti-CD3/CD28 triggering measured at 6 hours and 20 hours post stimulation. Half-offset histogram shows modal y-axis scaling (% max. count per condition). C, D) Percentage of MAIT (C) or CD161- CD8+ (D) cells positive for IFN-γ, TNF-α, GrB, and CD69 in response to 6/20 –hour anti-CD3/CD28 bead stimulation. N = 10. Results shown as mean ± S.E.M, *** p<0.001, **** p<0.0001 by two-way repeated measures ANOVA, with Turkey's multiple comparisons test.

where their expression of IFN-γ, TNF-α, GrB, and CD69 increased in a time-dependent manner.

To conclude, MAIT cells are a unique subset whose IFN-γ and TNF-α production is transient and peaks at early hours of contact with anti-CD3/CD28 beads. Therefore, it is relevant to examine extra signals for MAIT cell activation that may compensate for their hypo-responsiveness to the TCR triggering.

3.4.3. MAIT cells respond to fixed *E. coli*

Next, we investigated the activation of MAIT cells by fixed *E.coli* and THP1 cells (Figure 3-3A). We asked if the effector functions MAIT cells elicited by bacterial challenge, would be comparable to those in the anti-CD3/CD28 stimulation model.

The extent of Vα7.2 TCR downregulation was first examined in the presence of *E.coli* stimulation. 6 hours after co-incubation with *E. coli*, the proportion of Vα7.2+ cells within the CD161++ CD8+ subset markedly decreased to 54.5 ± 7.3% from 87.8 ± 4.1% at rest, and this loss in Vα7.2 expression was sustained when same donors were re-analysed at the 20-hour time point (Figure 3-3B, C). This suggests that the invariant TCR was promptly down-regulated during antigenic encounter, in line with previous studies showing that peptide MHC-triggered TCR/CD3 complexes are internalised and targeted for lysosomal degradation (José et al., 2000). The downregulation of MAIT TCR poses a potential challenge to detect activated MAIT cells with flow cytometry using either via Vα7.2 antibodies or MR1 tetramers. Given this, as well as the fact that MAIT cells account for the majority of the CD161++ CD8+ T cells, MAIT cells are defined as CD161++CD8+ T cells when responses were assessed with the THP-1/*E. coli* model.

CD8+ T cells were enriched from 7 healthy donors, and the percentage of MAIT cells expressing IFN-γ, TNF-α, GrB, and CD69 was measured by flow cytometry. MAIT cells exhibited limited effector functions and low levels of activation at 6 hours post stimulation by *E. coli*, with insignificant IFN-γ or TNF-α release, GrB upregulation, or CD69 expression. However, MAIT cells reached a significant state of activation at 20 hours. 35.1 ± 8.6% MAIT cells produced IFN-γ, 13.7 ± 4.8% produced TNF-α, 40.5 ± 10.6% upregulated their GrB expression, and 69.6 ± 8.2% expressed CD69 (Figure 3-3D). CD161- CD8+ T cells were also assessed for their expression of and CD69 (Figure 3-3E). From time point 0, to 6 hours, and lastly to 20 hours, the expression level of IFN-γ, TNF-α, and GrB by CD161-CD8+ T cells was constitutively low, and there was only a slight and insignificant increase in the percentage of CD69-expressing cells. This suggests that CD161-CD8+ T cells in the blood responded minimally to the MAIT/CD161++CD8+ T cell subset.

Lastly, whether the *E. coli*-induced activation was a result of the TCR-MR1 interaction was examined. Enriched CD8+ T cells were incubated with THP1 cells and *E. coli* for 20 hours in the presence of absence of an MR1 blocking antibody. The production of IFN-γ, TNF-α, and expression of GrB by CD161++ CD8+ T cells was abrogated in the presence of the MR1 blocking antibody, and the expression of CD69 was significantly reduced as well (Figure 3-3E). Given the low level of activation achieved by MAIT cells at the 6-hour time point, data relevant to 6-hour MR1 blockade is not shown.

Figure 3-3

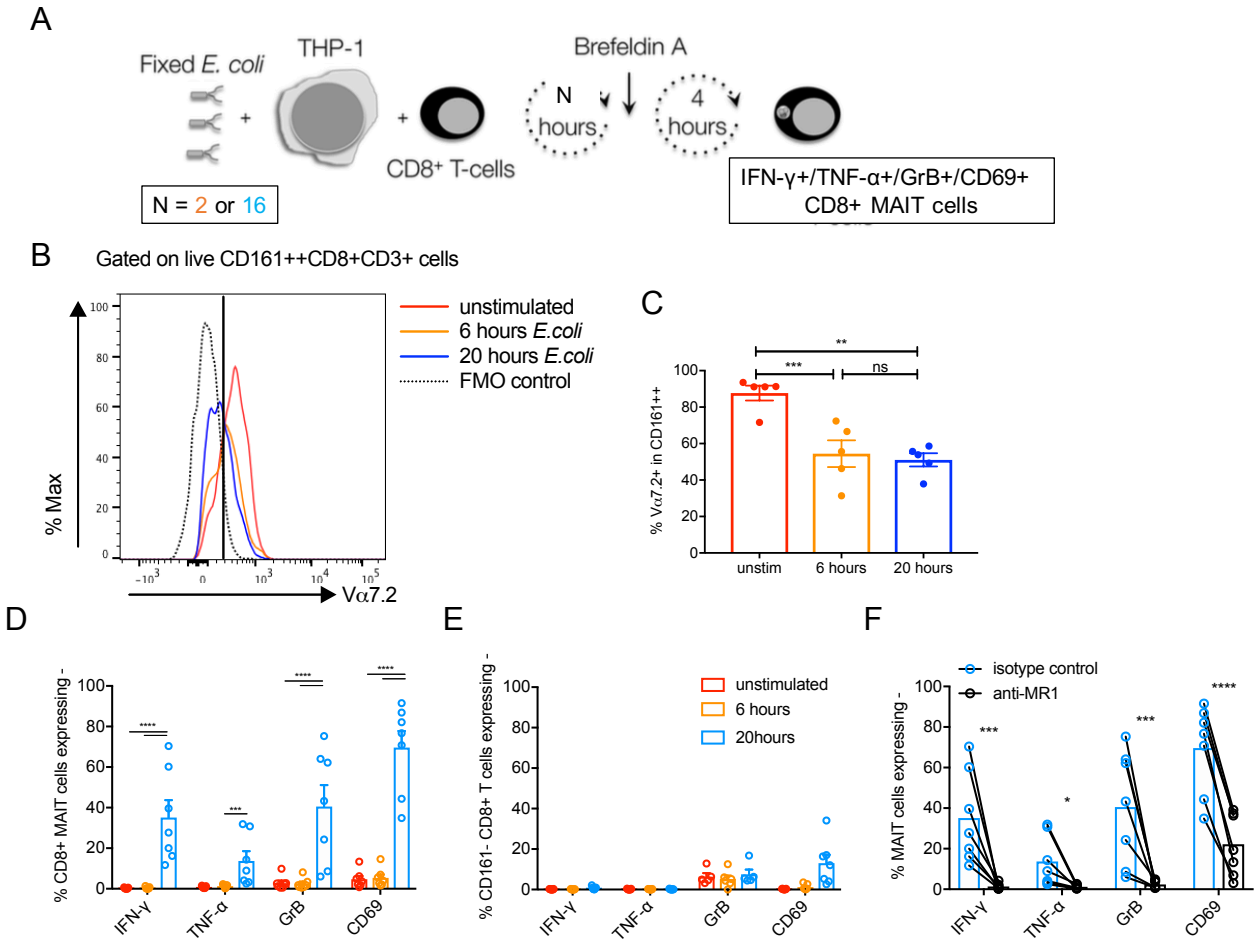


Figure 3-3. *E. coli* stimulates CD161++/MAIT CD8+ T cells in a MR1-dependent manner. A) A schematic view of the 6/20 hour E. coli stimulation. Brefedin A was added in the culture for the last 4 hours after CD8+ T cells, THP-1 cells, and E. coli were co-cultured for 2 or 16 hours, respectively. B) A representative sample whose Vα7.2 TCR expression in the CD161++CD8+ compartment was examined at rest, 6 hours or 20 hours post co-incubation with THP1 cells and *E.coli.* C) Cumulative frequencies showing Vα7.2 TCR expression on the CD161++CD8+ subset at indicated time points (n=5). ** p<0.01, *** p<0.001 by repeated measures one-way ANOVA, with Turkey's multiple comparisons test. D, E) Percentage of CD161++CD8+ T cells (D) or CD161-CD8+ T cells (E) that express IFN-γ, TNF-α, GrB, and CD69 in response to 6/20- hour in vitro *E.coli* stimulation (n=7). Results shown as mean ± S.E.M, **** p<0.0001 by two-way repeated measures ANOVA, with Turkey's multiple comparisons test. F) Percentage of CD161++CD8+ T cells expressing IFN-γ, TNF-α, GrB, and CD69 in the presence or absence of the MR1 blocking antibody after co-incubation with *E.coli* for 20 hours (n=7). * p<0.05, *** p<0.001, **** p<0.0001 by multiple t tests. Results shown as mean ± S.E.M.

3.4.4. MAIT cells are innate-like T cells that robustly respond to specific cytokine cues

IL-12/-18 in combination potently activate a range of immune cells including NK cells (Matikainen et al., 2001), Th cells (Tominaga et al., 2000), and as it was recently discovered, CD161++/MAIT CD8+ T cells (Fergusson et al., 2014; Ussher et al., 2013). This process has been shown independent of the TCR/MR1 interaction (Fergusson et al., 2014; Kurioka et al., 2017; Slichter et al., 2016; Ussher et al., 2013). To further understand MAIT cell's innate-like property, we asked whether more cytokines could enhance MAIT cell activation than IL-12/-18.

We first asked if common pro-inflammatory cytokines, including IL-12, IL-18, IL-23, and type I IFNs (IFN-α, IFN-β), could trigger the activation of MAIT cells. The production of IFN-γ, TNF-α, and the expression of CD69 was measured within CD8+ T cells and is shown here by percentages of MAIT cells expressing these markers measured at 6 hours (Figure 3-4A-C) and at 20 hours (Figure 3-4D-F). Cytokines, when added individually to the CD8+ T cell suspension, were insufficient to activate MAIT cells, as shown by low production of IFN-γ and TNF-α by MAIT cells after 6 hours and 20 hours. Interestingly for CD69 – the global marker of activation – was markedly upregulated on MAIT cells in response to IFN-α and IFN-β (17.5 ± 2.2%, 19.4 ± 2.5%, respectively) within 6 hours, but not after 20 hours (7.0 ± 1.5%, 10.8 ± 2.2%, respectively) (Figure 3-4C, F, G). One study documents that IFN-α elicits IFN-γ mRNA in NK cells in a more prompt manner than IL-12, suggesting an early role of type I IFNs in promoting activation (Matikainen et al., 2001). In addition, the level of CD69 expression triggered by IL-18 significantly decreased from 11.6 ± 1.8% at 6 hours to 3.7 ± 0.99% at 20 hours (Figure 3-4G), the mechanism underlying which is unknown.

Figure 3-4

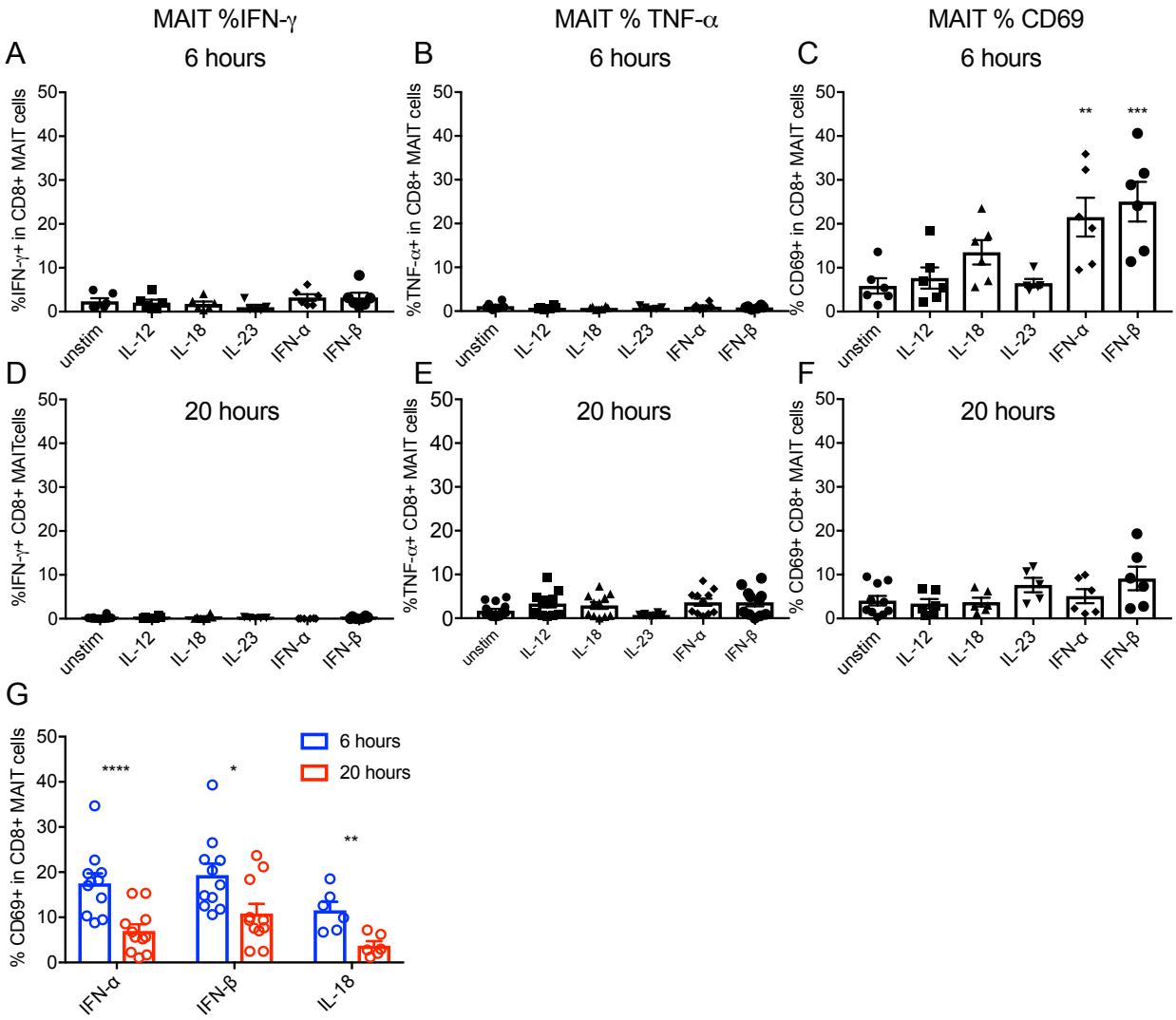


Figure 3-4. Cytokines, when administered singly to MAIT cells, are unable to trigger MAIT cell activation either within 6 hours or 20 hours. A-C) Frequencies of CD8+ MAIT cells expressing IFN-γ (A), TNF-α (B), and CD69 (C) in response to cytokines labelled under the x-axis, measured at 6-hour time point (n=5-6). ** p<0.01, *** p<0.001 by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test. D-F) Frequencies of CD8+ MAIT cells expressing IFN-γ (D), TNF-α (E), and CD69 (F) in response to cytokines labelled under the x-axis, measured at 20-hour time point (n=5-11). No significance reached by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test. G) Frequencies of MAIT cells expressing CD69 in response to IFN-α, IFN-β, and IL-18 measured at 6 hours (blue) or 20 hours (red) (n=6-11). * p<0.05, ** p<0.01, **** p<0.0001 by multiple t tests. Results shown as mean ± S.E.M.

Of note, MAIT cells were not the only subset in the CD8+ T cell population unable to reach a significant level of activation in response to individually-administered cytokines. At both time points, CD161+/CD161-/bulk CD8+ T cells also failed to increase their expression of IFN-γ and TNF-α, and only expressed baseline levels of CD69 (data not shown).

A real *in vivo* danger or stress signal consists often of a variety of cytokines released from a range of physiological pathways and cell-to-cell interactions. Thus we next investigated if combinations of cytokines could promote MAIT cell activation, and if so, the extent to which MAIT cells can be activated.

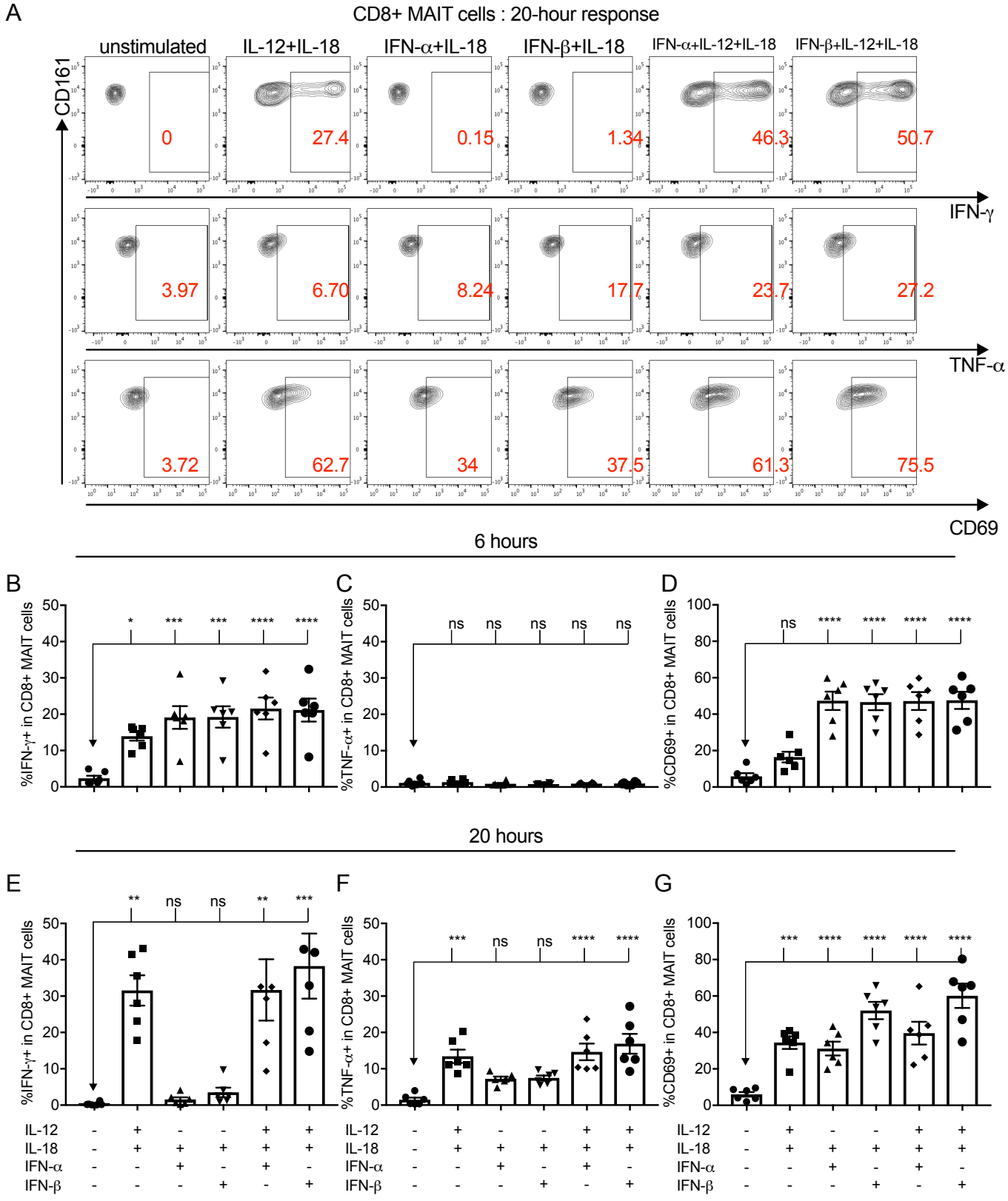
Type I IFNs, *i.e.* IFN-α and IFN-β, have a pivotal role in MAIT cell defence against viruses (van Wilgenburg et al., 2016), we thus first examined how they could impact on MAIT cell activation in synergy with IL-12 and/or IL-18. At 6 hours, combinations including IL-12/-18, or IL-18+IFN-α/β±IL-12 potently enhanced the release of IFN-γ by CD8+ MAIT cells (Figure 3-5B), and the activation was specific to the MAIT population because these cytokines had a minimal effect on CD161+/- CD8+ T cells (Data not shown). When measured at 20 hours, IFN-γ production was sustained and further promoted to a higher level in MAIT cells. IL-12/-18±IFN-α/β, in particular, induced on average >30% IFN-γ-expressing MAIT cells (figure 3-5A, E). IFN-γ expression by CD161+/- CD8+ T cells, however, when measures at 20 hours, was again minimal (Data not shown). Interestingly, all cytokine combinations tested in the assay did not trigger the production of TNF-α by MAIT cells at 6 hours (Figure 3-5C). However, at 20 hours, conditions that significantly enhanced the IFN-γ expression of MAIT cells in Figure 3-5E, *i.e.* 12+IL-18±IFN-α/β, also markedly promoted MAIT cell TNF-α production, where on average >15% MAIT cell expressed TNF-α (Figure 3-5F). In addition, type I IFNs robustly synergised with IL-

18 in the presence or absence of IL-12, and rapidly upregulated the CD69 expression specifically on CD8+ MAIT cells (Figure 3-5D) within 6 hours, but not on other CD8+ subsets (Data not shown). MAIT cell CD69 expression was sustained by all combinations of cytokines tested, as suggested by their CD69+ percentage measured at 20 hours (Figure 3-5G).

We then studied the kinetics of type I IFN-mediated MAIT cell activation in the presence of IL-18 or/and IL-12. In response to IFN-α+IL-18 stimulation, MAIT cell promptly produced IFN-γ, the response was then abrogated when IFN-γ production was measured later (19.1 ± 3.1%, 6 hours; versus 1.55 ± 0.59%, 20 hours, $p < 0.001$; Figure 3-6A, B). MAIT cells exposed to the IFN-β +IL-18 trigger showed similar kinetics of IFN-γ production (19.2 ± 2.9%, 6 hours; versus 3.51 ± 1.32%, 20 hours, $p < 0.0001$; Figure 3-6C). The production of TNF-α by MAIT cells, however, increased significantly from 0.88 ± 0.23% (6 hours) to 7.22 ± 0.63% (20 hours) when triggered by IFN-α+IL-18, and from 0.80 ± 0.06% (6 hours) to 7.46 ± 0.69% (20 hours) when triggered by IFN-β +IL-18. The differential kinetics of IFN-γ and TNF-α release by MAIT cells following IL-18+IFN-α/β triggering suggests that IFN-α/β induces the production of IFN-γ and TNF-α through different mechanisms, and that the release of effector molecules like IFN-γ and TNF-α is tightly regulated by MAIT cells.

Figure 3-5. CD8+ MAIT cells respond to a range of cytokine combinations consisting of IL-12, IL-18, IFN-α, and IFN-β. A) Representative FACS plots showing MAIT cell expression of IFN-γ, TNF-α, and CD69 upon various cytokine triggers measured at 20 hours. B, C, D) Cumulative data showing the fraction of MAIT cells that expressed IFN-γ (B), TNF-α (C), and CD69 (D) measured at 6 hours (n=6). E, F, G) Cumulative data showing the fraction of MAIT cells that expressed IFN-γ (E), TNF-α (F), and CD69 (G) measured at 20 hours (n=6). * $p<0.05$, ** $p<0.01$, *** $p<0.001$, **** $p<0.0001$ by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test. Results shown as mean ± S.E.M.

Figure 3-5


A
CD8+ MAIT cells : 20-hour response
unstimulated
IL-12+IL-18
IFN-α+IL-18
IFN-β+IL-18
IFN-α+IL-12+IL-18
IFN-β+IL-12+IL-18
CD161
IFN-γ
TNF-α
CD69
0
27.4
0.15
1.34
46.3
50.7
3.97
6.70
8.24
17.7
23.7
27.2
3.72
62.7
34
37.5
61.3
75.5
6 hours
B
%IFN-γ+ in CD8+ MAIT cells
C
%TNF-α+ in CD8+ MAIT cells
D
%CD69+ in CD8+ MAIT cells
20 hours
E
%IFN-γ+ in CD8+ MAIT cells
F
%TNF-α+ in CD8+ MAIT cells
G
%CD69+ in CD8+ MAIT cells
IL-12
IL-18
IFN-α
IFN-β

The dynamic change in MAIT cell expression of IFN-γ and TNF-α contrasts with that of CD69 in response to IL-18+IFN-α/β, which was sustained and remained unchanged between 6 hours and 20 hours (Figure 3-6B, C). This suggests that MAIT cells require lower activation threshold for CD69 expression, and that CD69 may be a less powerful marker of activation. We found that in contrast to type I IFNs, which rapidly induced transient MAIT cell activation, IL-12 synergised with IL-18 to promote and sustain the effector functions of MAIT cells over a longer time scale (20 hours), in the absence or presence of type I IFNs (absence, Figure 3-6D; presence, Figure 3-6E, F). The percentage of MAIT cells expressing IFN-γ significantly increased from 13.9 ± 1.2% (6 hours) to 31.6 ± 4.2% (20 hours) with an IL-12/-18 trigger (Figure 3-6D), was unchanged between 6 hours and 20 hours with an IL-12/-18+IFN-α trigger (Figure 3-6E), and significantly increased again from 21.1 ± 3.2% (6 hours) to 38.3 ± 9.0% (20 hours) with an IL-12/-18+IFN-β trigger (Figure 3-6F). The percentage of TNF-α expressing MAIT cells significantly increased from baseline levels at 6 hours to on average ~ 20% in response to all three triggers (Figure 3-6D-F). MAIT cells also significantly enhanced their CD69 expression from 16.5 ± 2.9% (6 hours) to 34.4 ± 3.4% (20 hours) with IL-12/-18 triggering, but an additional dose of IFN-α/β did not see marked changes of CD69 expression from 6 hours to 20 hours. Interestingly, despite a robust synergy with IL-18 at 6 hours, IFN-α or IFN-β poorly synergised with IL-12/-18 to promote MAIT cell effector functions at either 6 hours (Figure 3-6G) or 20 hours (Figure 3-6H). Therefore, we conclude that MAIT cell activation is intricately orchestrated by multiple proinflammatory cytokines. Responses triggered by these cytokines could be rapid, or longer-lasting, depending on the cytokine itself (e.g. type I IFNs versus IL-12 in the presence of IL-18), as well as other cytokines present in the environment (e.g. type I IFNs combined with only IL-18 versus both IL-12/-18).

Figure 3-6

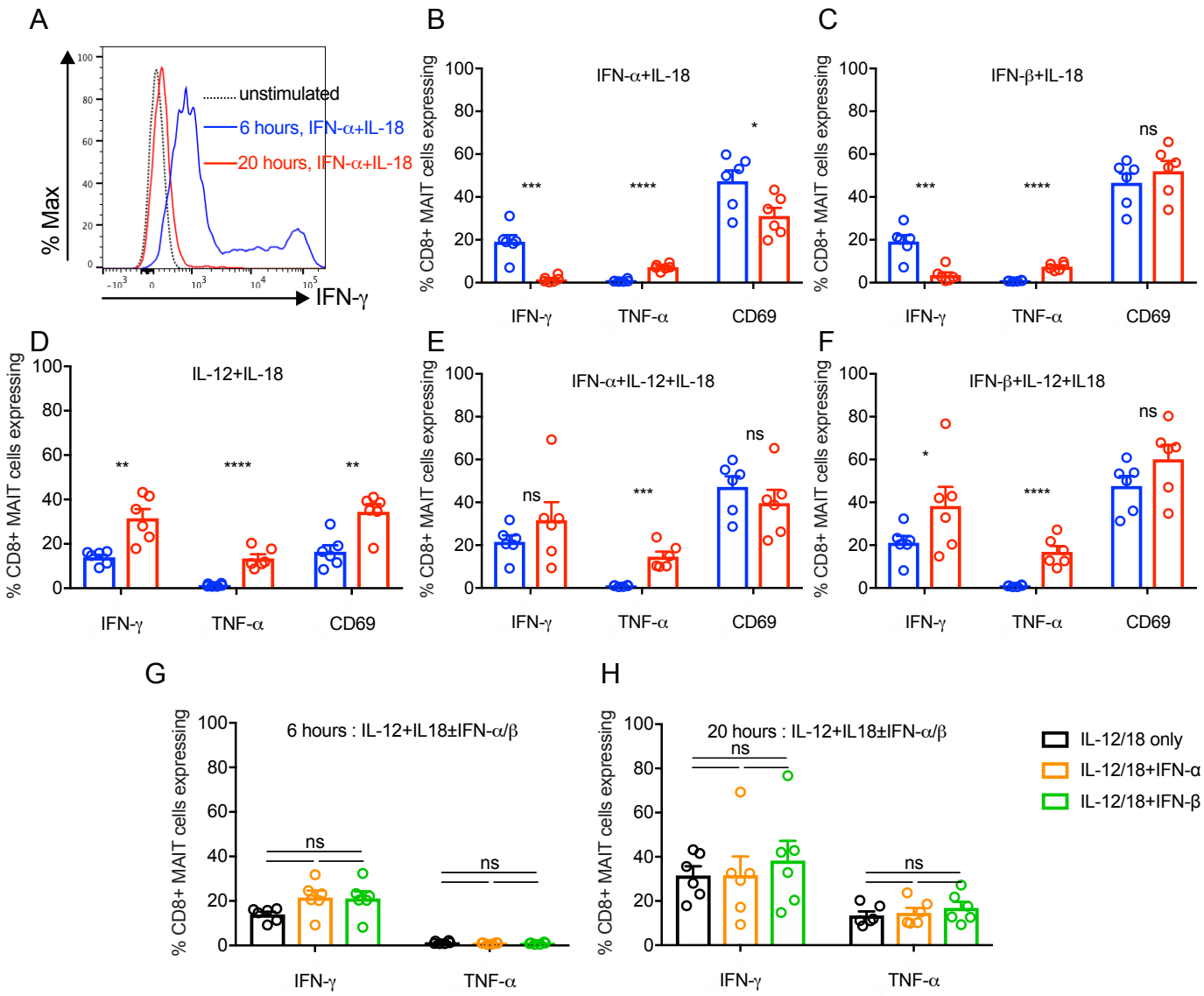


Figure 3-6. Cytokine-mediated MAIT cell activation is time sensitive. A) Representative FACS plot showing percentage of IFN-γ expressing CD8+ MAIT cells at t= 0, 6 hours, and 20 hours. Half-offset histogram shows modal y-axis scaling (% max. count per condition). B-F) Cumulative data showing the fraction of MAIT cells that expressed IFN-γ, TNF-α, and CD69 following IL-18 stimulation in combination with IFN-α (B), IFN-β (C), IL-12 (D), IL-12+IFN-α (E), or IL-12+IFN-β (F) (n=6). Responses were measured at 6 hours (blue empty circles) or 20 hours (red empty circles). ** p<0.01, *** p<0.001, **** p<0.0001 by multiple t tests. G-H) Percentage of MAIT cells expressing IFN-γ or TNF-α following stimulation by IL-12 and IL-18 in the absence (blue) or presence (red, green) of type I IFNs. Responses were measured at 6 hours (G) or 20 hours (H) (n=6). Two-way repeated measures ANOVA, with Dunnett's multiple comparisons test yielded non-significant results. Results shown as mean ± S.E.M.

IL-23 shares the IL12p40 subunit with IL-12, (Duvallet et al., 2011; Sarra et al., 2010), given that IL-12 robustly activates MAIT cells in synergy with IL-18, we asked if IL-23 could similarly trigger MAIT cell activation. CD8+ T cells were enriched and stimulated with IL-23 in combination with IL-12, IL-18, or both. The baseline level of IFN-γ, TNF-α, and CD69 expression by MAIT cells following an IL-23 trigger, suggests that IL-23 could not contribute to Th1 responses as triggered by IL-12 (Figure 3-7A-C). This is in line with reports showing that IL-23 is more involved in a Th17 response (Duvallet et al., 2011).

Figure 3-7

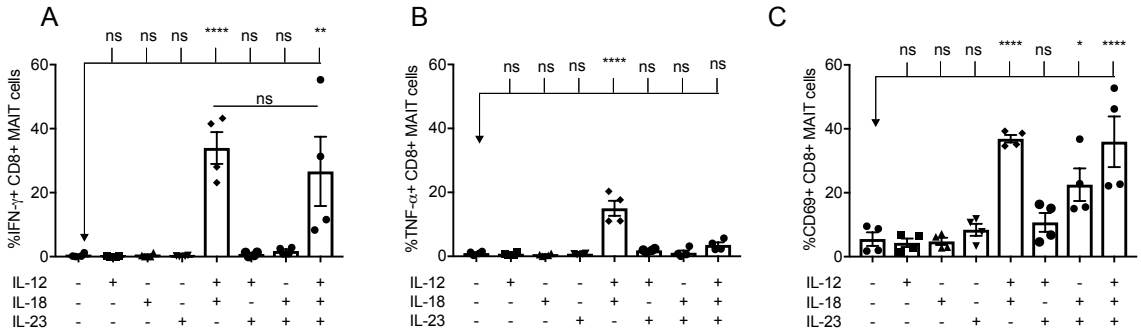


Figure 3-7. IL-23 does not robustly enhance MAIT cell effector functions. A-C) Percentage of MAIT cells expressing IFN-γ (A), TNF-α (B), or CD69 (C) following stimulation by combinations of IL-12, IL-18, and IL-23, measured at 20 hours (n=4). Results shown as mean ± S.E.M, * p<0.05, ** p<0.01, **** p<0.0001 by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test.

3.4.5. TL1A and IL-15 synergise with suboptimal levels of IL-12 and IL18 to trigger effector functions of MAIT cells

Recent studies have shed light on relevant roles of other distinct cytokines, including IL-15 and TL1A, in promoting effector functions of a range of innate-like T cells (Cohavy et al., 2011; Holmkvist et al., 2015; Sattler et al., 2015; Slichter et al., 2016). We probed MAIT cell response to IL-15 and TL1A, in the absence or presence of IL-12/-18.

Firstly, MAIT cells responded poorly to IL-15, TL1A, or the combination thereof. The percentage of MAIT cells releasing IFN-γ or TNF-α, or expressing GrB was insignificant (Figure 3-8A, B, C).

We then probed the synergistic effect of IL-15 and/or TL1A and a reduced dose of IL-12/-18. MAIT cells marginally responded to the suboptimal dose of IL-12/-18, with 7.3% MAIT cells producing IFN-γ (Figure 3-8D, E), 0.84% TNF-α (Figure 3-8D, F), and 2.6% GrB (Figure 3-8D, G). The reduced response of MAIT cells to a suboptimal IL-12/-18 trigger was complemented by the addition of IL-15 and TL1A. TL1A enhanced IFN-γ production to 21.1 ± 3.4%, TNF-α to 3.5 ± 1.0%, GrB to 6.9 ± 1.1%. IL-15 had a more pronounced impact on MAIT cell activation in synergy with IL-12/-18 by enhancing IFN-γ production to 48.5 ± 7.2 %, TNF-α to 7.5 ± 2.4%, GrB to 36.7 ± 6.8%. The combination of TL1A and IL-15 led to a more profound state of activation for MAIT cells, in particular when measured by MAIT cell production of IFN-γ and TNF-α. Of note, the impact of IL-15 and TL1A on promoting CD161+/- CD8+ T cell activation was again limited (Data not shown).

Interestingly, IL-15 significantly induced the cytotoxic phenotype of MAIT cells in the presence or absence of TL1A. This is in line with previous studies suggesting that IL-15 promotes MAIT cell cytotoxicity dependent of IL-18 signalling (Sattler et al., 2015). In addition, given the implication of TL1A in gut diseases (Meylan et al., 2008; Ślebioda and Kmieć, 2014; Ślebioda et al., 2015), the role of TL1A in activating gut-resident CD161-expresing cells will be further discussed in the following chapters.

Figure 3-8

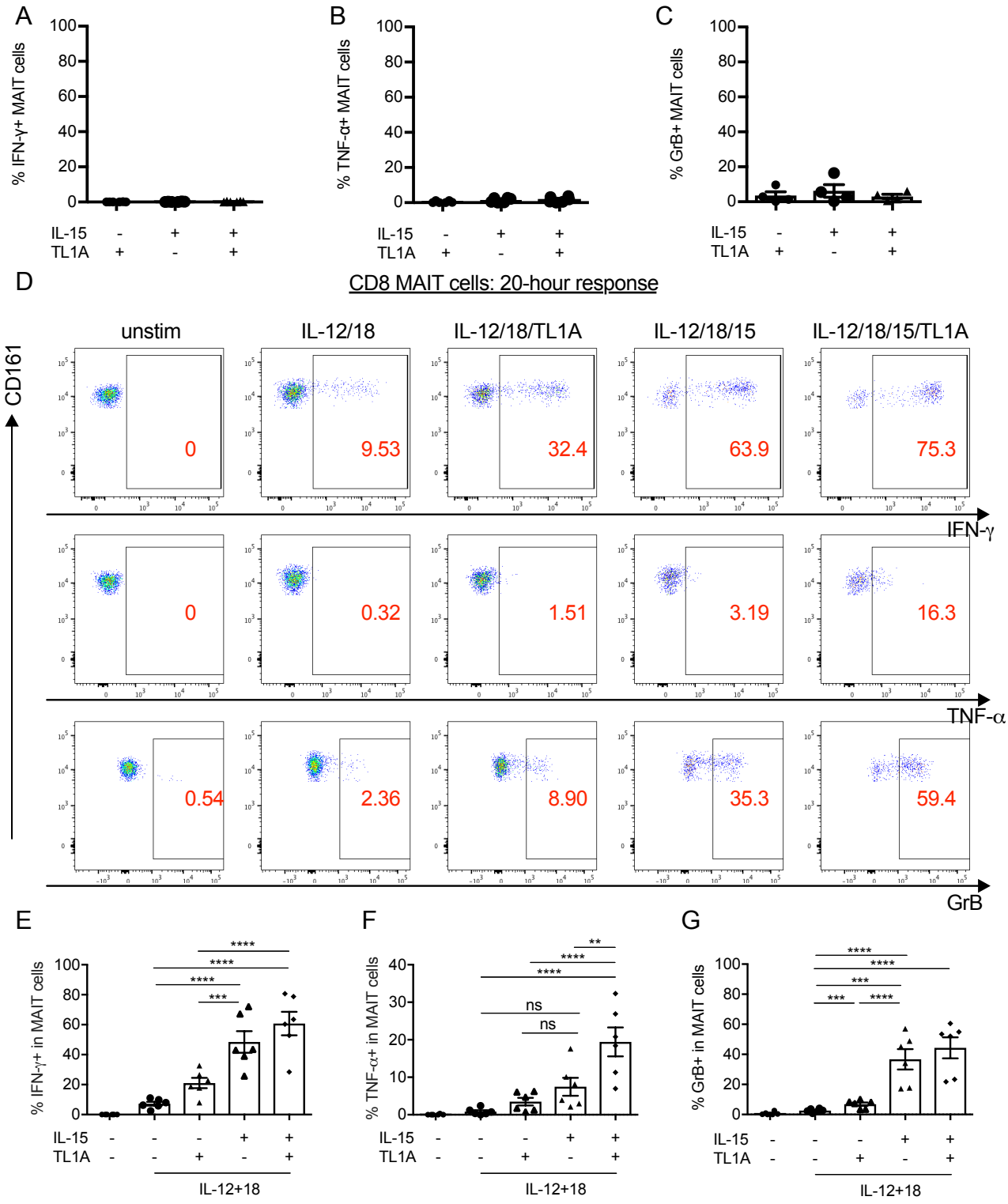

A
% IFN-γ+ MAIT cells
B
% TNF-α+ MAIT cells
C
% GrB+ MAIT cells
IL-15
TL1A
D
CD8 MAIT cells: 20-hour response
unstim
IL-12/18
IL-12/18/TL1A
IL-12/18/15
IL-12/18/15/TL1A
CD161
IFN-γ
TNF-α
GrB
0
9.53
32.4
63.9
75.3
0
0.32
1.51
3.19
16.3
0.54
2.36
8.90
35.3
59.4
E
% IFN-γ+ in MAIT cells
F
% TNF-α+ in MAIT cells
G
% GrB+ in MAIT cells
ns
IL-12+18

Figure 3-8. IL-15 and TL1A combine with suboptimal doses of IL-12 and IL-18, and activate MAIT cells effector functions. A-C) Percentage of MAIT cells expressing IFN-γ (A), TNF-α (B), or GrB (C) following IL-15 and/or TL1A stimulation, measured at 20 hours (n=4). D) Representative FACS plots showing MAIT cell response to IL-12+IL-18+TL1A and/or IL-15. E-G) Cumulative data showing percentage of activated MAIT cells expressing IFN-γ (E), TNF-α (F), or GrB (G) following IL-12+IL-18+IL-15 and/or TL1A stimulation, measured at 20 hours (n=6). Results shown as mean ± S.E.M, ** p<0.01, *** p<0.001, **** p<0.0001 by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test.

3.4.6. Type I IFNs, IL-12, and IL-18 synergise with the TCR signalling to enhance MAIT cell effector functions

The examination of MAIT cell activation and a range of innate and adaptive signals involved has prompted us to probe the synergistic effect of the TCR and cytokine signalling on MAIT cell activation.

Type I IFNs rapidly induced effector functions of MAIT cells in synergy with IL-18, and their impact was greatly subdued within 20 hours. Given this unique kinetics of type I IFN-induced MAIT cell activation (Figure 3.6), and that TCR signalling only triggers restricted effector functions of MAIT cells (Figure 3.2) (Slichter et al., 2016; Turtle et al., 2011), we hypothesised that the combination of IFN-α/β and the TCR signalling was more pronounced on MAIT cells during the first 6 hours. Indeed, we found that within 6 hours, the combination of IFN-α or IFN-β with TCR beads induced a significantly higher percentage of MAIT cells to produce IFN-γ (33.0 ± 2.8% for IFN-α, 32.7 ± 3.6% for IFN-β), compared with 14.3 ± 2.1% alone with TCR beads, or alone with either type I IFN (2.0 ± 0.44% with IFN-α, 3.0 ± 0.82% with IFN-β, Figure 3-9-A, B). Similar to IFN-α/β and IL-18 synergy (Figure 3-6A, B, C), the MAIT cell IFN-γ response was reduced to insignificant levels at 20 hours (Figure 3-9A, C). This again, highlights the rapid role of type I IFNs in enhancing MAIT cell Th1 response.

MAIT cells poorly responded to TCR±IFN-α/β to produce TNF-α, both at 6 hours or 20 hours (Figure 3-9D, E, F). This suggests that the threshold for TNF-α production by MAIT cells is higher than IFN-γ, and may require other complementary signals.

In contrast to IFN-γ, whose production by MAIT cells was only pronounced at 6 hours but not 20 hours (Figure 3.9-B, C), it took longer for MAIT cells to reach the peak of GrB expression. MAIT cells maximally responded to the TCR signalling at 20 hours (on average 86.5 ± 5.6% expressing GrB), and the contribution of additional doses of IFN-α/β was minimal (Figure 3-9G, I). At 6 hours, however, only 4.5 ± 1.2% MAIT cells expressed GrB in response to a single TCR triggering, but this was furthermore enhanced by the addition of IFN-α or β; 39.5 ± 9.7% MAIT cells expressed GrB in the IFN-α-supplemented media, and 36.7 ± 9.3% in response to IFN-β (Figure 3.9-G, H). The robust anti-viral and anti-bacterial function of type I IFNs may be attributed to their profound and rapid role in promoting MAIT cell IFN-γ and GrB release (Malmgaard, 2003; Sareneva et al.).

Given a strong effector phenotype of MAIT cells elicited by TCR and type I IFN synergy at 6 hours, we next studied the dose-dependent MAIT cell activation by type I IFNs. Enriched CD8+ T cells were incubated with TCR beads with increasing doses of IFN-α (Figure 3-10C, D, E), or IFN-β (Figure 3-10F, G, H). The percentage of MAIT cells expressing IFN-γ positively correlated to the concentration of type I IFNs in the media. 20,000 U/ml IFN-α significantly increased the percentage of MAIT cells producing IFN-γ from 23.5 ± 5.0% (only TCR, without IFN-α) to 48.9 ± 2.4% (Figure 3-10A, B, C). The synergistic role of IFN-β with the TCR signalling became pronounced at 5ng/ml, inducing 43.8 ± 5.4% MAIT cells to produce IFN-γ, compared with 23.5 ± 5.0% induced by a single TCR triggering (Figure 3-10A, B, F). The level of IFN-γ production continued to increase in response to higher

Figure 3-9

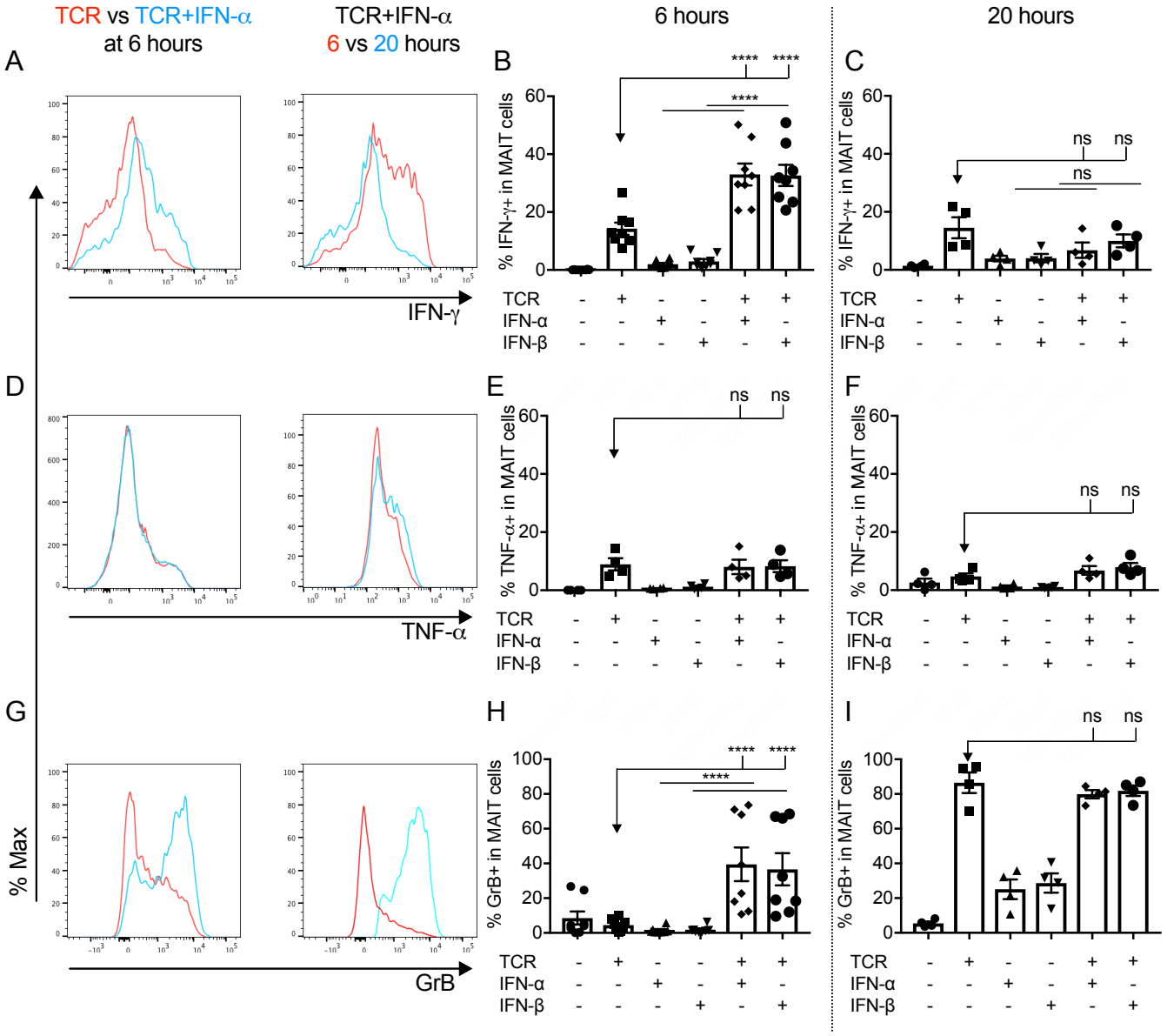


Figure 3-9. MAIT cells respond to IFN-α and IFN-β in combination with anti-CD3/CD28 (TCR) beads. A) Representative staining comparing IFN-γ production by MAIT cells following TCR (red line) vs TCR+IFN-α (blue line) triggering at 6 hours (right panel), or TCR+IFN-α triggering at 6 hours (red line) vs 20 hours (blue line), (left panel). B, C) Cumulative frequencies of IFN-γ-producing MAIT cells at 6 hours (B) or 20 hours (C) following the indicated conditions. D, G) Representative staining comparing TNF-α production (D) or GrB expression (G) by MAIT cells following TCR (red line) vs TCR+IFN-α (blue line) triggering at 6 hours (right panel), or TCR+IFN-α triggering at 6 hours (red line) vs 20 hours (blue line), (left panel). E, F, H, I) Cumulative frequencies of TNF-α-producing MAIT cells at 6 (E) vs 20 hours (F), or frequencies of GrB-expressing MAIT cells 6 (E) vs 20 hours (F) following the indicated conditions. n=4-8, results shown as mean ± S.E.M, * p<0.05, ** p<0.01, *** p<0.001, **** p<0.0001 by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test.

concentrations of IFN-β, and finally reached to 55.3 ± 6.5% in the presence of 500 ng/ml IFN-β, a concentration ten times higher than the normal working concentration. Type I IFNs were insufficient to drive further MAIT cell production of TNF-α induced by TCR triggering (Figure 3-10A, B, D, G), suggesting that the high threshold will have to be overcome by a stronger innate or adaptive signal. Type I IFNs also enhanced MAIT cell cytotoxicity in a dose-dependent manner by elevating their expression of GrB from 7.0 ± 3.3% (with only TCR triggering) to 38.7 ± 12.3% with additional 20,000 U/ml IFN-α (Figure 3-10A, B, E), or 50.6 ± 7.1% with 500ng/ml IFN-β (Figure 3-10A, B, H).

The synergistic effect of IL-12/-18 on MAIT cells, on the other hand, was more long-lasting than type I IFNs (Figure 3-5, 3-6). This led us to probe kinetics of IL-12/-18-induced MAIT cell activation in the presence of TCR beads. At 6 hours, a combined dose of IL-12/-18 significantly enhanced TCR-induced MAIT cell IFN-γ production (from to 12.5 ± 1.3% to 33.9 ± 4.7%, Figure 3-11B). In contrast to IFN-γ, the synergistic effect of TCR and IL-12 and/or IL-18 on promoting MAIT cell TNF-α production or GrB expression was minimal (Figure 3-11E, H). The combinatorial trigger consisting of innate and adaptive signals (i.e. TCR beads, IL-12, and IL-18) also induced profound effector functions of MAIT cells at 20 hours. MAIT cells responded to this trigger by significantly upregulating their IFN-γ and TNF-α production, compared with their counterparts that were exposed to a single TCR stimulus, or that combined only with IL-12 or IL-18 (Figure 3-11A, C, D, F). As discussed previously, TCR beads maximally triggered the expression of GrB by MAIT cells, hence the impact of TCR+IL-12/-18 was not pronounced on promoting MAIT cell cytotoxicity.

Figure 3-10

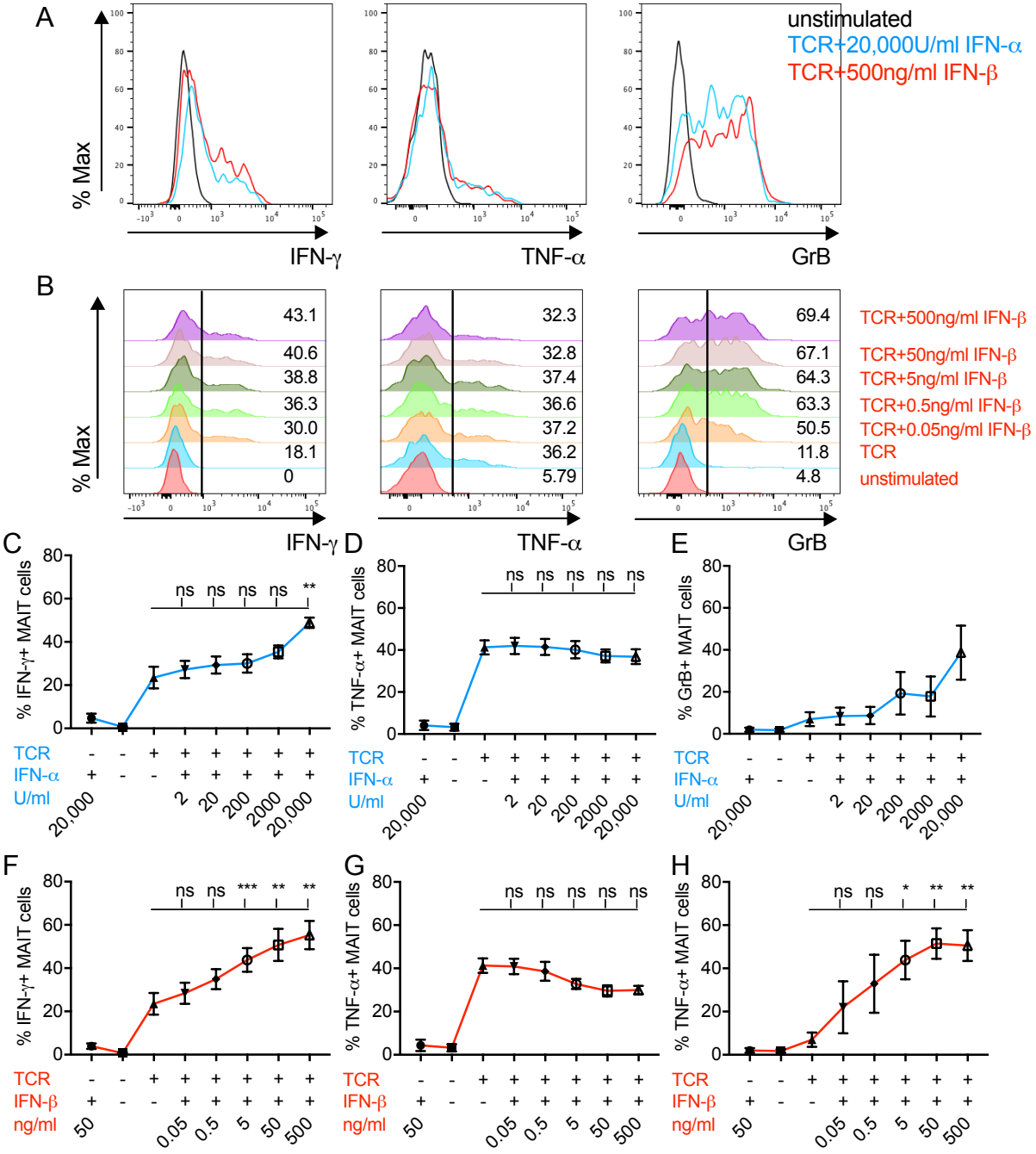


Figure 3-10. MAIT cells respond to IFN-α and IFN-β in a dose dependent manner at 6 hours. A) Representative staining showing the production of IFN-γ (left), TNF-α (middle) and GrB (right) by MAIT cells in response to TCR and high concentrations of IFN-α (blue) or IFN-β (red). B) Representative staining showing dose-dependent activation of MAIT cells in response to TCR beads and increasing doses of IFN-β. C-E) Cumulative frequencies of MAIT cells expressing IFN-γ (C), TNF-α (D), or GrB (E) following TCR beads and increasing doses of IFN-α. F-H) Cumulative frequencies of MAIT cells expressing IFN-γ (F), TNF-α (G), or GrB (H) following TCR beads and increasing doses of IFN-β. N=6, results shown as mean ± S.E.M, * p<0.05, ** p<0.01, *** p<0.001, by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test.

In Figure 3-11C and F, 50ng/ml IL-12/-18, also enhanced TCR-induced MAIT cell response to produce IFN-γ and TNF-α. Thus, we next asked whether IL-12/-18-mediated MAIT cell activation was also dose-dependent in the presence of a TCR trigger.

Enriched CD8+ T cells were stimulated by TCR beads, as well as increasing concentrations of IL-12 (Figure 3-12A, blue), or IL-18 (Figure 3-12A, red) ranging from 0.01 ng/ml to 100 ng/ml for 20 hours. IL-12 robustly synergised with the TCR stimulus to induce MAIT cell production of IFN-γ. 0.1 ng/ml IL-12 significantly increased the percentage of MAIT cells expressing IFN-γ to 37.6 ± 2.3%, and concentrations higher than 0.1ng/ml more profoundly enhanced IFN-γ release by MAIT cells (Figure 3-12B, D). IL-18, compared with IL-12, was less potent in synergising with the TCR signalling to promote MAIT cell IFN-γ production. IL-18 consistently elicited lower IFN-γ response in MAIT cells than IL-12 used at the same concentration (Figure 3-12A, C and E). In this titration experiment, MAIT cells also required a higher threshold for their TNF-α release. Similarly, IL-12 was more effective than IL-18 to synergise with the TCR signalling and drive TNF-α production. Of note, given that the TCR triggering maximally induces the expression of GrB by MAIT cells (Figure 3-11I), the expression of GrB induced by increasing concentrations of IL-12 or IL-18 was not examined.

We have established that a combined signal consisting of both innate and adaptive cues was able to promote the effector functions of human CD8+ MAIT cells. Lastly we asked if a suboptimal cytokine trigger for MAIT cells could be complemented by the TCR signal, and whether this was also dose-dependent.

Figure 3-11

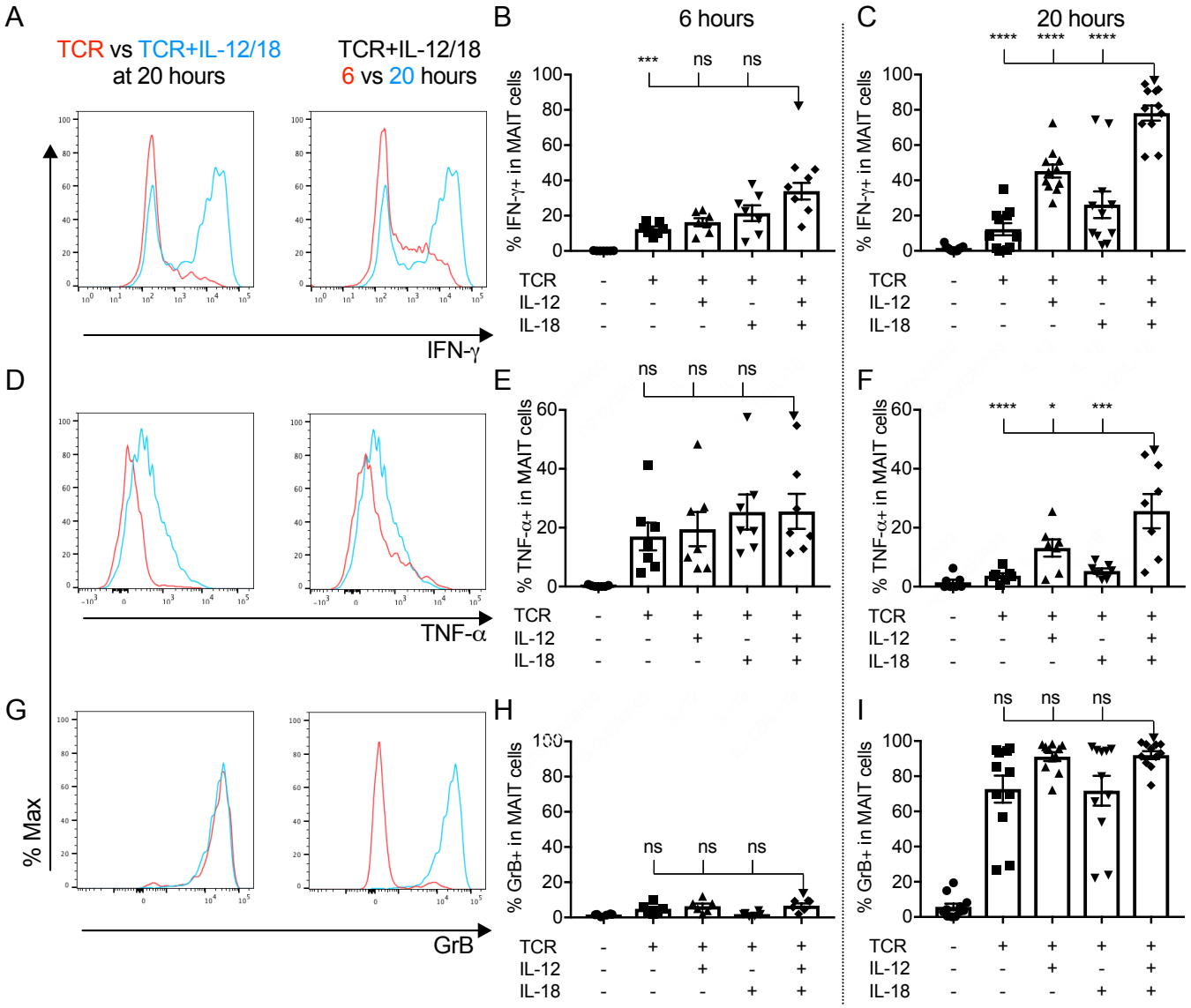


Figure 3-11. MAIT cells respond to IL-12 and IL-18 in combination with TCR beads. A) Representative staining comparing IFN-γ production by MAIT cells following TCR (red line) vs TCR+IL-12/18 (blue line) triggering at 6 hours (right panel), or TCR+IL-12/18 triggering at 6 (red line) vs 20 hours (blue line), (left panel). B, C) Cumulative frequencies of IFN-γ-producing MAIT cells 6 hours (B) or 20 hours (C) following the indicated conditions. D, G) Representative staining comparing TNF-α production (D) or GrB expression (G) by MAIT cells following TCR (red line) vs TCR+IL-12/18 (blue line) triggering at 6 hours (right panel), or TCR+IL-12/18 triggering at 6 (red line) vs 20 hours (blue line), (left panel). E, F, H, I) Cumulative frequencies of TNF-α-producing MAIT cells at 6 (E) vs 20 hours (F), or frequencies of GrB-expressing MAIT cells at 6 (E) vs 20 hours (F) following the indicated conditions. n=4-11, results shown as mean ± S.E.M, * $p<0.05$, ** $p<0.01$, *** $p<0.001$, **** $p<0.0001$ by repeated measures one-way ANOVA, with Dunnett's multiple comparisons test.

Figure 3-12

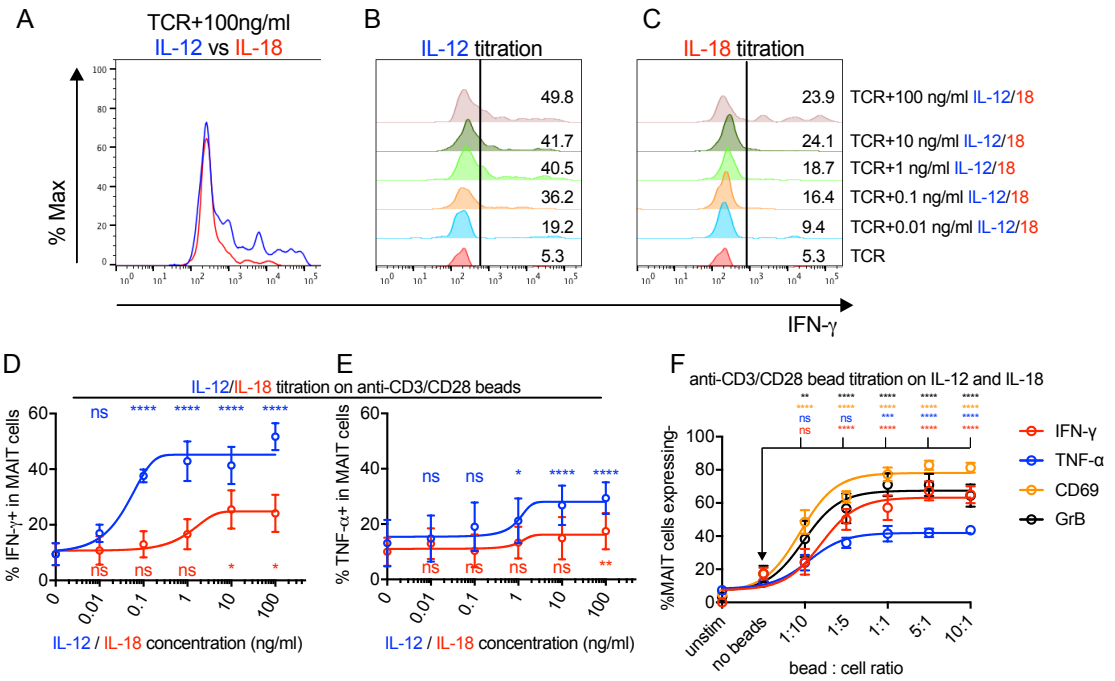


Figure 3-12. TCR and IL-12 and IL-18 synergise and induced MAIT cell activation in a dose-dependent manner. A) Representative staining comparing IFN-γ production by MAIT cells following TCR+100ng/ml IL-12 (blue line) vs IL-18 (red line) triggering at 20 hours. B, C) Representative staining showing dose-dependent activation of MAIT cells in response to TCR beads and increasing doses of IL-12 (B) or IL-18 (C). D, E) Cumulative frequencies of IFN-γ-expressing (D) or TNF-α-expressing (E) MAIT cells in response to TCR beads and IL-12 (blue) or IL-18 (red) at the concentrations indicated on the x-axis. F) Cumulative frequencies of MAIT cells expressing IFN-γ (red), TNF-α (blue), CD69 (orange), or GrB (black) in response to 2ng/ml IL-12 and IL-18, plus an increasing dose of TCR beads. Results shown as mean ± S.E.M, n = 7. ** p<0.01, *** p<0.001, **** p<0.0001 by repeated measures two-way ANOVA, with Dunnett's multiple comparisons test. Comparisons were made to the TCR-only group for D and E (labelled as "0" on the x-axis), and the "no beads" group for F.

CD8+ T cells were stimulated by 2ng/ml IL-12/-18 to trigger limited effector functions, as indicated by low levels of IFN-γ (red), TNF-α (blue), CD69 (orange) and GrB (black) expression (Figure 3-12F). Together with the lose dose of IL-12/-18, CD69 and GrB were very sensitive to the presence of a TCR stimulus in the media. TCR beads used at 1:10 bead-to-cell ratio significantly enhanced MAIT cell expression of CD69 and GrB, in line with previous experiment results showing a lower threshold for CD69 expression, and a robust TCR-mediated GrB expression in MAIT cells. TNF-α required the strongest dose of the complementary TCR signal (1:1 bead-to-cell ratio) to be significantly upregulated in MAIT cells. This is in line with previous results suggesting a high threshold for TNF-α release. IFN-γ

expression by MAIT cells was also enhanced significantly by TCR beads used at 1:5 bead-to-cell ratio. Furthermore, the activation curve suggests that a 1:1 bead-to-cell ration could sufficiently elicit all relevant MAIT cell effector functions examined in the assay. The responses of CD161+/- CD8+ T cells to TCR+IL-12/-18 triggering was also examined in parallel with MAIT cells, and their lower expression of effector molecules demonstrated above suggests they are not the primary respondent to this TCR/cytokine synergy.

We also confirmed that other proinflammatory cytokines, cytokines including IL-23, TNF-α, IL-15, and TL1A, when combined with TCR triggering, had limited impact on inducing MAIT cell production of IFN-γ, TNF-α, or expression of GrB at either 6 or and 20 hours (data not shown). This suggests their weaker capacity to promote MAIT cell activation in the presence of a TCR trigger.

3.4.7. The THP1/*E. coli* model further explores the synergy between the TCR-MR1 interaction and cytokine signals in activating MAIT cells

In vitro experiments have shown that MAIT cells can be activated through the cognate TCR/MR1 interaction (Figure 3-2, 3-3), as well as by a range of cytokines including recombinant IL-12, IL-18, IL-15, TL1A, and type I IFNs (Figure 3-5 – 3-8). We also found that these independent signals can synergise and tune MAIT cell effector functions at various time points (Figure 3-9 – 3-12). To further understand the contribution of innate and adaptive signals in MAIT cell activation, we studied MAIT cell response to fixed *E.coli* (Ussher et al., 2013). This model has also been extensively used to probe the cytotoxic phenotype of MAIT cells (Kurioka et al., 2015).

As previously discussed, MAIT cells downregulate their Vα7.2 TCR segment extensively in response to *E. coli* stimulation when examined at 6 hours, and this downregulation could not be recovered at 20 hours. We thus focused on the total CD8+CD161++ T cells for the investigation of MAIT cell activation to avoid the exclusion of significantly activated MAIT cells.

We first examined the dose-dependent activation of MAIT cells by fixed *E. coli*. The THP1 cell line was exposed to different doses of PFA-fixed *E. coli* (from 0 – 25 BpC), co-cultured with enriched CD8+ T cells for 20 hours, after which the activation profile of different CD8+ T cell subsets was evaluated. There was a dose-dependent increase of IFN-γ, TNF-α, GrB, and CD69 by CD8+ MAIT/CD161++ T cells with increasing doses of *E. coli* (Figure 3-13A, B, D, E, G, H, J, K). At the highest BpC used in the assay, however, there was no further increase in the expression of IFN-γ, TNF-α, GrB, or CD69. In fact, there was a trend of IFN-γ and TNF-α downregulation as the bacterial dose increased between 10 and 25 BpC. This could be due to downregulation of the TCR upon exposure to high doses of *E. coli,* which further limits TCR/MR1-induced activation. In addition, we and others have found a reduced MAIT cell frequency in response to high doses of *E. coli* (Dias et al., 2016). Given that MAIT cells are prone to apoptosis (Touch et al., 2018), it is likely that the peaked response of MAIT cells at higher bacterial doses maybe attributed to cell death of extremely activated MAIT cells.

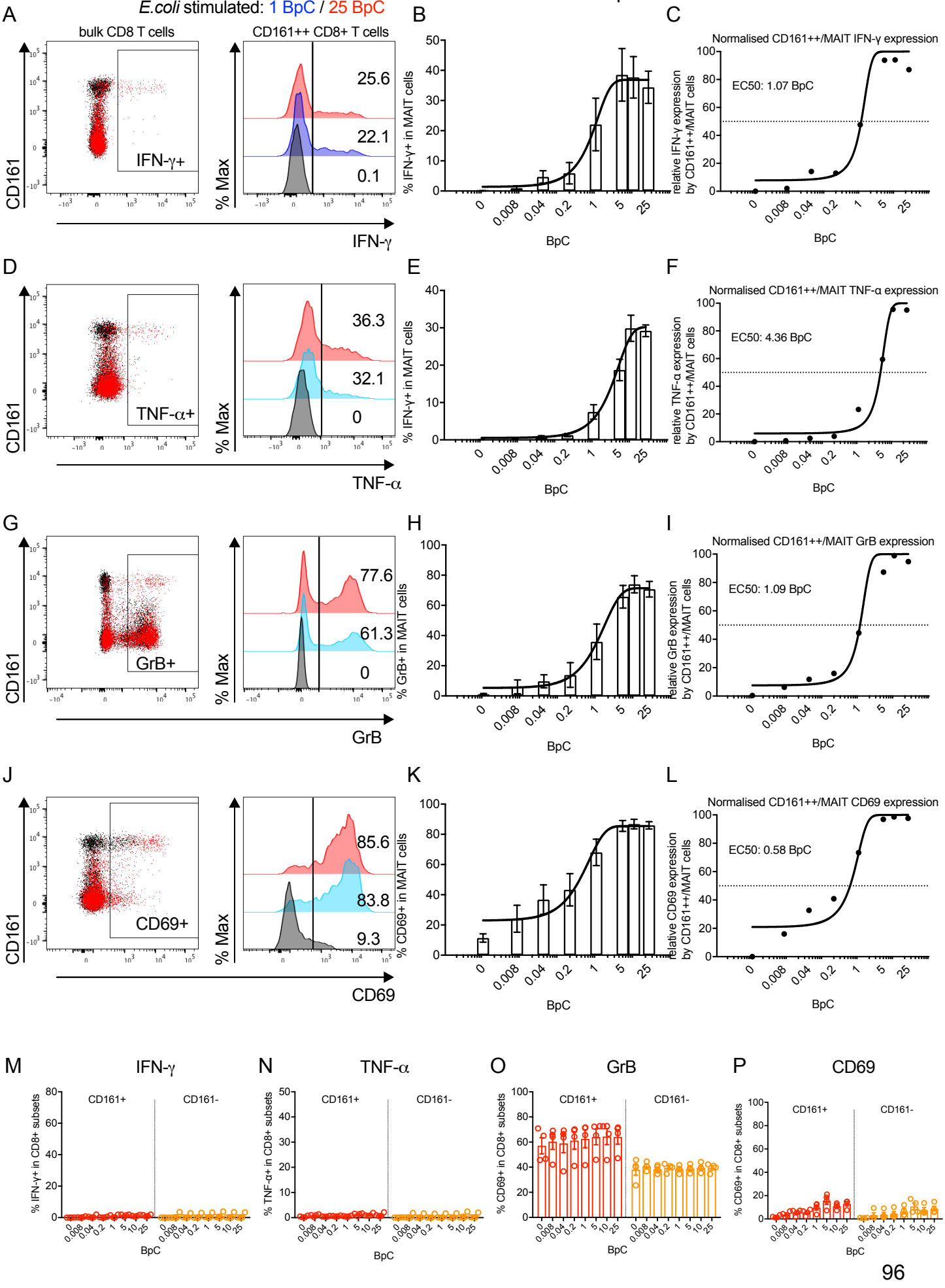
Nonlinear fit of normalised expression data demonstrated that the EC50 value, *i.e.* the required dose to reach 50% of the highest response for IFN-γ (Figure 3-13C), TNF-α (Figure 3-13F), GrB (Figure 3-13I), or CD69 (Figure 3-13L) was 1.07, 4.36, 1.09, and 0.58, respectively. The lower EC50 value for CD69 expression (0.58) and higher value (4.36) required for TNF-α release in CD8+CD161++ T cells in this *E.*

coli stimulation model suggests a hierarchical production of activation markers by MAIT cells. This is in line with results from antibody-coated TCR beads and recombinant cytokines, which describes a low threshold for MAIT cell CD69 expression, and a high threshold for TNF-α.

Although CD161+/- CD8+ T express higher GrB levels at rest (Figure 3-13O), they responded minimally to *E. coli* stimulation at any given dose to produce effector molecules IFN-γ (Figure 3-13M) and TNF-α (Figure 3-13N). They also failed to upregulate GrB (Figure 3-13O). The low CD69 expression level found on CD161+/- CD8+ T cell subsets (Figure 3-13P) suggests that *E. coli*-induced activation was restricted to the CD161++/MAIT subset in human CD8+ T cells. Thus, MAIT cells modify their activation profile upon physiological activation, and the response is dependent on the bacterial dose.

Figure 3-13. CD161++/MAIT cells are the predominant CD8+ T cell population that responds to increasing doses of *E. coli* trigger in a dose-dependent manner. A, D, G, J) Left: representative staining showing expression of IFN-γ (A), TNF-α (D), GrB (G), and CD69 (J) by CD8+ T cells in the absence (black dots) or presence (red dots) of 25BpC *E. coli.* Right: the comparison of IFN-γ (A), TNF-α (D), GrB (G), and CD69 (J) expression by CD8+ CD161++/MAIT cells. B, E, H, K) Cumulative frequencies of CD8+ CD161++/MAIT cells expressing IFN-γ (B), TNF-α (E), GrB (H), or CD69 (K) in response to increasing doses of *E. coli.* C, F, I, L) IFN-γ (C), TNF-α (F), GrB (I), or CD69 (L) expression by CD8+ CD161++/MAIT cells in response to *E. coli* stimulation was first normalised. For each sample, 0% response was defined as the smallest frequency in response to 0-25BpC stimulation, 100% defined as the largest value from the same dataset. Nonlinear fit of normalised data was then plotted using the built-in dose-response equation with “Log(agnonist) vs normalised response” function in Prism 7, which subsequently generated the EC50 value. M, N, O, P) Cumulative frequencies of CD8+ CD161+ (red) / - (orange) cells expressing IFN-γ (C), TNF-α (F), GrB (I), or CD69 (L) in response to increasing doses of *E. coli.* n=4, results shown as mean ± S.E.M, ** $p<0.01$, *** $p<0.001$, **** $p<0.0001$ by one-way ANOVA, with Turkey’s multiple comparisons test.

Figure 3-13 unstimulated
E.coli stimulated: 1 BpC / 25 BpC



Next, the contribution of cytokines and the MR1 signalling pathway to *E.coli*-induced MAIT cell activation was probed. Given that IL-12, IL-18 and type I IFNs are the common cytokines produced by activated APCs, we hypothesised that they were also involved in *E. coli*-induced MAIT cell activation. Enriched CD8+ T cells were cocultured for 20 hours with THP1 cells and fixed *E.coli* at 25 BpC – the dose shown to maximally induce effector function of MAIT cells, in the presence or absence of an MR1 blocking antibodies, antibodies against IL-12/-18, B18R – a soluble mock receptor for IFN-α and IFN-β previously shown to efficiently reduce type I IFN signalling (van Wilgenburg et al., 2016), or combinations thereof. MAIT cells significantly lowered their IFN-γ production in the presence of neutralising antibodies for IL-12/-18, as well as the anti-MR1 antibody (Figure 3-14A, B). B18R did not significantly alter MAIT cell IFN-γ production, neither did anti-IL-12, or anti-IL-18 individually (although they both lowered the response). The IFN-γ production by MAIT cells in the presence of neutralising reagents was then normalised in relation to the level where only an isotype control antibody was present. Anti-IL-12/IL18 antibodies combined reduced the percentage of IFN-γ-expressing cells to 25.3%, the anti-MR1 antibody lowered that to 19.0% (Figure 3-14E). This suggests that IL-12, IL-18 and the cognate MR1-TCR interaction equally contribute to MAIT cell activation in the presence of *E. coli* stimulation, and that neither signal is dispensable for MAIT cells to achieve maximal IFN-γ release. Anti-IL-12, when used singly or combined with anti-IL-18 antibodies, significantly reduced the GrB expression upon activation (Figure 3-14D), lowering the percentage of cells expressing GrB to 57.8% and 43.9% of the unblocked level, respectively (Figure 3-14H). In addition, blockade of the MR1 signalling pathway abrogated GrB expression, reducing the percentage of cells expressing GrB to 15.2%. This suggests that several factors were involved in regulating GrB expression, and

highlights the pronounced role of MR1 signalling in enhancing MAIT cell cytotoxic phenotype, in line with previous findings (Kurioka et al., 2015). The expression of TNF-α and CD69 in MAIT cells was predominantly regulated by the MR1 signalling (Figure 3-14C, E). Neutralising reagents against cytokines, including IL-12, IL-18, and type I IFNs did not impact on the release of TNF-α, and only minimally on CD69 expression, whereas the anti-MR1 antibody, in the absence or presence of these cytokine neutralisers abrogated TNF-α production by MAIT cells (Figure 3-14G, I).

We have dissected the dynamic signalling pathways and their respective roles in MAIT cell activation following 20-hour *E. coli* stimulation. Other studies using a similar model have suggested a time-dependent role for both the MR1 and cytokine signalling pathways, describing a dominant and rapid role of MR1 signalling mediating MAIT cell activation at early hours of *E. coli* stimulation, as well as a late but similarly robust effect of cytokines (e.g. IL-12/-18) (Ussher et al., 2013, 2014, 2016). To further understand the role of TCR-dependent and -independent signals in MAIT cell activation, we incubated enriched CD8+ T cells with THP1 cells and *E. coli*, in the presence of blocking/neutralising reagents discussed above and analysed their activation profile at 5 hours, 6 hours, 7 hours, 8 hours, 10 hours, 12 hours, 20 hours, and 28 hours, respectively (Figure 3-15A). Blocking the IL-12 signalling pathway significantly reduced the percentage of MAIT cells expressing IFN-γ at 20 and 28 hours (Figure 3-15B). Blocking IL-18 on its own achieved similar results, the effect of which was not pronounced until 20 hours later (Figure 3-15C, left). IL-18 blockade reduced the frequency of IFN-γ+ MAIT cells to 47.5 ± 7.9% of its unblocked level at 20 hours, and 54.7 ± 7.0% at 28 hours (Figure 3-15C, right). However, anti-IL-12 and anti-IL-18 in combination greatly reduced MAIT cell IFN-γ production at all time points (Figure 3-15D, left). In particular, IFN-γ production by

Figure 3-14

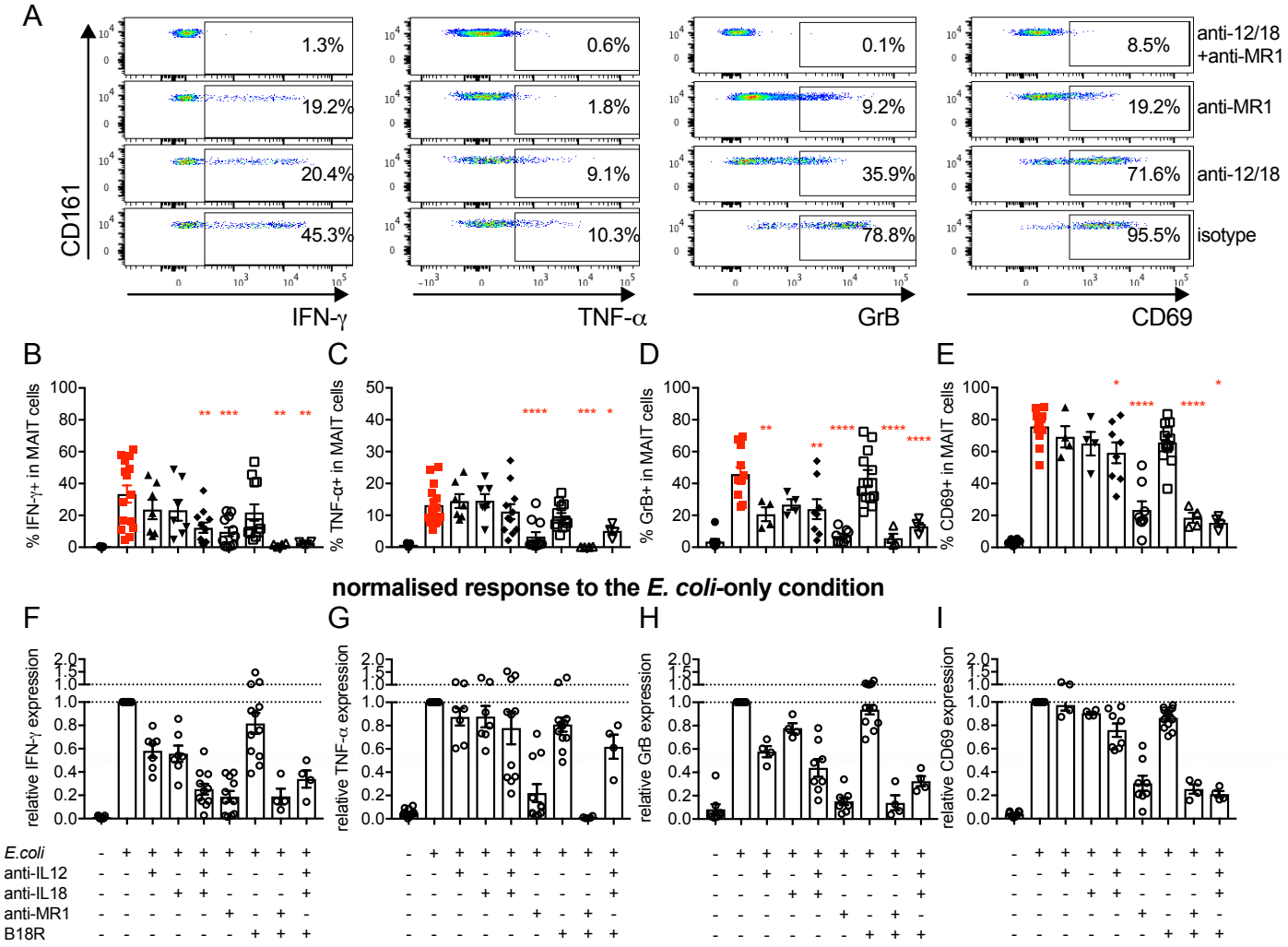


Figure 3-14. Cytokines and the MR1 signalling pathway combine and trigger effector functions of CD8+ CD161++/MAIT cells upon *E. coli* stimulation at 20 hours. A) Representative staining showing expression of IFN-γ, TNF-α, GrB, and CD69 by CD8+ CD161+ + T cells in the presence of neutralising antibodies against IL-12 and IL-18, an anti-MR1 antibody, the combination of both, or an isotype control antibody. B-E) Cumulative frequencies of CD8+ CD161++/MAIT cells expressing IFN-γ (B), TNF-α (C), GrB (D), or CD69 (E) in response to indicated combinations of blocking reagents. F-I) standardised expression of IFN-γ (F), TNF-α (G), GrB (H), or CD69 (I) by CD8+ CD161++/MAIT cells in response to indicated combinations of blocking reagents. n=5-12, results shown as mean ± S.E.M, ** p<0.01, *** p<0.001, **** p<0.0001 by one-way ANOVA, with Turkey's multiple comparisons test. Standardisations and statistical comparisons were made to the isotype control group, marked as red scattered dots in figures B - E.

MAIT cells was abrogated at 20 and 28 hours by anti-IL-12 and anti-IL-18, lowering the percentage of IFN-γ+ MAIT cells to 12.6 ± 8.7% and 17.4 ± 7.9%, respectively (Figure 3-15D, right).

The anti-MR1 blocking antibody also effectively hampered MAIT cells' capacity to produce IFN-γ (Figure 3-15E, left), where a blocking effect became pronounced at 10 hours post incubation. This is in line with previous studies suggesting an early role of MR1 signalling in mediating MAIT cell activation. The presence of the anti-MR1 antibody continued to contribute to the loss of IFN-γ expression in MAIT cells throughout the stimulation assay, and even more significantly so at later time points (Figure 3-15E, right). In particular, at 20 hours and 28 hours, MAIT cells exposed to *E. coli* demonstrated minimal levels of IFN-γ expression, suggesting that the role of MR1 signalling in this specific MAIT cell activation model is strong, rapid, and long-lasting. This finding contrasts with other studies showing that at late time points anti-MR1 only partially reduced MAIT cell production. This could be attributed to the fact that others probed the early role of MR1 signalling using THP1 cells pre-incubated with *E. coli* prior to exposure to MAIT cells.

Given the early and transient role of IFN-α/β in combination with TCR signalling or IL-12/-18, we used B18R to block IFN-α/β activity, then assessed its contribution to MAIT cell activation. The presence B18R did not markedly alter the average percentage of IFN-γ+ MAIT cells compared with cells incubated in the absence of it (Figure 3-15F, left). However, IFN-γ expression by MAIT cells in the presence of B18R relative to that in the absence of B18R suggests that between 8 and 20 hours, blocking type I IFNs indeed, significantly reduced IFN-γ expression by MAIT cells to 43.2 – 63.8% (Figure 3-15F, right). This result suggests that MAIT cell activation is

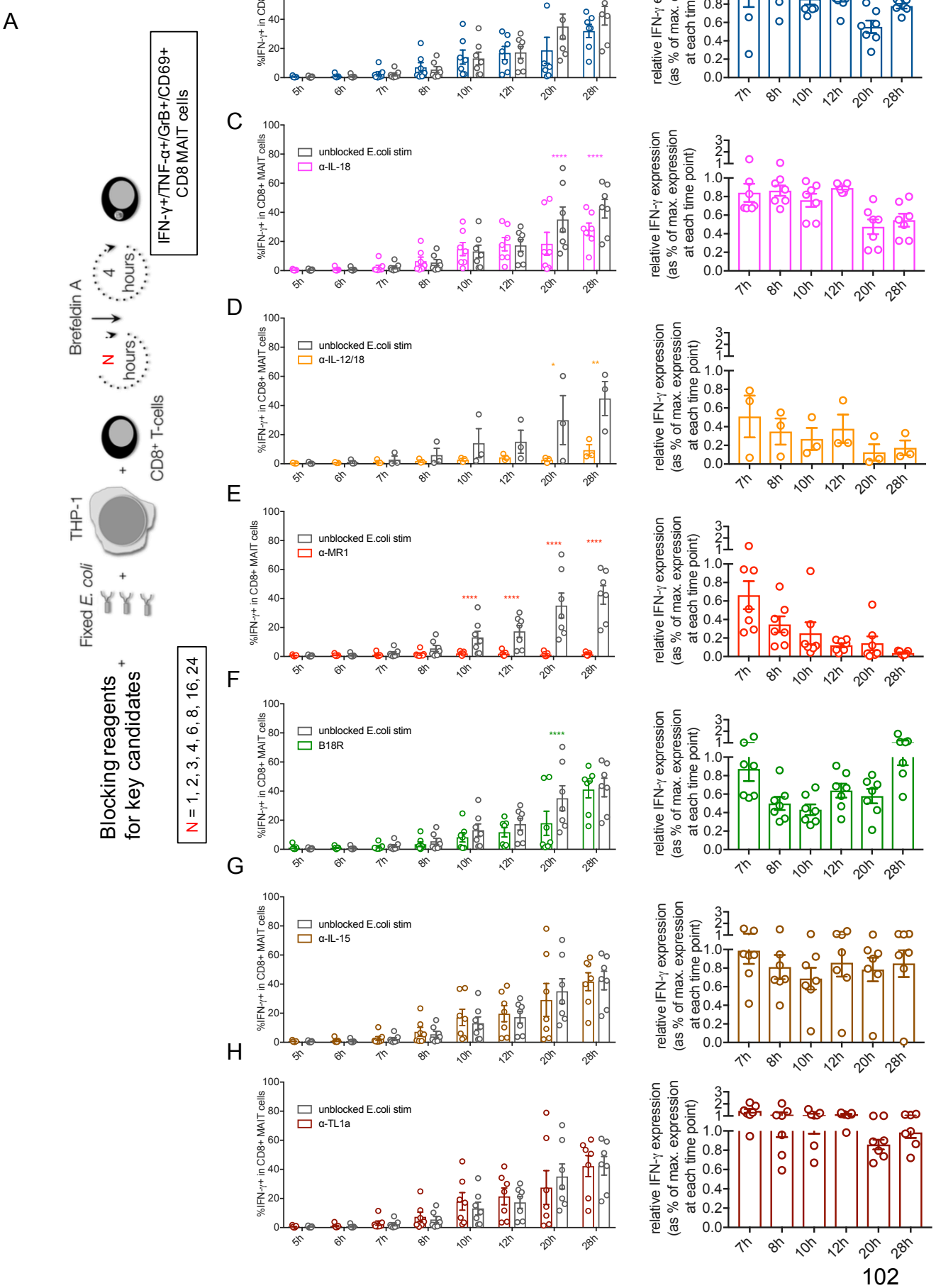
partially mediated by type I IFNs, and the role of type I IFNs is indeed restricted to early responses to bacterial infection.

Antibodies against IL-15 and TL1A had limited capacity to reduce IFN-γ+ production by MAIT cells, both in terms of absolute IFN-γ+ percentage (Figure 3-15G, H, left) and relative expression (Figure 3-15G, H, right). Despite previous findings regarding the robust synergistic effect of IL-15/TL1A with IL-12/-18, our results could be due to the lack of IL-15 and TL1A production in this THP-1 model, or because IL-15 and TL1A played a redundant role in this setting.

This model has identified 3 critical pathways that mediate MAIT cell anti-bacterial responses: IL-12/-18, type I IFNs, and MR1 signalling. We next sought to address their contributions to the release of effector molecules including TNF-α and GrB, as well as CD69, the generic T cell activation marker.

Figure 3-15. CD8+ CD161++/MAIT cells increase production of IFN-γ in response to *E. coli* stimulation in a time-dependent manner. A) A schematic view of the time point assay. B-H) Left: Frequencies of E. coli-induced IFN-γ expression by CD8+CD161++ T cells in the presence of reagents against IL-12 (B), IL-18 (C), IL-12+IL-18 (D), MR1 (E), type I IFNs (F), IL-15 (G), and TL1A (H). Right: relative expression of IFN-γ by CD8+CD161++ T cell in the presence of reagents against IL-12 (B), IL-18 (C), IL-12+IL-18 (D), MR1 (E), type I IFNs (F), IL-15 (G), and TL1A (H) benchmarked against IFN-γ expression level in unblocked counterparts. n=7, results shown as mean ± S.E.M. * $p<0.05$, ** $p<0.01$, *** $p<0.001$, **** $p<0.0001$ by two-way repeated measures ANOVA, with Dunnett's multiple comparisons test.

Figure 3-15


A
IFN-γ+/TNF-α+/GrB+/CD69+ CD8 MAIT cells
Brefeldin A
4 hours
N hours
CD8+ T-cells
THP-1
Fixed E. coli
Blocking reagents for key candidates
N = 1, 2, 3, 4, 6, 8, 16, 24
B
unblocked E.coli stim
α-IL-12
C
unblocked E.coli stim
α-IL-18
D
unblocked E.coli stim
α-IL-12/18
E
unblocked E.coli stim
α-MR1
F
unblocked E.coli stim
B18R
G
unblocked E.coli stim
α-IL-15
H
unblocked E.coli stim
α-TL1a
%IFN-γ+ in CD8+ MAIT cells
relative IFN-γ expression (as % of max. expression at each time point)
5h
6h
7h
8h
10h
12h
20h
28h

MAIT cells responded to *E. coli* to produce increasing levels of TNF-α and CD69 in a time-dependent manner (Figure 3-16A, E). In contrast to IFN-γ and its dependence on IL-12/-18, TNF-α / CD69 response by MAIT cells was only minimally impacted by these two proinflammatory cytokines at any studied time point (Figure 3-16B, F). Blocking type I IFNs also had a very limited effect on MAIT cell TNF-α and CD69 expression (Figure 3-16D, H). However, MAIT cells were almost exclusively dependent on the MR1-TCR interaction to express TNF-α and CD69: the production of which by MAIT cells was significantly lowered by the anti-MR1 antibody throughout the investigated time points, reducing TNF-α level from 20.9 ± 3.3% at 7 hours, to 10.1 ± 2.9% at 28 hours (Figure 3-16C), and lowering CD69 expression from at 61.0 ± 10.9% at 10 hours, to 38.2 ± 7.8% at 28 hours (Figure 3-16G). However, the percentage of TNF-α+ MAIT cells did not increase at the longest time point. Findings by Kang et al suggested that an increased level of CD69 is a negative regulator of TNF-α expression by MAIT cells in scrub typhus patients (Kang et al., 2016), and this could likely be applied to our finding as well.

MAIT cells expressed limited levels of GrB until 20 hours (Figure 3-16I). Similar to IFN-γ, the production of GrB by MAIT cells was tightly regulated by IL-12/-18, as well as the MR1 signalling pathway, as the blockade of either signals significantly reduced GrB expression in a time-dependent manner (Figure 3-16J, K). GrB expression by MAIT cells at 10 and 12 hours, albeit very low, was partially blocked by B18R (Figure 3-16L). Therefore, GrB production at early hours was partially attributed to type I IFNs (Figure 3-16L), in addition to MR1 signalling (Figure 3-16K). This again confirms the early and potent role of type I IFNs in promoting effector functions of MAIT cells, and suggests that type I IFNs have the potential to

complement the strong IL-12/-18 signal synergise with other optimal signals to initiate MAIT cell bacterial defence.

Figure 3-16

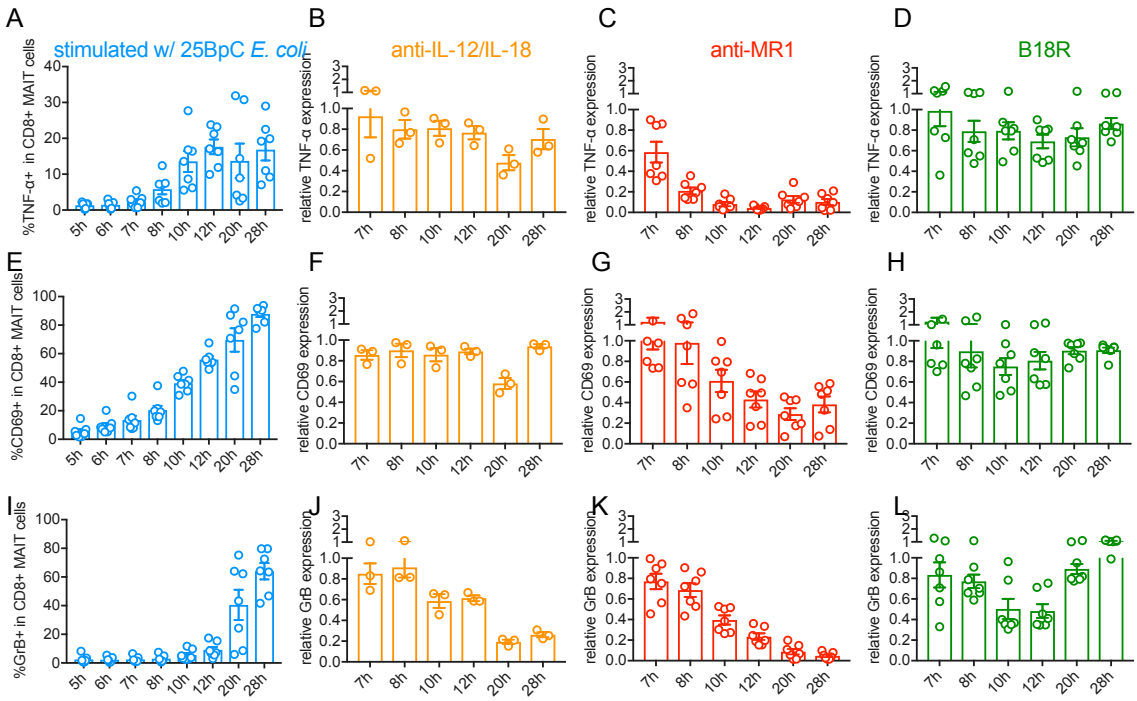


Figure 3-16. The expression of TNF-α, CD69, and GrB in CD8+ CD161++/MAIT cells following *E. coli* stimulation. A, E, I) Frequencies of CD8+ MAIT cells expressing TNF-α (A), CD69 (E), and GrB (I) at indicated time points. B, F, J) Relative expression of TNF-α (B), CD69 (F), and GrB (J) by CD8+ MAIT cells in the presence of blocking antibodies against IL-12+IL-18. C, G, K) Relative expression of TNF-α (C), CD69 (G), and GrB (K) by CD8+ MAIT cells in the presence of the anti-MR1 antibody. D, H, L) Relative expression of TNF-α (D), CD69 (H), and GrB (L) by CD8+ MAIT cell in the presence of B18R. N = 7, results shown as mean ± S.E.M.

Here, we describe the dominant role of MR1 signalling in initiating and maintaining MAIT cell activation. This was evidenced by the impact of MR1 blockade on MAIT cell expression of IFN-γ, TNF-α, GrB and CD69. We also highlight the wide range of innate pathways that contribute to MAIT cell activation. Various innate signals, including type I IFNs, IL-12, and IL-18, serve as potent mediators to induce specific MAIT cell effector functions, including IFN-γ release and upregulated cytotoxicity. Our study suggests that the IL-15 and TL1A were minimally involved in *E.coli*-mediated bacterial defence, and that their role in enhancing MAIT cell activation is context-dependent.

Overall, our data provide evidence that the innate and adaptive signals are both significant components contributing to the physiological activation of human MAIT cells, and we have described their diverse roles in inducing specific MAIT cell effector functions.

3.4.8. RNAseq results show transcriptional signatures of activated MAIT cells

To further understand the effector functions of MAIT cells elicited by the TCR or cytokine signals, we utilised RNAseq to characterize transcriptional profiles of sorted human MAIT cells treated 20 hours with different stimuli, including the TCR (anti-CD3/CD28 beads, “T”), Cytokines (IL-12/-18/-15/TL1A, “C”), and a combination of both (“TC”). Transcriptional profiles of differentially stimulated MAIT cells were compared with those of untreated (UT) MAIT cells, respectively.

The mRNA levels of 132, 1124, and 1375 genes were significantly modulated ($p < 0.01$, $|\text{fold change}| > 4$, false discovery rate (FDR) < 0.05, including upregulation and downregulation) by TCR, cytokines, or their combination, respectively. Venn diagrams describe the overlapping and unique transcriptional signatures elicited by these 3 different stimulations (Figure 3-17A, B, C). We found that the TCR and/or cytokines stimulus significantly altered of 89 mRNA transcripts in MAIT cells, including 88 upregulated genes (Figure 3-17B, Appendix Table 1), and 1 downregulated gene, *RasGRP2*, whose role in T cell activation has not been well studied (Figure 3-17C). A heat map consisting of all 88 genes describes their expression levels across 12 individual samples (Appendix Table 2, Figure 3-17D). In addition, Gene Ontology enrichment analysis on the 88 upregulated genes by MAIT cells predicts that they are involved in cytokine production (*IRF8, TNFRSF9, IRF4, MYB, NFKB1, NFKB2, FURIN, RELB, CCL3, CCL20, TNF, SEMA7A, SPHK1, CD83, EBI3*), IL-17 signalling (*NFKB1, NFKBIA, CCL20, TRAF4, TNF, IL23R*), IL-12

and IL-12-mediated signalling (*IL23R, EBI3, IL2RA, RELB, NFKB1, NFKB2, CCL3*), TNF signalling (*TNF, NFKB1, NFKBIA*) (Appendix Table 1).

Despite 89 overlapping genes, the other genes unique to TCR and cytokines indicate diverse physiological functions that these two signals induce in MAIT cells (Figure 3-17A). Among 1594 modulated genes, 960 (60.2%) were upregulated and the rest were downregulated (Figure 3-17B, C). TC-stimulated MAIT cells shared 572 upregulated genes with those only stimulated with cytokines. These genes constituted 82.1% of upregulated transcripts elicited by C, and 70.8% elicited by TC (Figure 3-17B). We speculate a less pronounced role of TCR signalling than cytokines in MAIT cell activation for the following two reasons. Firstly, we found that TCR ligation enhanced the expression levels of much fewer genes than cytokines (131 versus 572). Secondly, we also observed that amongst the genes upregulated by all stimuli (Appendix Table 1, 2), the TCR stimulus generally induced the lowest level of upregulation. For instance, IRF4 is enhanced by ~217 fold by TCR, but ~472 fold by cytokines, and ~1002 fold by TC. Similarly, the TNF transcript level was increased by ~192 fold by TCR, but ~659 fold by cytokines, and ~1200 fold by TC (Appendix Table 1, 2). In fact, for all shared 88 genes altered by these 3 stimuli, TCR induced a 70-fold increase in their mRNA levels, three times lower than what cytokines achieved (Figure 3-17E). Turtle et al. have also examined and confirmed the hyporesponsivess of human MAIT cells to a single TCR trigger (Turtle et al., 2011). The differential roles of TCR signalling and cytokines in MAIT cell activation were corroborated in this study by investigating activation profiles of MAITs cells derived from the same donors following a 20-hour stimulation by TCR beads and/or cytokines (Figure 3-17F). A TCR stimulus did not enhance MAIT cell effector functions e.g. IFN-γ or TNF-α release, or GrB upregulation, but moderately

enhanced their CD69 expression (as confirmed in Appendix Table 1), whereas cytokines induced maximal IFN-γ production by MAIT cells, and markedly upregulated their TNF-α and GrB expression. However, 221 upregulated genes unique to TC stimulation may describe certain synergy between the TCR signaling and cytokines to further drive MAIT cell activation and promote their effector function. Indeed, an additional TCR signalling promoted MAIT cell production of TNF-α and GrB to a further extent (Figure 3-17F).

Activated MAIT cells also possess a distinct array of downregulated genes – cells stimulated with cytokines in the presence or absence of the TCR triggering share 359 downregulated genes, and they overlapped minimally with those stimulated only with TCR beads (Figure 3-17C). Overall, studying mRNA transcripts from activated MAIT cells indicates a similar responsiveness of MAIT cells to cytokines with or without an additional TCR trigger.

Genome-wide RNA expression analysis identified 132 differentially expressed genes between UT and T conditions, (Figure 3-18A, Appendix Table 3),1124 between UT and C conditions (Figure 3-18B, Appendix Table 4), and 1375 between UT and TC conditions (Figure 3-18C, Appendix Table 5). In total, 1594 genes were significantly differentially regulated pooled from 3 stimulations (Figure 3-18D, Appendix Tables 6, 7). Average linkage hierarchical clustering of the 12 samples indicated that the activation profiles of MAIT cells under stimulation by cytokines in the presence or absence of TCR beads were largely similar, which was further confirmed in the PCA (Figure 3-18E). Clustering of C- and TC- conditions confirmed that cytokine stimulation was the dominant transcriptional driver of MAIT cell activation, and that the additional TCR triggering contributed to a less extent. However, 221 upregulated genes (Figure 3-17B) and 208 downregulated genes

(Figure 3-17C) unique to TC stimulation may also suggest a strong synergy between the TCR signalling and cytokines to further drive MAIT cell activation and promote their effector functions. Lastly, the close clustering of TCR-triggered and unstimulated MAIT cells on the PCA plot confirmed our hypothesis that the TCR signalling alone is a less potent stimulant for MAIT cell activation, and this indicates novel functions of MAIT cells uniquely attributed to the TCR signalling pathway. This will be further discussed in ***3.4.10.***

Figure 3-17

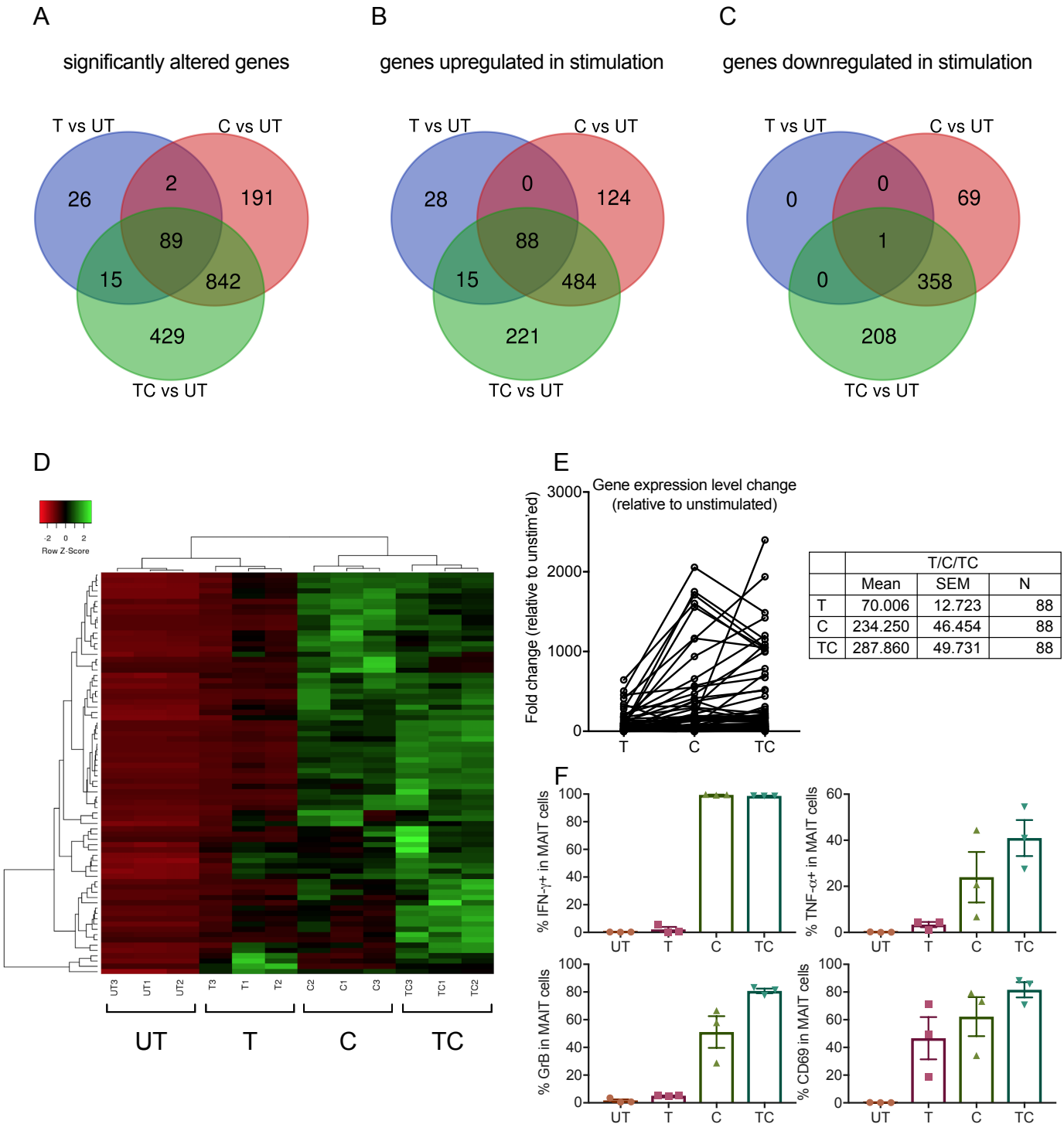


Figure 3-17. TCR beads and cytokines trigger differential transcriptional signatures in MAIT cells. A-C) Venn diagrams showing breakdown of differentially regulated (A), upregulated (B) and downregulated (C) genes unique to or shared by each condition (T: TCR beads, C: Cytokines, TC: TCR beads and cytokines) compared to unstimulated MAIT cells (UT). D) Heatmap showing 88 significantly upregulated genes shared between T, C, TC-stimulated MAIT cells in three donors compared with their UT counterparts. E) Average gene expression levels of 88 genes that were significantly upregulated by all 3 stimuli. F) Percentages of MAIT cells expressing IFN-γ (top left), TNF-α (top right), GrB (bottom left), or CD69 (bottom right) upon stimulation with T, C, or TC, or at rest. Significance in gene expression change was evaluated by filtering for genes with P value < 0.01, |fold change| > 4, and FDR < 0.05.

Figure 3-18

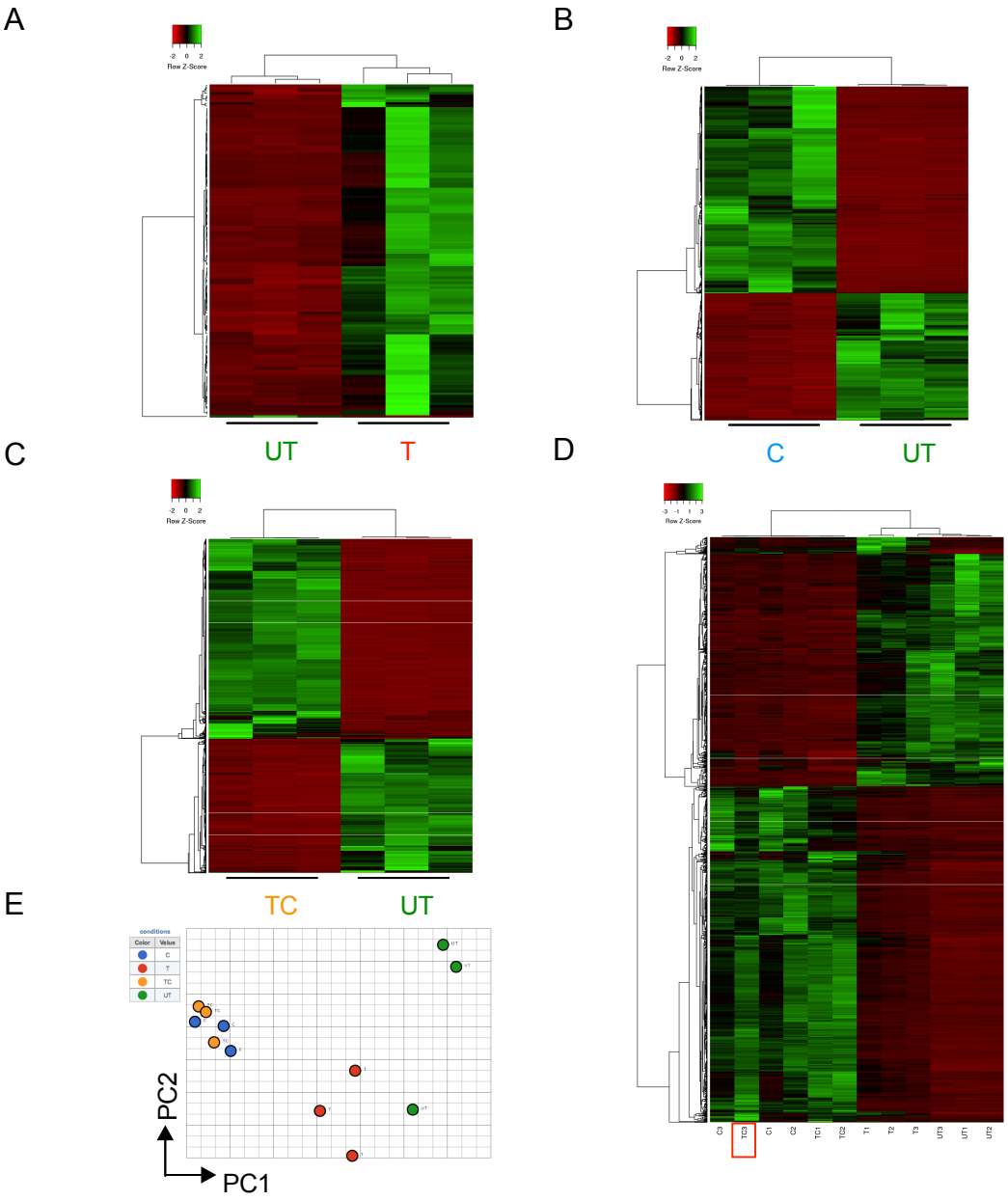


Figure 3-18. Differentially expressed genes in stimulated MAIT cells compared to their unstimulated counterparts. A-C) Heat maps showing 132 significantly upregulated genes in T-stimulated MAIT cells (A), 1124 genes in C-stimulated MAIT cells (B), and 1375 genes in TC-stimulated MAIT cells (C) in three donors compared with their UT counterparts. D) Heat map showing 1594 genes in 12 different samples (e.g. TC1: MAIT cells from donor 1 stimulated by TCR beads and cytokines) pooled from the aforementioned 3 comparisons. E) PCA of 1594 gene transcripts (three biological replicates) distinguishes between differentially stimulated MAIT cells. PC, principal component.

3.4.9. Validation of RNAseq data by qPCR

We plotted volcano plots that show differentially expressed transcriptional profiles of stimulated MAIT cells compared with their unstimulated counterparts. A limited number of genes were significantly altered by a single dose of TCR stimulation (Figure 3-19A). The transcriptional profiles of MAIT cells in the presence of cytokines were remarkably distinct from that of unstimulated (Figure 3-19B, C). On volcano plots we identified genes previously described associated with MAIT cell biology and their activation, including CD69, IFNG, GZMB, GZMH, TNF, IL12R, IL17F, and IL23A (marked in red).

Additionally, we identified 3 genes of interest through further investigation on the list of genes unregulated in maximally activated MAIT cells (stimulated by cytokines ± TCR). They encode for proteins IL-26, oncostatin M (OSM), and Heparin binding early growth factor (HBEGF), which may associate MAIT cells with novel physiological effector functions upon activation (Figure 3-19B, C marked in blue).

IL-26 is an emerging member of IL-10 family cytokines recognised for its versatile role in antiviral, antimicrobial, and autoimmune responses (Stephen-Victor et al., 2016). It can directly kill bacteria by mediating membrane-pore formation on extracellular bacteria (Brown et al., 2016a), or in an indirect manner by recruiting neutrophils to bacteria at the lungs, or triggering the production of IFN-α by plasmacytoid dendritic cells (Che et al., 2014; Meller et al., 2015). To confirm our findings from RNAseq, IL-26 mRNA transcript levels were subsequently quantified by qPCR analysis in RNA samples extracted from activated MAIT cells (Figure 3-19D). MAIT cells significantly upregulated their IL-26 mRNA level in response to cytokines (an averaged 89-fold increase compared with unstimulated samples). TCR triggering demonstrated a limited role in enhancing IL-26 transcription. The

addition of TCR beads to cytokine-stimulated MAIT cells did not significantly alter IL-26 transcript level either. Therefore, activated MAIT cells may exert their antibacterial functions via not only GrB and perforin release, but also IL-26 production.

Similarly, cytokines profoundly increased OSM and HBEGF mRNA transcript levels in MAIT cells, contributing to a >1000-fold increase for both genes compared with unstimulated samples (Figure 3-19E, F). HBEGF is a member of the ligand family of EGF receptor (EGFR) discovered in human macrophages (Besner et al., 1990), and regulates several biological processes, notably angiogenesis, would healing, and tumour progression (Singh et al., 2016; Taylor et al., 2014). OSM is an IL-6 family cytokine mainly produced by activated T cells, monocytes, and dendritic cells. OSM plays an important role in haematopoiesis, immunity, bone remodelling, and inflammation (Tanaka and Miyajima, 2003). It is also involved in intestinal epithelial restitution by enhancing STAT3-dependent cells proliferation, thus promoting intestinal barrier functions (Beigel et al., 2014). Given this, and that MAIT cells are a subset of tissue-homing lymphocytes with a role in barrier tissues (Kurioka et al., 2016; Riva et al., 2018), we speculate that barrier functions of MAIT cells could be further achieved by the expression of HBEGF and OSM mediated by innate cues upon activation.

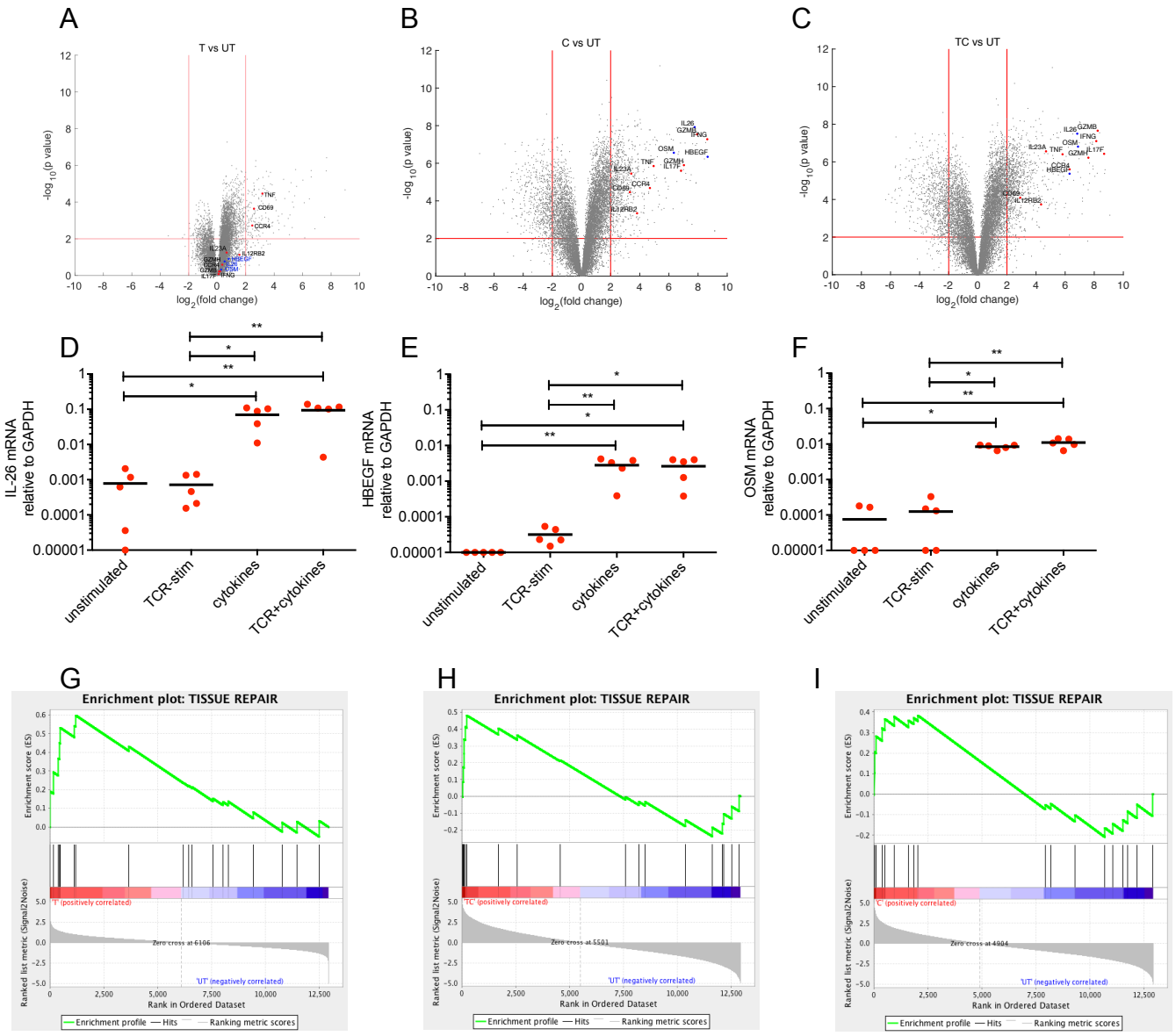
3.4.10. GSEA predicts the tissue repair role of MAIT cells induced by TCR ligation

The recent discovery of a skin-homing Tc17 subset in mouse responsive to commensal ligands has shed light on a unique form of adaptive immunity where antimicrobial functions and tissue repair are coupled within the same subset of unconventional T cells (Linehan et al., 2018). These commensal-specific T cells

elicited a tissue repair signature and accelerated wound closure, in addition to promoting protection against pathogens. MAIT cells similarly are associated with a type-17 phenotype (Billerbeck et al., 2010). Therefore, we investigated phenotypic overlap on a global scale between activated MAIT cells and mouse skin-homing Tc17 cells. Genes with significantly altered expression under stimulation were compared with the tissue repair gene data set (Linehan et al., 2018). GSEA demonstrates significant enrichment ($p<0.0002$) of these tissue repair related genes in MAIT cells stimulated by TCR ± cytokines (Figure 3-19G, H), but not by cytokines alone (Figure 3-19I).

The tissue repair gene set by Linehan et al. included TNF (Appendix Table 8). Indeed, studies have confirmed its role in dermal wound healing (Fedyk et al., 2001), as well as liver repair and regeneration (Galun and Axelrod, 2002; Krafts, 2010). MAIT cells also expressed TNF-α in response to fixed *E.coli* in a time-dependent manner, and such response was largely dependent on MR1 signaling, as the blocking antibody against MR1 (Figure 3-16F), but not against IL-12/-18 (Figure 3-16E) abrogated the release of TNF-α production by MAIT cells at investigated time points. Therefore, our findings on the activation profile of E.coli - stimulated MAIT cells provide preliminary evidence for the proposed model where MAIT cells exert tissue repair and wound healing functions via MR1-dependent TNF-α release.

Figure 3-19



Data set: T vs UT
Enrichment Score (ES): 0.6
Normalised ES (NES): 1.63
Nominal P value: <0.0002

Data set: TC vs UT
Enrichment Score (ES): 0.48
Normalised ES (NES): 1.57
Nominal P value: <0.0002

Data set: C vs UT
Enrichment Score (ES): 0.38
Normalised ES (NES): 1.34
Nominal P value: 0.304

Figure 3-19. Novel functions of stimulated MAIT cells. A-C) Volcano plots showing the genes whose expression value was significantly regulated by TCR beads (A), cytokines (B), TCR beads and cytokines (C), in comparison with the unstimulated control. Red lines mark +/- 4 times fold change, and 0.01 P value. D-E) qPCR data showing the regulation of mRNA transcripts of IL-26 (D), HBEGF (E), and OSM (F) under stimulation. G-I) Gene set enrichment summary plots for normalized activated MAIT (G: TCR-stimulated, H: cytokine-stimulated; I: cytokine+TCR-stimulated) versus unstimulated MAIT-cell ranked genes and the list of genes relevant for tissue repair (kindly provided by Y. Belkaid). Nominal P value < 0.0002, significant; Nominal P value = 0.304, ns.

3.5. Discussion

In this chapter, we probed in detail how TCR signalling and cytokines, individually or in combination, impacted on promoting effector functions of MAIT cells with IFN-γ, TNF-α, GrB, and CD69 as the functional read-out. In addition to TCR beads and recombinant cytokines as MAIT cell stimuli, a THP1 model with fixed *E. coli* was extensively utilised in this study for the investigation of the timing of MAIT cell activation, as well as for the definition of the individual contributions of inflammatory versus TCR signals to inducing MAIT cell effector function – which was further illustrated by a comprehensive RNAseq study on differentially activated MAIT cells.

3.5.1. CD69 should be used critically for gauging MAIT cell activation

CD69 has been described as an early marker of T cell activation. In this study, a 20-hour stimulation with TCR beads alone led to a uniform and robust upregulation of CD69 amongst MAIT cells. However, a dose-dependent expression of CD69 in response to cytokines, including IL-12, IL-18, IFN-α/β, IL-15, and TL1A, confirmed that both cytokine and TCR signalling are each independently sufficient to induce CD69-expression on MAIT cells. This suggests that MAIT cell expression of CD69 reflects activation. However, CD69 expression by MAIT cells requires a lower threshold, which does not necessarily indicate the right level of activation.

Expression of CD69 by MAIT cells is also often used as a biomarker to gauge the activation status of MAIT cells *in vivo* in disease (Braudeau et al., 2016; Haga et al., 2016), as well as to characterise the activation of certain MAIT cell clones (Huang et al., 2009; Kjer-Nielsen et al., 2012). It is worth noting that, typically, a proportion of MAIT cells from PBMC express CD69 basally in healthy donors. It is not yet clear whether steady-state CD69-expression signifies that MAIT cells are poised to

respond to TCR and/or cytokine stimulation, or that they are more likely to resist further activation. Whether CD69 expression by MAIT cells in the periphery indicated functional exhaustion requires further investigation.

3.5.2. TCR signalling and MAIT cells activation

Our results show that MAIT cells responded to TCR beads following a 6-hour stimulation as evidenced by a brief TNF-α and IFN-γ pulse. This was similar to naïve CD8+ T cells, which, prior to their first cell division, also briefly secrete IFN-γ after activation (Hosking et al., 2014). In the same study this brief IFN-γ pulse was unable to confer antiviral immunity; thus, the purpose of this proinflammatory pulse is not yet clear.

Previous studies using anti-CD3/CD28 beads have found that MAIT cells expressed little IFN-γ and TNF-α as a response (Annibali et al., 2011; Reantragoon et al., 2013; Turtle et al., 2011) over an extended period of time, as characterised by quantifying cytokine release in the supernatant, or flow cytometry that can determine expression on a per cell basis. In this study the latter strategy was used, and stimulation with anti-CD3/CD28 beads alone was shown unable to induce robust proinflammatory response following 20 hours stimulation – marked by low expression of TNF-α and IFN-γ. This finding regarding the TCR signal being unable to sustain MAIT effector functions may be relevant to the discovery of genes that differentially regulate the TCR signalling pathway. Turtle et al. described a significant upregulation of genes that negatively regulate the TCR signalling pathway in CD161++CD8+ T cells compared with CD161-CD8+ T cells, and a significant downregulation of genes that positively influences TCR signalling in the same cells (Turtle et al., 2011). This imply that TCR signalling could not be

sustained in MAIT cells – and furthermore provides mechanistic insight into MAIT cells' hypo-responsivess towards TCR ligation during prolonged time of incubation. It is worthwhile to note that TCR signalling alone was able to greatly enhance GrB expression by MAIT cells. Combined with the finding by Kurioka et al. that the cytotoxic profile of MAIT cells was altered by physiologic stimulation via MR1 (Kurioka et al., 2015), we demonstrated a specific role of the TCR stimuli in boosting MAIT cell cytotoxicity. Of note, GrB should not be, and is not the only marker for cytotoxicity. TCR-enhanced cytotoxicity should further be probed by studying the surface-expression of CD107a and that of perforin pre- and post- stimulation, and furthermore by conducting killing assays.

3.5.3. Cytokine signalling and MAIT cell activation

Studies have demonstrated that human MAIT cells respond to a range of cytokines, including IL-12/-18 (Ussher et al., 2013), type I IFNs (van Wilgenburg et al., 2016), and IL-15 (Sattler et al., 2015), which exhibit effector function after a relatively long period of incubation (often 20 hours / overnight). This study also furthered our knowledge of cytokine-induced MAIT activation by examining MAIT cell response following a shorter period of stimulation (6 hours versus 20 hours), as well as by highlighting the robust contribution of TL1A in MAIT cell activation.

Similar to IL-12, IFN-α/β signals through STAT4 and STAT1 (Matikainen et al., 2001; Sareneva et al.). STAT4 is required to maintain NK cell cytotoxicity, whereas STAT1 is associated with IFN-α/β-induced IL-15 mRNA expression (Nguyen et al., 2002). Furthermore, type I IFNs can also synergise with IL-18 *in vitro* and *in vivo*, as shown by their capacity to induce IFN-γ production and upregulate GrB expression (van Wilgenburg et al., 2016). Thus, MAIT cells may be a potent anti-viral population

possibly through secretion of further local antiviral cytokines or via clearance of infected cells.

Of note, different from the PBMC study by van Wilgenburg et al., this study only used enriched CD8+ T cells for similar assays, and the 20-hour response was much lower than what van Wilgenburg et al. had reported. This suggests that type I IFN-mediated MAIT cell activation was possibly a secondary effect induced by other relevant cytokines produced by autologous APCs or Th cells following type I IFN induction. Regardless this being a primary or secondary effect on MAIT cells, MAIT cells act as local amplifiers of type I IFNs signalling to exert their specific *in vivo* antiviral functions.

MAIT cells may respond weakly to a 20-hour stimulation of IL-18 and type I IFNs in the absence of APCs or Th cells. However, our data suggest that ~20% of them released IFN-γ following 6 hours IL-18+IFN-α/β induction. This, together with findings that type I IFNs peaked at earlier hours of infections such as Lymphocytic Choriomeningitis Virus (LCMV) infection in mouse NK cells (Mack et al., 2011), suggests an early role of type I IFNs in various inflammatory and viral settings.

Our data also show evidence of MAIT cell activation in response to TL1A. In addition to its proinflammatory and costimulatory role in the human blood (Cohavy et al., 2011; Holmkvist et al., 2015), TL1A has been linked to clinically active IBD (Jin et al., 2012; Shih et al., 2009). IBD patients have higher levels of DR3 and TL1A expression in their mucosal T cells and macrophages (Bamias et al., 2003b; Prehn et al., 2004). Our data show that TL1A enhanced the effector function of MAIT cells in the presence of a suboptimal dose of IL-12/-18, but not with TCR signalling, and

in the following chapters the contributions of TL1A to MAIT cell activation in the gut will be further addressed.

3.5.4. The TCR and cytokine signals integrate to activate MAIT cells

Although a TCR stimulus is not sufficient to induce the full range of effector functions in MAIT cells, we here demonstrate that a combined TCR+cytokine signal strongly promoted activation, described by robust responses elicited in MAIT cells by TCR+IL-12/-18 at 20 hours, as well as TCR+type I IFNs at 6 hours. Resting MAIT cells express a higher level of IL-18Rα on the cell surface, compared with their CD161++Vα7.2- or CD161- counterparts (Fergusson et al., 2014; Ussher et al., 2013). However, we found that IL-18 had a very limited role in enhancing MAIT cell activation in the presence of TCR triggering at 20 hours. In fact, both IL-18 receptor subunits, IL-18Rα and IL-18Rβ, are markedly upregulated in cytokine-activated NK and T lymphocytes, including IL-12 and IFN-α, but not by a single TCR signal (Sareneva et al., 2000). Thus, the observed low response of MAIT cells to TCR+IL-18 stimulation maybe due to insufficient expression of IL-18Rβ, which is important for downstream signalling (Cheung et al., 2005). We also show here that titrating anti-CD3/CD28 beads into a suboptimal IL-12/-18 stimulus restored effector function of MAIT cells. IL-12 and TCR synergy likely results from IL-12-mediated phosphorylation of Lck, a key player in the TCR signalling (Vacaflores et al., 2016).

Consistent with findings demonstrating the early and transient role of type I IFNs combined with IL-18 in promoting IFN-γ release by MAIT cells, our data also confirm that they could enhance the TCR signal at early hours and as a result, greatly increase the percentage of MAIT cells that expressed IFN-γ and GrB. This is particularly interesting as both type I IFN and TCR signals, as shown in this study, are very early mediators of MAIT cell activation. Given that type I IFNs is not only

produced in acute viral but also in bacterial infections, we hereby propose that MAIT cells form an important arm in the network of bacterial recognition and elimination that at least partially requires the involvement of IFN-α/β. This was further corroborated in our study by examining the effector function of MAIT cells triggered by *E. coli*-fed THP1 cells. We report that blockade of type I IFNs by B18R reduced IFN-γ and GrB expression levels in MAIT cells only between 8-12 hours post co-incubation. In addition, another study has shown that IFN-α was able to activate APCs leading to enhanced MR1-mediated MAIT cell activation (Ussher et al., 2016). Of note, type I IFNs, on their own, could not promote MAIT cell effector function either at 6 or 20 hours, indicating a potentially self-protecting mechanism to prevent over-activation.

Previous studies using the *E. coli*-fed THP1 model have shown two independent mechanisms of primary human MAIT cell activation: MR1 (TCR) –dependent activation that acts early, and IL-12/-18 –dependent activation, which occurs later (Ussher et al., 2013, 2016). Published data, using IFN-γ as the functional read-out, have also described that the MR1 and IL-12/-18 signalling pathways equally contributed to human primary MAIT cell activation following a long-term (20 hours) stimulation by *E. coli*-fed THP1 cells.

This study further investigated within this model various potential contributors to MAIT cell activation at different time points, incorporating not only IFN-γ, but also CD69, TNF-α, and GrB as functional read-outs. MR1 and IL-12/-18 signals were indeed both indispensable for IFN-γ secretion by MAIT cells following a 20-hour stimulation, as the blockade of either signal resulted in ~80% decrease in IFN-γ release. This is more striking than what was shown by by Ussher et al., where blocking IL-12/-18 or the MR1 pathway halved IFN-γ production (Ussher et al.,

2013). However, Ussher et al. also found that IL-12/-18 or MR1 blockade individually caused ~80% decrease in IFN-γ release when using primary monocytes as the APC (Ussher et al., 2016). A thorough investigation comparing THP1 cells, primary monocytes and monocyte-derived macrophages reported their varied potential to influence the activation pattern of MAIT cells (Ussher et al., 2016). Although this study and others induced MAIT cell activation by using the same THP1/*E. coli* model, THP1 cells cannot be guaranteed, and perhaps were not identical, with varying passage numbers and/or slight differences in culturing conditions. Thus, this could be key attributes to observed discrepancy between our results and others.

This study also highlights the role of MR1 signalling in inducing the expression of TNF-α, GrB, and CD69. In particular, the release of TNF-α by MAIT cells was highly dependent on the MR1 signalling pathway, as blocking IL-12/-18 did not contribute to any level of reduction in TNF-α secretion. We and others have demonstrated MAIT cells' hypo-responsiveness to the TCR ligation, and argued that innate cues are a predominant mediator in the long-term activation for MAIT cells. Indeed, TNF-α was induced in MAIT cells by strong doses of recombinant cytokines (e.g. IL-12/-18/-15/TL1A) in the absence of TCR signalling. However, whether such a strong cytokine signal could be generated in an *in vivo* setting is unclear. Given the MR-1 dependent production of TNF-α, we hereby propose that unique functional programmes of MAIT cells are driven by distinct signalling pathways, and that MR1 signalling may have an unappreciated role in initiating and maintaining the expression of TNF-α in the absence of cytokines. Understanding TCR-driven and cytokine-induced MAIT cell responses will of great importance in assessing MAIT cell effector functions in various tissues such as the gut, where the microbiome

delivers abundant antigens, but at the same time inflammatory response are limited to avoid pathology in healthy individuals.

3.5.5. Novel effector functions of MAIT cells predicted by RNAseq and GSEA

RNAseq data on differentially stimulated MAIT cells show that the transcriptional profiles of MAIT cells shared common features yet also possessed unique elements specific to the stimulus. The overlap between C- and TC- elicited transcriptional profile was striking, yet both conditions triggered unique genes that were differentially regulated. PCA analysis demonstrated that IL-12/-18/-15/TL1A strongly stimulated MAIT cells, the addition of another TCR trigger played a minor role in driving further enhancement of MAIT cell effector function.

In addition to bacterial killing, IL-26 promotes production of proinflammatory cytokines in the gut and is associated with IBD pathogenesis. We here report that in addition to intestinal intraepithelial cells, colonic Th17 cells, and innate lymphoid cells of CD patients (Dambacher et al., 2009; Geremia et al., 2011), MAIT cells also contribute to the pool of IL-26 producing cells. Further investigation on the activation profile of gut MAIT cells could perhaps shed light on their functions in IBD pathogenesis and disease progression.

In contrast to host defence and inflammation, there is yet to be a consensus established around the function of T cells in wound healing and tissue repair. The precise functions of different T cell types and subsets are largely unknown, and differs from tissue to tissue and between species. While γδ T cells are commonly believed to promote tissue healing process (Havran and Jameson, 2010), studies around CD4+ Tregs and CD8+ cytotoxic cells have suggested their diverse and distinct roles in wound healing. In the context of bone, fracture healing is

accelerated in mice depleted of T and B cells (Toben et al., 2011). However, other studies have shown that Tregs are critical to repair and regenerate several tissues including skin and lung (Julier et al., 2017), and that CD8+ T cells aid skeletal muscle regeneration (Zhang et al., 2014) and wound closure in mice (Linehan et al., 2018). Our findings on upregulated expression of HBEGF and OSM, as well as a statistically enriched tissue repair transcriptional signature in MAIT cells supports the notion that at least a subset of CD8+ T cells can directly or indirectly promote tissue repair in mucosal layers and at barriers sites. We found that MAIT cells expressed a high level of HBEGF with a strong stimulus. This indicates that MAIT cells could also be a direct mediator of wound healing in breach of epithelial integrity. In addition, HBEGF is also involved in cancer metastases, the level of which is elevated in cancers including hepatocellular cancer, breast cancer, and CRC (Jayne et al., 2000). Whether activated gut MAIT cells could lead to differential outcomes in disease development and progression via release of HBEGF is yet to be defined.

Expression of an IBD-associated gene OSM was also increased in cytokine-activated blood-derived MAIT cells. OSM has been reported to be present in colonic tissues of IBD patients, and recently its role in eliciting inflammatory responses in the gut has been studied. West *et al.* demonstrated that OSM is a gut-related cytokine by contributing to inflammation in mouse intestinal stroma, particularly in synergy with TNF. In addition, OSM is upregulated in severe anti-TNF-therapy-refractive IBD patients (West et al., 2017). Similar to HBEGF, OSM has also been shown to induce migration of keratinocytes *in vitro* and skin repair *in vivo* (Boniface et al., 2007; Hoffmann et al., 2011). Our finding on OSM upregulation in activated MAIT cells suggests an additional function for MAIT cells at the mucosal barrier.

Given the association of TCR-driven signals – potentially derived from interaction with commensal bacteria in the gut – with a tissue repair signature similar to that recently reported in IL17+ innate like T cells in murine skin models (Klenerman and Ogg, 2018; Linehan et al., 2018), we propose a model of novel tissue repair functions of MAIT cells. In the human gut and potentially also in the liver, MAIT cells are continuously exposed to MR1-bound ligand derived from the commensal bacteria present in the microbiome. In the absence of inflammatory signals, this serves only to drive the minimal transcriptional signature associated with local homeostatic function. Consistent with this, MAIT cells from healthy human gut tissue show evidence of persistent TCR-driven signalling (upregulation of CD39 and PD-1) together with downregulation of function compared with blood-derived cells (data shown in the following chapter). During IBD-associated loss of bowel integrity, MAIT cells have been shown to be further activated, but whether this is a response to tissue injury or they play a causative role is yet to be defined. Our data would suggest the innate cytokines would drive the full activation signal during tissue injury, which may induce a broad inflammatory response. We note that for example, IL17F, which has been recently shown to be pathogenic in IBD models (Tang et al., 2018), is not induced by TCR signals alone, but is strongly induced in the presence of inflammatory cytokines (fold change >200, $p < 10^{-6}$).

Together, our data demonstrate that a combined signal of cytokines and the TCR triggering elicit sustained effector function in human MAIT cells derived from the blood or the gut. We report TL1A as another potent inducer of specific MAIT cell functions. Furthermore, a comprehensive RNAseq study produced a set of genes that are significantly upregulated by activated blood MAIT cells. These genes suggest that in addition to their anti-bacterial, anti-viral, and cytotoxic roles, MAIT

cells could potentially impact on direct bacterial killing, wound healing and play an ongoing role in tissue remodelling.

3.6. Summary

1. CD8+ MAIT cells are unable to be fully activated by TCR trigger alone;
2. Combinations of cytokines, notably IL-12/-18 ± type I IFNs (6hours), or ± IL15/TL1A (20 hours) significantly enhanced MAIT cell effector functions;
3. TCR triggering and cytokines (type I IFNs at 6 hours and IL-12/-18 at 20 hours), in synergy promote MAIT cell activation. The *E.coli* stimulation model confirmed the early role of type I IFNs in inducing MAIT cell activation and an profound role for both MR1 and IL-12 + IL-18 signalling in mediating and sustaining effector functions of MAIT cells, in particular, their IFN-γ, TNF-α, and GrB expression in response to *E. coli*;
4. RNAseq analysis on differentially activated cells provides mechanistic insight on the contribution of TCR signalling and cytokine signalling in promoting specific effector functions of MAIT cells. The study of the transcriptional signatures of activated MAIT cells predicts a novel physiological functions, including a potential role in bacterial killing, wound healing, and tissue remodelling.

4. CHARACTERISING GUT-RESIDENT CD8+CD161++ T CELLS

4.1. Introduction

The pathogenesis of IBD is still largely unknown, but scientists and physicians hold the consensus that dysfunctional interaction between the mucosal immune system and the commensal bacteria in the gut is the main cause. Studies have individually discussed how the lack of tolerance to the antigens existing in resident intestinal flora (Duchmann et al., 2008), increased bacterial burden in the intestinal mucosae (Swidsinski et al., 2002; Swidsinski et al., 2008), and prolonged exposure to commensal bacteria (Darfeuille-Michaud et al., 1998; Martin et al., 2004) can all individually or in combination contribute to IBD.

IBD, with major clinical manifestations including UC and CD, is caused by a multitude of environmental and genetic factors. In terms of genetic factors underlying IBD pathogenesis, NOD2 (Ogura et al., 2001) and IL-23R (Duerr et al., 2006) are the most extensively studied. NOD2 is expressed on APCs (monocytes mostly) and in epithelial cells at the base of small intestine crypts named Paneth cells (Podolsky, 2002). Activation of NOD2 by bacterially derived PAMPs triggers activation of downstream inflammatory pathways (Uehara et al., 2004). The intestine of IBD patients with impaired NOD2 modulation is more likely to excessively produce proinflammatory cytokines, leading to inflammation. A SNP in the IL-23R gene has been identified as an IBD susceptibility gene in a GWAS study within an American CD cohort (Duerr et al., 2006). IL-23 activity is present in the intestinal tract including terminal ileum (Becker et al., 2003) and colon (Fuss et al., 2006). Mouse studies have demonstrated that IL-23 signalling induces severe systemic, multi-organ inflammation (Wiekowski et al., 2001), and is required for and

exacerbates murine colitis (Yen et al., 2006). Indeed, blocking the IL-23 signalling pathway showed effective results in a clinical trial in IBD (Mannon et al., 2004), but contradicting data also show that the absence of IL-23 worsens several models of murine colitis (Becker et al., 2006).

Th17 cells, exclusively originating from CD161+CD4+ T cell progenitors, are shown by multiple studies to be important in IBD pathogenesis (Cosmi et al., 2008). The overlapping signatures of MAIT cells and CD161+ Th17 cells – the abundance of MAIT cells in mucosal tissues, together with their Tc1/17 phenotype, tissue homing property, expression of CD161, IL-23R, and RORγt (Billerbeck et al., 2010; Dusseaux et al., 2011), indicate MAIT cells are a potential new player in IBD (Kumar and Ahmad, 2018; McGovern and Powrie, 2007; Treiner, 2015).

Findings have shown that MAIT cells are impacted by and perhaps influence IBD. MAIT cell frequencies are decreased in the blood of CD and UC patients, and enriched at inflamed intestinal sites (Haga et al., 2016; Serriari et al., 2014). Along with altered presence in disease, functional responses of MAIT cells also change in IBD, indicating their relevant roles in IBD pathogenesis. Serriari et al. and Haga et al. demonstrated that IL-17 producing MAIT cells were significantly enriched in the blood of UC and CD patients compared with the healthy controls (Haga et al., 2016; Serriari et al., 2014). Serriari et al. have also described decreased IFN-γ secretion in CD patients, and enhanced proliferative capacity as well as the level of activation (Serriari et al., 2014), and Hiejima et al. additionally provided evidence showing enhanced proapoptotic features of MAIT cells in peripheral blood and inflamed mucosa of IBD patients (Hiejima et al., 2015).

MAIT cells with a strong proinflammatory response – especially an enhanced IL-17-secreting profile – are considered deleterious in IBD. This is debatable for at least two reasons. First, IL-17A is not only a proinflammatory cytokine but also can play a protective role in bacterial infections. Secondly, human blood MAIT cells, when stimulated by bacteria, TCR beads or innate cytokine cues, express minimal amount of IL-17A. Furthermore, very little data, thus far, describe the *in vivo* regulation of cytokine responses by mucosal MAIT cells to bacteria, their cognate antigens and/or cytokines, and whether MAIT cells can produce IL-17A in the gut is still unknown.

Therefore, the exact physiological role of MAIT cells in IBD remains to be probed. *In vivo* and *in vitro* analyses of the phenotype and cytokine secretion patterns of human blood and mucosal MAIT cells will help elucidate whether MAIT cells are truly proinflammatory and pathogenic within the context of IBD.

4.2. Aims

1. Detect and quantify MAIT cells in healthy and inflamed intestinal tissues;
2. Analyse the phenotype and function of MAIT cells in healthy and inflamed intestinal tissues;
3. Study the differential regulation of cytokine secretion patterns of activated MAIT cells in the peripheral blood, and healthy and inflamed gut tissues;
4. Analyse the frequency, phenotype, and function of peripheral blood MAIT cells in IBD patients.

4.3. Chapter-specific materials and methods

4.3.1. Patient blood and tissue samples

Patients with IBD were recruited at the John Radcliffe Hospital Gastroenterology Unit (Oxford, UK). Resections were obtained from patients with IBD undergoing surgery for severe, chronic, or complicated disease. Non-IBD (non-inflamed) control specimens were obtained from normal regions of bowel adjacent to resected tumours from colorectal cancer patients diagnosed between 2016 and 2017. All patients were informed, and provided written consent for the study. Gut LP mononuclear cells (LPMCs) were further extracted. PBMCs were obtained from IBD patients attending the Infliximab infusion clinic, or healthy individuals in the Peter Medawar Building for Pathogen Research, or from frozen cones stored in liquid nitrogen.

4.3.2. Patient information

Relevant patient and sample information is listed in the tables below.

Table 4-1. Characteristics of the CRC patients.

CRC patients	n = 21
Age (Average, SD*)	68, 12
Sex (Male/Female)	12/9
Uninflamed, tumour-free tissue origin Small intestine Large intestine	 0 21
Time since diagnosis (years) Average, SD	 1, 1
Ongoing treatments	NA**

* SD: standard deviation
** NA: not available

Table 4-2. Characteristics of the IBD patients whose LPMCs were compared with LPMCs derived from non-inflamed tissue resections from CRC patients.

IBD patients	n = 15
Age (Average, SD)	37, 11
Sex (Male/Female)	4/11
Disease manifestation UC/CD	 8/7
Tissue origin Small intestine Large intestine	 4 11
Time since diagnosis (years) Average, SD	 9, 9
Ongoing treatments (cases) Corticosteroids[1] Cell cycle inhibitors[2] Anti-integrin[3] Anti-TNF[4] Non-steroidal anti-inflammatory drugs[5]	 6 7 3 4 4

1: Budesonide, Prednisolone, Predfoam.
2: Azathioprine, Mercaptopurine, Cyclosporine
3: Vedolizumab
4: Infliximab, Adalimumab
5: Mesalamine – Asacol, Pentasa

Table 4-3. Characteristics of the IBD patients whose uninflamed and inflamed tissue specimens were analysed in parallel.

IBD patients	n = 10
Age (Average, SD)	40, 15
Sex (Male/Female)	4/6
Disease manifestation UC/CD	 1/9
Paired inflamed/uninflamed tissue origin Small intestine Large intestine	 4 6
Time since diagnosis (years) Average, SD	 10, 9
Ongoing treatments (cases) Corticosteroids Cell cycle inhibitors Anti-integrin Anti-TNF Non-steroidal anti-inflammatory drugs	 4 7 1 2 1

Table 4-4. Characteristics of the IBD patients whose PBMCs were analysed.

IBD patients	n = 19
Age (Average, SD)	36, 15
Sex (Male/Female)	13/6
Disease manifestation UC/CD/unidentified	 12/4/3

Disease condition	
Active disease	4
Inactive/remission	15
Time since diagnosis (years)	NA
Ongoing treatments (cases)	
Corticosteroids	3
Cell cycle inhibitors	7
Anti-integrin	8
Anti-TNF	19
Non-steroidal anti-inflammatory drugs	6

4.3.2. Isolation and culturing of gut LPMCs

Intestinal mucosa was dissected and washed in 1 mM DTT solution for 15 mins at room temperature to remove mucus. Specimens were then washed three times in 0.75 mM EDTA at 37°C to remove epithelial crypts. The mucosa was washed extensively by PBS and digested for 2 hours at 37°C in the complete media containing 1.5 mg/ml collagenase A (Roche, UK) and 0.01 mg/ml DNase I (Sigma Aldrich). For enrichment of mononuclear cells, digests were centrifuged for 25 mins (2000rpm, 12°C) in a three-layer Percoll (Amersham Pharmacia Biotech AB) gradient and LPMCs were with a Pasteur pipette from the 40%/60% interface. LPMCs were then washed, counted (MACSQuant), and rested at 37°C for overnight in the complete media prior to further phenotyping and stimulation assays. For the scope of this thesis, all experiments with gut lymphocytes were performed with LPMCs without enrichment, and unenriched PBMCs were used as the control accordingly.

4.3.3. *E. coli* stimulation of T cells

$8x10^4$ THP1 cells, $2x10^6$ fixed *E. coli*, 10^6 PBMCs or LPMCs for 20 hours before analysis of cell activation. Brefeldin A was added for the last 4 hours of incubation. Cells were not enriched prior to stimulation.

4.3.4. PMA/ionomycin stimulation

PBMCs or LPMCs were incubated with 20 ng/ml phorbol 12-myristate 13-acetate (PMA) and 250 ng/ml ionomycin (both from Sigma Aldrich) for 20 hours. Brefeldin A (BioLegend) was added at 1:1000 dilution for the final 4 hours of the stimulation.

4.4. Results

4.4.1. Blood MAIT cells from IBD patients are phenotypically similar to those in healthy blood samples, but show an altered level of integrin β7 expression

We first tested characterised phenotypes circulating MAIT cells in IBD patients.

We found that CD8+ MAIT (CD161++Vα7.2+ cells) represented, on average, 7.86% CD8+ T cells in blood samples of IBD patients. This was similar to that in healthy donors (Figure 4-1A). Similar to healthy individuals, blood MAIT cells from IBD patients also predominantly displayed an effector memory (CD45RA- CCR7-) phenotype, and around 20% were effector memory RA cels (Temra, CD45RA+ CCR7-). Very few CD8 blood MAIT cells were central memory T cells (Tcm) or naïve, in line with previous reports (Figure 4-1B).

Our data measuring the percentage of MAIT cells that expressed IL-18Rα, as well as IL-18Rα gMFI within the MAIT subset confirm that blood MAIT cells from both IBD patients and healthy individuals expressed similar levels of IL-18Rα on the cell surface (Figure 4-1C, D). Our data also show that PLZF – the master TFof innate lymphocytes, and RORγt – the key TF regulating Th17/Tc17 activity – were both expressed to a similar extent in blood MAIT cells from IBD patients compared with those from healthy donors (Figure 4-1E, F). These data on innate markers specific

to MAIT cells indicate a similarity in MAIT cell phenotypes and functions between those from IBD blood samples and healthy blood samples.

We also established that compared with blood MAIT cells from healthy donors, those from IBD patients had similar levels of CD39 and PD-1 expression measured by the percentage of CD39+ cells, the percentage of PD-1 positive cells, the percentage of PD-1+CD3+ cells within the MAIT cell population (Figure 4-1G), as well as the gMFI of these two markers (Figure 4-1H).

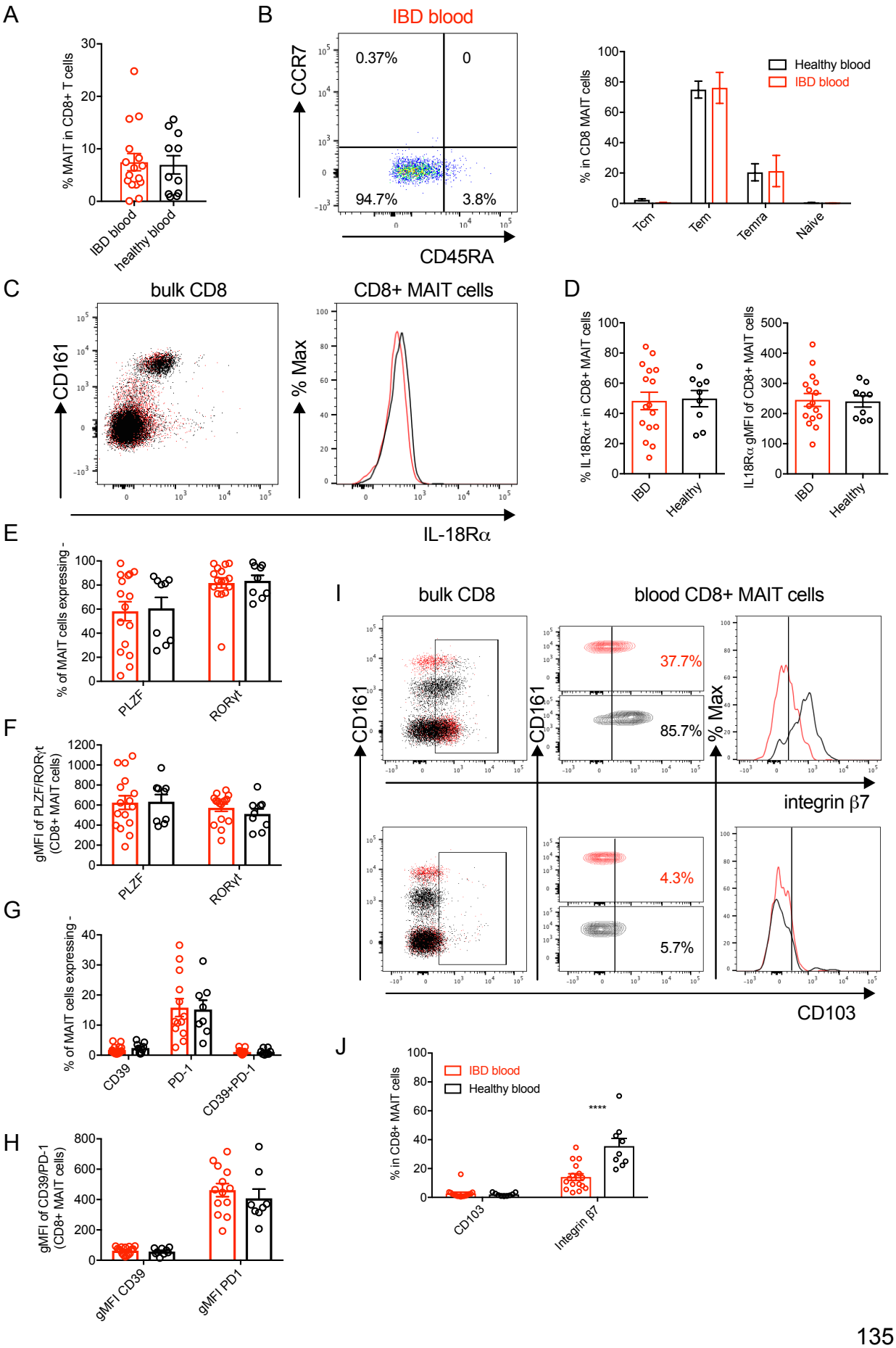
Two studies have reported a strong accumulation of MAIT cells in the total T cell compartment (Haga et al., 2016; Serriari et al., 2014). These pieces of evidence suggest that MAIT cells are actively recruited to the gut during inflammation. We hypothesised two alternatives of integrin β7 could be involved in this process. Integrin α4β7 mediates mucosal homing, and integrin αEβ7 is responsible for epithelial retention. Integrin α4β7 interacts with its ligand mucosal addressin cell adhesion molecule 1 (MAdCAM-1) and is crucial to T cell trafficking to the intestinal mucosae (Dusseaux et al., 2011). Additionally, liver-resident MAIT cells are recruited to the biliary epithelial layer by integrin αEβ7, thereby protecting the bile ducts from potential bacterial infections from the gut (Toubal and Lehuen, 2016).

We investigated the expression of integrin β7 – the shared component of both integrins, and CD103 – the unique component for integrin αEβ7. Our results show that compared with blood MAIT cells from healthy individuals, those from IBD patients significantly reduced their integrin β7 expression, but expressed the same level of CD103 (Figure 4-1I, J). The reduced integrin β7 expression in blood could indicate their enhanced ability to emigrate to the inflamed gut. It is possible that both αEβ7+ and α4β7+ MAIT cells are both selectively recruited to the gut, however,

given the low CD103 levels on both IBD and healthy blood MAIT cells, it is perhaps more likely that α4β7 is the major mediator in MAIT trafficking.

Figure 4-1. Phenotyping blood MAIT cells derived from IBD patients. A) Percentages of MAIT cells in CD8+ T cells from healthy and inflamed PBMCs. B) Representative plots showing the expression of CCR7 and CD45RA on blood MAIT cells from IBD patients (left), and cumulative frequencies of naïve and memory subsets within blood MAIT cells from healthy individuals and IBD patients (right). C) Representative plot showing the expression of IL-18Rα on blood CD8+ T cells from healthy donors (black) and IBD patients (red), and histogram showing the expression of IL-18Rα on blood CD8+ MAIT cells from healthy donors (black) and IBD patients (red). D) Cumulative frequencies of IL-18a-expressing blood MAIT cells (left), and IL-18Rα gMFI on blood MAIT cells from indicated origins. E) Cumulative frequencies of PLZF- (left) or RORγt (right) -expressing blood MAIT cells from indicated origins. F) PLZF (left) or RORγt (right) –gMFI on blood MAIT cells from indicated origins. G) Cumulative frequencies of CD39+, PD-1+, or PD-1+CD39+ blood MAIT cells from indicated origins. H) CD39 (left) or PD-1 (right) –gMFI on blood MAIT cells from indicated origins. I) Representative plots showing the expression of integrin β7 (top panel) or CD103 (bottom panel) on blood CD8 T cells (left), and MAIT cells (middle) from healthy donors (black) or IBD patients (red) The right panels include histograms showing the expression of integrin β7 (top panel) or CD103 (bottom panel) on MAIT cells. J) Cumulative frequencies of CD103+ or integrin β7+ blood MAIT cells from indicated origins. Results shown as mean ± S.E.M, IBD PBMCs n = 16, healthy PBMCs n = 9. **** $p<0.0001$ by repeated measures two-way ANOVA, with Bonferroni's multiple comparisons test.

Figure 4-1


A
% MAIT in CD8+ T cells
IBD blood
healthy blood
B
IBD blood
CCR7
0.37%
0
94.7%
3.8%
CD45RA
% in CD8 MAIT cells
Healthy blood
IBD blood
Tcm
Tem
Temra
Naive
C
bulk CD8
CD8+ MAIT cells
CD161
% Max
IL-18Rα
D
% IL18Rα+ in CD8+ MAIT cells
IBD
Healthy
IL18Rα gMFI of CD8+ MAIT cells
E
% of MAIT cells expressing -
PLZF
RORγt
F
gMFI of PLZF/RORγt (CD8+ MAIT cells)
G
% of MAIT cells expressing -
CD39
PD-1
CD39+PD-1
H
gMFI of CD39/PD-1 (CD8+ MAIT cells)
gMFI CD39
gMFI PD1
I
bulk CD8
blood CD8+ MAIT cells
CD161
37.7%
85.7%
% Max
integrin β7
4.3%
5.7%
CD103
J
IBD blood
Healthy blood
% in CD8+ MAIT cells
****
CD103
Integrin β7

4.4.2. Blood MAIT cells from IBD patients display a skewed Th1/17 activation profile

The PMA/ionomoycin stimulation induced IFN-γ secretion by 51.8 ± 3.4% healthy blood MAIT cells, and 61.0 ± 4.5% by IBD blood MAIT cells (Figure 4-2A). Our data demonstrate that PMA/ionomycin significantly increased TNF-α production in IBD blood MAIT cells (31.0 ± 4.1% in health versus 51.6 ± 4.4% in IBD) (Figure 4-2B). This contrasts with previous finding describing blood MAIT cells in health and inflammation with similar levels of TNF-α secretion under PMA/ionomycin stimulation. This maybe due to different concentrations of PMA/ionomycin and length of incubation (20 hours here versus 4-6 hours in others). PMA/ionomycin also maximally induced blood MAIT cells, from both IBD patients and healthy individuals, to upregulate GrB expression (Figure 4-2C). Lastly, IBD blood MAIT cells enhanced their IL-17A expression compared with those from healthy blood under PMA/ionomycin stimulation (8.2 ± 2.1% in health versus 16.4 ± 2.2% in IBD) (Figure 4-2D), in line with other studies (Serriari et al., 2014).

Blood MAIT cells from IBD patient were similarly responsive to *E. coli* stimulation compared with those from healthy blood samples (Figure 4-2E).

Although the investigation of innate markers (e.g. IL-18R and PLZF) implied that healthy and IBD blood MAIT cells possess similar degree of “innate-ness”, we studied blood MAIT cell response to IL-12/-18/-15/TL1A to further describe their distinct functions and activation profile in health and disease. Blood MAIT cells from inflamed blood expressed significantly lower levels of IFN-γ, TNF-α, and GrB, with 20.8%, 68.1%, and 17.3% reduction respectively from the level measured in healthy blood MAIT cells (Figure 4-2 F-I). This indicates that MAIT cell functions are differentially tuned in inflammation and health.

Figure 4-2

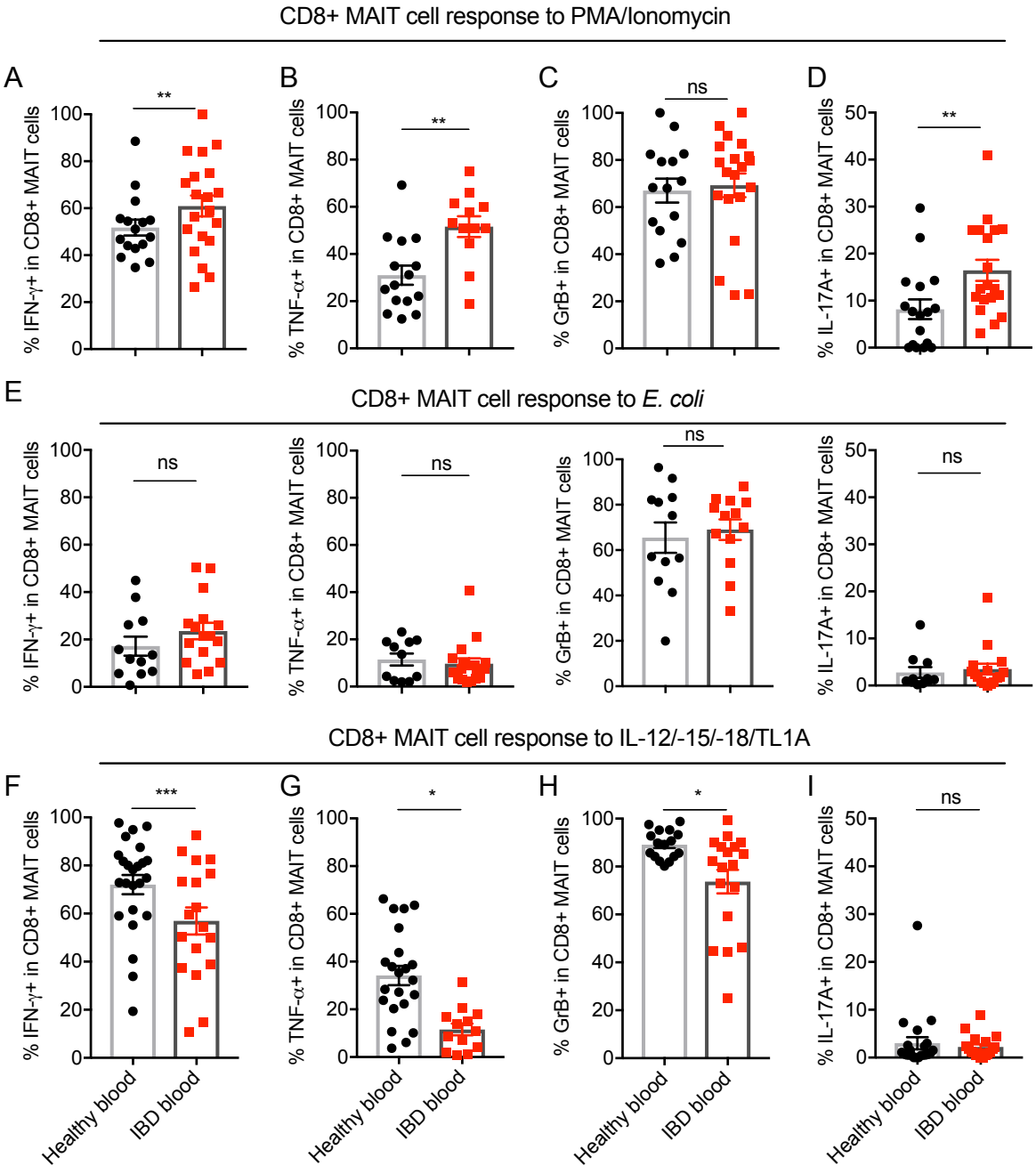


Figure 4-2. Blood MAIT cells from IBD patients show a moderately altered activation profile compared to those from healthy individuals. A, B, C, D) Cumulative frequencies showing the percentage of MAIT cells that expressed IFN-γ (A), TNF-α (B), GrB (C), and IL-17A (D) following PMA/ionomycin stimulation. E) Cumulative frequencies showing the percentage of MAIT cells that expressed IFN-γ, TNF-α, GrB, and IL-17A following *E. coli* stimulation. F, G, H, I) Cumulative frequencies showing the percentage of MAIT cells that expressed IFN-γ (F), TNF-α (G), GrB (H), and IL-17A (I) following IL-12/-15/-18/TL1A stimulation. Healthy PBMCs n = 24, inflamed PBMCs n = 18. *<0.05, **<0.01, ***<0.001 by two-tailed Mann-Whitney test.

4.4.3. MAIT cells are present in healthy and inflamed gut

Studies have established that MAIT cells in the blood express tissue-specific chemokine receptors such as CXCR6 and CCR9, therefore indicate that MAIT cells possess tissue homing properties. Indeed, MAIT cells are found in human lung, liver, and mucosal tissues like colon (Uehara et al., 2004). The different integrin β7 levels in the blood of IBD patients and healthy individuals prompted us to study MAIT cell distribution in healthy and inflamed intestinal tissues.

MAIT cells, characterised by the expression of CD161 and the Vα7.2 TCR, acaccounted for on average 6.8% of CD8+ T cells from healthy blood samples, and a much lower percentage for those from gut tissues: 2.4% of the CD8+ T cells in healthy intestinal tissues are MAIT cells, and only 0.76% in inflamed (Figure 4-3A, B). The strikingly low percentage of MAIT cells from inflamed intestinal tissues correlated to a significantly reduced frequency of CD161++ cells in IBD tissues (Figure 4-3C). This may be due to the proapoptotic features of MAIT cells in inflamed gut tissues described by Hiejima et al. (Hiejima et al., 2015).

Moreover, we found that in both healthy and inflamed gut tissues, MAIT cells overlapped to a lesser extent with the CD161++ populations compared with their blood-derived counterparts, and we describe here a substantial CD161++Vα7.2- population in the gut (Figure 4-3D). The percentage of CD161++ cells was significantly higher than that of MAIT cells in healthy and inflamed gut (Figure 4-3E), and MAIT cells only accounted for on average 23.8% of the CD8+CD161++ cells in healthy intestinal tissues, and 30.8% in inflamed tissues, both were significantly lower than the percentage in the healthy blood (81.8%) (Figure 4-3F). The expression of Vα7.2 was not different for the gut CD161-CD8+ population (data not shown), thus it is unlikely that this is caused by the downregulation of CD161 by

MAIT cells. One possible explanation could be TCR downregulation resulted from previous interaction with the microbiota and the subsequent TCR-MR1 signalling. Thus, in order to fully include activated MAIT cells, live CD3+CD8+CD161++ cells, instead of MAIT cells, were examined in this chapter.

To conclude, our data confirm that MAIT cells are a component of the gut-derived lymphocytes, and they were less enriched in the gut tissues, especially in inflamed intestinal tissues, possibly due to reduced expression of the TCR, or due to their highly proapoptotic features in inflammation.

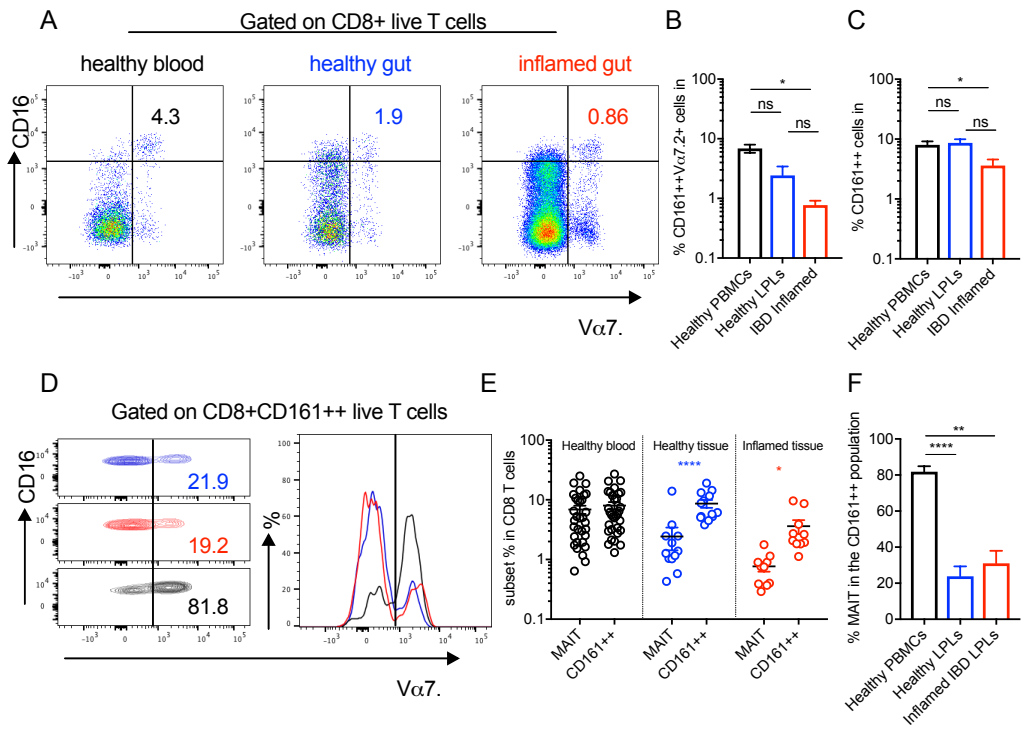


Figure 4-3. MAIT cells are present in the gut. A) Representative plots showing the expression of CD161 and Vα7.2 in live CD8+ T cells extracted from healthy blood samples (left), healthy intestinal samples (middle), and inflamed intestinal samples (right). B) Cumulative frequencies showing the percentage of MAIT cells amongst the total CD8 population. * p<0.05 by one-way repeated measures ANOVA, with Turkey's multiple comparisons test. C) Cumulative frequencies showing the percentage of CD161++ cells amongst the total CD8 population. * p<0.05 by one-way repeated measures ANOVA, with Turkey's multiple comparisons test. D) Representative plots (left) and histogram (right) showing the expression of Vα7.2 by CD8+CD161++ T cells in the healthy gut (blue), inflamed gut (red), and healthy blood (black). E) Cumulative frequencies of MAIT cells and CD161++ cells in the total CD8+ T cell subset separated by their origins. * p<0.05, **** p<0.0001 by multiple t-tests. F) Percentages of MAIT cells amongst CD8+CD161++ T cells. ** p<0.01, **** p<0.0001 by one-way repeated measures ANOVA, with Turkey's multiple comparisons test. Results shown as mean ± S.E.M. Healthy PBMCs, n = 32, healthy LPLs, n = 13, inflamed LPLs, n = 10.

4.4.4. The phenotype of gut CD161++CD8+ T cells

First we investigated CD45RA and CCR7 expression in CD161++CD8+ T cells. CCR7, a chemokine receptor recruiting cells to the lymph nodes, combined with the naïve cell marker CD45RA, discriminates naïve (CD45RA+CCR7+), Tcm (CD45RA−CCR7+), Tem (CD45RA−CCR7−), and Temra (CD45RA+CCR7−) from each other (Sallusto et al., 1999a, 1999b). We found that blood CD161++CD8+ cells derived from healthy individuals are predominantly CD45RA- CCR7- cells (Figure 4-4A) with an effector memory phenotype, in line with various previous findings (Rahimpour et al., 2015; Ussher et al., 2014). This was the same for CD161++CD8+ T cells extracted from healthy or inflamed gut tissues. 90.7% CD161++CD8+ T cells derived from the healthy gut tissues were Tem cells, and 86.5% of those in inflamed tissues were Tem cells (Figure 4-4B).

We then investigated the expression of IL-18Rα, PLZF, and RORγt on CD161++CD8+ T cells from different origins. These markers are characteristic of MAIT cells relevant to their innate functions (Fergusson et al., 2014; Ussher et al., 2013) and Tc17 transcriptional signatures (Billerbeck et al., 2010; Johnston and Gudjonsson, 2014), all of which have been described to be highly expressed by blood MAIT cells from healthy individuals.

Gut CD161++CD8+ T cells (from healthy and inflamed tissues) and those from healthy blood showed similar levels of IL-18Rα expression (Figure 4-4C, D), this is furthermore characterised by measuring the IL-18Rα geometric mean of fluorescence intensity (gMFI) (Figure 4-4D). Therefore, we conclude that high IL-18Rα expression is not restricted to only blood-derived CD161++CD8+ T cells, but is a shared phenotype that extends to their tissue-derived counterparts. Furthermore, PLZF expression was reduced on gut-derived CD161++CD8+ T cells

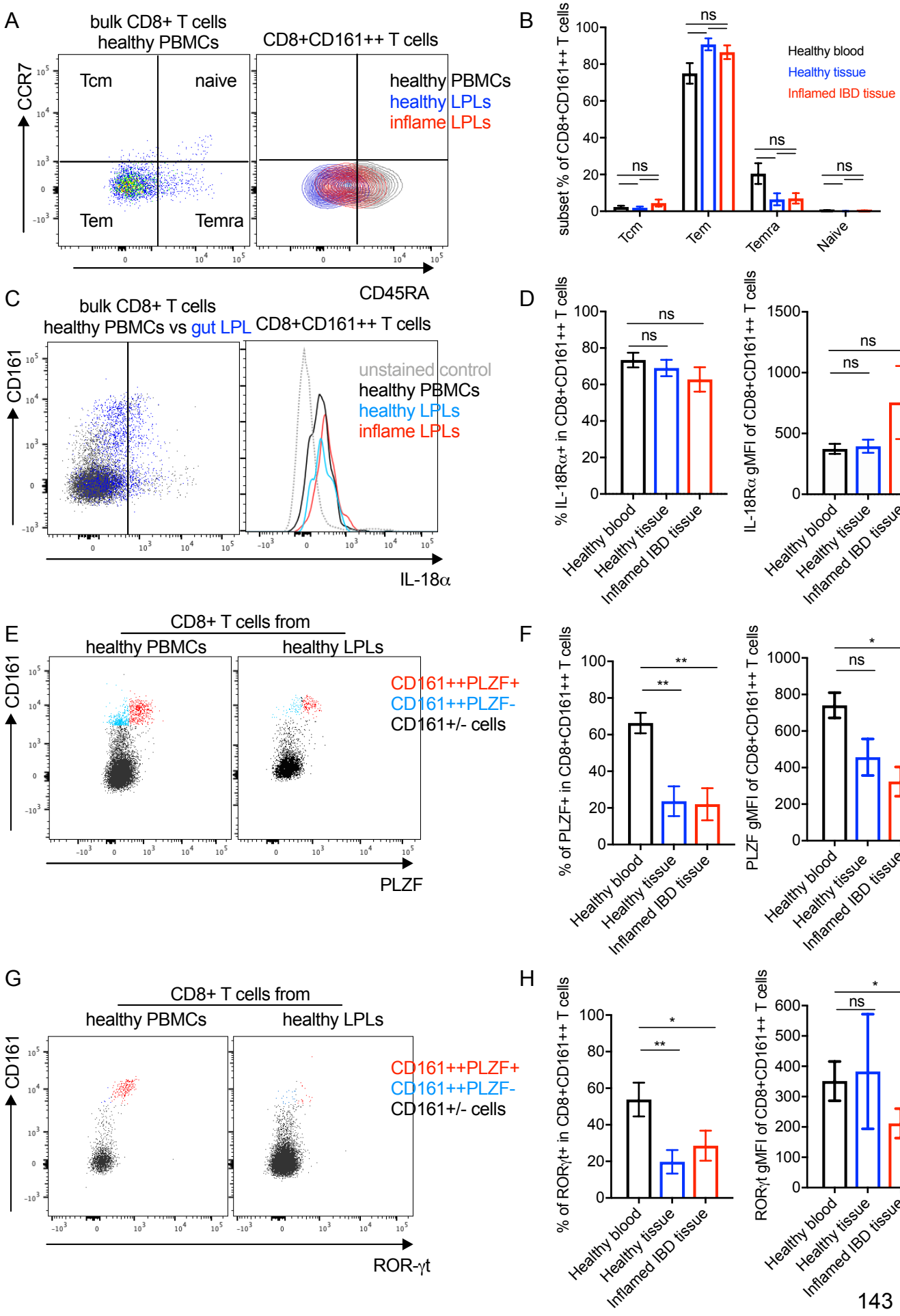
compared with those from the blood. Percentage-wise, PLZF-expressing CD161++CD8+ T cells decreased to on average 23.7% in those derived from healthy gut tissues, and further to 22.0% in those derived from inflamed gut tissues (Figure 4-4E, F). This is a striking reduction given that PLZF expression is a hallmark feature of blood CD161++CD8+ T cells – and our data confirm that in the healthy blood samples 66.7% CD161++CD8+ T cells expressed PLZF. This was also corroborated by measuring PLZF gMFI (Figure 4-4F).

Similar to PLZF expression, gut-resident CD161++CD8+ T cells also showed altered expression of RORγt, the master TF for Th17 cells. The percentage of RORγt-expressing CD8+CD161++ T cells decreased from 53.8% in the healthy blood to 19.8% in heathy gut tissues, and 23.6% in inflamed gut tissues, respectively (Figure 4-4G, H). The RORγt gMFI level, however, was only seen decreased in CD161++CD8+ T cells derived from inflamed gut (Figure 4-4H). This reduced RORγt expression contrasts with findings suggesting an enhanced IL-17A secretion by gut MAIT cells, especially those in IBD (Haga et al., 2016; Serriari et al., 2014).

Previous reports have described CD39 as a distinct marker for terminally exhausted CD8+ T cells during chronic HCV and HIV infections, and cells co-expressing CD39 and PD-1 are enriched for a gene signature for T cell exhaustion (Gupta et al., 2015). Interestingly, our data demonstrate that the gut-resident CD8+CD161++ T cells expressed higher levels of CD39 (Figure 4-4I, J) and PD-1 (Figure 4-4I, L) both as at the population (percentage-wise) and single-cell (gMFI-wise) level. This was particularly pronounced in cells derived from inflamed tissues (shown in red). There was also a higher proportion of exhausted population in gut CD8+CD161++ T cells

compared with those in the blood, based on the percentage of CD8+CD161++ T cells that co-expressed PD-1 and CD39 (Figure 4-4M, N).

Therefore, gut CD8+CD161++ T cells are a distinct subset of lymphocytes with phenotypes both shared with and unique from their blood counterparts. Predominantly a Tem subset, gut CD8+CD161++ T cells retain their surface IL-18Rα expression indicating their robust responsiveness to cytokines. On the other hand, gut CD8+CD161++ T cells showed a reduced expression in PLZF, a decreased level of RORγt, as well as enhanced expression of CD39 and PD-1, in particular observed in those derived from inflamed tissues. These unique features of gut CD8+CD161++ T cells prompted us to study further the functionality of these specific gut-resident CD8+CD161++ T cells with the hope to identify plausible links to their phenotypic features.


A
bulk CD8+ T cells
healthy PBMCs
CD8+CD161++ T cells
CCR7
Tcm
naive
Tem
Temra
healthy PBMCs
healthy LPLs
inflame LPLs
CD45RA
B
subset % of CD8+CD161++ T cells
ns
Healthy blood
Healthy tissue
Inflamed IBD tissue
Tcm
Tem
Temra
Naive
C
bulk CD8+ T cells
healthy PBMCs vs gut LPL
CD8+CD161++ T cells
CD161
unstained control
healthy PBMCs
healthy LPLs
inflame LPLs
IL-18α
D
% IL-18Rα+ in CD8+CD161++ T cells
IL-18Rα gMFI of CD8+CD161++ T cells
E
CD8+ T cells from
healthy PBMCs
healthy LPLs
CD161
CD161++PLZF+
CD161++PLZF-
CD161+/- cells
PLZF
F
% of PLZF+ in CD8+CD161++ T cells
PLZF gMFI of CD8+CD161++ T cells
G
CD8+ T cells from
healthy PBMCs
healthy LPLs
CD161
CD161++PLZF+
CD161++PLZF-
CD161+/- cells
ROR-γt
H
% of RORγt+ in CD8+CD161++ T cells
RORγt gMFI of CD8+CD161++ T cells

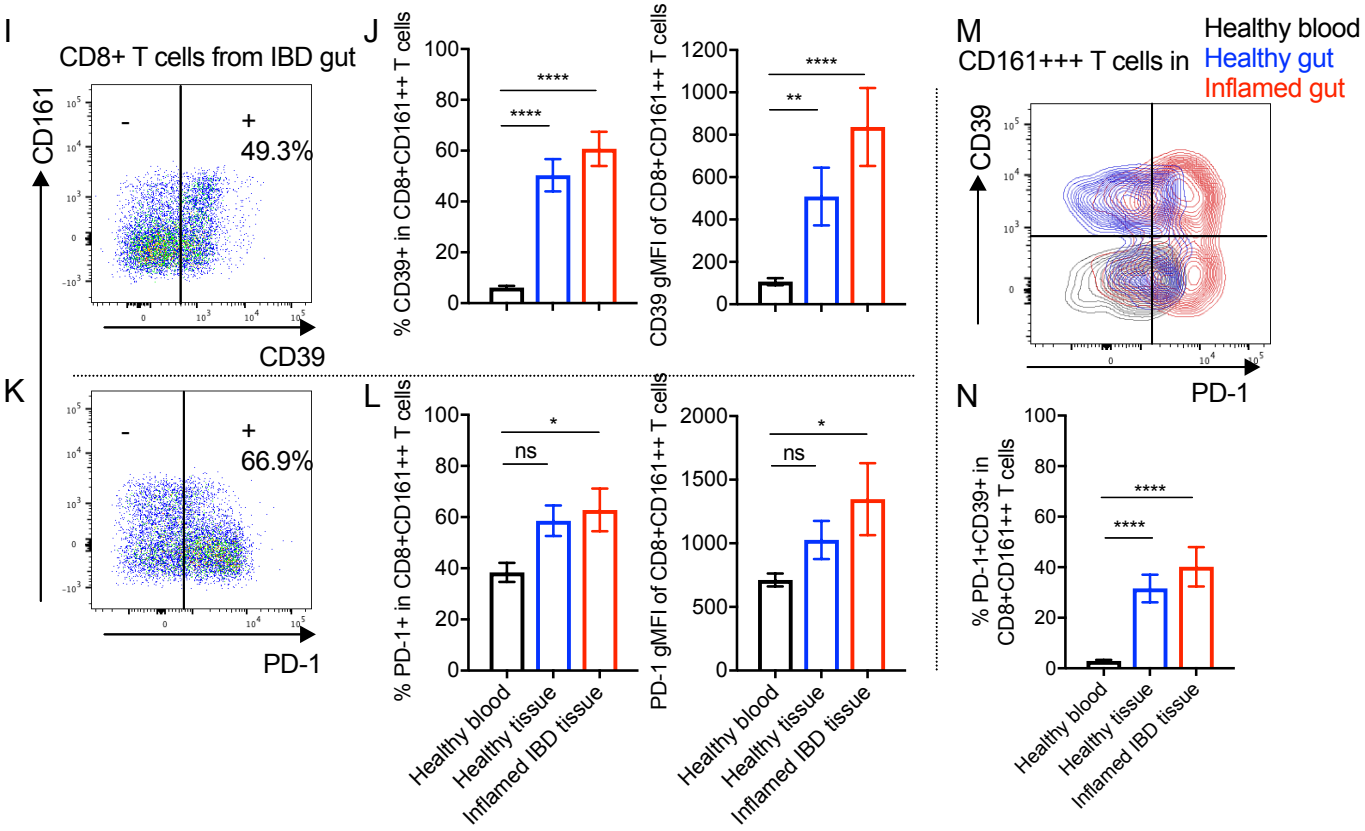


Figure 4-4. CD8+CD161++ T cells in the gut are mostly effector memory T cells with high IL-18Rα expression, intermediate PLZF and ROR-γt expression, and high CD39 and PD-1 expression. A) Representative plots showing the expression of CCR7 and CD45RA delineating Tcm, naive, Tem and Temra cells in CD8+ T cells in healthy blood (left) and CD8+CD161++ T cells from indicated origins (right). B) Cumulative frequencies showing the percentage of Tcm, naive, Tem and Temra cells in CD8+CD161++ T cells from indicated origins. C) Representative plots showing the expression of IL-18Rα within CD8+ T cells from the healthy blood and gut (left) and histograms showing IL-18Rα expression by CD8+CD161++ T cells from various origins (right). D) Cumulative data showing % of IL-18Rα expression (left) or the IL-18Rα gMFI level (right) in CD8+CD161++ T cells. E) Representative plots showing the expression of PLZF within CD8+ T cells from the healthy blood (left) and healthy gut (right). F) Cumulative data showing % of PLZF expression (left) or the PLZF gMFI level (right) in CD8+CD161++ T cells. G) Representative plots showing the expression of ROR-γt within CD8+ T cells from the healthy blood (left) and healthy gut (right). H) Cumulative data showing % of ROR-γt expression (left) or the ROR-γt gMFI level (right) in CD8+CD161++ T cells. I) Representative plot showing the expression of CD39 from an inflamed gut tissue. J) Cumulative data showing % of CD39 expression (left) or the CD39 gMFI level (right) in CD8+CD161++ T cells. K) Representative plot showing the expression of PD-1 from an inflamed gut tissue. L) Cumulative data showing % of PD-1 expression (left) or the PD-1 gMFI level (right) in CD8+CD161++ T cells. M) Representative plots showing the expression of PD-1 and CD39 in CD8+CD161++ T cells from different origins. N) Cumulative data showing % of PD-1 and CD39 co-expression in CD8+CD161++ T cells. Healthy PBMCs, n = 20, healthy LPLs, n = 12, inflamed LPLs, n = 8. Results shown as mean ± S.E.M. * p<0.05, ** p<0.01 by non-parametric test, with Dunn's multiple comparisons test.

4.4.5. Gut CD8+CD161++ T cells respond differentially to PMA/Ionomycin compared with their blood counterparts

Studies have demonstrated that blood MAIT cells from IBD patients display a skewed Th1/Th17 phenotype under the PMA/ionomycin stimulation. Serriari et al demonstrated that the reduced IFN-γ production was specific to CD and not observed in UC patient samples (Serriari et al., 2014), yet in both CD and UC MAIT cells show increased IL-17A production (Haga et al., 2016; Serriari et al., 2014). Using gut samples acquired from the Oxford cohort, we found that CD8+CD161++ T cells from healthy tissues robustly responded to PMA/ionomycin to produce IFN-γ, with 81.5 ± 3.1% expressed IFN-γ. PMA/ionomycin also triggered response of IFN-γ by CD8+CD161++ T cells from inflamed gut tissues, with 44.14 ± 12.9 % cells expressing IFN-γ, a percentage similar to cells derived from healthy blood (Figure 4-5A, B). Here we conclude that CD8+CD161++ T cells derived from inflamed gut tissues retain their ability to produce IFN-γ following PMA and ionomycin stimulation, in line with Hiejima et al (Hiejima et al., 2015).

The expression of GrB by gut-derived CD8+CD161++ T cells has not been examined following PMA/ionomycin stimulation. Here we demonstrate that gut CD8+CD161++ T cells, irrespective of their origin, display impaired capacity to upregulate GrB upon activation, and the reduction of GrB was more pronounced in those derived from inflamed tissues (Figure 4-5C).

Studies have not identified changes regarding TNF-α secretion by CD8+CD161++ T cells in an inflamed setting, and we could provide preliminary evidence that CD8+CD161++ T cells in the gut are more prone to release TNF-α when stimulated with PMA and ionomycin compared with their healthy blood-derived counterparts,

and that in inflammation their expression of TNF-α was notably more pronounced, although the statistical analysis did not yield significance (Figure 4-5D).

Increased IL-17A production by MAIT cells is a hallmark feature of inflammation and autoimmune diseases, including IBD, MS, and psoriatic arthritis (Kumar and Ahmad, 2018; Menon et al., 2014; Willing et al., 2014). We, however, with the number of samples acquired, were unable to confirm the enhanced expression of IL-17A by gut CD8+CD161++ T cells compared with those in the blood in the presence of PMA/ionomycin (Figure 4-5E).

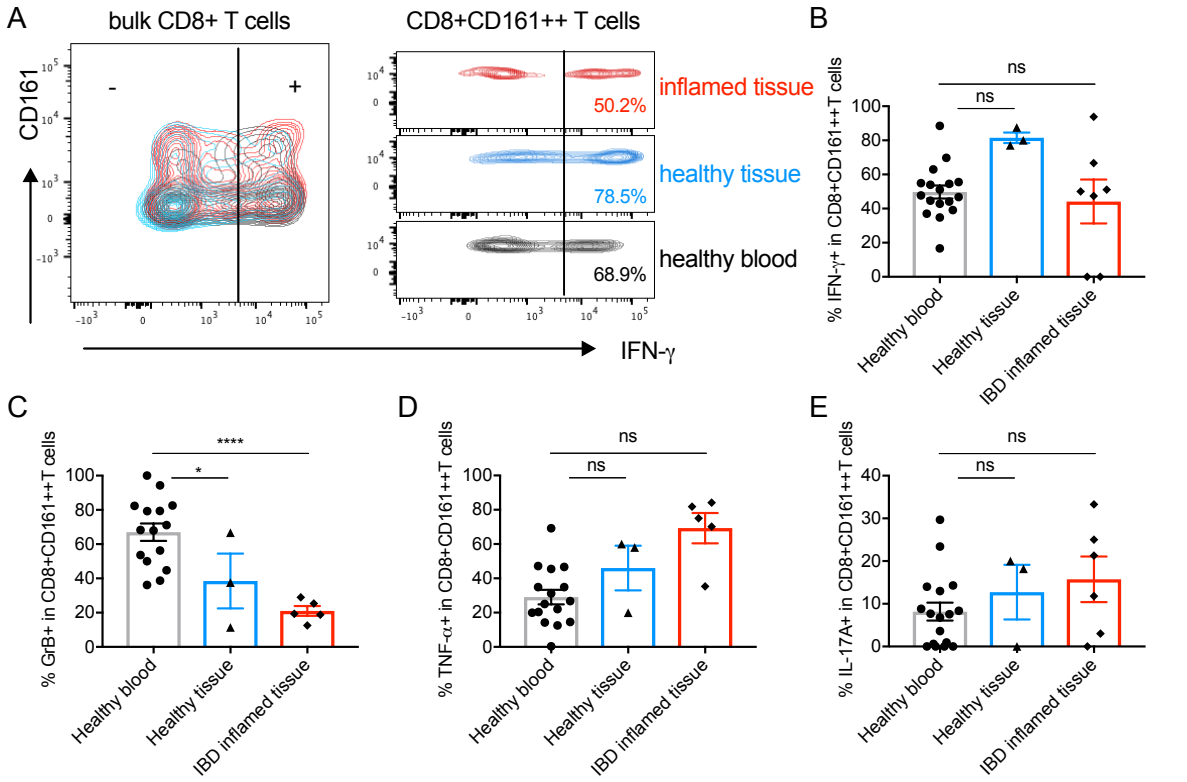


Figure 4-5. Gut-derived CD8+CD161++ T cells respond to PMA and ionomycin and secrete IFN-γ, TNF-α, IL-17A, and upregulate GrB expression to a lesser extent than those derived from healthy blood. A) Representative graph showing the expression of IFN-γ by bulk CD8+ T cells (left), and percentage of IFN-γ-producing CD8+CD161++ T cells from different origins (right). B, C, D, E) Cumulative frequencies showing expression of IFN-γ (B), GrB (C), TNF-α (D), and IL-17A (E) by CD8+CD161++ T cells from indicated origins. Healthy PBMCs, n = 17, healthy LPLs, n = 3, inflamed LPLs, n = 7. Results shown as mean ± S.E.M, * $p<0.05$, **** $p<0.0001$ by one-way repeated measures ANOVA, with Bonferroni's multiple comparisons test.

4.4.6. CD8+CD161++ T cells from the gut respond to *E. coli* stimulation

As described in Figure 3-13, CD8+CD161++/MAIT cells are the major CD8 T+ cell subset that responds to *E. coli* by releasing effector molecules including IFN-γ, TNF-α, and GrB. It is possible that the interplay between CD8+CD161++ T cells and the gut microbiota could be implicated in the pathogenesis of IBD (Serriari et al., 2014), but few studies have probed gut MAIT cell responses to real bacterial challenges. To address this, we first analysed gut-derived CD8+CD161++ T cell response to fixed *E. coli* stimulation. Studies have suggested that MAIT cells in inflamed gut could be more poised towards a Th17 phenotype (Haga et al., 2016; Serriari et al., 2014), we therefore also examined IL-17A expression.

The CD8+CD161++ T cell population in LPMCs extracted from inflamed colon tissues responded to overnight *E. coli* stimulation by significantly upregulating expression of IFN-γ (% of IFN-γ+ CD8+CD161++ T cells: 3.14 ± 1.59% unstimulated versus 16.44 ± 4.59% stimulated), as well as GrB (10.68 ± 4.51% unstimulated versus 41.74 ± 7.84% stimulated) (Figure 4-6A). The level of TNF-α and IL-17A expression by CD8+CD161++ T cells remained unchanged following the overnight bacterial stimulation. The activation profile of CD8+CD161++ T cells in inflammation is very similar to the functionality of CD8+CD161++ T cells derived from healthy PBMCs – where the bacterial challenge significantly enhanced the expression of IFN-γ and GrB, also TNF-α, to a smaller extent (Figure 4-6B).

We then assessed whether CD8+CD161++ T cells derived from healthy gut tissues possessed similar responsiveness to the bacterial trigger. To our surprise they were unable to increase their expression of effector molecules including IFN-γ, TNF-α, and IL-17A, but their GrB level was significantly enhanced after contact with *E. coli* (Figure 4-6C-G). This suggests that the release of IFN-γ by CD8+CD161++ T

Figure 4-6 CD8+CD161++ cells - overnight response to *E. coli*

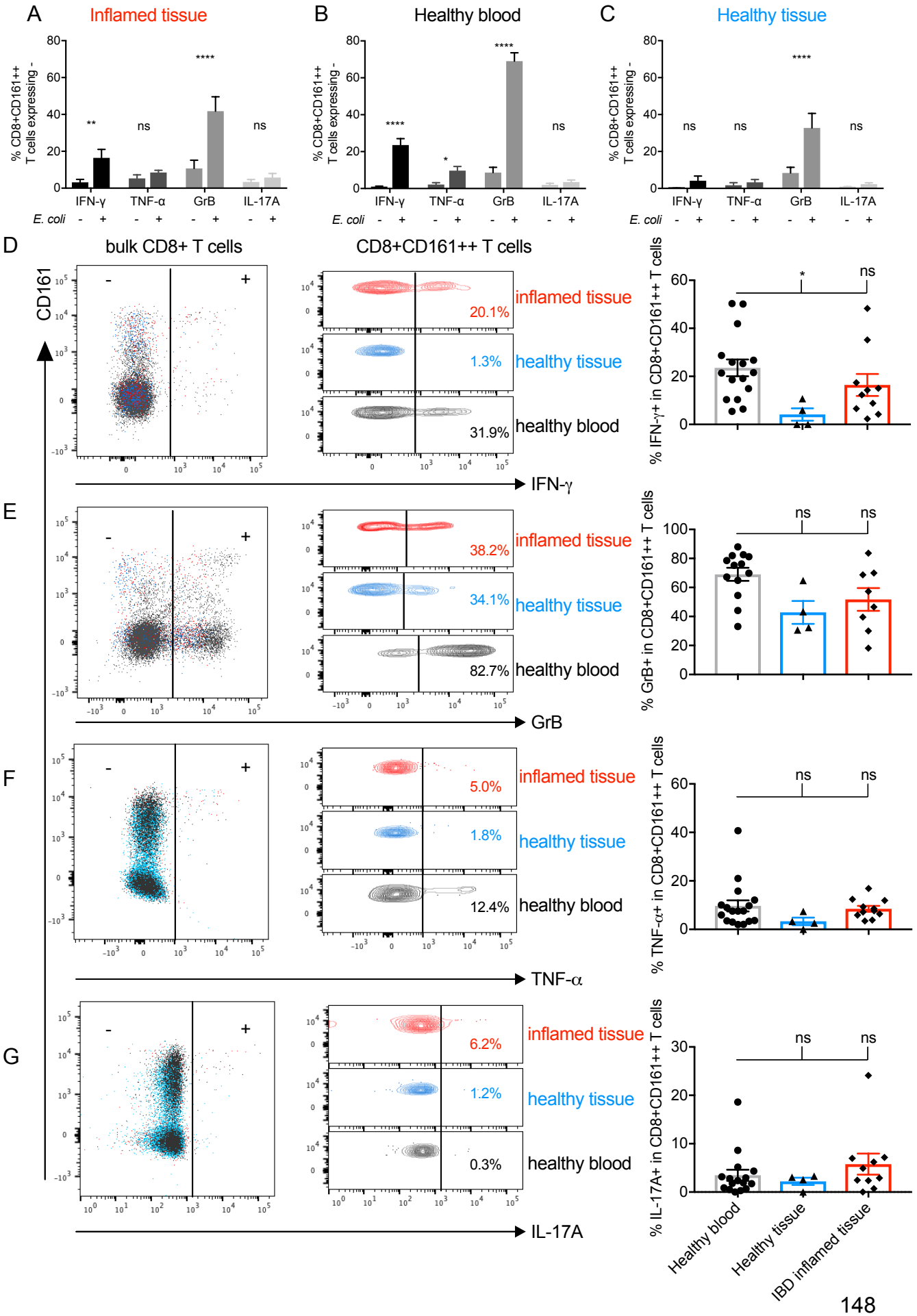


Figure 4-6. Gut-derived CD8+CD161++ T cells response to *E. coli*. A, B, C) Cumulative frequencies showing the expression of IFN-γ, TNF-α, GrB and IL-17A by CD8+CD161++ T cells from healthy blood (A), healthy gut tissues (B) and IBD gut tissues (C). Results shown as mean ± S.E.M, * $p<0.05$, ** $p<0.01$, **** $p<0.0001$ by two-way repeated measures ANOVA, with Bonferroni's multiple comparisons test. D, E, F) comparison between the expression of IFN-γ (D), TNF-α (E), GrB (F), and IL-17A (G) by CD8+CD161++ T cells derived from healthy blood samples (black), healthy gut tissues (blue), and inflamed gut tissues (red). Healthy PBMCs n = 16, healthy gut samples n = 4, inflamed gut samples n = 10. Results shown as mean ± S.E.M, * $p<0.05$ by one-way repeated measures ANOVA, with Turkey's multiple comparisons test.

cells in the gut could be more tightly controlled under healthy conditions. We also show that gut-resident CD8+CD161++ T cells, irrespective of their origin, upregulated GrB to a lesser extent when stimulated by *E. coli* compared with blood CD8+CD161++ T cells (Figure 4-6E). This is the first time that reduced cytotoxicity of gut-derived CD8+CD161++ T cells is described in response to a bacterial trigger. We speculate that this may be evidence supporting that CD8+ MAIT/CD161++ T cells, conventionally known as a potent killer cell subset, could, in the gut environment, downregulate this function in order to avoid excessive inflammation following contact with the gut microbiota.

4.4.7. The gut-associated cytokine TL1A increased IFN-γ secretion by CD8+CD161++ T cells derived from healthy and inflamed gut tissues

TL1A acts as a costimulator of IFN-γ secretion through its interaction with its receptor DR3 (Bamias et al., 2003a), and is corroborated by findings in Chapter 3. As a gut-associated cytokine given its specific localisation in intestinal tissues (Ślebioda et al., 2015; Tougaard et al., 2015), and its particular enrichment IBD tissues that correlates to IBD severity (Bamias et al., 2003a), we probed if i) TL1A could further enhance the CD8+CD161++ T cell activation in the gut, and ii) if CD8+CD161++ T cells derived from inflamed tissues could be more responsive to TL1A than those from normal intestinal tissues.

To address this, LPMCs isolated from healthy or inflamed gut tissues, or control PBMCs from healthy individuals were cultured in IL-12/-18-supplemented media (suboptimal dose) for 20 hours with or without an additional dose of TL1A. TL1A increased the expression of IFN-γ by blood CD8+CD161++ T cells (Figure 4-7A, from 26.5 ± 6.2% to 35.9 ± 4.3%), as well as those derived from gut samples (healthy gut tissues, Figure 4-7B: from 15.9 ± 3.8% to 27.4 ± 4.4%, inflamed gut tissues, Figure 4-7C: from 23.6 ± 4.0% to 35.2 ± 7.3%). Fold change-wise, TL1A induced 77.1 – 227% increase in IFN-γ production, and 127 – 232% increase in TNF-α production. However, TL1A had limited impact for enhancing the expression of GrB and IL-17A (Figure 4-7A, B, C). Our data on CD8+CD161++ T cell IFN-γ production provided limited evidence for the hypothesis that CD8+CD161++ T cells in IBD tissues are more responsive to TL1A compared with healthy tissues (Figure 4-7D). This could be attributed to a negative feedback system where CD8+CD161++ T cells are desensitised to TL1A trigger to limit excessive inflammatory activities in the gut in the presence of an ongoing inflammation.

Therefore, TL1A elicits a proinflammatory response in CD8+CD161++ T cells by synergising with other cytokines such as IL-12/-18. Further studies are required to understand the mechanisms underlying the regulation of CD8+CD161++ T cell response to TL1A in health and inflammation, which might help elucidate the role of CD8+CD161++ T cells in IBD pathogenesis and development.

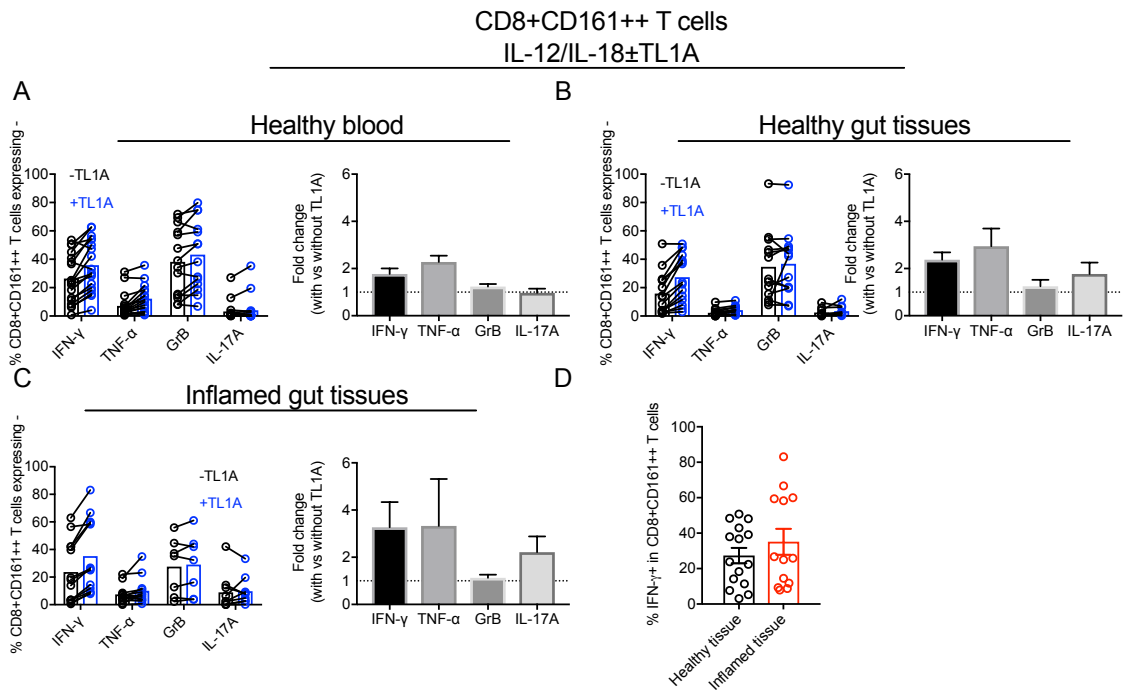


Figure 4-7. Gut-derived CD8+CD161++ T cells moderately enhance their IFN-γ release with additional TL1A. A) Right: Cumulative frequencies showing the expression of IFN-γ, TNF-α, GrB, and IL-17A by CD8+CD161++ T cells from healthy blood. Left: Fold change of IFN-γ, TNF-α, GrB, and IL-17A expression by CD8+CD161++ T cells triggered by IL-12/-18/TL1A compared to those with an IL-12/-18 stimulus. B, C) Datasets showing responses of CD8+CD161++ T cells from healthy gut tissues (B) and IBD gut tissues (C). D) Cumulative frequencies showing the expression of IFN-γ by CD8+CD161++ T cells from healthy and inflamed intestinal tissues. Healthy PBMCs n = 16, healthy gut samples n = 13, inflamed gut samples n = 15. Results shown as mean ± S.E.M, non significant results determined by repeated measures two-way ANOVA, with Bonferroni's multiple comparisons test (A-C), or two-tailed Mann-Whitney test (D).

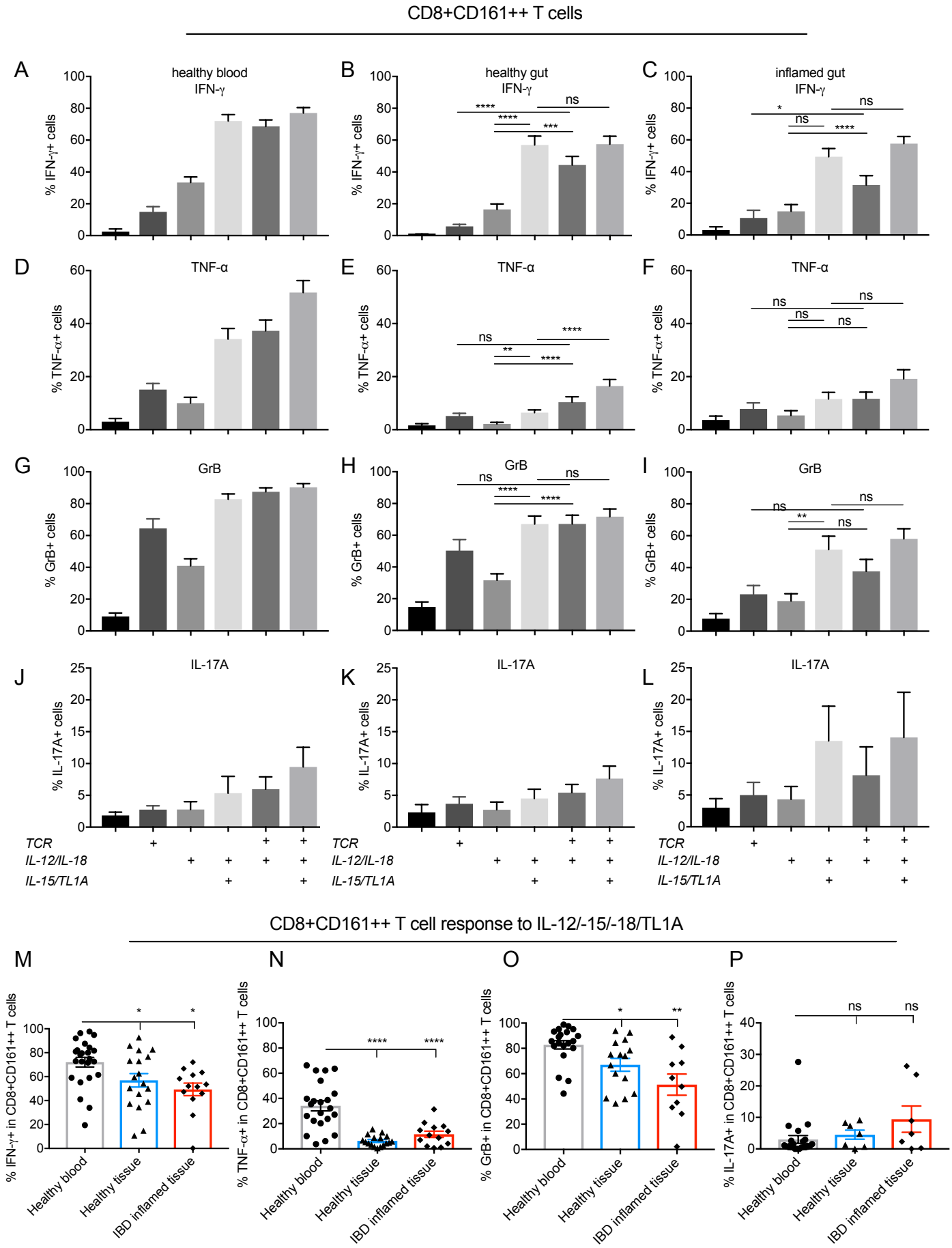
4.4.8. Gut CD8+CD161++ T cells show reduced responsiveness to cytokine/TCR trigger compared with those from healthy blood

Having established that gut CD8+CD161++ T cells have altered responsiveness to triggers including *E. coli* and PMA/ionomycin, we explored their effector functions elicited by a range of recombinant cytokines in the presence or absence of TCR beads. Similar to blood CD8+CD161++ T cells (Figure 4-8A, D, G, J), those derived from healthy and inflamed intestinal tissues responded to stimulations with cytokines ±TCR beads and as a result, upregulated their expression of IFN-γ (Figure 4-8B, C), TNF-α (more so for healthy tissue-derived CD8+CD161++ T cells than those from IBD samples, Figure 4-8E, F), and GrB (Figure 4-8H, I). In addition, percentages of CD8+CD161++ T cells producing IL-17A also increased in inflamed gut in response

to increasing doses of trigger (Figure 4-8L). In CD8+CD161++ T cells derived from healthy intestinal tissues, however, IL-17A upregulation is less pronounced (Figure 4-8K).

We also compared the activation profile of gut-derived CD8+CD161++ T cells to their blood counterparts stimulated with IL-12/-18/-15/TL1A. Percentages of IFN-γ+ cells in the CD8+CD161++ T cell compartment decreased from 72.1 ± 4.0% in the blood, to 56.9 ± 5.6% in healthy intestinal tissues, and 55.7 ± 6.8% in inflamed tissues (Figure 4-8M). Similarly, blood CD8+CD161++ T cells responded to the cytokine trigger more robustly as evidenced by a higher proportion of them expressing TNF-α (Figure 4-8N, 34.2 ± 4.0% in blood versus 6.4 ± 1.0% in the healthy gut, 11.6 ± 2.5% in inflammation), and GrB (Figure 4-8O, 82.8 ± 3.3% in blood versus 67.0 ± 5.1% in the healthy gut, 51.3 ± 8.4% in inflammation). In addition to a reduced Th1 phenotype and killing capacity, analysis on the expression of IL-17A by activated CD8+CD161++ T cells from different origins suggested that CD8+CD161++ T cells possess an enhanced Tc17 phenotype in intestinal tissues, especially in the inflamed gut, although it did not reach significance (Figure 4-8P).

Figure 4-8. Gut-derived CD8+CD161++ T cells respond to innate and adaptive triggers known to activate blood MAIT cells. A, B, C) Cumulative frequencies showing the expression of IFN-γ by CD8+CD161++ T cells derived from healthy blood (A), healthy gut tissues (B) and IBD gut tissues (C). D-F show TNF-α expression, G-I show GrB expression, and J-L show IL-17A expression by CD8+CD161++ T cells from these aforementioned origins. M, N, O, P) Comparison of CD8+CD161++ T cell activation profile under the IL-12/-15/-18/TL1A stimulation by examining their IFN-γ (M), TNF-α (N), GrB (O), and IL-17A (P) expression. Healthy PBMCs n = 24, healthy gut samples n = 18, inflamed gut samples n = 13. Results shown as mean ± S.E.M, * $p<0.05$, ** $p<0.01$, *** $p< 0.001$, **** $p< 0.0001$ by one-way repeated measures ANOVA, with Turkey's multiple comparisons test.


CD8+CD161++ T cells
A
healthy blood
IFN-γ
% IFN-γ+ cells
B
healthy gut
IFN-γ
C
inflamed gut
IFN-γ
D
TNF-α
% TNF-α+ cells
E
TNF-α
F
TNF-α
G
GrB
% GrB+ cells
H
GrB
I
GrB
J
IL-17A
% IL-17A+ cells
K
IL-17A
L
IL-17A
TCR
IL-12/IL-18
IL-15/TL1A
CD8+CD161++ T cell response to IL-12/-15/-18/TL1A
M
% IFN-γ+ in CD8+CD161++ T cells
N
% TNF-α+ in CD8+CD161++ T cells
O
% GrB+ in CD8+CD161++ T cells
P
% IL-17A+ in CD8+CD161++ T cells
Healthy blood
Healthy tissue
IBD inflamed tissue

As discussed previously, CD8+CD161++ T cells were studied in this study instead of CD8+ MAIT cells partially due to the scarcity of CD8+ MAIT cells. We additionally examined a number of samples which contained >50 MAIT cells in the CD8+ population, and show here that their responses to IL-12/-15/-18/TL1A were similar to their CD8+CD161++ counterparts (Figure 4-9A, B).

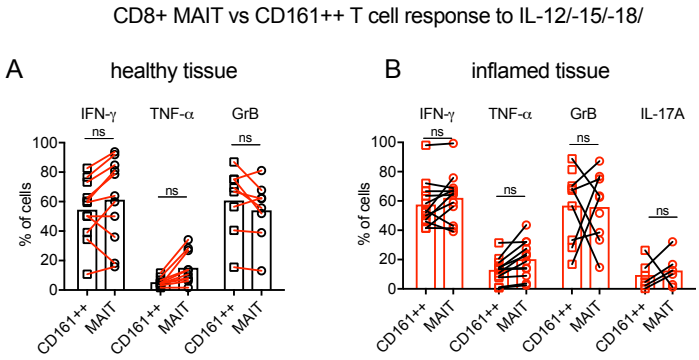


Figure 4-9. Intestinal CD8+CD161++ T cells and MAIT cells are similarly responsive to innate triggers. A) Cumulative frequencies showing the expression IFN-γ, TNF-α, and GrB by CD8+CD161++ T cells (squares) and CD8+ MAIT cells (circles) in healthy intestinal tissue samples. B) Responses by CD8+CD161++ T cells (squares) and CD8+ MAIT cells (circles) in inflamed intestinal tissue samples. N = 7-12. Results shown as mean ± S.E.M, not significant as determined by multiple t-tests.

4.4.9. CD8+CD161++ T cells from paired inflamed and healthy gut tissues share similar phenotypes

Our study on intestinal-derived CD8+CD161++ T cells suggest that they are a subset of innate-like T cells with no significant phenotypical or functional difference between those derived from healthy and inflamed intestinal tissues. However, one of the major caveats of the study is that the inflamed and healthy tissues were derived from different patients and samples were acquired on different days and, thus, analysed in different batches. This would likely introduce a range of confounding factors into the study. Therefore, we analysed CD8+CD161++ T cells both inflamed and uninflamed tissues from the same IBD patients.

CD161++ cells accounted for a lower (p=0.16) percentage of the total CD8+ T cells in inflamed gut tissues compared with healthy tissues. However, the percentage of

CD161++Vα7.2+ cells remained the same (Figure 4-10A). The percentage of IL-18Rα+ CD8+CD161++ T cells, as well as the gMFI of IL-18Rα on CD8+CD161++ T cells extracted from inflamed sites of the intestine was similar to those from uninflamed intestine resections (Figure 4-10B). This provides evidence that the IL-18Rα expression level by CD8+CD161++ T cells was not tissue- or location-dependent in the gut, also seen with CD8+CD161++ T cell PLZF expression (Figure 4-10C). RORγt+ cells acaccounted for a similar (p=0.48) percentage of the total CD8+ T cells in inflamed gut tissues compared with healthy tissues, but RORγt gMFI was markedly enhanced in CD8+CD161++ T cells in inflammation (Figure 4-10D).

Lastly, we investigated the surface expression of CD39 (Figure 4-10E), PD-1 (Figure 4-10F), and both CD39 and PD-1 (Figure 4-10G) by CD8+CD161++ T cells extracted from paired uninflamed or inflamed tissues. The lack of difference in these markers suggests that gut CD8+CD161++ T cells in inflammation and health are similarly activated/exhausted.

4.4.10. CD8+CD161++ T cells from paired inflamed and healthy gut tissues possess similar responsiveness to innate/adaptive signals

By analysing the percentage of CD8+CD161++ T cells expressing IFN-γ, TNF-α, GrB, and IL-17A, we here demonstrate that CD8+CD161++ T cells derived from paired healthy and inflamed tissue samples display a similar level of inflammatory responses and a similar cytotoxic profile following fixed *E. coli* stimulation (Figure 4-11A). In addition to similar responsiveness to a cognate MR1-TCR interaction, CD8+CD161++ T cells derived from paired inflamed and healthy intestinal tissues showed no statistically significant difference in their responses to stimulation with recombinant cytokines (IL-12, IL-18, IL-15, and TL1A, Figure 4-11B). Nonetheless,

Figure 4-10

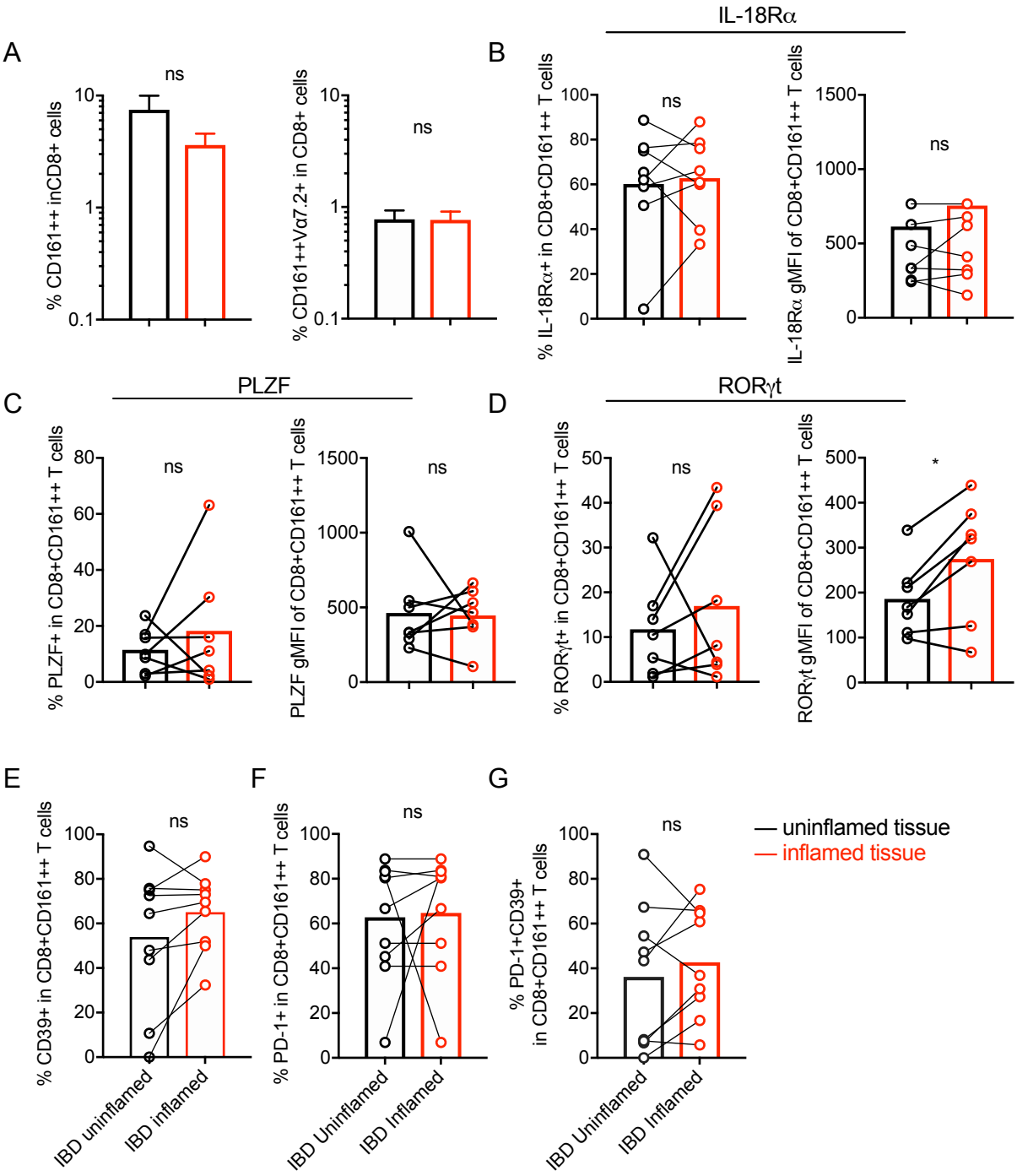


Figure 4-10. Comparison of phenotypes of CD8+CD161++ T cells derived from paired inflamed and uninflamed intestinal tissues. A) Cumulative frequencies showing percentages CD8+ T cells from indicated tissues that are CD161++ cells (left) and CD161++ Vα7.2+ cells (right). B, C, D) Cumulative frequencies showing percentages of CD8+CD161++ T cells that are IL-18Rα+ (B), RORγt+ (C), and PLZF+ (D) (left), or the gMFI of IL-18Rα (B), RORγt (C), and PLZF (D) of CD8+CD161++ T cells from indicated tissues (right). E, F, G) Cumulative frequencies showing percentages CD8+CD161++ T cells that are CD39+ (E), PD-1+ (F), and CD39+PD-1+ (G) from indicated tissues. Paired IBD uninflamed and inflamed tissues were collected from 9 patients. Results shown as mean ± S.E.M, * $p<0.05$ by paired student t-tests.

we observed a lowered response by CD8+CD161++ T cells derived from inflamed intestinal tissues to IL-12, IL-18, and TCR beads as evidenced by their reduced IFN-γ and GrB production, although this was not statistically significant (Figure 4-11C). This provides preliminary evidence describing the differential responsiveness of gut CD8+CD161++ T cells in health and inflammation, and suggests a possible link between CD8+CD161++ T cell activation and gut inflammation.

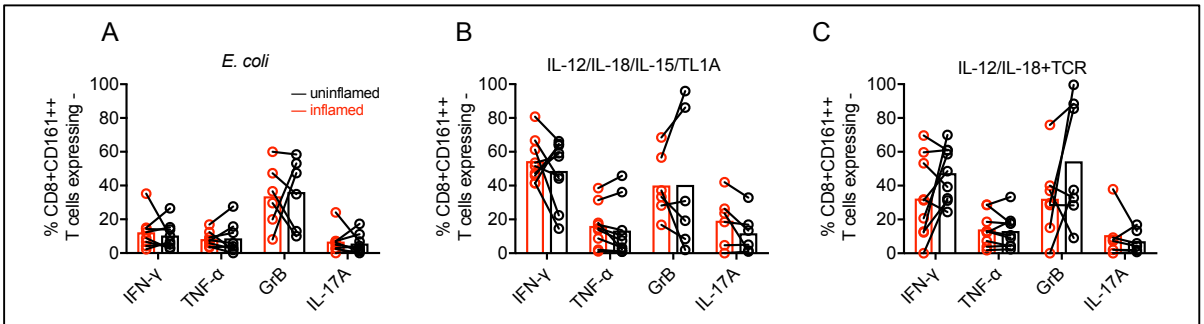


Figure 4-11. CD8+CD161++ T cells derived from paired inflamed and uninflamed intestinal tissues are similarly responsive to innate and adaptive triggers. A, B, C) Cumulative frequencies showing the expression IFN-γ, TNF-α, GrB and IL-17A by CD8+CD161++ T cells extracted from pair inflamed (red) and uninflamed (blue) intestinal tissues from the same IBD patients. CD8+CD161++ T cell activation was probed under *E. coli* stimulation (A), IL-12/-15/-18/TL1A stimulation (B), and IL-12/-18+TCR beads (C). In (A) n = 8, (B, C) n = 9. Results shown as mean ± S.E.M, not significant as determined by multiple t-tests.

4.5. Discussion

4.5.1. Modulated phenotypical and functional properties of CD8+ MAIT cells in IBD patient blood

First, there was no difference between the frequency of MAIT cells within CD8+ T cell populations in the blood of IBD patients compared with healthy individuals. This contrasts with observations by Serriari et al. that CD8+ MAIT cells are specifically reduced in the blood of IBD patients (Serriari et al., 2014). Neither study, however, compared MAIT cells from age-matched healthy individuals and IBD patients. As MAIT cell frequency decreases with age (Novak et al., 2014; Walker et al., 2014; van der Geest et al., 2018), age- and sex-matched healthy individuals and IBD

patients should be collected to better illustrate changes in MAIT cell frequency in the IBD blood.

Our data also highlight the lowered expression of integrin β7, but not CD103, expressed by peripheral blood MAIT cells in IBD patients compared with healthy individuals. Given that integrin β7 forms integrin αEβ7 with the CD103 subunit, and forms integrin α4β7 with CD49d, our data on altered integrin β7 levels on blood MAIT cells suggest that α4β7 could potentially be the mediator for MAIT cell trafficking to the inflamed mucosa in IBD, similar to other T cell subsets (Mora and von Andrian, 2006). This observation is supported by findings by Hiejima e al. that the frequency of integrin α4β7+ MAIT cells was reduced in the blood of UC and CD patients compared with healthy controls (Hiejima et al., 2015). Previous studies also have shown upregulated expression of MAdCAM-1 in the LP of IBD patients (Souza et al.). The enhanced interaction between MAdCAM-1 and α4β7 may contribute to the accumulation of inflammatory cells and signals in the IBD gut, as vedolizumab – a monoclonal antibody against integrin α4β7 has shown efficacy of alleviating symptoms in both UC and CD patients (Feagan et al., 2013; Sandborn et al., 2013), and has been approved in 2014 for treatment of both moderate-to-severe UC and CD. Thus, integrin α4β7-mediated MAIT cell trafficking to the gut may suggest their pathogenic role in IBD.

In terms of functional difference, MAIT cells from the peripheral blood of IBD patients specifically increased their IFN-γ and IL-17 production in response to PMA/ionomycin stimulation. This may indicate modulated cytokine secretion patterns. However, this finding contrasts with previous reports of decreased IFN-γ production in CD (Serriari et al., 2014), and UC patients' blood MAIT cells showed unchanged IFN-γ production (Haga et al., 2016; Hiejima et al., 2015; Serriari et al.,

2014). These findings, therefore, would need to be repeated with a larger cohort of patients with better stratification of clinical specimens according to their origin (small intestine versus colon), patient's sex, age, and disease (UC versus CD).

Furthermore, blood MAIT cells from the Oxford IBD cohort displayed similar levels of expression of IL-18Rα and PLZF compared with healthy controls, but showed decreased IFN-γ, TNF-α, and GrB production with IL-12/-15/-18/TL1A stimulation. To our knowledge, these data are the first to characterise responses of patient blood MAIT cells to innate cues in a disease setting.

4.5.2. MAIT cells are not enriched in healthy and IBD inflamed intestinal tissues compared with blood

Studies have suggested that IL-17A-producing cells enrich in inflamed IBD intestinal tissues, and the IL-17/23 axis may, in part, impact on the disease pathophysiology (McGovern and Powrie, 2007; Sarra et al., 2010). Given the high expression of RORγt and IL-17 by blood MAIT cells (Billerbeck et al., 2010; Dusseaux et al., 2011), together with their tissue homing properties (Billerbeck et al., 2010; Kurioka et al., 2016), frequencies of MAIT cells and CD8+CD161++ T cells within CD8+ T cells from healthy and IBD inflamed gut tissues were quantified. The frequency of MAIT cells in healthy and inflamed intestinal tissues was lower than that from the blood, and furthermore we found that in inflamed tissues the percentage of CD8+ MAIT cells was lower than in healthy gut tissues. The reduced presence of MAIT cells in IBD patients could be ascribed to their pronounced proapoptotic features, as illustrated by Hiejima et al. who provided evidence that MAIT cells in the blood and tissue of IBD patients express higher levels of activated capsases (Hiejima et al., 2015).

In addition, our data suggest that the level of CD161 expression was similar in gut tissues and healthy blood. This, combined with a decreased MAIT cells frequency in the gut, leads to the conclusion that the Vα7.2 TCR usage in CD8+ T cells derived from both healthy and inflamed gut tissues was much lower than in the peripheral blood. This could be due to a sustained interaction of MAIT cells with their cognate ligands produced by the commensal bacteria, leading to the downregulation of the receptor (José et al., 2000; Kurioka et al., 2015, unpublished data). Furthermore, studies suggested that collagenase exposure – a common step during gut lymphocytes isolation – could affect surface marker expression (Clark et al., 2006). We, however, rejected the hypothesis that the reduced MAIT cell presence in the gut was a direct result of the isolation process by showing that PBMCs stirred in the media used for tissue digestion and those in the normal R10 cell culture media harboured similar frequencies of MAIT cells following an overnight incubation in 37 °C (data not shown).

4.5.3. Modulated functional properties of CD8+CD161++ T cells in the gut

We are also the first to show that CD8+CD161++ T cells from inflamed intestinal tissues of IBD patients decreased their IFN-γ and GrB expression in response to PMA/ionomycin stimulation, as well as to cytokines including IL-12/-15/-18/TL1A, when compared with those from non-paired healthy tissues. It is also worth noting that these cells exhibited similar levels of IL-18Rα and PLZF. Given that levels of innate markers (IL-18Rα and PLZF) did not predict the functional discrepancy between blood or gut CD8+CD161++ T cells in health and IBD, we propose that this reduced functionality in IBD could be due to exhaustion, marked by enhanced CD39 and PD-1 expression. The role of these two regulatory/inhibitory markers in T cells biology will be discussed in ***4.5.4***.

Of note, CD8+CD161++ T cells derived from inflamed and unaffected tissues from the same IBD patients did not display different cytokine secretion profiles. Importantly, these patients in the paired-tissue study were on various IBD therapies, and this preliminary study has not taken into account whether certain medications could have a systemic impact on the physiology of CD8+CD161++ T cells. This is one of the limitations of the study, since all control tissues used in the study were either from tumour-free sections of CRC patients, or from unaffected bowel resections of IBD patients, but not from age and sex matched healthy individuals. We propose that cells derived from biopsy samples from healthy donors, rather than from patient tissue resections will better characterise healthy gut cells, but we also acknowledge the difficulty using biopsy samples because they contain limited number of LPMCs.

We are also the first to describe gut CD8+CD161++ T cell responses to *E. coli*-infected THP1 cells. Surprisingly we found that gut CD8+CD161++ T cells displayed impaired ability to secrete IFN-γ, or to upregulate GrB, compared with blood CD8+CD161++ T cells from healthy controls. Nonetheless, the CD8+CD161++ T cell response to bacteria was more robust in inflamed tissues. This potentially suggests that gut anti-bacterial responses by CD8+CD161++ T cells may be more tightly controlled due to the high presence of the commensal bacteria in the intestinal lumen. Furthermore, the enhanced expression of IFN-γ and GrB by CD8+CD161++ T cells in inflamed gut tissues could potentially support the hypothesis that IBD is at least partially caused by excessive immune response to the microflora, and that CD8+CD161++ T cells could directly contribute to IBD pathogenesis.

No studies so far have examined the expression of GrB in gut CD8+CD161++ T cells. *Ex vivo* MAIT cells are not efficient killers at rest based on their low expression of GrB and perforin (Kurioka et al., 2015), and our data confirmed this for resting gut CD8+CD161++ T cells. The reduced GrB response to both cytokine and ligand triggers by gut CD8+CD161++ T cells may be linked to their increased CD39 and PD-1 expression. Studies have shown that GrB expression is linked to perforin to confer lytic ability (Chowdhury and Lieberman, 2008), and is regulated by TFs like T-bet and B lymphocyte-induced maturation protein-1 (Blimp-1) (Cruz-Guilloty et al., 2009; Kallies et al., 2009). This proposes further studies which require a larger cohort of IBD patients for a thorough examination of the expression of perforin, T-bet, and Blimp-1 in order to provide a mechanistic view on GrB reduction in gut CD8+CD161++ T cells.

4.5.4. Enhanced expression of regulatory molecules on gut CD8+CD161++ T cells

The ectonucleotidase CD39, together with CD73, degrades ATP to adenosine through various steps. This marks a switch from ATP-mediated proinflammatory response to an immunoregulatory function orchestrated by adenosine. Indeed, multiple studies have suggested that CD39 is a consistent feature of activated and exhausted non-Treg CD4+ and CD8+ T cells (Bono et al., 2015; Gupta et al., 2015; Moncrieffe et al., 2010; Zhou et al., 2009). For example, $CD39^{-/-}$ mice showed better control of *L. monocytogenes* and enhanced production of inflammatory cytokines (Raczkowski et al., 2018). In humans, anti-CD3 mAb resulted in increase of CD39 expression in conventional CD4+ and CD8+ T cells. High CD39 expression was found in activated CD4+ and CD8+ T cells from the synovial fluid of inflamed joints of Juvenile idiopathic arthritis (JIA) patients (Raczkowski et al., 2018), as well as

tumour-reactive CD8+ T cells (Duhen et al., 2018). It is inferred that CD39 marks exhaustion because of their impaired ability to secrete effector cytokines in cancer patients (Canale et al., 2018).

PD-1 is an immune checkpoint and also a marker for self-tolerance by suppressing TCR signalling. PD-1 expressed on T cells, and its ligands PDL-1 and PDL-2 expressed by macrophages, DCs, B and T cells, negatively regulate immune responses. Numerous studies have suggested that overexpression of PD-1 on CD8+ T cells is a major indicator of T-cell exhaustion in chronic infection or cancer. As a critical CD8+ subset, CD161++ T cells have been described to upregulate PD-1 in various autoimmune diseases and viral infections (Hinks, 2016; Kurioka et al., 2016; Ussher et al., 2018).

Recently, CD39 has been described to denote a distinct Th17 cell subset with CD161 in CD patients. Bai et al. demonstrated that these CD161-expressing Th17 cells derived from the LP of patients with active CD robustly responded to PMA/ionomycin by secreting more IL-17 and IFN-γ compared with other CD4+ T cell subsets (Bai and Robson, 2015; Bai et al., 2014). Given that studies have suggested a role of MAIT cell in promoting IL-17 production in various stimulatory and physiological settings, it is tempting to speculate whether the co-expression of CD39 and CD161 in the gut CD8+CD161++ T cells could also mark a Tc17 phenotype. However, in this study we did not observe a significant increase in IL-17 production by CD8+CD161++ T cells in the inflamed gut; thus, were not able to establish a positive correlation, or in fact, any correlation between CD39 and IL-17 expression in the CD8+CD161++ T cell subset.

To conclude, CD8+CD161++ T cells in the gut show reduced effector function (IFN-γ and GrB). Their enhanced CD39 and PD-1 expression are indicative of their exhausted phenotype *in vivo*. We hypothesised that CD39 may also be an effective marker for Tc17 cells in the gut, which requires further investigation. Results presented in this chapter can be further strengthened by a bigger IBD cohort, an age- and gender- matched healthy cohort, a more sensitive detection method for IL-17, as well as the incorporation of the detection of IL-17F, another isoform of the IL-17 family with similar *in vivo* and *in vitro* proinflammatory and pathogenic implications (Seiderer et al., 2008; Tang et al., 2018).

4.6. Summary

1. Blood MAIT cells derived from IBD patients are phenotypically similar to those from healthy individuals, but with lowered expression of integrin β7; their effector function is also downregulated compared with those from healthy donors;
2. MAIT cells are present in the gut with likely TCR downregulation;
3. CD8+CD161++ T cells derived from the gut are phenotypically distinct from those derived from healthy blood samples, with reduced expression of PLZF and RORγt, as well as increased expression of CD39 and PD-1;
4. CD8+CD161++ T cells from the gut are functionally impaired compared with blood cells from healthy individuals with less upregulation of GrB, or secretion of IFN-γ and TNF-α;
5. CD8+CD161++ T cells in the gut are similarly responsive to the gut-associated cytokine TL1A.

5. CD161-EXPRESSING CD4+ T CELLS IN THE BLOOD AND GUT

5.1. Introduction

5.1.1. CD161-expressing CD4+ T cells, an innate-like T cell subset

CD161 marks a group of innate-like lymphocytes of different lineages, the expression of which marks a variety of phenotypes and functions shared amongst T cells (Fergusson et al., 2014). A population of CD161-expressing CD4+ T cells has been described in the adult circulation and cord blood, and gene-expression profiling of CD161+CD4+ T cells demonstrated that they share a large number of distinguishing genes with CD8+ MAIT cells, including IL-18RAP, one of the subunits of the IL-18R (Fergusson et al., 2014). CD161 expression also correlates with the percentage of IFN-γ secreting cells in response to IL-12/-18 (Fergusson et al., 2014). Studies have also demonstrated that TL1A and IL-15 synergise to induce proliferation and IFN-γ release by IL-18Rα+CD4+ memory T cells enriched in the inflamed small intestine of CD patients (Holmkvist et al., 2015), as well as CD161+CD4+ T cells (Cohavy et al., 2011).

Despite overlapping features with CD8+ MAIT cells, bodies of evidence suggest that CD161-expressing CD4+ T cells, at least a subset of them, are functionally and phenotypically distinct from their CD8 counterparts. A detailed comparison of the CD4+, CD8+ and DN CD161++Vα7.2+ T cell subsets found that CD4+ MAIT cells exhibit lower levels of Eomes and PLZF expression, as well as a low cytotoxic potential and reduced capacity to secrete Th1 cytokines (Kurioka et al., 2017). Further characterisation of their CD56 expression suggested that CD4+ MAIT cells may exhibit heterogeneous cytotoxic functions depending on the tissue they reside

in (liver versus blood). However, their cytotoxicity in the LP of the healthy and inflamed gut has yet to be probed *in vitro* and *in vivo*.

5.1.2. CD161-expressing Th17 CD4+ T cells in diseases

Studies have contributed to the understanding that Th17 cells, enriched in the CD161+ population, are the principal mediators of pathogenesis in diverse inflammatory and autoimmune disorders including UC (Lamb et al., 2016), RA (Afzali et al., 2013), JIA (Cosmi et al., 2011), and asthma (Cosmi et al., 2010).

The pathogenic role of Th17 cells could perhaps be ascribed to their resistance to suppressive effects of Tregs (Annunziato et al., 2007), their proinflammatory responses mediated by cytokines involving IL-23, IL-17, IL-17F, IL-22, plus IFN-γ and TNF-α (Chan et al., 2006; Kuestner et al., 2007; Zheng et al., 2007; Zhou et al., 2007), as well as their specific tissue homing properties as indicated by their chemokine receptor expression, such as CCR6 (Tesmer et al., 2008). In addition to evidence supporting a role of Th17 cells in immune-mediated diseases, studies have also described Th17 cells to be involved in host-pathogen interactions. In mice, Th17 cells are shown to be important in mediating host responses to infection by Gram-negative bacteria, especially *Klebsiella (Rice et al., 2005)*, *Streptococcus (Malley et al., 2006)*, and *Bordetella* species (Higgins et al., 2006), via the generation of adaptive Th17 responses and through potential innate immune functions of Th17-related cytokines. For example, mouse studies demonstrated IL-17-mediated neutrophil recruitment (Shibata et al., 2007), and the induction of chemokines by peritoneal mesothelial cells (Witowski et al., 2000). Th17 cells can also confer immune protection by, for instance, IL-22 and IL-17 induced anti-microbial peptides production (Liang et al., 2006), and enhancing microbial killing exerted by IL-26 – a proinflammatory cytokine promoted human Th17 cells (Meller

et al., 2015; Stephen-Victor et al., 2016; Woetmann et al., 2018). Conversely, mouse studies have also shown a less pronounced or even adverse role of the IL-23/IL-17 axis in host defence. Mouse studies on TB infections suggested that IL-23 induced IL-17 was rapid and short-lived, and, therefore, more likely to induce a transient innate response than an adaptive signal. Another study on BCG infected mice showed little evidence proving the efficacy of IL-17 neutralisation or the absence of IL-22 (Chackerian et al., 2006; Lockhart et al., 2006; Umemura et al., 2007). In another more extreme case, neutralization of IL-23 even promoted survival in a mouse model of *Pseudomonas aeruginosa (Belladonna et al., 2006)*. The complexities underlying the regulation of host-pathogen interactions by the IL-17/IL-22 axis mice warrant further studies probing the role of IL-17 and Th17 cells in bacterial infections in humans at various tissue sites, and a more detailed investigation on functional importance of the other members of the IL-17/IL-23 axis.

5.1.3. IL-23/IL17 axis in IBD

Gut inflammation in CD and UC patients have been traditionally linked to an aberrant and exaggerated Th1 or Th2 response, respectively. However, studies have reported that the strong effector T cell activation and intestinal inflammatory responses, is at least partially delivered by tissue-specific, IL-17 producing T cells (Aggarwal et al., 2003; Gálvez, 2014; McGovern and Powrie, 2007; Sarra et al., 2010). Of note, IL-23 is not required for the differentiation of naïve CD4+ T cells to Th17 cells, but it is an important regulator for their maintenance and expansion (Stritesky et al., 2008).

Th17 cells contribute to host defence by responding to extracellular bacteria and fungi, especially at mucosal sites through the induction of inflammatory molecules

and antimicrobial agents. On the other hand, a number of studies reveal a pathogenic role for Th17 cells in various murine and human immune pathology, including IBD (Gálvez, 2014; Stockinger et al., 2007). It has been reported that in IBD patients there is a significant number of Th17 cells infiltrating to both CD and UC intestinal tissues (Zenewicz et al., 2009), and their excessive release of Th17-related cytokines, including IL-17A, IL-17F, IL-21, IL-26, and IL-23 exacerbates inflammation by promoting Th1 and Th17 responses (Kamada et al., 2008). In line with increased presence of Th17 cells in IBD, RNA transcripts for IL-17A and IL-17F are also found significantly upregulated in the inflamed mucosa of IBD patients (Seiderer et al., 2008). Lastly, a positive correlation has been established between disease severity and levels of IL-17A secretion in the PBMCs of UC patients (Raza and Shata, 2012). These lines of evidence, combined propose an important role IL-17-producing cells, including Th17, in IBD.

We therefore wanted to examined the phenotype and functionality of CD161-expressing cells in the blood and intestinal tissues of healthy individuals and IBD patients, and further test if their cytokine secretion pattern is correlated to their specific location in humans, in health or disease.

5.2. Aims

1. Analyse the frequency, phenotype and function of peripheral blood CD161-expressing cells in IBD patients and healthy individuals;
2. Detect and quantify CD161-expressing CD4+ T cells in healthy and inflamed intestinal tissues;
3. Analyse the phenotype of CD161++/-CD4+ T cells in the gut and blood;

4. Study the differential regulation of cytokine secretion patterns of activated MAIT cells in the peripheral blood, and healthy and inflamed gut tissues.

5.3. Chapter-specific materials and methods

Please refer to section ***4.3.*** for chapter-specific material and methods.

5.4. Results

5.4.1. A subset of CD4+ T cells in the blood of healthy and IBD patients expresses CD161, with more integrin β7 expression on healthy blood CD4+ T cells

Results from the previous chapter described the phenotypical and functional overlap of IBD patient blood MAIT cells with those from healthy donors. Given that CD161++CD4+ T cells, both in tissue and in circulation, also bear clinical implications in a range of autoimmune diseases, we first studied the distribution of CD161-expressing CD4+ T cells – a T cell subset sharing innate phenotypes with CD8+ MAITs cells – in the blood of healthy donors and IBD patients.

The total CD4 population was first divided into three subpopulations by superimposing the gating strategy that separates CD8+ MAIT cells from their CD161-intermediate and CD161-low counterparts (Figure 5-1A). The level of CD161-expression in the CD4+ T cell population, measured by the percentage of CD4+ T cells with high, intermediate, or low CD161-expression, was not different in the blood of IBD patients (red) and healthy individuals (black) (Figure 5-1B).

In blood CD8+ T cells, high CD161 expression is almost exclusively restricted to an effector memory phenotype, as supported by the low surface expression of both

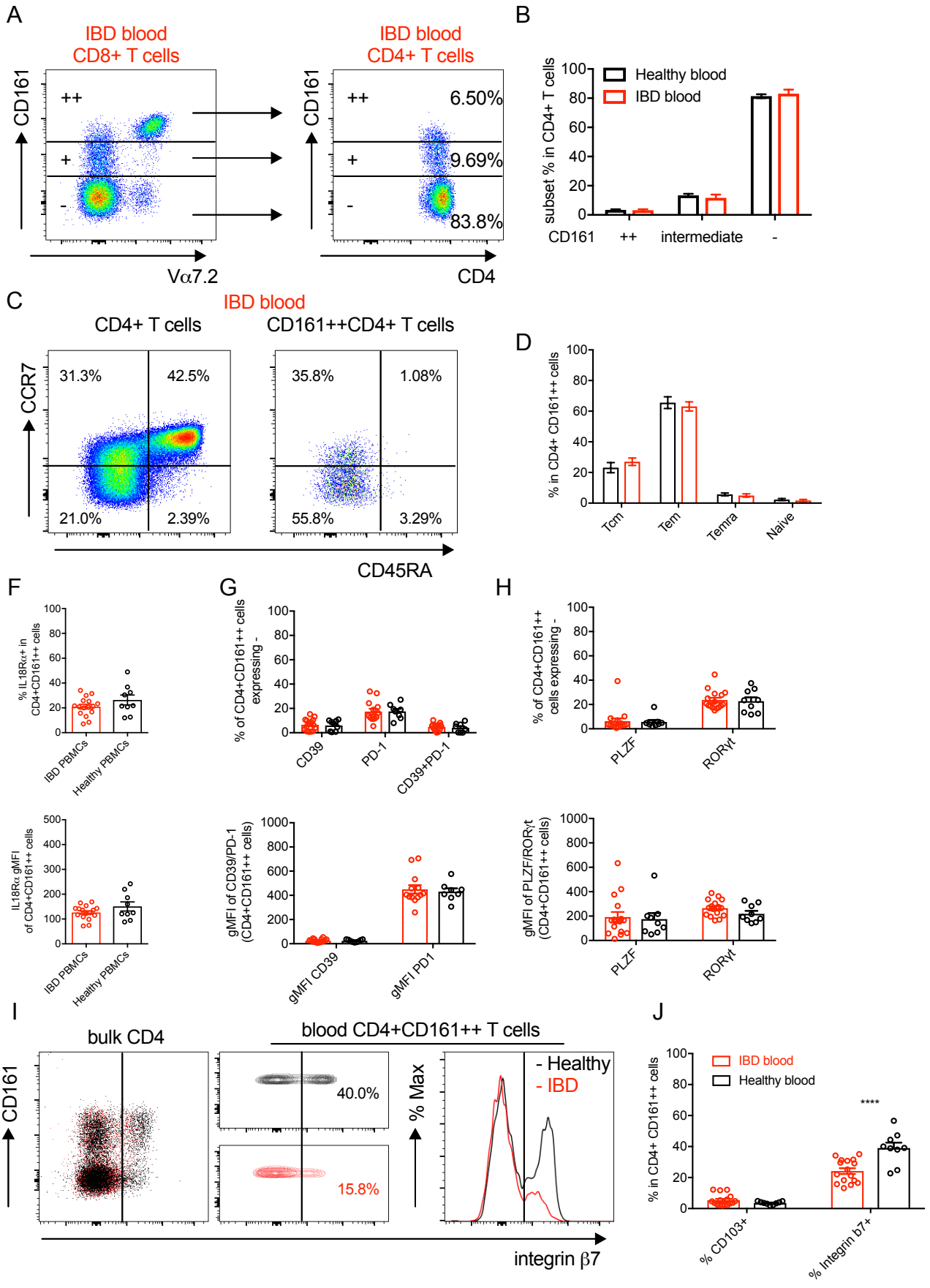
CCR7 and CD45RA (Figure 4-10B). Here we also confirm that blood CD161++ CD4+ T cells from both healthy and IBD individuals enriched for effector memory T cells, and lacked naïve T cells. There was also a substantial group of Tcm cells in the circulation of both healthy and IBD individuals. (Figure 5-1C, D).

Blood CD161++CD4+ T cells derived from IBD patients were also not different than those from healthy individuals in their expression of IL-18Rα (Figure 5-1F), CD39/PD-1 (Figure 5-1G), or PLZF/RORγt (Figure 5-1H). Based on these investigated markers, we conclude that IBD does not dramatically alter the phenotype of circulating CD161++CD4+ T cells.

The integrin β7 level, however, was reduced in blood CD161++CD4+ T cells patients (Figure 5-1I, J), same as their CD8+ counterparts. This finding suggests that CD161++CD4+ T cells might be more prone to gut migration in inflammation.

Figure 5-1. Phenotyping CD161++CD4+ T cells in the blood (black: healthy origin, red: IBD origin). A) Left: representative plot showing the gating strategy for CD8+CD161++/MAIT cells. Right: Superimposing the same gates to CD4+ T cells for the separation of CD161++/CD161+(intermediate)/CD161-CD4+ T cells derived from healthy or IBD patient blood. B) Cumulative frequencies showing percentages of blood CD4+ T cells in health and IBD that are CD161++, CD161+, and CD161-. Healthy PBMCs, n = 32; IBD PBMCs, n = 7. C) Representative plots showing CCR7/CD45RA expression by bulk CD4+ T cells (left) and CD161++CD4+ T cells (right) from one IBD blood sample. D) Percentages of Tcm, Tem, Temra, and naïve T cells in CD161++CD4+ T cells. Healthy PBMCs, n = 19; IBD PBMCs, n = 7. F) Top: the percentage of CD161++CD4+ T cells that express IL-18Rα, bottom: IL-18Rα gMFI of CD161++CD4+ T cells from healthy and IBD blood samples. G) Top: the percentage of CD161++CD4+ T cells that express CD39, PD-1, or both, bottom: CD39 or PD-1 gMFI of CD161++CD4+ T cells from healthy and IBD blood samples. G) Top: the percentage of CD161++CD4+ T cells that express PLZF or RORγt, bottom: PLZF or RORγt gMFI of CD161++CD4+ T cells from healthy and IBD blood samples. Healthy PBMCs, n = 9; IBD PBMCs, n = 13. I) Representative plots showing integrin β7 expression on bulk CD4 T cells (left) and CD161++CD4+ T cells (middle, right) derived from a healthy or IBD blood sample. J) Cumulative frequencies of CD103+/integrin β7+ cells amongst blood CD161++CD4 T cells in health and IBD. Healthy PBMCs, n = 9; IBD PBMCs, n = 16. Results shown as mean ± S.E.M, C, D, E, G, H: non-significant by multiple t-tests, F: non-significant by Mann-Whitney test, J: ****<0.0001 by multiple t-tests.

Figure 5-1


A
IBD blood
CD8+ T cells
IBD blood
CD4+ T cells
CD161
++
+
-
6.50%
9.69%
83.8%
Vα7.2
CD4
B
Healthy blood
IBD blood
subset % in CD4+ T cells
CD161
++
intermediate
-
C
IBD blood
CD4+ T cells
CD161++CD4+ T cells
CCR7
31.3%
42.5%
21.0%
2.39%
35.8%
1.08%
55.8%
3.29%
CD45RA
D
% in CD4+ CD161++ cells
Tcm
Tem
Temra
Naive
F
% IL-18Rα+ in CD4+CD161++ cells
IBD PBMCs
Healthy PBMCs
IL18Rα gMFI of CD4+CD161++ cells
G
% of CD4+CD161++ cells expressing -
CD39
PD-1
CD39+PD-1
gMFI of CD39/PD-1 (CD4+CD161++ cells)
gMFI CD39
gMFI PD1
H
% of CD4+CD161++ cells expressing -
PLZF
RORγt
gMFI of PLZF/RORγt (CD4+CD161++ cells)
I
bulk CD4
blood CD4+CD161++ T cells
CD161
40.0%
15.8%
% Max
- Healthy
- IBD
integrin β7
J
IBD blood
Healthy blood
% in CD4+ CD161++ cells
****
% CD103+
% Integrin b7+

5.4.2. Probing the functionality of blood CD161++ CD4+ T cells in health and disease

We then hypothesised that the functional responses of these blood CD4+CD161++ cells were also similar given their largely overlapped phenotypic profile in health and inflammation. To test this, we exposed extracted LPMCs to a range of a range of i*n vitro* triggers including PMA/ionomycin, fixed *E. coli*, and a cytokine cocktail consisting IL-12/-15/-18/TL1A.

A similar percentage of blood CD4+CD161++ cells from healthy individuals and IBD patients responded to PMA/ionomycin stimulation, as indicated by the expression of IFN-γ (Figure 5-2A), TNF-α (Figure 5-2B), GrB (Figure 5-2C). However, the expression of IL-17A was elevated in blood CD4+CD161++ cells derived from IBD patients (Figure 5-2D).

Activation of CD161++CD4+ T cells by fixed *E. coli* was much lower than that achieved by CD8+CD161++ T cells. As described in Figure 5-2E, the upregulation of IFN-γ, TNF-α, GrB, and IL-17A by blood CD161++CD4+ T cells, either from healthy or IBD individuals, was minimal. This could be due to a much lower Vα7.2 TCR usage by CD161++CD4+ T cells compared with CD8+CD161++ T cells (data not shown). On the other hand, the lowered responses of CD4+ MAIT cells bearing this specific Vα7.2 TCR in comparison to their CD8+ counterparts (Kurioka et al., 2017) suggest that perhaps bacterial-mediated activation requires CD8 co-receptor expression.

Consistent with a previous report (Holmkvist et al., 2015), blood CD161++CD4+ T cells from healthy and IBD individuals all robustly responded to IL-12/-18/-15/TL1A. We did not observe significant functional difference between the healthy and IBD

Figure 5-2

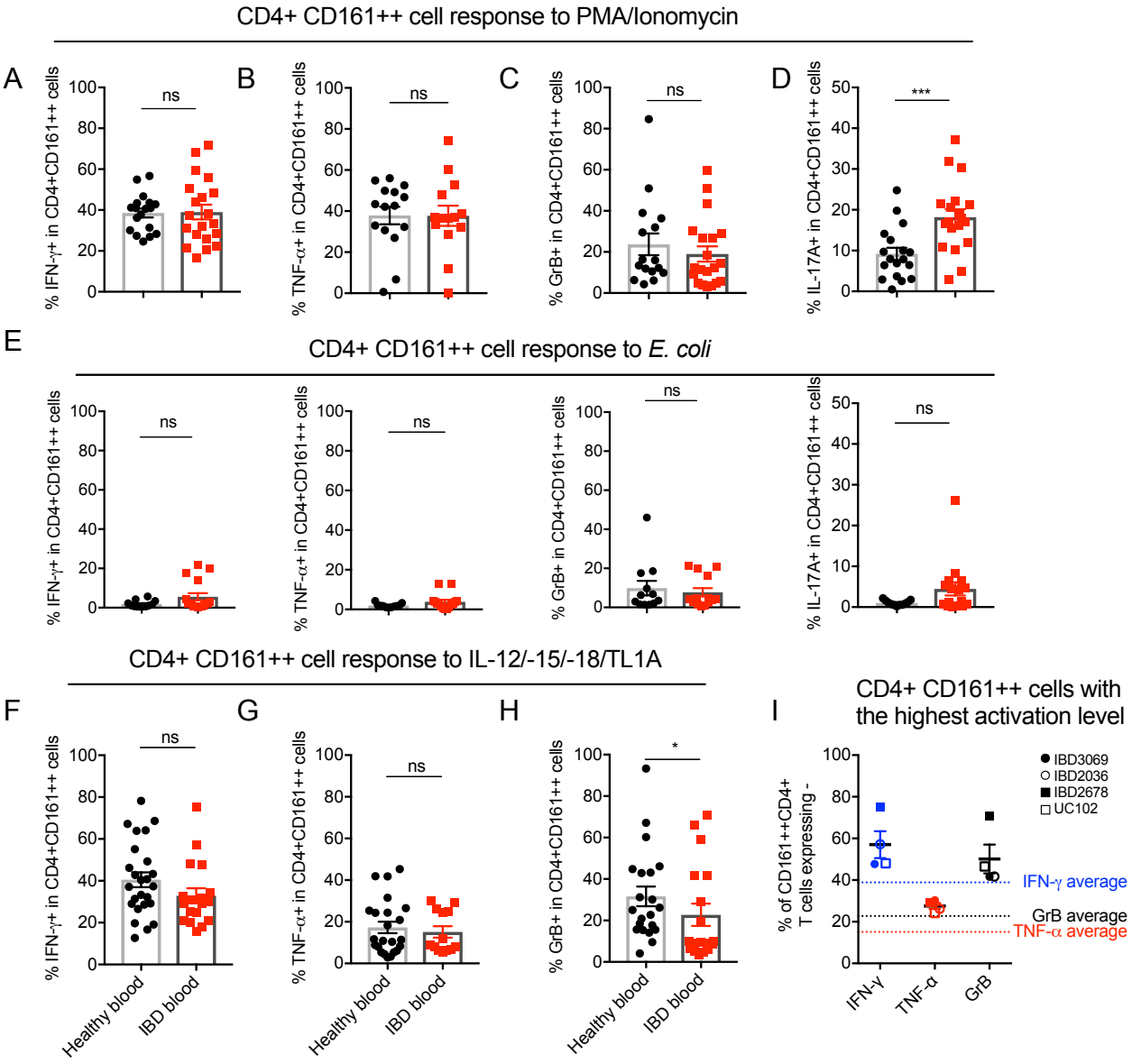


Figure 5-2. CD161++CD4+ T cells from IBD patient bloods (shown in red) possess similar functionality to those from healthy donors (shown in black). A, B, C, D) Cumulative frequencies of IFN-γ+ (A), TNF-α+ (B), GrB+ (C), and IL-17A+ (D) cells amongst CD161++CD4+ T cells in response to PMA and ionomycin. E) Percentages of CD4+CD161++ T cells expressing IFN-γ, TNF-α, GrB, and IL-17A in response to overnight incubation with THP1 cells and fixed *E. coli*. F, G, H) Cumulative frequencies of IFN-γ+ (F), TNF-α+ (G), and GrB+ (H) cells amongst CD161++CD4+ T cells in response to IL-12, IL-15, IL-18 and TL1A. Healthy PBMCs, n = 21; IBD PBMCs, n = 18. I) CD4+CD161++ T cells from the blood of 4 IBD patients displayed high expression of IFN-γ, TNF-α, and GrB. Results shown as mean ± S.E.M, ns: non-significant, *<0.05, ***<0.001 by two-tailed Mann-Whitney t-tests.

blood CD4+CD161++ cells (Figure 5-2F-H). However, CD161++CD4+ T cells with the highest IFN-γ-secreting potential (top 4 data points in Figure 5-2F, IBD PBMCs) also displayed high TNF-α (Figure 5-2G) and GrB (Figure 5-2H) expression capacity (Figure 5-2I, Patient ID: IBD3069, IBD2036, IBD2678, and UC102).

It is worth noting that blood CD4+CD161++ cells expressed lower levels of IL-18Rα, PLZF, and RORγt than their CD8+ counterparts (Figure 4-10). Kurioka et al. also observed reduced PLZF expression in CD4+ MAIT cells in the blood (Kurioka et al., 2017). This is interesting because our data show that CD8+CD161++ T cells in the blood either from healthy donors or IBD patients were more responsive to the cytokine trigger compared with CD4+CD161++ T cells (Figure 4-11E). For instance, 72.1% CD8+CD161++ T cells from the healthy donors secreted IFN-γ in response to IL-12/-15/-18/TL1A (Figure 4-11F), only 40.5% CD4+CD161++ cells were triggered to secrete IFN-γ. Taken together, our data suggest that the expression of IL-18Rα and/or PLZF could predict the response of blood CD161-expressing T cells to an innate trigger.

5.4.3. Gut CD4+ T cells are enriched for CD161++/+(intermediate) cells

We then investigated CD161 expression on CD4+ T cells in the gut. The percentages of CD4+ T cells that expressed CD161 in inflamed and healthy gut tissues were significantly higher than those in the blood (Figure 5-3A, B). Furthermore, CD161 expression was also higher in healthy gut than inflamed gut (Figure 5-3B). The reduced presence of CD161-expressing cells in inflammation could be attributed to their proapoptotic features that have been described on gut CD8+ MAIT cells (Hiejima et al., 2015). CD161-expressing cells were further divided into CD161++ and CD161+ cells following the gating strategy described in Figure 5-1A (Figure 5-3C). CD4+CD161-expressing cells – the frequencies of both CD161++

and CD161+ cells were higher in healthy and inflamed gut tissues than in the blood (Figure 5-D).

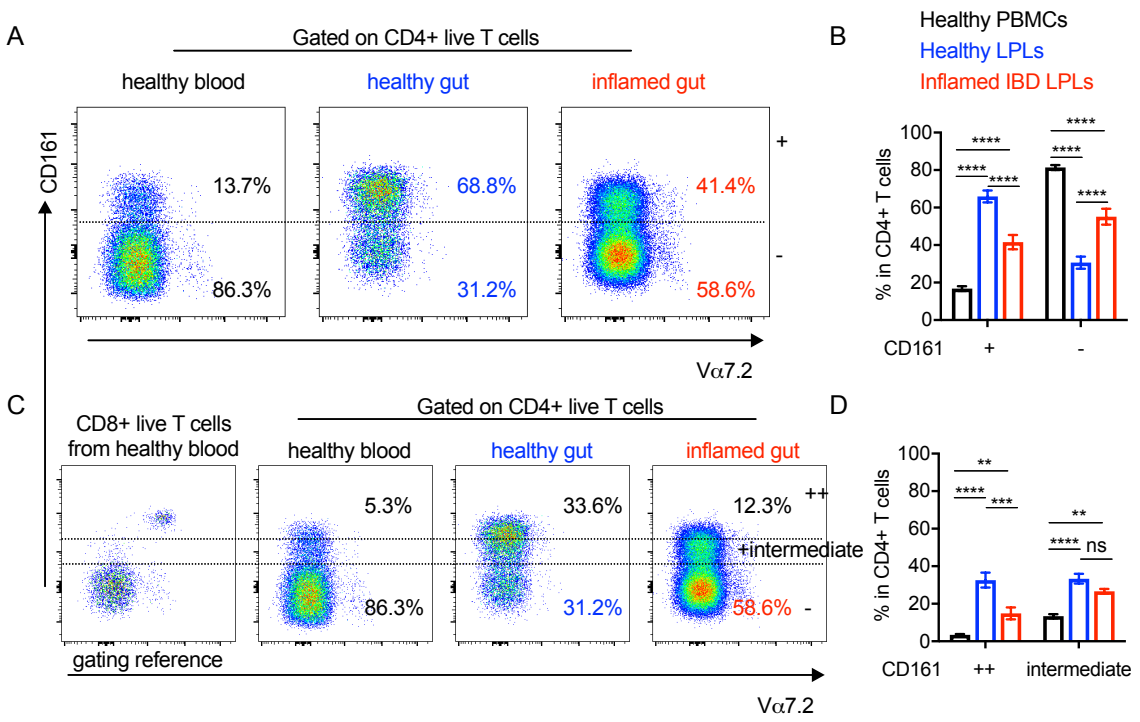


Figure 5-3. CD161 expression is more pronounced in CD4 T cells derived from gut tissues than from blood. A) Representative plots showing the division of total CD4 T cells into CD161-expressing and CD161-negative subpopulations. B) Cumulative frequencies showing the percentage of CD4+ T cells that express CD161 (+) or are negative for CD161(-) derived from healthy blood samples (black bars), healthy gut tissues (blue bars), and IBD gut tissues (red bars). C) Representative plots showing the division of total CD4 T cells into CD161-high (++), CD161-intermediate (+) and CD161-negative subpopulations using the gating strategy for CD8+ CD161++/+/- populations. D) Cumulative frequencies showing the percentage of CD4+ T cells that are either CD161++ or CD161+ derived from healthy blood samples (black bars), healthy gut tissues (blue bars), and IBD gut tissues (red bars). Healthy PBMCs, n = 32; healthy gut samples, n = 13, IBD gut samples, n = 10. Results shown as mean ± S.E.M, ns: non-significant, **<0.01, ***<0.001, ****<0.0001 by two-way ANOVA with Turkey's multiple comparisons test.

This chapter mainly presents findings on CD4+CD161++ T cells, since they share a similar level of CD161 expression with previously discussed CD8+CD161++ T cells.

5.4.4. Gut CD4+ CD161++ T cells share phenotypes with their blood-derived counterparts but also possess unique signatures

CD161 marks an effector memory phenotype across different T cell lineages, and our data confirm that the majority of CD161++ cells in the blood (Figure 5-4A) and gut (Figure 5-4B, C) were Tem cells. However, it is also interesting to note that, while in the blood there exists a naïve population mostly confined within CD161-

CD4+ T cells (Figure 5-4A), this naïve population was almost absence in the gut (Figure 5-4B, C). Instead, Tem cells were the dominant population in gut CD4+ T cells irrespective of their CD161 expression.

The expression of IL-18Rα was low in blood CD161++CD4+ T cells, but high in those derived from healthy and inflamed gut tissues (Figure 5-4D, E). IL-18Rα expression was also reduced in CD161++CD4+ T cells derived from inflamed gut tissues compared with those from healthy tissues (Figure 5-4E). Similar to blood CD161++CD4+ T cells, these cells derived from the gut also displayed low levels of RORγt (F, G) and PLZF (H, I) expression.

Consistent with our findings on CD8+ T cells, gut CD161++CD4+ T cells also increased their expression of CD39 (Figure 5-4J, K) and PD-1 (Figure 5-4 L, M). The level of CD39 was also higher in cells derived inflamed tissues than those from healthy tissues, suggesting that an ongoing inflammation could contribute to an enhanced level of CD39, a marker indicating a state of terminal exhaustion and extreme activation (Gupta et al., 2015). This was further confirmed by examining the co-expression of CD39 and PD-1 in the CD161++CD4+ T cells from different origins, where the highest frequency of CD39+PD-1+ cells was found in inflamed gut CD161++CD4+ T cells, followed by healthy gut cells, then by healthy PBMCs.

Figure 5-4 Part 1

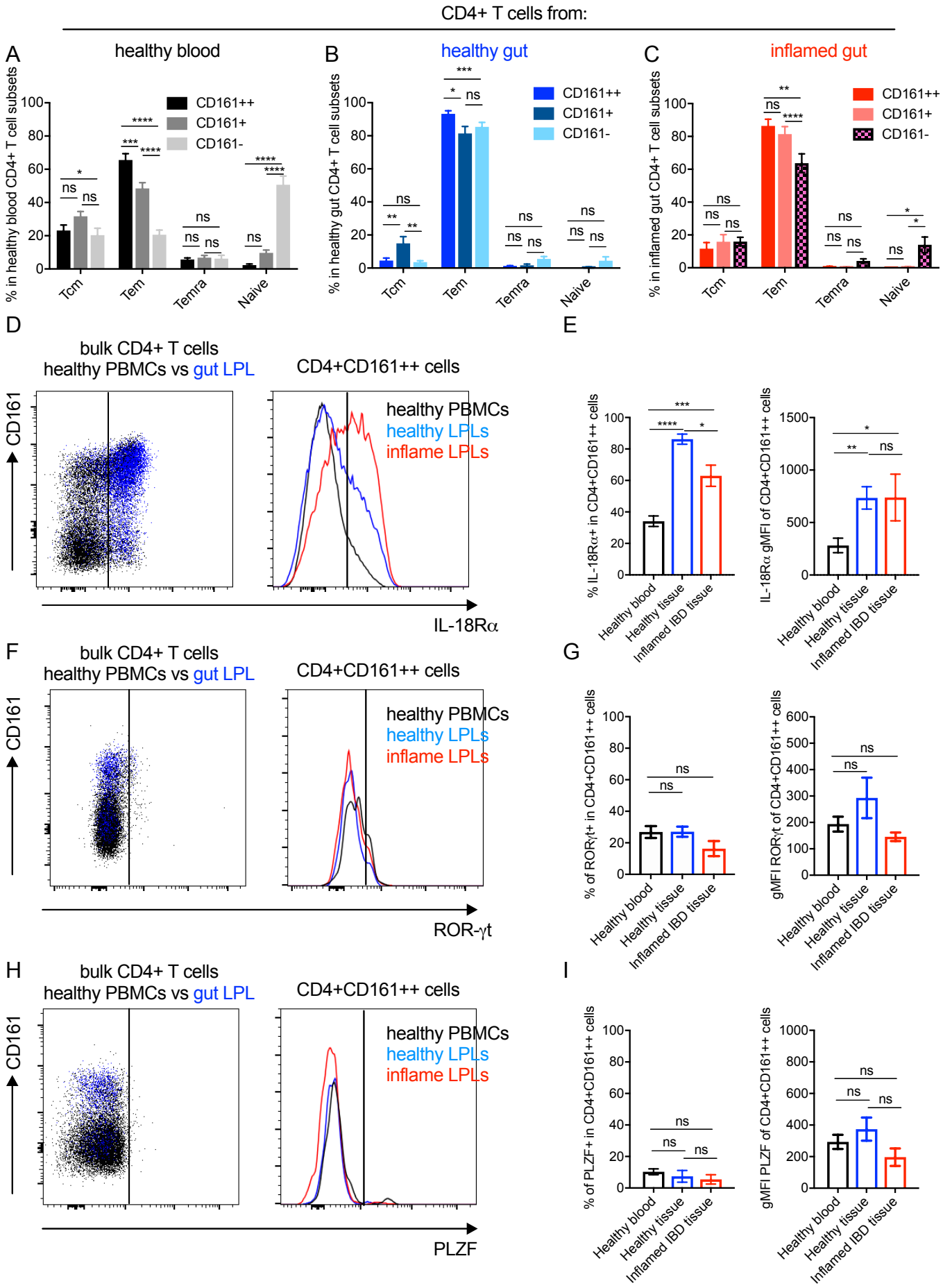


Figure 5-4 Part 2

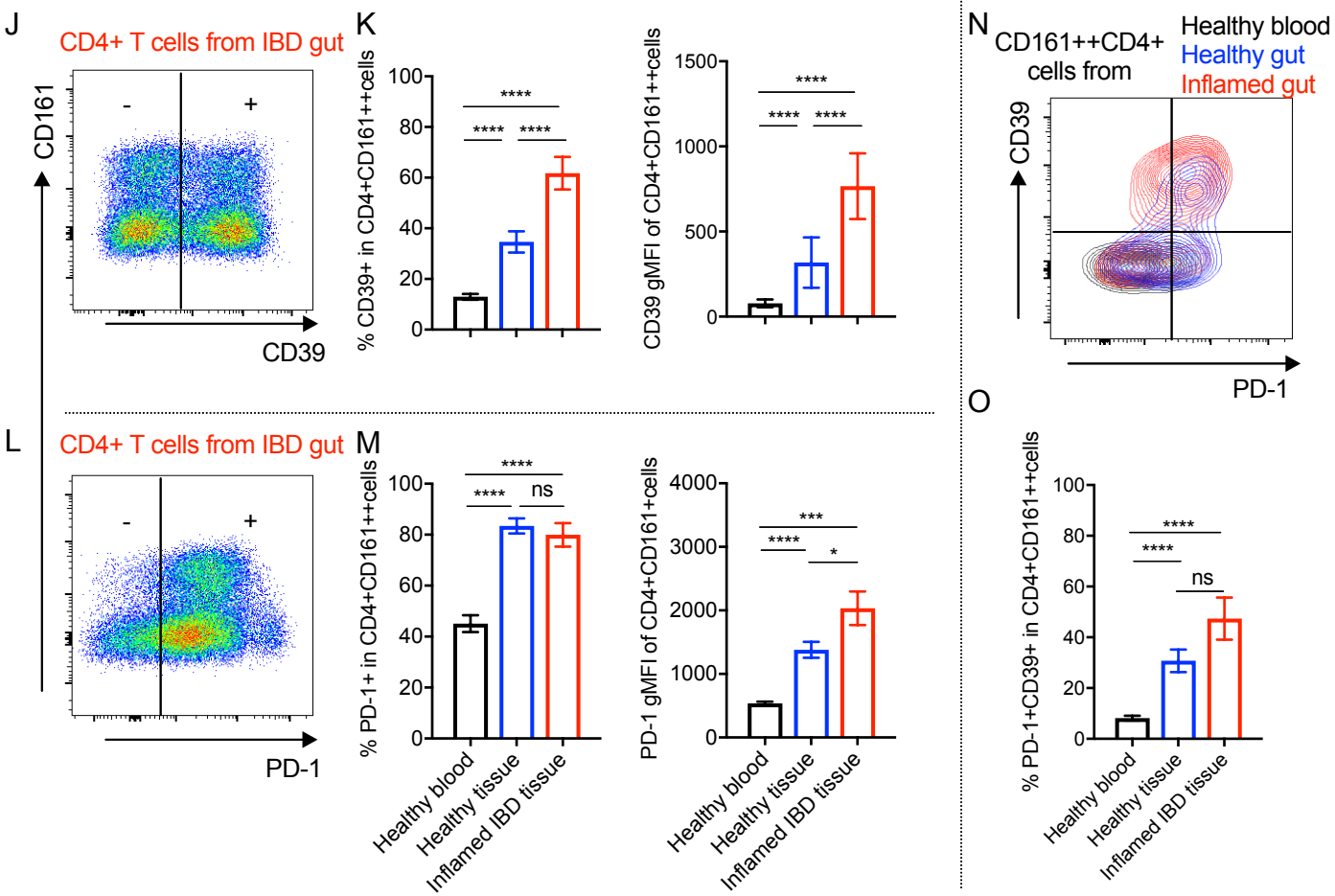


Figure 5-4. The majority of the CD4+ T cells from gut tissue are effector memory T cells with high IL-18Rα, CD39, and PD-1 expression and low PLZF/RORγt levels. A, B, C) Percentages of CD161++/CD161+/CD161- cells that are Tcm, Tem, Temra, or naïve cells derived from the healthy blood (A), healthy gut (B), and IBD gut (C). D) Representative plots showing on the left: the expression of IL-18Rα by CD4+ T cells derived from the blood of a healthy donor (black) and a healthy gut tissue (blue). Right: Histogram showing IL-18Rα expression by CD161++CD4+ T cells derived from a healthy blood sample, a healthy gut tissue, and an IBD inflamed gut tissue. E) Left: The percentage of CD161++CD4+ T cells that express IL-18Rα. Right: IL-18Rα gMFI of CD161++CD4+ T cells from indicated origins. F, G, H, I) Expression of RORγt and PLZF by CD4+ T cells, especially CD161++CD4+ T cells. J) A representative plot showing the expression of CD39 on CD4+ T cells derived from an inflamed gut tissue. K) Left: The percentage of CD161++CD4+ T cells that express CD39. Right: CD39 gMFI of CD161++CD4+ T cells from indicated origins. L, M) Expression of PD-1 PLZF by CD4+ T cells, especially CD161++CD4+ T cells. O) The percentage of CD161++CD4+ T cells from indicated origins that express both CD39 and PD-1. Healthy PBMCs, n = 31; healthy gut samples, n = 12, IBD gut samples, n = 8. Results shown as mean ± S.E.M, ns: non-significant, *<0.05, **<0.01, ***<0.001, ****<0.0001 by one-way ANOVA (E, G, I, K, M, O), or two-way ANOVA (A-C) with Turkey's multiple comparisons test.

5.4.5. CD161++CD4+ gut T cells respond to PMA/ionomycin but weakly to the fixed *E. coli* stimulation

The enhanced effector memory phenotype, increased expression of IL-18Rα, as well as tissue-specific elevation of CD39 and PD-1 expression has prompted us to further investigate the functional signatures of CD161++CD4+ T cells in the gut.

We first stimulated the extracted LPMCs with PMA/ionomycin. Our data show that CD161++CD4+ T cells derived from inflamed intestinal tissues exhibited reduced capacity to secrete IFN-γ or upregulate GrB (Figure 5-5A, B), compared with those derived from healthy blood. CD161++CD4+ T cells from healthy gut tissues also showed reduced GrB expression and unchanged IFN-γ secretion compared with their blood counterparts (Figure 5-5A, B). It is also of interest to note that the secretion of TNF-α and IL-17A was not altered in CD161++CD4+ T cells derived from intestinal tissues, healthy or inflamed (Figure 5-5C, D).

We next examined the CD161++CD4+ T cell response to *E. coli*. Similar to findings in blood CD161++CD4+ T cells, our data overall suggest that the response of CD4+ T cells to *E. coli* was minimal (data not shown), including the CD161++CD4+ T cells (Figure 5-5E, F, G). In the inflamed gut, CD161++CD4+ T cells slightly increased their secretion of IFN-γ as a response (Figure 5-5F). It is also interesting to note that the proportion of gut CD161++CD4+ T cells that expressed GrB was significantly increased after the *E. coli* stimulation. We speculate that this GrB-expressing subset of CD4+ T cells could be the previously described CD4+ CTLs (Takeuchi and Saito, 2017), although further phenotypic and functional studies are required. CD4 CTLs are gut-resident T cells with the potential to exacerbate autoimmune diseases, whose contribution to the induction of intestinal colitis has been discussed (Cortez et al., 2014; Takeuchi et al., 2016).

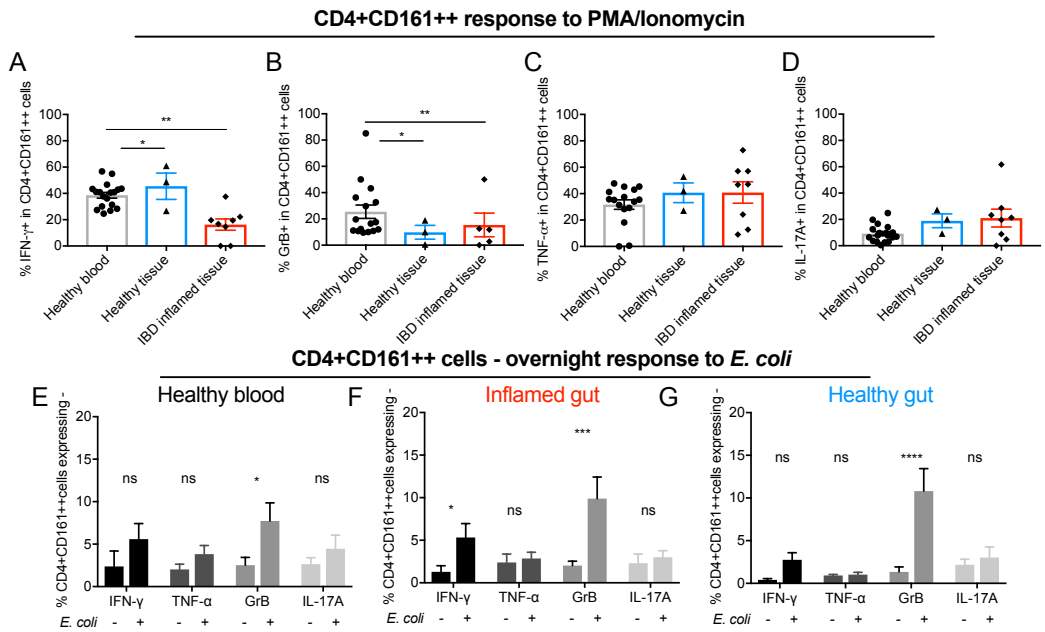


Figure 5-5. Gut-derived CD161++CD4+ T cells respond to PMA and ionomycin and secrete IFN-γ and express GrB to a lesser extent compared to those derived from healthy blood samples. Their response to fixed *E. coli* is minimal. A, B, C, D) The expression of IFN-γ (A), GrB (B), TNF-α (C), and IL-17A (D) by CD161++CD4+ T cells from indicated origins in response to PMA and ionomycin stimulation. Healthy PBMCs, n = 16; healthy gut samples, n = 3, IBD gut samples, n = 5. E, F, G) Responses of CD161++CD4+ T cells from the healthy blood (E), inflamed gut (F), and healthy gut (G) to fixed *E. coli*. Healthy PBMCs, n = 14; healthy gut samples, n = 5, IBD gut samples, n = 10. Results shown as mean ± S.E.M, ns: non-significant, *<0.05, **<0.01, ***<0.001, ****<0.0001 by one-way ANOVA (A-C), or two-way ANOVA (E-G) with Turkey's multiple comparisons test.

5.4.6. TL1A synergises with IL-12/-18 to enhance IFN-γ production by CD161++CD4+ T cells in the gut and blood

As previously discussed, TL1A is a gut-associated cytokine with possible implications in IBD pathogenesis (Papadakis et al., 2005). Our data on CD8+CD161++ T cells also confirmed that TL1A enhanced mucosal T cell responses to IL-12/-18. We wondered if blood and mucosal CD161++CD4+ T cells possessed a similar responsiveness.

PBMCs from healthy donors, or LPMCs extracted from healthy or inflamed intestinal tissues were treated with a low dose of IL-12/-18 in the presence or absence of TL1A. The percentage of CD161++CD4+ T cells expressing IFN-γ increased from 11.5 ± 3.1% (IL-12/-18 only) to 20.6 ±4.1% (IL-12/-18/TL1A) in the healthy blood

(Figure 5-6A), from 13.0 ± 4.8% to 27.4 ± 4.8% in healthy intestinal tissues (Figure 5-6B), and from 8.4 ± 2.3% to 16.1 ± 4.7% in inflamed intestinal tissues (Figure 5-6C). Fold change-wise, TL1A induced 158 – 329% increase in IFN-γ production, and 61.9 – 150% increase in TNF-α production. The impact of TL1A on enhancing the expression of GrB, or IL-17A by CD161++CD4+ T cells was not pronounced.

We hypothesised that CD161++CD4+ T cells derived from inflamed tissues could be more responsive to TL1A than those from normal intestinal tissues, given observed high levels of TL1A mRNA and protein in IBD intestinal tissues. However, this was not confirmed by our data which show that the secretion of IFN-γ by CD161++CD4+ T cells was not different between inflamed and healthy intestinal tissues (Figure 5-6D).

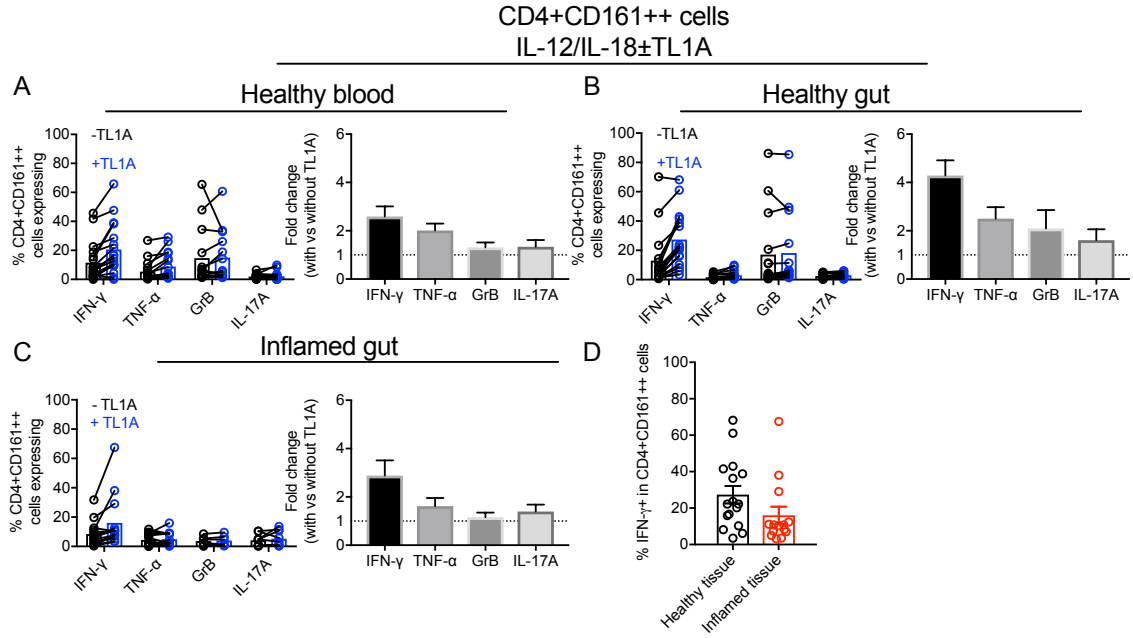


Figure 5-6. Gut-derived CD161++CD4+ T cells moderately enhance their IFN-γ release with additional TL1A. A) Right: Cumulative frequencies showing the expression of IFN-γ, TNF-α, GrB, and IL-17A by CD4+CD161++ T cells from healthy blood. Left: Fold change of IFN-γ, TNF-α, GrB, and IL-17A expression by CD8+CD161++ T cells triggered by IL-12/-18/TL1A compared to those with an IL-12/-18 stimulus. B, C) Datasets showing responses of CD4+CD161++ T cells from healthy gut tissues (B) and IBD gut tissues (C). D) Cumulative frequencies showing the expression of IFN-γ by CD4+CD161++ T cells from healthy and inflamed intestinal tissues. Healthy PBMCs n = 17, healthy gut samples n = 15, inflamed gut samples n = 14. Results shown as mean ± S.E.M, non significant results determined by repeated measures two-way ANOVA, with Bonferroni's multiple comparisons test (A-C), or two-tailed Mann-Whitney test (D).

This could be linked to the enhanced expression of CD39 and PD-1 on cells derived from inflamed intestinal tissues (Figure 5-4K, M, O), which lowered their responsiveness to cytokines.

Therefore, TL1A, a gut-associated cytokine, elicits a proinflammatory response in CD161++CD4+ T cells by synergising with other cytokines such as IL-12/-18. Our findings warrant further investigation on the role of TL1A and its corresponding receptor DR3 in activating CD161-expressing cells in IBD.

5.4.7. Gut CD161-expressings CD4+ T cells respond to combinations of adaptive and innate signals, whose release of IFN-γ and TNF-α is lower than those from the blood

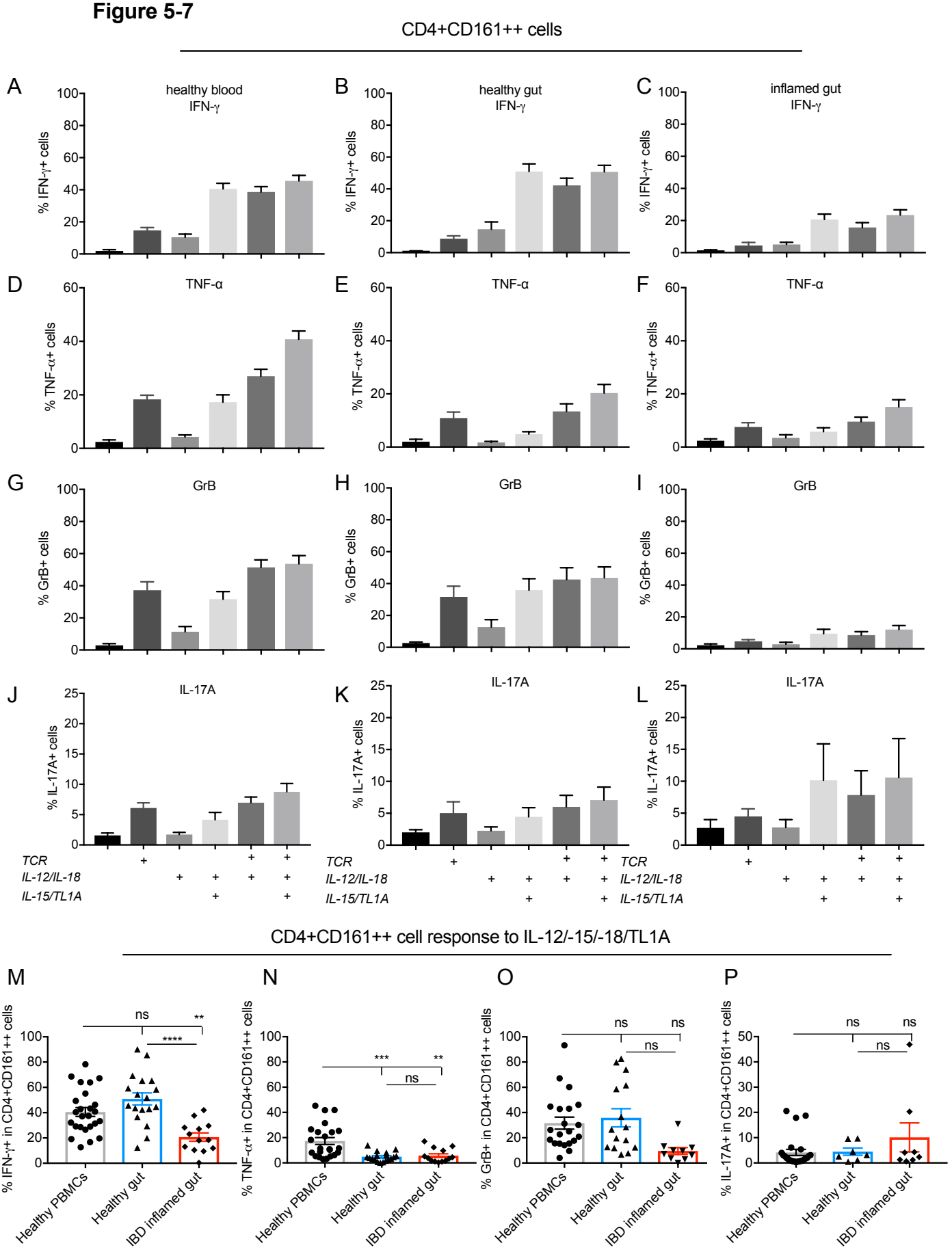
Having established that gut CD161++CD4+ cells exhibited altered responsiveness to PMA/ionomycin than their blood counterparts, we explored their effector functions elicited by a range of recombinant cytokines in the presence or absence of TCR beads. Similar to blood CD161++CD4+ cells (Figure 5-7A, D, G, J), CD161++CD4+ cells derived from healthy and inflamed intestinal tissues responded to stimulations with cytokines±TCR stimuli and as a result, upregulated their expression of IFN-γ (Figure 5-7B, C), TNF-α (Figure 5-7E, F), and GrB. The increase in GrB was pronounced in healthy tissues, but very insignificant in inflamed ones (Figure 5-7H, I). In addition, percentages of CD161++CD4+ T cells producing IL-17A also increased in the gut in response to increasing doses of trigger (Figure 4-8K, L).

We also compared the activation profile of gut-derived CD161++CD4+ T cells to their blood counterparts under the maximum cytokine stimulation - IL-12/-18/-15/TL1A. Percentage of IFN-γ+ cells in CD161++CD4+ T cells decreased from 31.6 ± 4.7% in the blood to 9.6 ± 2.7% in inflamed tissues (Figure 5-7M), and the level of

IFN-γ expression was comparable in the healthy gut to healthy blood, with 35.8 ± 7.2% of them secreting IFN-γ. In contrast, the expression of TNF-α was abrogated in gut-derived CD161++CD4+ T cells either in health and inflammation from 17.3 ± 2.8% in the healthy blood-derived CD161++CD4+ T cells to near baseline levels in the gut (Figure 5-7N). CD161++CD4+ T cells from inflamed gut tissues also exhibited impaired ability to upregulate GrB in response to the cytokine trigger (Figure 5-7O, 31.6 ± 4.8% in blood versus 35.9 ± 7.2% in the healthy gut, 9.6 ± 2.7% in inflammation). CD161++CD4+ T cells secreted limited amount of IL-17A in this setting (Figure 5-7P). Additionally, the activation induced by IL-12/-18/-15/TL1A was not seen in CD161- CD4+ T cells (data not shown).

Figure 5-7. Gut-derived CD161++CD4+ cells respond to innate and adaptive triggers known to activate blood MAIT cells. A, B, C) Cumulative frequencies showing the expression of IFN-γ by CD161++CD4+ T cells derived from healthy blood (A), healthy gut tissues (B) and IBD gut tissues (C). D-F show TNF-α expression, G-I show GrB expression, and J-L show IL-17A expression by CD161++CD4+ T cells from these aforementioned origins. M, N, O, P) Comparison of CD161++CD4+ T cell activation with IL-12/-15/-18/TL1A by examining their IFN-γ (M), TNF-α (N), GrB (O), and IL-17A (P) expression. Healthy PBMCs n = 21, healthy gut samples n = 15, inflamed gut samples n = 10. Results shown as mean ± S.E.M, * $p<0.05$, ** $p<0.01$, *** $p< 0.001$, **** $p< 0.0001$ by one-way repeated measures ANOVA, with Turkey's multiple comparisons test.

Figure 5-7


CD4+CD161++ cells
A
healthy blood
IFN-γ
B
healthy gut
IFN-γ
C
inflamed gut
IFN-γ
% IFN-γ+ cells
D
TNF-α
E
TNF-α
F
TNF-α
% TNF-α+ cells
G
GrB
H
GrB
I
GrB
% GrB+ cells
J
IL-17A
K
IL-17A
L
IL-17A
% IL-17A+ cells
TCR
IL-12/IL-18
IL-15/TL1A
CD4+CD161++ cell response to IL-12/-15/-18/TL1A
M
N
O
P
% IFN-γ+ in CD4+CD161++ cells
% TNF-α+ in CD4+CD161++ cells
% GrB+ in CD4+CD161++ cells
% IL-17A+ in CD4+CD161++ cells
ns
**
****
***
Healthy PBMCs
Healthy gut
IBD inflamed gut

5.4.8. CD161++CD4+ T cells from inflamed intestinal tissues express more CD39 and PD-1 than those from paired uninflamed tissues

Our data comparing cells from healthy and inflamed tissues of different individuals described a reduced Th1 response and cytotoxic capacity of CD161++CD4+ T cells in inflamed intestinal tissues. In order to further understand the phenotypic and functional modulation of CD161++CD4+ T cells – a subset of high frequency in the gut – in inflammation, we assessed these cells from paired inflamed and uninflamed intestinal tissues from IBD patients.

CD161++ cells accounted for a higher proportion of CD4+ T cells derived from healthy tissues than from inflamed tissues (27.4 ± 7.2% versus 14.9 ± 3.2%) (Figure 5-8A). Despite a higher presence in the healthy gut, they did not display a differential expression level of IL-18Rα (Figure 5-8B), RORγt (Figure 5-8C), or PLZF (Figure 5-8D) than those from inflamed tissues. Conversely, the percentage of cells expressing CD39 (Figure 5-8E), PD-1 (Figure 5-8F), or both (Figure 5-8G) was elevated in CD161++CD4+ T cells in inflammation, suggesting their advanced stage of activation, possibly due to the local inflammatory microenvironment.

5.4.9. CD161++ CD4+ T cells derived from inflamed gut tissues exhibit reduced IFN-γ secretion and GrB upregulation to various triggers.

We hypothesised that altered CD39/PD-1 expression CD161++CD4+ T cells from inflamed gut tissues could be indicative of altered physiological functions. In order to test this, we assessed CD161++CD4+ T cells from paired inflamed and uninflamed tissues for their responses to a range of *in vitro* cytokine+TCR triggers.

Our results show that the percentage of CD161++CD4+ T cells producing IFN-γ was significantly lower for those from inflamed tissues (marked in red) than from those matched uninflamed tissues (marked in black). This was consistent in all conditions

Figure 5-8

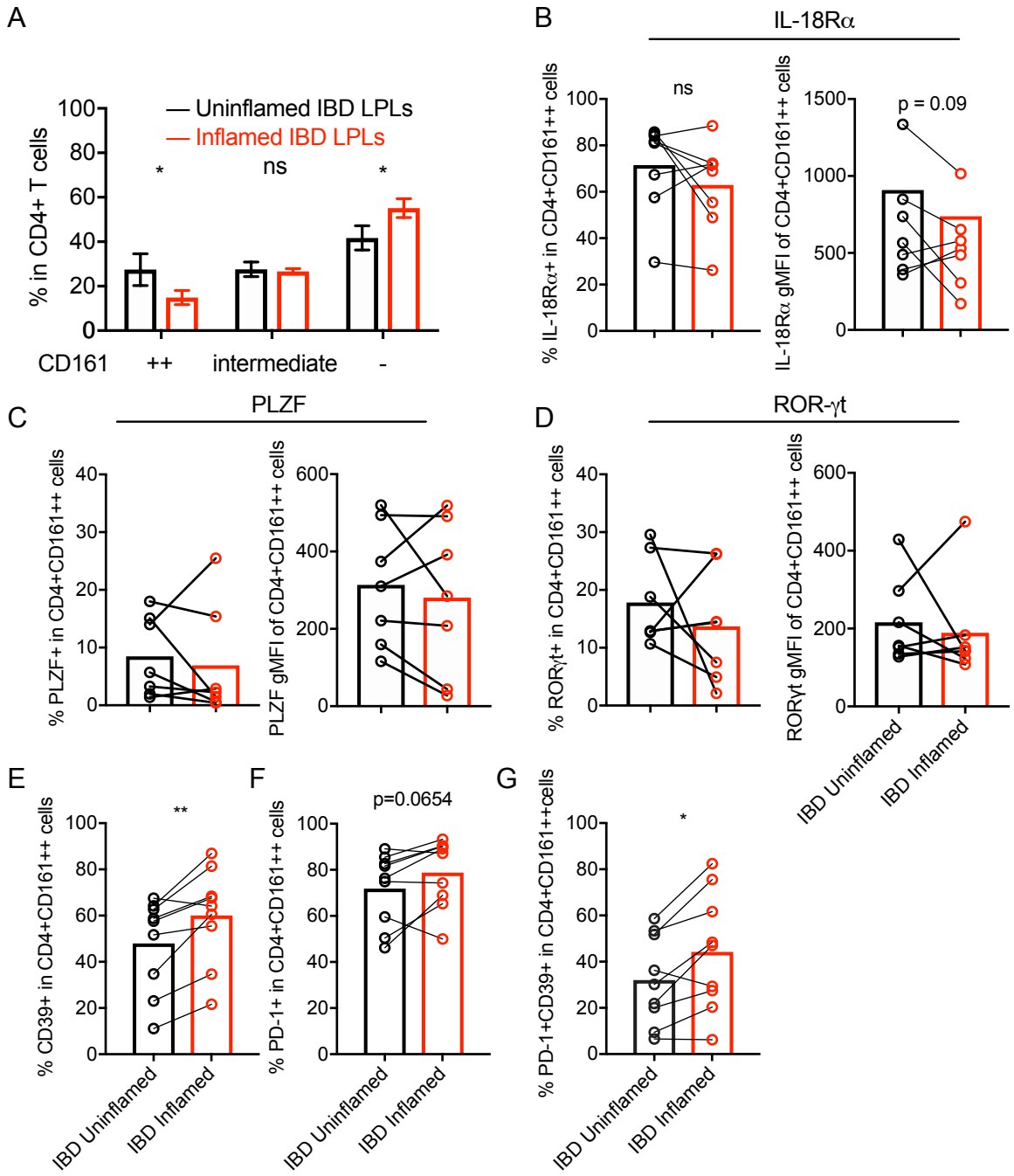


Figure 5-8. Comparison of phenotypes of CD161++CD4+ T cells derived from paired inflamed and uninflamed intestinal tissues. A) Cumulative frequencies showing percentages of CD4+ T cells from indicated tissues that are CD161++, CD161+, or CD161-. B, C, D) Cumulative frequencies showing percentages CD161++ CD4 T cells that are IL-18Rα+ (B), RORγt+ (C), or PLZF+ (D) cells from indicated tissues (left), or the gMFI of IL-18Rα (B), RORγt (C), and PLZF (D) of CD161++CD4+ T cells from indicated tissues (right). E, F, G) Cumulative frequencies showing percentages of CD161++CD4 T cells that are CD39+ (E), PD-1+ (F), or CD39+PD-1+ (G) in indicated tissues. Patient number n = 10. Results shown as mean ± S.E.M, * p<0.05, **<0.01 by paired student t-tests (B-G), or multiple t-tests (A).

(Figure 5-9A, IL-12/-15/-18/TL1A; Figure 5-9B, IL-12/-18+TCR; Figure 5-9C, IL-12/-15/-18/TL1A+TCR). CD161++CD4+ T cells in inflammation also displayed a weaker capacity to expression GrB than their counterparts derived from IBD uninflamed tissues, but their release of TNF-α and IL-17A was similar to those in uninflamed tissues.

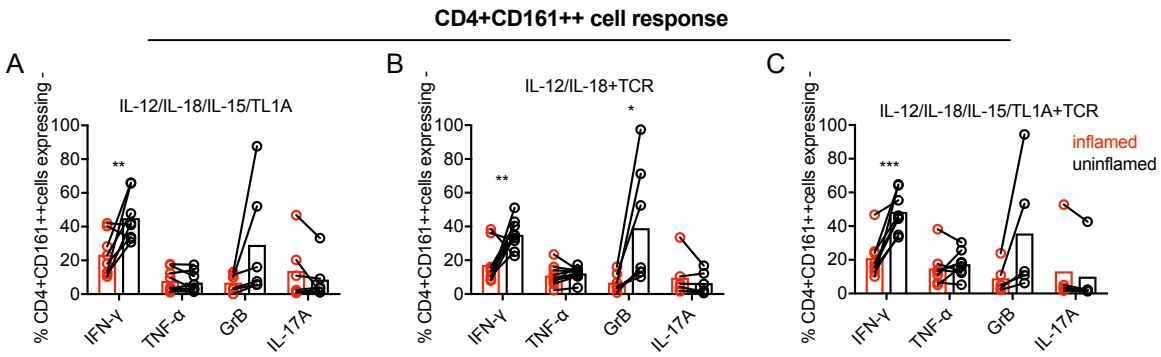


Figure 5-9. CD161++CD4+ T cells derived inflamed tissues are less able to secrete IFN-γ compared to those from uninflamed tissues of the same patients. A, B, C) Cumulative frequencies showing the expression IFN-γ, TNF-α, GrB and IL-17A by CD161++CD4+ T cells extracted from pair inflamed (red) and uninflamed (black) intestinal tissues from the same IBD patients. MAIT cell activation was probed under IL-12/-15/-18/TL1A stimulation (A), IL-12/-18+TCR beads (B), and IL-12/-15/-18/TL1A+TCR beads. Patient number n = 6. Results shown as mean ± S.E.M, * p<0.05, ** p<0.01, *** p< 0.001 by multiple t-tests.

5.4.10. Gut CD161-intermediate (+) CD4+ T cells are phenotypically similar to CD161++CD4+ T cells.

As illustrated in Figure 5-3, CD161-expressers are the predominant subset of infiltrating CD4+ T cells. They include not only CD161++ cells, which have been discussed extensively in this chapter, but also CD161-intermediate/+ cells representing on average 26.7% of CD4+ T cells in gut inflammatory infiltrates, and about a third of CD4+ T cells in healthy intestinal tissues. Previously, intermediate CD161 expression has been characterised in the gut and blood, which marks a predominant subset of polyclonal and poly-functional CD8+ memory T cells with tissue homing properties (Fergusson et al., 2016).

We hypothesised that CD161+CD4+ T cells also share key characteristics of their CD161++ counterparts in the gut, and we found that the expression of IL-18Rα, albeit low in blood CD161+CD4+ T cells, was high in those derived from healthy and inflamed gut tissues (Figure 5-10A). IL-18Rα expression was also reduced in CD161+CD4+ T cells derived from inflamed gut tissues compared with those from healthy tissues (Figure 5-10A). Similar to blood CD161+CD4+ T cells, these cells derived from the gut also displayed low levels of RORγt (Figure 5-10B) and PLZF (Figure 5-10C) expression. Of note, the IL-18Rα level in CD161+CD4+ T cells was comparable to that in CD161++CD4+ T cells (Figure 5-4E), but its expression in CD161-CD4+ T cells in the gut was very low (Figure 5-4E, cumulative data not shown).

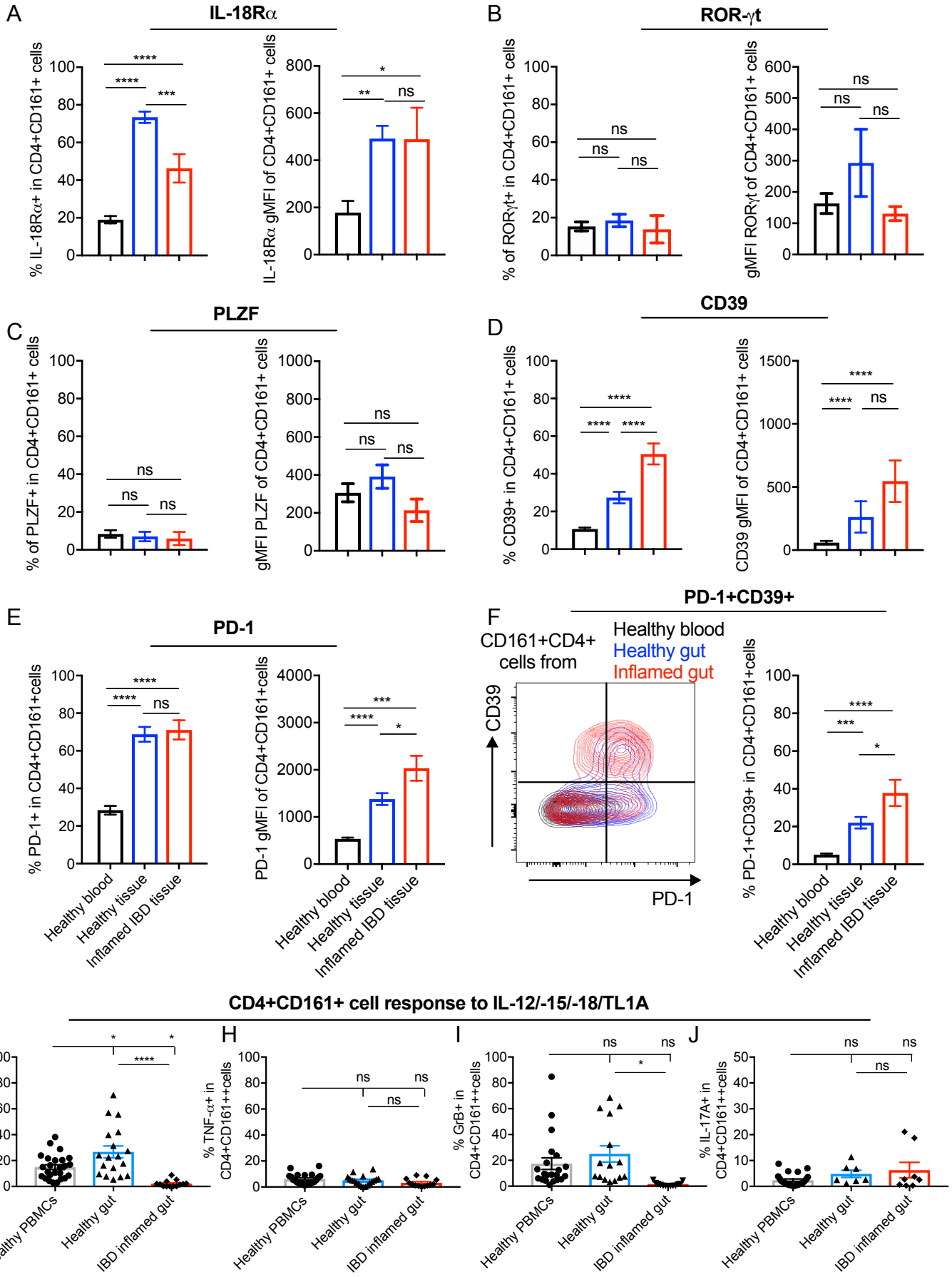
Interestingly, gut CD161+CD4+ T cells also increased their expression of CD39 (Figure 5-10D) and PD-1 (Figure 5-10E) compared with their blood counterparts, as both the population frequency (%) and individual cell expression (gMFI). The level of CD39 was also higher in cells derived inflamed tissues than those from healthy tissues, so was that of PD-1. In addition, the co-expression of CD39 and PD-1 in the CD161++CD4+ T cells from different origins was the highest in inflamed gut CD161++CD4+ T cells, followed by healthy gut cells, then by healthy PBMCs (Figure 5-10F). In fact, the enhanced CD39 and/or PD-1 expression in the gut is indeed a shared phenotype of all CD4+ T cells in the gut, including CD161-CD4+ T cells (data not shown).

Similar to CD161++CD4+ T cells, CD161+CD4+ T cells derived from healthy tissues also exhibited robust responses to the innate trigger consisting of IL-12-15/-18/TL1A. Their responses including the release of IFN-γ (Figure 5-10G), TNF-α

(Figure 5-10H), IL-17A (Figure 5-10J) and the upregulation of GrB (Figure 5-10I) were comparable to cells derived from healthy blood samples. This contrasts with a lack of responses by CD161+CD4+ T cells derived from inflamed intestinal tissues, marked by low levels of IFN-γ, TNF-α, GrB, and IL-17A expression. Combined with our data demonstrating low levels of activation observed in CD161++ CD4+ T and CD8+CD161++ T cells in the gut, we find evidence supporting that reduced functionality in CD161-expressing gut lymphocytes may be associated with increased surface expression of CD39 and PD-1.

Figure 5-10. Gut-derived CD161+CD4+ T cells share phenotypic and functional properties with CD161++CD4+ T cells. A, B, C, D, E) Left: Percentages of CD161+CD4+ T cells that express IL-18Rα (A), RORγt (B), PLZF (C), CD39 (D), and PD-1 (E). Right: IL-18Rα (A), RORγt (B), PLZF (C), CD39 (D), and PD-1 (E) gMFI of CD161+CD4+ T cells from indicated origins. F) Left: a representative plot showing the co-expression of CD39 and PD-1 on CD161+CD4+ T cells from the healthy blood (black), one healthy gut tissue (blue), and one inflamed gut tissue (red). Right: the percentage of CD161+CD4+ T cells from indicated origins that express both CD39 and PD-1. G, H, I, J) Comparison of CD161+CD4+ T cell activation with IL-12/-15/-18/TL1A by examining their IFN-γ (G), TNF-α (H), GrB (I) and IL-17A (J) expression. Healthy PBMCs, n = 22; healthy gut samples, n = 11, IBD gut samples, n = 9. Results shown as mean ± S.E.M, ns: non-significant, *<0.05, **<0.01, ***<0.001, ****<0.0001 by one-way ANOVA with Turkey's multiple comparisons test.

Figure 5-10


A
IL-18Rα
% IL-18Rα+ in CD4+CD161+ cells
IL-18Rα gMFI of CD4+CD161+ cells
B
ROR-γt
% of RORγt+ in CD4+CD161+ cells
gMFI RORγt of CD4+CD161+ cells
C
PLZF
% of PLZF+ in CD4+CD161+ cells
gMFI PLZF of CD4+CD161+ cells
D
CD39
% CD39+ in CD4+CD161+ cells
CD39 gMFI of CD4+CD161+ cells
E
PD-1
% PD-1+ in CD4+CD161+cells
PD-1 gMFI of CD4+CD161+cells
Healthy blood
Healthy tissue
Inflamed IBD tissue
F
PD-1+CD39+
CD161+CD4+ cells from
Healthy blood
Healthy gut
Inflamed gut
CD39
PD-1
% PD-1+CD39+ in CD4+CD161+cells
CD4+CD161+ cell response to IL-12/-15/-18/TL1A
G
% IFN-γ+ in CD4+CD161++cells
H
% TNF-α+ in CD4+CD161++cells
I
% GrB+ in CD4+CD161++cells
J
% IL-17A+ in CD4+CD161++cells
Healthy PBMCs
Healthy gut
IBD inflamed gut

5.5. Discussion

In this study, the phenotypic properties and functional capacity of human CD161-expresing CD4+ cells, especially CD161++ cells, in the gut and blood, was investigated. CD161 expression was found to mark innate-like T cells with robust responses to innate cytokines both in the gut and the blood, and is dramatically upregulated in CD4+ T cells resident in the LP of both inflamed and healthy gut. This work also provided preliminary evidence showing functional regulation of these cells in healthy and inflamed gut.

5.5.1. Enhanced CD161 expression in the gut

Our study found that CD161+ T cells were particularly enriched in the CD4+ T cell compartment of the gut LP. This is in line with findings by Iiai et al. that described an increased presence of CD161+ T cells in mononuclear cells from human liver and small intestine compared with in the peripheral blood. Furthermore, they discovered a pronounced enrichment of CD161-expressing T cells in the intraepithelial lymphocytes (IELs) isolated from the jejunum than from ileum or colon (Iiai et al., 2002). A significant enrichment of total CD161+ Th cells was also found within inflamed RA joints (Basdeo et al., 2015). The accumulation of CD161-expressing cells in the gut and inflammation has not been clearly understood. Poggi et al. have illustrated that CD161 expression marks the capacity of trans-endothelial migration in CD4+ T cells (Poggi et al., 1997a, 1997b). In agreement with this finding, pathway analysis revealed the migratory phenotype of CD161+ T cells characterised by expression of chemokine receptors and integrins, and *in vitro* investigation of CD161+ T cells confirmed an elevated expression of CCR9 and α4β7 in JIA synovial fluid (Duurland et al., 2017). Our data on increased proportion of CD161+CD4+ T cells in the gut indicate that they may be more prone to tissue

migration compared with CD161- cells. Moreover, unpublished data from our group supports this concept by showing high expression of CCR9 or α4β7 expression on gut-tropic CD161+ T cells.

In addition, our observation regarding the altered expression of integrin in blood CD161++CD4+ T cells led to the hypothesis that α4β7 downregulation on CD161++ CD4+ T cells in the peripheral blood of IBD patients could result from an enhanced migration capacity of blood α4β7+CD161++CD4+ T cells to the gut in an inflammatory setting. In order for this hypothesis to be tenable, relevant data should demonstrate an increased presence of CD161++/+ CD4+ T cells in inflamed IBD tissues compared with in healthy tissues. However, comparing the percentage of CD161++ cells amongst gut CD4+ T cells between healthy and diseased individuals is not sufficient to assess the migratory capacity of their corresponding blood counterparts, and this study could benefit from a bigger cohort of IBD patients and thorough quantification of CD161-expressing CD4+ T cell numbers in the tissue. We also believe that our findings provide a possible explanation regarding the origin of CD161+ CD4+ T cells in the gut, and further studies would be of interest to evaluate the hypothesis by studying more overlapping characteristics CD161+ T cells from gut tissues and blood of the same donor, for example, the degree of overlap in their TCR repertoire.

The enrichment of CD161+ CD4+ T cells in the gut could be linked to accumulation of Tregs in the gut environment. Although not being probed in this study, Treg cells, as shown by a number of studies, accumulate in the gut where they establish robust intestinal tolerance via different mechanisms (Makita et al., 2004; Uhlig et al., 2006; Yu et al., 2007). For instance, a mouse study reported that macrophages were able to capture and transfer dietary antigens to CD103+ DCs via a gap junction-mediated

process, which subsequently recruits and activates Tregs (Bopp et al., 2007; Mowat, 2003; Wu and Weiner, 2003). Additionally, the role of commensal bacteria in promoting Treg accumulation in the gut has been appreciated, highlighting the contribution of *Bacteroides fragilis* and several commensal Clostridium strains in inducing colonic Treg differentiation and maturation (Atarashi et al., 2011; Round and Mazmanian, 2010).

So, do Tregs express CD161? Interestingly, Afzali et al. have shown that a subset of Tregs can be modulated by IL-1β plus IL-2 and produce IL-17 *in vitro*. This "Th17 potential" is, indeed, specific to a subset of Tregs with CD161 expression, and surprisingly, highly compatible with Treg phenotypes (CD39, HLA-DR, and Cytotoxic T-Lymphocyte Associated Protein 4, CTLA-4), as well as suppressive functions *in vitro* (Afzali et al., 2013). These CD161+ Tregs with Th17 potential displayed a lower expression level of Helios – a putative marker for thymus-derived Treg cells (Thornton et al., 2010), suggesting that they undergo distinct developmental pathways different from that of conventional CD161-Tregs. Bodies of evidence have described the enriched presence of CD161+Tregs in inflammatory diseases, such as within inflamed joints of arthritis patients (Afzali et al., 2013), as well as in inflamed intestinal tissues of CD patients (Hovhannisyan et al., 2011). Although these CD161+ T cells with Treg characteristics were not identified by Hovhannisyan et al. in the bowel of healthy individuals or UC patients, further studies with a bigger patient cohort could benefit the understanding of CD161+ Tregs in tissues. The newly discovered connection between CD161+ Th17 cells and Tregs further extends knowledge of Th17 cells about their considerable level of plasticity, which has been demonstrated by their potential to convert to Th1 cells without losing their

CD161 expression in inflammatory conditions (Cosmi et al., 2011; Nistala et al., 2010).

5.5.2. The polyfunctional CD161+ Th17 cells in the gut

In this study, the majority of the CD161-expressing CD4+ cells, including CD161++ and CD161+ cells, in both gut and blood, displayed pronounced capacity to express IFN-γ in response to combinations of innate and adaptive triggers. The frequency of IL-17A+ cells could increase to up to 10-15% with a strong cytokine or PMA/ionomycin trigger. Such response was not distinctly different in healthy and inflamed intestine tissues, but was enhanced in blood cells derived from IBD patients. This is in line with other studies showing differential IL-17 responses of Th17 cells in the gut and blood (Kleinschek et al., 2009; Maggi et al., 2013). Albeit its elevated expression in the inflamed gut, IL-17 is still expressed to a lower extent than IFN-γ by CD161+CD4+ T cells, which is paradoxical, given again their marked Th17 phenotype. Indeed, detection methods of higher sensitivity would be desirable for more accurate detection of IL-17A (e.g. ELISA). However, several studies have provided alternative explanations to this. CD161+ Th cells from RA synovial fluid exhibit a polyfunctional cytokine production profile, with the ability to secrete IL-17 and IFN-γ, usually accompanied by GM-CSF, IL-2, and TNF (Basdeo et al., 2015). Th17 cells also co-produced IFN-γ and IL-17 in the gut of CD patients (Annunziato et al., 2007), and strikingly, these cells, following clonal expansion, were less susceptible to the suppressive activity of Tregs, in comparison with Th1 and Th2 clones. These lines of evidences suggest that a polyfunctional subset of Th17 cells possess the capacity of produce Th1 cytokines, and may be the key mediator of IBD pathology.

The functional and phenotypic plasticity of Th17 cells has been further corroborated by the discovery of a subset of Th17 cells that secrete IFN-γ with varying levels of IL-17. They are coined ex-Th17, or non-classical Th1 cells, and epigenetics studies have confirmed their shared origin with Th1 cells (Mazzoni et al., 2015). Multiple studies have addressed the phenotypic overlap and distinctiveness between Th17, ex-Th17 and Th1 cells, and have proposed a sorting strategy for ex-Th17 cells by CD161, CCR6, and their upregulated expression of CXCR3 – a marker also expressed on Th1 cells (Annunziato et al., 2008; Sallusto et al., 2012). Ex-Th17 cells may be very relevant to us, as the main body of CD161+ Th17 T cells in this study were IFN-γ producers but not IL-17 producers. Indeed, these ex-Th17 cells, despite losing their IL-17 production, were polyfunctional for cytokine production than either Th1 or Th17 cells (Basdeo et al., 2017). This, together with their enhanced survival and proliferation capacity, suggests they may exert a pathogenic role in autoimmunity. More relevantly, one study has argued the importance of ex-Th17 cells and their production of IFN-γ in the induction of mouse colitis (Harbour et al., 2015). This might, to certain extent, explain why therapies targeting IL-12p40 (hence both IL-12 and IL-23) (Burakoff et al., 2006) and IFN-γ (Reinisch et al., 2006) have shown promise in IBD trials, whereas Secukinumab – used to block IL-17A – was shown ineffective and more prone to adverse events in IBD patients (Hueber et al., 2012). In this regard, a thorough and detailed investigation of ex-Th17 cells in human gut is required for opening possible avenues for the development of therapeutic strategies in IBD.

5.5.3. The cytotoxicity of CD4+CD161-expressing T cells

This study on CD161+CD4+ T cells in the peripheral blood and healthy gut tissues described their enhanced GrB release upon activation – another unappreciated

features of CD161 expressing cells in the gut. In addition, the depletion of GrB expression in IBD inflamed tissues was intriguing, as this could further lead to in-depth exploration of GrB regulation in autoimmunity, the origin of these GrB+ Th17 cells, and furthermore, novel therapeutic strategies against IBD.

Kebir et al. first described a GrB-expressing Th17 phenotype. They reported that Th17 cells are highly encephalitogenic not only because their enhanced transmigratory capacity across the blood brain barrier compared with Th1 cells, but also could be partially due to their increased expression of GrB triggered by Th17-associated cytokines, which may contribute to enhanced cytolytic capacity (Kebir et al., 2007). More recently, a small subset of mouse CD4+ T cells with IFN-γ and GrB producing potential was particularly observed in the mucosal tissue (Takeuchi et al., 2016), whose migration, development, and tissue residency was controlled by their expression of CRTAM (Cortez et al., 2014). These CRTAM+ CD4+ T cells were also involved in the induction of mouse colitis, partially due to their GrB expression, as the disease progression in GrB-knockout mice was considerably slower than WT (Takeuchi et al., 2016). Of note, the CRATAM signalling pathway is involved in effector memory differentiation, in line with our findings that the majority of CD4+ T cells from the gut exhibited an effector memory phenotype. Overall, the CRTAM-induced CD4+ cytotoxicity in the gut and inflammation would be highly relevant to this study, if these CD4+ CTLs do express CD161. This has not been clearly illustrated yet, but a previous study reported that CRTAM$^{-/-}$ mouse CD4+ T cells have an defect in producing IL-17 and IL-22, hence suggesting a link between CRTAM and IL-17/-22 production – which is furthermore associated with CD161 (Yeh et al., 2008). Despite lacking direct evidence, we could speculate that these human CD4+CRTAM+ cells with the potential to upregulate GrB could also express

IL-17 and CD161. Studies on CRATAM+CD4+ T cells and their cytotoxicity may reveal the role of this interesting subset in various tissues and inflammatory settings, and will hopefully provide mechanistic insight into the maintenance of gut homeostasis.

T-helper cells are not the only subset of CD4+ T cells with the ability to express GrB. Studies have revealed that type 1 T regulatory (Tr1) cells, a critical subset of Tregs marked by their particularly high levels of IL-10 expression (Allan et al., 2008), also express GrB, and are capable of killing target cells in a perforin-dependent, TCR independent manner (Grossman, 2004). How this could have impacted on tissue pathology and whether GrB+ CD4+ cells, found in this study are Tr1 cells, is worth investigating. Several studies have contributed to our understanding of the Tr1 subset. CD4+ naïve cells are induced peripherally into Tr1 cells by tolerogenic APCs in the presence of IL-10 (Roncarolo et al., 2006), but they also exist and function in the tissues, particularly after chronic antigen stimulation, in the presence of IL-10. Studies have also addressed their enriched presence in mouse spleen and liver after parasitic infections, and illustrated how Tr1 cells could protect host tissues from inflammation via IL-10 production (Montes de Oca et al., 2016). Furthermore, a subset of CD25+ Tregs were shown to express GrB in response to *Leishmania* antigens in another study, although the expression of IL-10 or Foxp3 on these cells was not investigated (Naouar et al., 2014). More relevantly, Tr1 cells were shown to inhibit antigen-specific responses and prevent mouse colitis when transferred to the gut (Groux et al., 1997). It is also worth mentioning that CD39 promotes Tr1 cell differentiation by limiting eATP levels, and contributes to the *in vivo* suppressive function of Tr1 cells, therefore, is an central mediator in Tr1 biology. (Mascanfroni et al., 2015). This is again interesting, given Bai et al. illustrated that CD39 is a key

marker for CD161+ Th cells (Bai et al., 2014). With these bodies of evidence, it is tempting to speculate that Tr1 cells could make up a large proportion of the GrB-expressing CD161+CD4+ T cells derived from the gut.

In conclusion, to fully understand the mechanisms underlying the expression of GrB in stimulated CD161+CD4+ T cells, we must test our hypothesis regarding these cells comprising CD4+ CTLs or Tr1 cells. It is also interesting that the literature suggests that two subsets of CD4+ T cells with distinct functional programmes could be both linked to GrB expression, one being inflammatory and potent IFN-γ/IL-17 producer, and the other being a regulatory subset capable of releasing IL-10. Could this mean that GrB also has an inflammatory and regulatory role, depending on the cytokine microenvironment surrounding these GrB+ CD4+ T cells? Our study also indicated that GrB expression was significantly reduced in CD161+CD4+ T cells from inflamed intestinal tissues; thus, understanding the diverse functions and dynamic regulations of GrB in the gut or in an inflammatory setting may aid the development of novel therapies against IBD and other inflammatory diseases.

5.5.4. IL-18Rα expression on CD4+ CD161-expressing T cells in the gut

This study highlighted enhanced expression of IL-18Rα in CD4+CD161++/CD161+ cells specifically derived from the gut, the level of which was comparable to CD8+CD161++ T cells. Interestingly, IL-18Rα was differentially expressed on blood versus gut-derived CD161-CD4 T cells, with its level being significantly higher on the latter (10%, blood versus 50%, healthy gut versus 35%, IBD inflamed gut, data not shown). Thus, our data describe a universal upregulation of IL-18Rα in the CD4+ T cells from the gut. This is in line with a previous report demonstrating that IL-18Rα expression is linked to the effector memory phenotype of CD4+ T cells

(Holmkvist et al., 2015) – a phenotype displayed by most gut CD4+ cells in this study. Non-cognate activation of CD4+ T cells is less well characterised than CD8+ T cells, but various studies have suggested the capability of Th1, Th2, and Th17 cells to be stimulated upon cytokine encounter (Guo et al., 2012). At least for Th1 responses, it is believed that the intrinsic expression of IL-18Rα and DR3 – the activating receptor for TL1A – were required for optimal response to non-cognate stimulation of Th1 cells (Grossman, 2004). The high expression of IL-18Rα could be one of the direct attributes to the cytokine-responsiveness observed in the gut CD161-expressing CD4+ T cells, which compensates for their low PLZF expression – the master TF for innate-like cells. Of note, this study did not find significant differential expression of DR3 on various CD4/CD8 subsets in the blood and gut (not shown) at rest and post stimulation, we thus speculate that there exist other co-receptors that mediate non-cognate responses of CD161++/+CD4+ T cells.

5.6. Summary

1. Blood CD161++ CD4+ T cells from IBD patients express lower levels of integrin β7 than those from healthy individuals;
2. Both blood and gut CD161++CD4+ T cells are activated by innate cues;
3. CD161 expressers are markedly enriched in gut CD4+ T cells;
4. Gut CD4+CD161++ T cells predominantly exhibit an effector memory phenotype with high IL-18Rα, CD39, and PD-1 surface expression, and respond to innate/adaptive signals known to activate CD8+ MAIT cells;
5. CD161++CD4+ T cells from inflamed intestinal tissues express higher levels of CD39 and PD-1;
6. CD4+ T cells with an intermediate level of CD161 expression share similar phenotypical and functional characteristics with CD161++CD4+ T cells.

6. DISCUSSION

MAIT cells are a major population of human innate-like lymphocytes present in the circulation and tissues. In virtue of *in vitro* approaches developed by colleagues, as well as novel transcriptomic approaches, this study was able to conceptually distinguish two distinct signals known to activate MAIT cells: the MR1-TCR ligation, and the cytokine signalling pathway. These two signals may arise in isolation or in combination *in vivo*. The context of activation – including the cytokines present, the availability of the riboflavin ligand, timing of exposure, as well as the localisation of MAIT cells, and whether they are in health or disease – could prominently influence effector functions of MAIT cells *in vivo*.

In addition, CD161 marks T cells with innate-like properties independent of their T cell lineages (Fergusson et al., 2014). Given their propensity to migrate to the mucosal tissues (Billerbeck et al., 2010; Dusseaux et al., 2011), the presence, phenotypes and effector functions of CD161-expressing T cells in the healthy and inflamed IBD intestinal tissues were comprehensively investigated in this thesis, and key findings are summarised in Figure 6-1.

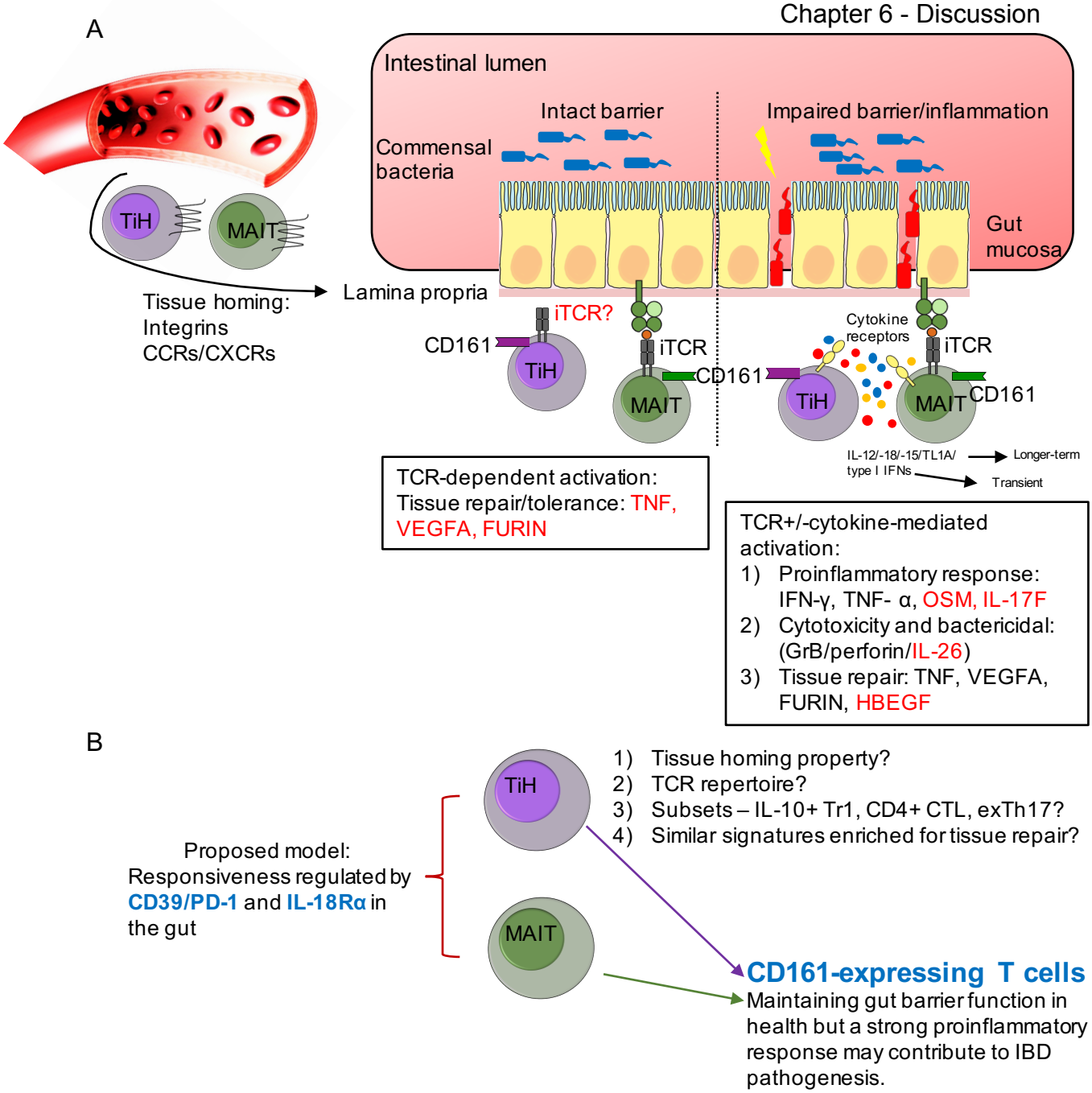


Figure 6-1. Proposed model of MAIT and TiH activation in the gut. A) MAIT and TiH cells migrate to the gut, and in health mainly exert homeostatic and tissue repair functions in the absence of proinflammatory cytokines. However, when the gut barrier integrity is breached, the tissue repair signature is likely to be replaced by inflammatory cytokine release and anti-bacterial effector functions mediated by both TCR and cytokine signals. Newly identified effector molecules are marked in red. B) The effector functions of the gut MAIT and TiH cells correlate to their IL-18Rα and CD39/PD-1 expression levels in health and disease. Key research aspects on TiH cells include their gut-homing property, their TCR repertoire (oligoclonal or polyclonal), their distinct subsets, as well as their hypothesised tissue repair function.

6.1. Key findings of the thesis

6.1.1. Diverse and novel effector functions of CD8+ MAIT cells

Firstly, our data demonstrate that **cytokines and the TCR stimulus** integrate and activate MAIT cells in **a dose- and time- dependent** manner. A TCR stimulus, as well as IFN-α/β, rapidly and transiently (within 6 hours) induced MAIT cell activation, while other cytokines, including IL-12, IL-18, IL-15, and TL1A promoted MAIT cell effector functions following a long-term (20 hours) stimulation.

Secondly, our transcriptome study suggests potential roles of MAIT cells in **wound healing, bacterial killing, and tissue remodelling**.

This thesis provides evidence on MR1-mediated TNF production and suggests MR-1 mediated tissue repair functions for MAIT cells. ***TNF*** is involved in wound healing, and also plays a role in liver regeneration (Krafts, 2010; Linehan et al., 2018). Furthermore, TCR-activated MAIT cells specifically elicited a tissue repair signature similar to that recently reported in IL-17+ innate like CD8+ T cells in the murine skin (Linehan et al., 2018), in which key tissue-repair genes including TNF, as well as ***CCL3***, ***CSF1***, ***FURIN***, and ***VEGFA*** were upregulated. The cytokine stimulus specifically induced MAIT cells to release IL-26, which mediates directly bacterial killing. Furthermore, certain genes implicated in wound healing, such as ***HBEFG***, as well as ***FURIN*** and ***VEGFA***, were also upregulated in cytokine-stimulated MAIT cells. Together, these results support a specialised role for MAIT cells in epithelial homeostasis and tissue repair.

6.1.2. CD8+CD161++ T cell phenotype and effector functions in the gut

Compared to PBMCs from healthy volunteers, gut-derived CD8+CD161++ T cells exhibited lowered expression of RORγt and PLZF, and a more activated phenotype marked by their increased expression of CD39 and PD-1, which may be indicative of the continuous TCR/MR1 interaction CD8+CD161++ T cells are exposed to in the gut. We hypothesised that they may be refractory to stimulation *in vitro* by innate and adaptive cues – which was further corroborated in our functional assays using either *E. coli* or combinatory cytokines+/- artificial TCR beads. This study suggests **tissue-dependent functional regulation** on gut CD8+CD161++ T cells possibly in order to avoid over-activation.

Nonetheless, **little evidence** was found in this study to **suggest phenotypical and functional differences between CD8+ MAIT/CD161++ cells in health vs IBD.**

6.1.3. CD161++CD4+ T (TiH) cells possess robust proinflammatory responses in healthy but not IBD gut tissue

We found that a combined dose of IL-12/-15/-18/TL1A elicited **robust proinflammatory and cytotoxic functions in CD161++CD4+ T cells** derived from healthy donor and IBD patient **PBMCs**, as well as from **the uninflamed gut**. In contrast, the secretion of IFN-γ and TNF-α by CD161++CD4+ T cells in the inflamed tissues was significantly reduced. Given their cytokine responsiveness marked by shared CD161 expression, we call them “innate-like T helper cells” (TiH cells).
Gut TiH cells are functionally distinct in IBD, and this could be a synergistic effect of IL-18Rα reduction and even more elevated surface expression of CD39 and PD-1 than their counterparts from the healthy gut.

However, whether novel functions relevant to MAIT cells, especially tissue repair and wound healing could be applied to TiH cells is unclear. The wound healing process maybe be triggered via the MR1 pathway by induction of tissue repair-related genes such as *TNF*, *VEGFA*, and *FURIN*, it may also be induced by cytokines which were shown to increase HBEGF mRNA transcripts levels by >400 fold. Although TiH cells lack the canonical MAIT TCR, they are innate-like cells that are highly responsive to cytokines. It is thus very likely that TiH cells also play an important role in maintaining gut homeostasis.

Please refer to **Appendices Section C** for tables detailing the phenotypic and functional characters of gut and blood CD161++ CD4/8+ T cells.

6.2. Are CD161-expressing T cells friend or foe?

The literature suggests diverse, and even contradictory roles for CD161-expressing cells, including MAIT cells and TiH cells in various diseases.

Most observations in humans support that MAIT cells are pathogenic in MS due to their proinflammatory profile (Abrahamsson et al., 2013). On the other hand, however, MAIT cells were found to accumulate in cancer and increase their release of cytotoxic molecules leading to enhanced killing capacity (Won et al., 2016). One study also suggested a protective role of murine MAIT cells in colitis (Ruijing et al., 2012). This, combined with their enhanced migration to diseased sites through expression of tissue homing markers strongly suggest a protective role of MAIT cells. CD161-expressing Th17 cells exert their physiological functions partially by secreting IL-17, which could be either protective (Witowski et al., 2000; Shibata et al., 2007) or pathogenic (Kuestner et al., 2007; Annunziato et al., 2007). A recent study suggested the link between CD161 expression and a favourable prognosis in

cancer (Gentles et al., 2015). These discoveries, taken together, drive the research community to further explore the physiological role of CD161-expressing T cells in various inflammatory and cancerous settings.

We believe that overall, CD161++ T cells play a **protective** in the intestinal mucosal environment. CD8+CD161++ T cells display reduced inflammatory response and downregulated cytotoxicity in the gut – this suggests they may be more poised to other physiological functions, such as maintaining gut homeostasis. Indeed, they may be functionally reminiscent of skin-resident γδ T cells with distinct tissue repair property (Nielsen et al., 2017), and GSEA results in Chapter 3 may support a pronounced tissue repair transcriptional profile dependent on the MR1 signal enriched in the gut. This is in line with their enhanced expression of CD39 and PD-1 – which may additionally prohibit abnormal proinflammatory responses that could lead to pathology.

It is worth noting, however, that CD8+ cells are not the major population of CD161++ cells in the gut. Instead, CD4+ TiH cells are enriched in the gut tissue in both health and disease, taking up ~ 50% of the total T helper cell population. A rough estimation based on the LPL CD4/CD8 ratio indicates that TiH cell number can be 5-10 times higher than that of their CD8 counterparts. Such a significant accumulation is unlikely a bystander effect of physiological processes and perhaps CD4 TiH cells are the bigger influencer of gut homeostasis and inflammation.

Given that TiH cells possess proinflammatory and cytotoxic responses in the healthy gut, and are very likely exposed to cytokines that could trigger such responses (such as IL-12/18/TL1A), one could argue that their existence in the gut helps contain unwanted bacterial infections, but at the same time, is a risk of persistent

inflammation which furthermore poses a threat to maintaining gut homeostasis. However, their reduced – and to certain extent – abolished proinflammatory and cytotoxic responses in inflammation, together with a strongly increased expression of PD-1 and CD39 are interesting to ponder. We believe that again this could a self-protection mechanism that aims to reduce inflammation levels in IBD, although the cells and signals mediating in the process are yet to be discovered.

6.3. Major limitations and caveats

Several caveats to data presented in this thesis are worth discussing.

1). The experiments could not use age- and sex- matched CRC (control) and IBD samples due to time constraints and sample availability.

We acknowledge that MAIT cells differ in abundance, phenotypes, and functions with age and maybe also gender. Thus, a comprehensive analysis including age- and sex- matched samples will be useful to determine the functional and phenotypical regulations of gut CD8+/CD4+ CD161++ T cells in and disease. Nonetheless, our study on cells derived from paired inflamed and uninflamed tissue sections produced similar results to that from different CRC/IBD individuals, suggesting that factors including age and sex were unlikely to impact on the results.

2). The reason underlying the scarcity of MAIT cells (CD161++Vα7.2+) in the gut was not fully investigated.

We hypothesised that the decline of MAIT cell frequency in the gut CD8+ population was likely due to downregulation of the TCR resulted from persistent antigenic exposure in the gut environment, or due to increased apoptotic features as demonstrated by Hiejima et al. (Hiejima et al., 2015). With this stipulation this thesis

focussed on the CD161-expressing cells without further assessing their Vα7.2 TCR expression, for both CD4 and CD8 subsets. This study could be more comprehensive with further analyses on surface expression of apoptotic markers, or a detailed study on the TCR repertoire of these innate-like T cells. The quantification of MAIT cell number in tissue sections on a per square metre basis (in health vs inflammation) could also benefit this study, considering a decreased MAIT frequency may not indicate reduction in their absolute numbers, but an indirect effect caused by non-MAIT cells accumulating in the gut, particular in inflammation.

Additionally, we acknowledge that DN MAIT cells were not studied in the thesis. Indeed, around 15% MAIT cells in healthy adult blood lack CD4/8 expression (Kurioka et al., 2017), our staining results suggest that DN MAIT cells take up a very minimal percentage of the total MAIT population in the gut. Furthermore, given that the Vα7.2 TCR expression may be downregulated in the gut, we believed it would be prudent to investigate DN MAIT cells in other physiological settings e.g. in the liver or other mucosal tissues.

3). The UC/CD samples were pooled together and analysed as one cohort than separate ones.

UC has traditionally been characterised as a Th2 cytokine mediated disease and CD as a Th1 disease. However, recent discoveries have suggested that Th17 cytokines may also be relevant in contributing to both UC and CD pathology. We wanted to test this hypothesis within our IBD and control cohort, and again due to the scarcity of the samples we felt more confident to study T cells in the IBD setting as a whole rather than individual conditions. Our data suggest that IL-17A production was not significantly different for either CD8 MAIT cells or CD4 TiH cells

when comparing between healthy and inflamed tissues, and our paired tissue study also found no evidence suggesting differential IL-17A secretion levels.

6.4. Future work

Lastly, this study can benefit from further work addressing the following aspects:

- The use of MR1 tetramers to allow precise identification of tissue-resident MAIT cells in health and disease;
- Proteomics study of TCR and/or cytokine- activated CD161++ T cells to confirm key upregulated mRNA transcripts;
- Age- and gender- controlled biopsy samples illustrating phenotypical functional discrepancies of intestinal CD161++ T cells in health and IBD;
- More accurate means of detection for Th17 cytokines (e.g. IL-17A, IL-17F);
- Interrogation of cell-to-cell and cytokine-receptor interaction using chip-based cell/tissue analysis;
- Further delineation of the GrB+ CD161-expressing CD4+ T cells in the gut.

Gut CD161-expressors, including CD8+CD161++/MAIT cells and CD161-expressing Th17 cells, are usually considered to play a pathogenic role in IBD and other immune-mediated diseases. Data from this study, however, suggests that CD161-expressing cells tune down their effector functions in the gut, and can exert protective functions under specific triggering. To support this hypothesis, CD161 has been recently described as a favourably prognostic biomarker of cancer outcomes (Gentles et al., 2015). Thus, a thorough understanding of CD161-expressing T cells in the gut may inform promising therapeutic strategies in the future.

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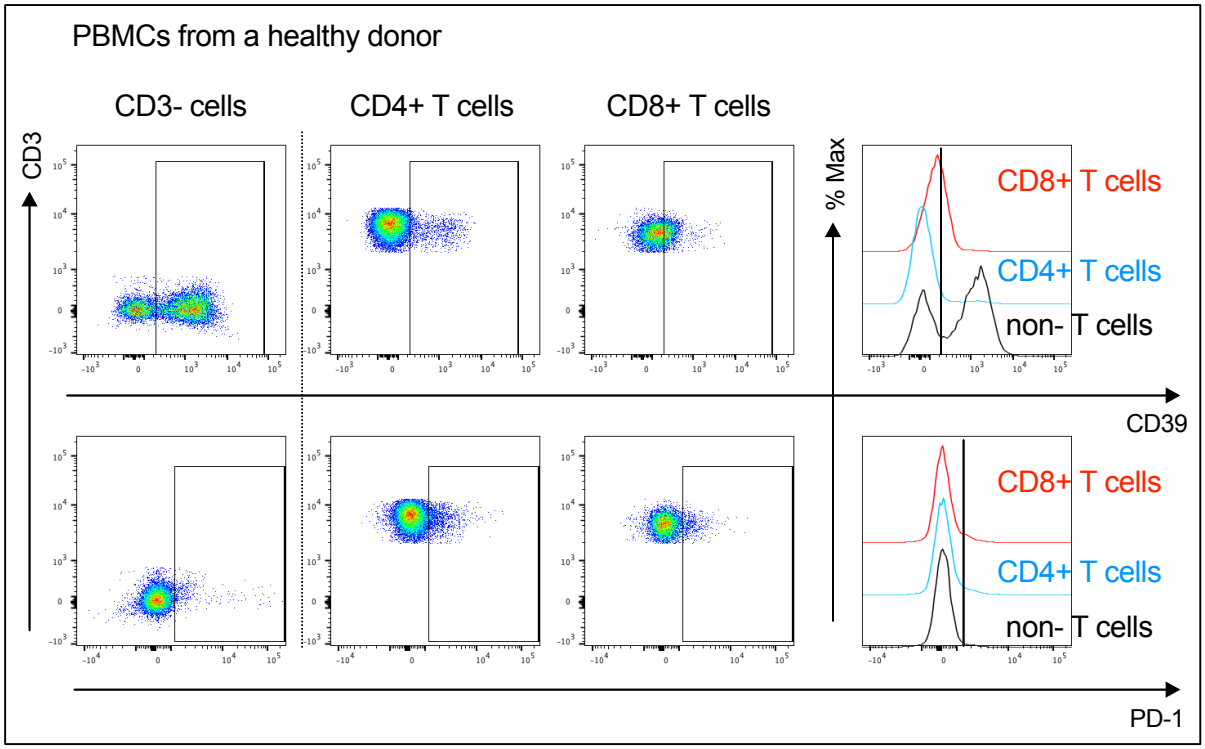
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APPENDICES

A. Gating strategy for CD39 and PD-1 using non-CD3 cells as the reference population.



B. Appendix Tables for RNAseq results in Chapter 3

Appendix Table 1. Upregulated genes in MAIT cells under any type of stimulation (a TCR stimulus, or cytokines, or TCR and cytokines combined), compared to unstimulated MAIT cells. (P<0.01, >4 fold change)

Gene Name	Contrast 1	P-value	FDR	Fold-Change	Contrast 2	P-value	FDR	Fold-Change	Contrast 3	P-value	FDR	Fold-Change
ACTN1	T vs UT	0.003531029	0.029349436	7.382555116	C vs UT	0.000405346	0.001345335	17.12349	TC vs UT	0.000273028	0.000891023	18.1960406
AGMAT	T vs UT	0.000120698	0.00686928	9.294765026	C vs UT	0.000259664	0.000960018	7.025204553	TC vs UT	1.67E-05	0.000122954	16.99850802
AK4	T vs UT	0.005730971	0.037575266	5.279491899	C vs UT	5.87E-07	2.16E-05	346.2596564	TC vs UT	3.48E-06	4.85E-05	117.3901595
ANKRD33B	T vs UT	5.82E-05	0.005291355	7.549289367	C vs UT	1.28E-05	0.000115975	11.48696909	TC vs UT	7.38E-06	7.30E-05	13.58255367
ARHGAP31	T vs UT	1.80E-05	0.003270511	9.320405423	C vs UT	1.40E-05	0.000121791	9.446555973	TC vs UT	6.35E-06	6.67E-05	12.25809693
BATF3	T vs UT	0.00090469	0.015094489	12.36155255	C vs UT	7.34E-06	8.23E-05	144.925525	TC vs UT	4.24E-06	5.34E-05	206.0935931
BCAT1	T vs UT	0.001147478	0.016958346	12.0962556	C vs UT	9.35E-06	9.42E-05	93.53064072	TC vs UT	2.41E-06	4.07E-05	242.3506179
BCL2A1	T vs UT	0.006765998	0.041121492	5.63723579	C vs UT	8.31E-05	0.000415299	19.58542516	TC vs UT	0.000145785	0.000551241	15.68566463
BHLHE40	T vs UT	0.001401855	0.018694049	4.390167505	C vs UT	2.02E-05	0.000157746	12.49042863	TC vs UT	2.76E-05	0.000168662	11.25403388
C2CD4A	T vs UT	6.71E-04	0.013176391	186.973189	C vs UT	1.10E-03	2.98E-03	151.5299411	TC vs UT	5.92E-04	1.65E-03	143.4461724
CCL20	T vs UT	8.87795E-05	0.006439125	8.650159	C vs UT	1.20E-06	3.00647E-05	43.42176122	TC vs UT	1.02E-06	2.77E-05	45.85930566
CCL3	T vs UT	0.004765335	0.034101326	15.48118835	C vs UT	1.76E-03	0.004351611	23.79529764	TC vs UT	3.78E-05	0.00020872	343.2488962
CCL3L1	T vs UT	3.21E-03	0.028010103	20.2060234	C vs UT	7.61E-03	0.014851615	14.46660495	TC vs UT	1.24E-04	4.90E-04	146.5226826
CCR4	T vs UT	1.89E-03	0.021918325	5.508529108	C vs UT	2.08E-05	1.61E-04	25.89242589	TC vs UT	2.50E-06	4.14E-05	79.22845596
CD69	T vs UT	2.30E-04	0.008522376	5.999582825	C vs UT	3.44E-05	2.25E-04	10.00433139	TC vs UT	8.06E-05	3.55E-04	7.528606285
CD83	T vs UT	2.77171E-05	0.003755508	12.18604013	C vs UT	4.70005E-05	0.000276487	10.26989142	TC vs UT	5.8885E-06	6.39757E-05	24.27810547
CHAC1	T vs UT	1.15E-05	0.002559195	14.55285542	C vs UT	3.82E-08	8.69E-06	265.5315346	TC vs UT	2.84E-08	8.31E-06	330.2355536
CLIC4	T vs UT	4.83E-05	0.004805832	14.11804117	C vs UT	8.77472E-07	2.60078E-05	106.9594022	TC vs UT	6.83E-07	2.28E-05	124.2455786
CSF1	T vs UT	0.008885649	0.047655527	5.580386477	C vs UT	0.000619298	0.001881236	11.48512766	TC vs UT	1.63E-04	0.000597717	20.14765879
DUSP4	T vs UT	0.00070629	0.013553827	7.754419666	C vs UT	1.06E-03	0.002869642	7.39738784	TC vs UT	3.00E-05	1.79E-04	28.38545664
DUSP5	T vs UT	6.42078E-05	0.005459879	26.86018717	C vs UT	9.80E-06	9.62868E-05	54.93737738	TC vs UT	1.00224E-05	8.80508E-05	54.02058465
EBI3	T vs UT	2.84E-03	0.026454429	116.6076652	C vs UT	1.76E-03	4.36E-03	191.6195345	TC vs UT	6.85E-04	1.86E-03	538.7079608
EGR2	T vs UT	2.00E-06	0.002130399	202.794261	C vs UT	3.98E-04	1.33E-03	12.06731806	TC vs UT	8.88E-06	8.17E-05	71.19145345
EPAS1	T vs UT	0.0007875	0.014094902	12.15374729	C vs UT	4.22E-04	1.38E-03	18.82250613	TC vs UT	9.03E-05	3.88E-04	36.21869032
ESPL1	T vs UT	0.000109079	0.006650528	69.45310286	C vs UT	8.45E-03	1.62E-02	6.224935778	TC vs UT	3.09E-04	9.84E-04	27.25907648
FABP5L7	T vs UT	1.26E-04	0.00686928	12.39235664	C vs UT	4.62E-05	2.73E-04	19.73074141	TC vs UT	3.73E-06	5.02E-05	55.29982094
FEZ1	T vs UT	0.002651897	0.025753482	8.967673002	C vs UT	2.40E-05	0.000174997	61.76419501	TC vs UT	1.43E-04	0.000542764	26.31393436
FURIN	T vs UT	2.12976E-05	0.003427694	6.046924822	C vs UT	2.07E-07	1.30E-05	24.63162473	TC vs UT	4.76E-07	1.92E-05	17.80735403
GPT2	T vs UT	6.81E-05	0.005638775	7.595855516	C vs UT	2.77E-07	1.45E-05	58.66222965	TC vs UT	1.27E-07	1.20E-05	90.18169582
HOXB9	T vs UT	0.000970241	0.015564746	8.656358495	C vs UT	3.45E-06	5.18E-05	142.1758213	TC vs UT	1.67E-06	3.41E-05	239.771107
HPDL	T vs UT	0.007118328	0.042101297	6.781785122	C vs UT	0.002001009	0.004833942	13.84305587	TC vs UT	1.40E-04	5.36E-04	42.80821106
ICAM1	T vs UT	0.001281123	0.017924844	4.66691018	C vs UT	5.94756E-06	7.23209E-05	22.30527453	TC vs UT	6.24288E-06	6.62223E-05	21.92955155
IER3	T vs UT	4.11414E-05	0.004529233	9.113627516	C vs UT	8.35E-08	9.69784E-06	137.9954901	TC vs UT	9.66957E-08	1.13548E-05	125.527434
IL23R	T vs UT	1.65E-04	0.00763911	7.311252525	C vs UT	5.48E-05	0.000310029	9.036498359	TC vs UT	1.39E-05	1.09E-04	14.30730749
IL2RA	T vs UT	0.002003661	0.022706933	14.55496791	C vs UT	8.29074E-06	8.76714E-05	176.6491094	TC vs UT	4.04E-06	5.23236E-05	295.6105967
IRF4	T vs UT	1.70E-06	0.002130399	45.56260872	C vs UT	3.32E-07	1.55201E-05	98.97687005	TC vs UT	9.92E-08	1.14797E-05	210.3213393
IRF8	T vs UT	0.000421391	0.010961511	5.999572707	C vs UT	1.11E-07	9.93E-06	227.0822813	TC vs UT	1.14E-07	1.19E-05	229.5736977
LIF	T vs UT	0.003851199	0.030675247	7.690136901	C vs UT	1.52E-04	6.43E-04	40.5321405	TC vs UT	2.62E-06	4.23E-05	428.4835622
LOC100288175	T vs UT	6.71E-03	0.040927187	4.988016219	C vs UT	5.59E-04	1.73E-03	10.15889882	TC vs UT	1.53E-03	3.63E-03	7.245832806

MAFF	T vs UT	0.002060303	0.02288607	4.446222171
METTL1	T vs UT	3.86E-05	0.004529233	6.562561802
MFSD2A	T vs UT	0.000785799	0.014094902	31.76934645
MIR146A	T vs UT	6.68694E-05	0.00560884	89.00819895
MIR155HG	T vs UT	0.001121904	0.016747069	5.309980941
MKX	T vs UT	6.21E-04	0.012832278	5.514660474
MTHFD1L	T vs UT	6.17964E-06	0.002448332	7.018847248
MYB	T vs UT	1.97E-03	0.02252016	26.46729328
MYO1B	T vs UT	4.53E-06	0.002448332	9.257981611
NAMPT	T vs UT	2.20E-03	0.0234604	4.005928467
NAMPTL	T vs UT	6.26E-04	0.012840597	4.347213368
NCS1	T vs UT	1.29E-04	0.006920261	4.705942584
NDFIP2	T vs UT	2.42E-06	0.002130399	13.39019971
NFKB1	T vs UT	1.83E-04	0.008006036	4.076535032
NFKB2	T vs UT	4.64E-05	0.004764748	6.017250052
NFKBIA	T vs UT	1.35E-05	0.002739231	6.092260632
PKM2	T vs UT	9.16187E-06	0.002542857	5.93235247
PMAIP1	T vs UT	2.65E-05	0.003712955	4.777295577
POU2F2	T vs UT	4.04E-03	0.031328401	4.139942745
PSAT1	T vs UT	1.95E-05	0.003333068	6.038196192
RELB	T vs UT	2.06973E-05	0.003420999	7.638313745
RGS16	T vs UT	9.94967E-05	0.006595668	39.18122585
SDC4	T vs UT	4.00281E-06	0.002448332	12.24519923
SEMA7A	T vs UT	5.55524E-07	0.002130399	6.537687114
SERPINE2	T vs UT	5.86E-04	0.012447885	19.77123252
SGK1	T vs UT	0.00270597	0.025890935	6.595162614
SHMT2	T vs UT	5.17E-06	0.002448332	7.519434672
SLC1A5	T vs UT	2.99E-05	0.003975318	5.467672175
SLC41A2	T vs UT	1.30E-05	0.002739231	9.652725862
SLC6A9	T vs UT	5.73E-04	0.012425163	8.717458117
SMS	T vs UT	0.000556279	0.012365268	4.246169247
SPHK1	T vs UT	8.54E-04	0.014668872	4.647327937
SPRED2	T vs UT	0.00836525	0.046067404	5.510659557
SPRY4	T vs UT	4.55696E-05	0.004761308	43.51950028
STX11	T vs UT	1.11E-04	0.006680273	5.284830051
TMEM217	T vs UT	2.46886E-05	0.003498972	11.2941036
TNF	T vs UT	3.44962E-05	0.00438493	9.037336401
TNFRSF18	T vs UT	5.75581E-06	0.002448332	25.39740849
TNFRSF9	T vs UT	1.9153E-06	0.002130399	97.22828542
TRAF1	T vs UT	0.000204059	0.008190814	7.587259519
TRAF4	T vs UT	5.68365E-05	0.005291355	16.74257859
TRIB1	T vs UT	0.001006579	0.015870994	19.01564235
ULBP1	T vs UT	0.000278782	0.009093597	7.106533516
UTS2	T vs UT	0.001362384	0.018572413	14.49557176
VDR	T vs UT	2.72697E-05	0.003735954	33.11299964
VEGFA	T vs UT	0.000305811	0.009535793	6.352725276
WARS	T vs UT	0.001246697	0.017709411	6.279224605
ZBED2	T vs UT	0.000189591	0.008017603	41.28012933
ZFHX2	T vs UT	0.000700081	0.013487496	10.69916843

C vs UT	1.77885E-05	0.000143919	15.61354277
C vs UT	1.65E-05	1.37E-04	8.089753983
C vs UT	2.51E-04	9.38E-04	50.62544306
C vs UT	1.15E-05	1.07E-04	231.2602203
C vs UT	6.75E-07	2.32E-05	103.5919676
C vs UT	2.28E-07	1.34E-05	144.0362388
C vs UT	5.89E-08	9.19887E-06	35.08929012
C vs UT	2.64E-04	9.70E-04	78.0733182
C vs UT	9.35E-09	5.10E-06	148.3694551
C vs UT	2.45E-07	1.38E-05	102.1693158
C vs UT	8.39E-08	9.70E-06	111.1857276
C vs UT	4.53E-06	6.15E-05	12.35798124
C vs UT	1.86E-08	5.88927E-06	129.8592809
C vs UT	8.97E-05	0.000439214	4.781569406
C vs UT	1.95E-06	3.78653E-05	14.57910272
C vs UT	6.34E-08	9.50E-06	36.79647684
C vs UT	3.13E-07	1.51E-05	14.72978416
C vs UT	5.63E-08	9.01E-06	30.26924991
C vs UT	2.20E-03	5.21E-03	4.465349846
C vs UT	1.30E-08	5.33E-06	91.7896364
C vs UT	4.26E-05	2.58E-04	6.175635407
C vs UT	7.06E-05	3.71E-04	56.43226493
C vs UT	7.07E-05	0.000371064	5.224139602
C vs UT	3.83736E-08	8.69402E-06	14.09752407
C vs UT	7.45E-03	1.46E-02	6.379000911
C vs UT	2.19E-06	4.08E-05	127.9217301
C vs UT	1.01E-07	9.93148E-06	25.96503653
C vs UT	1.03E-07	9.93E-06	33.89487156
C vs UT	5.90E-07	2.16E-05	31.83668046
C vs UT	2.79E-06	4.65E-05	113.7724922
C vs UT	6.68E-06	7.76731E-05	13.48842629
C vs UT	1.92E-05	0.000151989	16.3667743
C vs UT	0.000181865	0.000742518	19.81100895
C vs UT	4.09E-06	5.81E-05	184.703022
C vs UT	3.28914E-06	5.05675E-05	13.30104457
C vs UT	1.71E-05	1.40E-04	12.67834574
C vs UT	1.41E-06	3.27E-05	30.94375926
C vs UT	9.55E-07	2.66E-05	57.98599708
C vs UT	1.56E-06	3.43E-05	98.42496241
C vs UT	7.78E-05	3.97E-04	9.224697156
C vs UT	5.57E-05	3.13E-04	14.83037754
C vs UT	9.94E-04	2.73E-03	14.77637724
C vs UT	1.90E-07	1.27E-05	174.1537955
C vs UT	3.43E-03	7.55E-03	8.266790231
C vs UT	7.28E-04	2.14E-03	8.328746215
C vs UT	9.18E-08	9.92E-06	197.7808834
C vs UT	8.82E-06	9.07E-05	33.16262467
C vs UT	3.73E-03	8.11E-03	12.23400177
C vs UT	4.43E-03	9.33E-03	5.003526332

TC vs UT	0.000102002	0.000423775	8.64571895
TC vs UT	1.54E-06	3.26E-05	16.64499261
TC vs UT	3.06E-05	1.81E-04	191.6472519
TC vs UT	1.35E-05	1.06E-04	202.7387249
TC vs UT	2.03E-07	1.30E-05	209.5699303
TC vs UT	1.18E-07	1.20E-05	235.3957367
TC vs UT	2.62E-08	8.3081E-06	51.31844254
TC vs UT	2.69E-04	8.80E-04	61.8747994
TC vs UT	2.15E-08	8.31E-06	90.94607204
TC vs UT	5.11E-07	1.98E-05	67.16103641
TC vs UT	1.69E-07	1.24E-05	74.51835473
TC vs UT	5.42E-06	6.11E-05	11.50952367
TC vs UT	1.88E-08	8.3081E-06	127.5733316
TC vs UT	2.71E-05	1.67E-04	6.461695602
TC vs UT	2.78E-06	4.33E-05	13.01759381
TC vs UT	2.06E-07	1.30E-05	22.69245706
TC vs UT	1.40E-06	3.10825E-05	9.15328596
TC vs UT	3.63E-08	8.60E-06	36.6667203
TC vs UT	1.93E-03	4.38E-03	4.59948607
TC vs UT	7.45E-09	6.12E-06	127.7508876
TC vs UT	7.61E-05	3.41E-04	5.323604926
TC vs UT	5.89E-06	6.40E-05	263.5176103
TC vs UT	7.78E-06	7.53E-05	9.295555912
TC vs UT	2.48538E-08	8.3081E-06	16.31903902
TC vs UT	2.95E-04	9.48E-04	28.54894855
TC vs UT	2.80E-05	1.71E-04	32.62124264
TC vs UT	6.20E-08	9.59E-06	32.07969626
TC vs UT	5.22E-08	9.20E-06	46.76015238
TC vs UT	1.09E-06	2.83E-05	24.55011512
TC vs UT	1.17E-06	2.91E-05	204.3263882
TC vs UT	3.96E-06	5.19991E-05	15.82256328
TC vs UT	3.59E-06	4.92481E-05	34.05059447
TC vs UT	0.000361132	0.001113466	14.19099298
TC vs UT	6.83E-06	6.97E-05	133.6579936
TC vs UT	3.90E-06	5.14796E-05	12.56650299
TC vs UT	1.09E-06	2.83E-05	36.74607052
TC vs UT	3.96E-07	1.79E-05	56.50431917
TC vs UT	8.35E-07	2.49E-05	61.72098486
TC vs UT	2.33E-07	1.38E-05	341.5024118
TC vs UT	4.25E-05	2.26E-04	11.23195134
TC vs UT	1.59E-05	1.20E-04	25.32226607
TC vs UT	1.52E-04	5.67E-04	34.21731252
TC vs UT	1.52E-07	1.24E-05	201.2510293
TC vs UT	2.10E-04	7.26E-04	29.66138602
TC vs UT	3.03E-05	1.80E-04	27.63309271
TC vs UT	1.15E-07	1.19E-05	169.3717994
TC vs UT	3.72E-06	5.02E-05	50.32441656
TC vs UT	1.69E-05	1.24E-04	153.3415659
TC vs UT	2.12E-03	4.73E-03	6.388974662

Appendix Table 2. Expression values of genes shown in Appendix Table 1.

Gene Name	UT1	UT2	UT3	T1	T2	T3	C1	C2	C3	TC1	TC2	TC3
ACTN1	0.450252	0.457046	1.41809	9.94268	4.54884	2.6758	18.8239	15.8594	5.13549	16.4874	16.0691	9.75632
AGMAT	0.690333	0.750798	0.369889	8.93402	4.82572	3.07326	3.16135	6.13775	3.42369	10.7508	11.5325	8.50137
AK4	0.292097	0.219243	0.276397	1.18895	0.629058	2.34085	83.0491	66.8146	122.898	21.3852	15.1698	55.9175
ANKRD33B	2.31088	3.36192	3.63636	33.8276	22.7834	13.6666	39.9468	24.1923	42.795	42.9576	34.2581	49.2265
ARHGAP31	6.15218	5.38554	10.6624	92.3751	76.1421	38.3965	69.308	68.2758	72.1304	83.3403	84.67	104.12
BATF3	0.270191	0.391768	0.832126	10.0616	5.69591	2.71171	39.8509	51.1174	125.563	69.3823	65.7599	172.779
BCAT1	0.150151	0.228573	0.339074	5.76812	1.93826	0.97628	25.2901	26.2084	15.6376	89.2115	50.5395	34.2077
BCL2A1	3.33123	4.04734	3.79045	35.9095	21.5572	5.49563	79.7489	72.9344	66.0665	68.6593	58.7647	47.7694
BHLHE40	80.9075	97.2306	102.178	555.733	508.331	166.571	1268.63	1054.87	1177.77	947.224	1050.01	1157.45
C2CD4A	0.180161	0.195934	0.215811	87.0409	17.4831	6.14642	76.1102	4.88334	8.69789	50.4105	9.96376	24.5323
CCL20	2.61098	4.56956	5.33123	42.848	47.2672	18.1136	125.395	197.481	220.408	176.89	194.355	202.537
CCL3	3.66755	4.92664	12.3766	176.558	114.936	33.1583	279.231	142.954	76.8201	4410.82	2302.45	484.919
CCL3L1	4.91132	3.65146	6.23088	189.184	36.2612	73.4764	139.5	18.8401	55.6741	1576.64	247.474	343.496
CCR4	1.20051	1.14247	0.986205	6.80896	3.32266	8.20724	17.1954	28.9859	40.0192	56.4185	52.7863	154.561
CD69	29.9202	38.7099	20.9548	229.291	211.539	96.6419	385.008	311.596	199.634	184.791	233.407	256.252
CD83	2.85106	3.16609	5.42368	55.4686	45.4085	38.5413	30.1757	39.066	48.2544	51.4045	71.2296	155.128
CHAC1	0.300201	0.848715	0.5856	12.9239	6.60567	5.71256	153.032	145.287	162.25	185.966	182.396	204.437
CLIC4	0.180161	0.489685	0.832126	8.15339	6.72433	6.32719	45.3329	42.543	72.7742	50.1549	56.2894	80.1692
CSF1	6.2422	5.28762	2.86597	49.8738	21.2408	9.21957	37.5039	49.4148	78.4188	72.7249	67.3288	149.988
DUSP4	3.03112	14.9105	11.6176	77.066	88.4435	63.7049	41.24	119.035	58.3863	263.798	308.026	267.227
DUSP5	2.76103	4.70012	2.03394	113.974	116.843	24.2238	200.307	174.854	146.475	180.047	181.68	151.203
EBI3	0.0001	0.032739	0.0617316	3.81653	5.65637	1.55476	3.20924	9.45298	5.45935	16.5778	19.673	14.6951
EGR2	0.536211	2.28483	2.21884	397.919	450.311	173.828	10.9208	21.8142	28.0828	112.791	113.67	132.335
EPAS1	0.300201	1.1751	0.523968	7.97992	10.2447	6.0741	9.24435	23.2515	5.1355	28.6836	33.283	10.4445
ESPL1	0.0901304	0.065378	0.246626	11.1892	15.1494	1.59091	0.910156	0.806506	0.786601	3.83962	3.51918	3.60302
FABP5L7	1.0837	0.998995	1.71731	23.4198	13.5793	10.0919	11.5212	43.6536	19.802	78.2006	80.6034	51.3353
FEZ1	4.38158	6.91958	2.55781	58.2875	53.9917	12.0035	250.359	225.75	379.879	82.0305	81.6175	201.036
FURIN	77.936	84.275	88.4106	631.669	600.803	283.019	2276.54	1816.36	2080.31	1420.67	1352.42	1689.82
GPT2	0.540282	0.718159	0.986205	8.58707	5.49815	2.96479	48.9038	38.0804	44.6917	66.1755	58.8071	77.4434
HOXB9	0.0301101	0.195934	0.154179	1.64811	1.02851	0.614732	17.6264	17.741	18.6911	30.1742	32.8166	28.1757
HPDL	0.420242	0.065378	0.184995	2.342	1.26584	0.940125	0.910156	5.68974	2.68346	9.16978	13.1013	6.43678
ICAM1	8.02836	10.1703	6.28354	53.4484	44.6731	16.1346	168.963	162.356	214.763	159.846	159.641	217.396
IER3	1.74827	0.790805	1.39953	16.0761	13.2032	6.61555	176.537	216.847	150.125	146.373	196.354	151.675
IL23R	2.19084	2.97025	3.88289	30.7917	25.75	9.58112	26.0565	25.0883	30.5811	43.7256	39.6006	46.0688
IL2RA	5.58198	5.84249	8.25873	151.445	119.099	15.9443	968.325	1296.48	1212.21	1897.07	2078.43	1843.07
IRF4	3.90142	4.24317	6.16326	328.17	229.297	94.4361	351.189	492.932	572.025	938.831	954.682	1115.73
IRF8	0.390232	0.848715	0.862942	5.46454	2.37336	4.77253	145.706	132.697	198.898	111.527	144.195	226.816
LIF	0.420143	0.424404	1.32518	8.45697	4.03447	4.19406	7.04093	27.8659	53.0368	262.637	349.148	317.907
LOC100288175	1.11048	0.848715	0.308258	6.23828	3.48088	1.59091	9.14856	5.41966	8.46655	6.27885	3.34959	6.80111

MAFF	4.98178	6.07096	4.12942	37.0803	20.8057	9.61728	94.311	73.2929	69.4435	52.7597	41.3383	37.1627
METTL1	2.02073	1.7183	1.71636	16.6106	11.9915	7.19932	11.0645	20.7619	12.3065	28.5932	31.7568	30.4551
MFSD2A	0.0901304	0.68552	0.277442	16.7837	14.3583	2.31401	8.57379	28.2691	16.4704	60.0321	78.3951	63.395
MIR146A	0.150151	0.032739	0.184995	17.4343	12.8157	2.49478	29.2656	20.7427	35.0688	25.9282	20.521	28.1353
MIR155HG	1.65066	2.87233	1.81823	16.1766	11.3126	6.18257	133.874	352.355	170.671	406.402	578.105	344.423
MKX	0.0301101	0.065378	0.0617316	0.347048	0.158317	0.361648	6.46629	8.91537	7.26368	8.31155	10.6421	18.0552
MTHFD1L	0.840384	1.24119	1.54089	11.1559	7.43632	6.83335	35.1689	51.386	40.5549	55.425	68.3276	62.1468
MYB	0.180161	0.261212	0.616416	16.35	9.73047	1.9163	37.935	38.0804	6.5697	22.9921	28.492	13.9665
MYO1B	0.180161	0.391768	0.36989	3.20937	2.68979	2.82017	50.7236	42.471	46.5426	23.0372	25.7785	36.839
NAMPT	14.3445	19.2964	17.8033	115.485	51.8806	38.7157	2190	1235.33	1830.68	1393.34	827.095	1234.61
NAMPTL	12.2447	14.6397	15.1082	96.6735	43.2082	42.6689	1825.22	1103.77	1739.98	1237.4	722.646	1169.17
NCS1	2.43092	6.95221	5.20796	20.9471	23.0601	24.6577	48.2327	69.4408	62.643	53.3019	54.397	60.2376
NDFIP2	0.420242	0.881353	0.801311	11.1458	10.3238	6.68874	73.4751	112.537	87.0699	78.9589	95.3961	93.9197
NFKB1	30.7002	42.3655	42.4645	185.618	164.624	120.722	160.074	149.408	242.933	199.522	190.026	356.973
NFKB2	11.2839	18.18	10.6932	103.477	91.41	46.7482	196.572	197.392	191.491	147.032	168.365	207.352
NFKBIA	37.0025	50.0683	52.3561	339.32	308.325	201.78	1529.63	1582.39	2018.4	796.171	962.595	1405.17
PKM2	105.674	109.153	111.743	907.094	629.692	400.545	1528.89	1500.52	1780.9	929.372	986.75	1073.07
PMAIP1	5.34191	6.29944	4.89981	36.8635	24.8403	17.3183	162.029	193.619	145.04	181.353	207.738	217.419
POU2F2	17.9162	15.9932	9.24482	81.6195	70.6435	26.3931	88.899	51.5203	52.2795	86.8178	64.022	47.6476
PSAT1	3.15116	4.27581	4.869	37.6441	18.2347	18.3667	372.162	393.424	363.057	497.636	503.357	569.829
RELB	5.85207	14.3613	5.67021	78.6269	67.5591	51.5206	50.3886	51.0724	58.3863	46.0292	40.9996	50.7649
RGS16	0.210171	0.587602	1.7566	28.3198	29.824	41.9397	16.429	51.4756	76.2445	157.601	243.199	272.323
SDC4	8.73306	7.83347	7.98139	150.183	93.4672	56.9443	44.0661	34.7651	49.4106	87.8116	66.7777	73.5974
SEMA7A	2.9711	4.37373	3.02005	21.4242	26.7783	19.5599	51.7771	53.5365	40.8055	58.6771	59.8244	50.6434
SERPINE2	0.0301101	0.195934	0.369889	4.85738	4.43018	2.49478	0.62277	1.83691	1.34178	7.13709	6.23269	3.6435
SGK1	2.88107	3.62303	2.52699	35.5189	15.98	8.06261	449.944	228.844	476.487	78.191	62.5807	153.834
SHMT2	16.0236	14.5897	17.411	180.933	103.474	76.7091	429.674	410.109	407.171	523.261	484.035	533.31
SLC1A5	11.2839	21.1827	18.0191	132.102	77.4484	66.4891	546.987	563.935	600.286	807.744	756.951	796.027
SLC41A2	0.630313	1.72997	0.708863	9.28098	11.2335	9.11111	29.0261	33.1076	35.5777	19.1525	28.7887	27.4066
SLC6A9	0.210171	0.065378	0.400705	2.94916	1.46361	1.48245	22.7036	20.8323	33.4033	41.9637	40.7878	55.4251
SMS	2.85062	3.01999	3.71543	17.8052	15.7558	7.14299	34.3525	59.0254	35.9228	47.4587	58.615	45.6021
SPHK1	0.180161	0.783437	0.308258	2.342	1.97782	1.59091	5.65202	8.82577	6.33838	13.8675	16.3235	13.1163
SPRED2	0.900404	1.82789	0.462337	9.84477	5.89369	1.84399	29.4092	18.9954	14.8048	16.7133	15.7724	12.7925
SPRY4	0.0901304	0.228573	0.0309158	6.8957	5.93324	2.38632	22.512	23.789	18.2747	17.7974	19.4186	9.51341
STX11	9.87343	14.0675	8.25873	79.6681	59.8062	30.6955	148.435	138.747	141.108	132.08	127.874	144.684
TMEM217	0.150151	0.241158	0.131434	2.34061	2.44135	1.12196	2.34292	2.94017	1.34443	6.58511	6.81816	5.80548
TNF	15.5754	32.1494	16.1476	219.957	208.328	148.952	565.061	943.838	467.554	1295.48	1496.05	817.543
TNFRSF18	3.75137	1.66469	2.06476	89.1225	65.1859	35.6849	109.159	198.737	125.887	114.418	151.533	195.772
TNFRSF9	2.01078	2.90497	4.6841	511.662	296.222	125.493	223.874	450.065	270.927	1067.98	1139.8	1070.6
TRAF1	65.0012	74.4498	40.6765	618.368	545.449	202.857	435.565	581.848	644.209	530.98	738.638	753.565
TRAF4	6.57231	13.0642	5.36205	177.138	186.446	54.9555	107.258	126.242	137.239	180.507	179.636	272.877
TRIB1	0.540282	0.750798	0.678047	19.5593	15.4263	2.45863	13.2199	10.3938	5.48293	26.154	26.6264	14.5979
ULBP1	0.120141	0.130656	0.308258	1.97711	1.34495	0.650886	38.1682	29.0307	30.1626	37.9431	36.7587	37.8085
UTS2	0.863921	0.167165	1.15403	17.7282	10.5837	3.36251	5.86335	8.24343	3.9571	21.5036	24.8881	18.4218
VDR	1.71068	2.5133	4.19105	139.385	103.83	35.4319	14.9442	19.9811	35.1614	67.5303	66.1848	98.8181
VEGFA	0.930414	0.554963	0.554784	7.24265	3.00623	2.71171	158.349	94.8876	150.269	126.253	85.9845	133.308
WARS	26.6405	29.9325	28.2615	299.332	156.026	77.3368	1080.52	1147	585.818	1693.52	1666.97	908.765
ZBED2	0.570293	0.587602	0.400705	40.0293	14.0419	10.2681	1.53283	5.64494	11.8902	84.0179	47.7833	107.197
ZFHX2	0.118042	0.470434	0.184995	3.78219	3.48088	1.01243	1.14964	1.70251	1.01793	1.94245	1.86564	1.1336

Appendix Table 3. Genes with significantly altered expression values triggered by a TCR stimulus. P<0.01, |Fold Change| > 4. A negative number in fold change means downregulation upon stimulation. Expression value of each indicated gene in each sample is shown.

Gene Name	Contrast	P-value	FDR	Fold-Change	UT1	UT2	UT3	T1	T2	T3
RASGRP2	T vs UT	0.00876061	0.047371288	-5.40441305	25.2986	16.7766	17.2877	2.342	3.79731	4.84484
NAMPT	T vs UT	2.20E-03	0.0234604	4.005928467	14.3445	19.2964	17.8033	115.485	51.8806	38.7157
DNAJB5	T vs UT	0.002940069	0.026892475	4.008994056	2.13082	3.36192	6.74876	14.6153	20.2519	14.2089
NFKB1	T vs UT	0.000183036	0.008006036	4.076535032	30.7002	42.3655	42.4645	185.618	164.624	120.722
PTPN7	T vs UT	0.001751901	0.020945283	4.11089339	51.617	60.3169	56.054	338.659	255.714	96.2071
POU2F2	T vs UT	0.004039227	0.031328401	4.139942745	17.9162	15.9932	9.24482	81.6195	70.6435	26.3931
SMS	T vs UT	0.000556279	0.012365268	4.246169247	2.85062	3.01999	3.71543	17.8052	15.7558	7.14299
LOC644037	T vs UT	5.66E-06	0.002448332	4.287058869	0.601077	0.536579	0.590622	2.83206	2.75908	1.81808
NAMPTL	T vs UT	0.000625888	0.012840597	4.347213368	12.2447	14.6397	15.1082	96.6735	43.2082	42.6689
BACH2	T vs UT	0.00296899	0.026996792	4.369316339	33.3715	34.9238	44.0667	205.731	181.312	103.903
BHLHE40	T vs UT	0.001401855	0.018694049	4.390167505	80.9075	97.2306	102.178	555.733	508.331	166.571
NINJ1	T vs UT	0.002202577	0.0234604	4.429950101	19.6267	17.8863	41.7553	128.414	122.7	100.042
MAFF	T vs UT	0.002060303	0.02288607	4.446222171	4.98178	6.07096	4.12942	37.0803	20.8057	9.61728
PTPN6	T vs UT	0.000188129	0.008017603	4.447570256	19.2666	18.5391	17.75	119.394	83.6572	44.0366
NFKBID	T vs UT	3.54287E-05	0.004409658	4.467362192	6.05676	7.31125	4.49921	31.3909	31.027	17.4014
BTG2	T vs UT	2.30E-05	0.003427694	4.507760632	157.883	137.443	192.014	882.887	761.703	552.226
SPHK1	T vs UT	0.000854326	0.014668872	4.647327937	0.180161	0.783437	0.308258	2.342	1.97782	1.59091
SNX9	T vs UT	0.001040323	0.01619884	4.664018294	22.2076	28.1023	20.4926	163.547	120.364	46.3139
ICAM1	T vs UT	1.28E-03	0.017924844	4.66691018	8.02836	10.1703	6.28354	53.4484	44.6731	16.1346
NCS1	T vs UT	0.0001294	0.006920261	4.705942584	2.43092	6.95221	5.20796	20.9471	23.0601	24.6577
KLF10	T vs UT	4.48E-03	0.033064267	4.774295752	4.80172	5.5161	18.5821	29.1005	31.7228	77.1535
PMAIP1	T vs UT	2.64996E-05	0.003712955	4.777295577	5.34191	6.29944	4.89981	36.8635	24.8403	17.3183
FAM167A	T vs UT	0.000196649	0.008025588	4.965361642	1.65066	1.56677	4.65329	13.8347	12.7366	12.5097
LOC100288175	T vs UT	0.00671498	0.040927187	4.988016219	1.11048	0.848715	0.308258	6.23828	3.48088	1.59091
REL	T vs UT	0.00078538	0.014094902	5.090869283	5.25187	10.8036	5.79346	42.415	51.4608	17.3543
HIC1	T vs UT	4.60E-03	0.033588553	5.166856419	5.15714	7.47754	4.54628	53.2403	25.7247	9.8066
AK4	T vs UT	5.73E-03	0.037575266	5.279491899	0.292097	0.219243	0.276397	1.18895	0.629058	2.34085
STX11	T vs UT	0.000110791	0.006680273	5.284830051	9.87343	14.0675	8.25873	79.6681	59.8062	30.6955
MIR155HG	T vs UT	1.12E-03	0.016747069	5.309980941	1.65066	2.87233	1.81823	16.1766	11.3126	6.18257
CD82	T vs UT	7.86E-03	0.044320749	5.438351632	4.36488	5.27297	13.8324	62.5708	28.7368	36.332
SLC1A5	T vs UT	2.98744E-05	0.003975318	5.467672175	11.2839	21.1827	18.0191	132.102	77.4484	66.4891
CCR4	T vs UT	0.001890967	0.021918325	5.508529108	1.20051	1.14247	0.986205	6.80896	3.32266	8.20724
SPRED2	T vs UT	0.00836525	0.046067404	5.510659557	0.900404	1.82789	0.462337	9.84477	5.89369	1.84399
MKX	T vs UT	0.000621453	0.012832278	5.514660474	0.0301101	0.065378	0.0617316	0.347048	0.158317	0.361648
CSF1	T vs UT	8.89E-03	0.047655527	5.580386477	6.2422	5.28762	2.86597	49.8738	21.2408	9.21957
BCL2A1	T vs UT	0.006765998	0.041121492	5.63723579	3.33123	4.04734	3.79045	35.9095	21.5572	5.49563
AGRN	T vs UT	0.001103268	0.01667341	5.852378076	1.14048	1.56677	1.41763	8.19675	10.0865	5.85718
PKM2	T vs UT	9.16187E-06	0.002542857	5.93235247	105.674	109.153	111.743	907.094	629.692	400.545
TAGAP	T vs UT	2.31958E-05	0.003427694	5.981402646	81.8427	86.2219	77.6475	591.577	595.382	282.744
TNFRSF13C	T vs UT	0.000263127	0.009012964	5.984195327	1.65066	1.9258	1.41763	13.0974	12.341	4.44714
IRF8	T vs UT	4.21E-04	0.010961511	5.999572707	0.390232	0.848715	0.862942	5.46454	2.37336	4.77253
CD69	T vs UT	2.30E-04	0.008522376	5.999582825	29.9202	38.7099	20.9548	229.291	211.539	96.6419
NFKB2	T vs UT	4.64289E-05	0.004764748	6.017250052	11.2839	18.18	10.6932	103.477	91.41	46.7482
PSAT1	T vs UT	1.94632E-05	0.003333068	6.038196192	3.15116	4.27581	4.869	37.6441	18.2347	18.3667
FURIN	T vs UT	2.12976E-05	0.003427694	6.046924822	77.936	84.275	88.4106	631.669	600.803	283.019
NFKBIA	T vs UT	1.34634E-05	0.002739231	6.092260632	37.0025	50.0683	52.3561	339.32	308.325	201.78
WARS	T vs UT	0.001246697	0.017709411	6.279224605	26.6405	29.9325	28.2615	299.332	156.026	77.3368
CENPM	T vs UT	0.000396227	0.010702621	6.348686719	0.690333	0.750798	0.862942	5.76812	6.32878	2.53094
VEGFA	T vs UT	0.000305811	0.009535793	6.352725276	0.930414	0.554963	0.554784	7.24265	3.00623	2.71171
RBPJ	T vs UT	1.14573E-06	0.002130399	6.481411457	62.0913	75.8521	95.5549	549.958	527.05	436.391
SEMA7A	T vs UT	5.55524E-07	0.002130399	6.537687114	2.9711	4.37373	3.02005	21.4242	26.7783	19.5599
METTL1	T vs UT	3.86E-05	0.004529233	6.562561802	2.02073	1.7183	1.71636	16.6106	11.9915	7.19932
SGK1	T vs UT	0.00270597	0.025890935	6.595162614	2.88107	3.62303	2.52699	35.5189	15.98	8.06261
HPDL	T vs UT	7.12E-03	0.042101297	6.781785122	0.420242	0.065378	0.184995	2.342	1.26584	0.940125
ID3	T vs UT	3.08E-03	0.027613647	6.926901792	1.71068	1.37094	15.1306	42.848	34.1356	49.1709
SGPP2	T vs UT	0.003367266	0.028515375	6.982947422	2.3709	1.3383	1.84905	20.7736	9.65137	8.38802
MTHFD1L	T vs UT	6.18E-06	0.002448332	7.018847248	0.840384	1.24119	1.54089	11.1559	7.43632	6.83335
ULBP1	T vs UT	0.000278782	0.009093597	7.106533516	0.120141	0.130656	0.308258	1.97711	1.34495	0.650886
IL23R	T vs UT	1.65E-04	0.00763911	7.311252525	2.19084	2.97025	3.88289	30.7917	25.75	9.58112
ACTN1	T vs UT	0.003531029	0.029349436	7.382555116	0.450252	0.457046	1.41809	9.94268	4.54884	2.6758
IL21R	T vs UT	1.31E-03	0.018136002	7.443102157	7.09494	8.44576	13.0178	111.228	77.8204	23.5154
SHMT2	T vs UT	5.17316E-06	0.002448332	7.519434672	16.0236	14.5897	17.411	180.933	103.474	76.7091
ANKRD33B	T vs UT	5.82E-05	0.005291355	7.549289367	2.31088	3.36192	3.63636	33.8276	22.7834	13.6666
LAYN	T vs UT	0.00619479	0.039372043	7.560189827	1.35056	1.43622	1.38681	13.9123	9.3306	8.3102
TRAF1	T vs UT	0.000204059	0.008190814	7.587259519	65.0012	74.4498	40.6765	618.368	545.449	202.857
GPT2	T vs UT	6.81409E-05	0.005638775	7.595855516	0.540282	0.718159	0.986205	8.58707	5.49815	2.96479
RELB	T vs UT	2.06973E-05	0.003420999	7.638313745	5.85207	14.3613	5.67021	78.6269	67.5591	51.5206
LIF	T vs UT	0.003851199	0.030675247	7.690136901	0.420143	0.424404	1.32518	8.45697	4.03447	4.19406
DUSP4	T vs UT	0.00070629	0.013553827	7.754419666	3.03112	14.9105	11.6176	77.066	88.4435	63.7049
FCGBP	T vs UT	0.007265303	0.042401707	8.012114287	3.87141	12.2071	7.0261	53.17	83.4992	48.4475
NAPSA	T vs UT	0.001382737	0.018624545	8.012360967	0.780364	0.718159	0.647232	9.62792	5.14216	2.42247
CCL20	T vs UT	8.88E-05	0.006439125	8.650159	2.61098	4.56956	5.33123	42.848	47.2672	18.1136
HOXB9	T vs UT	9.70E-04	0.015564746	8.656358495	0.0301101	0.195934	0.154179	1.64811	1.02851	0.614732
SLC6A9	T vs UT	0.000572527	0.012425163	8.717458117	0.210171	0.065378	0.400705	2.94916	1.46361	1.48245
FEZ1	T vs UT	0.002651897	0.025753482	8.967673002	4.38158	6.91958	2.55781	58.2875	53.9917	12.0035
TNF	T vs UT	3.44962E-05	0.00438493	9.037336401	15.5754	32.1494	16.1476	219.957	208.328	148.952
FBXO27	T vs UT	7.84E-04	0.014094902	9.049428372	0.600303	0.489685	0.770495	8.89065	6.21012	1.73553
SLC43A2	T vs UT	0.000224479	0.008438482	9.1109579	0.510272	1.30566	0.955389	11.0591	10.7193	3.47096
IER3	T vs UT	4.11E-05	0.004529233	9.113627516	1.74827	0.790805	1.39953	16.0761	13.2032	6.61555
NR4A2	T vs UT	0.004813254	0.034285048	9.1859141	3.45127	19.812	2.06476	92.245	104.224	36.1911
MYO1B	T vs UT	4.53076E-06	0.002448332	9.257981611	0.180161	0.391768	0.36989	3.20937	2.68979	2.82017
AGMAT	T vs UT	0.000120698	0.00686928	9.294765026	0.690333	0.750798	0.369889	8.93402	4.82572	3.07326
ARHGAP31	T vs UT	1.80369E-05	0.003270511	9.320405423	6.15218	5.38554	10.6624	92.3751	76.1421	38.3965
SLC41A2	T vs UT	1.30102E-05	0.002739231	9.652725862	0.630313	1.72997	0.708863	9.28098	11.2335	9.11111

CCL4	T vs UT	3.94E-04	0.010699691	10.61143219	23.75	21.0561	30.2824	356.951	267.356	172.49
ZFHX2	T vs UT	0.000700081	0.013487496	10.69916843	0.118042	0.470434	0.184995	3.78219	3.48088	1.01243
TMEM217	T vs UT	2.46886E-05	0.003498972	11.2941036	0.150151	0.241158	0.131434	2.34061	2.44135	1.12196
BCAT1	T vs UT	1.15E-03	0.016958346	12.0962556	0.150151	0.228573	0.339074	5.76812	1.93826	0.97628
EPAS1	T vs UT	0.0007875	0.014094902	12.15374729	0.300201	1.1751	0.523968	7.97992	10.2447	6.0741
CD83	T vs UT	2.77171E-05	0.003755508	12.18604013	2.85106	3.16609	5.42368	55.4686	45.4085	38.5413
SDC4	T vs UT	4.00281E-06	0.002448332	12.24519923	8.73306	7.83347	7.98139	150.183	93.4672	56.9443
BATF3	T vs UT	0.00090469	0.015094489	12.36155255	0.270191	0.391768	0.832126	10.0616	5.69591	2.71171
FABP5L7	T vs UT	1.26E-04	0.00686928	12.39235664	1.0837	0.998995	1.71731	23.4198	13.5793	10.0919
NR4A3	T vs UT	0.002256405	0.02373846	13.09120101	1.35056	7.4418	0.770495	30.0112	42.2834	52.8947
NDFIP2	T vs UT	2.41894E-06	0.002130399	13.39019971	0.420242	0.881353	0.801311	11.1458	10.3238	6.68874
SHF	T vs UT	1.0258E-05	0.002542857	13.42750643	1.71068	1.79525	1.44844	24.46	25.4335	16.6313
CLIC4	T vs UT	4.83312E-05	0.004805832	14.11804117	0.180161	0.489685	0.832126	8.15339	6.72433	6.32719
UTS2	T vs UT	0.001362384	0.018572413	14.49557176	0.863921	0.167165	1.15403	17.7282	10.5837	3.36251
CHAC1	T vs UT	1.15E-05	0.002559195	14.55285542	0.300201	0.848715	0.5856	12.9239	6.60567	5.71256
IL2RA	T vs UT	0.002003661	0.022706933	14.55496791	5.58198	5.84249	8.25873	151.445	119.099	15.9443
HIVEP3	T vs UT	1.25E-03	0.017740944	15.0525396	9.87343	6.36471	7.08774	189.476	136.619	25.0193
CCL3	T vs UT	0.004765335	0.034101326	15.48118835	3.66755	4.92664	12.3766	176.558	114.936	33.1583
TRAF4	T vs UT	5.68365E-05	0.005291355	16.74257859	6.57231	13.0642	5.36205	177.138	186.446	54.9555
CRTAM	T vs UT	7.75742E-05	0.00608349	17.54725038	5.612	6.95221	4.37595	105.039	148.647	43.5666
LINGO4	T vs UT	0.00029639	0.009366328	17.58499406	0.840384	0.881354	1.04784	15.6562	22.3087	10.7381
TRIB1	T vs UT	0.001006579	0.015870994	19.01564235	0.540282	0.750798	0.678047	19.5593	15.4263	2.45863
SERPINE2	T vs UT	0.000585506	0.012447885	19.77123252	0.0301101	0.195934	0.369889	4.85738	4.43018	2.49478
CCL3L1	T vs UT	3.21E-03	0.028010103	20.2060234	4.91132	3.65146	6.23088	189.184	36.2612	73.4764
CCL4L2	T vs UT	0.000449107	0.011245576	23.38365659	4.73849	0.883607	6.17457	156.862	54.8048	64.1824
TNFRSF18	T vs UT	5.75581E-06	0.002448332	25.39740849	3.75137	1.66469	2.06476	89.1225	65.1859	35.6849
MYB	T vs UT	0.001974395	0.02252016	26.46729328	0.180161	0.261212	0.616416	16.35	9.73047	1.9163
DUSP5	T vs UT	6.42078E-05	0.005459879	26.86018717	2.76103	4.70012	2.03394	113.974	116.843	24.2238
MFSD2A	T vs UT	7.86E-04	0.014094902	31.76934645	0.0901304	0.68552	0.277442	16.7837	14.3583	2.31401
VDR	T vs UT	2.72697E-05	0.003735954	33.11299964	1.71068	2.5133	4.19105	139.385	103.83	35.4319
ASB2	T vs UT	0.005962705	0.038484164	33.70477551	1.08047	0.718158	0.462337	55.9458	18.2346	2.02477
SPRY2	T vs UT	0.000503798	0.011854638	34.56705264	0.510272	0.750798	0.431521	34.4348	20.8191	3.25403
CCL4L1	T vs UT	0.002451342	0.024693667	38.55311268	8.42431	1.72385	7.48654	465.928	50.9259	163.018
RGS16	T vs UT	9.94967E-05	0.006595668	39.18122585	0.210171	0.587602	1.7566	28.3198	29.824	41.9397
ZBED2	T vs UT	0.000189591	0.008017603	41.28012933	0.570293	0.587602	0.400705	40.0293	14.0419	10.2681
SPRY4	T vs UT	4.55696E-05	0.004761308	43.51950028	0.0901304	0.228573	0.0309158	6.8957	5.93324	2.38632
IRF4	T vs UT	1.70E-06	0.002130399	45.56260872	3.90142	4.24317	6.16326	328.17	229.297	94.4361
EGR1	T vs UT	6.40E-06	0.002448332	64.91326631	0.793634	1.80853	3.03418	155.601	126.807	83.4657
ESPL1	T vs UT	0.000109079	0.006650528	69.45310286	0.0901304	0.065378	0.246626	11.1892	15.1494	1.59091
TNFRSF4	T vs UT	0.00892561	0.04772453	71.06408913	0.150151	0.0001	0.369889	18.6486	12.8552	5.45947
MIR146A	T vs UT	6.69E-05	0.00560884	89.00819895	0.150151	0.032739	0.184995	17.4343	12.8157	2.49478
TNFRSF9	T vs UT	1.9153E-06	0.002130399	97.22828542	2.01078	2.90497	4.6841	511.662	296.222	125.493
NR4A1	T vs UT	4.23151E-06	0.002448332	97.55860441	0.960424	3.264	0.924574	206.783	194.963	100.583
EBI3	T vs UT	0.002839526	0.026454429	116.6076652	0.0001	0.032739	0.0617316	3.81653	5.65637	1.55476
C2CD4A	T vs UT	6.71E-04	0.013176391	186.973189	0.180161	0.195934	0.215811	87.0409	17.4831	6.14642
EGR2	T vs UT	2.00334E-06	0.002130399	202.794261	0.536211	2.28483	2.21884	397.919	450.311	173.828
EGR3	T vs UT	3.84E-07	0.002130399	206.1649239	0.690333	1.59941	1.29436	282.671	257.217	199.03
GNG4	T vs UT	2.17E-05	0.003427694	506.6197353	0.0901304	0.195934	0.123363	117.702	80.6115	9.11112

Appendix Table 4. Genes with significantly altered expression values triggered by cytokines. P<0.01, |Fold Change| > 4. Expression value of each indicated gene in each sample is shown.

Gene Name	Contrast	P-value	FDR	Fold-Change	UT1	UT2	UT3	C1	C2	C3
SCML4	C vs UT	3.05614E-07	1.50128E-05	-127.0638927	23.0671	13.9938	14.9883	2.04076	1.36403	2.10566
PRSS35	C vs UT	0.000123607	0.000555422	-113.1153511	51.7963	55.2349	56.4351	7.84855	7.77745	9.93824
CXCR3	C vs UT	0.000501604	0.001594425	-75.31897174	0.356989	0.371852	0.131841	1.79223	4.00069	2.31277
KIT	C vs UT	0.00020368	0.000803897	-66.40495162	14.3445	19.2964	17.8033	2190	1235.33	1830.68
CPNE7	C vs UT	8.53116E-05	0.000423081	-51.89410506	16.8784	14.1404	16.4273	76.4589	107.669	82.6957
DBP	C vs UT	2.52299E-05	0.000181496	-42.02660488	28.5097	32.476	26.5633	2.58657	1.92651	2.4984
MEGF6	C vs UT	0.000465536	0.001498839	-40.85615814	10.2035	10.0529	11.4327	38.1266	59.1364	37.7984
SPON1	C vs UT	0.000123731	0.000555427	-39.63992753	24.0023	18.5064	12.6023	3.34991	0.672105	3.51622
EPHA1	C vs UT	0.000137357	0.000597816	-39.02265276	17.2259	19.6488	15.1923	63.8479	89.5112	55.6569
TCF7	C vs UT	9.39163E-08	9.91583E-06	-37.9330414	4.64214	7.52639	11.9509	1.25188	0.728488	0.711669
SALL2	C vs UT	2.0768E-05	0.000160605	-36.12022923	10.5637	10.9015	14.0213	47.8499	45.6962	52.1867
TNFSF13B	C vs UT	0.004693007	0.009810914	-33.60227354	19.2365	18.2598	19.1467	3.00128	2.37088	0.234354
KLF2	C vs UT	5.26448E-06	6.74205E-05	-28.62895837	12.2447	14.6397	15.1082	1825.22	1103.77	1739.98
GAS7	C vs UT	8.35615E-06	8.77609E-05	-28.16767318	1.38057	1.9258	2.00313	32.4269	26.6115	23.1325
SORL1	C vs UT	3.08769E-06	4.90037E-05	-27.83748734	9.87344	13.5453	6.68713	1.14964	1.83691	2.59093
ACACB	C vs UT	0.000853883	0.002429811	-27.29738326	15.7949	18.2273	14.9473	67.8712	75.0637	64.7795
RASGRP2	C vs UT	0.000113443	0.000524665	-26.84066535	24.902	36.3686	27.875	5.64487	5.84725	7.2571
CD27	C vs UT	8.01451E-05	0.00040568	-26.52178647	49.0367	46.6087	59.2895	7.32845	5.33134	8.37403
SGK223	C vs UT	2.99619E-06	4.81656E-05	-26.08620382	9.06316	6.52791	6.28652	1.24544	2.46412	1.48057
NUAK2	C vs UT	2.38427E-07	1.36448E-05	-23.18581837	8.49034	17.467	18.4014	119.916	92.0904	196.814
NKD1	C vs UT	0.000606427	0.001850344	-22.27475574	13.0845	14.4266	15.0074	77.8817	99.367	62.1797
ACSL6	C vs UT	1.09E-06	2.8716E-05	-22.24271062	83.3826	83.9065	83.5145	517.611	506.195	409.114
VIPR1	C vs UT	0.000662331	0.001980729	-21.86221998	15.5753	18.8002	9.61463	88.4672	94.5297	53.0659
ZCCHC18	C vs UT	3.53783E-06	5.27467E-05	-21.42837344	8.43295	6.36471	6.6255	1.91601	1.07531	1.94322
SNAI3	C vs UT	3.61283E-05	0.000232739	-21.37037165	5.31189	4.92859	4.0986	1.62862	0.268902	0.509013
PLXND1	C vs UT	7.46571E-06	8.31984E-05	-20.94226361	6.48229	8.38757	4.98016	39.4019	57.0393	28.615
SYNM	C vs UT	9.96814E-06	9.75454E-05	-20.03333924	45.4355	48.3713	31.6479	10.0586	7.70576	5.59814
FAIM3	C vs UT	2.04983E-06	3.90618E-05	-19.94326971	5.19185	5.02652	10.5699	170.358	178.947	214.493
AMIGO1	C vs UT	1.79635E-05	0.000145239	-18.65861344	25.4786	27.5773	20.8116	128.751	139.149	103.91
DTX4	C vs UT	0.000251076	0.000937709	-18.41671832	29.8612	26.359	28.364	342.018	202.758	293.067
IL7R	C vs UT	0.000146204	0.000628115	-18.38278907	13.6547	11.1111	7.93283	1.86811	2.50894	1.94322
CD52	C vs UT	7.13098E-06	8.09622E-05	-18.16629126	0.990434	0.913993	0.924574	28.9303	27.2835	18.9224
AMICA1	C vs UT	5.09E-06	6.63574E-05	-18.09290689	3.42126	2.28483	2.46536	19.3028	15.6354	8.23524
IGFBP3	C vs UT	0.005773913	0.011713121	-17.95595303	12.3777	15.002	10.5031	46.3546	78.1214	55.1916
GOLGA2B	C vs UT	2.65498E-05	0.000188029	-17.87224319	114.732	122.263	198.665	1119.56	960.434	1161.08
ENPP5	C vs UT	0.00219133	0.005196272	-17.6568889	12.3961	12.5475	13.6534	59.413	91.9133	55.3373
LTK	C vs UT	2.29892E-05	0.000170449	-17.24318757	36.6412	30.3999	28.8009	7.63039	6.47694	4.2102
FAM102A	C vs UT	2.51979E-06	4.42082E-05	-17.08364654	24.8785	24.6837	28.3814	150.871	150.989	168.126
RASGEF1A	C vs UT	0.000457912	0.001478026	-16.93272905	8.49296	7.9314	7.51916	30.7504	44.3075	24.9832
RNF166	C vs UT	1.51332E-05	0.000128773	-16.87560606	14.5775	7.51483	5.73427	1.73004	1.10171	0.983835
FBLN5	C vs UT	0.00055612	0.00172763	-16.85656251	0.933096	0.915032	0.987047	6.0474	8.98434	7.37475
TMEM63A	C vs UT	1.42753E-06	3.29E-05	-16.41524814	8.34293	10.2814	9.92279	1.10175	0.537704	3.4237
RTN4R	C vs UT	0.000358426	0.001231371	-15.10046228	16.5467	19.127	11.9581	1.40065	1.24075	2.92842
SUSD3	C vs UT	0.002122568	0.005072932	-15.04697916	8.02078	9.09472	28.0898	0.691714	0.207393	0.259329
IER5L	C vs UT	0.000145593	0.000626655	-14.98624703	11.1939	12.1418	10.8781	72.5342	71.1086	49.4109
IL17RE	C vs UT	5.03243E-05	0.000290904	-14.89367056	20.9769	26.7967	26.7169	131.624	199.765	99.9789
SMARCD3	C vs UT	0.00018298	0.000746328	-14.68269978	2.51122	1.24114	1.22081	9.24353	4.88307	10.0435
ABCA7	C vs UT	1.61265E-05	0.000134442	-14.6809506	29.4101	19.0613	13.3742	1.05385	1.03051	2.12828
CXCR7	C vs UT	0.001085269	0.002933866	-14.67164323	190.563	198.638	177.069	11.8308	9.90098	6.66223
OBSCN	C vs UT	9.94723E-07	2.70153E-05	-14.50487529	14.5812	15.1446	20.6775	197.842	119.482	222.372
THBS1	C vs UT	1.15991E-06	2.92595E-05	-14.49584453	7.71271	3.49247	2.70607	0.862258	0.268902	0.740337
PLEKHB1	C vs UT	3.46892E-05	0.000225452	-14.29857386	0.240181	0.130656	0.339074	2.1076	3.13612	1.61937
PASK	C vs UT	1.22763E-05	0.00011229	-14.23760106	0.210171	0.065378	0.400705	22.7036	20.8323	33.4033
PIK3IP1	C vs UT	2.91562E-05	0.000201398	-14.03062503	3.81139	4.37124	3.91371	17.0996	15.6354	23.9653
LOC100129550	C vs UT	1.03289E-05	9.96673E-05	-13.9953275	19.7811	17.6859	24.5189	98.4355	200.317	113.232
MFGE8	C vs UT	3.13687E-05	0.000212164	-13.87938321	7.83275	9.62861	8.68834	39.132	50.8475	35.3001
NMT2	C vs UT	1.76696E-05	0.000143239	-13.85497758	10.0535	10.6731	10.9705	108.248	127.501	73.5611
YPEL3	C vs UT	2.11632E-06	3.99605E-05	-13.73651651	1.6926	0.686169	0.497801	12.3626	8.51964	2.59093
OSBPL7	C vs UT	2.23137E-07	1.32572E-05	-13.43230967	12.2442	11.0647	15.5929	124.488	112.404	157.345
LDLRAP1	C vs UT	0.000433764	0.001414148	-13.38275543	4.56164	4.1779	2.09557	30.942	35.4821	33.2181
LMTK3	C vs UT	1.71507E-05	0.00014051	-13.11096488	37.0025	50.0683	52.3561	1529.63	1582.39	2018.4
GALNT12	C vs UT	3.05586E-06	4.87962E-05	-12.87608701	9.11832	8.52537	5.25407	68.0993	105.671	104.065
RBM9	C vs UT	1.08598E-05	0.000102866	-12.77153544	3.99145	2.70914	2.21884	0.670668	0.627305	0.462748
ABTB1	C vs UT	3.96349E-07	1.68517E-05	-12.62251487	0.495419	0.25473	0.591697	25.577	26.4619	26.0472
ZMAT1	C vs UT	1.04631E-05	0.000100319	-12.53787478	1.11048	0.783437	0.493153	5.50833	2.77772	7.12487
FBXO32	C vs UT	9.33204E-07	2.63941E-05	-12.4865075	30.2502	38.351	31.7711	254.288	334.397	205.692
S1PR5	C vs UT	1.12668E-07	9.93148E-06	-12.45063093	40.4839	41.3864	41.0158	319.137	338.6	258.48
RIMBP3B	C vs UT	0.000542276	0.001695301	-12.17490159	6.74129	5.44814	6.51232	32.5557	35.127	21.8264
STMN3	C vs UT	0.000104836	0.000492279	-12.10387319	4.17151	4.50429	1.97231	1.10175	0.492904	1.06419
WDR52	C vs UT	9.8499E-06	9.65416E-05	-12.02339894	42.6805	48.0991	50.7227	8.33429	4.21133	14.9436
LOC283174	C vs UT	2.52424E-06	4.42082E-05	-12.00551477	44.6813	47.1642	41.9006	214.468	367.15	184.422
UBA7	C vs UT	0.000366442	0.001253322	-11.87852754	9.00815	6.9117	2.70291	0.914396	0.807669	1.71881
PLA2G6	C vs UT	1.28283E-06	3.10948E-05	-11.66940956	13.888	11.5811	12.0998	2.1555	1.34411	3.46996
RIMBP3	C vs UT	0.002827589	0.006420657	-11.61504972	46.0357	48.3711	63.1414	230.437	258.812	348.467
TPM1	C vs UT	5.51731E-06	6.9318E-05	-11.52984333	60.3503	36.1967	96.6078	13.9862	4.48013	16.4241
MDGA1	C vs UT	0.002073404	0.004979562	-11.43707604	11.674	11.13	15.5005	55.2741	78.4906	55.8879
FBXL16	C vs UT	5.86857E-05	0.000325357	-11.39384791	18.5268	21.2452	25.6249	99.2997	173.702	151.275
CELSR2	C vs UT	0.000256954	0.000952875	-11.38246318	0.901198	1.34789	0.85598	13.2422	14.358	10.4411
ATHL1	C vs UT	2.52E-04	0.000940617	-11.30091848	207.604	221.937	368.619	33.8895	25.9766	43.0367
LOC100129726	C vs UT	3.84643E-05	0.000242239	-11.19325215	1.79629	1.57868	2.35247	6.93987	9.39317	9.09288
SOX12	C vs UT	0.000155044	0.000653794	-11.16036943	11.9741	9.04112	15.1307	1.24544	0.403303	1.52684
RARRES3	C vs UT	6.28577E-06	7.47383E-05	-11.04884779	39.4565	28.5351	23.6349	9.03428	6.29056	7.35612
LY9	C vs UT	5.96687E-05	0.000329083	-11.01948833	248.397	179.352	217.279	16.6206	4.97294	9.20679
FCGRT	C vs UT	0.000418499	0.001378363	-10.97994421	150.801	167.47	183.598	869.917	1494.8	762.94

LPCAT4	C vs UT	2.47451E-05	0.000178843	-10.84443502	43.7251	41.5821	36.7939	717.539	647.13	730.274
IFIT2	C vs UT	0.005186932	0.010673589	-10.63127846	4.98178	6.07096	4.12942	94.311	73.2929	69.4435
JMJD7-PLA2G4	C vs UT	5.13578E-07	1.96659E-05	-10.58134979	9.06949	4.1309	4.65645	74.1895	41.2289	42.9615
CECR1	C vs UT	1.11754E-05	0.000105025	-10.40436983	5.78164	4.66986	4.23941	0.574878	0.74974	1.37175
TRANK1	C vs UT	6.35038E-05	0.000345087	-10.3972266	4.02146	2.28483	2.21884	0.431179	0.582504	0.509013
CROCCP3	C vs UT	0.001498748	0.003803943	-10.27679325	23.0779	14.3939	11.1554	3.44873	4.12173	3.79381
MMP24	C vs UT	0.002698083	0.006175491	-10.10305221	0.900404	1.30566	1.97231	5.69992	8.51217	10.0396
PLEKHA7	C vs UT	1.75376E-06	3.57754E-05	-10.07009356	47.2447	43.3439	24.0542	2.77817	1.92651	1.01793
LOC643733	C vs UT	0.000171605	0.000708605	-9.927969517	8.8831	10.5752	9.09076	49.9441	36.8207	39.2242
MTSS1	C vs UT	0.000245028	0.000921656	-9.754344996	69.2633	76.5062	66.6856	9.19646	7.07855	8.9292
CTPS2	C vs UT	1.88908E-05	0.000150702	-9.750473112	0.0601203	0.0980171	0.154179	54.9866	37.946	21.6983
MANBA	C vs UT	1.20105E-06	3.00384E-05	-9.748388144	11.3739	10.5399	11.3968	34.5125	61.2665	44.4077
AKAP5	C vs UT	1.08E-03	0.00292936	-9.705148421	24.4927	28.6044	24.79	125.939	104.037	147.669
ANO9	C vs UT	9.73E-04	0.002683061	-9.603172216	6.72238	5.8425	6.19408	1.38913	0.716905	1.24925
LOC100289019	C vs UT	0.000146433	0.000628663	-9.544963899	7.20253	8.42097	5.02307	0.431179	0.403303	1.34178
GLS2	C vs UT	5.69261E-05	0.000318033	-9.489830965	70.1869	92.3349	88.3484	22.0788	17.694	16.748
NTNG2	C vs UT	8.42061E-05	0.000418991	-9.487178691	47.5008	32.4333	31.1052	5.24507	4.39023	6.29211
GNG7	C vs UT	0.000794999	0.00229348	-9.450833558	7.75636	7.53474	7.70936	26.4012	56.4171	38.6777
WDR86	C vs UT	1.75723E-06	3.57754E-05	-9.445545235	38.412	26.7834	48.9283	8.03337	8.36693	9.5514
GNAO1	C vs UT	7.24558E-05	0.00037791	-9.40997231	18.2762	18.2453	17.0104	306.592	384.749	256.627
WASH5P	C vs UT	0.001367135	0.003519894	-9.331658539	5.03447	4.08412	5.51613	1.27431	1.25451	0.323954
CXCR4	C vs UT	0.000470727	0.001513446	-9.304420995	1.0837	0.998995	1.71731	11.5212	43.6536	19.802
YPEL1	C vs UT	4.01794E-05	0.000248451	-9.268922339	4.95177	3.65567	5.51613	1.19754	0.940907	1.20298
FAM13AOS	C vs UT	0.003270284	0.007254877	-9.158960607	1.89074	2.64386	2.09557	14.9921	24.5507	17.2569
MPP7	C vs UT	9.11626E-05	0.000444283	-9.020238671	1.95076	1.66469	1.01702	6.3226	8.73617	5.27428
BBS2	C vs UT	2.15063E-05	0.000163687	-9.0126468	22.5678	27.3842	25.4848	142.353	185.921	104.79
CNR2	C vs UT	0.008751669	0.016696283	-9.008592013	98.9437	105.587	84.1272	29.9361	16.4418	18.7836
NDRG2	C vs UT	5.51576E-06	6.9318E-05	-8.980657999	19.2366	13.8717	9.98442	83.8214	73.6526	44.5992
ASB13	C vs UT	0.000358553	0.001231464	-8.979092498	0.150151	0.228573	0.339074	25.2901	26.2084	15.6376
IFT140	C vs UT	0.000328291	0.001152243	-8.959546204	2.22085	2.28798	2.18802	19.1113	25.4019	12.3065
ATP8A1	C vs UT	5.47E-06	6.90908E-05	-8.882894989	37.8897	37.4415	41.2515	8.12917	4.78248	6.63159
TLE1	C vs UT	2.87521E-06	4.71909E-05	-8.771843359	4.74273	3.59039	3.29739	0.574872	0.716905	0.740337
CD84	C vs UT	0.000354347	0.001219398	-8.765949003	21.5174	16.7113	17.2878	82.24	93.3637	51.6315
TEF	C vs UT	0.001458675	0.003724285	-8.747714797	3699.82	3292.54	4121.08	186.035	102.951	315.571
ZFP36L2	C vs UT	6.04873E-07	2.1606E-05	-8.728400453	16.525	22.1069	28.094	1.80192	3.11673	4.03624
PCNXL2	C vs UT	7.9825E-07	2.50443E-05	-8.70765146	2.85062	3.01999	3.71543	34.3525	59.0254	35.9228
PTGDR	C vs UT	5.06055E-05	0.000291982	-8.701252761	135.647	132.35	123.172	1598.25	925.556	1890.77
ALS2CR8	C vs UT	0.000382189	0.001289653	-8.692840518	31.7208	37.8286	32.6339	195.09	265.672	140.047
SESN3	C vs UT	3.98632E-06	5.71527E-05	-8.687341999	15.9655	14.9814	15.9319	2.25129	3.13612	2.54466
D4S234E	C vs UT	0.001795305	0.004421916	-8.682039537	14.3149	11.3911	17.1645	202.033	296.444	191.536
VAMP1	C vs UT	5.02955E-05	0.000290874	-8.551751421	0.690333	0.620241	1.29436	2.29919	7.66096	7.91138
STON1-GTF2A	C vs UT	0.002348415	0.005512402	-8.539221673	0.0001	0.032739	0.0617316	3.20924	9.45298	5.45935
SIGIRR	C vs UT	3.11702E-06	4.90459E-05	-8.509985035	12.0342	6.00568	9.9536	0.431179	0.224102	0.370218
CAND2	C vs UT	0.003933398	0.008480293	-8.504901774	9.05135	8.68084	9.83625	49.6813	50.5025	34.0448
LRRC45	C vs UT	0.000231241	0.000881632	-8.493718353	1.26053	2.089	2.03394	5.79572	9.09457	10.5022
RASA3	C vs UT	4.8232E-06	6.41532E-05	-8.429353916	4.33715	3.12911	4.25268	25.521	19.8467	26.6023
ABCA2	C vs UT	2.23634E-06	4.13404E-05	-8.423667678	81.3875	55.7478	56.0847	7.18475	7.79536	7.95764
TMIGD2	C vs UT	0.00081791	0.002345854	-8.288645311	51.9543	45.703	61.2982	15.865	9.7624	13.8055
TMEM8B	C vs UT	2.85334E-07	1.45207E-05	-8.283322995	24.4164	33.6409	15.091	7.14825	5.31153	5.31945
NR1D1	C vs UT	2.2928E-05	0.000170097	-8.221281988	39.6435	43.2468	40.5845	150.974	216.341	136.62
FRAT1	C vs UT	5.4904E-08	9.01285E-06	-8.167398453	10.5337	10.5496	8.47445	30.8462	58.1063	40.343
MAPK8IP3	C vs UT	0.000188202	0.000762579	-8.166847207	5.83474	7.7266	7.67004	81.1198	116.866	74.7376
CDC25B	C vs UT	4.08193E-05	0.000251274	-8.156886471	0.180161	0.359129	0.308258	2.97306	4.93581	2.22933
PLCD1	C vs UT	3.60651E-05	0.000232453	-8.122364316	9.87343	14.0675	8.25873	148.435	138.747	141.108
LOC339192	C vs UT	0.001648732	0.004125942	-8.092360902	24.0382	19.5509	13.8672	141.584	106.984	144.623
TSC22D1	C vs UT	7.80655E-07	2.48079E-05	-8.081203985	17.9162	15.9932	9.24482	88.899	51.5203	52.2795
LRMP	C vs UT	4.78842E-05	0.000279949	-8.062744091	105.674	109.153	111.743	1528.89	1500.52	1780.9
LOC400685	C vs UT	0.000710907	0.002098512	-8.026416231	15.3052	14.9815	8.07382	91.7266	50.5349	60.0517
GOLGA6L5	C vs UT	0.000189025	0.000764371	-8.006520848	1.23502	0.920647	2.49843	6.71027	10.4987	10.4728
HERC2P2	C vs UT	0.000236949	0.000897293	-7.960204541	0.24963	0.302179	0.627794	4.71891	3.706	3.53414
AHNAK	C vs UT	0.001245474	0.003272954	-7.950503805	495.266	392.156	395.674	21.9372	14.605	34.3748
PILRB	C vs UT	1.03587E-05	9.96673E-05	-7.927493147	4.59166	9.76657	4.19106	50.8196	47.1809	51.5591
ABLIM1	C vs UT	3.81E-04	0.001286268	-7.902450568	55.4289	42.4308	42.8957	5.36464	2.73292	3.05358
ZC3H6	C vs UT	2.58619E-05	0.000184963	-7.900273928	22.6577	17.6578	21.4171	3.73612	3.04652	4.44152
BCL9L	C vs UT	2.3507E-05	0.000172435	-7.75645835	23.2811	28.8288	26.1319	86.4886	130.309	141.354
ATXN7L1	C vs UT	0.002381031	0.00557609	-7.727052794	5.36479	9.72517	4.32104	33.4236	45.3493	22.2645
TAGLN	C vs UT	0.001129062	0.003030097	-7.727020619	16.8958	18.3432	17.2569	3.16135	2.28492	5.922
DFNB31	C vs UT	0.001823675	0.004478373	-7.654083972	2.5091	3.57759	3.60069	23.9131	26.3256	20.9377
CCDC109B	C vs UT	0.000148274	0.000633373	-7.572077124	10.7408	11.0647	11.3711	99.7037	121.759	73.7466
CG030	C vs UT	0.007851858	0.015224628	-7.543433758	23.3642	25.8382	24.1181	97.5375	147.049	68.7627
KIAA1324	C vs UT	0.000188501	0.000763038	-7.511006134	0.180161	0.391768	0.36989	50.7236	42.471	46.5426
TRNAN34P	C vs UT	0.000333207	0.001166508	-7.4513433	31.0907	32.4759	46.316	8.0948	6.63055	11.0111
KIFC2	C vs UT	0.001348784	0.003482828	-7.43322235	5.0418	4.9286	5.73183	26.9665	47.6232	22.4848
IFFO1	C vs UT	5.87564E-06	7.17293E-05	-7.392089221	4.26154	3.88414	4.34513	17.0517	19.8914	15.2675
LRRC37B	C vs UT	6.99436E-06	7.99263E-05	-7.385230189	9.78533	10.6036	11.5343	2.4436	2.12504	1.35673
CRTAP	C vs UT	3.76527E-05	0.000239062	-7.365990358	0.300201	1.1751	0.523968	9.24435	23.2515	5.1355
MGC23284	C vs UT	3.28732E-05	0.000218387	-7.316315852	16.3009	19.1307	20.9239	74.8456	93.1853	58.7581
COL5A1	C vs UT	0.001438948	0.003679682	-7.310856807	23.6268	22.384	22.8032	161.194	170.017	138.768
FLJ46020	C vs UT	7.15736E-05	0.000374736	-7.304296098	49.446	54.7726	54.7395	255.301	254.51	180.727
UBXN11	C vs UT	8.42644E-05	0.000419053	-7.292867565	35.202	32.7697	38.9821	5.69992	3.58413	8.37403
KIAA1147	C vs UT	3.32901E-06	5.09264E-05	-7.288834375	0.180161	0.261212	0.616416	37.935	38.0804	6.5697
MIAT	C vs UT	0.002622777	0.006034491	-7.277330886	15.9655	16.1616	16.9488	77.9583	95.1113	71.3872
LOC115110	C vs UT	0.003080515	0.006887413	-7.276040681	13.5647	15.9932	13.3433	0.670668	0.716905	0.462748
PLCL1	C vs UT	0.000173645	0.000715589	-7.210623876	23.378	23.7613	22.5265	106.812	130.499	93.1277
GCHFR	C vs UT	1.67962E-05	0.00013862	-7.18765724	5.22186	6.88693	4.56084	50.149	82.343	47.514
LRFN1	C vs UT	4.49201E-06	6.14041E-05	-7.171976016	22.8977	24.5445	25.9161	136.557	175.796	180.846
TNFRSF13C	C vs UT	8.90267E-05	0.00043733	-7.167719537	24.6384	26.1433	44.7439	4.2151	5.15214	6.19958
PLEC	C vs UT	0.001855367	0.004549856	-7.1676107	1.05045	0.848715	0.986206	11.256	7.30256	5.55187
USP13	C vs UT	2.97451E-07	1.48484E-05	-7.135320822	13.9964	5.77652	12.2982	3.01765	1.55716	1.84652
EPHB6	C vs UT	9.40468E-06	9.42761E-05	-7.088113877	12.1381	12.5008	12.093	37.3403	74.0991	36.6828
SIRPG	C vs UT	9.33134E-05	0.000452518	-7.087544211	7.83274	3.39456	4.37594	1.62862	0.761706	1.11045
B3GNT1	C vs UT	0.000553856	0.001722332	-7.086767755	5.16185	7.08277	3.38984	38.0308	62.2724	46.1262
MXD4	C vs UT	8.4742E-07	2.57992E-05	-7.055016092	216.305	241.769	185.578	49.1144	40.1344	66.2666
PKD1P6	C vs UT	0.00010175	0.000481972	-7.035231333	29.7701	29.5384	25.7929	154.854	112.763	97.7576
SNED1	C vs UT	0.000438717	0.001427653	-6.997625667	41.264	50.4601	26.0394	9.53174	5.73452	6.4309
SGSM2	C vs UT	9.72771E-07	2.67823E-05	-6.971587261	46.035	36.7478	36.4606	10.7073	6.233	12.5202
SAMD3	C vs UT	0.000135584	0.000592188	-6.960767395	25.4784	26.025	32.9791	160.51	190.782	191.376
CRTAM	C vs UT	0.000914233	0.002560185	-6.903829821	134.506	142.24	138.216	2023.55	1811.09	2177.76
PRX	C vs UT	0.000337655	0.001178398	-6.87238263	13.8948	13.6759	12.9735	80.8993	73.6071	69.3047
CYP4F22	C vs UT	0.001276618	0.003337721	-6.815275812	6.2122	6.1036	9.49137	1.38913	1.79211	1.5731
CEP68	C vs UT	2.15329E-05	0.000163687	-6.803269174	37.2729	40.4398	46.7478	186.326	243.761	178.995
TMEM204	C vs UT	3.23785E-05	0.000216531	-6.780484999	9.23133	10.3424	12.1288	0.876214	0.806486	2.26707
RALGPS1	C vs UT	0.000380267	0.001285981	-6.70684922	10.3836	10.9015	14.6068	44.7366	31.898	74.8107

TNK2	C vs UT	6.59527E-06	7.70803E-05	-6.675138233	2.73102	2.41539	2.52699	0.766463	0.268902	0.740337
SLC35E2	C vs UT	4.8803E-06	6.48428E-05	-6.631787425	8.04282	6.91957	12.727	1.29334	0.716905	1.89696
RBPMS	C vs UT	0.001154957	0.003085725	-6.612025089	71.8507	88.2107	139.81	831.072	948.733	1116.73
LOC100129387	C vs UT	4.70989E-05	0.000276802	-6.588163078	159.211	129.659	150.131	40.4733	20.6522	28.7305
CAPRIN2	C vs UT	0.000132143	0.000581694	-6.553083127	24.6681	25.202	25.916	3.13346	2.51379	5.49242
TMEM71	C vs UT	1.45629E-06	3.31292E-05	-6.544177535	6.55632	4.20313	3.12573	0.76828	0.437004	1.03953
ATP1A3	C vs UT	1.35E-04	0.000590182	-6.526569899	1.72432	1.48562	2.23666	16.8839	9.29873	13.2567
SLAMF6	C vs UT	1.11948E-07	9.93148E-06	-6.478958582	6.18218	5.90777	4.59166	32.5226	19.6226	24.798
ECHDC2	C vs UT	4.33692E-06	6.02866E-05	-6.466299652	77.936	84.275	88.4106	2276.54	1816.36	2080.31
PCMTD2	C vs UT	2.42369E-06	4.35854E-05	-6.4611842	1.14049	0.750798	5.55259	18.9674	17.336	42.0269
RHPN1	C vs UT	0.000164804	0.000684416	-6.442512025	3.18983	4.44397	2.08068	15.0917	26.2623	10.3971
ZNF204P	C vs UT	9.81656E-06	9.6368E-05	-6.418532806	0.863921	0.167165	1.15403	5.86335	8.24343	3.9571
AQP3	C vs UT	6.76E-03	0.013440879	-6.404976386	5.21591	4.20471	4.31302	19.2473	23.4818	15.6937
THRA	C vs UT	2.71765E-06	4.57535E-05	-6.394335907	2.58097	1.99108	3.42065	50.7719	11.6034	65.0945
IGFBP4	C vs UT	0.009439891	0.017797226	-6.389839466	40.3297	38.1224	38.5734	8.09481	5.68946	9.26311
THBS3	C vs UT	0.000228892	0.00087484	-6.368754688	52.0677	41.9087	189.55	1.19754	0.851306	2.22081
LOC100129196	C vs UT	0.001379592	0.003548262	-6.361625897	1.02044	0.359129	1.20192	3.83191	8.69137	7.03235
CTSA	C vs UT	5.90662E-05	0.000326586	-6.329909906	177.404	133.121	102.281	28.1512	18.1428	20.91
ATM	C vs UT	4.58E-06	6.20236E-05	-6.323800045	80.9075	97.2306	102.178	1268.63	1054.87	1177.77
LOC388692	C vs UT	0.00021741	0.000841226	-6.314654704	19.0565	15.8627	12.8503	1.10175	1.34411	1.11046
PCYOX1	C vs UT	0.000119267	0.000545057	-6.268003738	23.735	22.871	27.2388	1.48493	0.582504	1.38804
F2R	C vs UT	2.69234E-05	0.000189912	-6.258076874	22.8378	23.3696	23.3255	120.99	134.579	116.819
CPT1A	C vs UT	1.9078E-06	3.72793E-05	-6.227677312	2.32401	2.22512	2.88912	12.7608	16.6781	12.8551
S1PR1	C vs UT	0.001805859	0.004444567	-6.227059485	8.55998	9.34578	11.1862	43.8763	72.9903	48.5511
KIF3C	C vs UT	8.39269E-05	0.000418447	-6.218867063	15.9566	10.2691	8.34481	2.74654	2.20793	2.07067
GOLGA8A	C vs UT	0.000464082	0.00149559	-6.218482037	10.9924	15.1329	23.1925	98.9157	104.12	121.311
TMC8	C vs UT	7.91481E-05	0.0004021	-6.188673225	89.9729	69.3333	73.8527	15.676	5.26429	15.9832
LOC678655	C vs UT	0.003267205	0.007250655	-6.18545571	2.03489	1.78969	1.84137	15.2346	12.5582	16.9678
LEPREL2	C vs UT	0.001051443	0.00285746	-6.182790368	55.6686	54.2138	53.4036	16.1416	9.18417	14.5735
SESN1	C vs UT	8.12625E-07	2.52552E-05	-6.173735398	23.3181	20.1057	25.0226	5.46044	5.15213	6.15332
NPTXR	C vs UT	0.001871603	0.00458147	-6.167531254	34.4217	44.2586	44.5289	4.69407	4.12173	5.36682
EVL	C vs UT	4.20241E-05	0.00025525	-6.142582791	191.309	201.984	212.218	783.106	863.66	808.856
MCART6	C vs UT	0.000194889	0.000779616	-6.136489087	11.8241	12.9578	11.7101	46.5087	54.2983	46.4036
AHSA2	C vs UT	1.46E-04	0.000626655	-6.125904592	19.8368	22.3578	31.9871	0.718565	0.851306	2.40587
FAM125B	C vs UT	1.07256E-05	0.0001022	-6.117351535	26.4654	28.8529	32.3033	96.7814	166.388	103.681
TNK1	C vs UT	0.004882111	0.010139199	-6.108996738	3.00775	2.69018	3.49622	20.7099	9.83755	38.0068
SYNE1	C vs UT	3.70058E-05	0.000236613	-6.075825028	0.0901304	0.065378	0.246626	0.910156	0.806506	0.786601
SBK1	C vs UT	0.000353395	0.0012168	-6.056930295	26.6405	29.9325	28.2615	1080.52	1147	585.818
BTBD11	C vs UT	5.10835E-06	6.64534E-05	-6.036334384	0.840384	0.880185	0.321438	4.98146	5.82414	5.69067
LTBP3	C vs UT	1.58542E-06	3.44691E-05	-6.004838393	17.256	16.9398	23.4508	0.958054	0.806506	2.26707
BTBD2	C vs UT	6.51182E-06	7.63947E-05	-5.96537048	17.1359	17.6905	18.3971	74.4811	124.32	76.0595
CCDC136	C vs UT	0.001567402	0.003951353	-5.958393926	3.51129	4.27581	4.0986	16.0937	24.8195	14.3422
FDXR	C vs UT	0.001320509	0.00342993	-5.94960722	41.5972	39.1222	39.5658	163.306	335.373	188.691
ZNF792	C vs UT	0.002721241	0.006215803	-5.925655063	6.33224	8.97583	8.13549	1.10175	2.24012	1.11045
REEP6	C vs UT	4.51877E-06	6.15113E-05	-5.918297487	45.5622	65.5996	79.4314	359.195	363.321	405.712
ZNF226	C vs UT	2.24044E-07	1.32572E-05	-5.910024359	5.13183	6.49527	10.4467	0.0958954	0.358503	0.555277
CA11	C vs UT	7.47639E-06	8.31984E-05	-5.908315655	0.450252	0.359129	0.215811	7.37634	13.7538	3.88634
SPOCK2	C vs UT	0.001167265	0.003111822	-5.890636054	10.1435	4.79804	7.24181	0.383281	0.0897007	1.98949
ZFYVE9	C vs UT	0.000256326	0.000951571	-5.857311307	12.1584	5.63356	3.17585	2.50219	1.59971	0.727938
PYCARD	C vs UT	0.004328437	0.009181082	-5.848964164	14.9151	15.112	17.2878	1.82021	4.03213	3.37909
AGAP1	C vs UT	0.000154111	0.000650972	-5.843125281	26.1657	26.6758	21.4305	6.09376	5.41732	4.90417
LOC390595	C vs UT	0.000156084	0.000657505	-5.781891563	25.1185	25.0342	26.6246	95.5067	139.955	80.0383
GGT7	C vs UT	7.60622E-06	8.39884E-05	-5.762738185	34.0018	39.2649	34.2982	257.023	212.406	228.08
LOC153684	C vs UT	0.005326625	0.010922549	-5.723357296	0.431559	0.753864	0.44023	1.53821	3.20732	2.63016
MTRNR2L2	C vs UT	0.001459206	0.003724285	-5.713984281	46.2455	47.7513	42.2485	4.45458	3.89773	3.97887
ZC3HAV1L	C vs UT	0.004338364	0.009195811	-5.690167685	48.8269	46.2175	42.7724	7.85532	3.40492	19.5701
SAMD12	C vs UT	0.005677596	0.011542416	-5.642972486	90.3973	100.039	104.342	546.279	641.866	526.25
LOC642852	C vs UT	0.002163366	0.005147237	-5.638213655	59.0516	40.1691	23.4568	2.68237	2.46412	3.46996
TRIM66	C vs UT	0.00092538	0.002583771	-5.609786373	13.6547	15.5036	14.237	2.25129	2.24012	1.52684
PATL2	C vs UT	0.000257191	0.000952875	-5.598705299	32.411	35.185	48.9356	457.472	472.777	556.983
CYP2U1	C vs UT	0.000143413	0.000618498	-5.592652974	54.7089	67.7258	81.2004	11.735	8.69137	12.8617
ATP10A	C vs UT	9.69E-06	9.57049E-05	-5.590864441	5.22186	4.24317	6.59468	86.3596	45.2934	65.141
CROCC	C vs UT	0.000135029	0.000590182	-5.563785673	7.45809	9.91398	7.36508	38.8866	44.6103	43.0736
NELL2	C vs UT	0.00519195	0.010680138	-5.536036545	164.308	187.674	181.166	758.579	990.808	1154.08
TJP3	C vs UT	0.000600557	0.001836848	-5.511278767	9.39328	7.63763	4.71491	0.62277	0.313702	1.34178
TRAM2	C vs UT	0.000271399	0.000991512	-5.499977707	1.68067	0.881354	1.97231	4.45458	8.55696	7.44873
CACNA2D2	C vs UT	0.000120982	0.000549318	-5.488664756	13.4596	12.4833	17.5308	43.0293	79.2732	63.7931
SCRN2	C vs UT	1.8612E-06	3.66991E-05	-5.485680722	5.90989	5.13913	4.08074	35.2182	22.5259	23.2602
DHRS1	C vs UT	5.43416E-05	0.000308144	-5.448402263	4.72871	4.01937	2.52699	17.4828	23.2105	9.66655
TCTN1	C vs UT	6.67792E-05	0.000357107	-5.427882185	0.180161	0.228573	0.0925474	12.4535	4.83854	266.161
CCDC64	C vs UT	0.000334016	0.001167684	-5.427600688	2.18888	1.89316	1.60159	5.55203	11.4669	8.18897
POLG2	C vs UT	7.35251E-05	0.000381872	-5.415640248	16.1155	10.8363	9.09076	1.62862	3.09132	3.19237
RRN3P1	C vs UT	0.004640295	0.0097238	-5.412214166	0.323646	0.701979	0.91303	4.08099	6.39554	2.83506
B3GNTL1	C vs UT	0.000159153	0.000666787	-5.398563269	55.8807	70.7896	59.9383	281.904	342.661	258.365
CDHR1	C vs UT	0.000540826	0.001693773	-5.39774669	0.379507	0.561984	0.434715	2.24672	1.78879	2.20889
LOC400986	C vs UT	0.009538133	0.017944032	-5.394554369	13.6847	12.6533	11.1246	102.404	205.753	131.732
STARD9	C vs UT	4.07895E-05	0.000251216	-5.390410628	10.9538	11.0974	7.70405	1.58072	2.37452	2.40587
PLAC8	C vs UT	1.74122E-05	0.000142114	-5.387554864	26.1525	26.9925	21.8877	102.389	99.1297	109.379
ACER2	C vs UT	7.60E-05	0.000391186	-5.387074484	17.2859	13.0883	12.7887	0.431179	0.537704	0.97166
FAM8A1	C vs UT	0.000124737	0.000557857	-5.369910699	0.304696	0.55546	0.477087	2.05237	4.28282	2.51736
EPHA4	C vs UT	0.006363096	0.012770259	-5.369176408	6.98622	7.84356	6.90284	68.4937	77.0119	57.6922
MAP2K6	C vs UT	0.000998858	0.002745413	-5.349601684	51.8568	65.7022	49.5829	382.119	313.122	417.402
LTB4R	C vs UT	4.06825E-06	5.8074E-05	-5.327278131	15.1852	17.6578	13.9905	1.82021	1.16491	1.66563
ZNF276	C vs UT	1.26741E-06	3.09809E-05	-5.319826218	19.3118	10.5667	5.12084	1.93523	0.403475	1.41191
MALAT1	C vs UT	0.001644467	0.004117846	-5.318233378	6.60357	7.86663	6.23089	26.5073	53.1162	35.0705
CALHM2	C vs UT	0.001540689	0.003891172	-5.304724818	35.4423	56.1354	33.71	431.354	764.007	373.085
TBC1D10C	C vs UT	2.14715E-05	0.000163687	-5.294905039	14.6561	12.8658	7.12763	1.78094	0.888441	1.68347
LAX1	C vs UT	2.12416E-06	3.99861E-05	-5.278176819	5.34191	3.72095	5.8551	19.7339	32.3011	13.8333
IRS2	C vs UT	7.91416E-06	8.55979E-05	-5.275151243	3.03112	2.83969	3.45147	12.4535	17.965	11.1037
ZNF554	C vs UT	0.00012306	0.000554376	-5.265471682	23.2972	13.051	27.1937	3.54453	1.61291	6.00953
CAPN12	C vs UT	0.000665199	0.001987376	-5.260246387	73.5853	65.5718	67.7952	8.14271	4.34573	7.40246
PDXDC2	C vs UT	0.007393419	0.014490679	-5.241358714	9.21322	9.36751	9.79952	42.5331	38.5283	66.8046
PLEKHG3	C vs UT	4.55854E-05	0.000270802	-5.232258135	23.9182	17.4294	23.9132	4.2151	4.12173	4.71911
LOC100131564	C vs UT	0.000201408	0.000798508	-5.232177857	17.346	21.5745	21.8177	93.7359	101.831	80.0844
MIB2	C vs UT	1.96238E-05	0.000154509	-5.173620585	12.2742	16.0911	12.6038	71.2718	95.8285	55.0087
TANC2	C vs UT	0.000578259	0.001782039	-5.147554277	3.99145	4.27581	6.53305	0.431179	0.672105	0.462748
C3AR1	C vs UT	9.0614E-07	2.63806E-05	-5.144986393	118.719	91.0303	119.813	11.735	11.8274	16.8405
ADAM22	C vs UT	0.005031537	0.010414445	-5.14226907	0.690333	0.750798	0.369889	3.16135	6.13775	3.42369
SUV420H2	C vs UT	0.001406083	0.003611122	-5.13000073	51.1373	50.6884	85.3591	10.6334	4.65934	19.5701
TPCN1	C vs UT	3.31914E-05	0.000219909	-5.125406721	34.1817	43.6385	20.0304	147.619	108.017	157.116
SMAD3	C vs UT	0.000346531	0.001198523	-5.118556852	18.1562	13.1863	11.9566	2.34709	1.29931	2.96105
POU6F1	C vs UT	2.54098E-05	0.000182471	-5.118140703	1.27222	1.94995	1.54037	8.44229	10.9439	7.04459
ADAM1	C vs UT	2.70E-04	0.000987082	-5.098992568	6.75238	7.605	7.05692	28.6429	38.9316	32.2004

TMEM107	C vs UT	0.002717317	0.006210235	-5.0784407	7.32257	4.73276	3.45147	0.766463	0.851306	1.06419
MAN1B1	C vs UT	9.52949E-06	9.4939E-05	-5.077604975	20.1969	21.4114	17.9966	117.301	128.307	97.5722
TTC12	C vs UT	8.42864E-05	0.000419053	-5.065781778	7.68913	7.57236	8.99254	0.799925	0.432015	2.91478
GDPD5	C vs UT	2.08165E-05	0.000160618	-5.064629157	25.123	24.5774	41.3148	8.85355	6.72015	6.52322
ABHD15	C vs UT	7.16E-06	8.1195E-05	-5.062312203	89.1805	80.7258	101.259	18.7334	13.1157	21.7164
PAIP2B	C vs UT	0.000159273	0.000666837	-5.05493039	130.327	127.183	139.136	24.8153	26.5931	32.9605
LOC729683	C vs UT	7.56828E-06	8.38427E-05	-5.047135292	52.5522	41.527	32.7537	5.24687	4.21949	6.53276
FLT4	C vs UT	4.76679E-05	0.000279214	-5.039938715	1.74827	0.790805	1.39953	176.537	216.847	150.125
HSBP1L1	C vs UT	0.000164267	0.000682878	-5.028191367	1.68067	2.5133	1.78742	6.94526	10.0354	8.79041
CROCCP2	C vs UT	0.002785789	0.006343264	-5.026530121	11.6683	12.6937	9.09023	142.838	98.8086	131.39
ANXA1	C vs UT	7.10E-04	0.002097724	-5.021547874	20.6771	27.6452	19.6914	112.944	188.7	121.259
FAM117B	C vs UT	8.66131E-05	0.000427459	-5.007545967	0.210171	0.522324	0.986205	7.85532	12.4546	13.5094
AMDHD2	C vs UT	1.61034E-05	0.00013434	-4.999285337	6.15218	5.38554	10.6624	69.308	68.2758	72.1304
TACC3	C vs UT	2.38144E-05	0.000174055	-4.998546144	3.06113	3.23136	2.89678	0.143793	1.03051	0.370218
SLC27A1	C vs UT	0.000298607	0.001070166	-4.994472764	80.7288	97.46	147.237	10.9208	11.1106	28.7768
PGAP3	C vs UT	3.74952E-06	5.50586E-05	-4.991960865	1.1705	1.9258	1.69497	8.478	11.5138	12.8155
STARD5	C vs UT	1.05533E-05	0.000100948	-4.967754802	42.7345	22.521	12.9427	5.22095	2.86732	2.12828
DYRK2	C vs UT	1.38019E-06	3.23532E-05	-4.962507995	0.330248	0.391768	0.308258	4.5224	3.40832	3.88805
CRIM1	C vs UT	0.000119938	0.00054711	-4.931699844	6.79097	5.09289	7.90373	45.8682	71.0169	56.0604
RNF168	C vs UT	3.95029E-06	5.69259E-05	-4.923991992	0.780363	0.848715	0.770495	4.98146	7.43695	2.77599
MZF1	C vs UT	1.30571E-05	0.000117599	-4.920966079	5.85207	14.3613	5.67021	50.3886	51.0724	58.3863
SNX33	C vs UT	0.000198979	0.000790911	-4.895303657	10.5037	11.8154	11.8025	1.86811	1.20971	4.44152
TMC6	C vs UT	9.59756E-06	9.53088E-05	-4.885886993	0.240181	1.5015	2.06476	6.03521	27.3283	13.2318
NLRC3	C vs UT	3.8696E-05	0.000242894	-4.88560596	14.8852	17.8536	12.1415	104.368	128.579	77.1234
POLI	C vs UT	0.000240317	0.000907672	-4.88087386	14.8851	15.5689	16.3017	174.205	198.913	159.523
CAMKK1	C vs UT	0.000626994	0.001898079	-4.877924605	0.990434	0.424407	1.04784	5.98731	5.68974	6.75476
YPEL2	C vs UT	0.00133557	0.00345667	-4.839069213	8.82308	8.38834	9.21402	1.53283	0.940907	2.72972
TCP11L2	C vs UT	2.38532E-06	4.30265E-05	-4.835775971	6.63233	17.8537	5.08471	0.431179	1.03051	0.185159
ASPH	C vs UT	1.31492E-05	0.000117924	-4.781453587	50.5972	61.6879	31.4014	375.39	286.015	246.453
MPPE1	C vs UT	1.83369E-07	1.2631E-05	-4.763941581	0.720343	0.522324	0.554784	3.73612	3.85293	2.44823
BTLA	C vs UT	0.000767609	0.002228018	-4.756325603	38.443	36.2619	43.6042	125.492	203.127	150.174
TRNAN35	C vs UT	1.8348E-05	0.000147382	-4.75462835	12.7244	12.5335	10.0769	2.0597	1.84857	3.33117
SLC27A3	C vs UT	0.000135835	0.000593074	-4.75258476	9.96347	6.52791	11.8642	0.814361	0.492904	1.85069
NBPF15	C vs UT	0.000269023	0.000983703	-4.741614793	47.2963	48.5343	49.7368	11.9745	9.67697	7.91138
ZNF846	C vs UT	0.008716941	0.016640329	-4.726790545	24.8186	22.88	56.0534	6.75368	3.58413	7.17114
NRBP2	C vs UT	0.003801204	0.008249312	-4.721313905	2.88107	3.62303	2.52699	449.944	228.844	476.487
MSX2P1	C vs UT	8.63627E-05	0.000426623	-4.715796083	8.26438	7.01493	8.54361	26.4096	48.5823	27.562
LOC613037	C vs UT	0.009245953	0.01749311	-4.712326114	2.43092	2.74178	3.08168	11.1603	16.621	12.3065
SLC35E2B	C vs UT	8.40881E-06	8.80249E-05	-4.701333536	8.54144	3.56781	7.19997	1.15421	0.778712	1.64382
DHX58	C vs UT	0.001118416	0.003006992	-4.677677023	16.2334	18.2127	24.4062	70.3619	131.757	96.8789
WDR27	C vs UT	1.46937E-05	0.000126389	-4.673737085	10.7384	8.64813	3.96135	0.850714	1.23261	0.938265
RORC	C vs UT	0.000134363	0.000588105	-4.669374675	0.990434	1.14247	1.1711	5.46044	10.1698	4.25646
ENG	C vs UT	0.000326147	0.001146247	-4.668605857	1.80071	0.913993	2.52699	72.7083	34.0932	95.4439
CXXC5	C vs UT	0.000980262	0.00270032	-4.648638607	29.0199	35.8703	28.3815	216.593	173.109	150.037
ADRB2	C vs UT	2.46E-05	0.000177771	-4.63986948	1.04408	1.26977	1.2186	22.2111	19.183	28.4503
RAB40B	C vs UT	8.53986E-05	0.000423081	-4.629544055	8.49297	8.15986	7.35732	0.479077	0.492904	1.11045
GNB5	C vs UT	0.000305287	0.001088231	-4.617757446	756.569	911.689	1137.84	273.216	192.915	209.899
LOC100132984	C vs UT	0.001803192	0.004439568	-4.609670591	1.29054	2.05636	1.87986	5.02936	14.7842	8.60536
MICAL2	C vs UT	0.00059671	0.001827479	-4.600918804	5.4516	5.44374	5.47076	55.52	77.044	48.7715
DDB2	C vs UT	5.72824E-06	7.09014E-05	-4.58742127	2.52095	3.13345	2.49618	25.5296	15.5458	19.6626
CHN2	C vs UT	0.001943694	0.004721385	-4.587410832	15.3053	14.5897	12.6654	42.6291	83.8217	48.717
FAM159A	C vs UT	6.16516E-05	0.000336351	-4.586781478	0.0301101	0.195934	0.154179	17.6264	17.741	18.6911
CAMK2G	C vs UT	2.49339E-05	0.000179892	-4.58434918	0.270191	0.163295	0.215811	9.43593	13.8434	11.52
TFDP2	C vs UT	5.26879E-05	0.000300482	-4.579075078	0.145849	1.58283	0.802544	5.42183	6.4457	2.86158
ANKAR	C vs UT	2.30765E-05	0.000170891	-4.568806999	2.19084	6.62582	1.63334	37.5039	33.7348	52.9272
LOC283070	C vs UT	3.95152E-05	0.000245948	-4.56241973	22.5077	28.8857	23.7283	158.253	152.277	131.115
SFXN3	C vs UT	0.000115441	0.000532109	-4.560800704	10.7592	10.1372	8.87079	2.37392	2.01487	2.74347
ZNF831	C vs UT	0.000153877	0.00065043	-4.558237497	17.9389	14.1236	5.35481	3.56326	3.28211	2.40587
TARBP1	C vs UT	8.29494E-05	0.000415252	-4.555249398	49.1967	32.9862	26.903	11.7535	4.4416	10.8112
CKAP2	C vs UT	0.000394168	0.00131817	-4.55188015	2.76103	4.70012	2.03394	200.307	174.854	146.475
CD300A	C vs UT	0.002599216	0.005993704	-4.537851942	0.420242	0.522324	0.770495	9.91492	18.8162	9.5381
AKAP8L	C vs UT	3.96127E-06	5.69259E-05	-4.524576143	67.5094	63.4888	66.0452	294.669	282.428	359.14
FLJ35390	C vs UT	9.1107E-05	0.000444187	-4.49697461	14.1649	22.4232	15.7469	290.564	527.825	212.637
HDAC5	C vs UT	4.14982E-06	5.85072E-05	-4.489697953	3.7941	3.39539	3.58462	21.415	26.9499	18.4047
TRERF1	C vs UT	0.00305316	0.006838413	-4.470168566	0.150151	0.0980171	0.647232	4.98146	3.89773	12.0289
ACBD4	C vs UT	0.000387912	0.001304323	-4.457072443	1.41058	1.56677	1.66415	7.23265	7.43696	9.90078
KLHL24	C vs UT	9.11875E-06	9.26147E-05	-4.438549996	4.98474	5.45578	3.3521	22.3326	37.0637	19.6605
EIF2C4	C vs UT	2.16211E-05	0.000163943	-4.429882827	31.7123	41.2424	44.9294	238.411	212.576	267.464
PRKCA	C vs UT	1.03391E-06	2.76532E-05	-4.428673187	1.35619	1.46487	1.87041	7.99855	7.36531	9.00039
CD5	C vs UT	0.000370177	0.001263293	-4.416845061	7.74271	8.94319	6.71794	44.066	53.7605	36.3642
FAM46A	C vs UT	1.82284E-05	0.000146708	-4.402713358	5.49196	5.67929	3.88289	15.3753	25.5363	19.3388
TBCD	C vs UT	9.31517E-05	0.000452011	-4.39754401	4.68168	3.62303	4.00615	0.479077	1.03051	1.43431
SLC25A45	C vs UT	0.000142665	0.000616133	-4.395882259	65.6023	63.744	44.7445	13.9862	5.60014	15.0824
CRTC1	C vs UT	2.34021E-07	1.34957E-05	-4.388751426	10.0535	15.014	10.2519	1.43703	1.92651	1.61937
MAGEE1	C vs UT	6.22681E-05	0.000339049	-4.381589624	3.06113	3.16608	2.43455	10.1544	18.861	14.2497
ZNF528	C vs UT	0.000872493	0.002470794	-4.381509073	0.570293	0.587602	0.400705	1.53283	5.64494	11.8902
PARP10	C vs UT	5.44649E-05	0.000308476	-4.381482104	49.7569	76.3427	67.3327	424.188	375.475	532.141
LOC440104	C vs UT	0.003171437	0.007073772	-4.366093826	0.420242	1.18593	0.832126	5.07901	10.0106	5.90899
PLD1	C vs UT	0.000522425	0.00164534	-4.364238384	50.6736	60.8344	52.6836	304.931	375.509	285.192
CLDN15	C vs UT	0.000108138	0.000504863	-4.36111314	194.194	203.341	216.759	45.7424	34.0932	43.9515
TRIM3	C vs UT	0.002979788	0.0067033	-4.341473471	13.9983	6.35777	5.42553	2.67487	1.58077	2.10709
TTC16	C vs UT	0.005832501	0.011822249	-4.341302424	3.8714	2.72063	2.15547	0.910156	0.492904	0.647807
DUSP1	C vs UT	5.88395E-05	0.000325844	-4.336869229	19.5376	18.7433	19.3884	231.239	154.541	182.42
MLLT3	C vs UT	4.38345E-05	0.000263263	-4.332790348	4.16395	4.43093	4.3319	22.5259	27.6923	23.9479
TSC22D3	C vs UT	4.47892E-06	6.13964E-05	-4.325071447	28.1796	63.8091	94.8812	0.239588	0.672105	0.740337
MPP1	C vs UT	0.001857001	0.004552051	-4.321336228	14.435	10.9994	12.4805	228.287	175.574	155.17
TK2	C vs UT	0.001792937	0.004416967	-4.31929076	10.2636	5.88503	3.68827	1.65237	0.409105	0.664854
CLK4	C vs UT	1.20737E-06	3.00746E-05	-4.309237052	21.2208	14.313	12.8195	2.77817	2.01612	2.68346
CLSTN3	C vs UT	5.79303E-06	7.12855E-05	-4.297700973	13.5433	13.5468	24.3921	76.7602	95.5653	113.198
ENGASE	C vs UT	3.47046E-05	0.000225452	-4.278957799	12.9945	14.7529	18.2739	1.77231	0.851306	2.26707
ACSS1	C vs UT	6.97E-05	0.000367247	-4.272656664	14.615	13.5453	19.2908	60.1117	62.4521	74.3012
PLEKHF1	C vs UT	0.000239057	0.000904163	-4.269532168	17.9128	13.6732	12.6254	88.9125	122.864	84.4208
RAB37	C vs UT	0.000595372	0.001824736	-4.265271759	36.6054	38.3309	43.9578	529.372	449.166	507.361
ANO8	C vs UT	2.32E-04	0.000884623	-4.237234353	197.136	189.023	160.626	38.4796	19.7635	28.2216
AMOT	C vs UT	6.38E-04	0.001922016	-4.231349411	61.1003	48.5671	39.5058	149.583	299.621	169.56
TLE2	C vs UT	0.000936501	0.002605383	-4.226800294	17.0914	11.3502	6.36259	1.37345	1.009	1.91841
SLA2	C vs UT	6.02107E-05	0.000331132	-4.224837329	4.38158	3.65567	2.65026	1.00595	0.627305	0.462748
FLJ32255	C vs UT	0.0008835	0.002494516	-4.224058625	8.02836	10.1703	6.28354	168.963	162.356	214.763
ZNF692	C vs UT	6.09413E-05	0.000333958	-4.215227165	7.26256	9.26959	10.6599	1.53283	1.12011	1.98949
CCL5	C vs UT	0.000342229	0.001187304	-4.185960163	10.5637	10.6078	5.76265	52.6396	59.5843	42.61
RABGAP1L	C vs UT	2.50568E-06	4.41357E-05	-4.183277185	0.180161	0.979277	0.154267	3.2576	4.39053	2.8686
NLGN2	C vs UT	1.2228E-06	3.03364E-05	-4.18213092	14.2728	19.4958	14.2275	88.0231	83.9825	86.8363
HPCAL4	C vs UT	0.007370059	0.01445753	-4.181831784	18.9427	21.3783	20.4429	113.895	139.512	105.716

ZNF446	C vs UT	6.41569E-05	0.000348023	-4.173591714	29.5598	23.7936	45.3611	9.34014	4.12053	6.9388
TP53TG1	C vs UT	0.001361296	0.003507057	-4.171760056	28.9	24.8383	13.5591	2.63447	1.16491	3.09984
SLC25A23	C vs UT	0.000276497	0.001006558	-4.164317746	8.35818	5.70608	3.9307	1.54772	1.2602	1.43895
MAP3K12	C vs UT	4.08952E-05	0.000251615	-4.159468169	19.059	20.5319	22.0276	101.069	133.203	105.365
LAPTM5	C vs UT	8.37825E-05	0.000418065	-4.150853105	2.43092	6.95221	5.20796	48.2327	69.4408	62.643
IDUA	C vs UT	5.13669E-05	0.000294858	-4.149389665	92.6716	88.1259	96.3307	12.0224	3.22572	9.90077
TPRG1	C vs UT	0.000695285	0.002059794	-4.145954868	20.167	12.9252	28.9053	2.29919	2.01611	5.73693
BZRAP1	C vs UT	0.000630828	0.001905465	-4.140330411	5.79206	6.13624	5.51613	246.626	226.153	252.56
RBL2	C vs UT	5.7064E-05	0.000318515	-4.138832921	28.2697	27.9065	27.0872	104.896	141.03	119.917
RAD54B	C vs UT	3.27383E-06	5.03949E-05	-4.136935034	65.0012	74.4498	40.6765	435.565	581.848	644.209
SEMA4C	C vs UT	0.001249006	0.003280138	-4.133354656	7.44261	7.11541	10.2618	0.383281	0.358503	0.416483
KIAA0513	C vs UT	3.08504E-05	0.000209348	-4.118907435	111.788	106.992	146.374	18.1533	16.4866	17.1181
CREB3L4	C vs UT	5.87739E-05	0.0003257	-4.117435553	4.62166	5.02651	10.385	62.2196	58.8677	61.5785
LOC728535	C vs UT	0.004954125	0.010273185	-4.114253101	54.129	58.4646	22.6386	735.61	449.9	353.793
CDC14B	C vs UT	0.001203216	0.003189091	-4.100041703	30.5204	42.2674	30.8159	280.008	437.072	241.125
NEO1	C vs UT	3.40949E-06	5.15184E-05	-4.092452302	18.3363	17.5599	15.9935	81.5214	68.679	81.1947
ZMYM3	C vs UT	7.77853E-07	2.48079E-05	-4.082478641	31.1206	17.6905	19.6606	1.48493	0.716905	3.56249
PKD1P4	C vs UT	0.006156503	0.012411654	-4.051968003	25.0681	24.6795	27.1269	128.006	218.874	132.011
CNNM3	C vs UT	2.63817E-06	4.53676E-05	-4.048598153	1.50061	1.3383	1.94149	7.80742	12.1858	5.6444
ZNF862	C vs UT	3.08224E-05	0.000209327	-4.047576909	86.0992	93.6415	86.9006	20.8835	11.3346	26.2785
ZNF767	C vs UT	0.009594098	0.01803281	-4.044565382	18.3063	16.7766	16.5174	5.17305	1.79211	4.81164
TRIM52	C vs UT	6.23382E-06	7.45519E-05	-4.039792266	16.4717	15.1189	8.05572	2.43767	1.43749	1.76023
GOLGA8B	C vs UT	0.002655178	0.006093121	-4.039277866	1.19944	1.93414	3.13427	10.1969	12.3377	11.2289
SYNE2	C vs UT	0.001763069	0.004359006	-4.037083733	7.29331	7.75496	4.34724	1.39089	0.358503	0.368258
LOC729678	C vs UT	0.000204807	0.000807311	-4.031039763	149.936	153.35	229.563	11.2493	8.73617	17.992
CCDC85C	C vs UT	0.000112447	0.000521415	-4.030769913	59.9004	68.9993	53.373	351.096	295.906	295.137
NUDT7	C vs UT	0.007040824	0.013896808	-4.02270954	52.3377	45.9558	44.683	310.67	195.601	456.076
MYO1F	C vs UT	0.000372565	0.001268284	-4.018745022	14.1349	17.5272	13.7131	52.6876	64.0194	65.1871
CBFA2T2	C vs UT	3.22769E-05	0.000216511	-4.018040585	0.750353	1.01191	1.84905	5.89152	16.845	7.12487
THAP8	C vs UT	0.00036914	0.001260104	-4.011506509	11.1939	10.314	12.6038	1.24544	1.07531	2.22081
DPYSL2	C vs UT	3.64142E-05	0.000233633	-4.0080371	219.614	200.027	227.501	2424.68	1923.82	1961.16
NOD1	C vs UT	1.02714E-05	9.93302E-05	-4.006113155	11.524	13.6106	11.3095	113.614	141.971	72.543
DYNC2H1	C vs UT	0.00261285	0.006016143	-4.004793183	1.78198	1.40928	1.51489	20.81	14.2727	15.6174
LOC387895	C vs UT	7.5511E-05	0.000389866	-4.001295937	13.1145	21.9009	12.6654	119.313	230.676	157.069
PARP15	C vs UT	0.000220679	0.000850513	-4.001175419	0.630313	1.72997	0.708863	29.0261	33.1076	35.5777
LOC644584	C vs UT	0.001566682	0.003950346	4.000906681	1.26457	1.3571	1.58618	3.90754	8.41549	6.69141
HPRT1	C vs UT	3.48357E-05	0.000226065	4.002244984	6.25381	5.26894	6.58911	26.9666	28.6597	29.7634
NDUFAF1	C vs UT	0.000179628	0.000735328	4.005183717	2.52095	2.79908	3.62436	13.1979	16.6229	13.618
RDX	C vs UT	1.49511E-06	3.37571E-05	4.00866948	1.74779	4.05431	5.32087	16.0016	17.0587	25.3061
LOC643276	C vs UT	6.63708E-05	0.00035627	4.013149355	69.5886	61.2636	64.6913	9.14893	7.92984	13.1856
GOLT1B	C vs UT	6.44527E-06	7.60235E-05	4.014363618	22.677	23.4689	24.3019	170.82	135.047	175.897
ATP6V0B	C vs UT	1.33354E-05	0.000118805	4.014817886	3.09122	3.83501	5.10663	12.6068	27.3932	16.3979
SLC25A22	C vs UT	0.000467939	0.001505659	4.023673209	0.780364	0.135325	0.678047	2.63447	2.39027	2.31334
PSMC6P1	C vs UT	9.57123E-06	9.5172E-05	4.024262042	137.162	100.768	102.345	8.53787	4.13499	8.05629
SRFBP1	C vs UT	3.02967E-05	0.000207201	4.028337615	439.831	654.348	689.652	56.9513	38.3041	96.4633
RNF145	C vs UT	1.1851E-08	5.09572E-06	4.031750254	5.88602	7.33166	8.61503	34.2093	37.862	32.5834
SEMA4A	C vs UT	0.005488382	0.011211357	4.031750436	28.1796	29.212	29.4908	3.78402	2.95692	4.25646
OTUD6B	C vs UT	0.000870972	0.002468187	4.031883746	14.842	20.1695	15.7449	60.1311	91.4568	56.8709
GPATCH4	C vs UT	0.000244215	0.000919161	4.032515635	67.2228	60.6107	56.0232	393.336	570.974	271.62
PSMB3	C vs UT	1.30719E-07	1.06037E-05	4.034053499	11.7729	15.1326	11.0049	1.62862	1.12011	1.5731
ARCN1	C vs UT	1.50E-07	1.1342E-05	4.036499847	66.0222	70.9909	58.3657	8.52589	6.89935	6.56971
PHB	C vs UT	1.17221E-05	0.000108509	4.04077455	0.900404	1.82789	0.462337	29.4092	18.9954	14.8048
PSMD2P1	C vs UT	6.02903E-07	2.1606E-05	4.042952067	5.52197	4.96123	5.97836	0.574872	0.672105	0.740337
LMNB1	C vs UT	0.000152158	0.000644711	4.044187634	11.2839	18.18	10.6932	196.572	197.392	191.491
CCT7	C vs UT	2.76224E-06	4.62122E-05	4.046967269	6.51235	3.7473	3.29762	20.8746	25.9042	16.363
LYPLA1	C vs UT	6.67305E-05	0.000357107	4.051434683	8.2829	10.771	11.2787	45.3591	49.9974	41.5458
EPRS	C vs UT	5.20657E-08	8.901E-06	4.054144501	0.540282	0.718159	0.986205	48.9038	38.0804	44.6917
H3F3B	C vs UT	5.00155E-09	4.41671E-06	4.055457269	4.73239	5.72968	3.93563	18.6244	25.0782	15.8721
INO80C	C vs UT	6.08307E-05	0.000333649	4.056228143	0.0301101	0.065378	0.0617316	6.46629	8.91537	7.26368
GTF2A2	C vs UT	1.7176E-06	3.56662E-05	4.058551856	7.33471	5.66808	6.54607	90.1597	65.4287	68.9947
PSMD8	C vs UT	9.18605E-07	2.63806E-05	4.058583612	15.5754	32.1494	16.1476	565.061	943.838	467.554
UPP1	C vs UT	8.94619E-06	9.16167E-05	4.064992637	10.3236	11.6849	10.1385	1.24544	1.25451	2.03575
SPPL2A	C vs UT	6.09221E-05	0.000333958	4.068502353	9.15113	11.508	15.7886	1.58069	1.83691	3.97291
PUS7	C vs UT	0.001265279	0.003314402	4.071034868	2.19084	2.6765	0.832126	18.8718	8.55696	13.1856
RBKS	C vs UT	0.003583099	0.007836042	4.07320473	119.623	152.394	110.751	34.0554	25.7602	28.6843
SAP30	C vs UT	0.000461907	0.00148897	4.07823079	1.71068	2.5133	4.19105	14.9442	19.9811	35.1614
SF3B5	C vs UT	1.74225E-06	3.57562E-05	4.081274645	60.0689	57.0059	59.0229	12.2222	10.8999	9.97998
HSP90AA1	C vs UT	2.70394E-06	4.57535E-05	4.086044436	0.55913	0.816076	0.647232	2.1076	3.67949	2.5654
NUDT15	C vs UT	0.000340399	0.001183956	4.091914777	52.6112	62.273	68.4923	13.6975	15.9117	13.7952
CTSH	C vs UT	0.000404054	0.001342854	4.093117254	2.35346	2.44803	2.71189	15.8542	22.8034	15.175
UFM1	C vs UT	2.19747E-05	0.000165515	4.102481133	0.0301101	0.195934	0.369889	0.62277	1.83691	1.34178
VAV1	C vs UT	8.22741E-07	2.54046E-05	4.106709365	7.65239	4.84313	5.00992	0.897381	0.424504	1.17974
SLC25A32	C vs UT	1.4889E-05	0.000127487	4.107048777	21.3373	8.29041	7.98139	1.38913	0.537704	1.98949
OSTC	C vs UT	7.21488E-06	8.14725E-05	4.109286624	6.96909	7.4551	5.75148	21.6466	38.4126	21.1212
DPH2	C vs UT	9.48112E-05	0.000458081	4.115746935	15.4853	15.3404	14.8533	1.77231	2.01612	1.80443
ESF1	C vs UT	0.000562766	0.00174476	4.11672401	0.750353	0.629184	1.14028	18.9197	21.2803	9.43812
SPTY2D1	C vs UT	4.85633E-08	8.901E-06	4.120465438	5.612	6.95221	4.37595	0.81436	0.806506	0.832866
ETF1	C vs UT	1.50619E-06	3.3766E-05	4.125493875	13.9515	19.121	14.8132	51.5918	91.9132	55.0307
AKR1A1	C vs UT	5.92E-06	7.21089E-05	4.125967342	122.353	138.519	127.641	521.043	595.467	451.722
PP1P	C vs UT	0.000185408	0.000754203	4.12844165	312.286	325.374	307.045	7.42423	8.73617	8.74414
LOC645652	C vs UT	2.13324E-05	0.000163169	4.129909533	1.60438	2.08016	2.24159	10.2416	10.2111	10.8732
LOC100130289	C vs UT	1.73428E-05	0.000141842	4.137793244	24.5184	19.1266	18.7669	6.131	3.94253	5.50561
STAT4	C vs UT	2.08666E-05	0.000160803	4.143501197	3.99145	5.3147	6.10565	0.239588	0.134501	0.462748
GTPBP4	C vs UT	4.25416E-05	0.000257701	4.146033853	8.85309	9.04111	7.42671	0.479077	0.358503	0.97166
ARRB2	C vs UT	6.95E-04	0.002059147	4.147949124	0.270191	0.391768	0.832126	39.8509	51.1174	125.563
ACVR1B	C vs UT	1.52E-06	3.3813E-05	4.148800656	38.7732	45.2051	34.1748	9.10066	8.91537	7.44873
THOC4	C vs UT	2.11534E-05	0.000162202	4.161879313	57.4096	56.4331	77.1316	4.35879	2.50892	7.40246
LGALS3	C vs UT	0.003972086	0.008551714	4.1686676	6.18982	9.18339	8.21905	68.6908	77.5838	52.3337
RAP1B	C vs UT	1.45498E-06	3.31292E-05	4.175626817	0.540282	0.750798	0.678047	13.2199	10.3938	5.48293
TRMT6	C vs UT	3.26512E-05	0.000217734	4.178210293	288.248	408.037	558.163	44.7367	31.226	99.0536
LYRM4	C vs UT	5.95746E-07	2.1606E-05	4.179919282	12.3643	9.33486	6.90284	1.29334	2.55372	1.43431
DNAJC25-GNG	C vs UT	1.20303E-05	0.000110614	4.186717073	4.02146	5.74457	4.46839	34.5344	39.2004	35.8553
HNRNPAB	C vs UT	1.93724E-05	0.00015292	4.18675148	0.405583	0.216814	0.414218	3.24795	4.11681	3.30172
TAP1	C vs UT	1.32711E-06	3.15892E-05	4.189050117	47.8938	22.9986	36.701	6.87889	2.72666	7.69664
RIOK1	C vs UT	1.6486E-05	0.000136595	4.196015826	40.7238	43.6715	39.0128	189.251	216.558	174.325
RRAS2	C vs UT	4.90942E-05	0.000285534	4.197786524	13.3138	14.443	8.48892	52.8496	42.6453	51.8435
RAPH1	C vs UT	0.000359715	0.001235111	4.199659189	10.0235	12.2724	9.79953	58.8659	54.7463	46.3578
DNAJC3	C vs UT	1.24901E-05	0.000113321	4.201108688	0.0907999	0.261661	0.123952	6.7325	6.81104	16.2204
ETV3	C vs UT	2.00837E-08	5.97545E-06	4.201262979	5.70202	7.99666	14.6992	1690.98	2843.96	2423.98
CPEB4	C vs UT	1.22608E-06	3.03565E-05	4.2028111	63.8884	58.9417	68.1105	287.157	416.003	316.228
DAB2IP	C vs UT	0.000680339	0.002023784	4.207125357	14.9962	13.3062	18.1549	1.0097	0.847309	2.22039
PPIL1	C vs UT	1.03628E-05	9.96673E-05	4.208477351	1.75259	1.94514	2.34358	0.239599	0.503196	0.370218
MTX1P1	C vs UT	0.000106048	0.000496232	4.211661093	0.780363	1.27302	0.616416	11.9745	12.813	10.0396

IL6ST	C vs UT	3.19207E-10	1.31194E-06	4.215565319	9.63645	8.78909	10.2026	1.00595	1.65771	1.24925
MYBL1	C vs UT	0.00187784	0.004594913	4.21818437	4.56164	4.83068	5.45449	0.335384	0.179301	0.647807
TRAF3IP2	C vs UT	0.000485351	0.001551162	4.219478465	11.3439	14.7864	15.408	2.14951	4.03213	2.03575
PSMC2	C vs UT	7.93106E-07	2.50102E-05	4.222228918	61.6417	45.6294	55.4984	9.81913	6.18255	8.00392
CYP51A1	C vs UT	1.522E-06	3.3813E-05	4.227928477	16.1155	20.4648	11.1246	3.83191	3.71853	3.2849
ZNRF1	C vs UT	0.000122922	0.000554376	4.23780919	3.72136	2.5133	2.40373	1.10175	0.448103	0.277689
RAN	C vs UT	3.3438E-06	5.10893E-05	4.240235565	6.57231	13.0642	5.36205	107.258	126.242	137.239
ACO2	C vs UT	7.71974E-08	9.50441E-06	4.241710249	51.9178	45.4988	34.7913	14.8484	7.25775	8.83667
CALR	C vs UT	6.92689E-06	7.92749E-05	4.244972986	1.28473	1.67525	0.924574	4.34497	6.72015	5.59814
TMED9	C vs UT	8.26216E-07	2.54046E-05	4.246226777	3.75137	2.54594	2.06476	17.1475	17.4274	13.1393
CLPB	C vs UT	8.75578E-05	0.000430973	4.248907904	0.536211	2.28483	2.21884	10.9208	21.8142	28.0828
LOC653503	C vs UT	4.12351E-07	1.71188E-05	4.252018721	88.3054	86.9351	102.051	871.975	683.945	907.848
MRPS36	C vs UT	5.62198E-06	7.00191E-05	4.252154545	62.1483	73.8945	92.8097	20.0692	16.9602	17.6771
MRPL1	C vs UT	0.000292154	0.001053292	4.252294123	6.18219	4.1779	6.4406	69.1166	45.5621	54.9629
RANP1	C vs UT	1.3406E-06	3.17877E-05	4.252747339	0.660323	0.391768	0.431521	20.8356	12.4546	19.8014
ATP6V1C2	C vs UT	2.02282E-05	0.000157746	4.253990831	28.9888	31.0387	27.8576	5.98731	3.85293	4.71911
CD226	C vs UT	0.001255045	0.003291902	4.258466072	9.15319	13.1536	8.65934	115.745	131.444	107.612
PSMB6	C vs UT	5.99151E-06	7.27119E-05	4.26206139	182.815	137.631	83.6595	29.465	21.3979	14.4347
DNAJB11	C vs UT	6.85758E-05	0.000363517	4.273699402	16.1155	17.0051	9.76871	136.414	105.639	115.754
EIF3CL	C vs UT	1.66947E-05	0.000137874	4.277537112	3.60131	4.50428	3.14331	32.7143	25.2675	29.3319
CDK4	C vs UT	1.31198E-05	0.000117906	4.28065134	90.8663	98.0001	108.719	1547.81	1420.7	1326.69
LOC653698	C vs UT	8.09032E-05	0.00040799	4.281502603	0.297717	1.03887	0.9328	9.76537	7.41551	6.81066
CDK7PS	C vs UT	3.2319E-05	0.000216531	4.289616274	29.5742	27.6534	41.536	0.595961	0.493199	1.26086
ST8SIA4	C vs UT	3.44693E-05	0.00022486	4.2933906	7.08249	5.77721	11.1246	1.86811	0.448103	1.20298
RANBP1	C vs UT	9.35102E-05	0.000453216	4.304839845	169.377	173.085	219.78	24.6674	10.3938	19.0149
LOC644563	C vs UT	7.97546E-06	8.58093E-05	4.308539616	4.41159	6.98485	5.39287	33.0494	43.9045	28.7305
ANKRD32	C vs UT	8.64E-07	2.58071E-05	4.313406357	122.482	179.42	112.926	844.23	840.753	706.532
C1QBP	C vs UT	8.67274E-05	0.000427459	4.342134295	0.590187	0.389866	0.699463	6.74585	4.37306	3.74162
IDI1	C vs UT	3.74607E-07	1.6237E-05	4.344145872	54.5883	35.1199	26.7174	2.73027	1.52331	2.4984
NARS	C vs UT	1.04105E-06	2.77043E-05	4.352268502	91.0505	101.409	141.105	7.28055	4.43533	8.05017
CCND2	C vs UT	0.000517782	0.001633637	4.352552703	60.3333	60.5112	66.0664	15.6523	15.5927	14.9218
ATP2A2	C vs UT	2.18E-08	6.09534E-06	4.355054205	1.02044	1.27302	1.63334	7.18474	9.04976	5.87573
SNRPG.1	C vs UT	2.45359E-06	4.36315E-05	4.358225669	1004.99	1100.43	1062.65	286.72	177.726	292.386
EIF1AXP1	C vs UT	0.00123475	0.003251701	4.367350074	7.14884	9.63641	7.17404	48.3156	45.4569	53.857
PSMD3	C vs UT	1.21783E-05	0.000111476	4.367955547	60.3242	59.6442	57.6141	307.72	284.554	278.901
DOCK10	C vs UT	0.000299236	0.001071929	4.371384929	10.4736	11.946	22.927	72.4697	81.179	65.1414
IFRD2	C vs UT	1.42916E-05	0.000123833	4.374338954	12.3343	8.0293	10.3542	2.34709	1.70251	2.96105
BZW1L1	C vs UT	7.6753E-07	2.467E-05	4.377594817	192.107	183.75	220.576	10.8729	6.18255	15.7764
ELOVL6	C vs UT	0.006545435	0.013082382	4.378580132	1.52609	1.25901	1.19309	37.2762	31.6795	20.6571
SLC31A1	C vs UT	0.000164069	0.000682283	4.379023722	12.4543	14.0675	19.1676	1.77231	0.716905	3.42369
PTS	C vs UT	6.45034E-05	0.000349134	4.389244482	41.8455	33.3145	30.1225	6.54528	3.62893	5.59814
TSEN15	C vs UT	5.12577E-07	1.96659E-05	4.393809187	3.90142	4.24318	3.94452	0.62277	0.627305	0.509013
PDK1	C vs UT	8.61204E-06	8.96643E-05	4.413076444	8.2734	8.33253	6.53924	30.9649	41.8701	28.0369
NDUFAB1	C vs UT	0.00014829	0.000633373	4.415368943	34.5102	42.1045	40.4305	244.993	293.073	209.713
GRPEL1	C vs UT	1.06801E-06	2.82588E-05	4.416071032	1.68923	1.91017	0.849082	8.25976	8.59183	7.07225
CCND3	C vs UT	0.00020817	0.000816394	4.416971918	2.024	2.81965	2.59853	13.5324	17.9915	14.3176
MYO1G	C vs UT	0.000266426	0.000976328	4.427346446	2.671	2.77442	3.32821	0.479077	0.448103	0.555277
CKS2	C vs UT	3.57691E-05	0.000231149	4.435170552	0.705186	1.25247	0.380166	4.5461	6.89727	2.53313
NME2P1	C vs UT	2.69994E-06	4.57535E-05	4.439323977	10.101	10.4014	9.93261	33.7667	64.7935	43.2691
SLC39A14	C vs UT	7.94822E-06	8.58093E-05	4.451424582	3.48127	4.73276	3.9137	0.574872	0.448103	1.52684
MRPL13	C vs UT	1.0961E-05	0.000103404	4.454075068	2.31088	2.089	2.43455	0.383281	0.537704	0.555277
SBNO2	C vs UT	1.02024E-08	5.09572E-06	4.459364303	4.92176	6.68215	4.80736	18.7686	33.4863	21.0408
POU2F2	C vs UT	0.002197757	0.005209216	4.465349846	6.02044	6.37319	6.7801	36.6296	44.6984	30.7077
WARS2	C vs UT	5.12529E-05	0.000294388	4.466175387	14.286	16.0845	28.3287	0.503628	0.806506	2.59093
FKBP14	C vs UT	0.000771639	0.002235282	4.466468525	57.9497	59.4685	62.4642	290.363	370.094	264.222
JMJD4	C vs UT	6.10635E-05	0.000334475	4.475312657	6.30221	5.95558	8.87303	31.8183	79.014	43.9505
UTP11L	C vs UT	6.78802E-06	7.84407E-05	4.483124732	0.360222	0.979271	0.462326	15.1636	36.4798	6.19959
DPY19L1	C vs UT	2.0335E-05	0.000158118	4.485082877	15.9355	13.48	17.072	198.15	171.718	150.361
PDIA6	C vs UT	4.11184E-05	0.000252234	4.485594446	0.899816	0.921428	1.06973	4.06147	6.49309	2.73666
XRCC4	C vs UT	1.38973E-05	0.000121728	4.502223699	5.13974	4.8929	3.49456	1.2261	0.731212	0.497148
TAF1B	C vs UT	7.30554E-06	8.21386E-05	4.506502734	7.13609	5.63374	6.33129	1.53322	1.90528	0.809053
PARVB	C vs UT	0.002245073	0.005299972	4.512303086	105.096	116.096	89.0583	585.65	528.327	537.497
PMVK	C vs UT	2.84999E-06	4.69178E-05	4.513372655	22.8078	25.9807	20.2153	169.271	174.811	124.638
PFDN4	C vs UT	0.00096085	0.00265634	4.518811785	1.62025	2.01395	1.41763	24.0926	14.5154	25.8159
NUDCP2	C vs UT	0.000121488	0.000550309	4.537066304	38.9833	34.0753	32.3258	4.78987	2.64332	4.95043
CYP51P2	C vs UT	3.80061E-05	0.000240362	4.53740457	52.0075	65.0501	46.1313	416.625	378.568	369.647
NOP10	C vs UT	8.53432E-07	2.58071E-05	4.538360011	2.9711	4.37373	3.02005	51.7771	53.5365	40.8055
SEC13	C vs UT	4.92313E-06	6.5262E-05	4.543854683	1.41058	1.14247	1.20192	7.23265	5.55535	4.11767
BOLA2B	C vs UT	8.63448E-06	8.97665E-05	4.550524978	78.1163	83.3277	95.2819	356.499	262.169	515.283
GBP5	C vs UT	5.73905E-05	0.000319614	4.556771131	38.6832	31.7253	20.1844	2.73027	2.77772	3.05358
INF2	C vs UT	5.45337E-05	0.000308724	4.564930474	1.65066	2.87233	1.81823	133.874	352.355	170.671
LOC100129009	C vs UT	0.000125899	0.00056041	4.57718136	3.42299	2.50501	1.7557	11.8123	22.0189	10.9068
CCDC6	C vs UT	1.76996E-05	0.000143388	4.577490074	0.884178	0.721649	1.81388	6.63153	9.08573	6.37945
EIF1	C vs UT	6.10285E-08	9.40602E-06	4.585884385	1.80071	1.56677	1.29436	9.10066	6.63055	9.80824
SNRPG	C vs UT	0.000554759	0.001724705	4.597490853	4.91132	3.65146	6.23088	139.5	18.8401	55.6741
ANAPC10P1	C vs UT	0.002705155	0.00618823	4.60432763	5.46194	6.33207	6.37897	1.00595	1.40673	1.38804
HSF5	C vs UT	0.000604578	0.001846073	4.611471363	0.72728	0.228573	0.947418	3.36575	4.16037	5.1115
ADPRH	C vs UT	2.61E-03	0.006005397	4.612454651	6.97614	5.94882	8.25525	49.7498	70.0386	38.5253
ANAPC10	C vs UT	1.57367E-05	0.000132164	4.616838585	6.9597	6.03832	7.58079	33.0016	39.6484	37.4283
USP12	C vs UT	5.19527E-05	0.000296976	4.619742792	17.9761	24.6752	23.944	3.11345	5.15214	7.72632
SRM	C vs UT	5.08203E-05	0.000292674	4.644551658	6.42228	6.20152	7.36508	0.814361	0.224102	0.323953
CISD1	C vs UT	8.06991E-06	8.63071E-05	4.648898193	7.59267	10.2487	9.09075	2.25129	2.01612	2.45213
CRELD2	C vs UT	7.33956E-05	0.00038136	4.657404389	68.7428	77.1783	76.6558	444.956	677.893	479.962
ADSL	C vs UT	9.95682E-08	9.93148E-06	4.65926615	0.292097	0.219243	0.276397	83.0491	66.8146	122.898
SEH1L	C vs UT	7.30787E-06	8.21386E-05	4.660076559	0.600303	1.10983	1.72578	5.50833	8.46736	7.26367
SRP54	C vs UT	1.1963E-05	0.000110296	4.668039895	20.0769	26.6989	37.7496	5.12515	5.33134	7.72632
POMP	C vs UT	4.48672E-05	0.00026777	4.669782452	30.8805	40.701	27.3645	171.522	326.908	225.541
IKBIP	C vs UT	1.94485E-06	3.78233E-05	4.676674863	16.5657	17.6252	14.5759	100.729	142.065	87.7644
BOP1	C vs UT	0.000236357	0.000896428	4.686992332	1.20051	1.14247	0.986205	17.1954	28.9859	40.0192
SRD5A3	C vs UT	3.69967E-05	0.000236613	4.687394151	5.16875	7.56447	4.67832	16.8591	46.109	37.0545
RRBP1	C vs UT	0.0005148	0.001626308	4.689258333	27.7895	37.7635	33.026	130.678	216.862	107.87
UBE2N	C vs UT	1.15988E-07	9.93148E-06	4.700948385	201.819	198.317	309.871	33.0016	25.2227	55.7952
LOC643689	C vs UT	1.08363E-07	9.93148E-06	4.714575236	33.5273	31.6983	31.6186	136.708	193.934	103.762
PLAUR	C vs UT	6.50998E-05	0.000351899	4.716758085	29.53	36.1314	33.7435	234.17	273.905	192.553
LONP1	C vs UT	2.28545E-05	0.000169654	4.72073197	91.591	101.9	119.502	1274.16	1043.27	1133.67
ITK	C vs UT	4.96722E-05	0.00028808	4.731361653	2.10398	1.8707	1.73475	7.17197	13.5544	7.26889
BZW1	C vs UT	1.26892E-06	3.09809E-05	4.731453706	21.4573	15.0467	23.6974	447.748	278.345	402.226
MAK16	C vs UT	8.30213E-06	8.77166E-05	4.742714028	2.05989	2.15239	1.71231	6.10645	11.303	7.04991
SUB1	C vs UT	1.48063E-06	3.35019E-05	4.743206681	19.3047	14.0549	6.34815	88.848	39.9269	45.0887
ANXA2P2	C vs UT	2.70E-06	4.57535E-05	4.751423444	14.375	17.5273	14.4527	59.2977	80.7755	46.0334
TMEM64	C vs UT	2.10874E-05	0.000162025	4.751980482	13.7448	9.56333	6.10163	0.718565	0.716905	1.52684
LRP8	C vs UT	1.11508E-07	9.93148E-06	4.780510998	12.9945	10.6404	8.13547	0.814361	1.07531	0.832866
NFKB1	C vs UT	8.96504E-05	0.000439214	4.781569406	43.7848	34.9892	39.9374	0.383281	0.134501	0.416483

UBE2MP1	C vs UT	1.57101E-06	3.44059E-05	4.786137542	8.70304	12.2071	12.6346	0.526974	0.352681	1.34178
PSMC3	C vs UT	1.71031E-06	3.56662E-05	4.790862769	5.34191	6.23416	4.31431	27.9724	35.1236	22.531
UBE2SP1	C vs UT	9.55988E-07	2.6608E-05	4.793482098	34.3316	31.1377	31.7712	6.03521	3.53933	4.39526
GTF3C6	C vs UT	5.86428E-06	7.16617E-05	4.810747952	27.4786	11.0585	12.9633	3.13603	2.60549	2.07561
TOMM40	C vs UT	1.08623E-05	0.000102866	4.815234961	26.2288	32.8021	24.9916	3.78401	2.06092	3.46996
FOXP4	C vs UT	6.92946E-05	0.000366068	4.824834961	182.822	255.303	366.646	106691	157774	55028
NDUFAF2	C vs UT	4.18628E-05	0.000254815	4.827454785	78.2382	106.27	89.646	9.19647	6.85455	5.96826
ANXA2	C vs UT	8.34E-06	8.7752E-05	4.848613736	58.2798	62.4058	64.96	265.115	280.228	263.153
RSL24D1P1	C vs UT	1.58577E-06	3.44691E-05	4.856539465	5.37089	7.27763	6.53305	22.512	38.0357	25.4457
PAK1IP1	C vs UT	9.15867E-07	2.63806E-05	4.856553964	14.6451	20.2689	20.4926	69.212	101.921	75.5053
LARP4	C vs UT	1.49937E-06	3.37571E-05	4.856590577	0.420242	0.881353	0.801311	73.4751	112.537	87.0699
CBWD1	C vs UT	0.004851952	0.010095715	4.860099008	36.8172	51.0799	45.773	236.448	311.417	174.331
CTPS	C vs UT	1.49344E-05	0.000127684	4.864581037	31.6908	35.4461	37.5029	162.014	142.891	134.714
CEBPB	C vs UT	1.78617E-06	3.5905E-05	4.868923328	73.525	83.0342	69.0281	585.631	903.266	614.662
DNAJA1	C vs UT	3.91493E-07	1.67608E-05	4.893773606	24.4159	17.1682	24.776	4.2151	2.46412	2.40587
MRPL3P1	C vs UT	1.14396E-05	0.000106695	4.903338307	72.4742	62.3732	55.2529	346.347	334.565	259.959
TMSB10	C vs UT	2.64546E-08	7.09097E-06	4.905750745	5.79206	5.48346	4.12941	0.910156	0.672105	0.231424
ILF2	C vs UT	4.38081E-07	1.78269E-05	4.911630934	0.150151	0.032739	0.184995	29.2656	20.7427	35.0688
TNFRSF12A	C vs UT	0.000146414	0.000628663	4.923651552	43.0229	35.0165	19.1224	4.51375	3.69917	3.68418
LRRC59	C vs UT	6.08811E-06	7.34505E-05	4.930775891	22.8678	22.0314	21.0473	3.06555	2.50892	2.54466
PSMB2	C vs UT	1.23856E-06	3.05189E-05	4.942960905	9.66335	10.9994	7.54998	44.0179	69.6209	40.3433
TCP1P1	C vs UT	2.23076E-05	0.00016693	4.946110436	8.16286	12.2071	13.3742	0.574872	0.403303	4.30273
RAB7L1	C vs UT	1.0674E-07	9.93148E-06	4.94934039	70.9938	61.8464	77.9418	1038.79	850.312	821.366
PSMB5	C vs UT	4.69039E-06	6.2725E-05	4.951182293	167.24	136.298	108.998	36.2179	24.3287	23.8877
BAK1P1	C vs UT	1.72407E-06	3.56662E-05	4.966553907	38.8037	38.1552	46.2237	7.56793	8.60175	7.77259
PSMD1	C vs UT	8.83908E-08	9.79792E-06	4.981198874	27.1294	30.2565	24.0672	151.021	103.354	132.688
TRIB3	C vs UT	2.90926E-06	4.7411E-05	4.98420198	72.6845	73.6663	118.334	423.282	218.806	756.521
CCT5	C vs UT	1.0951E-06	2.8729E-05	4.987671778	2.34864	1.52691	2.07199	0.383281	0.458307	0.60289
GFPT1	C vs UT	7.65637E-06	8.39884E-05	4.987680409	111.366	96.6705	99.4212	13.68	9.93583	18.5662
POP1	C vs UT	4.58994E-06	6.20548E-05	4.994949253	3.03112	2.31747	1.54089	20.2129	14.2018	8.88294
ZFHX2	C vs UT	0.004425229	0.009335	5.003526332	21.5473	12.4029	8.96749	4.35879	1.20971	2.08202
ARPC5L	C vs UT	2.10E-06	3.97701E-05	5.033477539	9.24322	10.771	9.83035	219.851	236.636	295.493
YWHAE	C vs UT	2.28097E-06	4.19766E-05	5.033894271	1.65066	1.9258	1.41763	0.287486	0.224102	0.185159
EPT1	C vs UT	3.42221E-06	5.15212E-05	5.040463974	19.3266	24.7404	22.095	82.8156	124.186	85.1743
PIGW	C vs UT	0.0001861	0.000756051	5.067704748	52.8716	73.4713	66.8616	276.33	264.204	255.559
BAK1	C vs UT	6.577E-06	7.70127E-05	5.078561547	17.9614	18.6795	19.9407	55.3953	121.24	69.0497
FKBP4	C vs UT	2.70546E-05	0.000190401	5.08047988	28.7497	27.7106	24.8992	146.425	173.29	151.654
ELL2	C vs UT	1.37439E-05	0.000120958	5.116616322	0.953379	0.777151	0.700754	17.9235	18.001	13.1207
GNG2	C vs UT	3.39524E-06	5.14924E-05	5.117774059	15.7471	18.7581	18.4067	71.6504	106.039	79.2823
AGK	C vs UT	3.18E-04	0.0011244	5.128931391	8.73305	7.89874	7.54997	31.5168	39.1557	29.1007
SARS	C vs UT	1.85731E-08	5.88927E-06	5.136392972	0.930414	0.554963	0.554784	158.349	94.8876	150.269
HYOU1	C vs UT	2.32406E-06	4.22649E-05	5.140464297	16.2852	16.5039	12.2332	2.78973	1.26491	2.04163
RND1	C vs UT	0.001104318	0.002978718	5.150527534	5.27341	6.63038	6.7223	28.6851	45.126	26.6559
CCT2	C vs UT	6.72523E-06	7.80077E-05	5.164273671	34.9019	37.9593	25.5464	5.46044	4.92814	5.41308
CLIC1	C vs UT	3.04886E-06	4.87962E-05	5.168840979	4.1415	6.13624	5.22865	28.4514	58.1958	29.7946
BZW2	C vs UT	5.5464E-05	0.000312698	5.170204566	29.9202	38.7099	20.9548	385.008	311.596	199.634
THOC6	C vs UT	1.12264E-06	2.8837E-05	5.193300759	4.20152	2.70914	3.05086	0.526974	0.806506	0.277689
BTG3	C vs UT	0.000209956	0.000820604	5.205159423	40.2388	35.2686	40.5845	163.714	244.119	171.195
SNX10	C vs UT	9.954E-05	0.000474421	5.210172892	12.1242	21.2154	12.8811	39.5158	102.906	54.4076
SDC4	C vs UT	7.07219E-05	0.000371064	5.224139602	102.457	91.4886	109.672	824.999	648.092	654.388
TUBB2A	C vs UT	0.000264954	0.000973369	5.247375712	0.840384	2.02278	0.561256	5.65537	3.89773	4.39526
LOC729200	C vs UT	0.00014023	0.000608172	5.248302393	4.80172	3.49248	4.37594	12.214	31.3603	20.6342
SCFD2	C vs UT	0.000198749	0.000790255	5.252375005	7.05248	5.3529	5.14634	1.34124	1.16491	1.24925
IL15RA	C vs UT	7.95924E-06	8.58093E-05	5.257070647	11.6418	11.6196	4.869	215.635	244.967	173.999
P2RY14	C vs UT	0.000299847	0.001072872	5.274003783	93.3918	99.8783	97.8386	601.974	446.35	544.795
SNRPB2	C vs UT	8.66699E-06	8.99529E-05	5.274134109	20.2588	19.3638	19.8151	3.35633	5.60396	5.78569
LASS6	C vs UT	1.28713E-05	0.000116352	5.282329867	6.18218	4.66748	5.33123	0.431179	0.537704	0.832866
ARID3A	C vs UT	0.000341071	0.001185956	5.283454522	31.1971	29.3432	30.1607	181.725	156.792	122.114
PFKFB3	C vs UT	0.001883671	0.004604612	5.284049329	5.79206	7.50709	3.05086	372.341	333.824	586.132
PGAM4	C vs UT	2.71077E-06	4.57535E-05	5.286062773	517.577	468.041	542.598	21.5061	10.1698	23.2219
CBWD3	C vs UT	0.000670316	0.001998306	5.290317577	4.3038	3.88654	5.10625	32.0048	32.8389	23.6911
ACOT7	C vs UT	7.69944E-06	8.41304E-05	5.293626409	0.450252	0.457046	1.41809	18.8239	15.8594	5.13549
TXNRD1	C vs UT	6.87379E-06	7.90357E-05	5.317208634	86.3697	76.3752	84.0661	12.5493	18.0546	22.2535
SLC4A10	C vs UT	1.78733E-07	1.25462E-05	5.323046174	10.6047	12.1279	7.30677	2.1555	1.83691	1.48057
LOC100132715	C vs UT	4.97415E-07	1.92261E-05	5.324764864	4.73786	4.85908	3.48124	22.9245	43.788	25.7933
TXNDC17	C vs UT	0.000291961	0.001053212	5.327203545	0.150151	0.457046	0.678047	2.25129	2.24012	2.12828
XPO5	C vs UT	2.87343E-07	1.45207E-05	5.336721123	4.68737	3.64796	1.75734	0.479077	0.414582	0.691058
RBM8A	C vs UT	2.52482E-06	4.42082E-05	5.337439269	0.360222	0.391768	0.246626	6.03521	4.30093	3.09984
EIF4A1	C vs UT	3.21295E-07	1.52956E-05	5.338773336	202.57	160.325	128.503	1073.54	529.035	636.611
LOC100287554	C vs UT	1.76578E-06	3.57754E-05	5.348337709	33.8526	49.5366	48.9244	4.07817	5.48365	6.53222
ARSB	C vs UT	1.14027E-07	9.93148E-06	5.349111424	22.9278	15.5403	17.114	1.96518	1.79352	2.40843
WIPI1	C vs UT	6.48899E-06	7.61993E-05	5.353968579	21.0673	20.1711	30.0456	1.86811	3.18092	3.09984
SCML2	C vs UT	0.00077585	0.002245593	5.354299803	6.42227	5.5123	5.79347	0.287486	0.492904	0.694072
GNPNAT1	C vs UT	2.20889E-06	4.10175E-05	5.354386994	41.6243	54.2794	38.3659	9.24435	7.03375	9.16053
HAX1	C vs UT	4.81366E-09	4.41671E-06	5.355564412	5.85057	7.69579	7.97336	34.3857	46.8069	33.9021
DCTPP1	C vs UT	4.15197E-06	5.85072E-05	5.360652313	3.40242	4.79225	3.27899	22.5244	20.9856	21.2992
AK2	C vs UT	1.34727E-05	0.000119596	5.361518756	2.1314	2.67183	1.63564	8.0041	13.2907	8.43245
EIF2B3	C vs UT	9.60376E-05	0.000462556	5.363066157	1.05882	0.784079	1.36651	7.80742	4.07132	8.19536
DNAJB9	C vs UT	1.52012E-06	3.3813E-05	5.366249533	58.7001	51.1455	44.8062	10.3939	7.66096	12.6304
STARD4	C vs UT	0.001200556	0.00318478	5.366263164	33.0073	34.7309	61.8013	3.81327	3.57665	7.53049
NEDD4	C vs UT	2.69894E-06	4.57535E-05	5.369821056	0.750353	1.14247	1.20192	4.1193	6.00335	2.4984
LOC100127952	C vs UT	0.000149283	0.00063515	5.3779746	10.7363	11.9179	5.59725	338.468	320.01	271.681
LDHAL7	C vs UT	0.000490941	0.001566433	5.386773012	11.7841	14.5057	13.1803	163.598	148.222	96.5997
TMEM208	C vs UT	3.0432E-06	4.87942E-05	5.388606254	18.495	12.6609	5.48078	2.82273	1.69008	2.27861
SEC24A	C vs UT	3.43538E-07	1.56526E-05	5.392975974	54.1458	48.8739	48.188	6.65927	3.53338	6.12075
UBE2S	C vs UT	7.21362E-06	8.14725E-05	5.393889032	9.1832	9.66125	16.4249	1.58072	1.52331	3.14611
HMGB3	C vs UT	0.000131706	0.000579978	5.401657059	5.19185	4.56956	4.06778	0.239588	0.403303	0.509013
CHCHD2	C vs UT	5.54856E-06	6.95419E-05	5.40282945	40.3597	48.5987	45.8488	182.006	242.586	141.748
PSMD12	C vs UT	7.73404E-06	8.43154E-05	5.421375121	6.42227	6.75638	6.74876	34.2469	48.4741	31.5527
NPM3	C vs UT	0.000201488	0.000798569	5.437202502	13.7147	17.5273	14.0213	216.063	180.634	195.976
GDAP1	C vs UT	6.22828E-05	0.000339049	5.44395896	5.25187	4.7654	4.19105	22.8952	48.7429	24.1503
SATB1	C vs UT	1.16181E-06	2.92595E-05	5.445901319	7.6827	8.6168	3.1125	90.4399	56.6519	81.8676
TUBE1	C vs UT	2.21563E-07	1.32572E-05	5.448718692	6.36225	4.21053	3.63157	0.383281	0.896107	0.925396
TNFAIP8	C vs UT	5.25924E-06	6.74205E-05	5.457401046	5.28188	6.07096	8.69016	2.0118	0.716906	1.01793
TIMM17A	C vs UT	9.29828E-06	9.38967E-05	5.457884212	8.19287	7.01749	2.89678	1.14965	1.34411	1.43432
SLC2A3	C vs UT	1.37591E-07	1.0875E-05	5.472590926	4.68168	5.90776	7.02611	0.383281	1.34411	0.97166
GALNT6	C vs UT	0.000116641	0.000536046	5.478400409	8.01281	10.7057	12.0799	125.348	85.6135	123.388
PSMC4	C vs UT	1.37353E-07	1.0875E-05	5.484387054	0.150151	0.241158	0.131434	2.34292	2.94017	1.34443
PRDX1	C vs UT	4.20764E-07	1.74095E-05	5.511924014	23.5881	20.8564	23.5742	1.72442	1.20971	1.75816
TICAM1	C vs UT	6.84928E-08	9.50441E-06	5.520176218	41.444	23.5655	43.5737	162.034	109.76	180.853
ID2	C vs UT	0.00019073	0.000768531	5.535671868	31.5873	34.0129	33.6661	6.03476	4.4144	6.08189
PPA1	C vs UT	6.96842E-05	0.000367247	5.540477077	9.9011	9.955	13.3125	2.44288	2.19532	2.22081
FAM57A	C vs UT	0.000376306	0.001276438	5.545940109	308.331	339.564	352.014	1171.56	1736.47	1177.65

EHD4	C vs UT	1.47318E-05	0.000126581	5.546057481	6.99246	4.83067	6.13244	0.526974	0.358503	0.509013
TCEB1P2	C vs UT	6.65625E-05	0.000356843	5.549731631	11.0738	11.2606	17.9965	0.718565	0.761706	2.31334
GPR160	C vs UT	0.004448965	0.009375447	5.550774337	11.674	8.58416	16.4249	40.6653	42.9636	64.7246
CD70	C vs UT	0.006482983	0.012974384	5.581331199	5.9121	4.96123	4.53002	18.5365	34.0484	22.346
SPNS3	C vs UT	0.003801508	0.008249312	5.58156613	14.0482	12.8102	7.79192	2.71966	2.12147	3.10418
PTTG1	C vs UT	9.13454E-05	0.000444822	5.584169537	13.1145	14.2821	13.8516	52.6299	91.0579	54.9323
SPSB2	C vs UT	5.14309E-06	6.6472E-05	5.584530094	12.072	8.14029	4.52396	0.993771	0.539913	0.873314
VDAC1P1	C vs UT	7.02774E-07	2.36754E-05	5.608195036	1.11048	1.99108	1.94149	11.0575	3.67373	13.4169
METRNL	C vs UT	0.000364225	0.001248164	5.621444777	37.2271	36.7586	42.5002	222.205	265.479	188.055
EIF4A1P2	C vs UT	4.09088E-07	1.70985E-05	5.623722432	25.1786	27.4822	21.1397	167.403	176.605	129.635
LOC728324	C vs UT	2.30077E-06	4.19925E-05	5.626390885	0.0901304	0.0465361	0.308258	10.5855	3.67373	5.7832
BOLA3	C vs UT	4.12638E-06	5.83948E-05	5.630593057	28.9899	27.3842	20.1844	407.082	479.901	247.794
SEC23B	C vs UT	1.01359E-06	2.73303E-05	5.631160714	31.2057	49.5676	34.329	196.569	233.367	219.716
PSME2P2	C vs UT	2.04977E-07	1.2966E-05	5.640839496	1.32055	1.56677	0.862942	7.08896	5.82415	5.55187
LYRM1	C vs UT	8.6017E-08	9.79792E-06	5.642574815	5.66652	10.067	7.59016	27.5113	65.6096	42.8053
YARS	C vs UT	7.28837E-06	8.2069E-05	5.644119787	12.2142	10.6731	10.6932	2.82606	1.47851	3.46996
FBXO6	C vs UT	1.25555E-06	3.08386E-05	5.648516587	0.930414	0.587602	0.554784	5.46044	4.97294	5.73693
AARS	C vs UT	1.28678E-06	3.10948E-05	5.651228675	16.89	18.3197	23.0903	103.309	111.779	114.379
EIF4A1P4	C vs UT	3.09177E-07	1.50678E-05	5.686019838	19.9881	20.946	22.5385	2.77816	3.08948	2.96313
VARS	C vs UT	3.99835E-05	0.000247861	5.686021974	200.739	188.916	145.634	44.8804	20.7427	38.955
MPDU1	C vs UT	3.21278E-06	4.97398E-05	5.703271203	33.1915	48.6975	56.1464	303.868	278.566	312.756
LOC389333	C vs UT	0.001331612	0.003448597	5.706028143	0.360222	0.750798	0.554784	40.7612	34.3621	59.5892
ACTR3	C vs UT	1.10506E-07	9.93148E-06	5.713313445	3.51128	3.264	4.40676	57.8606	37.8566	51.7708
HSPD1	C vs UT	1.43906E-05	0.000124255	5.714504956	14.2849	12.2397	13.3125	70.1223	74.727	43.2114
NUS1	C vs UT	2.30581E-05	0.000170857	5.727559116	142.667	168.482	86.9003	944.578	1228.82	837.016
NANS	C vs UT	3.95398E-05	0.000245977	5.731827521	44.2351	44.7483	48.1346	194.849	187.397	170.58
CSTF2	C vs UT	1.10851E-06	2.87746E-05	5.733704034	6.69236	5.05915	4.0986	19.2549	32.3011	13.6945
TMEM65	C vs UT	1.82508E-06	3.62372E-05	5.734498926	0.758891	0.991343	0.4001	2.14015	3.47104	2.9921
PSME2P1	C vs UT	7.00614E-07	2.36673E-05	5.737398715	100.684	101.769	113.834	465.567	725.091	535.449
CALU	C vs UT	5.47675E-06	6.90908E-05	5.740766293	2.76103	6.59319	4.6841	166.492	174.034	177.355
CXCL16	C vs UT	0.007965873	0.015382806	5.744616352	123.581	139.6	116.761	27.206	16.6658	16.8405
CMAH	C vs UT	0.000266451	0.000976328	5.748620955	239.692	295.968	254.725	1307.76	1250.61	1066.25
SNRPD1	C vs UT	4.91229E-05	0.000285566	5.752563308	3.66755	4.92664	12.3766	279.231	142.954	76.8201
PPIF	C vs UT	8.68649E-07	2.58706E-05	5.757590573	0.630313	0.736272	0.999944	3.31297	5.43191	2.96023
ATF4	C vs UT	6.66E-06	7.76503E-05	5.765071669	35.9822	42.8878	39.9065	231.299	264.724	296.567
FAM100B	C vs UT	1.74558E-06	3.57562E-05	5.786736191	0.330211	0.587603	0.708863	1.98304	3.1487	3.65502
MAPK6	C vs UT	1.32682E-05	0.000118463	5.790901815	3.15116	4.27581	4.869	372.162	393.424	363.057
LOC727919	C vs UT	3.4356E-05	0.000224846	5.792588445	26.3485	25.752	27.9497	83.771	141.387	98.307
IARS	C vs UT	1.97792E-07	1.27284E-05	5.793656733	23.9946	30.4832	28.5722	115.658	181.57	112.273
PSMC1P	C vs UT	2.25792E-07	1.32572E-05	5.801034082	43.9949	48.2409	44.2828	179.906	238.876	160.906
PSPH	C vs UT	3.44038E-05	0.00022486	5.804085886	3.75137	1.66469	2.06476	109.159	198.737	125.887
VCP	C vs UT	1.74286E-08	5.88927E-06	5.815876795	13.7965	10.8939	9.6974	2.91671	2.34977	1.75816
JUN	C vs UT	0.007573751	0.014790046	5.818972339	4.47161	3.49248	3.38984	0.862258	0.851306	0.694072
NHP2P1	C vs UT	7.16352E-05	0.000374899	5.82244671	16.0458	19.6139	15.7215	80.0233	95.6073	57.8383
PNO1	C vs UT	6.66422E-05	0.00035695	5.827833532	123.895	116.305	110.522	450.365	595.609	423.214
TCEB1	C vs UT	4.96214E-08	8.901E-06	5.843183335	2.43092	1.37094	5.17715	0.0958954	0.179301	0.323953
NUPL1	C vs UT	3.87811E-08	8.69402E-06	5.879078408	84.0594	83.9794	84.0355	13.3157	12.5442	13.0467
ARF4	C vs UT	8.34E-06	8.7752E-05	5.879721651	2.79104	2.74178	3.20494	14.7047	25.4019	14.2496
SURF4	C vs UT	8.90605E-08	9.79792E-06	5.881127256	9.60107	6.37444	12.5409	2.33108	1.70884	2.06819
PGAM1	C vs UT	2.25627E-07	1.32572E-05	5.898114395	60.0166	64.0615	69.3802	741.78	572.954	833.855
LOC643576	C vs UT	1.58081E-06	3.44691E-05	5.910136668	42.3549	38.4112	33.0384	4.59965	3.16887	5.30096
CARS	C vs UT	4.57126E-07	1.82406E-05	5.917086886	0.300201	0.848715	0.5856	153.032	145.287	162.25
TUBB2C	C vs UT	9.19904E-07	2.63806E-05	5.9195621	5.76204	4.92859	2.52699	0.574872	0.313702	1.11045
LOC642969	C vs UT	2.75935E-07	1.45207E-05	5.923148067	6.57232	3.91678	7.02044	85.6631	63.66	103.273
HSPD1P4	C vs UT	9.7403E-05	0.000467853	5.939464859	12.5443	13.4474	17.4418	1.91601	2.15052	1.98949
LDHAL3	C vs UT	0.00012287	0.000554376	5.947830002	1.50784	2.24579	2.54008	7.72891	14.7529	7.90079
LOC100130003	C vs UT	2.87414E-07	1.45207E-05	5.95249941	37.0259	51.4806	57.497	3.51497	2.2933	4.72971
DUXAP8	C vs UT	0.000903336	0.002536582	5.978439158	17.9524	19.2242	23.306	248.622	151.415	197.927
HSP90AB1	C vs UT	3.08807E-06	4.90037E-05	5.979472533	4.95861	5.60734	5.13725	22.1721	23.5036	21.0946
UCHL3	C vs UT	1.92284E-05	0.000151989	6.018966616	15.7554	13.4147	27.1172	5.12515	3.44972	5.04296
HMGCS1	C vs UT	1.83081E-07	1.2631E-05	6.029827519	3.48128	3.98206	3.05086	0.574872	0.896107	1.15672
PRDX4	C vs UT	3.73951E-06	5.50217E-05	6.068652345	3.57131	5.47305	5.36205	17.0369	26.0377	16.883
GAPDHP1	C vs UT	5.07963E-07	1.95724E-05	6.09455112	24.1282	24.1856	28.4123	5.60413	3.89773	5.04296
TRIP10	C vs UT	1.77099E-06	3.57973E-05	6.141341487	18.3663	27.4495	25.8545	3.97561	4.21133	8.23524
NCRNA00263	C vs UT	0.000540388	0.00169283	6.146032822	4.86175	4.70012	6.2557	26.6312	44.7465	33.9586
COX17P1	C vs UT	8.15145E-08	9.66417E-06	6.159680382	26.9407	25.7178	28.0009	193.369	227.51	178.404
GAPDHL10	C vs UT	2.95984E-08	7.35445E-06	6.161680429	3.90142	4.24317	6.16326	351.189	492.932	572.025
SEC61G	C vs UT	2.3837E-05	0.000174117	6.162638079	32.1708	49.5684	38.786	169.348	247.961	189.402
RELB	C vs UT	4.2553E-05	0.000257701	6.175635407	6.51257	7.06924	6.10199	34.7249	40.9848	31.5419
ZAK	C vs UT	0.000114009	0.000526887	6.181577146	19.5367	5.28762	34.4213	0.526974	0.403303	0.832866
MZT1	C vs UT	2.34156E-05	0.000172161	6.182216923	8.55301	4.27581	6.47143	346.43	86.2423	131.114
NFE2L1	C vs UT	1.75719E-08	5.88927E-06	6.193802039	15.3353	18.1148	21.3863	261.622	259.866	266.621
LOC150417	C vs UT	5.11114E-06	6.64534E-05	6.197223965	4.49094	5.53602	6.46184	49.2801	67.2802	33.3433
ATP1B3	C vs UT	1.68718E-05	0.000138877	6.217900572	6.30283	5.21803	7.05948	26.8018	34.9937	22.7549
B4GALT2	C vs UT	7.62164E-06	8.39884E-05	6.220842145	92.4762	110.741	105.537	429.789	530.825	390.988
ESPL1	C vs UT	0.008452102	0.016205009	6.224935778	6.56489	5.98261	5.51613	22.0237	31.2665	20.022
SRPRB	C vs UT	1.72854E-06	3.56662E-05	6.229522138	8.27096	9.07376	12.8133	1.14964	1.83691	2.40587
HSPA5	C vs UT	2.23332E-05	0.000166991	6.232022289	32.1861	29.427	42.2321	6.093	5.64662	8.83546
GAPDHL18	C vs UT	3.19178E-05	0.00021506	6.254766882	0.390232	0.848715	0.862942	145.706	132.697	198.898
SDF2L1	C vs UT	0.00016094	0.000671538	6.260517688	17.6773	17.4257	20.0146	98.7611	113.14	82.2467
TBXAS1	C vs UT	0.000108963	0.000507753	6.284601994	5.01648	3.86079	5.31486	0.49715	1.18728	1.13808
PFDN2	C vs UT	1.47957E-06	3.35019E-05	6.294749583	2.40089	2.40962	2.68106	65.9887	52.893	58.0075
TAF13	C vs UT	4.758E-05	0.000279208	6.300052714	62.4515	76.6369	92.7254	21.7935	12.5442	20.5417
MAFG	C vs UT	1.8459E-08	5.88927E-06	6.304651266	4.17151	5.74457	3.57473	20.5003	27.4627	15.0362
BCL2	C vs UT	0.000656144	0.001966996	6.318320695	13.4432	11.587	12.3572	78.3608	72.2184	70.6453
UBXN8	C vs UT	0.000148031	0.00063332	6.332125512	1.50061	3.4272	3.45147	7.80742	12.0962	13.8795
SERPINE2	C vs UT	0.007452847	0.014595553	6.379000911	12.5143	11.2932	7.08773	0.862258	0.537704	1.06419
RSL24D1	C vs UT	7.22571E-08	9.50441E-06	6.388801893	38.203	28.1023	26.9332	3.83191	4.79374	4.44152
PDCD1	C vs UT	5.50803E-05	0.000311104	6.391697992	12.5443	12.6261	9.49136	59.7465	76.9576	46.1068
JUNB	C vs UT	4.59132E-07	1.82616E-05	6.41366769	0.725105	0.739808	0.616416	11.085	18.8459	2.99122
GCH1	C vs UT	1.02862E-07	9.93148E-06	6.417876599	52.9075	55.4542	55.5613	282.779	329.975	438.593
VDAC1	C vs UT	1.15973E-07	9.93148E-06	6.423430312	4.83173	6.82166	7.11855	0.191691	1.12011	0.370218
TTC7B	C vs UT	0.002131963	0.005088484	6.45601543	8.08723	7.97749	6.3741	1.14964	0.761706	1.43431
CKS1BP3	C vs UT	3.96953E-05	0.000246448	6.46158188	1.1705	1.72997	1.97231	70.0743	50.1318	66.5747
KIF3B	C vs UT	1.34586E-06	3.17901E-05	6.484545236	24.6984	19.1918	12.9736	108.68	61.5108	81.5647
PTGER4	C vs UT	4.71243E-07	1.84458E-05	6.485226492	0.0901304	0.163295	0.431521	20.5003	91.7072	48.393
HSP90AB3P	C vs UT	3.75095E-06	5.50586E-05	6.48770311	1.34332	1.5079	1.68188	6.88008	12.8443	6.53402
CCDC86	C vs UT	9.12502E-05	0.000444534	6.531507915	0.180161	0.489685	0.832126	45.3329	42.543	72.7742
B4GALT5	C vs UT	1.93732E-07	1.27284E-05	6.556217038	6.42227	4.66748	6.4406	20.116	43.5007	27.0188
LDHAL4	C vs UT	1.50438E-05	0.00012819	6.576664509	8.87217	9.34957	7.11879	89.3025	88.459	59.1741
HSP90AA3P	C vs UT	7.98197E-05	0.000404511	6.620000634	5.44703	4.33575	6.59455	56.0399	91.4194	59.8288
LOC644936	C vs UT	0.000288031	0.001042083	6.639940138	64.6054	75.6959	72.0532	422.151	453.323	377.017
NME1-NME2	C vs UT	1.20755E-05	0.000110782	6.646413074	3.30121	3.36192	3.14331	22.1768	24.1922	14.0646

PRDM1	C vs UT	7.62564E-08	9.50441E-06	6.656871785	15.5753	16.3195	12.6962	290.634	421.562	398.368
ZNF593	C vs UT	0.000127157	0.000564175	6.656912431	0.118042	0.470434	0.184995	1.14964	1.70251	1.01793
CHCHD9	C vs UT	2.20496E-05	0.000165978	6.65845842	32.7711	29.669	23.9748	186.993	117.153	73.6072
RPF2	C vs UT	1.14848E-06	2.91975E-05	6.659448055	57.0792	51.2107	42.7416	187.327	276.55	155.727
BCL2L1	C vs UT	7.22217E-06	8.14725E-05	6.672946272	1.74757	1.15997	0.66921	4.612	5.50457	8.80557
SYTL3	C vs UT	9.67501E-06	9.56944E-05	6.699580321	4.56164	4.27581	5.97836	0.431179	0.224102	0.694072
LMAN1	C vs UT	9.37694E-06	9.41812E-05	6.722247492	30.7002	42.3655	42.4645	160.074	149.408	242.933
PIM3	C vs UT	1.9086E-07	1.27284E-05	6.723147833	13.8948	15.1773	11.2479	64.7537	75.6233	47.838
SLAMF1	C vs UT	5.16812E-05	0.000295835	6.730810128	2.80655	2.74226	2.81853	0.20187	0.403303	1.02199
KIAA0020	C vs UT	3.86106E-05	0.000242784	6.741712598	2.42965	2.40917	2.05536	7.56071	13.7665	7.7088
MANF	C vs UT	7.17775E-07	2.38707E-05	6.778347169	15.7854	15.112	13.5282	132.725	145.287	88.2735
TANK	C vs UT	5.73139E-07	2.13499E-05	6.792671144	4.32225	5.14439	2.79691	0.489484	0.231932	0.810279
SPC24	C vs UT	3.71206E-06	5.47484E-05	6.799047363	4.77157	5.45082	3.69796	1.48493	0.716673	0.832866
LYN	C vs UT	6.56987E-05	0.000353646	6.801357907	5.34191	6.29944	4.89981	162.029	193.619	145.04
EIF2S2	C vs UT	9.47307E-09	5.09572E-06	6.829712816	20.1369	19.6814	17.9349	300.705	341.122	297.624
LDLR	C vs UT	7.47593E-08	9.50441E-06	6.838572034	7.89276	9.00845	7.45754	48.8562	35.0338	46.9122
OBFC2A	C vs UT	5.49332E-05	0.000310415	6.8433159	10.7137	11.1627	11.4636	180.141	157.924	149.806
SPAG1	C vs UT	8.53966E-05	0.000423081	6.847293463	4.53163	4.47165	3.05086	0.766463	0.0449003	0.786601
SLC29A1	C vs UT	0.001309268	0.003405753	6.86063541	111.758	46.2497	29.0285	6.08311	3.89773	6.5697
USP12PX	C vs UT	0.000256263	0.000951571	6.866403237	5.76646	3.11991	3.83024	1.29427	0.6868	0.911774
SLC3A2	C vs UT	6.42256E-07	2.26258E-05	6.885116799	9.69338	5.09179	5.91673	2.39498	0.985707	1.61937
SEC61B	C vs UT	2.52506E-06	4.42082E-05	6.908838004	8.75902	9.18628	9.50242	69.5856	124.977	65.3995
NFIL3	C vs UT	1.6871E-06	3.54982E-05	7.002595911	0.480262	1.46886	0.339074	3.49663	5.33134	3.42369
XBP1	C vs UT	2.4014E-07	1.36448E-05	7.007105662	3.45127	3.06817	3.72881	0.718565	0.448103	1.38804
MARS	C vs UT	8.52221E-07	2.58071E-05	7.007838038	25.6532	32.9263	24.6722	128.078	160.923	122.509
AGMAT	C vs UT	0.000259664	0.000960018	7.025204553	7.16176	7.4583	6.46275	1.20476	1.46395	1.54846
NRIP3	C vs UT	0.000275911	0.001005901	7.029529819	21.6074	22.2599	26.4092	0.862258	0.582504	1.24925
HSPE1P2	C vs UT	2.94743E-05	0.000203117	7.036021035	14.8455	14.5871	13.1883	2.73027	1.07531	1.48057
STIP1	C vs UT	2.70568E-07	1.45207E-05	7.04821949	3.03112	14.9105	11.6176	41.24	119.035	58.3863
NOP16	C vs UT	3.88065E-05	0.000243062	7.073286177	72.8044	79.6286	74.8519	12.692	11.5614	12.5614
RPF2P	C vs UT	0.000122444	0.000553573	7.10218332	0.120141	0.130656	0.308258	38.1682	29.0307	30.1626
TP53INP2	C vs UT	0.000331156	0.001160975	7.125985921	3.13045	3.96157	4.37842	0.369099	0.893482	0.744853
TWSG1	C vs UT	1.43721E-07	1.11398E-05	7.137953383	10.0693	4.47513	12.8293	0.613774	0.904531	0.838444
FAM46C	C vs UT	5.04794E-08	8.901E-06	7.137988093	1.02044	0.848715	0.554784	3.25714	5.37614	2.54466
EXOSC4	C vs UT	4.63928E-06	6.22699E-05	7.164903226	6.60233	3.23136	4.0986	65.3798	55.8213	78.9284
BCL3	C vs UT	1.17183E-05	0.000108509	7.189649018	0.390232	1.1751	0.801311	4.69407	9.04976	4.11766
FTHL5	C vs UT	0.000371713	0.001266083	7.193033466	26.9185	29.705	28.0555	116.384	114.011	126.575
EIF5A	C vs UT	4.45286E-07	1.80012E-05	7.201154962	14.3149	14.3286	11.9874	2.73027	2.28492	3.00731
BNIP3P	C vs UT	0.000982232	0.002705142	7.241091271	95.7935	91.2908	102.648	353.287	304.29	603.498
TIMM10	C vs UT	5.6346E-06	7.00349E-05	7.247872193	10.8993	7.41528	6.17777	2.49275	1.0779	1.11045
SLC16A6	C vs UT	0.000227935	0.000873077	7.248331742	2.52095	3.23136	3.29739	0.287486	0.0897007	0.555277
TBX21	C vs UT	1.02696E-05	9.93302E-05	7.316821363	0.420242	0.065378	0.184995	0.910156	5.68974	2.68346
MRTO4	C vs UT	3.6322E-05	0.000233255	7.324974559	9.42328	10.1508	8.04302	2.53868	2.24012	1.89696
FICD	C vs UT	8.3136E-06	8.7752E-05	7.347339744	100.745	100.822	92.2315	888.656	549.25	809.932
IER5	C vs UT	3.01856E-07	1.49207E-05	7.348160814	14.2249	14.9488	11.1246	50.2448	71.5704	41.4508
DUSP4	C vs UT	0.001057751	0.002869642	7.39738784	0.618273	0.415287	0.639922	5.93223	5.36801	5.84911
ARID5B	C vs UT	1.23E-03	0.003250586	7.399590044	6.31575	9.56276	8.97547	35.5399	46.4673	41.4314
EIF2S2P4	C vs UT	8.41581E-08	9.69784E-06	7.429802814	10.2635	11.1627	22.6805	0.383281	0.627305	0.555277
LDHA	C vs UT	3.1097E-06	4.90459E-05	7.439462914	4.08148	3.81887	4.56084	16.3811	23.0723	10.4559
FERMT2	C vs UT	3.16998E-06	4.94758E-05	7.451987469	8.48524	7.98524	8.85404	43.8799	92.284	54.78
VASP	C vs UT	1.72372E-08	5.88927E-06	7.455826399	9.0379	4.76137	12.1757	0.479077	0.313702	0.976306
MMP25	C vs UT	0.004324934	0.009176808	7.456290144	9.72338	7.73554	5.14634	1.10175	0.940907	0.555277
AK2P1	C vs UT	6.87797E-06	7.90357E-05	7.474601264	5.72395	4.83762	3.76794	1.07741	1.03041	1.02856
CDYL2	C vs UT	0.000188845	0.000764183	7.484456466	43.8749	49.9377	29.8914	670.312	509.359	1011.27
EBNA1BP2	C vs UT	2.20754E-05	0.000166071	7.509279304	33.3	29.8072	36.9162	358.773	234.484	329.18
HSPD1P1	C vs UT	6.08753E-06	7.34505E-05	7.539878617	37.8129	27.8738	27.0564	3.20924	2.15052	3.19237
CCDC58	C vs UT	0.000176417	0.000724833	7.547173518	10.5166	11.5212	20.7699	143.98	98.6905	153.026
SLAMF7	C vs UT	1.57461E-05	0.000132164	7.562925655	19.4467	17.3641	25.8547	3.49663	2.50892	4.71911
EIF5AL1	C vs UT	1.10315E-07	9.93148E-06	7.570864465	22.1776	29.1467	28.5972	135.598	162.491	100.533
NLN	C vs UT	0.000212155	0.000825977	7.575328025	18.2463	17.1682	13.1276	135.168	152.231	80.9635
SEC24D	C vs UT	2.99707E-05	0.000205414	7.588496872	81.5511	70.2558	92.3011	8.03653	3.63928	6.09493
CPD	C vs UT	3.06991E-06	4.88412E-05	7.618260095	26.1163	24.1684	36.2834	91.6517	146.667	131.98
ESPN	C vs UT	9.51285E-05	0.000459074	7.638900511	4.47161	4.04734	5.26961	18.8239	25.6259	21.8834
HUWE1	C vs UT	2.42659E-07	1.37247E-05	7.650967409	12.1548	10.4401	10.3677	49.1811	61.6408	46.7564
FNDC3B	C vs UT	6.84245E-07	2.3379E-05	7.698951277	30.5048	37.6329	39.2286	276.142	239.764	273.039
GBE1	C vs UT	3.57807E-07	1.59627E-05	7.761969636	4.25433	2.21799	4.75508	14.9466	19.9822	15.3173
HSPA2	C vs UT	0.000280723	0.001020433	7.801186272	0.990434	1.44153	0.862942	5.92156	6.864	4.50708
PGK1P2	C vs UT	6.84495E-07	2.3379E-05	7.899906233	6.73409	6.37701	5.17482	28.5889	23.1324	22.675
HSP90AB2P	C vs UT	1.13872E-06	2.90541E-05	7.903040831	2.17938	4.3288	2.68677	10.9133	15.6026	12.8523
ECE2	C vs UT	9.87017E-07	2.69011E-05	7.913938572	23.4808	21.7564	22.6295	252.906	147.297	201.611
HSPA13	C vs UT	3.51645E-07	1.58951E-05	7.914319648	6.14757	6.20126	6.43273	35.0362	44.4477	26.1886
TPX2	C vs UT	0.000702113	0.002076032	8.005398745	7.32258	5.38554	3.97534	1.14964	0.672105	1.7119
SREBF1	C vs UT	2.31245E-05	0.000170929	8.062825052	24.2182	37.9917	105.727	0.383281	0.134501	1.7119
CCRN4L	C vs UT	0.000160676	0.000671311	8.078459277	22.3576	35.8375	53.4655	0.526974	1.25451	0.370218
METTL1	C vs UT	1.64757E-05	0.000136595	8.089753983	14.1049	14.3939	13.405	56.184	72.4426	48.3004
TMEM22	C vs UT	0.009368684	0.017698157	8.160121215	15.0073	11.5786	4.31834	3.01757	2.05155	1.48907
WDR12	C vs UT	7.98974E-06	8.5888E-05	8.230621422	211.564	206.37	97.6861	67.0089	22.2659	38.4461
PPPDE2	C vs UT	1.28839E-06	3.10948E-05	8.244914132	32.3209	32.0464	20.431	8.1906	5.33134	4.99669
UTS2	C vs UT	0.003431646	0.007547662	8.266790231	14.4451	13.1801	8.99359	3.81101	1.80617	2.08785
CHAC2	C vs UT	0.000260173	0.000960747	8.268860783	9.47646	11.4304	8.20619	36.5505	50.7757	34.562
VDR	C vs UT	0.000727992	0.002142339	8.328746215	1438.38	1431.47	2405.85	325.373	159.353	410.88
FLOT1	C vs UT	1.74576E-06	3.57562E-05	8.34256635	9.02523	5.19748	6.47674	1.34123	1.43371	2.21361
SUSD1	C vs UT	7.65061E-06	8.39884E-05	8.356099514	6.33224	7.99666	9.09075	0.143793	0.627305	0.555277
NFE2L3	C vs UT	3.39473E-06	5.14924E-05	8.418365877	3.2712	3.59039	3.48229	14.082	26.9698	13.2781
MAGOHB	C vs UT	1.47762E-05	0.000126874	8.484545962	17.1059	14.8835	12.388	3.92771	2.10572	2.63719
TUBA1C	C vs UT	3.76766E-07	1.62431E-05	8.508100195	25.2986	16.7766	17.2877	1.34123	0.268902	0.601542
HOMER1	C vs UT	2.03379E-05	0.000158118	8.566838427	38.9668	41.662	46.0157	240.589	267.323	242.221
PAICSP4	C vs UT	9.15418E-05	0.000445602	8.61199273	38.3682	32.0537	34.5568	4.35502	5.16008	6.31452
EIF5AL3	C vs UT	4.9542E-06	6.5262E-05	8.740098818	4.83907	5.54182	4.00615	0.670668	0.761706	1.06419
CD80	C vs UT	1.1772E-05	0.000108807	8.848099587	4.32156	3.59039	4.22186	0.239588	0.403303	0.601542
FTHL8	C vs UT	2.37285E-06	4.28991E-05	8.867591149	2.3892	1.10983	1.14028	7.02693	6.72015	7.43103
MSC	C vs UT	0.000293105	0.001055795	8.86942349	54.0285	54.6684	61.5431	194.186	307.001	220.672
PGK1	C vs UT	1.15209E-08	5.09572E-06	8.885116222	5.95277	5.64527	6.6374	50.3683	30.5816	43.0337
CHPF	C vs UT	1.20591E-05	0.000110744	8.898107639	20.527	24.2509	24.3754	103.411	131.937	74.8102
SELS	C vs UT	2.13866E-06	4.01976E-05	9.003616465	28.2697	32.2148	20.1537	338.63	252.941	301.699
KPNA2	C vs UT	6.75262E-07	2.31922E-05	9.016254658	33.0412	34.6302	31.8636	131.91	167.911	133.382
IL23R	C vs UT	5.48397E-05	0.000310029	9.036498359	2.02073	1.7183	1.71636	11.0645	20.7619	12.3065
NUDCD1	C vs UT	3.96063E-06	5.69259E-05	9.091237998	16.0236	14.5897	17.411	429.674	410.109	407.171
EIF4EBP1	C vs UT	3.23291E-06	4.9952E-05	9.118160364	2.22085	1.30566	1.57171	10.1544	9.31859	8.28149
NELF	C vs UT	3.96955E-05	0.000246448	9.196236769	43.6349	48.5343	44.0974	232.159	241.341	226.418
POLR3G	C vs UT	0.000928515	0.00259135	9.209971597	97.8243	75.4782	92.4439	19.2071	13.2162	17.7658
SH3BP5	C vs UT	0.000132827	0.000583872	9.216224507	11.0738	9.85708	18.089	44.5928	47.6677	73.0983
FTHL7	C vs UT	7.24058E-07	2.38707E-05	9.2222149	30.8775	32.2763	32.8058	142.188	195.911	133.219

TRAF1	C vs UT	7.78338E-05	0.000397342	9.224697156	2.7602	1.42782	2.70883	0.172409	0.385349	1.15672
CISH	C vs UT	2.3567E-05	0.000172759	9.243580973	30.5504	31.3335	49.4905	8.09481	8.33296	9.25305
CYCS	C vs UT	1.23098E-06	3.04169E-05	9.248741136	258.3	332.341	508.702	18.2243	18.1442	27.9822
DDX21	C vs UT	5.31362E-07	2.01124E-05	9.324810929	4.38158	6.91958	2.55781	250.359	225.75	379.879
GOT1	C vs UT	2.44929E-09	3.68745E-06	9.349902102	0.420143	0.424404	1.32518	7.04093	27.8659	53.0368
NDUFV2	C vs UT	6.4176E-07	2.26258E-05	9.350062974	4.80172	4.96123	10.1077	0.143793	0.313702	0.0926296
LOC399942	C vs UT	1.08279E-08	5.09572E-06	9.353755616	4.80172	4.17789	2.52699	12.0703	24.2372	10.0858
MMD	C vs UT	6.34872E-08	9.50441E-06	9.362735492	4.07712	4.45041	4.18715	21.6024	26.94	23.1791
BYSL	C vs UT	4.24492E-06	5.95448E-05	9.365816411	19.6865	37.9666	30.5577	1.33942	0.250167	1.73639
FABP5	C vs UT	0.000903025	0.002536582	9.417753139	0.0601203	0.261212	0.0925474	76.061	64.0198	26.9262
ARHGAP31	C vs UT	1.40E-05	0.000121791	9.446555973	37.9929	32.9982	41.1084	240.494	207.381	287.073
YRDC	C vs UT	2.9205E-06	4.74437E-05	9.471185817	40.4237	28.7224	67.1472	6.75367	3.62893	6.06078
FTHL2	C vs UT	3.12219E-06	4.90459E-05	9.498807657	5.46195	6.23415	6.07081	41.24	92.4232	55.8876
INSIG1	C vs UT	7.96883E-06	8.58093E-05	9.523771388	12.3183	13.7138	19.789	4.40895	3.88137	2.28512
FTHL16	C vs UT	1.39964E-06	3.26379E-05	9.573935997	9.36326	7.89874	9.73788	0.670668	0.448103	0.694072
MAPK11	C vs UT	5.97089E-06	7.25331E-05	9.577305977	78.9865	88.1254	67.517	17.8659	14.2018	20.9118
FLJ36031	C vs UT	5.59527E-08	9.01285E-06	9.599632948	43.9633	52.1561	34.8217	221.092	311.808	191.947
TUBA1B	C vs UT	9.54305E-07	2.6608E-05	9.659241588	9.03314	5.80984	7.88894	0.143793	0.134501	1.06419
SYP	C vs UT	0.000202456	0.00080086	9.667535066	11.7341	7.14805	11.0938	0.670667	0.0897007	1.01793
FTH1	C vs UT	8.20002E-07	2.54036E-05	9.750030086	8.94312	8.32305	8.22792	38.7493	47.3988	33.0794
SELK	C vs UT	1.70368E-07	1.22844E-05	9.758331607	0.600303	0.391768	0.647232	145.654	177.994	70.0451
FTHL11	C vs UT	9.73113E-07	2.67823E-05	9.852720083	10.5556	8.91056	8.4059	48.4245	58.1865	39.9142
FTHL20	C vs UT	2.30226E-06	4.19925E-05	9.886561694	2.19084	2.97025	3.88289	26.0565	25.0883	30.5811
FTHL10	C vs UT	8.7191E-07	2.59052E-05	9.905424617	7.77273	18.1147	6.19407	125.298	219.923	106.409
CD69	C vs UT	3.44046E-05	0.00022486	10.00433139	1.50061	1.86052	1.41763	202.275	270.151	89.568
RAB33A	C vs UT	2.81801E-05	0.000196527	10.09730476	48.1303	44.0981	50.5879	720.121	592.32	693.136
SLC1A4	C vs UT	2.68533E-06	4.57535E-05	10.13414236	5.49196	5.37016	4.23969	0.910162	0.179301	0.647807
LOC283014	C vs UT	1.03595E-05	9.96673E-05	10.13821853	5.49701	4.33355	4.0278	15.4239	28.8895	12.3939
LOC100288175	C vs UT	0.000558698	0.001734326	10.15889882	0.750353	1.95844	0.523969	8.90907	7.61616	6.19958
FTHL12	C vs UT	2.81118E-06	4.65885E-05	10.24771078	1.53062	2.5133	5.48531	161.657	443.213	480.619
CD83	C vs UT	4.70005E-05	0.000276487	10.26989142	47.2803	42.282	77.5214	7.62904	7.10349	11.6634
LOC642590	C vs UT	1.35166E-06	3.18662E-05	10.28971131	43.3648	37.894	36.2086	11.2561	6.80975	8.74414
NDUFV2P1	C vs UT	8.62763E-07	2.58071E-05	10.34756789	12.1242	16.8745	6.96447	153.463	140.358	78.9269
SAMSN1	C vs UT	3.73487E-05	0.000237498	10.36474385	7.43162	5.98672	9.50288	40.6872	41.096	46.7635
SLCO4A1	C vs UT	0.000642073	0.001932802	10.52278036	30.9564	25.4947	21.3632	8.55661	2.98216	3.25413
RCN1	C vs UT	6.01419E-07	2.1606E-05	10.54298021	30.2895	45.3369	52.4984	321.817	393.342	374.94
PLEK	C vs UT	2.02722E-05	0.0001579	10.56116055	119.077	121.32	95.9583	30.7504	12.8578	11.7513
PGK1P1	C vs UT	4.66071E-05	0.000275223	10.57180272	0.180161	0.783437	0.308258	5.65202	8.82577	6.33838
IGHV_	C vs UT	0.000121629	0.000550747	10.57318328	11.464	10.3467	9.39892	1.29334	1.07531	0.832866
ATF4C	C vs UT	0.000833099	0.002381111	10.61565042	7.59267	12.4356	6.84121	61.9317	52.4613	78.7888
ODC1	C vs UT	7.78394E-06	8.46332E-05	10.63443841	1.89074	1.94514	1.23273	10.9687	15.083	10.6873
IL23A	C vs UT	3.54796E-06	5.28338E-05	10.6687585	8.22287	11.4891	22.1875	61.1652	121.767	52.603
SLC16A3	C vs UT	2.16267E-05	0.000163943	10.70754883	66.6839	48.2596	29.1631	7.26223	4.64707	11.6148
FTHL3	C vs UT	3.57584E-06	5.30567E-05	10.77313722	0.720343	0.65288	0.523969	131.096	192.149	89.7538
KBTBD8	C vs UT	3.37118E-06	5.13803E-05	10.7984349	0.840384	1.24119	1.54089	35.1689	51.386	40.5549
IRAK2	C vs UT	1.44101E-05	0.000124336	10.85608937	6.18569	7.24273	6.00716	33.0428	47.74	30.0636
LOC643634	C vs UT	9.33321E-07	2.63941E-05	10.95157269	8.25289	5.5161	9.39892	66.4821	37.1396	44.4606
PIM1	C vs UT	4.62334E-07	1.82711E-05	11.0261273	3.30122	4.83068	4.16023	14.1778	21.4595	13.8795
ZC3H12A	C vs UT	9.62521E-06	9.54265E-05	11.0775112	4.71169	5.05915	2.74271	1.38913	1.12011	0.509013
PSMD14	C vs UT	7.03819E-08	9.50441E-06	11.0799454	30.6705	33.0308	33.8358	5.93942	4.56973	4.39526
SOD2	C vs UT	1.9138E-06	3.73373E-05	11.10621041	9.64626	9.60002	13.2522	3.72597	1.56811	2.6323
EML5	C vs UT	7.10801E-07	2.38157E-05	11.15132787	2.56953	3.87115	2.22469	0.183565	0.451868	0.277689
FRMD4B	C vs UT	9.89743E-08	9.93148E-06	11.19070836	5.22186	2.44803	2.85296	59.2736	27.2269	24.7595
TNFRSF1B	C vs UT	1.55995E-05	0.000131381	11.28562961	28.8699	13.8391	16.3941	0.526974	0.179301	0.740337
KCNN4	C vs UT	0.001889883	0.004617051	11.3687503	10.5044	13.8561	12.2565	827.207	1069.76	726.127
PHLDA1	C vs UT	0.000127056	0.00056393	11.38267437	30.697	26.2937	29.6482	195.343	140.712	147.783
TARS	C vs UT	1.63958E-07	1.20333E-05	11.39199348	2.64099	3.94942	2.09557	16.3811	25.4019	6.43091
CREM	C vs UT	4.94013E-06	6.5262E-05	11.45767911	30.8542	35.7728	33.6981	207.628	319.43	232.49
FTHL4	C vs UT	1.90507E-06	3.72793E-05	11.47148299	5.58198	5.84249	8.25873	968.325	1296.48	1212.21
CSF1	C vs UT	0.000619298	0.001881236	11.48512766	21.8175	22.2926	19.2215	83.8494	133.82	101.551
ANKRD33B	C vs UT	1.28108E-05	0.000115975	11.48696909	0.123324	1.36354	0.171412	5.31407	5.88528	6.40436
LOC100129096	C vs UT	6.01996E-07	2.1606E-05	11.48830368	9.84341	11.13	11.0938	2.25129	2.73292	2.68346
PAICS	C vs UT	3.11423E-06	4.90459E-05	11.74209355	9.93345	8.06194	8.81342	40.9527	50.304	26.1397
VLDLR	C vs UT	6.22775E-05	0.000339049	11.79473999	36.2193	19.8673	39.1957	3.10162	1.79211	2.97832
ATF3	C vs UT	8.23418E-05	0.000413049	11.88191078	3.33123	4.04734	3.79045	79.7489	72.9344	66.0665
CYCSP45	C vs UT	5.36258E-06	6.82359E-05	11.96180265	19.6866	22.6842	23.4201	3.59243	5.19694	4.34899
EGR2	C vs UT	0.000397776	0.001328074	12.06731806	29.8004	33.7161	36.948	448.965	650.08	306.902
IQCG	C vs UT	5.97463E-05	0.000329312	12.13372325	6.33225	6.16887	5.54694	59.5373	50.1765	59.2653
ZBED2	C vs UT	0.003726623	0.008111078	12.23400177	4.85906	2.93475	4.59014	0.126289	0.842014	1.05886
LOC386597	C vs UT	0.005560543	0.011330607	12.24119591	34.9462	18.0375	22.8638	1.91601	1.5431	1.76999
DLEU2	C vs UT	1.73071E-05	0.000141698	12.25132042	14.1649	16.8418	17.0412	149.058	180.053	132.132
BLM	C vs UT	4.93729E-06	6.5262E-05	12.2538917	2.61098	4.56956	5.33123	125.395	197.481	220.408
NCS1	C vs UT	4.52816E-06	6.15113E-05	12.35798124	0.480262	0.750798	0.523969	3.16135	5.83323	3.46996
BHLHE40	C vs UT	2.02396E-05	0.000157746	12.49042863	7.23247	7.4519	7.64286	29.4404	74.725	41.6651
TPI1P1	C vs UT	1.07287E-08	5.09572E-06	12.49768148	61.3219	39.2674	42.2567	13.3173	4.77847	12.0302
CDK6	C vs UT	6.16449E-06	7.39379E-05	12.51875933	0.930414	3.03553	2.06476	8.76538	9.99058	6.61597
LOC646347	C vs UT	3.75933E-06	5.51161E-05	12.65701311	12.5374	10.1917	11.6978	2.05939	2.71703	2.12004
TMEM217	C vs UT	1.71365E-05	0.000140487	12.67834574	8.28493	4.17621	3.34853	1.50973	0.449128	1.66216
SOCS2	C vs UT	4.53022E-06	6.15113E-05	12.752586	2.0708	5.9404	1.63334	17.4828	21.7731	14.5735
SLC7A1	C vs UT	1.29051E-07	1.05377E-05	12.76248408	2.82105	4.99388	4.25268	0.479077	1.25451	0.740337
PSMA6P1	C vs UT	1.19095E-07	1.00578E-05	12.84530378	3.90141	3.55775	3.3282	20.8356	34.5413	22.8086
TPM4	C vs UT	8.57789E-07	2.58071E-05	12.85912355	4.95177	4.99387	11.5868	0.191691	0.358503	0.416483
RBBP8	C vs UT	3.70682E-05	0.000236613	13.04482163	38.4345	38.4207	45.0835	4.59826	4.43071	6.0602
SESN2	C vs UT	1.0933E-08	5.09572E-06	13.09390252	9.4833	7.47445	8.84423	0.958053	1.16491	1.89696
ADM2	C vs UT	7.91375E-07	2.50102E-05	13.18970935	51.6637	47.8081	46.6282	226.095	359.239	197.984
STX11	C vs UT	3.28914E-06	5.05675E-05	13.30104457	20.4652	30.5918	21.4096	70.9272	176.636	68.9239
TSHZ3	C vs UT	0.00020883	0.000817422	13.45459878	2.58097	1.59941	1.66415	4.93356	11.8274	7.03234
SMS	C vs UT	6.67977E-06	7.76731E-05	13.48842629	18.0904	18.8621	19.1849	2.3207	1.71793	3.37511
HPDL	C vs UT	0.002001009	0.004833942	13.84305587	5.57975	4.78157	6.94303	75.2325	56.6481	57.6292
GADD45B	C vs UT	1.81536E-06	3.61605E-05	13.99446226	43.3965	53.1546	57.3613	458.27	499.65	507.907
TPI1	C vs UT	9.73931E-09	5.09572E-06	14.04304344	108.756	87.5539	78.158	32.2029	13.4535	22.6405
IL12RB2	C vs UT	0.000456498	0.001473845	14.07757667	13.8133	9.95386	10.4171	3.74876	2.13899	2.33067
SEMA7A	C vs UT	3.83736E-08	8.69402E-06	14.09752407	432.006	493.779	445.855	51.1572	38.676	67.3135
HAPLN3	C vs UT	1.6118E-06	3.46832E-05	14.36442886	2.46849	2.76121	3.47715	13.7198	17.4617	15.1803
SCD	C vs UT	3.39207E-07	1.55481E-05	14.37202903	3.24119	2.3002	2.07775	16.4769	30.6883	15.5451
PCK2	C vs UT	2.91464E-06	4.7411E-05	14.42617974	51.6464	62.8148	151.487	2152.73	1906.28	2446.84
CYTIP	C vs UT	1.57015E-09	3.22667E-06	14.43352657	3.96592	4.37901	3.91998	24.8469	12.7081	30.4655
CCL3L1	C vs UT	0.007612507	0.014851615	14.46660495	53.0237	50.1337	54.0197	16.908	9.85617	9.80823
ENO1	C vs UT	1.02409E-08	5.09572E-06	14.48904257	97.2375	120.532	86.3108	534.456	545.922	475.837
NFKB2	C vs UT	1.95008E-06	3.78653E-05	14.57910272	14.4598	13.8356	13.6919	2.49008	3.13806	2.02586
SLC16A1	C vs UT	8.51478E-09	5.09572E-06	14.63320152	2397.63	1878.97	1707.08	336.863	58.8677	356.886
PKM2	C vs UT	3.13049E-07	1.50777E-05	14.72978416	6.93749	5.17417	5.44653	0.899898	1.13039	1.50414
PTMS	C vs UT	2.29726E-06	4.19925E-05	14.7443651	2.01078	2.90497	4.6841	223.874	450.065	270.927

TRIB1	C vs UT	0.000994334	0.002734893	14.77637724	10.5248	3.92227	3.88203	1.37428	0.663439	1.4593
CCR1	C vs UT	6.07472E-07	2.1606E-05	14.8223513	47.0262	64.9191	62.7715	428.027	331.026	571.985
TRAF4	C vs UT	5.56942E-05	0.000313423	14.83037754	40.3637	25.5238	18.0889	8.52588	5.15214	7.30994
TIFA	C vs UT	1.42528E-06	3.29E-05	15.08457272	3.18117	4.705	2.1244	0.573171	0.314528	0.685889
JAKMIP1	C vs UT	6.43318E-06	7.59781E-05	15.47621739	3.33123	3.36192	3.48228	16.0828	16.973	10.2116
MAFF	C vs UT	1.77885E-05	0.000143919	15.61354277	0.840384	0.554963	0.616416	2.34977	11.922	4.25646
MT2P1	C vs UT	0.000771743	0.002235282	15.81786955	23.0065	24.5787	26.1277	84.6703	129.656	99.1562
LGALS1	C vs UT	0.003745768	0.008146996	15.94827035	79.5269	84.0119	91.1554	626.624	454.359	496.542
FASLG	C vs UT	1.05954E-07	9.93148E-06	16.09526317	211.142	232.168	274.123	1011.78	1732.28	1545.8
GARS	C vs UT	4.69911E-09	4.41671E-06	16.26663264	97.8019	100.429	106.592	483.442	355.976	602.811
SPHK1	C vs UT	1.92297E-05	0.000151989	16.3667743	14.326	13.342	24.6704	3.97561	3.40493	4.11767
TXN	C vs UT	7.23446E-09	5.09572E-06	16.45419335	5.98627	6.29596	7.66348	0.919151	0.215678	0.503435
ACTN1	C vs UT	4.05E-04	0.001345335	17.12349	13.1746	3.62303	23.112	482.038	599.17	541.259
PIM2	C vs UT	1.53545E-08	5.88927E-06	17.15745636	11.0738	10.8363	10.2001	33.9116	72.8011	42.425
LAG3	C vs UT	1.2366E-05	0.000112609	17.70845655	0.420242	0.587602	0.369889	3.40084	2.10572	2.96105
DDIT4	C vs UT	3.87094E-05	0.000242894	17.71117504	0.210171	0.0980171	0.184995	13.0283	5.37614	7.58753
CD40LG	C vs UT	2.82717E-06	4.66967E-05	18.74236953	6.2422	5.28762	2.86597	37.5039	49.4148	78.4188
EPAS1	C vs UT	0.000421554	0.001384593	18.82250613	12.4843	10.2488	4.59165	0.526974	0.492904	0.509013
BCL2A1	C vs UT	8.30598E-05	0.000415299	19.58542516	63.9215	65.4737	69.2736	21.123	11.1106	17.2106
HMOX1	C vs UT	4.00756E-05	0.000248183	19.67726954	2.05769	1.87249	2.31083	16.3999	19.865	22.112
GSG2	C vs UT	2.16806E-06	4.05648E-05	19.6990646	0.390232	0.457046	0.745308	1.87389	2.96353	2.45213
ICOS	C vs UT	6.71351E-06	7.7945E-05	19.70054555	23.91	22.6026	15.63	3.22341	3.94701	4.49458
FABP5L7	C vs UT	4.61954E-05	0.000273315	19.73074141	21.3673	30.067	25.1766	5.79572	4.88334	6.38464
AK3P1	C vs UT	0.000247317	0.000928003	19.77226767	3.42125	4.30845	4.25268	18.6802	16.4418	16.5629
SPRED2	C vs UT	0.000181865	0.000742518	19.81100895	15.7172	11.8769	14.4689	2.71869	1.45196	3.38949
GK	C vs UT	9.64796E-08	9.93148E-06	20.17254434	14.0449	11.7828	13.1892	2.1076	1.34411	2.82225
ICAM1	C vs UT	5.94756E-06	7.23209E-05	22.30527453	12.1401	14.3412	15.3104	665.852	1381.8	710.291
CSDA	C vs UT	1.40875E-05	0.000122323	22.33969313	36.4625	39.2974	42.3102	153.223	179.02	146.43
GK4P	C vs UT	7.44668E-08	9.50441E-06	22.52601856	57.4097	51.4717	42.4644	2.1555	1.88171	1.24925
MAP3K8	C vs UT	9.60045E-06	9.53088E-05	22.5592471	2.82105	3.23136	3.45147	15.6626	23.9235	18.0896
PDGFA	C vs UT	0.001004652	0.002760722	23.35060784	4.53164	5.90777	6.50223	24.1883	47.1298	26.1397
SOCS1	C vs UT	6.95347E-07	2.36523E-05	23.61176916	64.3418	92.5644	70.6915	16.5248	11.8722	23.1325
CCL3	C vs UT	0.001758644	0.004351611	23.79529764	3.30121	2.48066	2.28047	12.9804	11.5138	9.76199
CDC6	C vs UT	4.0462E-05	0.000249698	24.40176772	19.6868	20.5043	25.5798	79.7545	98.366	99.9545
SLC7A5	C vs UT	1.61679E-06	3.47301E-05	24.46284128	2.89367	0.998901	5.22359	0.475708	0.403303	0.192861
FURIN	C vs UT	2.07278E-07	1.2966E-05	24.63162473	2.04079	2.38275	1.54089	5.69992	10.3042	8.18896
TFRC	C vs UT	1.04207E-06	2.77043E-05	24.90554491	0.570293	1.69733	1.01702	4.64617	14.5602	18.1359
BATF	C vs UT	1.6789E-08	5.88927E-06	25.19654532	4.62957	4.70956	5.24332	0.526974	1.07531	0.86584
CCR4	C vs UT	2.07874E-05	0.000160605	25.89242589	12.9645	14.5245	12.8503	65.2369	54.5664	49.7348
SHMT2	C vs UT	1.01341E-07	9.93148E-06	25.96503653	6.48229	7.2786	9.89254	0.72367	1.34411	0.925396
CTH	C vs UT	1.6766E-08	5.88927E-06	26.5592767	4.21697	3.48642	11.5004	45.6549	61.876	39.1649
HK2	C vs UT	3.98489E-07	1.68717E-05	27.12098393	38.233	40.701	37.318	10.1065	5.24174	10.1321
RGS1	C vs UT	0.000323961	0.001139989	29.21132375	8.9431	7.76818	8.50525	49.8135	72.442	57.739
PMAIP1	C vs UT	5.62847E-08	9.01285E-06	30.26924991	2.22085	2.44803	3.20494	11.2561	13.2162	11.0111
TNF	C vs UT	1.40769E-06	3.26871E-05	30.94375926	70.2565	74.6283	37.2115	7.68598	5.20623	21.3478
SLC41A2	C vs UT	5.8961E-07	2.1606E-05	31.83668046	0.180161	0.195934	0.215811	76.1102	4.88334	8.69789
SLC27A2	C vs UT	0.001416823	0.003634921	32.10254832	6.33224	5.71193	5.48531	36.9292	16.3522	76.4295
NFKBIZ	C vs UT	6.53E-06	7.65351E-05	32.92425206	6.99246	8.02929	8.59771	38.3661	80.8197	28.6843
WARS	C vs UT	8.82137E-06	9.07151E-05	33.16262467	14.6751	13.7085	15.0998	1.86811	0.448103	2.77599
SLC1A5	C vs UT	1.03011E-07	9.93148E-06	33.89487156	4.83174	5.45082	6.47143	1.34124	0.582504	2.03575
MTHFD1L	C vs UT	5.89385E-08	9.19887E-06	35.08929012	69.3587	72.3431	61.1303	320.172	313.81	212.97
TREML2	C vs UT	5.75176E-06	7.09902E-05	35.78536649	47.182	52.6632	66.5426	8.02219	5.4916	13.0318
NFKBIA	C vs UT	6.34131E-08	9.50441E-06	36.79647684	8.73306	7.83347	7.98139	44.0661	34.7651	49.4106
CDKN1A	C vs UT	4.47882E-07	1.8047E-05	36.89050046	10.5937	8.63513	9.79776	38.1733	70.4693	46.9587
DUSP6	C vs UT	2.98363E-05	0.00020472	38.33150732	29.543	24.0864	32.1822	348.348	206.758	260.001
GNA15	C vs UT	0.000212108	0.000825977	38.58395986	6.79789	7.605	7.63507	58.135	86.9537	53.6112
LIF	C vs UT	0.000151643	0.000643414	40.5321405	4.65167	6.46263	4.53002	42.2189	30.5987	36.7332
ADAM19	C vs UT	4.98585E-05	0.000288888	40.65359228	5.22324	4.771	4.64396	23.9677	29.9814	21.1291
CD274	C vs UT	6.58724E-12	8.12207E-08	41.57995587	10.9238	12.5661	12.3572	2.29919	3.04652	2.82225
CCL20	C vs UT	1.20454E-06	3.00647E-05	43.42176122	20.6771	21.4766	15.2539	4.26299	4.52493	4.53405
PHGDH	C vs UT	0.000296977	0.001065695	45.04677794	0.0901304	0.228573	0.0309158	22.512	23.789	18.2747
MFSD2A	C vs UT	0.000251218	0.000937788	50.62544306	12.6644	14.4592	15.1615	80.1331	85.5693	66.2051
FES	C vs UT	6.4501E-06	7.60235E-05	52.70243198	3.70337	4.8389	4.64958	15.1915	40.9902	22.1709
CDKN2B	C vs UT	6.10641E-06	7.34787E-05	53.59543788	22.532	23.1447	19.3961	4.6	4.61406	4.97099
DUSP5	C vs UT	9.80048E-06	9.62868E-05	54.93737738	7.30007	5.40277	7.78382	80.5622	56.8989	58.6769
RGS16	C vs UT	7.05572E-05	0.000370831	56.43226493	4.20152	3.75359	3.91371	58.8186	71.0091	65.4641
TNFRSF18	C vs UT	9.55461E-07	2.6608E-05	57.98599708	7.59266	16.3196	3.94452	0.670668	1.20971	0.555277
ABTB2	C vs UT	2.87897E-08	7.35445E-06	58.1929705	3.09114	2.70914	3.14331	0.479077	0.672105	0.509013
GPT2	C vs UT	2.7672E-07	1.45207E-05	58.66222965	5.76205	5.12443	4.31431	0.287486	0.224102	0.647807
FEZ1	C vs UT	2.40283E-05	0.000174997	61.76419501	0.790729	0.881354	1.02303	5.12767	8.61052	5.22469
FOXP3	C vs UT	1.68152E-05	0.000138683	62.47502227	26.259	20.53	14.5143	2.82606	2.59852	2.86852
LTA	C vs UT	2.98234E-08	7.35445E-06	65.9925324	59.8092	86.6571	53.0644	1022.6	591.748	492.931
MTHFD2	C vs UT	5.2704E-08	8.901E-06	71.63596045	0.390232	0.68552	0.832269	2.53868	2.37452	3.09984
MYB	C vs UT	0.000263633	0.000970037	78.0733182	14.7786	19.286	19.9979	82.6314	127.391	78.533
SOCS3	C vs UT	5.83986E-08	9.19887E-06	79.03956113	61.4608	45.6623	107.731	9.38805	5.86895	9.25306
OSM	C vs UT	2.7684E-07	1.45207E-05	80.86938379	11.2839	21.1827	18.0191	546.987	563.935	600.286
PSAT1	C vs UT	1.29563E-08	5.32505E-06	91.7896364	20.347	39.3956	19.0751	368.281	421.345	399.304
BCAT1	C vs UT	9.34709E-06	9.41582E-05	93.53064072	39.1032	34.01	31.9561	7.24873	7.20884	8.46157
TNFRSF9	C vs UT	1.5642E-06	3.43437E-05	98.42496241	88.1407	61.6554	120.582	20.5961	14.1122	24.0578
IRF4	C vs UT	3.32304E-07	1.55201E-05	98.97687005	11.4747	8.99028	10.784	1.80674	2.5164	2.23636
NAMPT	C vs UT	2.4545E-07	1.37557E-05	102.1693158	0.210171	0.587602	1.7566	16.429	51.4756	76.2445
MIR155HG	C vs UT	6.7523E-07	2.31922E-05	103.5919676	19.5367	20.5301	20.5234	75.8222	116.66	72.173
CLIC4	C vs UT	8.77472E-07	2.60078E-05	106.9594022	1.64377	1.20774	1.14288	9.03568	13.982	8.59377
NAMPTL	C vs UT	8.38841E-08	9.69784E-06	111.1857276	6.69236	7.86611	6.50223	24.8589	37.0948	26.4173
SLC6A9	C vs UT	2.79117E-06	4.65069E-05	113.7724922	52.5365	50.4928	64.7381	16.1843	4.32822	11.1135
IL17F	C vs UT	2.49034E-06	4.39912E-05	113.9114594	0.840384	0.620241	0.523969	6.94526	4.65934	7.40246
CTLA4	C vs UT	0.00012527	0.000558821	117.602514	42.5544	47.6531	43.9742	161.511	226.196	165.858
SGK1	C vs UT	2.18661E-06	4.08221E-05	127.9217301	2.04076	1.04455	2.3421	7.9032	16.4096	11.8169
NDFIP2	C vs UT	1.86279E-08	5.88927E-06	129.8592809	8.11901	12.3254	9.04771	34.329	46.9668	42.506
GZMH	C vs UT	1.26311E-06	3.09626E-05	130.4348409	2.95425	2.39702	2.28076	14.7244	17.7466	12.9588
IER3	C vs UT	8.3517E-08	9.69784E-06	137.9954901	10.5636	8.15984	7.79651	53.8855	42.5159	83.9707
HOXB9	C vs UT	3.44516E-06	5.18034E-05	142.1758213	1.68966	2.19658	1.96385	5.37527	9.97925	8.12273
MKX	C vs UT	2.28485E-07	1.33517E-05	144.0362388	25.0886	25.7196	22.4648	88.4674	120.783	88.1344
BATF3	C vs UT	7.33715E-06	8.23176E-05	144.925525	104.858	115.968	130.287	479.547	609.429	401.489
MYO1B	C vs UT	9.34873E-09	5.09572E-06	148.3694551	3.56948	4.10805	3.18826	36.1995	43.4072	34.9511
C2CD4A	C vs UT	0.001104517	0.002978718	151.5299411	2.85106	3.16609	5.42368	30.1757	39.066	48.2544
ULBP1	C vs UT	1.89881E-07	1.27284E-05	174.1537955	39.5582	41.4391	30.8511	10.5926	5.36533	8.56588
IL2RA	C vs UT	8.29074E-06	8.76714E-05	176.6491094	0.0901304	0.68552	0.277442	8.57379	28.2691	16.4704
SPRY4	C vs UT	4.08772E-06	5.81333E-05	184.703022	62.1157	30.3931	24.4439	11.1975	3.61549	8.45411
EBI3	C vs UT	0.001762362	0.004359006	191.6195345	0.389428	0.602602	0.481863	4.53169	2.67674	3.39333
VEGFA	C vs UT	9.1822E-08	9.91583E-06	197.7808834	30.7765	28.5459	46.9437	1.14964	0.224102	1.30704
IL26	C vs UT	1.19851E-08	5.09572E-06	217.6893767	11.1939	11.2606	12.2956	0.62277	0.492904	1.38804
IRF8	C vs UT	1.11065E-07	9.93148E-06	227.0822813	1.44059	1.9258	1.20192	5.12516	9.76657	4.53405

MIR146A	C vs UT	1.15229E-05	0.00010731	231.2602203	6.48546	6.46021	6.84406	25.3762	29.7	24.9327
TNFRSF8	C vs UT	1.07733E-05	0.000102496	234.4714879	116.586	75.9658	65.6974	3.41328	3.34302	28.7305
ZBTB32	C vs UT	8.97944E-08	9.79792E-06	240.1586615	4.41159	3.32928	4.59165	1.72442	0.537704	0.694072
GZMB	C vs UT	2.8863E-08	7.35445E-06	245.0503404	8.79414	7.7022	7.27949	1.00344	0.748527	0.372156
CHAC1	C vs UT	3.81804E-08	8.69402E-06	265.5315346	28.382	31.3995	27.0108	143.902	201.262	120.586
AK4	C vs UT	5.86579E-07	2.1606E-05	346.2596564	2.31088	3.36192	3.63636	39.9468	24.1923	42.795
ETV5	C vs UT	7.89374E-08	9.50441E-06	367.0346472	0.510272	0.685519	0.647232	35.8821	145.938	58.5744
IFNG	C vs UT	5.27575E-08	8.901E-06	396.9989314	19.2962	26.144	21.3246	145.608	139.998	135.323
HBEGF	C vs UT	4.531E-07	1.81978E-05	403.5155819	1.11048	0.848715	0.308258	9.14856	5.41966	8.46655
IL22	C vs UT	0.003942871	0.008496259	565.4577743	28.93	32.8594	25.1756	198.417	208.374	202.645

Appendix Table 5. Genes with significantly altered expression values triggered by cytokines and TCR beads. P<0.01, |Fold Change| > 4. Expression value of each indicated gene in each sample is shown.

Gene Name	Contrast	P-value	FDR	Fold-Change	UT1	UT2	UT3	TC1	TC2	TC3
KIT	TC vs UT	0.000102077	0.000423775	-80.57859957	52.0677	41.9087	189.55	0.54215	0.466484	2.51
CPNE7	TC vs UT	5.26353E-05	0.000262219	-69.93819214	22.3576	35.8375	53.4655	0.225954	0.763274	0.607333
MEGF6	TC vs UT	0.000145849	0.000551293	-61.17515249	28.8699	13.8391	16.3941	0.316296	0.0424986	0.607333
EPHA1	TC vs UT	8.05187E-05	0.00035495	-59.00999078	8.02078	9.09472	28.0898	0.243813	0.19829	0.323958
RASGRP2	TC vs UT	3.45494E-05	0.000197037	-51.80213011	25.2986	16.7766	17.2877	0.451808	0.127296	0.566851
SPON1	TC vs UT	0.000101123	0.000420947	-51.7892118	30.7765	28.5459	46.9437	0.451808	0.466484	1.1336
LTK	TC vs UT	1.9866E-06	3.71697E-05	-50.96652782	54.5883	35.1199	26.7174	0.722833	0.508883	1.05264
CXCR3	TC vs UT	0.00158732	0.003735762	-50.69965705	24.2182	37.9917	105.727	0.858346	0.551281	1.90276
RTN4R	TC vs UT	2.91798E-05	0.00017497	-50.5706494	8.70304	12.2071	12.6346	0.0791247	0.381687	0.202511
SCML4	TC vs UT	1.67153E-06	3.40589E-05	-50.12958131	43.7848	34.9892	39.9374	0.768004	0.466484	1.1336
TCF7	TC vs UT	4.75146E-08	9.19697E-06	-49.36923474	312.286	325.374	307.045	3.47825	6.95346	8.70378
PRSS35	TC vs UT	0.00045507	0.001339756	-49.24467214	28.1796	63.8091	94.8812	0.903517	2.16243	0.72878
FBLN5	TC vs UT	0.0001579	0.000583431	-47.3480315	11.7341	7.14805	11.0938	0.135613	0.254491	0.242993
DBP	TC vs UT	2.57078E-05	0.000161066	-42.96096867	29.5742	27.6534	41.536	0.443881	0.950194	0.904839
SNAI3	TC vs UT	8.31732E-06	7.78092E-05	-41.71477241	23.735	22.871	27.2388	0.54215	0.29689	0.931191
SORL1	TC vs UT	1.44983E-06	3.1615E-05	-39.94782117	517.577	468.041	542.598	9.3053	9.96377	18.9862
KLF2	TC vs UT	2.70907E-06	4.28063E-05	-39.38732494	57.4097	51.4717	42.4644	1.49074	0.975267	1.3765
IL7R	TC vs UT	3.27013E-05	0.00018921	-37.42944664	3699.82	3292.54	4121.08	67.666	65.3786	163.872
MAP2K6	TC vs UT	7.76522E-06	7.53306E-05	-31.85145761	5.28188	6.07096	8.69016	0.135613	0.169694	0.323958
CD52	TC vs UT	1.92284E-06	3.65675E-05	-31.13785475	192.107	183.75	220.576	4.47201	4.19756	10.485
ENPP5	TC vs UT	0.000479137	0.001392025	-30.87297816	6.33224	7.99666	9.09075	0.0452708	0.551281	0.162029
GAS7	TC vs UT	6.45192E-06	6.73202E-05	-30.00422049	10.2635	11.1627	22.6805	0.361467	0.339289	0.769262
FAM13AOS	TC vs UT	0.0002307	0.000779325	-29.5987257	7.29331	7.75496	4.34724	0.0452708	0.328168	0.281843
CD27	TC vs UT	0.000124456	0.00049121	-27.32101421	19.6865	37.9666	30.5577	1.44557	0.720875	1.06224
PIK3IP1	TC vs UT	5.66295E-06	6.25665E-05	-27.24108474	149.936	153.35	229.563	5.30183	4.91764	9.34101
TRANK1	TC vs UT	5.31449E-06	6.08516E-05	-26.42441725	169.377	173.085	219.78	5.33026	4.40955	11.5375
CECR1	TC vs UT	8.86219E-07	2.57216E-05	-26.29763322	73.5853	65.5718	67.7952	2.03279	1.95043	3.88639
SMARCD3	TC vs UT	5.84567E-05	0.000281502	-26.25249438	9.0379	4.76137	12.1757	0.406638	0.299315	0.283476
IGFBP3	TC vs UT	0.001433858	0.003440256	-25.78599634	6.63233	17.8537	5.08471	0.0904417	0.975267	0.0810645
TNFSF13B	TC vs UT	0.003521876	0.007254382	-25.73384259	19.5367	5.28762	34.4213	0.225954	0.254491	1.8218
ACACB	TC vs UT	0.000388574	0.001180974	-25.69879555	12.0342	6.00568	9.9536	0.722834	0.0424986	0.323958
NTNG2	TC vs UT	8.92994E-06	8.18633E-05	-25.48480182	7.20253	8.42097	5.02307	0.225954	0.381687	0.202511
NUAK2	TC vs UT	1.81921E-07	1.26016E-05	-25.26279038	13.5647	15.9932	13.3433	0.406638	0.805673	0.485887
SUSD3	TC vs UT	0.000841536	0.002203002	-25.24656224	14.286	16.0845	28.3287	0.316296	0.551281	1.45746
MFGE8	TC vs UT	8.26586E-06	7.74552E-05	-25.04794404	11.1939	11.2606	12.2956	0.271125	0.508883	0.607334
MMP24	TC vs UT	0.000811436	0.002135997	-25.0140979	19.2365	18.2598	19.1467	0.306447	0.713744	1.24425
RNF166	TC vs UT	6.24468E-06	6.62223E-05	-24.07489824	91.0505	101.409	141.105	4.56235	3.17999	6.11292
ABCA7	TC vs UT	5.01263E-06	5.90877E-05	-24.02995661	29.4101	19.0613	13.3742	0.632492	0.848071	1.09312
LY9	TC vs UT	1.05624E-05	9.042E-05	-23.85935382	92.6716	88.1259	96.3307	2.98138	2.9256	5.7081
STON1-GTF2A	TC vs UT	0.000264053	0.000866821	-23.85708894	14.6751	13.7085	15.0998	1.0842	0.212093	0.526369
AHNAK	TC vs UT	0.000143229	0.000544393	-23.81679504	2397.63	1878.97	1707.08	69.8794	51.0056	130.353
YPEL1	TC vs UT	3.13726E-06	4.60505E-05	-23.39972409	54.1458	48.8739	48.188	1.43406	2.85733	2.17055
LRMP	TC vs UT	2.58374E-06	4.19178E-05	-23.21305327	14.8455	14.5871	13.1883	0.768004	0.339289	0.72878
RIMBP3	TC vs UT	0.00039766	0.001202338	-22.39785389	10.0693	4.47513	12.8293	0.488764	0.108428	0.624968
TMEM63A	TC vs UT	7.28512E-07	2.35145E-05	-22.35824592	137.162	100.768	102.345	5.0921	5.01275	5.11434
LDLRAP1	TC vs UT	0.000139036	0.000533057	-22.04255086	57.4096	56.4331	77.1316	1.62625	2.54401	4.49363
GOLGA2B	TC vs UT	1.34698E-05	0.000106327	-21.73505281	12.4843	10.2488	4.59165	0.632492	0.381687	0.242993
PLXND1	TC vs UT	8.50847E-06	7.90962E-05	-21.27241132	248.397	179.352	217.279	14.6806	7.50465	8.13703
YPEL3	TC vs UT	7.36891E-07	2.36378E-05	-21.16647299	81.5511	70.2558	92.3011	3.42299	3.39928	4.7105
SYNM	TC vs UT	9.94498E-06	8.78362E-05	-20.38862903	47.2447	43.3439	24.0542	2.84584	1.52645	1.2506
ACSL6	TC vs UT	1.60608E-06	3.33384E-05	-19.96388266	17.2859	13.0883	12.7887	0.677663	0.59368	0.890709
PLCD1	TC vs UT	1.97956E-06	3.70941E-05	-19.86942036	22.8678	22.0314	21.0473	0.903517	0.59368	1.8218
S1PR5	TC vs UT	3.14151E-08	8.3081E-06	-19.74577365	78.2382	106.27	89.646	4.38167	5.13033	4.37218
F2R	TC vs UT	7.72115E-07	2.38079E-05	-19.66213736	123.581	139.6	116.761	7.18226	6.1903	5.95099
SALL2	TC vs UT	8.71496E-05	0.000377434	-19.38754642	4.80172	4.96123	10.1077	0.271125	0.551282	0.202511
LMTK3	TC vs UT	7.71348E-06	7.51242E-05	-18.87687784	5.76205	5.12443	4.31431	0.271125	0.169694	0.36444
OSBPL7	TC vs UT	8.64425E-08	1.06584E-05	-18.74692901	19.0565	15.8627	12.8503	0.813175	0.763274	0.971673
LGALS3BP	TC vs UT	0.001878486	0.004291594	-17.63264413	14.675	10.6404	19.0119	0.397185	0.254469	1.86228
MIAT	TC vs UT	0.001027396	0.002600655	-17.49377806	116.586	75.9658	65.6974	4.15333	2.9256	7.68341
RARRES3	TC vs UT	1.3742E-06	3.08911E-05	-17.3138224	46.2455	47.7513	42.2485	1.49074	2.28962	4.0888
THBS1	TC vs UT	6.88642E-07	2.27846E-05	-16.76905345	23.5881	20.8564	23.5742	1.26488	0.848071	1.94325
D4S234E	TC vs UT	0.000319563	0.001009794	-16.37302219	33.0073	34.7309	61.8013	1.51936	2.01498	4.37743
CXCR4	TC vs UT	9.70794E-05	0.000408821	-16.26998409	439.831	654.348	689.652	26.109	21.8354	61.695
SAMD3	TC vs UT	7.6835E-06	7.49324E-05	-16.24137957	34.3316	31.1377	31.7712	1.44557	1.06006	3.48157
CD84	TC vs UT	5.4968E-05	0.000270561	-15.89866209	61.4608	45.6623	107.731	4.3365	2.41682	6.76064
NLRP6	TC vs UT	0.000884815	0.002293413	-15.44705469	6.36224	5.97304	7.33426	0.0452708	0.29689	0.931191
LPCAT4	TC vs UT	6.89096E-06	6.99881E-05	-15.40356668	37.8129	27.8738	27.0564	1.80693	0.975267	3.23868
ATHL1	TC vs UT	0.000102249	0.000424106	-15.25817167	111.758	46.2497	29.0285	3.2524	3.0952	5.91051
SIGIRR	TC vs UT	5.76161E-07	2.12062E-05	-15.04921577	38.9833	34.0753	32.3258	2.1683	2.16243	2.67193
NRBP2	TC vs UT	9.47031E-05	0.000402097	-14.77566016	7.32258	5.38554	3.97534	0.271125	0.169694	0.688298
IL17RE	TC vs UT	4.05922E-05	0.000219134	-14.69513866	9.36326	7.89874	9.73788	0.316296	0.508883	1.01216
ZMAT1	TC vs UT	7.00943E-06	7.05731E-05	-14.6124206	12.5143	11.2932	7.08773	0.496979	0.848071	0.769262
MDGA1	TC vs UT	0.001121267	0.002798062	-14.56210601	7.59266	16.3196	3.94452	0.451808	0.975267	0.485887
TMEM71	TC vs UT	9.46784E-08	1.12248E-05	-14.5514899	30.6705	33.0308	33.8358	2.52967	1.86564	2.30759
NMT2	TC vs UT	1.64489E-05	0.000121911	-14.50919821	37.0259	51.4806	57.497	2.9689	2.71013	4.38379
TJP3	TC vs UT	2.73188E-05	0.000167666	-14.48879453	5.13974	4.8929	3.49456	0.27383	0.169694	0.490107
PLEKHB1	TC vs UT	4.15748E-05	0.00022249	-14.45340116	17.256	16.9398	23.4508	1.35522	0.932869	1.70035
MTSS1	TC vs UT	9.72442E-05	0.000409362	-14.37567261	28.9	24.8383	13.5591	1.71659	1.10246	1.86228
CALHM2	TC vs UT	0.000104688	0.000430556	-14.35910286	52.5365	50.4928	64.7381	3.93546	2.44659	5.30165
PECAM1	TC vs UT	0.003141391	0.006591788	-14.13512731	2.73102	14.3939	11.8334	0.180783	1.01767	0.850227
TMEM8B	TC vs UT	4.82267E-08	9.19697E-06	-13.9273862	5.52197	4.96123	5.97836	0.316296	0.339291	0.526369
FAIM3	TC vs UT	4.98034E-06	5.88759E-05	-13.65324269	190.563	198.638	177.069	17.9781	16.2101	7.2869
AMICA1	TC vs UT	1.05103E-05	9.0182E-05	-13.62017175	495.266	392.156	395.674	28.1415	18.7403	47.3238
B3GNT8	TC vs UT	0.000143028	0.000544072	-13.54693941	31.1806	26.1113	36.1471	1.67142	0.975267	4.25073
MPP7	TC vs UT	2.25571E-05	0.000148866	-13.53143392	26.2288	32.8021	24.9916	1.58108	1.18726	3.44109

JMJD7-PLA2G	TC vs UT	2.38669E-07	1.37765E-05	-13.47869041	38.6832	31.7253	20.1844	2.1683	2.20483	2.34807
CNR2	TC vs UT	0.006687555	0.012539166	-13.41625055	10.1435	4.79804	7.24181	0.271125	0.127296	1.25505
CELSR2	TC vs UT	0.000201716	0.000702986	-13.27304458	11.9741	9.04112	15.1307	0.587321	0.678477	1.45746
TEF	TC vs UT	0.000415764	0.001246381	-13.20496776	21.0673	20.1711	30.0456	1.0842	1.39925	2.91482
FAM102A	TC vs UT	5.59722E-06	6.22306E-05	-13.03467933	258.3	332.341	508.702	25.4672	25.0955	33.7771
OBSCN	TC vs UT	1.29208E-06	3.0116E-05	-13.02484941	34.9462	18.0375	22.8638	2.34096	1.39925	2.08308
RIMBP3B	TC vs UT	0.000565189	0.00159239	-12.97651214	5.98627	6.29596	7.66348	0.731049	0.540172	0.265841
MGC23284	TC vs UT	5.16095E-06	6.02029E-05	-12.78273084	9.63645	8.78909	10.2026	0.496979	0.932868	0.809745
TMEM107	TC vs UT	0.000149904	0.000561993	-12.73432848	8.82308	8.38834	9.21402	0.768004	0.254491	1.05264
THAP8	TC vs UT	8.40243E-06	7.83889E-05	-12.68452031	3.45127	3.06817	3.72881	0.310448	0.254491	0.242993
FBXL16	TC vs UT	4.91029E-05	0.000250595	-12.67069915	14.9962	13.3062	18.1549	0.858364	1.02685	1.78129
TMIGD2	TC vs UT	0.000209204	0.000723357	-12.48366553	40.4237	28.7224	67.1472	2.89104	2.03523	5.99147
CAPN12	TC vs UT	4.77083E-05	0.000245101	-12.47475502	30.9564	25.4947	21.3632	1.3783	1.45724	3.4022
ATXN7L1	TC vs UT	0.000628036	0.001731594	-12.37859718	12.4543	14.0675	19.1676	0.587321	0.59368	2.51
CROCCP3	TC vs UT	0.000476358	0.00138722	-12.25822671	12.072	8.14029	4.52396	0.54215	0.169694	1.30608
COL5A1	TC vs UT	0.000583076	0.001630603	-11.87299674	24.0023	18.5064	12.6023	1.44557	0.848072	2.34807
UBA7	TC vs UT	0.000411496	0.001235691	-11.83391527	31.1206	17.6905	19.6606	0.993858	1.22966	3.56254
LOC388692	TC vs UT	3.90393E-05	0.000213083	-11.72692489	89.9729	69.3333	73.8527	5.69367	4.96465	9.22403
ABTB1	TC vs UT	5.74413E-07	2.12051E-05	-11.68905603	55.4289	42.4308	42.8957	4.38167	3.77357	3.88639
KIAA1324	TC vs UT	4.13176E-05	0.00022151	-11.59689865	11.1939	10.314	12.6038	0.813175	0.508883	1.61939
PDGFB	TC vs UT	0.005615241	0.010831652	-11.59340294	3.51129	7.57235	23.3585	0.316296	0.508883	2.14566
ANO9	TC vs UT	5.86E-04	0.001638824	-11.58504841	21.3373	8.29041	7.98139	1.03903	0.466484	1.74084
LOC10012955(	TC vs UT	1.98176E-05	0.000137353	-11.58482561	8.85309	9.04111	7.42671	0.496979	0.636079	1.05264
LOC400685	TC vs UT	0.000247872	0.000826465	-11.55411242	9.23133	10.3424	12.1288	0.704739	0.460188	1.5789
MYO1F	TC vs UT	7.9533E-06	7.6374E-05	-11.53010359	108.756	87.5539	78.158	6.12762	6.30945	11.3674
NKD1	TC vs UT	0.00285818	0.006096066	-11.45108444	4.95177	4.99387	11.5868	0.768004	0.424086	0.688298
NDRG2	TC vs UT	2.70686E-06	4.28063E-05	-11.40909336	6.18218	4.66748	5.33123	0.587321	0.466484	0.36444
CD300A	TC vs UT	0.000214707	0.000738655	-11.39807126	10.5037	11.8154	11.8025	0.722833	0.975267	1.29553
FBXO32	TC vs UT	1.19661E-06	2.93907E-05	-11.36591627	28.5097	32.476	26.5633	2.62001	3.17999	1.90276
SPOCK2	TC vs UT	0.000127524	0.000498532	-11.34151177	1438.38	1431.47	2405.85	106.558	82.7197	275.888
WDR86	TC vs UT	9.9831E-07	2.75392E-05	-11.31855125	23.0671	13.9938	14.9883	1.73656	1.25909	1.60292
AMOT	TC vs UT	3.11E-05	0.000183228	-11.21669371	4.83174	5.45082	6.47143	0.496979	0.551281	0.445405
MXD4	TC vs UT	1.62658E-07	1.24442E-05	-11.13460414	111.788	106.992	146.374	11.6542	11.8293	9.31101
CXCR7	TC vs UT	0.001370428	0.003309318	-10.99147433	6.42228	6.20152	7.36508	0.135613	0.508883	1.17409
ADRB2	TC vs UT	7.95306E-07	2.41019E-05	-10.94609071	38.7732	45.2051	34.1748	2.4845	3.81597	4.49363
FCGRT	TC vs UT	0.000356547	0.001102915	-10.75861804	4.56164	4.27581	5.97836	0.451808	0.763274	0.162029
TBC1D10C	TC vs UT	1.35895E-06	3.0799E-05	-10.75384284	97.8243	75.4782	92.4439	7.49846	5.55431	11.659
GDPD5	TC vs UT	1.08808E-06	2.83066E-05	-10.7047145	14.3149	14.3286	11.9874	1.03903	0.975267	1.78132
TP53INP1	TC vs UT	2.55047E-05	0.0001602	-10.58899036	29.41	28.4614	32.1719	2.43933	2.50162	3.56254
TRNAN34P	TC vs UT	0.00010406	0.000429404	-10.5843557	16.525	22.1069	28.094	1.06443	2.55692	2.68285
PTGDR	TC vs UT	2.91055E-05	0.000174633	-10.55114959	9.72338	7.73554	5.14634	0.768004	0.848071	0.526369
PLD1	TC vs UT	2.06507E-05	0.000141189	-10.5195812	18.3663	27.4495	25.8545	1.80693	1.48405	3.52205
PASK	TC vs UT	3.03585E-05	0.000179898	-10.49586469	59.0516	40.1691	23.4568	4.02031	3.0528	4.61508
FLJ32255	TC vs UT	2.68073E-05	0.000165598	-10.48223923	62.4515	76.6369	92.7254	6.00782	4.36715	11.7399
KIF3C	TC vs UT	1.56113E-05	0.000117802	-10.45852773	14.0449	11.7828	13.1892	1.17454	1.01767	1.53842
TMC6	TC vs UT	5.03818E-07	1.97209E-05	-10.39997925	167.24	136.298	108.998	12.0252	11.0304	16.6114
SESN3	TC vs UT	2.0416E-06	3.74405E-05	-10.3743666	34.4217	44.2586	44.5289	3.97513	2.8408	5.06038
SGK223	TC vs UT	2.894E-05	0.000174063	-10.36291663	21.6074	22.2599	26.4092	3.65894	1.90804	1.21457
ANXA1	TC vs UT	6.56E-05	0.000307104	-10.31923738	65.6023	63.744	44.7445	4.06548	3.85837	8.94667
LOC153684	TC vs UT	0.000440115	0.001304163	-10.25020375	4.74273	3.59039	3.29739	0.361467	0.0848971	0.688298
CD5	TC vs UT	1.6169E-05	0.000120826	-10.20852076	64.3418	92.5644	70.6915	5.23992	6.52948	10.5255
SFXN3	TC vs UT	5.76556E-06	6.34015E-05	-10.18714607	39.5582	41.4391	30.8511	4.7863	2.88888	3.30419
RASGEF1A	TC vs UT	0.003090438	0.006502576	-10.16539253	9.03314	5.80984	7.88894	0.722834	0.339289	1.17408
EVL	TC vs UT	6.33617E-06	6.66595E-05	-10.12656446	177.404	133.121	102.281	12.511	9.11492	19.1387
ZCCHC18	TC vs UT	2.69609E-05	0.000166048	-10.12481534	7.44261	7.11541	10.2618	0.587321	0.932869	0.931191
SMAD3	TC vs UT	2.87759E-05	0.000173584	-10.09931209	200.739	188.916	145.634	14.2289	10.5574	28.2162
ZNF792	TC vs UT	0.000538266	0.00153211	-10.06648645	24.8186	22.88	56.0534	3.52343	2.28962	4.49362
STMN3	TC vs UT	0.000169305	0.000614926	-10.06394433	36.2193	19.8673	39.1957	3.85729	1.90012	3.71028
AMIGO1	TC vs UT	0.000140357	0.000537454	-10.03028618	19.8368	22.3578	31.9871	2.89103	2.03523	2.46952
B3GALT4	TC vs UT	5.17667E-05	0.000259254	-9.943093472	17.2859	14.7203	16.1168	1.21971	1.27206	2.34807
RALGPS1	TC vs UT	8.14236E-05	0.000357916	-9.843163596	8.08723	7.97749	6.3741	0.538046	0.40657	1.33502
NTN4	TC vs UT	0.000381096	0.001162809	-9.842074886	31.3905	27.6778	17.3494	2.1683	1.10246	4.49363
SYNE1	TC vs UT	9.53409E-06	8.56609E-05	-9.828281237	119.077	121.32	95.9583	13.0093	10.7693	10.4445
IER5L	TC vs UT	0.000627303	0.001730345	-9.800634999	2.43092	1.37094	5.17715	0.225954	0.339289	0.350924
TMC8	TC vs UT	1.71873E-05	0.000125174	-9.724941113	182.815	137.631	83.6595	16.1926	10.5117	14.8493
C3AR1	TC vs UT	7.04717E-08	1.04484E-05	-9.715076683	38.8037	38.1552	46.2237	4.38167	4.45195	3.84591
PLAC8	TC vs UT	2.04663E-06	3.74405E-05	-9.605701552	9.78533	10.6036	11.5343	0.837077	1.27206	1.21424
THRA	TC vs UT	6.0596E-07	2.15316E-05	-9.565031926	51.7963	55.2349	56.4351	6.51239	5.65311	4.92451
VIPR1	TC vs UT	0.003492262	0.00720542	-9.524494788	5.13183	6.49527	10.4467	0.225954	0.59368	1.49794
PLEC	TC vs UT	0.000739421	0.001973817	-9.518705077	288.248	408.037	558.163	23.5341	26.9656	81.288
CAPRIN2	TC vs UT	3.67972E-05	0.00020474	-9.511218136	18.1562	13.1863	11.9566	1.31005	0.975267	2.2671
TSC22D1	TC vs UT	4.42791E-07	1.86973E-05	-9.454559141	38.4345	38.4207	45.0835	3.70411	3.90077	5.29245
CLU	TC vs UT	0.000315295	0.000999123	-9.399370927	2.22085	4.14526	3.14331	0.180783	0.466484	0.36444
PYCARD	TC vs UT	0.001728446	0.0039992	-9.384265781	7.68913	7.57236	8.99254	0.575276	0.362373	1.64689
TLE1	TC vs UT	2.39891E-06	4.06389E-05	-9.277038309	11.7729	15.1326	11.0049	1.44559	1.10246	1.53842
LOC643733	TC vs UT	0.000181183	0.000645102	-9.262411072	13.7448	9.56333	6.10163	0.632492	0.720876	1.8218
GOLGA6L5	TC vs UT	0.000150001	0.000561993	-9.19033506	4.32225	5.14439	2.79691	0.657753	0.388615	0.288028
ZNF831	TC vs UT	1.25512E-05	0.000101546	-9.073705218	86.0992	93.6415	86.9006	8.76324	7.54705	13.0759
RBPMS	TC vs UT	0.00059247	0.001650884	-9.067661525	5.76204	4.92859	2.52699	0.632492	0.339289	0.485887
CACNA2D2	TC vs UT	1.77368E-05	0.000127817	-9.021861904	10.6047	12.1279	7.30677	1.53591	0.89047	0.903243
ZFP36L2	TC vs UT	5.80065E-07	2.12232E-05	-8.990900055	432.006	493.779	445.855	44.0376	49.1604	59.3606
WDR52	TC vs UT	2.55257E-05	0.00016025	-8.972464378	6.42227	5.5123	5.79347	0.722834	0.848071	0.404922
RASA3	TC vs UT	3.56593E-06	4.91162E-05	-8.925778986	69.2633	76.5062	66.6856	10.7959	7.41985	5.58665
IFFO1	TC vs UT	2.6953E-06	4.28063E-05	-8.923125412	26.259	20.53	14.5143	3.02655	1.73844	2.10518
LAIR1	TC vs UT	0.001058652	0.002664458	-8.90190195	42.9146	22.4211	15.0958	2.62001	1.31446	5.10086
NCAPH	TC vs UT	8.36592E-05	0.000365268	-8.864293351	4.77171	5.22234	2.89678	0.451808	0.678477	0.323958
GCHFR	TC vs UT	7.17961E-06	7.1564E-05	-8.811041188	19.9881	20.946	22.5385	1.58108	2.58641	3.03627
PLEKHA7	TC vs UT	2.71661E-06	4.28063E-05	-8.810165817	15.1852	17.6578	13.9905	2.25864	1.35685	1.70035
SIRPG	TC vs UT	4.13378E-05	0.00022151	-8.804152156	10.3236	11.6849	10.1385	0.858346	1.78084	1.01216
KIFC2	TC vs UT	0.000879858	0.002283914	-8.778707549	7.71271	3.49247	2.70607	0.722834	0.254491	0.607333
GNB5	TC vs UT	3.41875E-05	0.000195879	-8.774876873	16.8958	18.3432	17.2569	2.03279	1.39925	2.55048
CLSTN3	TC vs UT	3.26414E-07	1.64273E-05	-8.738828722	53.0237	50.1337	54.0197	5.33026	6.82627	5.82954
SGSM2	TC vs UT	4.17338E-07	1.81954E-05	-8.733082978	47.5008	32.4333	31.1052	4.67672	4.59698	3.44109
SLAMF6	TC vs UT	3.29088E-08	8.3081E-06	-8.73091561	84.0594	83.9794	84.0355	7.67914	12.0837	9.10861
IGFBP4	TC vs UT	0.006991387	0.013031566	-8.717092353	8.16286	12.2071	13.3742	0.316296	0.720876	2.83386
TK2	TC vs UT	0.000155972	0.000578214	-8.670969399	12.2142	10.6731	10.6932	1.03903	0.89047	1.94325
LRRC37B	TC vs UT	4.53598E-06	5.5678E-05	-8.647670874	16.2852	16.5039	12.2332	2.14969	1.59757	1.45903
MSX2P1	TC vs UT	7.06692E-06	7.09569E-05	-8.634829989	4.47161	3.49248	3.38984	0.316296	0.59368	0.404922
PLCL1	TC vs UT	7.63624E-05	0.000341512	-8.596244807	13.6547	15.5036	14.237	1.03903	2.71361	1.29553
LAPTM5	TC vs UT	3.96445E-06	5.19991E-05	-8.572884192	756.569	911.689	1137.84	103.396	86.4094	137.517
FLT4	TC vs UT	5.68464E-06	6.27499E-05	-8.563120536	58.7001	51.1455	44.8062	4.11065	5.8935	8.05606
ZC3H6	TC vs UT	1.77282E-05	0.000127817	-8.558917912	28.1796	29.212	29.4908	2.62001	2.71361	4.81749
SLC27A3	TC vs UT	1.51473E-05	0.000115573	-8.554544991	14.4451	13.1801	8.99359	1.29128	1.02768	1.96167

GIMAP4	TC vs UT	1.85419E-05	0.00013109	-8.470916328	227.904	231.859	214.931	16.5778	19.6731	43.3974
TMEM229B	TC vs UT	0.000107478	0.000439174	-8.468202685	42.3444	44.6829	49.367	2.57484	3.81597	9.71583
FAM8A1	TC vs UT	2.086E-05	0.000142102	-8.46227821	45.4355	48.3713	31.6479	7.00158	4.70634	3.11723
LTB4R	TC vs UT	6.40389E-07	2.23315E-05	-8.435915455	23.91	22.6026	15.63	2.53204	2.12199	2.71241
ATM	TC vs UT	1.69323E-06	3.41695E-05	-8.430097983	197.136	189.023	160.626	19.8328	18.6192	26.4091
LOC100129726	TC vs UT	9.61863E-05	0.000406501	-8.303567809	8.79414	7.7022	7.27949	0.500976	1.03969	1.32266
NLRC3	TC vs UT	5.28233E-06	6.08516E-05	-8.292411316	159.211	129.659	150.131	19.0622	14.2884	19.5894
ABLIM1	TC vs UT	0.000230632	0.000779306	-8.280087823	6.48229	7.2786	9.89254	0.413698	1.61138	0.831583
DTX4	TC vs UT	0.001333027	0.003233715	-8.252264973	3.99145	5.3147	6.10565	0.180783	0.59368	1.09312
MGC39372	TC vs UT	0.000262515	0.00086384	-8.242770267	4.47161	3.4272	3.48229	0.225954	0.466484	0.688298
TRERF1	TC vs UT	0.000742217	0.001979994	-8.22374568	48.8269	46.2175	42.7724	3.74903	3.90077	9.1086
DHX58	TC vs UT	0.000106709	0.000437409	-8.190189849	10.9538	11.0974	7.70405	0.587321	1.10246	1.94325
VNN2	TC vs UT	0.000532041	0.00151748	-8.113366521	7.74271	4.79804	5.51612	1.4004	0.339289	0.485887
SLC25A23	TC vs UT	2.45407E-05	0.000156862	-8.106794421	17.9761	24.6752	23.944	2.25864	2.79841	3.15771
SAMD12	TC vs UT	0.001307808	0.003185554	-8.069539546	9.1832	9.66125	16.4249	0.858346	0.678477	2.83386
GALNT12	TC vs UT	1.34632E-05	0.000106327	-8.056345647	6.99246	4.83067	6.13244	0.948687	0.551281	0.72878
AQP3	TC vs UT	2.58E-03	0.005593968	-8.011621264	80.7288	97.46	147.237	6.14333	6.82627	27.6496
RHPN1	TC vs UT	8.30006E-05	0.000362907	-8.006670372	6.36225	4.21053	3.63157	0.54215	0.381687	0.850227
FLJ46020	TC vs UT	5.00977E-05	0.000253886	-8.002137395	24.4159	17.1682	24.776	3.97513	2.37442	1.94325
IL16	TC vs UT	4.38952E-05	0.000231195	-7.999735455	313.978	289.26	320.987	27.9582	24.6255	62.9483
UBXN11	TC vs UT	6.39642E-05	0.000301598	-7.929830648	14.5775	7.51483	5.73427	1.50983	1.11368	0.885599
CYP4F22	TC vs UT	0.000997803	0.00254035	-7.90594236	7.08249	5.77721	11.1246	0.903517	0.551281	1.57891
FAM125B	TC vs UT	3.6676E-06	4.98584E-05	-7.902012302	54.7089	67.7258	81.2004	8.13085	6.02069	11.6185
SELPLG	TC vs UT	0.000122234	0.000484925	-7.890617968	297.092	293.795	324.667	29.2707	25.2272	61.5328
RAB37	TC vs UT	5.27628E-05	0.000262748	-7.890199065	3.8714	2.72063	2.15547	0.316296	0.508883	0.283476
SLC9A9	TC vs UT	0.000112589	0.000455007	-7.84543485	5.642	3.81887	4.00615	0.768004	0.381687	0.566851
TRIB2	TC vs UT	0.004248698	0.008525052	-7.815672413	45.3756	47.0983	56.393	3.11689	2.24722	13.6831
RALGPS2	TC vs UT	0.001783737	0.004110931	-7.814625373	3.15116	9.43058	8.78267	0.54215	1.01767	1.17408
ZNF226	TC vs UT	7.2876E-08	1.04484E-05	-7.81231324	15.9655	14.9814	15.9319	2.07796	1.69604	2.22662
BLK	TC vs UT	0.008116666	0.01480232	-7.791898486	49.3457	14.8106	45.3125	5.37074	1.69969	6.97862
TTC16	TC vs UT	0.001138077	0.002830844	-7.782025071	12.1584	5.63356	3.17585	1.00118	0.8971	0.796106
PLA2G6	TC vs UT	5.23049E-06	6.07841E-05	-7.779445256	12.9945	10.6404	8.13547	1.31005	1.35685	1.41698
CRTAP	TC vs UT	3.0849E-05	0.000181733	-7.749447361	49.0367	46.6087	59.2895	6.77573	4.91833	8.29896
TPM1	TC vs UT	2.46714E-05	0.000157371	-7.669369574	8.49297	8.15986	7.35732	1.35523	0.763274	1.01216
MANBA	TC vs UT	2.80405E-06	4.33392E-05	-7.658490178	11.464	10.3467	9.39892	1.35522	1.06006	1.65987
MAGEE1	TC vs UT	6.16578E-06	6.57079E-05	-7.651863202	12.3343	8.0293	10.3542	0.993859	1.44165	1.57891
EIF2C4	TC vs UT	2.48021E-06	4.13256E-05	-7.630729837	98.9437	105.587	84.1272	13.0545	12.5077	12.2662
ITM2C	TC vs UT	0.00135462	0.00327692	-7.528105228	56.1791	75.9835	136.669	8.08568	6.61427	21.0104
LOC678655	TC vs UT	0.001142719	0.002840671	-7.473686026	6.55632	4.20313	3.12573	0.677863	0.177542	1.00247
LOC100287278	TC vs UT	0.00019482	0.000683785	-7.431983491	6.15218	7.11541	6.25571	0.496979	1.44165	0.688298
PCNXL2	TC vs UT	1.45251E-06	3.1615E-05	-7.419535773	42.3549	38.4112	33.0384	4.93014	3.98668	6.42168
BCL9L	TC vs UT	2.78008E-05	0.000169527	-7.417736324	207.604	221.937	368.619	27.3915	35.701	44.5091
TANC2	TC vs UT	0.000232188	0.000782847	-7.410388045	42.6805	48.0991	50.7227	5.14957	5.59671	8.34885
TMEM204	TC vs UT	2.37609E-05	0.000153993	-7.409635415	61.6417	45.6294	55.4984	8.26637	5.76631	7.93461
CNN2	TC vs UT	8.61822E-05	0.000374033	-7.397954053	203.177	236.529	350.786	31.936	31.8837	43.0331
SBK1	TC vs UT	0.000182166	0.000647763	-7.395164965	35.202	32.7697	38.9821	3.43308	3.98557	7.04401
CCDC136	TC vs UT	0.001485247	0.003540816	-7.391154388	5.31189	4.92859	4.0986	0.768004	0.848071	0.323958
TRIM3	TC vs UT	0.000304571	0.000969877	-7.34057427	8.43295	6.36471	6.6255	1.44557	0.339289	1.1336
LRFN1	TC vs UT	3.97821E-06	5.20137E-05	-7.310883638	12.5443	13.4474	17.4418	1.98762	2.37442	1.57891
ABCD2	TC vs UT	1.51E-05	0.000115414	-7.291055952	8.76306	12.0765	9.553	1.0842	1.06006	2.02421
DHRS1	TC vs UT	2.12418E-05	0.000143907	-7.253561364	5.78164	4.66986	4.23941	0.734592	0.477308	0.813438
BBS2	TC vs UT	3.57798E-05	0.000201353	-7.24764581	22.9278	15.5403	17.114	2.98893	1.31614	3.36391
IFIT2	TC vs UT	0.004484173	0.008924915	-7.22247999	11.0738	11.2606	17.9965	0.587321	0.381687	4.61507
BTBD2	TC vs UT	3.29466E-06	4.72718E-05	-7.18609019	37.8897	37.4415	41.2515	4.73198	5.11793	6.37347
CD200R1	TC vs UT	0.000661293	0.001803926	-7.178939811	6.63234	5.28762	8.07384	0.903517	0.424086	1.45746
WASH5P	TC vs UT	0.004580994	0.009080974	-7.168308681	19.3118	10.5667	5.12084	1.24868	1.48787	2.14596
LOC283174	TC vs UT	1.49112E-05	0.000114441	-7.15736503	5.19185	4.56956	4.06778	0.858346	0.466484	0.607333
TP53TG1	TC vs UT	0.000252848	0.000838269	-7.15613986	4.41159	3.32928	4.59165	0.406638	0.466484	0.850227
DYNC2H1	TC vs UT	0.000320449	0.001011816	-7.035526509	4.17151	4.50429	1.97231	0.316296	0.508883	0.688298
WDR27	TC vs UT	2.51479E-06	4.1363E-05	-6.985664808	7.05248	5.3529	5.14634	0.768004	0.975267	0.769262
PCYOX1	TC vs UT	9.87079E-05	0.000413285	-6.975983817	47.182	52.6632	66.5426	7.39578	7.11752	9.33822
RBM43	TC vs UT	1.69269E-05	0.000123862	-6.971353546	19.6867	21.0849	13.7131	3.07172	1.95043	2.79337
ABCA2	TC vs UT	4.10417E-06	5.27942E-05	-6.969513431	81.3875	55.7478	56.0847	8.08568	7.25026	12.3877
SLC35E3	TC vs UT	1.84515E-05	0.000130938	-6.93579035	9.06316	7.05013	8.25874	1.12937	0.805673	1.57891
ISG20	TC vs UT	0.000260407	0.000858507	-6.905004906	35.232	39.2322	26.7174	2.57484	3.0104	9.06812
GZMK	TC vs UT	0.005295768	0.010282473	-6.86141868	112.748	171.551	159.811	8.17602	8.8614	47.6882
OAS1	TC vs UT	0.004106895	0.008278244	-6.805088477	10.4736	6.07096	12.4805	0.361467	0.381687	3.52205
GIMAP8	TC vs UT	4.49518E-05	0.000235285	-6.782186351	54.4385	49.1871	56.3006	5.7368	6.0631	11.7804
CTPS2	TC vs UT	8.03398E-05	0.000354669	-6.78173587	4.32156	3.59039	4.22186	0.632492	0.508883	0.647816
BTBD11	TC vs UT	3.19475E-06	4.63973E-05	-6.751440536	28.9888	31.0387	27.8576	3.65894	3.73117	5.62713
LRRC45	TC vs UT	0.000720547	0.001934323	-6.703701584	5.79206	5.48346	4.12941	0.632492	1.01767	0.647816
HLA-DPB1	TC vs UT	0.002022769	0.004559869	-6.659000284	22.0576	7.605	7.18018	3.2524	1.18726	1.09312
MAPK8IP3	TC vs UT	0.000382707	0.001166571	-6.648622734	43.0229	35.0165	19.1224	4.96696	4.21282	5.43405
SSX2IP	TC vs UT	2.83181E-05	0.000171832	-6.601658998	6.42227	7.63763	5.8551	1.12937	0.551281	1.33601
LTBP3	TC vs UT	1.04553E-06	2.77852E-05	-6.590322193	31.5873	34.0129	33.6661	4.34251	4.29231	6.42761
ZNF528	TC vs UT	0.000218892	0.000748667	-6.589689962	18.3063	16.7766	16.5174	2.62001	1.52645	3.68398
HERC2P2	TC vs UT	0.000515993	0.001479235	-6.574461232	14.6561	12.8658	7.12763	1.4573	1.96261	1.85041
FRAT1	TC vs UT	1.22226E-07	1.19875E-05	-6.568496099	15.4853	15.3404	14.8533	2.1683	2.8832	1.90276
SNN	TC vs UT	0.001427123	0.003426096	-6.556545361	4.34778	4.26158	6.17533	0.759	0.399857	1.09609
GIMAP6	TC vs UT	1.50817E-05	0.000115358	-6.524201741	232.181	243.977	237.831	32.3876	28.9159	48.1334
LOC100289019	TC vs UT	0.000776655	0.002051007	-6.520520117	9.39328	7.63763	4.71491	1.35523	0.805673	1.17408
PPP2R2B	TC vs UT	0.000127383	0.000498182	-6.518310116	10.1135	9.92236	7.98138	1.21971	0.932868	2.14566
LOC642852	TC vs UT	0.00330666	0.006880569	-6.51689831	8.34293	10.2814	9.92279	1.4004	1.44165	1.53843
PLEKHG3	TC vs UT	1.84779E-05	0.000130938	-6.513597609	36.6412	30.3999	28.8009	6.59505	4.57914	3.53996
VAMP1	TC vs UT	0.000162577	0.000596243	-6.49233413	16.5467	19.127	11.9581	3.02109	2.08278	2.23274
CDC14B	TC vs UT	0.00021917	0.000749408	-6.484761427	9.64626	9.60002	13.2522	1.15941	1.57157	2.28054
LOC400986	TC vs UT	0.003811757	0.007756884	-6.479264657	18.495	12.6609	5.48078	2.89674	1.9904	0.767313
SESN1	TC vs UT	5.99202E-07	2.15252E-05	-6.46334566	72.8044	79.6286	74.8519	9.03427	10.4237	15.7072
CCDC109B	TC vs UT	0.00017678	0.000633265	-6.457235456	18.0904	18.8621	19.1849	1.69646	1.77503	5.22224
CDHR1	TC vs UT	0.000295414	0.000948063	-6.451933793	9.87344	13.5453	6.68713	1.53591	2.07763	1.05264
SLC27A1	TC vs UT	0.000122758	0.000486533	-6.449592633	13.9964	5.77652	12.2982	1.62625	1.48405	1.86228
DPYSL2	TC vs UT	4.14634E-06	5.29786E-05	-6.434602007	7.59267	10.2487	9.09075	1.49074	1.39925	1.29553
GGT7	TC vs UT	5.22963E-06	6.07841E-05	-6.429113334	4.83907	5.54182	4.00615	0.768004	0.741011	0.72878
CYTH4	TC vs UT	1.12414E-06	2.84386E-05	-6.399717504	58.9994	55.6826	54.9756	8.26637	8.64941	9.59439
TTC12	TC vs UT	2.87686E-05	0.000173584	-6.399623899	3.99145	2.70914	2.21884	0.406638	0.339289	0.647816
ALS2CR8	TC vs UT	1.57E-03	0.003697116	-6.370000847	5.49196	5.37016	4.23969	0.949133	0.935181	0.486457
ATG9B	TC vs UT	1.19984E-06	2.94116E-05	-6.341799391	3.06864	3.49994	2.96454	0.399516	0.576568	0.527136
SYNE2	TC vs UT	0.00044006	0.001304163	-6.322537804	211.564	206.37	97.6861	28.7739	23.9553	28.8234
PRX	TC vs UT	0.000239202	0.00080233	-6.291419515	3.90142	4.24318	3.94452	1.21971	0.29689	0.404922
EPHB6	TC vs UT	1.3097E-05	0.000104725	-6.290509356	10.0535	15.014	10.2519	1.44557	2.67121	1.49794
ECHDC2	TC vs UT	4.72222E-06	5.68748E-05	-6.280654039	21.2208	14.313	12.8195	3.11689	1.95043	2.63144
CCL5	TC vs UT	5.03889E-05	0.000254943	-6.262434169	1004.99	1100.43	1062.65	137.138	101.163	267.584
IRS2	TC vs UT	3.75671E-06	5.02931E-05	-6.25237318	24.1282	24.1856	28.4123	3.5686	3.56158	5.14134

ZNF652	TC vs UT	0.000144505	0.000547893	-6.24024197	74.6356	68.8031	88.4715	10.6152	8.77661	17.7718
DDX60L	TC vs UT	0.000104634	0.000430476	-6.235787457	26.6191	23.6633	16.0551	3.20723	2.28962	5.14134
MCART6	TC vs UT	0.000191459	0.000673522	-6.234115906	24.6384	26.1433	44.7439	5.46577	4.91833	4.93893
CTSA	TC vs UT	6.59971E-05	0.000308521	-6.204141616	47.2803	42.282	77.5214	8.96624	6.99927	10.9655
PLEKHF1	TC vs UT	4.96235E-05	0.000252142	-6.202761728	31.0907	32.4759	46.316	5.55612	4.79114	7.36786
MOV10	TC vs UT	9.03865E-05	0.00038818	-6.1938564	29.9369	22.62	25.4251	4.05733	2.78486	5.74802
TAGLN	TC vs UT	0.00139776	0.003367405	-6.179630292	10.7384	8.64813	3.96135	1.60464	0.430221	1.74334
ARHGAP12	TC vs UT	7.3569E-06	7.28014E-05	-6.169334209	10.3836	11.5217	10.6007	2.12313	1.52645	1.61939
SLC35E2	TC vs UT	6.48194E-06	6.73313E-05	-6.137195044	38.3682	32.0537	34.5568	4.23145	6.33275	6.54112
HDAC11	TC vs UT	0.000667022	0.00181674	-6.107328318	7.38259	4.24317	6.37897	1.17454	0.720876	1.05264
ABHD15	TC vs UT	3.28257E-06	4.72718E-05	-6.101416722	89.1805	80.7258	101.259	14.6109	11.9203	17.9119
SGSH	TC vs UT	6.75938E-05	0.000313674	-6.09067667	36.2716	27.16	20.4274	6.84482	3.60398	3.31964
LEPREL2	TC vs UT	0.001126951	0.002807854	-6.089010469	4.20152	2.70914	3.05086	0.271125	0.636079	0.72878
MALAT1	TC vs UT	0.00190108	0.004332776	-6.083907546	70.2565	74.6283	37.2115	11.6752	8.93542	9.32024
GPR155	TC vs UT	0.000298014	0.000955163	-6.078064311	12.3343	9.33485	9.09076	1.80693	1.22966	2.02421
CYBA	TC vs UT	3.07046E-05	0.000181081	-6.071497042	115.779	94.3266	82.8023	15.2678	9.45498	23.5203
POU6F1	TC vs UT	1.39351E-05	0.000108678	-6.065030602	17.1059	14.8835	12.388	2.80069	2.28962	2.22662
PILRB	TC vs UT	2.81604E-05	0.000171212	-6.056606216	52.5522	41.527	32.7537	8.19315	5.02597	7.72213
FDXR	TC vs UT	0.002999342	0.006352093	-6.04185323	3.06113	3.23136	2.89678	0.406638	0.466484	0.647816
ERMP1	TC vs UT	1.11715E-06	2.83426E-05	-6.008173603	57.8956	70.9361	50.1662	9.32071	9.25376	11.2179
PATL2	TC vs UT	0.000148822	0.000559468	-5.986784428	4.02146	2.28483	2.21884	0.271125	0.424086	0.72878
APOB48R	TC vs UT	0.00354536	0.007295442	-5.985683664	30.6103	27.939	42.8955	2.89128	1.99283	12.0638
SENP7	TC vs UT	1.7263E-06	3.43787E-05	-5.974610484	38.0791	39.8523	39.5369	5.82714	5.13033	8.70378
LOC100129196	TC vs UT	0.001310809	0.003192233	-5.957200662	3.18117	4.705	2.1244	0.712127	0.222156	0.746133
LOC100131564	TC vs UT	0.000145672	0.000551132	-5.953560424	10.8993	7.41528	6.17777	1.58733	0.906103	1.62047
NS3BP	TC vs UT	0.009406088	0.016815582	-5.941554383	4.32156	2.97025	3.54392	0.722834	0.169694	0.931191
PARP15	TC vs UT	3.85664E-05	0.000211344	-5.939604135	40.3637	25.5238	18.0889	4.56235	4.07036	5.50568
DFNB31	TC vs UT	0.00456347	0.009053513	-5.905955433	42.7345	22.521	12.9427	6.05299	4.07036	3.11723
CD244	TC vs UT	0.001386038	0.00334284	-5.895870924	8.04282	9.88971	4.40676	0.587321	1.86564	1.33601
CD101	TC vs UT	0.00820947	0.014945041	-5.883434889	2.3709	8.83969	3.40692	0.361467	1.44165	0.681402
AKAP5	TC vs UT	0.004835158	0.00950989	-5.876838562	2.52095	3.23136	3.29739	0.180783	0.508883	0.850227
CROCC	TC vs UT	0.00010957	0.000445534	-5.872976356	15.7172	11.8769	14.4689	2.12313	1.52645	3.51255
PARP10	TC vs UT	1.34525E-05	0.000106327	-5.851591211	43.3648	37.894	36.2086	6.68539	4.23996	9.14908
ACBD4	TC vs UT	0.000150289	0.000562558	-5.826252949	7.83274	3.39456	4.37594	0.858346	0.848071	0.971674
NBPF15	TC vs UT	0.000170739	0.000617712	-5.82102544	61.3219	39.2674	42.2567	8.57349	8.09926	7.86693
P2RY10	TC vs UT	2.82086E-05	0.000171347	-5.819676016	35.412	33.8469	39.5061	3.92996	5.8935	8.86571
TNK2	TC vs UT	1.20184E-05	9.85285E-05	-5.811736709	41.8455	33.3145	30.1225	4.92372	5.42583	7.76596
CDC25B	TC vs UT	0.000147729	0.000557375	-5.801434177	118.719	91.0303	119.813	21.5918	16.9171	18.2981
TCP11L2	TC vs UT	9.9838E-07	2.75392E-05	-5.800221053	9.9011	9.955	13.3125	1.62625	1.86564	2.22662
CTNNBIP1	TC vs UT	2.76195E-06	4.32168E-05	-5.799854987	7.07312	9.01068	10.0764	1.62625	1.18394	1.70029
TUBB4	TC vs UT	0.004252971	0.008530779	-5.786220997	4.1929	5.15115	8.05923	0.259874	1.66544	1.0824
GNG7	TC vs UT	0.002796756	0.005984728	-5.781771866	3.99145	4.27581	6.53305	0.406638	1.06006	1.09312
PSTPIP1	TC vs UT	6.3528E-05	0.000300115	-5.768768341	35.8923	24.7078	23.6667	6.36919	4.02796	4.21025
ACSS1	TC vs UT	2.13E-05	0.000143945	-5.728797553	51.9178	45.4988	34.7913	9.757	7.20786	6.11292
LOC100049716	TC vs UT	0.001783095	0.00411022	-5.68423358	12.6344	6.35217	6.68713	2.19387	1.22966	1.09312
EPHA4	TC vs UT	0.008157815	0.014868567	-5.668526511	51.1373	50.6884	85.3591	11.0218	8.22542	13.7746
PAIP2B	TC vs UT	0.000120831	0.000480594	-5.640201184	11.3439	14.7864	15.408	2.02733	2.54399	2.79337
FAM46A	TC vs UT	5.35038E-06	6.09942E-05	-5.639026216	16.1155	20.4648	11.1246	2.1683	3.0528	3.23868
B3GNT1	TC vs UT	0.001536423	0.003640017	-5.631157831	8.04282	6.91957	12.727	1.44557	1.56885	1.90276
SIT1	TC vs UT	2.00594E-05	0.000138562	-5.595214956	25.4486	28.8203	19.9687	4.29133	3.34959	5.62713
LOC653080	TC vs UT	0.003546182	0.007295917	-5.594955461	17.2597	14.3938	6.86149	4.11215	1.85555	0.916173
ZNF449	TC vs UT	0.00010712	0.000438072	-5.552135736	12.0041	10.6106	11.2787	1.76176	2.03523	2.30759
NOD1	TC vs UT	2.16337E-06	3.88274E-05	-5.540203712	24.5184	19.1266	18.7669	4.29133	2.9256	4.04832
CPT1A	TC vs UT	3.1482E-06	4.61561E-05	-5.538092338	34.9019	37.9593	25.5464	5.78197	5.46952	6.51774
IFT140	TC vs UT	0.001836673	0.004212458	-5.533902841	4.64214	7.52639	11.9509	1.54984	1.23575	1.57289
PTPN22	TC vs UT	3.68134E-05	0.00020474	-5.522861668	67.2227	76.3759	44.3132	11.2025	9.62457	13.1973
MAN1B1	TC vs UT	6.74432E-06	6.91251E-05	-5.520637721	40.3297	38.1224	38.5734	6.06279	6.31806	8.81698
ZNF204P	TC vs UT	2.16862E-05	0.000145242	-5.516711076	9.4833	7.47445	8.84423	1.49074	1.52645	1.65987
ACER2	TC vs UT	6.52E-05	0.000305759	-5.515586017	3.09114	2.70914	3.14331	0.632492	0.381687	0.607333
CBFA2T2	TC vs UT	8.2114E-06	7.74122E-05	-5.502598	63.9215	65.4737	69.2736	12.4673	9.75178	13.8855
TPPP	TC vs UT	0.008817214	0.015908143	-5.49447582	5.19185	14.2574	3.48228	1.49074	1.61125	1.07159
XAF1	TC vs UT	0.007709968	0.014182293	-5.483031928	18.1342	11.592	8.17211	1.29363	2.48681	3.13149
SNTA1	TC vs UT	0.005125225	0.010000637	-5.479814004	15.9655	20.8233	33.6433	3.92997	2.16243	6.76063
GAB3	TC vs UT	2.38046E-05	0.000153993	-5.466007116	52.3381	43.4428	42.0944	8.13085	7.37745	9.71583
LOC339192	TC vs UT	0.005131055	0.010008845	-5.460862944	17.0914	11.3502	6.36259	1.35732	1.87781	3.13825
AUTS2	TC vs UT	3.08335E-05	0.000181729	-5.45690748	82.7389	106.697	121.661	16.8036	16.2812	23.9251
LOC390595	TC vs UT	0.000173646	0.000626587	-5.44251664	7.32257	4.73276	3.45147	1.35523	0.805673	0.688298
TRNAN35	TC vs UT	9.47473E-06	8.52726E-05	-5.42735173	24.902	36.3686	27.875	4.82391	4.57419	7.02714
LOC728468	TC vs UT	0.002091106	0.004686175	-5.424946093	1.81933	5.13968	1.93051	0.268289	0.468547	0.901803
AHSA2	TC vs UT	0.000302393	0.000965183	-5.412155058	66.6839	48.2596	29.1631	10.1128	7.51908	8.99461
ZNF83	TC vs UT	2.20673E-05	0.000146691	-5.40142071	42.4645	25.9155	19.1059	6.00781	4.19756	5.99147
PLA2G16	TC vs UT	0.000115334	0.000463968	-5.39340426	6.93244	6.00568	4.80736	1.12937	1.22966	0.931191
IFI44L	TC vs UT	2.32167E-05	0.000151895	-5.39211403	46.6058	26.4377	25.7929	6.27885	5.08793	6.96304
EPB49	TC vs UT	0.006863325	0.012837942	-5.375199248	3.60352	5.59303	2.83929	0.090533	0.350308	1.7983
RBL2	TC vs UT	1.68344E-05	0.00012341	-5.326460971	216.305	241.769	185.578	31.3271	34.3376	55.1758
TTC22	TC vs UT	0.000586946	0.001638824	-5.310707503	16.5357	11.8154	12.3264	1.4004	1.44165	4.81749
CEP68	TC vs UT	6.28407E-05	0.000297714	-5.307168593	24.6681	25.202	25.916	3.29494	4.78657	6.19844
SUV420H2	TC vs UT	0.001877533	0.004290211	-5.300487003	5.03447	4.08412	5.51613	0.54215	1.06006	1.1588
NPTXR	TC vs UT	0.003468789	0.007159386	-5.275348855	20.167	12.9252	28.9053	2.89104	2.58641	6.27485
CHN2	TC vs UT	0.001025964	0.002598097	-5.273876551	4.77157	5.45082	3.69796	0.451808	0.932635	1.25505
CCM2	TC vs UT	4.70638E-05	0.000243182	-5.269284704	49.6066	48.8501	58.82	9.59285	8.35117	11.9038
LOC100132984	TC vs UT	0.001027013	0.00260022	-5.269275532	8.19287	7.01749	2.89678	0.948688	1.31446	1.17321
ZC3HAV1L	TC vs UT	0.007857733	0.014415392	-5.256104212	23.2972	13.051	27.1937	3.83962	3.08721	5.16233
ANO8	TC vs UT	7.70E-05	0.000343677	-5.238206993	8.35818	5.70608	3.9307	1.52312	1.10246	0.809745
TC2N	TC vs UT	0.000128312	0.000501297	-5.236542314	278.915	276.509	291.528	33.0199	55.2031	73.5157
NR1D1	TC vs UT	0.000135902	0.000523156	-5.222422958	33.8526	49.5366	48.9244	7.17458	9.48338	8.67772
ACP6	TC vs UT	9.35E-05	0.000398497	-5.219623347	9.63335	5.45082	6.68713	1.53591	0.975267	1.65987
MBOAT1	TC vs UT	0.000388844	0.001181481	-5.208866592	17.7661	15.5036	15.069	1.58108	1.95043	5.74858
ZNF33B	TC vs UT	0.000114225	0.000460562	-5.208054708	37.732	33.971	30.738	5.37543	5.10913	9.18517
FGD3	TC vs UT	7.99101E-06	7.64956E-05	-5.206862999	108.805	99.9488	125.65	19.9106	18.5698	25.7433
OBFC1	TC vs UT	3.05718E-06	4.50897E-05	-5.195904726	25.034	24.0877	24.0056	4.42684	4.74874	4.89845
CLEC2B	TC vs UT	0.000174727	0.000629018	-5.190633124	33.1531	39.9829	18.7977	5.05923	5.8511	6.80112
PRIC285	TC vs UT	0.000370157	0.001137311	-5.179497469	32.351	32.3127	30.7541	3.74928	3.98556	10.6874
IQSEC2	TC vs UT	4.03003E-06	5.23056E-05	-5.151178884	2.85106	2.25219	2.61944	0.587321	0.466484	0.445405
KIAA1147	TC vs UT	1.42715E-05	0.000110741	-5.141587776	111.366	96.6705	99.4212	16.922	16.3947	26.4816
STARD5	TC vs UT	9.22819E-06	8.37877E-05	-5.140186287	6.93749	5.17417	5.44653	1.37533	0.870748	1.16979
ZNF276	TC vs UT	1.52383E-06	3.23946E-05	-5.12472463	60.0689	57.0059	59.0229	11.6621	10.7507	11.9496
SCRN2	TC vs UT	2.53855E-06	4.15073E-05	-5.087706657	14.4598	13.8356	13.6919	3.5895	2.19369	2.46952
ANGPTL6	TC vs UT	2.39E-04	0.00080233	-5.080226338	9.97956	6.78394	6.65479	2.16212	1.36853	1.07904
TXK	TC vs UT	0.000133238	0.000516285	-5.074261121	16.4757	15.1773	12.8195	3.29757	1.82324	3.6435
ATG16L2	TC vs UT	0.000931429	0.002395103	-5.068202738	31.2696	18.1888	11.7127	4.22696	2.72629	5.11634
ORAI3	TC vs UT	8.4777E-06	7.89502E-05	-5.056572216	14.7661	13.7135	17.1353	2.62001	2.75738	3.6435
DIP2A	TC vs UT	5.96174E-06	6.4368E-05	-5.051430668	57.6194	43.7691	41.1083	9.757	7.88623	10.566

SLC35E2B	TC vs UT	5.63613E-06	6.2438E-05	-5.046718262	130.327	127.183	139.136	19.4309	26.696	32.468
ARAP3	TC vs UT	1.23E-05	0.000100052	-5.018848719	10.9538	8.09458	7.76568	1.62625	1.61125	2.10518
PTPLAD2	TC vs UT	0.000227382	0.000770562	-5.014540444	19.1643	18.1834	21.9289	3.39778	2.15828	6.26487
STARD9	TC vs UT	7.41539E-05	0.00033453	-5.005947314	13.888	11.5811	12.0998	2.31213	2.9256	2.2671
LOC283070	TC vs UT	3.02892E-05	0.000179824	-5.001523528	38.233	40.701	37.318	8.26636	6.23269	8.74426
STK38	TC vs UT	4.93871E-06	5.8665E-05	-4.998776213	191.343	168.644	151.953	34.1491	31.587	36.6771
GNAO1	TC vs UT	0.000773761	0.002045004	-4.99318271	12.9945	14.7529	18.2739	2.75552	2.33202	4.12929
PARP8	TC vs UT	2.34556E-06	4.05095E-05	-4.988838729	104.684	120.445	92.9704	17.9296	20.1047	25.728
DYRK2	TC vs UT	1.41421E-06	3.11937E-05	-4.972592778	194.194	203.341	216.759	38.5308	42.8226	42.1825
SORBS3	TC vs UT	7.27642E-05	0.000329979	-4.955943914	27.2523	29.7646	31.6169	4.69787	5.13033	8.05613
MGST3	TC vs UT	0.000926216	0.002385179	-4.955427008	6.99246	8.38833	6.56387	0.858346	1.06006	2.51
ADCY7	TC vs UT	2.18E-04	0.000746886	-4.94966708	63.1409	57.2983	69.9224	13.561	11.8668	13.0316
THBS3	TC vs UT	0.000680265	0.00184791	-4.944003591	4.68737	3.64796	1.75734	0.632498	0.637685	0.771213
SIPA1	TC vs UT	3.16807E-08	8.3081E-06	-4.927018486	74.7559	77.0612	68.935	14.1386	16.5779	14.0879
SEMA4B	TC vs UT	8.09478E-06	7.69534E-05	-4.918106935	11.9441	12.4029	14.1754	2.75552	2.16243	2.91482
NELL2	TC vs UT	0.007082898	0.013180218	-4.915638601	60.3503	36.1967	96.6078	10.1635	5.8935	23.2369
GAB1	TC vs UT	0.001353241	0.003274869	-4.913823452	1.53062	3.07281	1.9415	0.406638	0.763274	0.162029
LAX1	TC vs UT	2.99323E-06	4.4681E-05	-4.909363862	41.6243	54.2794	38.3659	9.35046	7.71664	10.2826
PARVG	TC vs UT	3.47829E-05	0.000198023	-4.899502801	45.0153	30.844	24.3138	7.49846	6.10549	6.8416
CAMK2G	TC vs UT	1.82998E-05	0.000130426	-4.894333998	39.1032	34.01	31.9561	7.09847	6.50765	7.86143
KLRB1	TC vs UT	0.000168309	0.000612926	-4.886243965	180.571	160.029	226.096	34.1041	24.5913	57.2825
GRAP	TC vs UT	0.003199173	0.0066914	-4.879861001	25.1147	12.6474	36.7033	6.85743	3.17999	5.22231
ARSA	TC vs UT	1.25E-04	0.000491955	-4.868477605	16.9858	12.5008	10.9705	2.39415	1.90804	4.00784
CPNE2	TC vs UT	0.000343419	0.001069281	-4.866316745	3.36123	6.6911	3.63636	0.54215	0.975267	1.29553
TRGV_	TC vs UT	6.11152E-05	0.000291171	-4.85850996	177.112	214.278	163.405	32.257	27.0232	54.9102
RGS14	TC vs UT	1.98471E-05	0.00013748	-4.853690646	47.2059	49.187	41.2316	6.36919	9.031	12.9544
IFI6	TC vs UT	5.18831E-05	0.000259626	-4.849319411	8.16287	7.83348	8.41283	1.58108	1.14486	2.30759
HSBP1L1	TC vs UT	0.000255723	0.000844872	-4.846709259	5.01648	3.86079	5.31486	1.05414	1.00005	0.874012
TMEM187	TC vs UT	0.00012429	0.000490711	-4.839972139	7.29257	6.42999	9.3681	1.76176	1.18726	1.8218
ZNF846	TC vs UT	0.006925618	0.012930476	-4.835049783	3.72136	2.5133	2.40373	0.180783	0.59368	1.01216
PARP4	TC vs UT	2.29343E-06	4.02247E-05	-4.817966106	77.9666	74.4169	60.5532	13.0093	13.7796	17.4074
PLCD3	TC vs UT	0.00661421	0.012428103	-4.794080524	2.59726	3.9353	2.92497	0.349547	0.626655	0.996548
HCG4P7	TC vs UT	0.002655141	0.005729416	-4.793921538	6.99852	4.03	4.41023	1.09849	0.535927	1.58607
LOC729678	TC vs UT	9.62531E-05	0.000406501	-4.784811925	51.9543	45.703	61.2982	9.87126	9.92358	13.426
GSDMB	TC vs UT	0.001389353	0.00334977	-4.781150412	5.80546	9.30401	4.47624	0.948688	1.56885	1.57891
ZC3H12B	TC vs UT	6.71416E-05	0.000312281	-4.770338023	2.73173	3.15796	3.04894	0.580173	0.696883	0.596738
BTLA	TC vs UT	0.001139623	0.002834118	-4.768637358	3.48127	4.73276	3.9137	0.858346	0.551282	1.1336
LSS	TC vs UT	1.73114E-05	0.000125792	-4.766180291	29.4219	26.1098	24.5077	5.4206	4.40955	6.96304
PLEKHM1P	TC vs UT	0.000719062	0.001930757	-4.763656622	22.2074	16.3457	10.8598	3.29528	3.00144	4.07618
TFDP2	TC vs UT	4.38058E-05	0.000230823	-4.755500633	32.3209	32.0464	20.431	6.36919	7.29265	4.16977
TRBV_	TC vs UT	3.32228E-05	0.000191688	-4.747653909	769.817	753.565	976.8	146.625	128.511	251.478
RCSD1	TC vs UT	0.000853654	0.002229518	-4.742052082	157.982	154.254	183.609	23.8048	18.6991	62.0595
B3GALT2	TC vs UT	0.001885458	0.004303534	-4.728506517	136.771	100.887	128.933	19.7397	11.8293	45.9589
CYP2U1	TC vs UT	0.000325449	0.001024452	-4.71726952	8.27096	9.07376	12.8133	1.62625	2.24722	2.51962
PCMTD2	TC vs UT	1.04336E-05	9.0182E-05	-4.7155249	69.5886	61.2636	64.6913	13.2464	12.3404	15.8811
GOLGA8B	TC vs UT	0.001461112	0.003494765	-4.711878262	49.1967	32.9862	26.903	7.67075	4.07829	11.4022
LLGL2	TC vs UT	0.000102073	0.000423775	-4.702269574	17.436	12.6967	11.6485	3.38791	2.50162	2.99578
H2AFY2	TC vs UT	0.009268657	0.016598772	-4.696901054	2.34089	1.86052	4.00615	0.768004	0.169694	0.809745
CTDSP2	TC vs UT	1.17574E-06	2.91175E-05	-4.689066552	336.473	354.659	404.562	78.0552	77.9287	77.6858
PINK1	TC vs UT	3.27074E-06	4.71676E-05	-4.686710151	21.3448	30.6423	27.4039	6.04974	4.98403	5.90584
KLRG1	TC vs UT	0.000101569	0.000422235	-4.680305275	52.037	65.9961	42.1866	7.72432	14.1612	12.3472
TMEM143	TC vs UT	0.000134788	0.000520657	-4.678741454	4.29155	2.54594	2.71189	0.496979	1.01767	0.526369
PRR5-ARHGAF	TC vs UT	8.22058E-05	0.00036007	-4.67225642	99.7543	58.4241	76.3	16.5326	13.6948	19.9578
DPYD	TC vs UT	0.000282803	0.000916633	-4.662796907	21.3373	23.3991	27.2392	3.43308	4.02796	7.9751
HLA-DRA	TC vs UT	0.004075527	0.00822039	-4.662014059	3.00111	2.48067	3.45147	0.406638	0.254491	1.25505
UTRN	TC vs UT	0.000197792	0.000692046	-4.661534506	82.3476	79.8675	53.5271	12.4673	15.4756	18.3385
ACSS2	TC vs UT	1.35E-03	0.003259669	-4.637199257	2.25086	5.3529	3.79044	0.587321	1.06006	0.809745
ASB13	TC vs UT	0.004234518	0.008499365	-4.634256818	9.96347	6.52791	11.8642	2.62001	1.27206	2.22662
LOC100132062	TC vs UT	0.000952246	0.002444389	-4.633495496	10.4412	11.2959	5.67106	2.25539	1.75007	1.90978
S1PR4	TC vs UT	0.000109744	0.000445534	-4.622148905	107.857	97.3623	117.347	18.5201	19.1643	32.1025
SNX30	TC vs UT	0.000292069	0.000939774	-4.613335008	24.7585	21.9663	31.1547	4.24616	4.57915	8.05606
GM2A	TC vs UT	0.000834617	0.00218814	-4.609744636	12.8002	17.1407	24.9287	3.43308	4.11276	4.35713
ZNF767	TC vs UT	0.005766761	0.01107714	-4.583924685	17.9389	14.1236	5.35481	3.32195	2.84554	1.99522
PRMT2	TC vs UT	8.35097E-07	2.49316E-05	-4.564975699	113.499	90.4754	89.9823	20.4625	20.7754	23.1559
CARHSP1	TC vs UT	0.000169317	0.000614926	-4.56390144	23.9918	28.1369	27.5323	5.34066	4.73005	7.38389
SNED1	TC vs UT	0.002609122	0.005642953	-4.55586955	7.65239	4.84313	5.00992	1.12095	1.13345	1.58799
MIB2	TC vs UT	3.27006E-05	0.00018921	-4.548069502	13.6547	11.1111	7.93283	2.1683	1.83199	3.18928
RABGAP1L	TC vs UT	1.64297E-06	3.3793E-05	-4.545887011	62.1483	73.8945	92.8097	16.2771	16.8151	17.2505
WDFY2	TC vs UT	4.94853E-05	0.000251713	-4.545251918	41.7359	43.6339	44.9603	7.88644	8.31884	12.4686
KLHL24	TC vs UT	8.21325E-06	7.74122E-05	-4.538967521	70.1869	92.3349	88.3484	18.2943	20.945	16.0311
RWDD2A	TC vs UT	2.59386E-05	0.000162264	-4.536531832	6.33224	6.62582	6.74876	1.31005	1.73844	1.29553
DUSP1	TC vs UT	4.72507E-05	0.000243664	-4.524483139	30.5504	31.3335	49.4905	8.71807	7.16545	8.73241
CLIC5	TC vs UT	0.000496504	0.001430348	-4.516496588	39.8837	40.8645	45.6078	8.40188	5.8511	13.7236
ZMYM1	TC vs UT	0.000279859	0.000909504	-4.504718237	9.45328	9.33485	6.40979	1.53591	1.10246	2.9553
CRTC1	TC vs UT	2.05126E-07	1.302E-05	-4.49765011	10.9238	12.5661	12.3572	2.89103	2.20483	2.87434
REEP6	TC vs UT	1.60612E-05	0.000120313	-4.485464787	2.671	2.77442	3.32821	0.587321	0.720876	0.647816
GATS	TC vs UT	2.85794E-06	4.35579E-05	-4.481905793	30.4451	27.5707	24.7748	6.56667	5.61521	6.29031
PLCG1	TC vs UT	3.8567E-06	5.10774E-05	-4.468297556	88.0157	75.852	83.141	14.8161	16.6628	23.8014
SIDT2	TC vs UT	1.10002E-05	9.30263E-05	-4.463907061	17.1236	19.6644	22.4393	3.97513	4.33613	4.95677
FLJ35776	TC vs UT	0.002282903	0.005045384	-4.461154568	11.1939	9.85709	8.47444	2.52967	0.89047	3.1982
BMP8B	TC vs UT	0.002156376	0.004804502	-4.460718966	5.53858	4.29676	5.02424	0.722834	0.584879	2.0235
CERK	TC vs UT	2.39461E-06	4.06389E-05	-4.459115024	325.4	323.257	462.389	88.3995	84.3732	76.39
AMDHD2	TC vs UT	2.20843E-05	0.000146699	-4.457964753	7.16176	7.4583	6.46275	1.04484	2.27778	1.40663
ZNF862	TC vs UT	2.29793E-05	0.00015087	-4.45684084	46.035	36.7478	36.4606	9.44717	7.77275	9.53521
HHAT	TC vs UT	2.50478E-05	0.000158803	-4.453043917	3.66134	3.62303	3.45147	0.587321	0.932868	0.890709
ZFP36	TC vs UT	0.000124874	0.000491955	-4.450679109	94.3809	96.4823	110.011	27.4188	16.6628	23.5203
LZTS2	TC vs UT	1.70051E-05	0.000124214	-4.447400861	21.6184	17.0269	20.5285	3.83962	4.19756	5.26808
CXXC5	TC vs UT	0.000743439	0.001981111	-4.426500433	20.0769	26.6989	37.7496	3.2524	4.79114	11.0517
ARHGAP9	TC vs UT	0.000293834	0.00094422	-4.423096969	23.7812	23.1317	20.3214	6.94757	4.49435	3.75882
RNASEL	TC vs UT	2.07826E-06	3.79067E-05	-4.42013187	22.5677	22.3578	23.3277	3.74928	6.1055	5.58665
CKAP2	TC vs UT	0.00040338	0.001215518	-4.414352142	14.326	13.342	24.6704	2.71035	4.40955	4.73652
FAM159A	TC vs UT	6.78804E-05	0.000314412	-4.404944617	6.2122	6.1036	9.49137	1.17454	2.03523	1.74084
TRIM6-TRIM34	TC vs UT	5.50814E-06	6.16851E-05	-4.402868386	7.32258	4.83068	7.14936	1.49074	1.31446	1.57891
COL6A2	TC vs UT	0.000173459	0.000626096	-4.39499588	23.1828	20.166	13.7748	3.11689	4.53675	5.34375
ST3GAL5	TC vs UT	3.13745E-05	0.000184301	-4.387061091	25.9888	27.2537	22.3724	4.56235	5.42712	7.24642
KIAA0513	TC vs UT	2.22273E-05	0.000147266	-4.377572716	25.123	24.5774	41.3148	8.53739	6.31744	5.93642
CHST12	TC vs UT	8.6759E-07	2.53169E-05	-4.375056052	23.0778	21.9662	21.9409	4.69787	5.51192	5.10087
GIMAP7	TC vs UT	8.03421E-06	7.64956E-05	-4.366108124	110.617	122.723	99.72	19.4236	24.6761	32.1835
POLI	TC vs UT	0.00044662	0.001320582	-4.362356266	12.7244	12.5335	10.0769	2.62001	3.0104	2.46952
MX1	TC vs UT	0.006234036	0.011809136	-4.36132212	17.9461	17.0189	19.6221	1.21971	1.95043	9.34604
TACC3	TC vs UT	4.15275E-05	0.000222334	-4.360790821	23.9182	17.4294	23.9132	5.28509	3.68878	5.99147
TBCD	TC vs UT	9.81176E-05	0.000411773	-4.359025281	38.412	26.7834	48.9283	8.6675	8.31631	9.19722
USP13	TC vs UT	2.79558E-06	4.33392E-05	-4.357499791	38.203	28.1023	26.9332	6.54987	7.84384	7.00353

CROCCP2	TC vs UT	0.005595134	0.010803006	-4.34088042	62.1157	30.3931	24.4439	12.4221	5.34232	9.17776
KIAA1609	TC vs UT	0.000656165	0.001793111	-4.33712529	10.3536	8.84527	11.1246	2.71035	1.56885	2.71241
GOLGA8A	TC vs UT	0.002326006	0.005129611	-4.324019713	47.8938	22.9986	36.701	10.3978	5.71598	8.76894
PTCH1	TC vs UT	2.02604E-05	0.000139501	-4.305535018	41.1617	41.568	34.098	10.3658	9.031	7.73752
PQLC3	TC vs UT	0.000208104	0.000720563	-4.304819655	20.287	17.4945	24.7144	3.79445	3.47678	7.24642
PYHIN1	TC vs UT	3.08559E-06	4.5346E-05	-4.304729442	26.5891	33.5203	25.0842	5.46577	7.92863	6.39629
SPATA7	TC vs UT	0.000111698	0.000452295	-4.295194657	2.3709	1.72997	1.20192	0.451808	0.29689	0.485887
FAM117A	TC vs UT	4.7189E-07	1.91672E-05	-4.280304158	74.8014	79.221	68.806	15.5993	15.6187	20.841
ZFP14	TC vs UT	4.34259E-05	0.000229311	-4.277573843	16.6257	14.1328	17.9041	2.89103	3.22239	5.26279
ZNF554	TC vs UT	0.000354782	0.001098546	-4.274474221	6.33224	8.97583	8.13549	1.49074	2.37442	1.61939
CRAT	TC vs UT	0.000489698	0.001415222	-4.272596351	15.5454	16.0585	22.5572	4.60752	2.968	5.10086
RBMS2	TC vs UT	0.001938378	0.004396653	-4.268178635	7.56636	6.23899	12.6158	2.18657	1.5001	2.5036
AKAP7	TC vs UT	0.000304191	0.000969619	-4.2608015	12.2442	11.8481	9.52217	3.52342	2.54401	1.8218
ZIK1	TC vs UT	0.000143182	0.000544382	-4.259608478	13.6247	12.3703	16.1784	2.52967	2.75601	4.61508
ZFYVE9	TC vs UT	0.000615421	0.001700995	-4.25933448	7.26256	9.26959	10.6599	1.12937	1.61125	3.6435
RASSF7	TC vs UT	0.000142415	0.000542764	-4.247406395	20.0469	13.2189	15.8086	3.83962	2.28962	5.42472
ZNF238	TC vs UT	0.006104252	0.01160787	-4.246481815	25.7789	23.3696	36.5474	4.29133	4.91834	10.9708
MTRNR2L2	TC vs UT	0.004449433	0.008861494	-4.24185824	3.13045	3.96157	4.37842	0.80297	0.60571	1.29543
NR3C2	TC vs UT	7.60495E-07	2.36378E-05	-4.235868867	30.3404	32.4433	34.5755	8.44705	6.35989	8.17751
NDRG3	TC vs UT	7.86272E-06	7.58587E-05	-4.227152483	39.5539	34.1407	47.5709	9.98284	8.98859	9.71582
TBC1D5	TC vs UT	6.75717E-05	0.000313674	-4.220153127	65.0305	62.893	67.426	14.6354	11.5749	20.0793
CLIP2	TC vs UT	0.000271438	0.000887137	-4.215995129	9.06318	8.19251	11.1554	2.07796	1.90803	2.75289
NEO1	TC vs UT	3.3862E-06	4.78806E-05	-4.210489061	55.6686	54.2138	53.4036	13.0545	12.0837	13.6426
ZDHHC23	TC vs UT	0.005599325	0.010807714	-4.207359917	3.51129	3.49248	2.49618	0.54215	0.339289	1.3765
INPP4A	TC vs UT	3.05439E-07	1.60683E-05	-4.204276445	110.856	103.596	102.093	24.031	22.5985	28.6616
TRAF5	TC vs UT	2.50215E-06	4.1363E-05	-4.202924213	67.4335	52.2877	51.1235	14.7258	11.0661	14.8571
H6PD	TC vs UT	0.000167282	0.000610051	-4.201224346	70.4334	57.314	74.6045	15.7647	11.0661	21.3342
PHF7	TC vs UT	0.002718906	0.00583942	-4.199049427	3.53337	3.264	2.71669	0.948688	0.588352	0.728728
AGAP1	TC vs UT	0.000563727	0.00159052	-4.196193669	19.4467	17.3641	25.8547	2.98138	5.59671	6.3558
BCAS3	TC vs UT	2.39565E-05	0.000154605	-4.193752054	9.12318	10.3323	11.8642	2.12313	2.71361	2.63144
ARHGAP32	TC vs UT	0.000429761	0.001278397	-4.188164472	5.28189	9.13905	8.41281	1.49074	1.65364	2.30759
ZMYM3	TC vs UT	6.9126E-07	2.27846E-05	-4.183272804	23.3181	20.1057	25.0226	5.46577	5.51191	5.38424
GPC1	TC vs UT	0.001180952	0.002920405	-4.180277945	3.06113	3.88414	4.49921	0.54215	1.10246	1.09312
KIAA1109	TC vs UT	2.84482E-05	0.000172415	-4.179080427	56.5093	47.9467	48.0419	11.7897	10.8965	13.8045
TXNDC16	TC vs UT	4.43917E-05	0.000233312	-4.178548923	4.53163	4.43901	4.83818	0.768004	1.48405	1.05264
ALOX5AP	TC vs UT	0.002581051	0.005594017	-4.175757322	66.1712	79.2796	55.7143	10.8863	7.25026	30.038
PRKCA	TC vs UT	1.48547E-06	3.18853E-05	-4.174190951	78.9865	88.1254	67.517	17.8426	17.6803	20.6865
ZCCHC24	TC vs UT	0.000346455	0.001076559	-4.159316973	5.82206	6.39915	6.31623	0.773747	1.29517	2.38793
TMEM170B	TC vs UT	5.8194E-05	0.000280945	-4.156214795	9.42328	12.2071	7.64242	2.1683	2.16243	2.71241
MAP4K1	TC vs UT	1.57983E-06	3.30396E-05	-4.150828091	12.7844	10.9342	10.385	2.80069	2.54107	2.87434
LSP1	TC vs UT	9.34283E-05	0.000398193	-4.145662483	120.97	147.035	169.578	22.7661	29.5519	53.234
RNF168	TC vs UT	8.74003E-06	8.07225E-05	-4.14547044	47.2963	48.5343	49.7368	14.1386	12.6773	8.29895
IDS	TC vs UT	0.00015565	0.000577541	-4.143901236	361.283	389.109	435.411	78.3312	79.9274	127.898
XYLT1	TC vs UT	0.009030265	0.016240251	-4.138577595	61.9031	30.1143	69.9375	13.2091	5.87677	20.0472
ESYT1	TC vs UT	0.001146113	0.002847385	-4.131576857	125.261	111.429	161.26	25.2054	22.9802	48.1336
TSPAN9	TC vs UT	0.001537779	0.003642108	-4.131086825	1.59064	2.05636	2.49618	0.451808	0.508883	0.526369
ATP8A1	TC vs UT	9.64047E-05	0.000406661	-4.125073606	66.0222	70.9909	58.3657	17.3006	21.1569	8.9062
DHRS12	TC vs UT	7.91743E-06	7.60976E-05	-4.123870558	4.92176	5.38554	4.06778	1.17454	0.975267	1.33601
MAP3K12	TC vs UT	4.74771E-05	0.000244463	-4.107807472	13.8133	9.95386	10.4171	3.39192	2.69503	2.23483
DYRK1B	TC vs UT	4.58999E-05	0.000238796	-4.101662877	11.9741	13.2189	12.9119	3.07172	2.33202	3.8864
CACNB3	TC vs UT	0.001362319	0.003293606	-4.098868346	5.22186	5.09179	3.20494	1.44557	0.678477	1.17408
KLF12	TC vs UT	4.78162E-06	5.73515E-05	-4.097861991	92.7318	110.484	100.213	22.7662	23.0225	28.2567
YPEL2	TC vs UT	0.003037972	0.006419571	-4.097753905	29.5598	23.7936	45.3611	7.31766	6.76603	10.0062
CARD16	TC vs UT	0.000468928	0.001371415	-4.093779973	7.74277	6.97029	8.80303	1.15929	1.59829	2.98677
LOC100133331	TC vs UT	0.003306914	0.006880569	-4.07367508	15.5972	13.7922	7.6359	2.11623	3.49687	3.47581
ZKSCAN3	TC vs UT	0.000451083	0.001329895	-4.070820114	4.79141	5.10542	6.7727	1.67142	0.848071	1.57539
BZRAP1	TC vs UT	0.000875778	0.002278131	-4.067697157	9.69338	5.09179	5.91673	1.58108	1.48405	2.02421
ZNF821	TC vs UT	9.45533E-05	0.000401599	-4.067609296	1.95076	3.23136	3.17413	0.768004	0.679001	0.607333
ITM2B	TC vs UT	2.68729E-05	0.000165754	-4.063614462	210.736	225.273	217.251	37.8533	47.4863	75.4189
SEPW1	TC vs UT	1.19146E-05	9.78079E-05	-4.061059269	23.5881	21.444	25.5464	5.64645	5.21512	6.51774
NPC2	TC vs UT	0.000519586	0.00148746	-4.039831736	8.65795	9.73155	14.7917	2.71035	2.62881	2.87434
DDX60	TC vs UT	0.001363407	0.003294944	-4.038778172	22.0876	23.5328	22.0642	3.52342	2.62881	10.6064
ANKRD13D	TC vs UT	9.17E-06	8.34321E-05	-4.036264553	40.4237	29.8322	28.9361	9.30529	6.44468	8.82523
KBTBD3	TC vs UT	1.31591E-05	0.000105085	-4.031004314	5.50132	6.19258	4.41487	1.35523	1.10246	1.53853
ENG	TC vs UT	0.000504386	0.001450346	-4.028277819	9.60107	6.37444	12.5409	2.64165	3.08883	1.34857
ZBTB4	TC vs UT	3.30017E-06	4.72718E-05	-4.022515654	179.667	178.201	202.815	41.8283	43.7978	53.7599
CTSO	TC vs UT	8.12135E-05	0.000357247	-4.020561779	29.8302	28.9836	34.2056	6.8209	5.38472	10.9303
ZNF799	TC vs UT	5.2E-05	0.000260106	-4.020233631	6.36374	8.81936	10.4816	1.4812	2.13583	2.76684
TSC22D3	TC vs UT	6.84768E-06	6.98085E-05	-4.012232103	119.623	152.394	110.751	29.7677	31.587	34.0456
LOC728535	TC vs UT	0.00525325	0.010211662	-4.00148579	24.4164	33.6409	15.091	5.32994	7.99871	4.95161
PRDX3	TC vs UT	2.1823E-06	3.90533E-05	4.004751571	18.2462	20.171	21.1398	77.6485	88.3592	72.5035
SPINT1	TC vs UT	0.001111236	0.002777528	4.007765845	0.480262	0.652881	1.23273	3.34274	3.26479	2.87434
GHITM	TC vs UT	2.11636E-07	1.31791E-05	4.011875735	64.702	69.2928	68.596	278.93	272.241	261.598
AGPAT5	TC vs UT	1.0145E-05	8.86558E-05	4.012166606	13.8948	14.4918	16.086	61.1613	62.5379	54.7323
CCDC124	TC vs UT	6.46683E-06	6.73202E-05	4.013044004	10.9838	11.946	12.0183	44.9899	48.4614	46.7972
SIAH2	TC vs UT	3.50982E-05	0.000199153	4.018857487	35.4718	37.4046	38.9516	169.345	165.228	114.848
H3F3B	TC vs UT	5.27775E-09	5.91588E-06	4.019521236	191.309	201.984	212.218	866.152	806.925	760.785
RPL7L1	TC vs UT	3.52635E-06	4.89639E-05	4.019832869	93.6191	89.6108	83.3841	381.122	388.857	301.765
PSMC6P1	TC vs UT	9.03894E-06	8.24336E-05	4.024558727	16.3009	19.1307	20.9239	81.778	81.7099	63.318
RPL26P30	TC vs UT	0.000116488	0.000467392	4.026463166	1.95589	2.20697	2.35306	7.84172	9.60796	8.78644
NOC2L	TC vs UT	1.35723E-05	0.000106726	4.030323374	19.9028	18.2803	20.0543	74.0524	89.6535	71.0095
GTF2A2	TC vs UT	1.64023E-06	3.3793E-05	4.030834339	6.56489	5.98261	5.51613	23.582	27.1369	22.0926
KLHL8	TC vs UT	5.53371E-06	6.17042E-05	4.037076116	10.2636	11.2279	11.4328	45.0809	49.0549	38.782
PSMD2P1	TC vs UT	6.41149E-07	2.23315E-05	4.037407477	6.48546	6.46021	6.84406	28.071	30.8107	21.0176
RCL1	TC vs UT	7.18588E-05	0.00032767	4.037655656	4.8954	5.18654	7.41274	24.1035	24.9937	21.5402
ANAPC10	TC vs UT	2.77609E-05	0.000169368	4.039287371	2.1314	2.67183	1.63564	8.4825	10.0042	7.52179
EIF4G1	TC vs UT	2.98652E-06	4.46724E-05	4.042944299	87.8701	89.7247	85.0206	358.878	370.944	331.918
CEBPG	TC vs UT	3.10063E-07	1.60743E-05	4.051171026	28.6599	35.2828	35.9312	115.367	141.396	147.843
RAB7L1	TC vs UT	2.8715E-07	1.55798E-05	4.058906307	72.4742	62.3732	55.2529	258.374	258.466	254.759
DLD	TC vs UT	1.25104E-05	0.000101282	4.061193222	12.2142	14.7203	13.9288	50.6819	66.6932	48.5789
LOC644037	TC vs UT	7.04897E-06	7.08344E-05	4.061757991	0.601077	0.536579	0.590622	2.0187	2.31172	2.68942
GFM1	TC vs UT	5.91641E-06	6.41031E-05	4.062969592	14.2641	14.2203	15.8564	57.065	68.6008	54.4893
EIF1	TC vs UT	1.16272E-07	1.1947E-05	4.063062615	239.692	295.968	254.725	1167.2	1080.87	963.315
PGK1	TC vs UT	3.60199E-07	1.67209E-05	4.067992976	88.3054	86.9351	102.051	361.91	364.207	401.904
POLR2K	TC vs UT	7.3852E-07	2.36378E-05	4.069216729	13.2046	15.9932	14.6376	56.9153	60.291	61.1696
BCCIP	TC vs UT	8.76745E-05	0.000379175	4.071901094	11.0517	10.8243	10.9739	42.7484	50.4975	40.5157
ITK	TC vs UT	9.98029E-05	0.000416578	4.077871898	97.8019	100.429	106.592	342.625	374.058	526.347
DDX1	TC vs UT	1.84613E-05	0.000130938	4.078882247	7.38259	6.82166	6.62549	28.8643	32.9014	23.1964
SUB1P1	TC vs UT	0.000106913	0.000437807	4.086903728	1.4706	1.27302	2.03394	8.06193	5.3036	6.1599
YBX1	TC vs UT	3.31645E-06	4.73285E-05	4.092919556	93.074	105.377	106.951	414.539	446.588	388.858
B4GALT4	TC vs UT	0.004520644	0.0089888	4.099621049	11.7641	9.49806	6.90284	58.9003	36.0812	20.4841
STAT5A	TC vs UT	9.76957E-05	0.000410842	4.1043426	57.3293	53.4485	68.5813	174.881	234.323	326.947
LONRF1	TC vs UT	4.23955E-06	5.33568E-05	4.106979831	5.55198	6.1036	3.85207	21.6821	20.309	21.6986

NDUFAF1	TC vs UT	0.000126477	0.000495695	4.116096035	4.08148	3.81887	4.56084	17.1199	19.8002	14.3713
ETFA	TC vs UT	0.000140644	0.000538218	4.118936801	5.07181	5.12443	3.45147	19.288	20.733	16.193
XRCC4	TC vs UT	1.94154E-05	0.000135333	4.119563774	1.41058	1.14247	1.20192	5.7368	4.83354	4.89845
PGAP1	TC vs UT	0.000178264	0.000636917	4.122749061	3.2712	5.48345	5.60857	26.154	16.7476	16.3145
PSMD11	TC vs UT	4.4888E-07	1.87617E-05	4.126975383	29.9202	28.4613	28.4123	122.278	133.174	102.744
POLR1C	TC vs UT	2.75906E-05	0.000168662	4.129646759	5.16057	5.97666	5.22372	25.2445	22.9647	19.3558
NFAT5	TC vs UT	0.000129051	0.000503496	4.132752277	67.8323	80.2903	50.604	256.633	301.602	263.053
HSPBP1	TC vs UT	2.70555E-05	0.000166548	4.135841217	7.23254	8.68208	10.1385	31.6649	38.9644	37.1223
RND1	TC vs UT	0.002540199	0.005521005	4.13688666	0.150151	0.457046	0.678047	2.21347	1.48405	1.61939
TIMM8AP1	TC vs UT	0.001260427	0.003084769	4.144566541	0.720333	0.668504	0.283874	2.1474	2.65381	2.13145
TRAP1	TC vs UT	9.73754E-05	0.000409774	4.145298592	8.98368	4.89064	5.36357	25.3904	29.268	25.0884
ANK3	TC vs UT	3.83E-03	0.0077905	4.145939114	10.2622	10.0602	7.39308	44.6173	51.5865	18.7028
ANAPC10P1	TC vs UT	3.95E-03	0.007994356	4.163105362	0.780364	0.135325	0.678047	2.58674	2.33846	1.70969
NOC4L	TC vs UT	4.22901E-06	5.33568E-05	4.164560044	2.25086	2.05636	2.03394	9.84735	9.031	7.5298
MTHFD1	TC vs UT	0.000166579	0.000607849	4.164842562	5.35874	4.44509	3.45364	16.8565	19.4987	18.8601
HERPUD1	TC vs UT	5.8563E-07	2.13634E-05	4.168029962	38.9832	45.1072	39.9989	170.113	191.683	155.412
EHD4	TC vs UT	5.20658E-05	0.000260329	4.173134318	13.5433	13.5468	24.3921	66.2645	66.3325	82.2451
SNRPEL1	TC vs UT	1.09318E-06	2.83066E-05	4.173134722	5.42591	6.17509	6.89885	26.7763	25.4264	24.9996
CCDC59	TC vs UT	7.61086E-07	2.36378E-05	4.175683195	11.5536	11.5771	12.1026	47.0605	53.6796	46.3831
SNRPA	TC vs UT	7.21779E-07	2.33583E-05	4.178982047	15.0051	15.4384	13.7131	61.6586	59.2735	63.5976
ISOC2	TC vs UT	0.000406471	0.001223582	4.185528097	3.81139	4.56956	5.23878	19.0622	21.7506	16.193
QTRT1	TC vs UT	0.000126018	0.00049437	4.189702986	3.42125	2.21955	2.18802	10.7056	10.5573	11.5375
UFM1	TC vs UT	1.77121E-05	0.000127817	4.189742319	57.0792	51.2107	42.7416	207.516	247.186	178.08
PUS1	TC vs UT	2.32889E-05	0.000152093	4.190225675	9.09316	6.85429	7.52661	35.2333	32.6046	30.5237
ANKRD13B	TC vs UT	8.20E-04	0.002155645	4.191362229	1.17229	0.700171	0.504782	3.31884	4.21574	2.4293
SNRPG.1	TC vs UT	2.81347E-06	4.33392E-05	4.193649324	8.2734	8.33253	6.53924	33.7224	34.1811	29.1592
HS6ST1	TC vs UT	8.59809E-06	7.96998E-05	4.195955679	8.04103	7.16106	10.0603	38.815	31.8546	35.3301
FBXO6	TC vs UT	5.31182E-06	6.08516E-05	4.199930629	3.40242	4.79225	3.27899	17.1348	13.6589	17.3949
TTC26	TC vs UT	0.000151504	0.00056659	4.202625047	1.05045	1.69733	0.678047	4.92372	4.49435	4.97941
GRASP	TC vs UT	0.001006717	0.002557234	4.206733212	0.720343	1.29585	1.14028	4.3365	5.24449	3.69746
EZH2	TC vs UT	0.000248575	0.00082836	4.209408464	2.43092	2.35011	1.81823	10.3894	9.45498	7.93461
AKR1A1	TC vs UT	5.10E-06	5.96422E-05	4.211685221	8.73305	7.89874	7.54997	33.02	35.0637	33.7623
LOC644422	TC vs UT	4.86589E-05	0.000248891	4.218224642	2.38374	2.59037	1.48621	8.68358	9.2122	9.35529
ACVR1B	TC vs UT	1.38983E-06	3.09498E-05	4.22025891	14.615	13.5453	19.2908	57.7736	72.2047	70.2775
PLEK	TC vs UT	0.000527951	0.001508256	4.230149098	59.8092	86.6571	53.0644	266.286	256.353	321.406
NRIP3	TC vs UT	0.001844965	0.004229116	4.231540411	0.750353	1.95844	0.523969	4.24293	6.35989	3.07675
FICD	TC vs UT	9.40977E-05	0.000400353	4.235893821	2.5091	3.57759	3.60069	16.2528	14.8906	9.89133
WDR3	TC vs UT	2.22261E-05	0.000147266	4.243670547	10.7367	10.9668	13.066	44.6027	54.9897	47.9582
PDIA6	TC vs UT	4.99784E-05	0.00025349	4.247383247	33.5273	31.6983	31.6186	142.615	164.508	104.212
POLR2H	TC vs UT	8.19153E-06	7.74122E-05	4.249938142	9.09317	6.36471	7.08773	35.4592	32.223	28.1353
ABCF2	TC vs UT	3.60726E-07	1.67209E-05	4.263141131	32.9812	32.9655	37.1022	148.971	156.831	133.509
SNRPE	TC vs UT	8.35749E-06	7.81257E-05	4.266560632	4.91836	7.04776	7.973	28.5827	29.6593	26.8295
PSMD8	TC vs UT	6.78357E-07	2.27846E-05	4.266770193	25.0886	25.7196	22.4648	108.365	114.647	89.6274
LOC100130289	TC vs UT	1.34665E-05	0.000106327	4.273338304	4.73239	5.72968	3.93563	19.9225	19.6541	21.9496
SEC61G	TC vs UT	0.000112389	0.00045446	4.275931821	3.30121	3.36192	3.14331	14.3192	16.1964	11.4161
UBE2N	TC vs UT	1.85122E-07	1.26808E-05	4.28029216	40.7238	43.6715	39.0128	178.646	176.843	172.734
SNRPF	TC vs UT	1.65102E-05	0.000122265	4.280871092	5.70202	4.47165	4.43757	19.3332	22.853	20.3626
GPN3	TC vs UT	4.18174E-05	0.00022311	4.288402012	4.47298	4.43307	4.08863	17.9089	19.5591	18.2585
CD55	TC vs UT	8.99298E-06	8.21359E-05	4.291312438	17.0158	17.0377	15.5621	69.2019	87.8079	55.9063
DDX49	TC vs UT	3.42083E-06	4.81497E-05	4.294750762	5.55198	7.11541	5.30042	30.7163	20.097	26.354
SLAMF1	TC vs UT	0.000332859	0.001042456	4.305561768	52.3377	45.9558	44.683	183.035	139.958	292.601
YBX1P1	TC vs UT	1.93505E-06	3.66476E-05	4.306882487	51.3545	52.074	57.8895	230.513	247.046	217.219
LOC100130139	TC vs UT	7.96157E-05	0.000351733	4.308447141	0.488732	0.587602	0.400705	2.34406	2.00161	2.01807
SLC25A5	TC vs UT	2.37224E-06	4.05095E-05	4.309165216	50.1193	48.7108	61.4828	224.689	244.368	221.758
ARHGEF2	TC vs UT	2.63E-05	0.000163941	4.314803395	34.763	35.7016	46.3482	167.499	172.411	164.114
BCL3	TC vs UT	0.000104431	0.000430476	4.319741146	7.59267	12.4356	6.84121	34.3299	30.5695	51.1696
LOC652276	TC vs UT	1.48062E-05	0.000113887	4.336507317	1.81286	1.4111	1.5633	9.3328	5.50775	5.91945
NAA20	TC vs UT	3.81219E-06	5.07058E-05	4.344135193	13.3729	13.0628	12.9543	54.3526	62.9718	53.7912
TTC27	TC vs UT	9.77996E-05	0.000410998	4.348326771	4.17151	4.34109	4.19105	19.559	20.9449	14.7356
TIMM44	TC vs UT	1.69077E-06	3.41695E-05	4.349631103	9.12318	8.74736	7.42671	36.9498	37.014	36.0698
CBWD3	TC vs UT	0.001333714	0.003234597	4.359067571	1.74757	1.15997	0.66921	4.92466	4.03	6.63663
BZW1L1	TC vs UT	7.5792E-07	2.36378E-05	4.360894167	92.4762	110.741	105.537	449.513	483.743	413.19
CAMK2D	TC vs UT	0.000366703	0.001128668	4.365523804	33.0112	41.3209	27.3954	148.251	187.065	108.777
TWISTNB	TC vs UT	1.84551E-06	3.57785E-05	4.366547162	14.525	16.8092	15.5929	62.9231	73.7736	68.2127
PSMB3	TC vs UT	8.46288E-08	1.06477E-05	4.367020245	11.8241	12.9578	11.7101	58.4063	50.8783	50.0766
SEC23B	TC vs UT	3.30047E-06	4.72718E-05	4.36783556	13.0845	14.4266	15.0074	57.2314	74.1549	54.3274
POLR1B	TC vs UT	1.07849E-06	2.82715E-05	4.368769115	23.9182	22.3905	27.1796	102.922	109.558	108.574
BAK1	TC vs UT	1.35642E-05	0.000106726	4.369764847	31.1971	29.3432	30.1607	161.673	121.102	113.567
LOC401010	TC vs UT	6.94327E-06	7.02398E-05	4.375012307	1.06548	1.45686	1.84494	6.83831	6.6313	5.63732
PNPT1	TC vs UT	0.000100712	0.000419519	4.379923353	6.27222	5.25498	5.0847	27.3285	23.4889	21.9415
KIAA0664	TC vs UT	0.000123484	0.000488627	4.383890008	17.568	15.9837	13.177	67.0463	77.4878	60.3191
IKZF4	TC vs UT	0.000153093	0.000569767	4.386143675	2.91108	2.31747	3.5131	10.9766	9.83657	17.529
CCT4	TC vs UT	7.55468E-06	7.42107E-05	4.398395016	33.3793	35.7502	44.3599	153.58	185.744	159.848
LOC643689	TC vs UT	1.56017E-07	1.24442E-05	4.399396377	6.25381	5.26894	6.58911	23.9805	27.5236	28.1771
NQO1	TC vs UT	0.00137918	0.003327845	4.399447227	2.42208	1.43931	1.90605	7.07358	6.50898	11.791
NOC3L	TC vs UT	3.01394E-05	0.00017918	4.403137717	5.49253	3.32141	5.02118	22.3622	15.0716	23.4841
GINS3	TC vs UT	1.29927E-05	0.000104181	4.413962512	2.9711	1.99108	3.45147	11.338	11.9141	13.8855
FAM89A	TC vs UT	1.46083E-06	3.16555E-05	4.415066919	5.36372	4.74886	5.08327	22.1338	25.0648	19.892
ATP2A2	TC vs UT	2.05508E-08	8.3081E-06	4.417315422	58.2798	62.4058	64.96	280.291	298.566	241.198
PFDN6	TC vs UT	2.17919E-05	0.000145713	4.421425349	6.92494	5.40117	5.54283	25.0542	29.8678	24.0842
PGK1P1	TC vs UT	0.000856601	0.002235783	4.432907775	0.297717	1.03887	0.9328	3.83603	2.85788	3.36608
GGCT	TC vs UT	2.89605E-05	0.000174102	4.436763784	6.10954	6.50775	5.39115	28.3665	26.8384	24.6943
PHF5A	TC vs UT	1.97761E-06	3.70941E-05	4.44505948	14.405	15.6016	14.5143	72.0024	66.184	59.7115
ARMC6	TC vs UT	1.29E-06	3.01078E-05	4.445848655	7.04293	7.60809	7.36351	32.4228	36.164	29.2865
LOC389333	TC vs UT	0.003422621	0.007084258	4.448430017	3.75137	2.54594	2.06476	13.5062	14.5428	9.14909
PSMD3	TC vs UT	1.00334E-05	8.80508E-05	4.45130611	19.5367	20.5301	20.5234	89.077	101.121	79.5076
ATP5G1	TC vs UT	1.00514E-05	8.81461E-05	4.452794614	6.87242	6.49738	6.03999	30.0704	27.8984	28.4591
PA2G4P4	TC vs UT	4.82216E-07	1.93672E-05	4.453343895	12.6786	13.1086	12.8108	58.7045	62.1283	51.0577
BNIP1	TC vs UT	5.38429E-05	0.000266748	4.453711196	3.12115	2.74178	2.65026	13.9127	13.3556	10.6469
DCAF13	TC vs UT	5.38476E-06	6.1024E-05	4.460113659	8.14601	10.1849	9.14889	45.3445	41.9147	35.3039
LYPLA1	TC vs UT	3.92893E-05	0.000214068	4.466097223	14.2249	14.9488	11.1246	55.4698	75.7657	48.7406
LMNB1	TC vs UT	8.5084E-05	0.000369879	4.476349809	11.674	8.58416	16.4249	56.057	50.6239	57.5256
GLA	TC vs UT	9.07349E-07	2.57779E-05	4.486583717	4.08148	5.15707	4.77655	24.3923	20.3514	18.1361
LOC100127952	TC vs UT	0.000336811	0.001052694	4.493713179	1.68923	1.91017	0.849082	8.19943	6.76314	5.02765
BTG3	TC vs UT	0.000348721	0.00108251	4.495202222	5.36479	9.72517	4.32104	28.9946	35.3838	22.8779
FLOT1	TC vs UT	2.20941E-05	0.000146699	4.505940276	16.1155	17.0051	9.76871	64.9558	55.7966	72.5041
PGAM4	TC vs UT	6.4225E-06	6.73202E-05	4.506210377	1.60438	2.08016	2.24159	9.37847	10.7968	6.52907
PTGER4	TC vs UT	2.45101E-06	4.12339E-05	4.507776244	33.1915	48.6975	56.1464	191.162	200.971	230.1
EIF2S1	TC vs UT	9.39827E-07	2.65173E-05	4.509311178	34.4554	34.1078	36.1759	151.232	169.282	151.786
SLC17A9	TC vs UT	0.001062176	0.002671147	4.510387526	2.16083	0.816076	1.04784	6.23368	6.65668	5.26279
ZNHIT6	TC vs UT	6.91308E-07	2.27846E-05	4.51290042	11.8841	12.6588	13.3434	53.8434	59.5282	57.6057
HMGCS1	TC vs UT	7.59361E-07	2.36378E-05	4.514260056	24.8785	24.6837	28.3814	124.852	134.953	92.0528
UTP15	TC vs UT	3.17146E-05	0.000185679	4.51980921	8.43295	8.84527	6.47142	35.2785	39.558	32.5073

MCM4	TC vs UT	1.96919E-06	3.70688E-05	4.520966923	6.06215	5.28762	7.48834	31.3938	27.1352	26.6374
CBWD1	TC vs UT	0.008774534	0.015842729	4.522231528	2.51122	1.24114	1.22081	10.9248	2.87024	8.69477
MRPL17	TC vs UT	1.12246E-05	9.42443E-05	4.522953785	11.2539	10.0856	12.1415	53.9339	55.0331	42.4659
CEBPB	TC vs UT	2.37018E-06	4.05095E-05	4.527853575	9.05135	8.68084	9.83625	43.0803	40.603	41.1425
RUVBL2	TC vs UT	9.83241E-07	2.73049E-05	4.529183255	5.13183	4.6022	4.99226	21.6821	23.2769	21.7391
SENP3_	TC vs UT	1.37824E-07	1.24442E-05	4.530953827	155.849	139.91	153.562	688.525	703.793	643.532
TRMT61A	TC vs UT	2.29543E-05	0.000150787	4.531260134	8.40294	8.2904	6.53304	35.866	36.5477	32.8311
LOC152594	TC vs UT	0.000332789	0.001042456	4.536139187	1.31752	1.35092	0.956771	4.88121	6.50979	5.05344
RPL26L1	TC vs UT	1.61348E-05	0.000120717	4.536299704	1.88561	2.00366	1.37585	8.23929	8.15724	7.48762
UBE2SP1	TC vs UT	1.32076E-06	3.02372E-05	4.537532241	5.88602	7.33166	8.61503	38.2457	34.5219	26.299
SLC43A2	TC vs UT	0.001667921	0.003889082	4.539437595	0.510272	1.30566	0.955389	4.11064	3.77357	4.69603
NIP7	TC vs UT	3.15859E-06	4.62452E-05	4.541129699	21.167	20.5732	25.3309	100.438	107.91	96.2305
IDH3A	TC vs UT	1.66325E-06	3.40098E-05	4.541856209	13.8587	15.0038	13.1028	59.6137	67.1448	63.8422
SFXN1	TC vs UT	5.31502E-06	6.08516E-05	4.55952706	22.6277	22.8148	22.6497	93.8198	91.9626	124.686
RRAS2	TC vs UT	3.47203E-05	0.000197829	4.564572021	8.11901	12.3254	9.04771	32.6633	49.3847	52.571
PA2G4P5	TC vs UT	6.03858E-06	6.48005E-05	4.566380025	4.19053	4.74246	5.56071	22.1067	25.8343	18.2428
ARF4	TC vs UT	2.36E-05	0.000153293	4.575969115	31.7208	37.8286	32.6339	158.868	182.737	125.982
CKS1B	TC vs UT	1.28515E-07	1.20044E-05	4.576185602	3.11699	2.41029	3.13948	12.1178	13.6124	13.9304
ADSL	TC vs UT	1.06184E-07	1.1947E-05	4.579037198	6.75238	7.605	7.05692	32.3424	36.0812	29.6332
MDFIC	TC vs UT	0.000102252	0.000424106	4.579081461	55.9991	72.2957	77.8714	290.857	355.852	297.344
LOC645233	TC vs UT	1.66703E-05	0.000122934	4.590846246	1.91855	2.07909	2.25015	9.46425	12.5037	6.71473
POU2F2	TC vs UT	0.001927242	0.004375418	4.59948607	17.9162	15.9932	9.24482	86.8178	64.022	47.6476
CHCHD8	TC vs UT	6.47688E-06	6.73313E-05	4.612264207	12.3943	12.7619	12.8811	59.7611	58.6373	57.0397
TIMM9	TC vs UT	3.987E-06	5.20208E-05	4.61773447	4.65472	4.23645	5.36675	19.1822	22.9944	23.6628
CDK7PS	TC vs UT	2.11635E-05	0.000143455	4.618846335	1.28473	1.67525	0.924574	5.83528	5.62009	6.48681
SDF2L1	TC vs UT	0.000420396	0.001255253	4.624163265	6.99246	8.02929	8.59771	34.1944	47.7407	27.2851
MRPS23	TC vs UT	7.13177E-06	7.13177E-05	4.627640602	6.27222	6.65847	8.32036	32.9298	33.8765	31.5359
PPIF	TC vs UT	2.37065E-06	4.05095E-05	4.630528664	20.1969	21.4114	17.9966	97.3884	96.8382	81.7755
HSP90AA2	TC vs UT	1.25259E-06	2.99391E-05	4.63588301	23.2471	25.3706	27.0407	115.713	134.397	100.633
NUP35	TC vs UT	2.20153E-06	3.92267E-05	4.638907853	3.90142	4.70012	3.17413	18.2492	19.3339	17.0431
CHCHD2	TC vs UT	1.01984E-05	8.90552E-05	4.639196466	36.8172	51.0799	45.773	223.143	220.647	176.331
FAM60A	TC vs UT	2.40418E-07	1.37877E-05	4.642302836	37.0606	40.0428	39.7516	192.045	191.38	159.051
SMTN	TC vs UT	0.000305094	0.000971039	4.645898828	0.630313	0.913993	0.400705	3.02655	3.98557	2.02421
LOC541471	TC vs UT	0.005620661	0.010838952	4.646117673	0.897144	0.997592	0.34332	5.02094	3.76237	1.61497
GCSH.1	TC vs UT	0.00057135	0.001605822	4.648857454	1.6103	2.46933	2.80677	8.7896	13.3753	9.84906
SEC24D	TC vs UT	0.000215251	0.000739906	4.649414783	18.2463	17.1682	13.1276	77.1065	97.0923	51.4936
HPRT1	TC vs UT	1.50684E-05	0.000115358	4.651158359	5.49196	5.67929	3.88289	20.327	24.6336	25.0586
TFB2M	TC vs UT	5.45899E-05	0.000269156	4.652748542	4.32156	5.80985	5.14634	24.573	28.5767	17.9337
SNHG3_	TC vs UT	9.56467E-06	8.57066E-05	4.65365726	15.3974	14.2164	17.4497	70.1088	69.3876	79.5207
GTF2F2	TC vs UT	2.40182E-05	0.000154887	4.655816487	6.18219	6.39734	6.68713	28.4576	34.8094	26.435
SHF	TC vs UT	0.000567884	0.001598268	4.674492609	1.71068	1.79525	1.44844	6.18851	4.66394	12.3067
RPIA	TC vs UT	1.38294E-06	3.09498E-05	4.675373581	11.8841	10.1835	12.2031	51.9014	56.3474	51.9795
HSPA9P1	TC vs UT	5.46211E-06	6.13927E-05	4.675696559	2.31778	2.57858	1.87986	10.1869	11.6457	9.85095
HELLS	TC vs UT	0.000226031	0.000767363	4.680292426	0.870394	0.457046	0.801311	3.52343	3.64638	2.79337
SRSF1	TC vs UT	6.0959E-06	6.52049E-05	4.683128854	108.968	118.969	87.1206	483.716	534.418	457.32
SNRPG	TC vs UT	0.000407307	0.001225024	4.693884493	0.899816	0.921428	1.06973	5.4691	3.75224	4.34854
PTS	TC vs UT	4.30587E-05	0.000227762	4.695003584	1.95076	1.66469	1.01702	7.76949	7.46224	6.51774
BZW1	TC vs UT	1.2846E-06	3.01078E-05	4.695009463	55.8807	70.7896	59.9383	289.048	315.068	272.013
SLC19A1	TC vs UT	3.19798E-05	0.0001867	4.696034956	3.94198	3.40088	4.26082	18.2943	16.5356	19.6614
VCP	TC vs UT	4.80001E-08	9.19697E-06	4.698917947	90.3973	100.039	104.342	459.892	505.896	419.352
CYP27B1	TC vs UT	1.63056E-05	0.000121538	4.700507514	1.50061	1.56677	2.24965	9.39563	8.31022	7.28691
TBXAS1	TC vs UT	0.000283415	0.000917181	4.704538852	3.03112	2.31747	1.54089	11.3832	11.1509	9.87776
NAA15	TC vs UT	1.44858E-05	0.000111911	4.715996537	26.7839	36.1936	26.6994	136.093	161.221	125.601
SLC31A1	TC vs UT	0.00012043	0.000479309	4.719455813	9.93345	8.06194	8.81342	53.6992	46.5942	26.2295
B4GALT5	TC vs UT	8.68534E-07	2.53169E-05	4.720031628	37.9929	32.9982	41.1084	155.252	160.479	213.382
LOC644584	TC vs UT	0.00075612	0.002008392	4.732721873	0.758891	0.991343	0.4001	3.19633	4.05858	2.92202
FASN	TC vs UT	5.52377E-06	6.16974E-05	4.739012615	21.5474	23.9898	24.9609	110.804	128.68	94.6072
TCEB1P2	TC vs UT	0.000122756	0.000486533	4.750785479	1.27222	1.94995	1.54037	7.40756	8.39578	6.82248
MAPK13	TC vs UT	7.15056E-05	0.000326301	4.753468668	8.4774	11.5276	7.5079	32.4057	56.923	41.4529
XBP1	TC vs UT	1.32181E-06	3.02372E-05	4.754642125	102.457	91.4886	109.672	467.193	439.705	536.693
LOC729342	TC vs UT	0.000492829	0.00142242	4.755022338	0.838384	1.01569	0.967538	4.24012	5.13599	4.04072
THOC4	TC vs UT	9.94952E-06	8.78362E-05	4.758546596	3.57131	5.47305	5.36205	21.5066	25.064	21.9829
PSMD1	TC vs UT	1.08864E-07	1.1947E-05	4.766895318	15.9655	16.1616	16.9488	81.2169	85.6027	67.12
HSP90AA1	TC vs UT	1.12555E-06	2.84386E-05	4.784253843	308.331	339.564	352.014	1588.29	1814.98	1380.55
WDR36	TC vs UT	4.53167E-05	0.000236861	4.802242262	14.7951	19.1592	15.1614	72.4539	94.5924	68.8193
IRAK2	TC vs UT	0.000337178	0.001053309	4.805616567	8.01281	10.7057	12.0799	44.3579	31.6294	72.018
RBM28	TC vs UT	2.0463E-05	0.000140406	4.809973123	5.01179	4.99387	3.75963	21.6369	26.0328	18.541
SLC35F2	TC vs UT	6.48428E-05	0.000304808	4.816566257	11.8841	11.489	11.1555	52.8951	56.9414	56.4728
TRIP10	TC vs UT	5.38308E-06	6.1024E-05	4.8182068	4.33715	3.12911	4.25268	14.824	19.6538	21.9865
PPAT	TC vs UT	1.78893E-05	0.000128766	4.824979123	8.26781	9.17189	7.59109	37.3796	46.4204	36.973
PGAM1	TC vs UT	5.91523E-07	2.13885E-05	4.825823751	64.6054	75.6959	72.0532	373.469	373.929	277.388
MRPL24	TC vs UT	1.08115E-05	9.16719E-05	4.828135827	4.89176	4.04734	5.11553	23.9407	24.0401	19.8768
CBWD6	TC vs UT	0.000994905	0.002535064	4.828876335	0.92588	2.05313	2.4198	4.67103	9.97867	11.4205
RRP15	TC vs UT	1.83719E-05	0.000130864	4.83097142	8.97313	10.3467	8.81341	38.8922	50.6664	46.3522
DHX33	TC vs UT	1.67562E-05	0.000123276	4.835741051	14.4338	11.9928	12.3556	65.7542	69.1982	52.5884
SNRPB2	TC vs UT	1.18519E-05	9.76176E-05	4.845472541	12.5443	12.6261	9.49136	60.5686	58.9922	48.392
TXNDC17	TC vs UT	0.000329143	0.001034235	4.853607793	3.18983	4.44397	2.08068	17.0429	17.3125	12.7949
TRMT6	TC vs UT	1.37089E-05	0.000107253	4.855035989	8.49296	7.9314	7.51916	40.0216	41.1267	35.0984
SAP30	TC vs UT	0.000161161	0.000592463	4.857056946	0.750353	1.14247	1.20192	4.60753	5.8087	4.61507
VASP	TC vs UT	1.11914E-07	1.1947E-05	4.8581595	40.4839	41.3864	41.0158	188.004	219.539	189.458
CYP51P2	TC vs UT	2.78425E-05	0.000169697	4.885033646	0.379507	0.561984	0.434715	2.54727	2.40783	1.76772
TNFSF4	TC vs UT	0.009201528	0.016488132	4.891116593	4.98178	4.17789	4.28349	8.53739	15.518	41.6967
GLRX2	TC vs UT	0.000285516	0.00092278	4.905123321	1.35056	1.24038	0.924574	6.05299	5.76631	5.42472
LOC729200	TC vs UT	0.000176997	0.000633857	4.906776638	0.990434	1.44153	0.862942	5.20034	5.96274	5.00427
EPRS	TC vs UT	1.88791E-08	8.3081E-06	4.907001357	36.4625	39.2974	42.3102	189.72	210.72	178.93
MRRF	TC vs UT	9.4716E-06	8.52726E-05	4.907069067	7.20143	6.59318	5.54694	36.4943	26.9645	31.4516
CCT3	TC vs UT	3.80726E-06	5.07058E-05	4.917871853	30.8805	31.7253	39.7833	169.255	187.614	146.667
JMJD4	TC vs UT	3.85647E-05	0.000211344	4.91796099	4.25433	2.21799	4.75508	17.1263	19.1914	18.8982
CALU	TC vs UT	1.07396E-05	9.12609E-05	4.918684939	22.5678	27.3842	25.4848	128.917	150.643	91.4894
FAM100B	TC vs UT	3.45066E-06	4.83182E-05	4.934968777	29.0199	35.8703	28.3815	167.899	148.48	143.914
CCT7	TC vs UT	8.98628E-07	2.57216E-05	4.948196339	38.443	36.2619	43.6042	189.627	214.913	180.877
NDUFAB1	TC vs UT	6.91579E-05	0.000317941	4.950128564	5.34191	3.72095	5.8551	25.7023	27.9832	20.1603
CISD1	TC vs UT	5.31978E-06	6.08516E-05	4.96243235	3.51129	4.27581	4.0986	20.9594	21.7082	16.3144
WDR46	TC vs UT	9.94263E-06	8.78362E-05	4.962821859	9.84343	11.6196	9.73789	53.121	56.2619	45.4616
FTHL12	TC vs UT	4.94496E-05	0.000251636	4.969467263	0.618273	0.415287	0.639922	2.63501	2.01839	3.66291
PSMC3	TC vs UT	1.38758E-06	3.09498E-05	4.972306147	7.83275	9.62861	8.68834	46.8424	46.3833	36.7986
LYN	TC vs UT	0.000221936	0.000756558	4.979614116	10.5636	8.15984	7.79651	36.5885	35.2334	60.2375
CAMTA2	TC vs UT	2.30055E-05	0.000150962	4.982383976	35.8331	31.7375	32.9994	178.955	176.24	145.883
CCND2	TC vs UT	0.000318554	0.00100738	5.023235769	95.7935	91.2908	102.648	345.686	336.357	773.351
WARS2	TC vs UT	2.68602E-05	0.000165754	5.024443577	4.92176	6.68215	4.80736	22.8806	33.4101	26.1668
HYOU1	TC vs UT	2.63392E-06	4.23496E-05	5.027901101	57.9497	59.4685	62.4642	282.72	373.235	248.476
COX17P1	TC vs UT	1.98042E-07	1.302E-05	5.029283179	2.024	2.81965	2.59853	12.9496	11.9915	12.4877
NOL10	TC vs UT	2.70146E-07	1.52096E-05	5.036798316	5.90868	5.74405	5.67021	27.6899	31.7125	27.8497

PDCD1	TC vs UT	0.00014839	0.000558672	5.043103443	8.25289	5.5161	9.39892	54.3858	30.1879	32.2644
TANK	TC vs UT	1.99989E-06	3.72077E-05	5.046189787	22.8078	25.9807	20.2153	109.992	121.302	116.912
SLC38A5	TC vs UT	3.59218E-05	0.000201692	5.047269945	5.40192	5.12443	6.00919	25.1602	33.2405	25.0585
FTHL8	TC vs UT	2.32215E-05	0.000151895	5.051428122	23.4808	21.7564	22.6295	122.518	79.0128	141.293
LOC643576	TC vs UT	3.17648E-06	4.62452E-05	5.075728793	18.9427	21.3783	20.4429	110.082	115.015	83.3236
IL21R	TC vs UT	0.002720691	0.005841218	5.085782574	7.09494	8.44576	13.0178	36.0735	52.2483	56.9206
PES1	TC vs UT	3.17118E-06	4.62452E-05	5.093329837	10.6537	13.4474	13.6823	63.1037	68.9402	60.3992
SLC25A32	TC vs UT	4.72803E-06	5.68748E-05	5.10036534	14.842	20.1695	15.7449	87.182	98.8478	72.8461
LONP1	TC vs UT	1.48993E-05	0.000114441	5.123451082	14.2849	12.2397	13.3125	77.6037	75.9783	50.5218
LOC389465	TC vs UT	8.87677E-05	0.00038256	5.124790736	0.599061	0.850611	0.400705	3.11576	3.22454	3.14249
EIF3J	TC vs UT	6.62323E-07	2.26516E-05	5.129962365	33.4832	40.2922	34.5307	185.356	193.014	177.236
MRPL13	TC vs UT	5.03695E-06	5.91482E-05	5.136590464	3.03112	2.83969	3.45147	16.8488	16.7051	14.3308
IER5	TC vs UT	1.5021E-06	3.19878E-05	5.138937043	30.5048	37.6329	39.2286	158.907	155.39	237.451
NHP2	TC vs UT	5.3202E-06	6.08516E-05	5.138999988	14.2331	13.0718	16.2228	75.2943	73.6474	74.747
PSMC4	TC vs UT	1.80749E-07	1.25912E-05	5.145713817	12.6644	14.4592	15.1615	74.8484	74.2824	68.4558
POFUT1	TC vs UT	5.27285E-07	2.00044E-05	5.150522737	30.1603	29.8321	35.9313	158.323	158.867	176.867
SUV39H2	TC vs UT	3.37368E-05	0.000194018	5.153717012	2.23863	3.32539	1.88289	11.8864	13.9097	12.5832
LRRC59	TC vs UT	4.67391E-06	5.6666E-05	5.159197359	23.9946	30.4832	28.5722	151.908	165.552	111.012
LOC402152	TC vs UT	4.57367E-05	0.000238148	5.159421732	1.0059	0.743715	0.665303	5.13561	3.4004	3.92355
NARS	TC vs UT	4.34707E-07	1.86167E-05	5.162559242	33.0412	34.6302	31.8636	162.073	184.307	167.476
FTHL7	TC vs UT	7.38974E-06	7.30093E-05	5.165321156	33.3	29.8072	36.9162	180.46	130.294	205.899
ARPC5L	TC vs UT	1.81E-06	3.53085E-05	5.166458337	25.4786	27.5773	20.8116	133.482	130.715	117.437
PFDN4	TC vs UT	0.000451172	0.001329895	5.168108291	1.26457	1.3571	1.58618	7.1136	7.11852	7.51446
NDUFAF4	TC vs UT	7.75707E-06	7.53306E-05	5.172212898	7.1125	7.44179	6.59469	37.5823	40.9571	30.8476
EIF3CL	TC vs UT	6.44946E-06	6.73202E-05	5.173691931	26.1163	24.1684	36.2834	118.673	158.874	170.33
POLD2	TC vs UT	2.79387E-06	4.33392E-05	5.190762396	8.97313	11.8481	12.7578	54.7923	61.0117	58.4968
GRPEL1	TC vs UT	4.42128E-07	1.86973E-05	5.193070378	19.3266	24.7404	22.095	116.404	120.793	106.387
EIF3C	TC vs UT	1.93789E-06	3.66476E-05	5.19978867	41.1969	51.0881	59.6965	243.413	283.94	262.918
POMP	TC vs UT	2.48808E-05	0.000158297	5.216552698	4.17151	5.74457	3.57473	24.2117	27.1776	18.9863
LOC642969	TC vs UT	4.95197E-07	1.96719E-05	5.224886696	38.9668	41.662	46.0157	238.369	233.124	190.211
CCT6A	TC vs UT	9.28928E-07	2.63303E-05	5.225888194	34.568	34.6954	39.814	189.36	207.116	173.55
TPX2	TC vs UT	0.00222486	0.004938347	5.227519042	0.180161	0.979277	0.154267	1.94245	2.37448	2.55049
BOLA2B	TC vs UT	4.19621E-06	5.32845E-05	5.23042958	6.30283	5.21803	7.05948	35.8409	29.5588	31.7834
ATF4	TC vs UT	1.0242E-05	8.92468E-05	5.233346535	122.482	179.42	112.926	758.734	792.335	619.872
RBPJ	TC vs UT	2.81793E-06	4.33392E-05	5.240475048	62.0913	75.8521	95.5549	379.403	414.032	430.207
POLR3D	TC vs UT	2.79729E-05	0.000170324	5.247132124	7.20254	11.0974	7.88894	46.6008	53.9608	36.8548
SLC25A22	TC vs UT	0.000121746	0.000483765	5.249783327	6.96909	7.4551	5.75148	36.1408	40.0797	29.6974
PRDM1	TC vs UT	2.08999E-07	1.3081E-05	5.25613826	51.8568	65.7022	49.5829	290.67	304.472	283.379
SERBP1	TC vs UT	4.57426E-06	5.58946E-05	5.260628746	103.067	118.777	129.164	559.132	704.529	582.862
DDX10	TC vs UT	5.38471E-05	0.000266748	5.277768813	7.20253	7.11541	6.65631	37.8533	40.3636	32.4804
NEFH	TC vs UT	0.00039671	0.001200942	5.280871563	2.52095	1.17415	3.48228	14.3644	11.1508	12.3877
NUPL1	TC vs UT	6.2056E-08	9.59336E-06	5.291385612	22.5077	28.8857	23.7283	136.731	136.608	124.159
FTH1	TC vs UT	9.41561E-06	8.52311E-05	5.293736044	219.614	200.027	227.501	1100.22	883.94	1441.65
TMEM208	TC vs UT	3.17507E-06	4.62452E-05	5.301119704	5.34191	6.23416	4.31431	31.3035	30.0607	22.8726
MRPL3	TC vs UT	1.29835E-05	0.000104181	5.301610012	20.5539	23.8817	19.3743	104.068	129.638	104.589
LOC644563	TC vs UT	2.81559E-06	4.33392E-05	5.303582199	1.68067	2.5133	1.78742	11.0218	11.0661	9.63487
FARSA	TC vs UT	3.45629E-06	4.83182E-05	5.309368502	10.2636	8.55152	10.9397	49.688	52.8712	55.42
SELS	TC vs UT	1.60285E-05	0.000120141	5.316234295	11.524	13.6106	11.3095	69.7434	76.233	47.7689
BRIX1	TC vs UT	1.43904E-05	0.000111454	5.318082355	9.56822	9.85985	7.21349	48.2748	52.0433	41.3639
DCUN1D5	TC vs UT	6.12348E-06	6.53702E-05	5.320807821	7.17252	8.25777	7.70405	38.4405	48.4616	36.1912
RELB	TC vs UT	7.61388E-05	0.000340883	5.323604926	5.85207	14.3613	5.67021	46.0292	40.9996	50.7649
UBE2S	TC vs UT	6.99832E-06	7.05554E-05	5.325801632	5.27341	6.63038	6.7223	34.2208	37.6505	27.3275
FTHL2	TC vs UT	2.85049E-05	0.00017254	5.331991494	29.543	24.0864	32.1822	151.659	116.007	189.881
LOC728324	TC vs UT	2.72054E-06	4.28063E-05	5.332381837	6.14757	6.20126	6.43273	38.8942	30.3044	30.9519
HAX1	TC vs UT	4.8785E-09	5.91588E-06	5.334952742	22.8378	23.3696	23.3255	123.679	117.571	129.705
GART	TC vs UT	4.12092E-07	1.81467E-05	5.338379528	21.8962	19.6508	21.0431	107.787	119.33	107.012
NEDD4	TC vs UT	2.64013E-06	4.23496E-05	5.346367292	7.89276	9.00845	7.45754	45.9385	40.4905	43.8019
AHCY	TC vs UT	1.20795E-05	9.87013E-05	5.351265033	9.72339	11.2279	13.8056	63.285	61.9444	60.764
SURF4	TC vs UT	1.37449E-07	1.24442E-05	5.353276833	50.6736	60.8344	52.6836	313.227	324.308	241.429
FTHL20	TC vs UT	2.43747E-05	0.000156125	5.353575983	17.9524	19.2242	23.306	102.971	81.9977	138.829
LYRM4	TC vs UT	1.68598E-07	1.24442E-05	5.368969023	4.26154	3.88414	4.34513	25.4313	20.945	20.6865
FARSB	TC vs UT	1.3423E-05	0.000106327	5.369380771	5.79206	5.61401	4.86899	28.3674	33.4525	25.5671
CSTF2	TC vs UT	1.40541E-06	3.10825E-05	5.376892893	7.74271	8.94319	6.71794	43.4545	38.7456	43.6399
SUB1	TC vs UT	7.67869E-07	2.37885E-05	5.399982752	23.378	23.7613	22.5265	124.108	133.722	118.364
PSMB2	TC vs UT	8.04339E-07	2.42482E-05	5.40460982	25.6532	32.9263	24.6722	155.388	163.149	131.406
UTP11L	TC vs UT	2.49801E-06	4.1363E-05	5.405078023	5.37089	7.27763	6.53305	32.3874	38.5403	32.7502
LRP8	TC vs UT	5.99558E-08	9.59336E-06	5.416955873	12.1548	10.4401	10.3677	64.8887	60.9757	52.6928
HSP90AA3P	TC vs UT	0.000143402	0.000544883	5.428118709	0.304696	0.55546	0.477087	2.6047	2.27779	2.37622
CENPN	TC vs UT	2.16795E-05	0.000145242	5.434412776	1.67694	1.67055	2.14398	11.9926	9.72188	8.12844
TAF4B	TC vs UT	8.71405E-05	0.000377434	5.436279626	3.51129	5.61401	4.89981	24.573	27.22	24.4514
NCRNA00263	TC vs UT	0.000908978	0.002348145	5.438881632	0.420242	0.587602	0.369889	1.80693	2.20483	3.48157
SERBP1P1	TC vs UT	2.34947E-06	4.05095E-05	5.4421609	13.9369	14.1952	13.4458	71.346	81.392	73.5353
NME2P1	TC vs UT	9.74685E-07	2.71284E-05	5.44590676	1.79629	1.57868	2.35247	10.4028	10.516	10.2723
TICAM1	TC vs UT	7.25036E-08	1.04484E-05	5.451469652	13.8948	13.6759	12.9735	80.0428	71.2721	69.7105
MCM6	TC vs UT	6.2244E-08	9.59336E-06	5.452321622	18.0062	20.2037	20.1536	109.584	101.841	106.791
RRP9	TC vs UT	0.000341788	0.001065239	5.45776495	2.13082	2.57858	1.81823	12.5124	13.398	9.71583
UCK2	TC vs UT	6.92647E-06	7.01754E-05	5.459562207	7.26011	10.7705	10.6007	50.9073	55.4135	49.994
ETF1	TC vs UT	3.57004E-07	1.67209E-05	5.465941748	42.5544	47.6531	43.9742	247.223	271.607	214.599
TRIB3	TC vs UT	1.89896E-06	3.64707E-05	5.466337755	10.0235	12.2724	9.79953	58.4506	65.3785	51.6152
LOC100132840	TC vs UT	3.67669E-05	0.000204687	5.470465825	1.68067	1.63205	1.07865	8.13085	8.56461	7.32738
THOC6	TC vs UT	8.93206E-07	2.57216E-05	5.472524574	1.35619	1.46487	1.87041	8.83799	7.3332	9.50303
LOC643276	TC vs UT	1.36933E-05	0.000107199	5.482715333	1.68966	2.19658	1.96385	10.8965	12.6376	8.54029
TMEM121	TC vs UT	0.000398692	0.001204281	5.49154019	1.02044	1.86052	1.23273	6.36919	9.58218	6.63919
TOMM34	TC vs UT	4.45308E-06	5.50165E-05	5.504764395	6.66235	7.86611	10.2618	52.7143	44.6035	39.1465
GNL2	TC vs UT	1.07822E-05	9.14969E-05	5.508115885	10.3836	12.2397	8.47445	54.7923	66.9477	49.5502
TCEB1	TC vs UT	6.1704E-08	9.59336E-06	5.513705878	6.02044	6.37319	6.7801	35.4596	37.6917	32.567
GADD45A	TC vs UT	4.37967E-05	0.000230823	5.51547028	4.80172	7.93138	5.60858	34.2395	34.1733	32.7502
LOC100129096	TC vs UT	8.95556E-06	8.19763E-05	5.522602939	7.33471	5.66808	6.54607	34.8967	31.8343	41.2296
FTHL10	TC vs UT	8.12536E-06	7.71846E-05	5.524103499	29.8612	26.359	28.364	156.677	120.102	190.473
SARS	TC vs UT	1.31445E-08	7.50086E-06	5.52734638	43.6349	48.5343	44.0974	241.663	256.894	254.636
LOC727896	TC vs UT	6.9657E-07	2.27846E-05	5.529606377	1.9637	2.91575	2.16793	14.2692	13.4644	11.2358
NANS	TC vs UT	4.06942E-05	0.000219301	5.534768737	4.98474	5.45578	3.3521	25.123	30.2169	20.999
YWHAE	TC vs UT	1.38989E-06	3.09498E-05	5.552166112	32.1708	49.5684	38.786	228.585	239.093	201.499
LOC100129009	TC vs UT	5.65197E-05	0.000275777	5.557675923	0.390232	0.457046	0.745308	3.16746	3.60038	2.08324
GCH1	TC vs UT	1.87252E-07	1.27559E-05	5.560208586	25.1786	27.4822	21.1397	123.542	144.793	142.012
TAP1	TC vs UT	3.20114E-07	1.62112E-05	5.566698336	123.895	116.305	110.522	684.282	726.8	541.277
EIF1AXP1	TC vs UT	0.000352095	0.001091335	5.5670787	20.4652	30.5918	21.4096	112.745	193.534	97.1491
HSPH1	TC vs UT	6.07753E-06	6.51051E-05	5.591592356	21.9075	25.0016	25.8854	142.109	152.55	112.378
GTF3C6	TC vs UT	2.87218E-06	4.36745E-05	5.593803938	4.47161	4.04734	5.26961	26.7412	27.5167	22.8725
PSME2P1	TC vs UT	7.74287E-07	2.38079E-05	5.602940056	4.16395	4.43093	4.3319	24.8384	21.8041	25.7855
LOC442112	TC vs UT	1.4421E-06	3.15828E-05	5.621808679	25.9339	28.0692	34.056	160.609	178.409	156.033
NUDCP2	TC vs UT	4.10523E-05	0.000220546	5.624801495	0.431559	0.753864	0.44023	3.44577	3.28162	2.41659
FTHL16	TC vs UT	1.12398E-05	9.42443E-05	5.628048248	7.30007	5.40277	7.78382	37.1167	28.459	49.7243

EXOSC5	TC vs UT	1.33841E-05	0.000106327	5.636122412	2.52095	3.03553	3.14331	16.6229	17.5531	14.8571
MTX1P1	TC vs UT	2.3444E-05	0.000152702	5.636231154	2.42965	2.40917	2.05536	14.5196	12.5522	11.7854
VDAC1P1	TC vs UT	6.80567E-07	2.27846E-05	5.639207266	7.43162	5.98672	9.50288	44.3395	41.7829	43.1352
ERRFI1	TC vs UT	1.77173E-05	0.000127817	5.652406047	1.71068	1.30566	2.49618	9.80216	9.45497	11.9019
SLC19A2	TC vs UT	7.41772E-05	0.00033453	5.662032336	5.3419	6.07096	4.16023	35.7754	34.3853	18.0147
MKI67IP	TC vs UT	1.68894E-06	3.41695E-05	5.664690814	11.9097	13.6855	13.4894	70.533	76.778	74.0911
PHB	TC vs UT	2.03645E-06	3.74405E-05	5.672062858	26.3485	25.752	27.9497	154.843	166.836	132.371
NPM1	TC vs UT	1.93761E-06	3.66476E-05	5.683064571	106.278	109.881	119.182	651.041	682.03	572.699
BOLA3	TC vs UT	3.75927E-06	5.02931E-05	5.686203043	1.02044	1.27302	1.63334	7.90499	6.52948	7.89413
ESF1	TC vs UT	0.000108146	0.000441097	5.686995325	6.69236	5.05915	4.0986	29.1805	34.7668	26.1921
FTHL11	TC vs UT	8.40303E-06	7.83889E-05	5.691381644	19.5376	18.7433	19.3884	102.859	81.4923	143.867
FTHL5	TC vs UT	0.001008923	0.002561257	5.691421658	0.389428	0.602602	0.481863	3.3688	1.48524	3.5345
MRPL15	TC vs UT	3.90794E-06	5.14796E-05	5.693934789	6.57232	6.39735	8.22792	44.6289	41.254	34.8148
MZT1	TC vs UT	2.93649E-05	0.000175847	5.694178189	5.0418	4.9286	5.73183	25.5217	39.6002	24.2893
TSHZ3	TC vs UT	0.003457101	0.007138846	5.694887072	0.360222	0.391768	0.246626	2.84586	1.95043	0.890709
ILF2	TC vs UT	2.04471E-07	1.302E-05	5.70587776	30.8775	32.2763	32.8058	184.309	195.461	167.763
PSMC1P	TC vs UT	2.34755E-07	1.37765E-05	5.725487083	37.2271	36.7586	42.5002	231.605	244.483	190.851
TSEN15	TC vs UT	1.3913E-07	1.24442E-05	5.736372317	28.2697	27.9065	27.0872	143.282	153.229	181.118
IL6ST	TC vs UT	6.73611E-11	4.15281E-07	5.746563669	26.9185	29.705	28.0555	156.114	169.18	161.318
DNAJA1	TC vs UT	1.73798E-07	1.24442E-05	5.776407947	37.2729	40.4398	46.7478	241.758	252.945	224.231
CD226	TC vs UT	0.000303012	0.00096641	5.782810534	12.1242	21.2154	12.8811	82.9334	123.507	60.8449
LMAN1	TC vs UT	1.5454E-05	0.000117103	5.799943992	67.2228	60.6107	56.0232	337.157	449.508	279.694
LOC643634	TC vs UT	9.44455E-06	8.52311E-05	5.80358509	5.57975	4.78157	6.94303	35.4497	29.2908	35.6867
NDUFV2	TC vs UT	3.8436E-06	5.10135E-05	5.805883944	8.87217	9.34957	7.11879	55.383	43.0062	48.735
CLPB	TC vs UT	2.12925E-05	0.000143935	5.811897227	3.30121	2.48066	2.28047	14.6806	17.7651	14.4118
PRDX4	TC vs UT	4.32892E-06	5.4122E-05	5.814442553	2.82105	3.23136	3.45147	19.6946	20.1818	15.3834
LRRC8B	TC vs UT	0.000125231	0.000492646	5.82927065	5.06848	7.38196	11.7956	56.9669	53.5085	30.8611
ARSB	TC vs UT	7.59E-08	1.04623E-05	5.847396054	6.9597	6.03832	7.58079	36.3613	42.4363	41.5348
TAF13	TC vs UT	5.79418E-05	0.000280276	5.851974916	6.48229	8.38757	4.98016	37.2167	47.7474	31.1977
CHCHD9	TC vs UT	3.65576E-05	0.000204221	5.856777371	4.3038	3.88654	5.10625	29.9105	21.467	26.4976
VDAC1	TC vs UT	1.68763E-07	1.24442E-05	5.866749665	25.4784	26.025	32.9791	162.287	167.234	166.117
CMAH	TC vs UT	0.000249201	0.000829326	5.877406791	10.5637	10.6078	5.76265	55.7409	61.3507	41.211
RPL22L1	TC vs UT	2.41442E-05	0.000155328	5.88476762	4.65167	7.08278	6.07081	31.8455	33.707	39.2273
MPP6	TC vs UT	3.44843E-05	0.00019703	5.888062362	0.690333	1.24038	0.924574	5.73679	5.89351	5.18182
PRMT5	TC vs UT	5.27778E-06	6.08516E-05	5.903561619	10.5208	9.79981	10.1715	61.8585	69.2753	48.8784
PPIL1	TC vs UT	1.82448E-06	3.54823E-05	5.9083976	11.3739	10.5399	11.3968	60.9141	70.8209	65.077
NPM1P6	TC vs UT	3.54889E-06	4.91162E-05	5.911699529	16.2276	15.2131	19.3774	99.207	108.956	92.2588
PSME2P2	TC vs UT	1.58722E-07	1.24442E-05	5.950742893	4.07712	4.45041	4.18715	24.7615	25.9106	24.9897
MAPK6	TC vs UT	1.06789E-05	9.0996E-05	5.959596681	20.9769	26.7967	26.7169	161.304	172.478	110.152
SEMA4A	TC vs UT	0.001992953	0.004502218	5.966784158	1.50061	3.4272	3.45147	7.00158	16.1964	26.7994
FNDC3B	TC vs UT	1.92436E-06	3.65675E-05	5.979284682	4.02146	5.74457	4.46839	23.7599	30.0183	31.3334
RHOB	TC vs UT	7.67761E-06	7.49324E-05	5.994080029	2.70101	2.6765	4.22186	16.8488	21.6234	19.0672
ATAD3A	TC vs UT	1.98E-04	0.000693458	6.00973958	4.22512	6.6378	4.05685	26.4108	34.8113	28.4419
LOC285591	TC vs UT	2.14267E-05	0.000144446	6.029345455	1.27801	1.99402	1.25232	9.33123	9.42334	8.5243
MANF	TC vs UT	1.11042E-06	2.83426E-05	6.031737432	16.5657	17.6252	14.5759	105.925	107.948	80.2759
MIR17HG	TC vs UT	0.008321703	0.015133716	6.048013304	1.4706	0.946632	0.431521	6.64021	7.67424	2.91482
OTUD6B	TC vs UT	0.00012667	0.000496138	6.048726199	4.80172	4.17789	2.52699	22.0435	30.2303	17.3265
MMD	TC vs UT	3.59332E-07	1.67209E-05	6.056575896	6.33225	6.16887	5.54694	31.9812	32.3926	44.9356
NOLC1	TC vs UT	7.49023E-06	7.37067E-05	6.08037199	67.5525	66.486	69.3979	387.699	450.142	399.128
LOC150417	TC vs UT	5.27846E-06	6.08516E-05	6.084343935	3.7941	3.39539	3.58462	20.973	23.7118	20.8686
BCL2	TC vs UT	0.000705054	0.001901009	6.101373925	50.5972	61.6879	31.4014	308.157	295.435	273.093
EPT1	TC vs UT	1.35183E-06	3.07529E-05	6.119993051	21.8175	22.2926	19.2215	127.201	146.106	114.282
SEC61B	TC vs UT	3.84875E-06	5.1027E-05	6.128841549	14.8852	17.8536	12.1415	93.1879	102.773	79.1035
JUN	TC vs UT	0.00759372	0.013991418	6.130059378	0.145849	1.58283	0.802544	3.38923	8.77576	3.35154
SRD5A3	TC vs UT	1.10932E-05	9.35562E-05	6.135659086	3.81139	4.37124	3.91371	20.4173	23.44	30.3617
SCML2	TC vs UT	0.00047501	0.001384602	6.136274732	0.480262	1.46886	0.339074	3.79445	5.46952	4.777
PSMD12	TC vs UT	4.22741E-06	5.33568E-05	6.137240937	12.2742	16.0911	12.6038	87.4964	95.5668	68.3743
TPM4	TC vs UT	1.15696E-05	9.57402E-05	6.140408734	70.9938	61.8464	77.9418	442.051	359.057	493.18
KIF3B	TC vs UT	1.68137E-06	3.40976E-05	6.142768822	34.0018	39.2649	34.2982	230.588	231.673	198.485
MAFG	TC vs UT	2.07091E-08	8.3081E-06	6.146803142	19.2962	26.144	21.3246	147.701	135.459	127.229
PSMB5	TC vs UT	1.70832E-06	3.42763E-05	6.150295754	11.674	11.13	15.5005	81.6694	84.2038	69.7108
ABCE1	TC vs UT	1.87E-05	0.000131896	6.182545174	29.6192	35.0218	28.9954	173.588	223.52	181.803
CKS1BP3	TC vs UT	4.4958E-05	0.000235285	6.192211072	0.884178	0.721649	1.81388	7.66839	7.23438	6.27276
SRFBP1	TC vs UT	3.73328E-06	5.01633E-05	6.193831419	3.30122	4.83068	4.16023	24.7086	26.2872	25.1396
PTTG1	TC vs UT	5.57827E-05	0.000273661	6.194284917	0.720343	0.522324	0.554784	3.92885	3.56158	3.6435
LOC100130003	TC vs UT	2.33818E-07	1.37765E-05	6.194778392	2.95425	2.39702	2.28076	16.3341	15.3016	15.6431
CHPF	TC vs UT	4.34196E-05	0.000229311	6.209402254	10.7408	11.0647	11.3711	72.2215	77.3688	56.4168
TCP1P1	TC vs UT	7.16343E-06	7.15405E-05	6.212582115	0.630313	0.736272	0.999944	5.35571	4.57263	4.77391
JUNB	TC vs UT	4.99375E-07	1.96719E-05	6.221013108	52.9075	55.4542	55.5613	309.591	315.677	394.498
LRP11	TC vs UT	0.001266092	0.003096175	6.221833497	0.63703	1.56677	1.01702	7.18227	4.24183	8.61534
GTPBP4	TC vs UT	5.79561E-06	6.34635E-05	6.228546121	13.9515	19.121	14.8132	92.1003	117.747	88.4107
IGHV	TC vs UT	0.000626948	0.001729871	6.24873562	5.22186	2.44803	2.85296	32.3268	13.9655	19.4621
NFE2L1	TC vs UT	1.61381E-08	8.29095E-06	6.269484497	79.5269	84.0119	91.1554	574.355	496.349	526.097
BEND3	TC vs UT	2.08662E-06	3.79757E-05	6.290738534	2.13082	2.35011	2.36714	13.7772	12.34	16.9622
GAR1	TC vs UT	1.05072E-05	9.0182E-05	6.292683383	3.96144	4.99387	3.29739	26.38	29.5095	21.2128
EIF4A1P2	TC vs UT	2.39106E-07	1.37765E-05	6.292856812	16.8784	14.1404	16.4273	102.37	99.866	96.3354
TSR1	TC vs UT	2.89248E-06	4.38466E-05	6.299319935	14.363	16.5961	13.7338	91.7207	103.801	86.0136
RAN	TC vs UT	4.7147E-07	1.91672E-05	6.323234414	54.0285	54.6684	61.5431	372.841	383.24	320.387
SLC25A19	TC vs UT	2.16468E-05	0.000145197	6.347733815	1.99855	3.5141	3.17087	20.8261	19.8907	14.4039
CARS	TC vs UT	3.36181E-07	1.64489E-05	6.363211304	13.4432	11.587	12.3572	78.4609	73.9852	85.4578
PRDX1	TC vs UT	2.17513E-07	1.34771E-05	6.363702015	19.059	20.5319	22.0276	125.355	132.824	133.943
SPAG1	TC vs UT	0.000110284	0.000447158	6.372235629	1.1705	1.9258	1.69497	8.98909	9.07338	12.4686
NDUFAF2	TC vs UT	1.03485E-05	8.97938E-05	6.381691456	1.50784	2.24579	2.54008	12.7633	14.1079	13.2933
ZFHX2	TC vs UT	0.002118765	0.004734392	6.388974662	0.118042	0.470434	0.184995	1.94245	1.86564	1.1336
RBM8A	TC vs UT	1.05011E-06	2.77852E-05	6.402003251	14.7786	19.286	19.9979	119.135	126.527	100.447
PIM1	TC vs UT	3.28614E-06	4.72718E-05	6.405691063	91.591	101.9	119.502	672.207	606.649	726.08
EIF4A1P4	TC vs UT	1.83047E-07	1.26088E-05	6.410091408	2.32401	2.22512	2.88912	14.0904	18.4953	15.0942
HUWE1	TC vs UT	4.58233E-07	1.88334E-05	6.413486373	100.745	100.822	92.2315	694.938	597.134	592.198
AARS	TC vs UT	7.51961E-07	2.36378E-05	6.414469766	16.89	18.3197	23.0903	114.637	128.497	130.83
LOC653698	TC vs UT	1.34518E-05	0.000106327	6.43496466	2.17938	4.3288	2.68677	19.536	20.5964	19.0368
UCHL3	TC vs UT	1.11423E-05	9.3778E-05	6.437862284	0.990434	1.14247	1.1711	7.31778	7.75904	6.19388
GNPNAT1	TC vs UT	8.99044E-07	2.57216E-05	6.456628774	12.3961	12.5475	13.6534	88.7619	91.29	69.1551
CIRH1A	TC vs UT	7.81216E-07	2.39017E-05	6.457406854	5.642	6.78902	6.37897	42.2801	42.1018	37.0819
NFKB1	TC vs UT	2.70915E-05	0.000166603	6.461695602	30.7002	42.3655	42.4645	199.522	190.026	356.973
RANP1	TC vs UT	1.74266E-07	1.24442E-05	6.462514872	23.0065	24.5787	26.1277	167.129	162.546	146.695
NDUFV2P1	TC vs UT	4.53823E-06	5.5678E-05	6.464395223	11.7841	14.5057	13.1803	99.9146	76.2611	78.9744
PFDN2	TC vs UT	1.25357E-06	2.99391E-05	6.476482928	4.41159	6.98485	5.39287	39.5246	37.3109	31.9002
TXNRD1	TC vs UT	2.89466E-06	4.38466E-05	6.478326433	46.0357	48.3711	63.1414	303.319	304.499	412.83
INSIG1	TC vs UT	3.94761E-05	0.000214707	6.500415456	43.3965	53.1546	57.3613	190.983	359.374	450.138
TPI1P1	TC vs UT	1.13837E-07	1.1947E-05	6.504626571	36.6054	38.3309	43.9578	258.51	226.388	288.464
AK2	TC vs UT	5.39E-06	6.10434E-05	6.511652584	51.6637	47.8081	46.6282	334.9	367.438	249.013
WDR43	TC vs UT	1.03672E-05	8.983E-05	6.526130334	15.7855	19.1592	17.8732	99.5561	133.934	111.206
EIF4A1	TC vs UT	1.25607E-07	1.19875E-05	6.537487977	63.8884	58.9417	68.1105	436.515	431.474	380.282

LOC100132715	TC vs UT	1.99701E-07	1.302E-05	6.544840253	2.46849	2.76121	3.47715	20.4181	19.0497	17.5171
USP12	TC vs UT	9.95757E-06	8.78362E-05	6.569476542	27.7895	37.7635	33.026	213.125	267.734	166.753
SLC25A33	TC vs UT	0.000682732	0.001854204	6.613422329	2.80251	2.98254	2.24396	17.6398	16.9689	18.4905
RANBP1	TC vs UT	1.19115E-05	9.78079E-05	6.628647718	8.26438	7.01493	8.54361	51.7101	58.7602	47.4434
RAPH1	TC vs UT	5.79753E-05	0.000280328	6.671990667	0.390232	0.68552	0.832269	5.55611	3.77357	3.40061
HSPA5	TC vs UT	1.62082E-05	0.000120973	6.673629371	150.801	167.47	183.598	1073.2	1485.61	790.472
YARS	TC vs UT	3.6229E-06	4.95237E-05	6.679635466	31.2057	49.5676	34.329	243.242	268.256	257.343
HNRNPAB	TC vs UT	2.03837E-06	3.74405E-05	6.682301792	26.4654	28.8529	32.3033	207.696	211.146	166.672
CCT5	TC vs UT	2.7933E-07	1.53073E-05	6.69334409	40.2388	35.2686	40.5845	261.13	281.236	234.676
MRPL3P1	TC vs UT	2.40876E-06	4.07014E-05	6.703173845	2.10398	1.8707	1.73475	11.8863	14.2632	12.1218
RIOK1	TC vs UT	1.85043E-06	3.57801E-05	6.705541439	6.69236	7.86611	6.50223	51.7207	48.2919	41.2109
NUDT15	TC vs UT	3.18524E-05	0.000186221	6.727626265	5.49701	4.33355	4.0278	30.0163	39.019	24.1986
GDAP1	TC vs UT	2.65543E-05	0.000164679	6.73294421	2.22085	1.30566	1.57171	11.067	11.2357	12.0233
FTHL4	TC vs UT	1.23138E-05	0.000100052	6.799999178	0.330248	0.391768	0.308258	2.75669	1.73844	2.51073
TIMM17A	TC vs UT	3.30098E-06	4.72718E-05	6.813554336	9.66335	10.9994	7.54998	64.6399	70.5098	57.0796
MRPL1	TC vs UT	3.07089E-05	0.000181081	6.826429411	1.44059	1.9258	1.20192	10.299	10.6845	10.2016
SELK	TC vs UT	6.044E-07	2.15316E-05	6.827404524	10.0535	10.6731	10.9705	72.2735	82.8047	61.3304
SREBF1	TC vs UT	4.18601E-05	0.000223242	6.838581556	4.59166	9.76657	4.19106	39.7129	48.801	38.3369
CCT2	TC vs UT	1.82004E-06	3.5452E-05	6.840108859	17.1359	17.6905	18.3971	123.813	136.565	103.676
MYC	TC vs UT	2.66088E-05	0.000164679	6.871987489	71.0943	56.9877	89.3352	478.229	515.169	500.69
RSL24D1P1	TC vs UT	3.38819E-07	1.65124E-05	6.876991597	2.52095	2.79908	3.62436	21.8935	19.2483	20.3687
MAMLD1	TC vs UT	0.000778667	0.002055002	6.880584738	1.1705	1.14247	1.54089	6.41436	7.67424	12.4281
RPP40	TC vs UT	0.0006354	0.001746039	6.885345664	0.540282	0.881354	0.400705	5.05923	4.45195	3.03627
NFIL3	TC vs UT	1.77547E-06	3.49705E-05	6.90585932	4.65167	6.46263	4.53002	39.886	29.9631	38.1884
ZC3H12A	TC vs UT	4.77568E-05	0.000245248	6.926764442	28.2697	32.2148	20.1537	177.792	154.796	225.974
FTHL3	TC vs UT	1.8677E-05	0.000131668	6.932436451	1.78198	1.40928	1.51489	11.9074	6.84924	13.8685
SLAMF7	TC vs UT	2.08524E-05	0.000142102	6.94766306	142.667	168.482	86.9003	818.969	1042.8	903.744
SLC39A14	TC vs UT	1.04024E-06	2.77852E-05	6.957534468	14.6451	20.2689	20.4926	136.509	132.962	116.022
CKS2	TC vs UT	4.10622E-06	5.27942E-05	6.963801695	2.18888	1.89316	1.60159	13.0889	12.6759	13.8149
NUS1	TC vs UT	9.54566E-06	8.56609E-05	6.976226607	44.6813	47.1642	41.9006	270.925	415.971	246.148
HMGB3	TC vs UT	4.51686E-05	0.000236287	6.981327659	0.330211	0.587603	0.708863	3.83962	3.10408	4.41266
LOC399942	TC vs UT	3.17709E-08	8.3081E-06	6.983029985	2.05769	1.87249	2.31083	14.6853	14.6405	14.2553
FKBP4	TC vs UT	6.33089E-06	6.66595E-05	6.987337443	16.2334	18.2127	24.4062	138.267	148.309	124.644
AEBP1	TC vs UT	6.95E-04	0.001879458	6.993636729	0.300201	0.457046	0.986205	2.98137	4.07036	5.14134
MAPK11	TC vs UT	1.75465E-05	0.000127189	7.016521555	0.840384	0.620241	0.523969	5.4206	3.64637	4.85797
EIF2B3	TC vs UT	2.80894E-05	0.000170864	7.016547853	1.50061	1.3383	1.94149	12.4672	12.1685	8.90619
CDK4	TC vs UT	1.22769E-06	2.97981E-05	7.043015455	13.4596	12.4833	17.5308	103.91	102.49	99.7864
PAK1IP1	TC vs UT	1.65276E-07	1.24442E-05	7.06858604	2.43092	2.74178	3.08168	19.017	21.0722	18.2576
LOC100287554	TC vs UT	5.19289E-07	1.99465E-05	7.087273237	5.85057	7.69579	7.97336	51.1662	56.1857	45.1642
SOD2	TC vs UT	1.05673E-05	9.042E-05	7.104686019	60.0166	64.0615	69.3802	366.139	333.848	674.474
NOP14	TC vs UT	9.32585E-05	0.000397744	7.117842358	24.371	23.151	22.3075	158.49	192.769	145.777
TPI1	TC vs UT	1.00552E-07	1.14797E-05	7.130474277	48.1303	44.0981	50.5879	335.4	305.439	377.51
GPATCH4	TC vs UT	1.63265E-05	0.000121538	7.133553846	12.1381	12.5008	12.093	83.4863	101.691	76.8518
SRM	TC vs UT	6.50115E-06	6.74173E-05	7.148650929	11.0738	10.8363	10.2001	76.4293	86.2387	66.8768
FOXP4	TC vs UT	1.42851E-05	0.000110777	7.164639569	10.4736	11.946	22.927	103.758	119.605	101.53
METRNL	TC vs UT	0.000125797	0.000493816	7.168836788	8.22287	11.4891	22.1875	101.228	122.955	76.1872
MPDU1	TC vs UT	1.14708E-06	2.86886E-05	7.196618476	6.18569	7.24273	6.00716	49.1593	49.8421	40.8691
PARVB	TC vs UT	0.000393003	0.001191476	7.206296281	1.68067	0.881354	1.97231	10.5701	13.4829	8.62281
PP1P	TC vs UT	1.45486E-05	0.000112255	7.214773884	2.05989	2.15239	1.71231	14.1741	13.5577	15.0128
PFAS	TC vs UT	1.13968E-05	9.50119E-05	7.216602743	8.02318	6.07092	6.00051	51.7682	49.943	43.3036
LOC100288178	TC vs UT	0.001530834	0.003631239	7.245832806	1.11048	0.848715	0.308258	6.27885	3.34959	6.80111
DCTPP1	TC vs UT	1.00976E-06	2.75831E-05	7.26148601	10.5937	8.63513	9.79776	67.1232	72.1616	71.4912
TNFAIP8	TC vs UT	1.48704E-06	3.18853E-05	7.278709478	100.684	101.769	113.834	725.012	815.25	761.901
FLJ36031	TC vs UT	1.56272E-07	1.24442E-05	7.282063045	14.1649	16.8418	17.0412	138.539	111.763	99.5864
MAGOHB	TC vs UT	2.23932E-05	0.000148126	7.282527193	2.22085	2.28798	2.18802	15.6256	18.5707	14.5737
STIP1	TC vs UT	2.28996E-07	1.37733E-05	7.318326627	29.53	36.1314	33.7435	262.489	258.081	206.908
LARP4	TC vs UT	2.37926E-07	1.37765E-05	7.334464387	15.7471	18.7581	18.4067	119.015	145.65	123.415
NPM1P5	TC vs UT	1.36365E-06	3.0799E-05	7.336345944	0.687009	0.5384	0.701602	4.69356	5.1262	4.31746
MSC	TC vs UT	0.000557171	0.001576031	7.338916857	9.06949	4.1309	4.65645	53.7548	25.6137	51.6813
VARS	TC vs UT	1.33356E-05	0.000106083	7.345894023	8.55998	9.34578	11.1862	71.3038	77.5926	64.8104
TOMM40	TC vs UT	1.53275E-06	3.24166E-05	7.374544558	13.1145	14.2821	13.8516	106.173	107.039	90.9757
SGPP2	TC vs UT	0.002887571	0.006149179	7.3853894	2.3709	1.3383	1.84905	14.1386	6.95346	19.9578
SCFD2	TC vs UT	4.41746E-05	0.000232468	7.390119372	3.2712	3.59039	3.48229	23.9858	31.163	21.2937
C1QBP	TC vs UT	6.88638E-06	6.99881E-05	7.404420953	17.9614	18.6795	19.9407	143.8	150.659	124.494
LOC727919	TC vs UT	1.07647E-05	9.14106E-05	7.408673256	1.34332	1.5079	1.68188	10.6805	12.4338	10.4699
EIF2S2	TC vs UT	6.52654E-09	6.09722E-06	7.467137893	23.6268	22.384	22.8032	165.173	174.939	173.732
LOC100128881	TC vs UT	0.000700248	0.001890117	7.46969059	1.15797	1.1751	0.344364	4.83297	6.90821	8.25848
TUBA1B	TC vs UT	2.29053E-06	4.02247E-05	7.47975023	71.8507	88.2107	139.81	722.612	761.199	759.154
CD69	TC vs UT	8.06237E-05	0.000355286	7.528606285	29.9202	38.7099	20.9548	184.791	233.407	256.252
TWSG1	TC vs UT	1.10996E-07	1.1947E-05	7.538983114	8.9431	7.76818	8.50525	59.6255	65.5479	64.9337
FOSB	TC vs UT	0.003346449	0.006948756	7.582619764	1.02044	4.83068	0.770495	14.4548	26.16	9.59439
IFRD2	TC vs UT	1.10521E-06	2.83426E-05	7.583822358	10.5337	10.5496	8.47445	74.2608	76.5052	73.3944
XPO5	TC vs UT	6.32748E-08	9.63184E-06	7.607000066	17.6773	17.4257	20.0146	142.519	157.018	119.742
IL15RA	TC vs UT	1.62694E-06	3.36712E-05	7.654260732	10.5556	8.91056	8.4059	73.7137	74.1462	65.4798
TIMM8A	TC vs UT	1.17448E-05	9.70602E-05	7.657985299	1.80071	2.54594	1.72578	15.2666	17.0267	14.2093
LMNA	TC vs UT	6.02414E-05	0.000288569	7.661420791	4.68168	12.9578	5.97836	60.258	54.8639	65.8241
ELL2	TC vs UT	2.92562E-06	4.41673E-05	7.67437172	7.45809	9.91398	7.36508	77.1955	69.8606	42.786
B4GALT2	TC vs UT	2.81862E-06	4.33392E-05	7.72349283	2.79104	2.74178	3.20494	21.5466	23.1074	22.8321
SRPRB	TC vs UT	6.47014E-07	2.24092E-05	7.735330873	25.0681	24.6795	27.1269	200.091	215.113	179.446
SCD	TC vs UT	2.74375E-06	4.29865E-05	7.763669799	15.3353	18.1148	21.3863	145.989	174.389	105.353
ZAK	TC vs UT	5.12096E-05	0.00025772	7.78751017	0.600303	1.10983	1.72578	6.64021	10.6845	9.43246
FRMD6	TC vs UT	0.002831844	0.006048265	7.794726586	0.210171	0.261212	0.95539	2.1683	5.51192	3.44109
ATP1B3	TC vs UT	6.91806E-06	7.01754E-05	7.808906215	20.6771	27.6452	19.6914	192.745	211.781	126.587
DPH2	TC vs UT	4.96533E-06	5.88678E-05	7.824459763	15.3053	14.5897	12.6654	116.315	119.904	96.7934
MAK16	TC vs UT	9.04048E-07	2.57434E-05	7.826952588	12.3777	15.002	10.5031	95.6569	106.491	94.3594
ACOT7	TC vs UT	1.49E-06	3.18853E-05	7.844490044	1.41058	1.56677	1.66415	12.9641	10.8965	12.5496
HSPA2	TC vs UT	0.000274125	0.000893224	7.854566568	0.930414	0.587602	0.554784	5.14958	5.34232	5.78905
CCDC6	TC vs UT	1.73695E-06	3.43787E-05	7.860154942	23.2811	28.8288	26.1319	153.535	219.119	242.339
POP1	TC vs UT	5.90068E-07	2.13885E-05	7.902341174	3.06113	3.16608	2.43455	22.6307	24.8881	20.9294
SYTL3	TC vs UT	5.66053E-06	6.25665E-05	7.908384903	17.9128	13.6732	12.6254	127.601	146.955	75.0848
HSPA13	TC vs UT	3.35797E-07	1.64489E-05	7.937482022	30.2502	38.351	31.7711	264.254	313.235	219.214
EIF2S2P4	TC vs UT	6.20897E-08	9.59336E-06	8.00327501	26.9407	25.7178	28.0009	207.453	217.13	220.955
IARS	TC vs UT	5.20744E-08	9.19697E-06	8.012780608	28.7497	27.7106	24.8992	213.02	224.461	214.435
ARID5B	TC vs UT	0.000615234	0.00170086	8.02102422	6.33224	5.71193	5.48531	44.7192	29.1703	66.7148
NHP2P1	TC vs UT	1.81438E-05	0.000129688	8.040445475	3.42299	2.50501	1.7557	22.0803	22.9713	16.7289
TUBE1	TC vs UT	4.1347E-08	8.944E-06	8.145179108	6.51257	7.06924	6.10199	48.8355	59.1948	52.2978
ID2	TC vs UT	4.27507E-05	0.000226686	8.153547528	43.9633	52.1561	34.8217	344.656	404.341	318.637
SEH1L	TC vs UT	5.68643E-07	2.11186E-05	8.178411387	10.101	10.4014	9.93261	81.7836	87.5788	79.5474
RAB33A	TC vs UT	5.77306E-05	0.000279583	8.19963041	6.18219	4.1779	6.4406	60.9359	36.4628	40.3607
AGK	TC vs UT	5.64276E-05	0.000275696	8.210848855	5.22324	4.771	4.64396	46.9949	43.8536	29.3435
TUBA1C	TC vs UT	4.24358E-07	1.832E-05	8.213762434	30.2895	45.3369	52.4984	375.132	346.169	331.086
SLC3A2	TC vs UT	3.18059E-07	1.62112E-05	8.256672965	49.7569	76.3427	67.3327	525.431	451.294	620.382
BOP1	TC vs UT	2.08387E-05	0.000142102	8.278293447	3.09122	3.83501	5.10663	36.4139	29.8835	33.3141

SNRPD1	TC vs UT	1.03223E-05	8.9756E-05	8.282520124	4.53164	5.90777	6.50223	49.1897	49.9222	41.2076
UBXN8	TC vs UT	4.17088E-05	0.000222917	8.319540136	0.780363	0.848715	0.770495	7.18226	6.91106	5.87002
LASS6	TC vs UT	1.68115E-06	3.40976E-05	8.391867005	7.75636	7.53474	7.70936	60.2051	76.4743	56.3375
GK	TC vs UT	1.32082E-06	3.02372E-05	8.454059796	0.953379	0.777151	0.700754	7.12972	6.95619	6.46831
PUS7	TC vs UT	5.95325E-05	0.000285879	8.466301625	2.58097	1.59941	1.66415	15.3582	19.6307	14.4928
PIGW	TC vs UT	1.99978E-05	0.000138369	8.482793387	4.80172	3.49248	4.37594	29.4515	43.3738	34.6529
SLC1A4	TC vs UT	5.05859E-06	5.92894E-05	8.507850944	12.2442	11.0647	15.5929	83.7023	108.456	138.813
HSPE1P2	TC vs UT	1.43253E-05	0.000111019	8.508856756	0.790729	0.881354	1.02303	9.75614	7.24307	5.93312
MARS	TC vs UT	4.00917E-07	1.79577E-05	8.55976961	28.93	32.8594	25.1756	247.471	246.858	250.072
RSL24D1	TC vs UT	2.15985E-08	8.3081E-06	8.604909772	34.5102	42.1045	40.4305	341.607	330.539	335.017
ESPN	TC vs UT	6.15584E-05	0.000292717	8.621699033	4.21697	3.48642	11.5004	53.2909	51.7135	60.5648
SLCO4A1	TC vs UT	0.000877632	0.002281509	8.640822749	1.14049	0.750798	5.55259	18.377	19.236	26.7082
MAFF	TC vs UT	0.000102002	0.000423775	8.64571895	4.98178	6.07096	4.12942	52.7597	41.3383	37.1627
TIMM10	TC vs UT	2.70869E-06	4.28063E-05	8.646801143	3.90141	3.55775	3.3282	34.1494	30.0607	29.0662
PLAGL2	TC vs UT	2.66968E-06	4.26389E-05	8.682354291	41.8942	52.7777	47.6105	415.385	466.512	353.451
PPPDE2	TC vs UT	1.01089E-06	2.75831E-05	8.70623711	15.7854	15.112	13.5282	142.424	139.831	104.525
NELF	TC vs UT	4.68397E-05	0.000242457	8.735249921	4.56164	4.1779	2.09557	30.7164	29.7638	34.1672
PPA1	TC vs UT	1.04698E-05	9.0182E-05	8.780032766	6.60357	7.86663	6.23089	54.0034	65.4312	62.3216
BLM	TC vs UT	1.30861E-05	0.000104706	8.818940164	5.22186	4.24317	6.59468	49.7335	38.5403	53.3559
HSF5	TC vs UT	4.96309E-05	0.000252142	8.829657976	1.02044	0.848715	0.554784	8.31153	8.39502	4.69604
HSP90AB1	TC vs UT	6.10986E-07	2.16479E-05	8.853257967	211.142	232.168	274.123	1993.03	2235.41	2123.18
USP12PX	TC vs UT	9.68023E-05	0.000408091	8.90658469	0.323646	0.701979	0.91303	5.19175	7.34427	4.73078
AK2P1	TC vs UT	3.49446E-06	4.86305E-05	8.946908014	6.97614	5.94882	8.25525	71.5107	72.7344	45.2523
BZW2	TC vs UT	5.3574E-06	6.09942E-05	8.980244484	6.42227	4.66748	6.4406	54.5615	56.556	46.3094
NFE2L3	TC vs UT	2.64075E-06	4.23496E-05	9.024329926	6.18982	9.18339	8.21905	75.5279	80.4828	56.8937
RPF2	TC vs UT	3.32648E-07	1.64329E-05	9.040937007	4.86175	4.70012	6.2557	45.6804	47.7233	49.6019
TBX21	TC vs UT	4.26727E-06	5.35855E-05	9.052216291	30.8805	40.701	27.3645	296.727	329.098	269.856
LOC386597	TC vs UT	0.009325596	0.016686199	9.082229506	0.240181	1.5015	2.06476	4.78821	17.6379	12.1448
NUDCD1	TC vs UT	3.54034E-06	4.91029E-05	9.086356497	4.49094	5.53602	6.46184	52.41	55.5365	41.8767
HSPD1	TC vs UT	1.99802E-06	3.72077E-05	9.09734799	41.5972	39.1222	39.5658	377.531	409.606	307.14
PNO1	TC vs UT	1.03586E-05	8.98182E-05	9.099354044	5.66652	10.067	7.59016	64.3621	79.9679	67.9
DLEU2	TC vs UT	4.30209E-05	0.00022766	9.106964503	0.901198	1.34789	0.85598	8.87393	11.1317	8.27214
NME1-NME2	TC vs UT	3.18104E-06	4.62527E-05	9.109898609	19.7811	17.6859	24.5189	192.097	206.48	166.108
HSPD1P4	TC vs UT	1.51307E-05	0.000115518	9.119227723	3.70337	4.8389	4.64958	41.6649	46.6577	31.9769
PKM2	TC vs UT	1.40161E-06	3.10825E-05	9.15328596	105.674	109.153	111.743	929.372	986.75	1073.07
CYTIP	TC vs UT	6.92304E-09	6.09722E-06	9.15465607	90.8663	98.0001	108.719	826.711	909.244	988.335
EIF5A	TC vs UT	1.65759E-07	1.24442E-05	9.244287797	68.7428	77.1783	76.6558	698.414	725.709	633.442
HSP90AB3P	TC vs UT	9.01196E-07	2.57216E-05	9.250049327	18.5268	21.2452	25.6249	189.244	213.508	202.172
SDC4	TC vs UT	7.77765E-06	7.53407E-05	9.295555912	8.73306	7.83347	7.98139	87.8116	66.7777	73.5974
CTPS	TC vs UT	9.67058E-07	2.6977E-05	9.355803155	5.9121	4.96123	4.53002	50.0946	54.1007	39.9156
ATF4C	TC vs UT	1.16E-03	0.00287637	9.425508889	0.123324	1.36354	0.171412	7.2095	3.92495	4.49567
PSMA6P1	TC vs UT	3.04894E-07	1.60683E-05	9.500577265	5.83474	7.7266	7.67004	60.1676	78.4023	63.1405
CD3EAP	TC vs UT	4.02825E-05	0.000218064	9.573582709	3.92659	2.0526	4.62207	33.7204	32.1719	35.5998
LOC283014	TC vs UT	1.28583E-05	0.000103623	9.592961206	0.24963	0.302179	0.627794	3.1071	3.29551	4.91326
EML5	TC vs UT	1.20645E-06	2.95149E-05	9.599413635	11.6683	12.6937	9.09023	92.4214	88.5528	140.147
SLC16A6	TC vs UT	8.95649E-05	0.000385323	9.652934075	1.89074	1.94514	1.23273	13.3255	19.449	16.1525
GNA15	TC vs UT	0.004760392	0.009385295	9.668921506	1.80071	0.913993	2.52699	16.8488	6.95242	26.8803
RDH10	TC vs UT	0.000952764	0.002444389	9.671604802	5.67202	7.05013	3.82126	82.211	52.5292	25.261
LOC642590	TC vs UT	1.57219E-06	3.3024E-05	9.782561975	0.405583	0.216814	0.414218	3.13138	3.61129	3.39809
FERMT2	TC vs UT	1.1875E-06	2.93424E-05	9.812741546	2.52095	3.13345	2.49618	31.6198	19.3338	29.0258
BCL2L1	TC vs UT	1.83699E-06	3.56694E-05	9.849188043	35.9822	42.8878	39.9065	304.541	378.268	487.044
VLDLR	TC vs UT	9.91332E-05	0.000414624	9.981105357	7.6827	8.6168	3.1125	61.2688	53.1489	79.3354
EIF5AL1	TC vs UT	3.76076E-08	8.74908E-06	10.01395834	30.8542	35.7728	33.6981	349.584	342.738	312.329
NPM3	TC vs UT	1.49154E-05	0.000114441	10.11058506	1.29054	2.05636	1.87986	18.7912	18.1043	15.9501
SPNS3	TC vs UT	0.000502381	0.001445928	10.1527049	1.11048	1.99108	1.94149	20.2818	7.84384	23.075
EED	TC vs UT	1.32811E-05	0.000105774	10.23917803	6.72237	8.1925	5.97836	70.8283	86.7903	56.3109
ENO1	TC vs UT	2.97645E-08	8.3081E-06	10.31156457	134.506	142.24	138.216	1470.73	1350.99	1457.18
CYCS	TC vs UT	7.54688E-07	2.36378E-05	10.37885113	30.5204	42.2674	30.8159	341.669	401.594	332.025
EBNA1BP2	TC vs UT	6.01277E-06	6.4636E-05	10.47888118	4.1415	6.13624	5.22865	54.2053	64.3609	43.9234
EXOSC4	TC vs UT	1.14396E-06	2.86688E-05	10.48085919	2.35346	2.44803	2.71189	25.6571	29.0431	24.0465
KBTBD8	TC vs UT	3.71823E-06	5.01633E-05	10.48375458	5.22186	6.88693	4.56084	65.0914	70.8059	38.8631
HSP90AB2P	TC vs UT	4.17623E-07	1.81954E-05	10.50943781	0.933096	0.915032	0.987047	8.47684	12.1959	9.12339
SOCS1	TC vs UT	8.86161E-06	8.15401E-05	10.52967603	2.40089	2.40962	2.68106	20.3221	15.6487	42.913
KIAA0020	TC vs UT	6.51896E-06	6.74885E-05	10.62532479	5.25187	4.7654	4.19105	46.481	61.8591	42.6279
RPF2P	TC vs UT	2.75867E-05	0.000168662	10.75338805	0.480262	0.750798	0.523969	6.76319	6.2503	5.85901
SAMSN1	TC vs UT	3.09057E-05	0.00018198	10.76948099	12.1242	16.8745	6.96447	156.378	130.205	100.72
GOT1	TC vs UT	1.44205E-09	3.55609E-06	10.83442717	6.98622	7.84356	6.90284	81.0363	78.4796	75.9445
PSMD14	TC vs UT	7.16994E-08	1.04484E-05	10.91429914	5.4516	5.44374	5.47076	61.5571	68.2299	48.8375
ZNF593	TC vs UT	2.15682E-05	0.000145082	10.93766602	2.04076	1.04455	2.3421	19.0427	18.4292	21.8913
CCDC86	TC vs UT	1.18369E-05	9.7589E-05	11.00819268	7.23247	7.4519	7.64286	82.9787	95.6036	67.2002
CD80	TC vs UT	5.86339E-06	6.39757E-05	11.02585592	0.590187	0.389866	0.699463	4.56839	5.27787	8.67185
KCTD15	TC vs UT	9.44401E-05	0.000401395	11.03764578	1.83072	0.620241	2.40373	20.7787	16.4507	16.3549
TIFA	TC vs UT	3.58762E-06	4.92481E-05	11.1049521	20.347	39.3956	19.0751	244.319	279.611	351.336
CCDC58	TC vs UT	4.31661E-05	0.000228233	11.19111246	0.390232	1.1751	0.801311	8.40188	9.58218	8.50136
TRAF1	TC vs UT	4.25342E-05	0.000225763	11.23195134	65.0012	74.4498	40.6765	530.98	738.638	753.565
BHLHE40	TC vs UT	2.75801E-05	0.000168662	11.25403388	80.9075	97.2306	102.178	947.224	1050.01	1157.45
DUXAP8	TC vs UT	0.000102066	0.000423775	11.26047074	0.705186	1.25247	0.380166	9.49951	9.80799	7.01743
EIF5AL3	TC vs UT	2.04512E-06	3.74405E-05	11.27992163	6.79097	5.09289	7.90373	74.0676	81.2331	67.9017
CHAC2	TC vs UT	6.91355E-05	0.000317941	11.46814629	0.750353	1.01191	1.84905	12.8286	14.458	14.1284
NCS1	TC vs UT	5.41993E-06	6.11415E-05	11.50952367	2.43092	6.95221	5.20796	53.3019	54.397	60.2376
NLN	TC vs UT	5.07069E-05	0.000255921	11.64643098	1.02044	0.359129	1.20192	8.80842	9.031	12.2257
CD40LG	TC vs UT	1.04456E-05	9.0182E-05	11.66007927	21.4573	15.0467	23.6974	231.004	190.327	280.623
EIF4EBP1	TC vs UT	1.49384E-06	3.18853E-05	11.68246992	4.62166	5.02651	10.385	86.006	67.7952	80.236
FRMD4B	TC vs UT	8.27618E-08	1.06361E-05	11.77116873	15.9355	13.48	17.072	178.741	194.439	174.033
GK4P	TC vs UT	4.35899E-07	1.86167E-05	11.78420306	1.52609	1.25901	1.19309	18.5538	13.7325	14.5935
HAPLN3	TC vs UT	2.93782E-06	4.42829E-05	11.85884677	6.60233	3.23136	4.0986	50.8623	42.9076	71.451
HSPD1P1	TC vs UT	1.02514E-06	2.77193E-05	12.17814956	8.48524	7.98524	8.85404	111.396	113.153	83.857
ARHGAP31	TC vs UT	6.3524E-06	6.67164E-05	12.25809693	6.15218	5.38554	10.6624	83.3403	84.67	104.12
CCRN4L	TC vs UT	4.64715E-05	0.000241058	12.27132392	0.840384	0.880185	0.321438	8.13085	8.18302	8.74426
TARS	TC vs UT	1.2667E-07	1.19875E-05	12.31037996	14.8851	15.5689	16.3017	189.808	192.913	192.859
JAKMIP1	TC vs UT	1.2563E-05	0.000101575	12.31527341	1.38057	1.9258	2.00313	21.0045	17.3411	27.0422
YRDC	TC vs UT	1.0609E-06	2.80105E-05	12.51466882	8.75902	9.18628	9.50242	121.125	130.51	91.8642
SLC16A1	TC vs UT	1.3923E-08	7.50086E-06	12.53041743	10.7137	11.1627	11.4636	117.668	135.083	165.012
STX11	TC vs UT	3.89578E-06	5.14796E-05	12.56650299	9.87343	14.0675	8.25873	132.08	127.874	144.684
CDKN1A	TC vs UT	7.43738E-06	7.34211E-05	12.57733608	2.76103	6.59319	4.6841	35.4594	60.5455	80.5598
CISH	TC vs UT	8.88737E-06	8.16552E-05	12.6500106	10.5166	11.5212	20.7699	175.546	146.569	219.403
ADM2	TC vs UT	8.68E-07	2.53169E-05	12.65257253	3.51128	3.264	4.40676	45.3518	42.6527	53.4772
NOP16	TC vs UT	4.85872E-06	5.79858E-05	12.77169441	4.73786	4.85908	3.48124	60.3347	60.0962	46.5997
NFKB2	TC vs UT	2.77991E-06	4.33392E-05	13.01759381	11.2839	18.18	10.6932	147.032	168.365	207.352
KCNN4	TC vs UT	0.001172289	0.002903058	13.26802194	0.570293	1.69733	1.01702	6.36919	19.885	17.3265
ECE2	TC vs UT	1.61366E-07	1.24442E-05	13.29516634	1.64377	1.20774	1.14288	18.3172	18.6679	16.121
MRTO4	TC vs UT	3.86921E-06	5.11881E-05	13.50624672	6.30221	5.95558	8.87303	95.8929	101.659	87.8459
CREM	TC vs UT	3.01068E-06	4.47914E-05	13.52946603	9.15319	13.1536	8.65934	131.837	130.418	156.701

ANKRD33B	TC vs UT	7.38E-06	7.2952E-05	13.58255367	2.31088	3.36192	3.63636	42.9576	34.2581	49.2265
BYSL	TC vs UT	1.25126E-06	2.99391E-05	13.60976955	5.16185	7.08277	3.38984	66.8978	74.918	70.9655
DDX21	TC vs UT	1.45835E-07	1.24442E-05	13.69395181	73.525	83.0342	69.0281	980.165	1136.39	972.631
DDIT4	TC vs UT	8.11028E-05	0.000356887	13.91338062	43.8749	49.9377	29.8914	445.659	367.299	908.184
LOC646347	TC vs UT	2.68667E-06	4.28063E-05	13.96008764	5.44703	4.33575	6.59455	70.6487	90.0271	67.9532
PTMS	TC vs UT	2.69921E-06	4.28063E-05	13.99437181	14.435	10.9994	12.4805	214.377	180.36	135.859
CDKN2B	TC vs UT	0.000217542	0.000746118	14.04475938	0.270191	0.163295	0.215811	1.21971	1.90804	5.99147
CYCSP45	TC vs UT	2.84034E-06	4.35508E-05	14.05942029	0.180161	0.359129	0.308258	3.98641	4.07226	3.85736
SPRED2	TC vs UT	0.000361132	0.001113466	14.19099298	0.900404	1.82789	0.462337	16.7133	15.7724	12.7925
PIM3	TC vs UT	1.39919E-08	7.50086E-06	14.23805559	22.8977	24.5445	25.9161	395.359	356.708	292.413
KPNA2	TC vs UT	1.48782E-07	1.24442E-05	14.27104085	6.79789	7.605	7.63507	108.577	123.634	82.2937
IL23R	TC vs UT	1.39087E-05	0.00010854	14.30730749	2.19084	2.97025	3.88289	43.7256	39.6006	46.0688
ATF3	TC vs UT	4.83091E-05	0.000247775	14.34169613	2.19084	6.62582	1.63334	47.1131	49.564	53.1935
PAICSP4	TC vs UT	1.88326E-05	0.000132462	14.37394954	0.420242	1.18593	0.832126	11.257	14.5554	9.2355
FASLG	TC vs UT	1.44319E-07	1.24442E-05	14.37517334	14.3149	11.3911	17.1645	212.8	242.393	161.079
HOMER1	TC vs UT	3.76076E-06	5.02931E-05	14.44327908	1.89074	2.64386	2.09557	29.9484	34.6821	31.1309
NR4A1	TC vs UT	0.000180018	0.000641719	14.83207362	0.960424	3.264	0.924574	19.559	17.3411	39.4702
WDR12	TC vs UT	1.04652E-06	2.77852E-05	14.88582582	3.24119	2.3002	2.07775	37.1302	42.5659	33.7212
RCN1	TC vs UT	2.02231E-07	1.302E-05	15.00544665	3.56948	4.10805	3.18826	50.1262	54.0779	58.8419
MAP3K8	TC vs UT	2.60827E-05	0.000162929	15.02618403	11.6418	11.6196	4.869	118.934	155.434	148.325
ODC1	TC vs UT	2.50196E-06	4.1363E-05	15.04426454	13.1145	21.9009	12.6654	233.67	250.959	232.694
GADD45B	TC vs UT	1.26522E-06	3.00003E-05	15.22456103	29.8004	33.7161	36.948	438.631	547.576	543.321
BCL2A1	TC vs UT	0.000145785	0.000551241	15.68566463	3.33123	4.04734	3.79045	68.6593	58.7647	47.7694
SESN2	TC vs UT	6.27318E-09	6.09722E-06	15.75291586	13.7147	17.5273	14.0213	241.032	235.905	236.092
PSPH	TC vs UT	1.13746E-06	2.86222E-05	15.80091591	0.900404	1.30566	1.97231	21.9983	21.0298	22.994
SMS	TC vs UT	3.96435E-06	5.19991E-05	15.82256328	2.85062	3.01999	3.71543	47.4587	58.615	45.6021
POLR3G	TC vs UT	0.000109128	0.000443929	16.17491982	0.840384	0.554963	0.616416	9.39563	14.6836	8.46089
SEMA7A	TC vs UT	2.48538E-08	8.3081E-06	16.31903902	2.9711	4.37373	3.02005	58.6771	59.8244	50.6434
SLC29A1	TC vs UT	7.27667E-05	0.000329979	16.33595696	0.690333	0.620241	1.29436	16.2616	13.8644	12.4281
NR4A3	TC vs UT	0.001582345	0.003726188	16.57860276	1.35056	7.4418	0.770495	37.2209	37.438	83.8799
METTL1	TC vs UT	1.5418E-06	3.2552E-05	16.64499261	2.02073	1.7183	1.71636	28.5932	31.7568	30.4551
SLC7A1	TC vs UT	5.87677E-08	9.59336E-06	16.6670481	32.411	35.185	48.9356	628.869	658.448	654.921
GSG2	TC vs UT	2.98495E-06	4.46724E-05	16.8154686	0.750353	0.629184	1.14028	15.7196	16.4507	10.2016
AGMAT	TC vs UT	1.67E-05	0.000122954	16.99850802	0.690333	0.750798	0.369889	10.7508	11.5325	8.50137
KCNQ5	TC vs UT	0.000427444	0.001272426	17.03825671	0.330211	0.489685	0.801311	5.4206	13.822	8.37992
IQCG	TC vs UT	2.25078E-05	0.000148645	17.2225763	9.11832	8.52537	5.25407	119.568	119.542	155.248
FURIN	TC vs UT	4.75683E-07	1.91672E-05	17.80735403	77.936	84.275	88.4106	1420.67	1352.42	1689.82
SOCS2	TC vs UT	1.89342E-06	3.6421E-05	17.97602931	1.62025	2.01395	1.41763	25.0699	19.6731	46.0689
SYP	TC vs UT	3.56989E-05	0.000201081	18.18629105	0.240181	0.130656	0.339074	3.34274	5.68151	3.88639
ACTN1	TC vs UT	0.000273028	0.000891023	18.1960406	0.450252	0.457046	1.41809	16.4874	16.0691	9.75632
SLC27A2	TC vs UT	0.002946051	0.006254272	18.28203652	0.360222	0.979271	0.462326	11.1121	15.5944	6.23436
CDC6	TC vs UT	6.08381E-05	0.000290645	18.28940674	0.450252	0.359129	0.215811	6.73056	7.08066	4.93893
TXN	TC vs UT	5.08773E-09	5.91588E-06	18.65384833	4.20152	3.75359	3.91371	76.9711	69.035	75.393
KCNK5	TC vs UT	0.003061637	0.006458508	18.87789669	0.390232	1.5015	0.207943	13.8068	18.9947	6.83593
PAICS	TC vs UT	7.00023E-07	2.28341E-05	19.03298256	13.6847	12.6533	11.1246	236.181	262.001	214.842
EGR1	TC vs UT	7.4342E-05	0.000335151	19.09285241	0.793634	1.80853	3.03418	30.7561	28.5115	48.3462
PIM2	TC vs UT	1.01605E-08	6.95996E-06	19.96579774	43.7251	41.5821	36.7939	812.811	837.472	787.562
CSF1	TC vs UT	0.000163221	0.000597717	20.14765879	6.2422	5.28762	2.86597	72.7249	67.3288	149.988
DUSP6	TC vs UT	0.000129895	0.000505718	20.32662135	1.1705	1.72997	1.97231	31.6649	20.1394	47.2427
IL12RB2	TC vs UT	0.000183894	0.000652119	20.37235025	7.77273	18.1147	6.19407	210.543	283.859	159.174
PCK2	TC vs UT	1.11218E-06	2.83426E-05	20.60901731	6.57232	3.91678	7.02044	121.136	94.3317	145.387
BATF	TC vs UT	2.83447E-08	8.3081E-06	20.71005899	9.24322	10.771	9.83035	194.732	162.726	260.625
FABP5	TC vs UT	0.000103451	0.000427895	21.64756135	0.356989	0.371852	0.131841	5.83616	7.71372	5.0818
ICAM1	TC vs UT	6.24288E-06	6.62223E-05	21.92955155	8.02836	10.1703	6.28354	159.846	159.641	217.396
GARS	TC vs UT	2.0737E-09	4.17479E-06	22.01303675	20.1369	19.6814	17.9349	427.177	448.067	396.081
RBBP8	TC vs UT	9.35823E-06	8.48433E-05	22.23634509	0.780363	1.27302	0.616416	18.7912	19.9699	20.6055
NFKBIA	TC vs UT	2.05524E-07	1.302E-05	22.69245706	37.0025	50.0683	52.3561	796.171	962.595	1405.17
TREML2	TC vs UT	1.58061E-05	0.00011898	23.48974011	0.660323	0.391768	0.431521	7.76948	9.79417	17.286
CDK6	TC vs UT	1.04775E-06	2.77852E-05	23.62724583	35.4423	56.1354	33.71	946.487	1288.8	724.917
ADAM19	TC vs UT	0.00013761	0.000528743	23.97862928	13.1746	3.62303	23.112	276.267	321.509	359.2
CD83	TC vs UT	5.8885E-06	6.39757E-05	24.27810547	2.85106	3.16609	5.42368	51.4045	71.2296	155.128
SLC41A2	TC vs UT	1.08685E-06	2.83066E-05	24.55011512	0.630313	1.72997	0.708863	19.1525	28.7887	27.4066
TRAF4	TC vs UT	1.59302E-05	0.000119551	25.32226607	6.57231	13.0642	5.36205	180.507	179.636	272.877
IL23A	TC vs UT	2.76306E-07	1.53073E-05	25.75219426	5.46195	6.23415	6.07081	111.528	150.561	195.448
HMOX1	TC vs UT	2.00483E-05	0.000138562	26.28850451	0.210171	0.522324	0.986205	16.3068	15.4756	13.3997
FEZ1	TC vs UT	0.00014258	0.000542764	26.31393436	4.38158	6.91958	2.55781	82.0305	81.6175	201.036
ICOS	TC vs UT	2.79418E-06	4.33392E-05	26.96546542	14.1649	22.4232	15.7469	482.301	592.082	336.852
ESPL1	TC vs UT	0.000309359	0.000983851	27.25907648	0.0901304	0.065378	0.246626	3.83962	3.51918	3.60302
SLC7A5	TC vs UT	1.24167E-06	2.99391E-05	27.39236496	51.6464	62.8148	151.487	2611.47	2216.92	2456.56
VDR	TC vs UT	3.03406E-05	0.000179898	27.63309271	1.71068	2.5133	4.19105	67.5303	66.1848	98.8181
HK2	TC vs UT	3.68642E-07	1.69603E-05	28.04109834	5.19185	5.02652	10.5699	168.97	206.467	207.49
DUSP4	TC vs UT	2.99777E-05	0.000178563	28.38545664	3.03112	14.9105	11.6176	263.798	308.026	267.227
SERPINE2	TC vs UT	0.000295277	0.000947869	28.54894855	0.0301101	0.195934	0.369889	7.13709	6.23269	3.6435
NFKBIZ	TC vs UT	8.51263E-06	7.90962E-05	29.12157317	10.7363	11.9179	5.59725	238.557	301.89	282.281
LAG3	TC vs UT	3.63996E-06	4.97017E-05	29.57758861	18.2762	18.2453	17.0104	580.57	613.926	388.85
UTS2	TC vs UT	0.00020996	0.000725564	29.66138602	0.863921	0.167165	1.15403	21.5036	24.8881	18.4218
SHMT2	TC vs UT	6.20136E-08	9.59336E-06	32.07969626	16.0236	14.5897	17.411	523.261	484.035	533.31
SGK1	TC vs UT	2.80164E-05	0.000170505	32.62124264	2.88107	3.62303	2.52699	78.191	62.5807	153.834
SPHK1	TC vs UT	3.59475E-06	4.92481E-05	34.05059447	0.180161	0.783437	0.308258	13.8675	16.3235	13.1163
TRIB1	TC vs UT	0.000151964	0.000567105	34.21731252	0.540282	0.750798	0.678047	26.154	26.6264	14.5979
CD274	TC vs UT	9.72691E-12	1.19933E-07	34.78941484	5.79206	6.13624	5.51613	194.641	208.898	203.342
TFRC	TC vs UT	4.56312E-07	1.88171E-05	35.51392318	15.5753	16.3195	12.6962	457.395	540.835	585.374
FES	TC vs UT	1.24642E-05	0.000101079	35.80601038	0.210171	0.0980171	0.184995	6.68538	4.53675	6.43678
EPAS1	TC vs UT	9.02558E-05	0.000387754	36.21869032	0.300201	1.1751	0.523968	28.6836	33.283	10.4445
CSDA	TC vs UT	4.35667E-06	5.43152E-05	36.35541341	0.420242	0.522324	0.770495	23.0917	23.0349	16.1525
PMAIP1	TC vs UT	3.62825E-08	8.60314E-06	36.6667203	5.34191	6.29944	4.89981	181.353	207.738	217.419
TMEM217	TC vs UT	1.09299E-06	2.83066E-05	36.74607052	0.150151	0.241158	0.131434	6.58511	6.81816	5.80548
CCL4L2	TC vs UT	0.000187767	0.000663182	40.11009385	4.73849	0.883607	6.17457	301.623	94.235	77.3075
GNG4	TC vs UT	0.000566355	0.001594425	40.33335828	0.0901304	0.195934	0.123363	3.11689	4.40955	8.98715
PDGFA	TC vs UT	0.000315891	0.001000241	40.56894514	0.150151	0.0980171	0.647232	14.4548	12.7621	9.1086
HPDL	TC vs UT	0.000139805	0.000535674	42.80821106	0.420242	0.065378	0.184995	9.16978	13.1013	6.43678
ABTB2	TC vs UT	5.11E-08	9.19697E-06	43.77871379	0.495419	0.25473	0.591697	16.94	20.0282	21.7761
SOCS3	TC vs UT	1.60736E-07	1.24442E-05	45.07108068	5.79206	7.50709	3.05086	256.134	215.908	264.87
CCL20	TC vs UT	1.0235E-06	2.77193E-05	45.85930566	2.61098	4.56956	5.33123	176.89	194.355	202.537
CTH	TC vs UT	4.90253E-09	5.91588E-06	46.2114692	0.990434	0.913993	0.924574	50.9526	48.1225	31.6571
EGR3	TC vs UT	4.95998E-06	5.8861E-05	46.31966194	0.690333	1.59941	1.29436	56.3733	35.2757	74.3657
SLC1A5	TC vs UT	5.22131E-08	9.19697E-06	46.76015238	11.2839	21.1827	18.0191	807.744	756.951	796.027
CCL4	TC vs UT	1.55541E-05	0.000117586	48.37301422	23.75	21.0561	30.2824	2042.08	1194.74	395.44
ETV5	TC vs UT	1.79905E-06	3.52659E-05	48.49423469	0.0601203	0.0980171	0.154179	5.46577	5.46952	4.21025
WARS	TC vs UT	3.72397E-06	5.01633E-05	50.32441656	26.6405	29.9325	28.2615	1693.52	1666.97	908.765
MTHFD1L	TC vs UT	2.61823E-08	8.3081E-06	51.31844254	0.840384	1.24119	1.54089	55.425	68.3276	62.1468
DUSP5	TC vs UT	1.00224E-05	8.80508E-05	54.02058465	2.76103	4.70012	2.03394	180.047	181.68	151.203
FABP5L7	TC vs UT	3.73063E-06	5.01633E-05	55.29982094	1.0837	0.998995	1.71731	78.2006	80.6034	51.3353

TNF	TC vs UT	3.95966E-07	1.78837E-05	56.50431917	15.5754	32.1494	16.1476	1295.48	1496.05	817.543
TNFRSF18	TC vs UT	8.34596E-07	2.49316E-05	61.72098486	3.75137	1.66469	2.06476	114.418	151.533	195.772
MYB	TC vs UT	0.00026882	0.000879657	61.8747994	0.180161	0.261212	0.616416	22.9921	28.492	13.9665
PHGDH	TC vs UT	0.000161343	0.000592954	65.4417033	0.0901304	0.0465361	0.308258	15.7647	6.10549	7.24642
NAMPT	TC vs UT	5.11238E-07	1.98225E-05	67.16103641	14.3445	19.2964	17.8033	1393.34	827.095	1234.61
EGR2	TC vs UT	8.88096E-06	8.16552E-05	71.19145345	0.536211	2.28483	2.21884	112.791	113.67	132.335
CCL4L1	TC vs UT	0.000930889	0.002394213	72.83359228	8.42431	1.72385	7.48654	948.651	110.684	225.063
NAMPTL	TC vs UT	1.69342E-07	1.24442E-05	74.51835473	12.2447	14.6397	15.1082	1237.4	722.646	1169.17
TNFRSF4	TC vs UT	0.00791721	0.014504897	78.27360352	0.150151	0.0001	0.369889	9.93769	10.0486	20.727
HBEGF	TC vs UT	4.26771E-06	5.35855E-05	78.96088989	0.0601203	0.261212	0.0925474	9.30531	10.2181	13.1569
EVI5	TC vs UT	0.000585358	0.001636242	79.09663691	0.150151	0.228573	0.246626	22.9921	24.0825	2.38855
CCR4	TC vs UT	2.50421E-06	4.1363E-05	79.22845596	1.20051	1.14247	0.986205	56.4185	52.7863	154.561
GPT2	TC vs UT	1.27361E-07	1.19875E-05	90.18169582	0.540282	0.718159	0.986205	66.1755	58.8071	77.4434
MYO1B	TC vs UT	2.15481E-08	8.3081E-06	90.94607204	0.180161	0.391768	0.36989	23.0372	25.7785	36.839
MTHFD2	TC vs UT	3.30168E-08	8.3081E-06	91.94863722	10.5044	13.8561	12.2565	1116.09	1194.71	1056.09
FOXP3	TC vs UT	9.56421E-06	8.57066E-05	95.75994878	0.0907999	0.261661	0.123952	9.32893	7.37903	28.9133
IL26	TC vs UT	3.17421E-08	8.3081E-06	113.8155214	0.720343	0.65288	0.523969	61.5228	93.3194	61.0878
AK4	TC vs UT	3.48E-06	4.85287E-05	117.3901595	0.292097	0.219243	0.276397	21.3852	15.1698	55.9175
OSM	TC vs UT	1.54533E-07	1.24442E-05	118.1345564	0.360222	0.750798	0.554784	54.0237	43.543	99.2223
CLIC4	TC vs UT	6.83058E-07	2.27846E-05	124.2455786	0.180161	0.489685	0.832126	50.1549	56.2894	80.1692
IER3	TC vs UT	9.66957E-08	1.13548E-05	125.527434	1.74827	0.790805	1.39953	146.373	196.354	151.675
NDFIP2	TC vs UT	1.88039E-08	8.3081E-06	127.5733316	0.420242	0.881353	0.801311	78.9589	95.3961	93.9197
PSAT1	TC vs UT	7.44727E-09	6.12166E-06	127.7508876	3.15116	4.27581	4.869	497.636	503.357	569.829
LTA	TC vs UT	8.22523E-09	6.14698E-06	130.775966	12.1401	14.3412	15.3104	1666.72	2152.99	1645.65
SPRY4	TC vs UT	6.82867E-06	6.96999E-05	133.6579936	0.0901304	0.228573	0.0309158	17.7974	19.4186	9.51341
C2CD4A	TC vs UT	0.000591604	0.001648842	143.4461724	0.180161	0.195934	0.215811	50.4105	9.96376	24.5323
CTLA4	TC vs UT	8.48422E-05	0.000368996	146.2010667	1.50061	1.86052	1.41763	318.736	232.851	147.072
CCL3L1	TC vs UT	0.000123901	0.000489647	146.5226826	4.91132	3.65146	6.23088	1576.64	247.474	343.496
ZBED2	TC vs UT	1.68579E-05	0.000123504	153.3415659	0.570293	0.587602	0.400705	84.0179	47.7833	107.197
VEGFA	TC vs UT	1.14672E-07	1.1947E-05	169.3717994	0.930414	0.554963	0.554784	126.253	85.9845	133.308
MFSD2A	TC vs UT	3.05741E-05	0.000180719	191.6472519	0.0901304	0.68552	0.277442	60.0321	78.3951	63.395
GZMH	TC vs UT	6.02288E-07	2.15252E-05	193.6394111	0.510272	0.685519	0.647232	97.9459	190.508	68.4276
ULBP1	TC vs UT	1.51984E-07	1.24442E-05	201.2510293	0.120141	0.130656	0.308258	37.9431	36.7587	37.8085
MIR146A	TC vs UT	1.34607E-05	0.000106327	202.7387249	0.150151	0.032739	0.184995	25.9282	20.521	28.1353
SLC6A9	TC vs UT	1.17042E-06	2.90953E-05	204.3263882	0.210171	0.065378	0.400705	41.9637	40.7878	55.4251
BATF3	TC vs UT	4.24085E-06	5.33568E-05	206.0935931	0.270191	0.391768	0.832126	69.3823	65.7599	172.779
MIR155HG	TC vs UT	2.02708E-07	1.302E-05	209.5699303	1.65066	2.87233	1.81823	406.402	578.105	344.423
IRF4	TC vs UT	9.92269E-08	1.14797E-05	210.3213393	3.90142	4.24317	6.16326	938.831	954.682	1115.73
IRF8	TC vs UT	1.13902E-07	1.1947E-05	229.5736977	0.390232	0.848715	0.862942	111.527	144.195	226.816
MKX	TC vs UT	1.17561E-07	1.19795E-05	235.3957367	0.0301101	0.065378	0.0617316	8.31155	10.6421	18.0552
ZBTB32	TC vs UT	9.0374E-08	1.09246E-05	236.0018887	0.600303	0.391768	0.647232	158.644	155.69	72.545
HOXB9	TC vs UT	1.6715E-06	3.40589E-05	239.771107	0.0301101	0.195934	0.154179	30.1742	32.8166	28.1757
BCAT1	TC vs UT	2.40973E-06	4.07014E-05	242.3506179	0.150151	0.228573	0.339074	89.2115	50.5395	34.2077
RGS16	TC vs UT	5.88909E-06	6.39757E-05	263.5176103	0.210171	0.587602	1.7566	157.601	243.199	272.323
IFNG	TC vs UT	7.89124E-08	1.04623E-05	282.2466428	182.822	255.303	366.646	78401.5	100549	48193.1
IL2RA	TC vs UT	4.03566E-06	5.23236E-05	295.6105967	5.58198	5.84249	8.25873	1897.07	2078.43	1843.07
GZMB	TC vs UT	2.2111E-08	8.3081E-06	301.2903863	5.70202	7.99666	14.6992	3540.57	3174.33	1841.13
CHAC1	TC vs UT	2.83782E-08	8.3081E-06	330.2355536	0.300201	0.848715	0.5856	185.966	182.396	204.437
TNFRSF9	TC vs UT	2.32771E-07	1.37765E-05	341.5024118	2.01078	2.90497	4.6841	1067.98	1139.8	1070.6
CCL3	TC vs UT	3.77906E-05	0.00020872	343.2488962	3.66755	4.92664	12.3766	4410.82	2302.45	484.919
IL17F	TC vs UT	3.74424E-07	1.70987E-05	409.8282962	1.53062	2.5133	5.48531	1839.15	1246.75	819.451
TNFRSF8	TC vs UT	4.15702E-06	5.30601E-05	419.0395571	0.0901304	0.163295	0.431521	80.7207	114.729	91.5703
LIF	TC vs UT	2.62393E-06	4.23496E-05	428.4835622	0.420143	0.424404	1.32518	262.637	349.148	317.907
EBI3	TC vs UT	0.00068526	0.001859432	538.7079608	0.0001	0.032739	0.0617316	16.5778	19.673	14.6951

Appendix Table 6. 1594 differentially regulated genes in activated MAIT cells compared to unstimulated cells. P<0.01, |Fold Change| > 4. Expression value of each indicated gene in each sample is shown.

Gene Name	Contrast 1	P value	FDR	Fold-Change	Contrast 2	P value	FDR	Fold-Change	Contrast 3	P value	FDR	Fold-Change
AARS	T vs UT	5.58E-05	0.005282629	2.90343611	C vs UT	1.29E-06	3.11E-05	5.651228675	TC vs UT	7.52E-07	2.36E-05	6.414469766
ABCA2	T vs UT	0.006132657	0.039179097	-1.918062098	C vs UT	2.24E-06	4.13E-05	-8.423667678	TC vs UT	4.10E-06	5.28E-05	-6.969513431
ABCA7	T vs UT	0.004835316	0.03438261	-3.154106161	C vs UT	1.61E-05	0.000134442	-14.6809506	TC vs UT	5.01E-06	5.91E-05	-24.02995661
ABCD2	T vs UT	0.256224278	0.411092433	1.305320095	C vs UT	0.000271522	0.000991666	-3.755666584	TC vs UT	1.51E-05	0.000115414	-7.291055952
ABCE1	T vs UT	0.008898437	0.047665299	2.032313822	C vs UT	0.000276225	0.001006458	3.658057661	TC vs UT	1.87E-05	0.000131896	6.182545174
ABCF2	T vs UT	0.00226083	0.023744488	1.531377648	C vs UT	3.62E-06	5.36E-05	2.947448283	TC vs UT	3.61E-07	1.67E-05	4.263141131
ABHD15	T vs UT	0.578680853	0.712476601	-1.089705256	C vs UT	7.16E-06	8.12E-05	-5.062312203	TC vs UT	3.28E-06	4.73E-05	-6.101416722
ABLIM1	T vs UT	0.209420426	0.358068561	-1.571553858	C vs UT	0.000380769	0.001286268	-7.902450568	TC vs UT	0.000230632	0.000779306	-8.280087823
ABTB1	T vs UT	0.008067018	0.044987034	-1.830387492	C vs UT	3.96E-07	1.69E-05	-12.62251487	TC vs UT	5.74E-07	2.12E-05	-11.68905603
ABTB2	T vs UT	0.007840529	0.044320749	1.897878446	C vs UT	2.88E-08	7.35E-06	58.1929705	TC vs UT	5.11E-08	9.20E-06	43.77871379
ACACB	T vs UT	0.122228896	0.247468356	-3.067379659	C vs UT	0.000853883	0.002429811	-27.29738326	TC vs UT	0.000388574	0.001180974	-25.69879555
ACBD4	T vs UT	0.242463677	0.395237591	-1.442189367	C vs UT	0.000387912	0.001304323	-4.457072443	TC vs UT	0.000150289	0.000562558	-5.826252949
ACER2	T vs UT	0.005259931	0.03593072	-2.236207868	C vs UT	7.60E-05	0.000391186	-5.387074484	TC vs UT	6.52E-05	0.000305759	-5.515586017
ACO2	T vs UT	0.001082895	0.01650373	1.477678137	C vs UT	7.72E-08	9.50E-06	4.241710249	TC vs UT	3.51E-07	1.67E-05	3.291402951
ACOT7	T vs UT	0.002188893	0.0234604	2.146163429	C vs UT	7.70E-06	8.41E-05	5.293626409	TC vs UT	1.49E-06	3.19E-05	7.844490044
ACP6	T vs UT	0.99112878	0.994921262	1.010643721	C vs UT	0.000419329	0.00137949	-3.808258684	TC vs UT	9.35E-05	0.000398497	-5.219623347
ACSL6	T vs UT	0.005112166	0.035411798	-2.4434108	C vs UT	1.09E-06	2.87E-05	-22.24271062	TC vs UT	1.61E-06	3.33E-05	-19.96388266
ACSS1	T vs UT	0.242857981	0.395618827	-1.300987046	C vs UT	6.97E-05	0.000367247	-4.272656664	TC vs UT	2.13E-05	0.000143945	-5.728797553
ACSS2	T vs UT	0.197757962	0.344206052	-1.547184823	C vs UT	0.094855422	0.131190953	-1.85631759	TC vs UT	0.001345892	0.003259669	-4.637199257
ACTN1	T vs UT	0.003531029	0.029349436	7.382555116	C vs UT	0.000405346	0.001345335	17.12349	TC vs UT	0.000273028	0.000891023	18.1960406
ACTR3	T vs UT	0.000174339	0.007829869	1.93933946	C vs UT	1.11E-07	9.93E-06	5.713313445	TC vs UT	7.86E-07	2.40E-05	3.856444119
ACVR1B	T vs UT	0.419105119	0.573663327	1.094488018	C vs UT	1.52E-06	3.38E-05	4.148800656	TC vs UT	1.39E-06	3.09E-05	4.22025891
ADAM1	T vs UT	0.016689455	0.068800062	-2.171983108	C vs UT	0.000270027	0.000987082	-5.098992568	TC vs UT	0.007372645	0.013641163	-2.641517755
ADAM19	T vs UT	0.873335129	0.92127773	-1.175982643	C vs UT	4.99E-05	0.000288888	40.65359228	TC vs UT	0.00013761	0.000528743	23.97862928
ADAM22	T vs UT	0.667284974	0.777248795	-1.238657262	C vs UT	0.005031537	0.010414445	-5.14226907	TC vs UT	0.012634447	0.021763444	-3.855672936
ADCY7	T vs UT	0.004027517	0.031311028	-2.469959576	C vs UT	0.004584589	0.009621784	-2.600435473	TC vs UT	0.000217887	0.000746886	-4.94966708
ADM2	T vs UT	0.022253081	0.082076124	1.7636203	C vs UT	7.91E-07	2.50E-05	13.18970935	TC vs UT	8.68E-07	2.53E-05	12.65257253
ADPRH	T vs UT	0.009806851	0.050645561	3.894432121	C vs UT	0.002606235	0.006005397	4.612454651	TC vs UT	0.016812332	0.027960084	2.907828063
ADRB2	T vs UT	0.055252322	0.148682045	-1.467393852	C vs UT	2.46E-05	0.000177771	-4.63986948	TC vs UT	7.95E-07	2.41E-05	-10.94609071
ADSL	T vs UT	4.72E-05	0.004764748	1.974649327	C vs UT	9.96E-08	9.93E-06	4.65926615	TC vs UT	1.06E-07	1.19E-05	4.579037198
AEBP1	T vs UT	0.054820696	0.147779618	2.170265945	C vs UT	0.019875874	0.033788711	2.945320249	TC vs UT	0.000694711	0.001879458	6.993636729
AGAP1	T vs UT	0.282299173	0.438934275	-1.322570726	C vs UT	0.000154111	0.000650972	-5.843125281	TC vs UT	0.000563727	0.00159052	-4.196193669
AGK	T vs UT	0.012658664	0.058304567	2.646178329	C vs UT	0.00031817	0.0011244	5.128931391	TC vs UT	5.64E-05	0.000275696	8.210848855
AGMAT	T vs UT	0.000120698	0.00686928	9.294765026	C vs UT	0.000259664	0.000960018	7.025204553	TC vs UT	1.67E-05	0.000122954	16.99850802
AGPAT5	T vs UT	0.000473245	0.01143047	2.279882724	C vs UT	0.000109942	0.000511156	2.761222793	TC vs UT	1.01E-05	8.87E-05	4.012166606
AGRN	T vs UT	0.001103268	0.01667341	5.852378076	C vs UT	0.559507549	0.614640777	1.244145707	TC vs UT	0.731776273	0.770455251	1.399931296
AHCY	T vs UT	0.000699098	0.013487496	2.574410445	C vs UT	0.000268227	0.000981086	3.061880185	TC vs UT	1.21E-05	9.87E-05	5.351265033
AHNAK	T vs UT	0.086523062	0.1975459	-2.515813645	C vs UT	0.001245474	0.003272954	-7.950503805	TC vs UT	0.000143229	0.000544393	-23.81679504
AHSA2	T vs UT	0.009790844	0.050639317	-2.601170809	C vs UT	0.00014566	0.000626655	-6.125904592	TC vs UT	0.000302393	0.000965183	-5.412155058
AK2	T vs UT	0.013860409	0.061213968	1.755208865	C vs UT	1.35E-05	0.000119596	5.361518756	TC vs UT	5.39E-06	6.10E-05	6.511652584
AK2P1	T vs UT	0.003960647	0.031085158	2.173341722	C vs UT	6.88E-06	7.90E-05	7.474601264	TC vs UT	3.49E-06	4.86E-05	8.946908014
AK3P1	T vs UT	0.396163578	0.553753845	-1.313307498	C vs UT	0.000247317	0.000928003	19.77226767	TC vs UT	0.010881743	0.01908019	6.26894706
AK4	T vs UT	0.005730971	0.037575266	5.279491899	C vs UT	5.87E-07	2.16E-05	346.2596564	TC vs UT	3.48E-06	4.85E-05	117.3901595
AKAP5	T vs UT	0.257797998	0.412704403	1.855290723	C vs UT	0.001082889	0.00292936	-9.705148421	TC vs UT	0.004835158	0.00950989	-5.876838562
AKAP7	T vs UT	0.903985168	0.942272138	1.042920256	C vs UT	0.002903155	0.006571674	-2.664004603	TC vs UT	0.000304191	0.000969619	-4.2608015
AKAP8L	T vs UT	0.008444442	0.046296117	-1.578976707	C vs UT	3.96E-06	5.69E-05	-4.524576143	TC vs UT	1.05E-05	9.02E-05	-3.759128581
AKR1A1	T vs UT	0.001265937	0.017846623	1.970319225	C vs UT	5.92E-06	7.21E-05	4.125967342	TC vs UT	5.10E-06	5.96E-05	4.211685221
ALOX5AP	T vs UT	0.513310953	0.657707997	1.281574569	C vs UT	0.170929982	0.219195702	-1.641151553	TC vs UT	0.002581051	0.005594017	-4.175757322
ALS2CR8	T vs UT	0.197584955	0.3439604	-1.728271813	C vs UT	0.000382189	0.001289653	-8.692840518	TC vs UT	0.001566231	0.003697116	-6.370000847
AMDHD2	T vs UT	0.096269056	0.211606727	-1.391576261	C vs UT	1.61E-05	0.00013434	-4.999285337	TC vs UT	2.21E-05	0.000146699	-4.457964753
AMICA1	T vs UT	0.509846639	0.654902496	-1.200267222	C vs UT	5.09E-06	6.64E-05	-18.09290689	TC vs UT	1.05E-05	9.02E-05	-13.62017175
AMIGO1	T vs UT	0.200141738	0.347065091	-1.547933574	C vs UT	1.80E-05	0.000145239	-18.65861344	TC vs UT	0.000140357	0.000537454	-10.03028618
AMOT	T vs UT	0.651716593	0.765812026	-1.129650071	C vs UT	0.000637554	0.001922016	-4.231349411	TC vs UT	3.11E-05	0.000183228	-11.21669371
ANAPC10	T vs UT	0.019651996	0.076006624	1.589029227	C vs UT	1.57E-05	0.000132164	4.616838585	TC vs UT	2.78E-05	0.000169368	4.039287371
ANAPC10P1	T vs UT	0.077711101	0.184442324	1.826378918	C vs UT	0.002705155	0.00618823	4.60432763	TC vs UT	0.003951792	0.007994356	4.163105362
ANGPTL6	T vs UT	0.423041178	0.577581599	-1.254018899	C vs UT	0.001024147	0.002798699	-3.562037796	TC vs UT	0.000239201	0.00080233	-5.080226338
ANK3	T vs UT	0.106576143	0.225748813	-1.853638131	C vs UT	0.011199788	0.020647934	3.268160065	TC vs UT	0.003833834	0.0077905	4.145939114
ANKAR	T vs UT	0.005656492	0.037270205	-1.868995431	C vs UT	2.31E-05	0.000170891	-4.568806999	TC vs UT	0.000864524	0.002251707	-2.449777837
ANKRD13B	T vs UT	0.354828783	0.514213134	1.290082596	C vs UT	0.021748232	0.036468884	2.181113976	TC vs UT	0.000819949	0.002155645	4.191362229
ANKRD13D	T vs UT	0.000634616	0.012915135	-2.157804213	C vs UT	0.000220476	0.000850318	-2.457312639	TC vs UT	9.17E-06	8.34E-05	-4.036264553
ANKRD32	T vs UT	0.604153538	0.730171841	-1.05464699	C vs UT	8.64E-07	2.58E-05	4.313406357	TC vs UT	2.13E-05	0.000143923	2.605614241
ANKRD33B	T vs UT	5.82E-05	0.005291355	7.549289367	C vs UT	1.28E-05	0.000115975	11.48696909	TC vs UT	7.38E-06	7.30E-05	13.58255367
ANO8	T vs UT	0.03518061	0.110629157	-1.812196764	C vs UT	0.000232312	0.000884623	-4.237234353	TC vs UT	7.70E-05	0.000343677	-5.238206993
ANO9	T vs UT	0.10534545	0.224163167	-2.53510369	C vs UT	0.000972909	0.002683061	-9.603172216	TC vs UT	0.000586491	0.001638824	-11.58504841
ANXA1	T vs UT	0.163557878	0.301896502	-1.632499444	C vs UT	0.00071047	0.002097724	-5.021547874	TC vs UT	6.56E-05	0.000307104	-10.31923738
ANXA2	T vs UT	0.565305951	0.701582524	1.115796606	C vs UT	8.34E-06	8.78E-05	4.848613736	TC vs UT	0.001304298	0.00317826	2.165864085
ANXA2P2	T vs UT	0.597567709	0.725412017	1.087065729	C vs UT	2.70E-06	4.58E-05	4.751423444	TC vs UT	0.000455887	0.001340614	2.179676185
APOB48R	T vs UT	0.903807554	0.942166651	-1.072542764	C vs UT	0.205165784	0.257685048	-1.722048642	TC vs UT	0.00354536	0.007295442	-5.985683664
AQP3	T vs UT	0.388709824	0.54662319	-1.354001334	C vs UT	0.006761863	0.013440879	-6.404976386	TC vs UT	0.002580575	0.005593968	-8.011621264
ARAP3	T vs UT	0.98568125	0.991551751	1.009376513	C vs UT	0.003933156	0.008480293	-1.954114091	TC vs UT	1.23E-05	0.000100052	-5.018848719
ARCN1	T vs UT	0.085984724	0.196696039	1.173007055	C vs UT	1.50E-07	1.13E-05	4.036499847	TC vs UT	7.58E-07	2.36E-05	3.104115352
ARF4	T vs UT	0.025735955	0.089791831	1.621428592	C vs UT	8.34E-06	8.78E-05	5.879721651	TC vs UT	2.36E-05	0.000153293	4.575969115
ARHGAP12	T vs UT	0.009035676	0.04810444	-1.750326687	C vs UT	0.000149503	0.000635645	-3.341537158	TC vs UT	7.36E-06	7.28E-05	-6.169334209
ARHGAP31	T vs UT	1.80E-05	0.003270511	9.320405423	C vs UT	1.40E-05	0.000121791	9.446555973	TC vs UT	6.35E-06	6.67E-05	12.25809693
ARHGAP32	T vs UT	0.244310744	0.397303018	-1.373834922	C vs UT	0.000813078	0.002335998	-3.534477923	TC vs UT	0.000429761	0.001278397	-4.188164472
ARHGAP9	T vs UT	0.670897324	0.779951349	1.195490628	C vs UT	0.000573399	0.001769225	-3.896617349	TC vs UT	0.000293834	0.00094422	-4.423096969
ARHGEF2	T vs UT	0.001463786	0.018916514	2.340763415	C vs UT	0.000313932	0.001111655	2.786459794	TC vs UT	2.63E-05	0.000163941	4.314803395
ARID3A	T vs UT	0.123569321	0.249322489	-1.568504714	C vs UT	0.000341071	0.001185956	5.283454522	TC vs UT	0.018621969	0.030557476	2.266907505
ARID5B	T vs UT	0.098421503	0.214785333	2.046093108	C vs UT	0.001234063	0.003250586	7.399590044	TC vs UT	0.000615234	0.00170086	8.02102422
ARMC6	T vs UT	0.000271777	0.009056795	2.054159836	C vs UT	3.69E-05	0.000236505	2.630516515	TC vs UT	1.29E-06	3.01E-05	4.445848655
ARPC5L	T vs UT	0.021616278	0.080644087	1.484210263	C vs UT	2.10E-06	3.98E-05	5.033477539	TC vs UT	1.81E-06	3.53E-05	5.166458337
ARRB2	T vs UT	0.085796739	0.196521233	-1.690044978	C vs UT	0.000694899	0.002059147	4.147949124	TC vs UT	0.00202606	0.004565301	3.389858516
ARSA	T vs UT	0.653020283	0.766544171	-1.134773432	C vs UT	0.00538107	0.01102136	-2.360615934	TC vs UT	0.00012492	0.000491955	-4.868477605
ARSB	T vs UT	0.111199596	0.23211292	1.192256732	C vs UT	1.14E-07	9.93E-06	5.349111424	TC vs UT	7.59E-08	1.05E-05	5.847396054
ASB13	T vs UT	0.34553305	0.504729594	-1.407195164	C vs UT	0.000358553	0.001231464	-8.979092498	TC vs UT	0.004234518	0.008499365	-4.634256818
ASB2	T vs UT	0.005962705	0.038484164	33.70477551	C vs UT	0.060366887	0.088357517	5.927152174	TC vs UT	0.127074206	0.166065179	3.742559686

ASPH	T vs UT	0.014421391	0.062943627	-1.61810984
ATAD3A	T vs UT	0.088096546	0.19989518	1.767560796
ATF3	T vs UT	0.064796719	0.164560976	1.890597044
ATF4	T vs UT	0.088731308	0.200818104	1.40316677
ATF4C	T vs UT	0.030682792	0.10107369	2.559487971
ATG16L2	T vs UT	0.034103102	0.108414193	-2.252182263
ATG9B	T vs UT	0.766082414	0.84712281	-1.044843298
ATHL1	T vs UT	0.150495627	0.284862371	-2.020300712
ATM	T vs UT	0.086099944	0.196886556	-1.39797089
ATP10A	T vs UT	0.102801888	0.220935649	-1.381646589
ATP1A3	T vs UT	0.932309478	0.958906896	-1.035982284
ATP1B3	T vs UT	0.007253123	0.042401707	2.045059166
ATP2A2	T vs UT	0.006823914	0.041143697	1.282231355
ATP5G1	T vs UT	0.000542588	0.01228667	2.389213036
ATP6V0B	T vs UT	0.184621287	0.32915424	1.232017948
ATP6V1C2	T vs UT	0.025087467	0.088379564	1.561517691
ATP8A1	T vs UT	0.087800282	0.199444906	-1.487904925
ATXN7L1	T vs UT	0.250358169	0.40425828	-1.789286625
AUTS2	T vs UT	0.018763676	0.073915694	-1.764414123
B3GALT2	T vs UT	0.914284434	0.94795086	-1.023321732
B3GALT4	T vs UT	0.364672465	0.52363008	-1.319270996
B3GNT1	T vs UT	0.276533336	0.433192229	-1.356741495
B3GNT8	T vs UT	0.367050115	0.52600278	-1.42168104
B3GNTL1	T vs UT	0.062888175	0.161342323	-1.820413895
B4GALT2	T vs UT	0.002555369	0.025323382	2.194804915
B4GALT4	T vs UT	0.32296214	0.481048947	1.487143407
B4GALT5	T vs UT	0.00205636	0.02288607	1.668051648
BACH2	T vs UT	0.00296889	0.026996792	4.369316339
BAK1	T vs UT	0.190493295	0.335300831	1.278663222
BAK1P1	T vs UT	0.833750709	0.895249171	1.022728412
BATF	T vs UT	3.68E-05	0.004443589	3.283518873
BATF3	T vs UT	0.00090469	0.015094489	12.36155255
BBS2	T vs UT	0.026420998	0.091405978	-1.96074067
BCAS3	T vs UT	0.776548784	0.854212218	1.065671142
BCAT1	T vs UT	0.001147478	0.016958346	12.0962556
BCCIP	T vs UT	0.021708623	0.080875427	1.792872981
BCL2	T vs UT	0.014008476	0.061555421	3.316531016
BCL2A1	T vs UT	0.006765998	0.041121492	5.63723579
BCL2L1	T vs UT	0.000230858	0.008522376	3.343793405
BCL3	T vs UT	0.002017128	0.022775815	2.496271736
BCL9L	T vs UT	0.045025619	0.129681355	-1.737363798
BEND3	T vs UT	6.21E-05	0.005372728	3.227669669
BHLHE40	T vs UT	0.001401855	0.018694049	4.390167505
BLK	T vs UT	0.952002264	0.971131479	1.050708997
BLM	T vs UT	0.003500355	0.029320228	2.643862007
BMP8B	T vs UT	0.347279336	0.506528525	-1.422538875
BNIP1	T vs UT	0.047322512	0.134134844	1.602850815
BNIP3P	T vs UT	0.31568795	0.473696954	-1.258801864
BOLA2B	T vs UT	0.00090734	0.015097852	2.189686565
BOLA3	T vs UT	0.002953095	0.026912305	1.924699127
BOP1	T vs UT	0.005492162	0.036783465	2.517516455
BRIX1	T vs UT	0.085467711	0.196022485	1.416994985
BTBD11	T vs UT	0.242729362	0.395513815	1.261941325
BTBD2	T vs UT	0.014947762	0.064218087	-1.665897661
BTG2	T vs UT	2.30E-05	0.003427694	4.507760632
BTG3	T vs UT	0.098746613	0.215343013	1.560504342
BTLA	T vs UT	0.173103226	0.313808221	1.636061461
BYSL	T vs UT	0.003225207	0.028123619	2.288857134
BZRAP1	T vs UT	0.136422379	0.265732691	1.537872889
BZW1	T vs UT	3.04E-05	0.003989467	2.790013742
BZW1L1	T vs UT	1.87E-05	0.003291605	2.640224539
BZW2	T vs UT	0.002451141	0.024693667	2.485401947
C1QBP	T vs UT	0.005475936	0.036774667	2.114283194
C2CD4A	T vs UT	0.000670804	0.013176391	186.973189
C3AR1	T vs UT	0.223460373	0.374051914	-1.151859796
CA11	T vs UT	0.935255336	0.960814722	1.031351949
CACNA2D2	T vs UT	0.595565907	0.724349191	-1.11121696
CACNB3	T vs UT	0.097063639	0.212650083	-1.79025757
CALHM2	T vs UT	0.20091525	0.347982164	-1.572848352
CALR	T vs UT	0.000576415	0.012425163	2.176477473
CALU	T vs UT	0.27891593	0.43565156	1.204686925
CAMK2D	T vs UT	0.090462602	0.203022184	1.675047674
CAMK2G	T vs UT	0.003198529	0.027998974	-1.973858287
CAMKK1	T vs UT	0.0759036	0.181620685	-1.798706216
CAMTA2	T vs UT	0.049816505	0.138934714	1.617583259
CAND2	T vs UT	0.936415347	0.961517326	-1.012489353
CAPN12	T vs UT	0.32106689	0.479123686	-1.42461447
CAPRIN2	T vs UT	0.023086034	0.083830775	-2.187064712
CARD16	T vs UT	0.152859891	0.287842059	1.528388845
CARHSP1	T vs UT	0.150893099	0.285384119	-1.407607028
CARS	T vs UT	0.000575735	0.012425163	1.990727159
CBFA2T2	T vs UT	0.011035859	0.054275114	-1.735377694
CBWD1	T vs UT	0.218842339	0.368472762	1.735768623
CBWD3	T vs UT	0.193930124	0.339984169	1.549556298
CBWD6	T vs UT	0.097710895	0.21365053	1.669352918
CCDC109B	T vs UT	0.708059662	0.807545614	-1.109984004
CCDC124	T vs UT	0.002610224	0.025563197	1.792705587
CCDC136	T vs UT	0.399402453	0.557022085	-1.474515139
CCDC58	T vs UT	0.012730293	0.058431114	2.541168191
CCDC59	T vs UT	0.133654906	0.262665762	1.190518914
CCDC6	T vs UT	0.028178752	0.095453438	1.56644589
CCDC64	T vs UT	0.073160094	0.178004246	1.852183603
CCDC85C	T vs UT	0.367238973	0.52615112	-1.187017034
CCDC86	T vs UT	0.00376481	0.03022932	2.844078058
CCL20	T vs UT	8.88E-05	0.006439125	8.650159
CCL3	T vs UT	0.004765335	0.034101326	15.48118835
CCL3L1	T vs UT	0.003205373	0.028010103	20.2060234
CCL4	T vs UT	0.000393876	0.010699691	10.61143219
CCL4L1	T vs UT	0.002451342	0.024693667	38.55311268
CCL4L2	T vs UT	0.000449107	0.011245576	23.38365659
CCL5	T vs UT	0.908045114	0.944723973	-1.019696964
CCM2	T vs UT	0.033093525	0.105985239	-1.706068491
CCND2	T vs UT	0.574456604	0.709177056	-1.149620722
CCND3	T vs UT	0.719587087	0.81405651	1.089900277
CCR1	T vs UT	0.04353963	0.126763552	-1.568556214
CCR4	T vs UT	0.001890967	0.021918325	5.508529108

C vs UT	1.31E-05	0.000117924	-4.781453587
C vs UT	0.002266742	0.005342943	3.626630472
C vs UT	8.23E-05	0.000413049	11.88191078
C vs UT	6.66E-06	7.77E-05	5.765071669
C vs UT	0.000833099	0.002381111	10.61565042
C vs UT	0.003525866	0.007728698	-3.770061452
C vs UT	8.42E-05	0.000418991	-2.786817344
C vs UT	0.000252357	0.000940617	-11.30091848
C vs UT	4.58E-06	6.20E-05	-6.323800045
C vs UT	9.69E-06	9.57E-05	-5.590864441
C vs UT	0.000135012	0.000590182	-6.526569899
C vs UT	1.69E-05	0.000138877	6.217900572
C vs UT	2.18E-08	6.10E-06	4.355054205
C vs UT	1.97E-05	0.000155234	3.988909449
C vs UT	1.33E-05	0.000118805	4.014817886
C vs UT	2.02E-05	0.000157746	4.253990831
C vs UT	5.47E-06	6.91E-05	-8.882894989
C vs UT	0.002381031	0.00557609	-7.727052794
C vs UT	0.000142044	0.000614527	-3.938867492
C vs UT	0.009355764	0.017679168	-3.32952827
C vs UT	0.006192857	0.012479511	-2.721424655
C vs UT	0.000553856	0.001722332	-7.086767755
C vs UT	0.010575176	0.019628469	-3.610132343
C vs UT	0.000159153	0.000666787	-5.398563269
C vs UT	7.62E-06	8.40E-05	6.220842145
C vs UT	0.01033837	0.019229461	3.265376783
C vs UT	1.94E-07	1.27E-05	6.556217038
C vs UT	0.003178524	0.007087017	-3.838361215
C vs UT	6.58E-06	7.70E-05	5.078561547
C vs UT	1.72E-06	3.57E-05	4.966553907
C vs UT	1.68E-08	5.89E-06	25.19654532
C vs UT	7.34E-06	8.23E-05	144.925525
C vs UT	2.15E-05	0.000163687	-9.0126468
C vs UT	0.000172999	0.000713222	-2.91492848
C vs UT	9.35E-06	9.42E-05	93.53064072
C vs UT	0.00122466	0.003233418	2.652264578
C vs UT	0.000656144	0.001966996	6.318320695
C vs UT	8.31E-05	0.000415299	19.58542516
C vs UT	7.22E-06	8.15E-05	6.672946272
C vs UT	1.17E-05	0.000108509	7.189649018
C vs UT	2.35E-05	0.000172435	-7.75645835
C vs UT	3.59E-05	0.000231655	3.561776567
C vs UT	2.02E-05	0.000157746	12.49042863
C vs UT	0.022300056	0.037232185	-5.547185629
C vs UT	4.94E-06	6.53E-05	12.2538917
C vs UT	0.004958285	0.010280083	-3.767274967
C vs UT	0.000138081	0.000600545	3.809740337
C vs UT	0.000982232	0.002705142	7.241091271
C vs UT	8.63E-06	8.98E-05	4.550524978
C vs UT	4.13E-06	5.84E-05	5.630593057
C vs UT	0.000236357	0.000896428	4.686992332
C vs UT	0.000152645	0.000646107	3.46798015
C vs UT	5.11E-06	6.65E-05	-6.036334384
C vs UT	6.51E-06	7.64E-05	-5.96537048
C vs UT	0.000532566	0.001672578	2.611723826
C vs UT	0.000209956	0.000820604	5.205159423
C vs UT	0.000767609	0.002228018	-4.756325603
C vs UT	4.24E-06	5.95E-05	9.365816411
C vs UT	0.000630828	0.001905465	-4.140330411
C vs UT	1.27E-06	3.10E-05	4.731453706
C vs UT	7.68E-07	2.47E-05	4.377594817
C vs UT	5.55E-05	0.000312698	5.170204566
C vs UT	8.67E-05	0.000427459	4.342134295
C vs UT	0.001104517	0.002978718	151.5299411
C vs UT	9.06E-07	2.64E-05	-5.144986393
C vs UT	7.48E-06	8.32E-05	-5.908315655
C vs UT	0.000120982	0.000549318	-5.488664756
C vs UT	0.045427469	0.068980381	-1.902551881
C vs UT	0.001540689	0.003891172	-5.304724818
C vs UT	6.93E-06	7.93E-05	4.244972986
C vs UT	5.48E-06	6.91E-05	5.740766293
C vs UT	0.002186616	0.005189794	3.05717227
C vs UT	2.49E-05	0.000179892	-4.58434918
C vs UT	0.000626994	0.001898079	-4.877924605
C vs UT	0.000148426	0.000633373	3.435242775
C vs UT	0.003933398	0.008480293	-8.504901774
C vs UT	0.000665199	0.001987376	-5.260246387
C vs UT	0.000132143	0.000581694	-6.553083127
C vs UT	0.332782077	0.39287658	-1.261002931
C vs UT	0.001465281	0.003737467	-2.857686542
C vs UT	4.57E-07	1.82E-05	5.917086886
C vs UT	3.23E-05	0.000216511	-4.018040585
C vs UT	0.004851952	0.010095715	4.860099008
C vs UT	0.000670316	0.001998306	5.290317577
C vs UT	0.002097511	0.005026687	3.865240719
C vs UT	0.000148274	0.000633373	-7.572077124
C vs UT	4.54E-05	0.000269704	2.985625584
C vs UT	0.001567402	0.003951353	-5.958393926
C vs UT	0.000176417	0.000724833	7.547173518
C vs UT	5.44E-06	6.91E-05	3.068376243
C vs UT	1.77E-05	0.000143388	4.577490074
C vs UT	0.000334016	0.001167684	-5.427600688
C vs UT	0.000112447	0.000521415	-4.030769913
C vs UT	9.13E-05	0.000444534	6.531507915
C vs UT	1.20E-06	3.01E-05	43.42176122
C vs UT	0.001758644	0.004351611	23.79529764
C vs UT	0.007612507	0.014851615	14.46660495
C vs UT	0.881781777	0.900030572	1.08481785
C vs UT	0.724554012	0.764744989	-1.348700853
C vs UT	0.855104817	0.878327424	-1.170115125
C vs UT	0.000342229	0.001187304	-4.185960163
C vs UT	0.000189827	0.000765642	-3.711024315
C vs UT	0.000517782	0.001633637	4.352552703
C vs UT	0.00020817	0.000816394	4.416971918
C vs UT	6.07E-07	2.16E-05	14.8223513
C vs UT	2.08E-05	0.000160605	25.89242589

TC vs UT	0.00045971	0.001349256	-2.584622754
TC vs UT	0.000198307	0.000693458	6.00973958
TC vs UT	4.83E-05	0.000247775	14.34169613
TC vs UT	1.02E-05	8.92E-05	5.233346535
TC vs UT	0.001159413	0.00287637	9.425508889
TC vs UT	0.000931429	0.002395103	-5.068202738
TC vs UT	1.20E-06	2.94E-05	-6.341799391
TC vs UT	0.000102249	0.000424106	-15.25817167
TC vs UT	1.69E-06	3.42E-05	-8.430097983
TC vs UT	9.28E-05	0.000395746	-3.588872506
TC vs UT	0.005951196	0.011363018	-2.955678588
TC vs UT	6.92E-06	7.02E-05	7.808906215
TC vs UT	2.06E-08	8.31E-06	4.417315422
TC vs UT	1.01E-05	8.81E-05	4.452794614
TC vs UT	1.82E-05	0.000130037	3.729337678
TC vs UT	4.54E-05	0.000237154	3.705641577
TC vs UT	9.64E-05	0.000406661	-4.125073606
TC vs UT	0.000628036	0.001731594	-12.37859718
TC vs UT	3.08E-05	0.000181729	-5.45690748
TC vs UT	0.001885458	0.004303534	-4.728506517
TC vs UT	5.18E-05	0.000259254	-9.943093472
TC vs UT	0.001536423	0.003640017	-5.631157831
TC vs UT	0.000143028	0.000544072	-13.54693941
TC vs UT	0.002014975	0.004545305	-3.28322713
TC vs UT	2.82E-06	4.33E-05	7.72349283
TC vs UT	0.004520644	0.0089888	4.099621049
TC vs UT	8.69E-07	2.53E-05	4.720031628
TC vs UT	0.236002009	0.287086106	-1.41227817
TC vs UT	1.36E-05	0.000106726	4.369764847
TC vs UT	5.37E-06	6.10E-05	3.950772871
TC vs UT	2.83E-08	8.31E-06	20.71005899
TC vs UT	4.24E-06	5.34E-05	206.0935931
TC vs UT	3.58E-05	0.000201353	-7.24764581
TC vs UT	2.40E-05	0.000154605	-4.193752054
TC vs UT	2.41E-06	4.07E-05	242.3506179
TC vs UT	8.77E-05	0.000379175	4.071901094
TC vs UT	0.000705054	0.001901009	6.101373925
TC vs UT	0.000145785	0.000551241	15.68566463
TC vs UT	1.84E-06	3.57E-05	9.849188043
TC vs UT	0.000104431	0.000430476	4.319741146
TC vs UT	2.78E-05	0.000169527	-7.417736324
TC vs UT	2.09E-06	3.80E-05	6.290738534
TC vs UT	2.76E-05	0.000168662	11.25403388
TC vs UT	0.008116666	0.01480232	-7.791898486
TC vs UT	1.31E-05	0.000104706	8.818940164
TC vs UT	0.002156376	0.004804502	-4.460718966
TC vs UT	5.38E-05	0.000266748	4.453711196
TC vs UT	0.384373043	0.440702958	1.448460302
TC vs UT	4.20E-06	5.33E-05	5.23042958
TC vs UT	3.76E-06	5.03E-05	5.686203043
TC vs UT	2.08E-05	0.000142102	8.278293447
TC vs UT	1.44E-05	0.000111454	5.318082355
TC vs UT	3.19E-06	4.64E-05	-6.751440536
TC vs UT	3.29E-06	4.73E-05	-7.18609019
TC vs UT	0.000629138	0.001733856	2.537907183
TC vs UT	0.000348721	0.00108251	4.495202222
TC vs UT	0.001139623	0.002834118	-4.768637358
TC vs UT	1.25E-06	2.99E-05	13.60976955
TC vs UT	0.000875778	0.002278131	-4.067697157
TC vs UT	1.28E-06	3.01E-05	4.695009463
TC vs UT	7.58E-07	2.36E-05	4.360894167
TC vs UT	5.36E-06	6.10E-05	8.980244484
TC vs UT	6.89E-06	7.00E-05	7.404420953
TC vs UT	0.000591604	0.001648842	143.4461724
TC vs UT	7.05E-08	1.04E-05	-9.715076683
TC vs UT	0.000146034	0.000551825	-3.33897448
TC vs UT	1.77E-05	0.000127817	-9.021861904
TC vs UT	0.001362319	0.003293606	-4.098868346
TC vs UT	0.000104688	0.000430556	-14.35910286
TC vs UT	1.28E-05	0.00010325	3.759212924
TC vs UT	1.07E-05	9.13E-05	4.918684939
TC vs UT	0.000366703	0.001128668	4.365523804
TC vs UT	1.83E-05	0.000130426	-4.894333998
TC vs UT	0.003160371	0.006623725	-3.535595961
TC vs UT	2.30E-05	0.000150962	4.982383976
TC vs UT	0.080070562	0.110395844	-3.222556171
TC vs UT	4.77E-05	0.000245101	-12.47475502
TC vs UT	3.68E-05	0.00020474	-9.511218136
TC vs UT	0.000468928	0.001371415	-4.093779973
TC vs UT	0.000169317	0.000614926	-4.56390144
TC vs UT	3.36E-07	1.64E-05	6.363211304
TC vs UT	8.21E-06	7.74E-05	-5.502598
TC vs UT	0.008774534	0.015842729	4.522231528
TC vs UT	0.001333714	0.003234597	4.359067571
TC vs UT	0.000994905	0.002535064	4.828876335
TC vs UT	0.00017678	0.000633265	-6.457235456
TC vs UT	6.47E-06	6.73E-05	4.013044004
TC vs UT	0.001485247	0.003540816	-7.391154388
TC vs UT	4.32E-05	0.000228233	11.19111246
TC vs UT	7.61E-07	2.36E-05	4.175683195
TC vs UT	1.74E-06	3.44E-05	7.860154942
TC vs UT	0.005996903	0.011430176	-2.896817339
TC vs UT	0.000472454	0.00137911	-3.071992093
TC vs UT	1.18E-05	9.76E-05	11.00819268
TC vs UT	1.02E-06	2.77E-05	45.85930566
TC vs UT	3.78E-05	0.00020872	343.2488962
TC vs UT	0.000123901	0.000489647	146.5226826
TC vs UT	1.56E-05	0.000117586	48.37301422
TC vs UT	0.000930889	0.002394213	72.83359228
TC vs UT	0.000187767	0.000663182	40.11009385
TC vs UT	5.04E-05	0.000254943	-6.262434169
TC vs UT	4.71E-05	0.000243182	-5.269284704
TC vs UT	0.000318554	0.00100738	5.023235769
TC vs UT	0.062941909	0.089399117	1.724035378
TC vs UT	0.000164306	0.000600979	3.470432319
TC vs UT	2.50E-06	4.14E-05	79.22845596

CCRN4L	T vs UT	0.01167772	0.055926165	2.909793454
CCT2	T vs UT	0.009889806	0.050914951	1.715419943
CCT3	T vs UT	0.002163932	0.023445764	1.896690043
CCT4	T vs UT	0.003339844	0.028439418	1.827126212
CCT5	T vs UT	0.000787973	0.014094902	1.902520585
CCT6A	T vs UT	0.000754408	0.013933748	1.934392614
CCT7	T vs UT	0.001638316	0.020272713	1.739378708
CD101	T vs UT	0.59431868	0.72381957	-1.30879361
CD200R1	T vs UT	0.842859555	0.901028118	-1.042607552
CD226	T vs UT	0.939190289	0.96333219	1.003708975
CD244	T vs UT	0.279765906	0.436315915	1.522778602
CD27	T vs UT	0.145237555	0.277898673	2.121744643
CD274	T vs UT	5.04E-05	0.004895281	1.634016266
CD300A	T vs UT	0.059642702	0.155854086	-2.054494322
CD3EAP	T vs UT	0.021636516	0.080695175	2.141510512
CD40LG	T vs UT	0.855771608	0.909893742	1.006053561
CD5	T vs UT	0.066025921	0.166755348	1.772450866
CD52	T vs UT	0.295717537	0.453112618	1.384050695
CD55	T vs UT	0.850754995	0.906852887	-1.025058498
CD69	T vs UT	0.000229692	0.008522376	5.999582825
CD70	T vs UT	0.10585344	0.224681171	2.809551956
CD80	T vs UT	0.040135606	0.119823733	1.703090355
CD82	T vs UT	0.007858562	0.044320749	5.438351632
CD83	T vs UT	2.77E-05	0.003755508	12.18604013
CD84	T vs UT	0.715785352	0.811552496	1.171561338
CDC14B	T vs UT	0.073771932	0.178810286	-1.745440395
CDC25B	T vs UT	0.00390062	0.03081015	-2.551252732
CDC6	T vs UT	0.637122062	0.755117681	1.271007612
CDHR1	T vs UT	0.180636018	0.324151085	-1.546281424
CDK4	T vs UT	0.001389036	0.018624545	2.053751122
CDK6	T vs UT	0.522990474	0.66520245	1.157870703
CDK7PS	T vs UT	0.019535312	0.075816934	1.645665253
CDKN1A	T vs UT	0.000423884	0.010974543	3.964736182
CDKN2B	T vs UT	0.015223101	0.065033285	3.282667351
CDYL2	T vs UT	0.147592131	0.281138725	1.609706984
CEBPB	T vs UT	0.308308863	0.466239837	-1.134365663
CEBPG	T vs UT	0.023782383	0.085516707	1.283978919
CECR1	T vs UT	0.094056219	0.208524072	-1.546487229
CELSR2	T vs UT	0.163516179	0.301896502	-1.793988736
CENPM	T vs UT	0.000396227	0.010702621	6.348686719
CENPN	T vs UT	0.000549666	0.012365268	2.963240374
CEP68	T vs UT	0.125278015	0.251817968	-1.448960284
CERK	T vs UT	0.643765134	0.760236003	1.059164528
CG030	T vs UT	0.262921413	0.417975893	-2.268149737
CHAC1	T vs UT	1.15E-05	0.002559195	14.55285542
CHAC2	T vs UT	0.030167925	0.0999115	2.358882644
CHCHD2	T vs UT	0.006975475	0.041710767	1.759438588
CHCHD8	T vs UT	0.012033777	0.056914644	1.638468888
CHCHD9	T vs UT	0.005407853	0.036548551	2.384248429
CHN2	T vs UT	0.636983967	0.755117681	1.260752157
CHPF	T vs UT	0.020639168	0.07842248	2.06775849
CHST12	T vs UT	0.04920923	0.137935678	-1.270856251
CIRH1A	T vs UT	0.000418382	0.01095764	2.201262161
CISD1	T vs UT	0.032564811	0.104836584	1.476075201
CISH	T vs UT	0.320490274	0.47863918	-1.300188709
CKAP2	T vs UT	0.696447626	0.799776402	-1.085012577
CKS1B	T vs UT	0.022312722	0.082173195	1.278575789
CKS1BP3	T vs UT	0.01807173	0.072440481	1.906323196
CKS2	T vs UT	0.056123725	0.149914543	1.486968575
CLDN15	T vs UT	0.014731292	0.063665206	-1.887185606
CLEC2B	T vs UT	0.446465039	0.598295178	-1.244764424
CLIC1	T vs UT	0.004021119	0.031300756	1.818221685
CLIC4	T vs UT	4.83E-05	0.004805832	14.11804117
CLIC5	T vs UT	0.502052223	0.647453604	-1.169211095
CLIP2	T vs UT	0.76161569	0.843654789	-1.083621918
CLK4	T vs UT	0.015518571	0.065776548	-1.409419664
CLPB	T vs UT	0.023102755	0.083830775	1.82135496
CLSTN3	T vs UT	0.721369367	0.815334522	1.055139872
CLU	T vs UT	0.020097815	0.076862922	-2.624677539
CMAH	T vs UT	0.300871361	0.458389211	-1.305811682
CNN2	T vs UT	0.034127044	0.108422173	-1.85633339
CNNM3	T vs UT	0.020722902	0.078571152	-1.372227825
CNR2	T vs UT	0.471177382	0.619626399	-1.825182992
COL5A1	T vs UT	0.123619732	0.249342598	-2.269026177
COL6A2	T vs UT	0.548784441	0.686955549	1.143406092
COX17P1	T vs UT	0.00105627	0.016341033	1.630423953
CPD	T vs UT	0.090802836	0.203600467	1.389892182
CPEB4	T vs UT	0.390924131	0.54884767	1.112109767
CPNE2	T vs UT	0.947163789	0.968449251	-1.057008234
CPNE7	T vs UT	0.295135284	0.452557898	-1.513144418
CPT1A	T vs UT	0.001119737	0.016734982	-2.067905548
CRAT	T vs UT	0.20462087	0.352552705	-1.375179667
CREB3L4	T vs UT	0.911150347	0.946667968	1.025806643
CRELD2	T vs UT	0.012653303	0.058301654	1.926544798
CREM	T vs UT	0.001202774	0.017324998	3.237150916
CRIM1	T vs UT	0.023476838	0.084788932	1.910219676
CROCC	T vs UT	0.130225018	0.258275948	-1.552453448
CROCCP2	T vs UT	0.117031948	0.240540744	-2.057886939
CROCCP3	T vs UT	0.053480515	0.145509862	-3.219091717
CRTAM	T vs UT	7.76E-05	0.00608349	17.54725038
CRTAP	T vs UT	0.092087976	0.205584781	-1.489905962
CRTC1	T vs UT	0.014515631	0.063216932	-1.336372819
CSDA	T vs UT	0.468414231	0.6171116	1.409670232
CSF1	T vs UT	0.008885649	0.047655527	5.580386477
CSTF2	T vs UT	0.002606269	0.025563197	1.786960432
CTDSP2	T vs UT	0.598125522	0.725874772	-1.063192003
CTH	T vs UT	0.885134542	0.929393784	1.023088628
CTLA4	T vs UT	0.019672665	0.076023103	11.85422262
CTNNBIP1	T vs UT	0.067454755	0.16906005	-1.372698333
CTPS	T vs UT	0.01105035	0.054283194	1.742345668
CTPS2	T vs UT	0.195510844	0.341699302	-1.374019417
CTSA	T vs UT	0.556205289	0.693709409	-1.153674412
CTSH	T vs UT	0.031182708	0.102174539	1.948158069
CTSO	T vs UT	0.421237809	0.57568856	-1.169789475
CXCL16	T vs UT	0.198250131	0.34467345	-1.930112549
CXCR3	T vs UT	0.364776507	0.523657507	-1.657950886

C vs UT	0.000160676	0.000671311	8.078459277
C vs UT	6.73E-06	7.80E-05	5.164273671
C vs UT	1.96E-05	0.000154237	3.645221401
C vs UT	2.26E-05	0.000168438	3.663548665
C vs UT	1.10E-06	2.87E-05	4.987671778
C vs UT	4.65E-06	6.23E-05	3.86370472
C vs UT	2.76E-06	4.62E-05	4.046967269
C vs UT	0.024616076	0.040555347	-4.679775232
C vs UT	0.087611278	0.122379864	-1.936125752
C vs UT	0.001255045	0.003291902	4.258466072
C vs UT	0.103850472	0.14218036	-1.949200377
C vs UT	8.01E-05	0.00040568	-26.52178647
C vs UT	6.59E-12	8.12E-08	41.57995587
C vs UT	0.002599216	0.005993704	-4.537851942
C vs UT	0.002629807	0.006046499	3.519895778
C vs UT	2.83E-06	4.67E-05	18.74236953
C vs UT	0.000370177	0.001263293	-4.416845061
C vs UT	7.13E-06	8.10E-05	-18.16629126
C vs UT	6.37E-05	0.000345853	3.067342901
C vs UT	3.44E-05	0.00022486	10.00433139
C vs UT	0.006482983	0.012974384	5.581331199
C vs UT	1.18E-05	0.000108807	8.848099587
C vs UT	0.986378515	0.988703934	-1.048133606
C vs UT	4.70E-05	0.000276487	10.26989142
C vs UT	0.000354347	0.001219398	-8.765949003
C vs UT	0.001203216	0.003189091	-4.100041703
C vs UT	4.08E-05	0.000251274	-8.156886471
C vs UT	4.05E-05	0.000249698	24.40176772
C vs UT	0.000540826	0.001693773	-5.39774669
C vs UT	1.31E-05	0.000117906	4.28065134
C vs UT	6.16E-06	7.39E-05	12.51875933
C vs UT	3.23E-05	0.000216531	4.289616274
C vs UT	4.48E-07	1.80E-05	36.89050046
C vs UT	6.11E-06	7.35E-05	53.59543788
C vs UT	0.000188845	0.000764183	7.484456466
C vs UT	1.79E-06	3.59E-05	4.868923328
C vs UT	9.29E-07	2.64E-05	3.356217966
C vs UT	1.12E-05	0.000105025	-10.40436983
C vs UT	0.000256954	0.000952875	-11.38246318
C vs UT	0.00357626	0.007825251	-3.146543081
C vs UT	0.000723118	0.002130475	2.794590239
C vs UT	2.15E-05	0.000163687	-6.803269174
C vs UT	4.39E-06	6.08E-05	-3.970092518
C vs UT	0.007851858	0.015224628	-7.543433758
C vs UT	3.82E-08	8.69E-06	265.5315346
C vs UT	0.000260173	0.000960747	8.268860783
C vs UT	5.55E-06	6.95E-05	5.40282945
C vs UT	2.49E-05	0.000179831	3.675891469
C vs UT	2.20E-05	0.000165978	6.65845842
C vs UT	0.001943694	0.004721385	-4.587410832
C vs UT	1.21E-05	0.000110744	8.898107639
C vs UT	2.73E-05	0.000191731	-2.525536315
C vs UT	2.70E-05	0.000190063	3.286573582
C vs UT	8.07E-06	8.63E-05	4.648898193
C vs UT	2.36E-05	0.000172759	9.243580973
C vs UT	0.000394168	0.00131817	-4.55188015
C vs UT	3.52E-07	1.59E-05	3.805715434
C vs UT	3.97E-05	0.000246448	6.46158188
C vs UT	3.58E-05	0.000231149	4.435170552
C vs UT	0.000108138	0.000504863	-4.36111314
C vs UT	0.014925107	0.026406453	-2.156425954
C vs UT	3.05E-06	4.88E-05	5.168840979
C vs UT	8.77E-07	2.60E-05	106.9594022
C vs UT	0.002465116	0.00573813	-3.200515082
C vs UT	0.001883349	0.004604612	-2.707108831
C vs UT	1.21E-06	3.01E-05	-4.309237052
C vs UT	8.76E-05	0.000430973	4.248907904
C vs UT	5.79E-06	7.13E-05	-4.297700973
C vs UT	0.058923474	0.086492162	-2.335912114
C vs UT	0.000266451	0.000976328	5.748620955
C vs UT	0.011163613	0.02059356	-2.481435142
C vs UT	2.64E-06	4.54E-05	-4.048598153
C vs UT	0.008751669	0.016696283	-9.008592013
C vs UT	0.001438948	0.003679682	-7.310856807
C vs UT	0.009654172	0.018126381	-2.117508366
C vs UT	8.15E-08	9.66E-06	6.159680382
C vs UT	3.07E-06	4.88E-05	7.618260095
C vs UT	1.23E-06	3.04E-05	4.2028111
C vs UT	0.011998993	0.021859867	-2.458063891
C vs UT	8.53E-05	0.000423081	-51.89410506
C vs UT	1.91E-06	3.73E-05	-6.227677312
C vs UT	0.00508071	0.010496842	-2.635435725
C vs UT	5.88E-05	0.0003257	-4.117435553
C vs UT	7.34E-05	0.00038136	4.657404389
C vs UT	4.94E-06	6.53E-05	11.45767911
C vs UT	0.000119938	0.00054711	-4.931699844
C vs UT	0.000135029	0.000590182	-5.563785673
C vs UT	0.002785789	0.006343264	-5.026530121
C vs UT	0.001498748	0.003803943	-10.27679325
C vs UT	0.000914233	0.002560185	-6.903829821
C vs UT	3.77E-05	0.000239062	-7.365990358
C vs UT	2.34E-07	1.35E-05	-4.388751426
C vs UT	1.41E-05	0.000122323	22.33969313
C vs UT	0.000619298	0.001881236	11.48512766
C vs UT	1.11E-06	2.88E-05	5.733704034
C vs UT	2.93E-06	4.76E-05	-3.869628009
C vs UT	1.68E-08	5.89E-06	26.5592767
C vs UT	0.00012527	0.000558821	117.602514
C vs UT	7.19E-05	0.000375668	-3.106369227
C vs UT	1.49E-05	0.000127684	4.864581037
C vs UT	1.89E-05	0.000150702	-9.750473112
C vs UT	5.91E-05	0.000326586	-6.329909906
C vs UT	0.000404054	0.001342854	4.093117254
C vs UT	0.000350752	0.001209049	-3.134172262
C vs UT	0.007965873	0.015382806	5.744616352
C vs UT	0.000501604	0.001594425	-75.31897174

TC vs UT	4.65E-05	0.000241058	12.27132392
TC vs UT	1.82E-06	3.55E-05	6.840108859
TC vs UT	3.81E-06	5.07E-05	4.917871853
TC vs UT	7.55E-06	7.42E-05	4.398395016
TC vs UT	2.79E-07	1.53E-05	6.69334409
TC vs UT	9.29E-07	2.63E-05	5.225888194
TC vs UT	8.99E-07	2.57E-05	4.948196339
TC vs UT	0.00820947	0.014945041	-5.883434889
TC vs UT	0.000661293	0.001803926	-7.178939811
TC vs UT	0.000303012	0.00096641	5.782810534
TC vs UT	0.001386038	0.00334284	-5.895870924
TC vs UT	0.000124456	0.00049121	-27.32101421
TC vs UT	9.73E-12	1.20E-07	34.78941484
TC vs UT	0.000214707	0.000738655	-11.39807126
TC vs UT	4.03E-05	0.000218064	9.573582709
TC vs UT	1.04E-05	9.02E-05	11.66007927
TC vs UT	1.62E-05	0.000120826	-10.20852076
TC vs UT	1.92E-06	3.66E-05	-31.13785475
TC vs UT	8.99E-06	8.21E-05	4.291312438
TC vs UT	8.06E-05	0.000355286	7.528606285
TC vs UT	0.018662501	0.030599553	3.98936723
TC vs UT	5.86E-06	6.40E-05	11.02585592
TC vs UT	0.127058163	0.166061814	2.605407887
TC vs UT	5.89E-06	6.40E-05	24.27810547
TC vs UT	5.50E-05	0.000270561	-15.89866209
TC vs UT	0.00021917	0.000749408	-6.484761427
TC vs UT	0.000147729	0.000557375	-5.801434177
TC vs UT	6.08E-05	0.000290645	18.28940674
TC vs UT	0.000295414	0.000948063	-6.451933793
TC vs UT	1.23E-06	2.98E-05	7.043015455
TC vs UT	1.05E-06	2.78E-05	23.62724583
TC vs UT	2.12E-05	0.000143455	4.618846335
TC vs UT	7.44E-06	7.34E-05	12.57733608
TC vs UT	0.000217542	0.000746118	14.04475938
TC vs UT	0.004858464	0.009548113	3.436351443
TC vs UT	2.37E-06	4.05E-05	4.527853575
TC vs UT	3.10E-07	1.61E-05	4.051171026
TC vs UT	8.86E-07	2.57E-05	-26.29763322
TC vs UT	0.000201716	0.000702986	-13.27304458
TC vs UT	0.048217537	0.070608342	2.029909153
TC vs UT	2.17E-05	0.000145242	5.434412776
TC vs UT	6.28E-05	0.000297714	-5.307168593
TC vs UT	2.39E-06	4.06E-05	-4.459115024
TC vs UT	0.051980157	0.075481464	-5.061990178
TC vs UT	2.84E-08	8.31E-06	330.2355536
TC vs UT	6.91E-05	0.000317941	11.46814629
TC vs UT	1.02E-05	8.91E-05	4.639196466
TC vs UT	6.48E-06	6.73E-05	4.612264207
TC vs UT	3.66E-05	0.000204221	5.856777371
TC vs UT	0.001025964	0.002598097	-5.273876551
TC vs UT	4.34E-05	0.000229311	6.209402254
TC vs UT	8.68E-07	2.53E-05	-4.375056052
TC vs UT	7.81E-07	2.39E-05	6.457406854
TC vs UT	5.32E-06	6.09E-05	4.96243235
TC vs UT	8.89E-06	8.17E-05	12.6500106
TC vs UT	0.00040338	0.001215518	-4.414352142
TC vs UT	1.29E-07	1.20E-05	4.576185602
TC vs UT	4.50E-05	0.000235285	6.192211072
TC vs UT	4.11E-06	5.28E-05	6.963801695
TC vs UT	0.000549303	0.00155914	-3.220075805
TC vs UT	0.000174727	0.000629018	-5.190633124
TC vs UT	0.000113736	0.000459037	2.719832984
TC vs UT	6.83E-07	2.28E-05	124.2455786
TC vs UT	0.000496504	0.001430348	-4.516496588
TC vs UT	0.000271438	0.000887137	-4.215995129
TC vs UT	6.31E-06	6.66E-05	-3.239276019
TC vs UT	2.13E-05	0.000143935	5.811897227
TC vs UT	3.26E-07	1.64E-05	-8.738828722
TC vs UT	0.000315295	0.000999123	-9.399370927
TC vs UT	0.000249201	0.000829326	5.877406791
TC vs UT	8.62E-05	0.000374033	-7.397954053
TC vs UT	2.19E-05	0.000146049	-2.868438947
TC vs UT	0.006687555	0.012539166	-13.41625055
TC vs UT	0.000583076	0.001630603	-11.87299674
TC vs UT	0.000173459	0.000626096	-4.39499588
TC vs UT	1.98E-07	1.30E-05	5.029283179
TC vs UT	7.33E-05	0.000331652	3.769704659
TC vs UT	8.01E-06	7.65E-05	3.080705789
TC vs UT	0.000343419	0.001069281	-4.866316745
TC vs UT	5.26E-05	0.000262219	-69.93819214
TC vs UT	3.15E-06	4.62E-05	-5.538092338
TC vs UT	0.000489698	0.001415222	-4.272596351
TC vs UT	0.001663158	0.003880176	-2.361948231
TC vs UT	0.000220406	0.000752391	3.642146931
TC vs UT	3.01E-06	4.48E-05	13.52946603
TC vs UT	0.03877712	0.05829333	-1.84590962
TC vs UT	0.00010957	0.000445534	-5.872976356
TC vs UT	0.005595134	0.010803006	-4.340880419
TC vs UT	0.000476358	0.00138722	-12.25822671
TC vs UT	0.226346643	0.276815523	1.824375036
TC vs UT	3.08E-05	0.000181733	-7.749447361
TC vs UT	2.05E-07	1.30E-05	-4.49765011
TC vs UT	4.36E-06	5.43E-05	36.35541341
TC vs UT	0.000163221	0.000597717	20.14765879
TC vs UT	1.41E-06	3.11E-05	5.376892893
TC vs UT	1.18E-06	2.91E-05	-4.689066552
TC vs UT	4.90E-09	5.92E-06	46.2114692
TC vs UT	8.48E-05	0.000368996	146.2010667
TC vs UT	2.76E-06	4.32E-05	-5.799854987
TC vs UT	9.67E-07	2.70E-05	9.355803155
TC vs UT	8.03E-05	0.000354669	-6.78173587
TC vs UT	6.60E-05	0.000308521	-6.204141616
TC vs UT	0.000661941	0.001805293	3.657801516
TC vs UT	8.12E-05	0.000357247	-4.020561779
TC vs UT	0.120586126	0.158527235	2.871327529
TC vs UT	0.00158732	0.003735762	-50.69965705

CXCR4	T vs UT	0.624658033	0.74538213	-1.10710508
CXCR7	T vs UT	0.25117744	0.404997756	-1.828819158
CXXC5	T vs UT	0.003800725	0.030383079	3.248023845
CYBA	T vs UT	0.276376263	0.433001184	-1.291385771
CYCS	T vs UT	0.012678563	0.058348752	1.724657752
CYCSP45	T vs UT	0.02181526	0.081034051	1.873397194
CYP27B1	T vs UT	0.010526057	0.052608949	1.772933935
CYP2U1	T vs UT	0.149708293	0.283723217	-1.455043889
CYP4F22	T vs UT	0.992363707	0.995593532	1.000849882
CYP51A1	T vs UT	0.000239542	0.008752096	2.049125568
CYP51P2	T vs UT	0.003220869	0.028105674	2.220596622
CYTH4	T vs UT	0.232355653	0.383424144	-1.202127164
CYTIP	T vs UT	0.02261454	0.082913257	1.290072833
D4S234E	T vs UT	0.07002259	0.173059243	-2.143565022
DAB2IP	T vs UT	0.017584235	0.071149525	2.108817357
DBP	T vs UT	0.027267697	0.093652008	-2.61311218
DCAF13	T vs UT	0.001963268	0.022476411	1.889739848
DCTPP1	T vs UT	0.000190201	0.008017603	2.660127953
DCUN1D5	T vs UT	0.032859248	0.105481523	1.516780992
DDB2	T vs UT	0.40734254	0.563822802	-1.098013508
DDIT4	T vs UT	0.120861047	0.245605687	1.993606662
DDX1	T vs UT	0.020277037	0.077452249	1.601182214
DDX10	T vs UT	0.018694656	0.073757272	1.931132579
DDX21	T vs UT	0.000970482	0.015564746	2.224347288
DDX49	T vs UT	0.005765748	0.037694418	1.61630684
DDX60	T vs UT	0.850613871	0.906801749	-1.051363413
DDX60L	T vs UT	0.944860644	0.966815912	1.0078871
DFNB31	T vs UT	0.330813228	0.489586279	1.616545833
DHRS1	T vs UT	0.363010784	0.521851809	-1.253197503
DHRS12	T vs UT	0.048291858	0.135944889	-1.379466455
DHX33	T vs UT	0.154548982	0.2898675	1.320190622
DHX58	T vs UT	0.183190127	0.327270912	-1.532514125
DIP2A	T vs UT	0.129096865	0.256901928	-1.296575286
DLD	T vs UT	0.000721619	0.013752027	2.212048028
DLEU2	T vs UT	0.018508652	0.073405732	2.451163059
DNAJA1	T vs UT	2.23E-05	0.003427694	2.5364538
DNAJB11	T vs UT	0.049509349	0.138495272	1.546589668
DNAJB5	T vs UT	0.002940069	0.026892475	4.008994056
DNAJB9	T vs UT	0.25640952	0.411282605	1.17400816
DNAJC25-GNG	T vs UT	0.097764668	0.213720095	1.330560425
DNAJC3	T vs UT	0.101765604	0.219403725	1.317702296
DOCK10	T vs UT	0.796933973	0.868729191	1.077643449
DPH2	T vs UT	0.00149859	0.019207506	2.517258343
DPY19L1	T vs UT	0.133383182	0.262423992	1.324050328
DPYD	T vs UT	0.632722465	0.752311282	-1.094612701
DPYSL2	T vs UT	0.015684967	0.066163408	-1.613837707
DTX4	T vs UT	0.615482771	0.738651214	-1.244468522
DUSP1	T vs UT	0.48824974	0.634467744	1.161546034
DUSP4	T vs UT	0.00070629	0.013553827	7.754419666
DUSP5	T vs UT	6.42E-05	0.005459879	26.86018717
DUSP6	T vs UT	0.022230042	0.082015684	4.282384072
DUXAP8	T vs UT	0.029482574	0.098408266	2.373551163
DYNC2H1	T vs UT	0.69680151	0.799890167	-1.190786686
DYRK1B	T vs UT	0.340640447	0.499654618	-1.196334842
DYRK2	T vs UT	0.007533939	0.043347395	-1.533821181
EBI3	T vs UT	0.002839526	0.026454429	116.6076652
EBNA1BP2	T vs UT	0.005306561	0.036144786	2.361269055
ECE2	T vs UT	9.04E-05	0.006442009	3.049116263
ECHDC2	T vs UT	0.00734771	0.042588608	-1.864675585
EED	T vs UT	0.073135239	0.178001875	1.673783093
EGR1	T vs UT	6.40E-06	0.002448332	64.91326631
EGR2	T vs UT	2.00E-06	0.002130399	202.794261
EGR3	T vs UT	3.84E-07	0.002130399	206.1649239
EHD4	T vs UT	0.00344527	0.028957178	2.099761871
EIF1	T vs UT	0.005100917	0.035373626	1.355498404
EIF1AXP1	T vs UT	0.121893717	0.247067884	1.621184874
EIF2B3	T vs UT	0.028063271	0.095191233	1.881323547
EIF2C4	T vs UT	0.004343898	0.032520389	-1.937070556
EIF2S1	T vs UT	0.003184481	0.027926491	1.604959782
EIF2S2	T vs UT	0.000173255	0.007826698	1.703448251
EIF2S2P4	T vs UT	0.000904345	0.015094489	1.786514585
EIF3C	T vs UT	0.002906236	0.026752166	1.771607335
EIF3CL	T vs UT	0.002268551	0.023748798	1.986307948
EIF3J	T vs UT	0.003836637	0.030602064	1.612451399
EIF4A1	T vs UT	0.00033836	0.010164245	1.918917568
EIF4A1P2	T vs UT	0.000426343	0.010974543	1.963382406
EIF4A1P4	T vs UT	0.000732148	0.0138042	1.810661452
EIF4EBP1	T vs UT	0.08559992	0.200620684	1.38801899
EIF4G1	T vs UT	0.009134683	0.048401649	1.554945382
EIF5A	T vs UT	5.76E-05	0.005291355	2.824182605
EIF5AL1	T vs UT	1.61E-05	0.00304623	2.861432295
EIF5AL3	T vs UT	0.000757745	0.013933748	2.979703439
ELL2	T vs UT	0.00636805	0.039880172	1.911176968
ELOVL6	T vs UT	0.639811224	0.756931715	1.24921587
EML5	T vs UT	0.33345236	0.492155566	-1.187184254
ENG	T vs UT	0.075361022	0.180778482	-1.710100887
ENGASE	T vs UT	0.012697174	0.058372916	-1.797459114
ENO1	T vs UT	7.50E-05	0.00608349	2.346679146
ENPP5	T vs UT	0.41421837	0.569793286	-1.549669816
EPAS1	T vs UT	0.0007875	0.014094902	12.15374729
EPB49	T vs UT	0.426265959	0.580309073	-1.744779074
EPHA1	T vs UT	0.088669557	0.200715191	-2.624393546
EPHA4	T vs UT	0.047444754	0.134326938	-2.499518084
EPHB6	T vs UT	0.545248457	0.68350076	-1.136376511
EPRS	T vs UT	0.000356437	0.010415434	1.532840035
EPT1	T vs UT	0.028536114	0.096318174	1.477345802
ERMP1	T vs UT	0.068887573	0.171143215	-1.328243169
ERRFI1	T vs UT	0.001117749	0.016734982	2.585591288
ESF1	T vs UT	0.131171934	0.259565068	1.537585569
ESPL1	T vs UT	0.000109079	0.006650528	69.45310286
ESPN	T vs UT	0.008918854	0.047709097	2.490843582
ESYT1	T vs UT	0.915136661	0.948488666	-1.024263493
ETF1	T vs UT	0.000643727	0.012991708	1.842494332
ETFA	T vs UT	0.028042952	0.095189976	1.798515254
ETV3	T vs UT	0.094293955	0.208733296	1.131212046
ETV5	T vs UT	0.004348451	0.032520389	3.469052684

C vs UT	0.000470727	0.001513446	-9.304420995
C vs UT	0.001085269	0.002933866	-14.67164323
C vs UT	0.000980262	0.00270032	-4.648638607
C vs UT	0.00370885	0.0080781	-2.459889866
C vs UT	1.23E-06	3.04E-05	9.248741136
C vs UT	5.36E-06	6.82E-05	11.96180265
C vs UT	0.001597271	0.004011887	2.205820399
C vs UT	0.000143413	0.000618498	-5.592652974
C vs UT	0.001276618	0.003337721	-6.815275812
C vs UT	1.52E-06	3.38E-05	4.227928477
C vs UT	3.80E-05	0.000240362	4.53740457
C vs UT	3.19E-05	0.00021506	-3.157934836
C vs UT	1.57E-09	3.23E-06	14.43352657
C vs UT	0.001795305	0.004421916	-8.682039537
C vs UT	0.000680339	0.002023784	4.207125357
C vs UT	2.52E-05	0.000181496	-42.02660488
C vs UT	3.27E-05	0.000217877	3.291966052
C vs UT	4.15E-06	5.85E-05	5.360652313
C vs UT	6.75E-05	0.00035951	3.431795869
C vs UT	5.73E-06	7.09E-05	-4.58742127
C vs UT	3.87E-05	0.000242894	17.71117504
C vs UT	0.00010294	0.000485931	3.042090132
C vs UT	0.001028887	0.002807886	3.096741892
C vs UT	5.31E-07	2.01E-05	9.324810929
C vs UT	9.67E-05	0.000464885	2.488998936
C vs UT	0.071795064	0.102946056	-1.94245494
C vs UT	0.022006225	0.036811389	-2.050178987
C vs UT	0.001823675	0.004478373	-7.654083972
C vs UT	5.43E-05	0.000308144	-5.448402263
C vs UT	0.000340213	0.001183641	-2.296115057
C vs UT	0.002616025	0.006022328	2.175313928
C vs UT	0.001118416	0.003006992	-4.677677023
C vs UT	3.46E-05	0.000225027	-3.554066439
C vs UT	2.14E-05	0.000163664	3.690256285
C vs UT	1.73E-05	0.000141698	12.25132042
C vs UT	3.91E-07	1.68E-05	4.893773606
C vs UT	6.86E-05	0.000363517	4.273699402
C vs UT	0.112572021	0.152730306	1.7243834
C vs UT	1.52E-06	3.38E-05	5.366249533
C vs UT	1.20E-05	0.000110614	4.186717073
C vs UT	1.25E-05	0.000113321	4.201108688
C vs UT	0.000299236	0.001071929	4.371384929
C vs UT	9.48E-05	0.000458081	4.115746935
C vs UT	2.03E-05	0.000158118	4.485082877
C vs UT	0.000767859	0.002228132	-3.909606807
C vs UT	3.64E-05	0.000233633	-4.0080371
C vs UT	0.000251076	0.000937709	-18.41671832
C vs UT	5.88E-05	0.000325844	-4.336869229
C vs UT	0.001057751	0.002869642	7.39738784
C vs UT	9.80E-06	9.63E-05	54.93737738
C vs UT	2.98E-05	0.00020472	38.33150732
C vs UT	0.000903336	0.002536582	5.978439158
C vs UT	0.00261285	0.006016143	-4.004793183
C vs UT	0.002755729	0.006287592	-2.082957659
C vs UT	1.38E-06	3.24E-05	-4.962507995
C vs UT	0.001762362	0.004359006	191.6195345
C vs UT	2.21E-05	0.000166071	7.509279304
C vs UT	9.87E-07	2.69E-05	7.913938572
C vs UT	4.34E-06	6.03E-05	-6.466299652
C vs UT	0.002481155	0.005770019	3.136299926
C vs UT	0.414920118	0.474315321	1.419908239
C vs UT	0.000397776	0.001328074	12.06731806
C vs UT	0.074205642	0.105946684	-1.94971986
C vs UT	1.47E-05	0.000126581	5.546057481
C vs UT	6.10E-08	9.41E-06	4.585884385
C vs UT	0.00123475	0.003251701	4.367350074
C vs UT	9.60E-05	0.000462556	5.363066157
C vs UT	2.16E-05	0.000163943	-4.429882827
C vs UT	3.04E-06	4.88E-05	3.704316147
C vs UT	9.47E-09	5.10E-06	6.829712816
C vs UT	8.42E-08	9.70E-06	7.429802814
C vs UT	1.18E-05	0.000108782	3.703594005
C vs UT	1.67E-05	0.000137874	4.277537112
C vs UT	2.70E-06	4.58E-05	3.949817872
C vs UT	3.21E-07	1.53E-05	5.338773336
C vs UT	4.09E-07	1.71E-05	5.623722432
C vs UT	3.09E-07	1.51E-05	5.686019838
C vs UT	3.23E-06	5.00E-05	9.118160364
C vs UT	6.65E-06	7.75E-05	3.511724628
C vs UT	4.45E-07	1.80E-05	7.201154962
C vs UT	1.10E-07	9.93E-06	7.570864465
C vs UT	4.95E-06	6.53E-05	8.740098818
C vs UT	1.37E-05	0.000120958	5.116616322
C vs UT	0.006545435	0.013082382	4.378580132
C vs UT	7.11E-07	2.38E-05	11.15132787
C vs UT	0.000326147	0.001146247	-4.668605857
C vs UT	3.47E-05	0.000225452	-4.278957799
C vs UT	1.02E-08	5.10E-06	14.48904257
C vs UT	0.00219133	0.005196272	-17.6568889
C vs UT	0.000421554	0.001384593	18.82250613
C vs UT	0.720418024	0.761106638	-1.307548436
C vs UT	0.000137357	0.000597816	-39.02265276
C vs UT	0.006363096	0.012770259	-5.369176408
C vs UT	9.40E-06	9.43E-05	-7.088113877
C vs UT	5.21E-08	8.90E-06	4.054144501
C vs UT	3.42E-06	5.15E-05	5.040463974
C vs UT	1.06E-05	0.000101551	-3.771893195
C vs UT	0.000205542	0.000809433	3.414223211
C vs UT	0.000562766	0.00174476	4.11672401
C vs UT	0.008452102	0.016205009	6.224935778
C vs UT	9.51E-05	0.000459074	7.638900511
C vs UT	0.032153301	0.05107578	-2.01234849
C vs UT	1.51E-06	3.38E-05	4.125493875
C vs UT	0.000366993	0.001254221	3.486077825
C vs UT	2.01E-08	5.98E-06	4.201262979
C vs UT	7.89E-08	9.50E-06	367.0346472

TC vs UT	9.71E-05	0.000408821	-16.26998409
TC vs UT	0.001370428	0.003309318	-10.99147433
TC vs UT	0.000743439	0.001981111	-4.426500433
TC vs UT	3.07E-05	0.000181081	-6.071497042
TC vs UT	7.55E-07	2.36E-05	10.37885113
TC vs UT	2.84E-06	4.36E-05	14.05942029
TC vs UT	1.63E-05	0.000121538	4.700507514
TC vs UT	0.000325449	0.001024452	-4.71726952
TC vs UT	0.000997803	0.00254035	-7.90594236
TC vs UT	1.59E-05	0.000119436	2.892809198
TC vs UT	2.78E-05	0.000169697	4.885033646
TC vs UT	1.12E-06	2.84E-05	-6.399717504
TC vs UT	6.92E-09	6.10E-06	9.15465607
TC vs UT	0.000319563	0.001009794	-16.37302219
TC vs UT	0.080580897	0.110950582	1.626312905
TC vs UT	2.57E-05	0.000161066	-42.96096867
TC vs UT	5.38E-06	6.10E-05	4.460113659
TC vs UT	1.01E-06	2.76E-05	7.26148601
TC vs UT	6.12E-06	6.54E-05	5.320807821
TC vs UT	4.97E-05	0.000252397	-3.114266464
TC vs UT	8.11E-05	0.000356887	13.91338062
TC vs UT	1.85E-05	0.000130938	4.078882247
TC vs UT	5.38E-05	0.000266748	5.277768813
TC vs UT	1.46E-07	1.24E-05	13.69395181
TC vs UT	3.42E-06	4.81E-05	4.294750762
TC vs UT	0.001363407	0.003294944	-4.038778172
TC vs UT	0.000104634	0.000430476	-6.235787457
TC vs UT	0.00456347	0.009053513	-5.905955433
TC vs UT	2.12E-05	0.000143907	-7.253561364
TC vs UT	7.92E-06	7.61E-05	-4.123870558
TC vs UT	1.68E-05	0.000123276	4.835741051
TC vs UT	0.000106709	0.000437409	-8.190189849
TC vs UT	5.96E-06	6.44E-05	-5.051430668
TC vs UT	1.25E-05	0.000101282	4.061193222
TC vs UT	4.30E-05	0.00022766	9.106964503
TC vs UT	1.74E-07	1.24E-05	5.776407947
TC vs UT	0.00012293	0.000486938	3.702895193
TC vs UT	0.440095004	0.496012011	1.294481396
TC vs UT	6.62E-06	6.82E-05	3.951619367
TC vs UT	4.93E-05	0.000251073	3.229575726
TC vs UT	4.84E-05	0.000248009	3.272823566
TC vs UT	0.000676321	0.001839222	3.469091324
TC vs UT	4.97E-06	5.89E-05	7.824459763
TC vs UT	0.000272364	0.000889837	2.827295285
TC vs UT	0.000282803	0.000916633	-4.662796907
TC vs UT	4.15E-06	5.30E-05	-6.434602007
TC vs UT	0.001333027	0.003233715	-8.252264973
TC vs UT	4.73E-05	0.000243664	-4.524483139
TC vs UT	3.00E-05	0.000178563	28.38545664
TC vs UT	1.00E-05	8.81E-05	54.02058465
TC vs UT	0.000129895	0.000505718	20.32662135
TC vs UT	0.000102066	0.000423775	11.26047074
TC vs UT	0.000320449	0.001011816	-7.035526509
TC vs UT	4.59E-05	0.000238796	-4.101662877
TC vs UT	1.41E-06	3.12E-05	-4.972592778
TC vs UT	0.00068526	0.001859432	538.7079608
TC vs UT	6.01E-06	6.46E-05	10.47888118
TC vs UT	1.61E-07	1.24E-05	13.29516634
TC vs UT	4.72E-06	5.69E-05	-6.280654039
TC vs UT	1.33E-05	0.000105774	10.23917803
TC vs UT	7.43E-05	0.000335151	19.09285241
TC vs UT	8.88E-06	8.17E-05	71.19145345
TC vs UT	4.96E-06	5.89E-05	46.31966194
TC vs UT	5.21E-05	0.000260329	4.173134318
TC vs UT	1.16E-07	1.19E-05	4.063062615
TC vs UT	0.000352095	0.001091335	5.5670787
TC vs UT	2.81E-05	0.000170864	7.016547853
TC vs UT	2.48E-06	4.13E-05	-7.630729837
TC vs UT	9.40E-07	2.65E-05	4.509311178
TC vs UT	6.53E-09	6.10E-06	7.467137893
TC vs UT	6.21E-08	9.59E-06	8.00327501
TC vs UT	1.94E-06	3.66E-05	5.19978867
TC vs UT	6.45E-06	6.73E-05	5.173691931
TC vs UT	6.62E-07	2.27E-05	5.129962365
TC vs UT	1.26E-07	1.20E-05	6.537487977
TC vs UT	2.39E-07	1.38E-05	6.292856812
TC vs UT	1.83E-07	1.26E-05	6.410091408
TC vs UT	1.49E-06	3.19E-05	11.68246992
TC vs UT	2.99E-06	4.47E-05	4.042944299
TC vs UT	1.66E-07	1.24E-05	9.244287797
TC vs UT	3.76E-08	8.75E-06	10.01395834
TC vs UT	2.05E-06	3.74E-05	11.27992163
TC vs UT	2.93E-06	4.42E-05	7.67437172
TC vs UT	0.0721731	0.100940826	2.228317752
TC vs UT	1.21E-06	2.95E-05	9.599413635
TC vs UT	0.000504386	0.001450346	-4.028277819
TC vs UT	0.000265827	0.000871715	-2.993493752
TC vs UT	2.98E-08	8.31E-06	10.31156457
TC vs UT	0.000479137	0.001392025	-30.87297816
TC vs UT	9.03E-05	0.000387754	36.21869032
TC vs UT	0.006863325	0.012837942	-5.375199248
TC vs UT	8.05E-05	0.00035495	-59.00999078
TC vs UT	0.008157815	0.014868567	-5.668526511
TC vs UT	1.31E-05	0.000104725	-6.290509356
TC vs UT	1.89E-08	8.31E-06	4.907001357
TC vs UT	1.35E-06	3.08E-05	6.119993051
TC vs UT	1.12E-06	2.83E-05	-6.008173603
TC vs UT	1.77E-05	0.000127817	5.652406047
TC vs UT	0.000108146	0.000441097	5.686995325
TC vs UT	0.000309359	0.000983851	27.25907648
TC vs UT	6.16E-05	0.000292717	8.621699033
TC vs UT	0.001146113	0.002847385	-4.131576857
TC vs UT	3.57E-07	1.67E-05	5.465941748
TC vs UT	0.000140644	0.000538218	4.118936801
TC vs UT	1.04E-06	2.78E-05	2.372469195
TC vs UT	1.80E-06	3.53E-05	48.49423469

EVI5	T vs UT	0.256520182	0.411406587	2.388922404
EVL	T vs UT	0.155062528	0.290698035	-1.44123521
EXOSC4	T vs UT	0.00065231	0.013038063	2.753943847
EXOSC5	T vs UT	0.007763159	0.044161954	1.935449786
EZH2	T vs UT	0.911170173	0.946667968	1.099716174
F2R	T vs UT	0.008328198	0.045924276	-2.006194293
FABP5	T vs UT	0.019686783	0.076045748	4.148119878
FABP5L7	T vs UT	0.000125691	0.00686928	12.39235664
FAIM3	T vs UT	0.377925042	0.536659653	1.278807489
FAM100B	T vs UT	0.744483972	0.832380067	1.064852659
FAM102A	T vs UT	0.670237937	0.779478756	-1.104520907
FAM117A	T vs UT	0.075764597	0.181371566	-1.228173751
FAM117B	T vs UT	0.19731625	0.343786381	-1.295828745
FAM125B	T vs UT	0.930000279	0.957570225	1.010901707
FAM13AOS	T vs UT	0.137548228	0.267136294	-2.602791143
FAM159A	T vs UT	0.109372798	0.229646496	-1.421377365
FAM167A	T vs UT	0.000196649	0.008025588	4.965361642
FAM46A	T vs UT	0.057697065	0.152891643	-1.469310527
FAM46C	T vs UT	0.351356153	0.510694491	-1.10814577
FAM57A	T vs UT	0.337036863	0.49602107	1.409302261
FAM60A	T vs UT	0.154743296	0.290187808	1.168934516
FAM89A	T vs UT	0.003248052	0.028223034	1.649778497
FAM8A1	T vs UT	0.029932871	0.099266353	-1.905103448
FARSA	T vs UT	0.001816473	0.021320798	1.995506049
FARSB	T vs UT	0.002367573	0.024289898	2.205232771
FASLG	T vs UT	0.001112066	0.016721672	2.146473689
FASN	T vs UT	0.041184774	0.122047983	1.450367677
FBLN5	T vs UT	0.790127277	0.865133587	-1.145123051
FBXL16	T vs UT	0.073410829	0.178390918	-1.838097675
FBXO27	T vs UT	0.000784141	0.014094902	9.049428372
FBXO32	T vs UT	0.020780265	0.078667688	-1.662506418
FBXO6	T vs UT	0.058171885	0.153555844	1.349550823
FCGBP	T vs UT	0.007265303	0.042401707	8.012114287
FCGRT	T vs UT	0.266848085	0.422638007	-1.611711191
FDXR	T vs UT	0.466612173	0.615526703	-1.352897961
FERMT2	T vs UT	0.020051274	0.076804042	1.669339711
FES	T vs UT	0.013929471	0.061369099	3.667706516
FEZ1	T vs UT	0.002651897	0.025753482	8.967673002
FGD3	T vs UT	0.021821444	0.081034051	-1.574176051
FICD	T vs UT	0.08405387	0.194297754	1.515820986
FKBP14	T vs UT	0.446193098	0.59799756	-1.2681168
FKBP4	T vs UT	0.168290664	0.307839876	1.335910007
FLJ32255	T vs UT	0.257690286	0.41263912	-1.385690565
FLJ35390	T vs UT	0.665074187	0.775888421	-1.095682934
FLJ35776	T vs UT	0.974646081	0.985077873	1.007869796
FLJ36031	T vs UT	0.094332159	0.208742914	1.253403046
FLJ46020	T vs UT	0.261059738	0.415829168	-1.329581872
FLOT1	T vs UT	0.171616948	0.311826056	-1.312825854
FLT4	T vs UT	0.002958086	0.026937369	-2.351381927
FNDC3B	T vs UT	0.000878274	0.014918221	2.157475417
FOSB	T vs UT	0.188522471	0.333211306	1.741269409
FOXP3	T vs UT	0.014133502	0.061950258	3.932978141
FOXP4	T vs UT	0.001600118	0.019948893	2.673295952
FRAT1	T vs UT	0.079567091	0.18754774	-1.236540441
FRMD4B	T vs UT	0.684583411	0.791443555	-1.039775066
FRMD6	T vs UT	0.038008439	0.116068008	3.389280507
FTH1	T vs UT	0.350619113	0.510164463	1.212264666
FTHL10	T vs UT	0.224569632	0.375144772	1.262503262
FTHL11	T vs UT	0.468639252	0.617342091	1.158713199
FTHL12	T vs UT	0.303298956	0.461182583	1.268785557
FTHL16	T vs UT	0.360314387	0.519456999	1.188478014
FTHL2	T vs UT	0.646142673	0.761949039	1.119735547
FTHL20	T vs UT	0.340281819	0.499425644	1.23434353
FTHL3	T vs UT	0.089468483	0.201598391	1.533895711
FTHL4	T vs UT	0.005214409	0.035744572	2.235050222
FTHL5	T vs UT	0.430903412	0.584235658	-1.204261401
FTHL7	T vs UT	0.615281396	0.738563733	1.095883786
FTHL8	T vs UT	0.576324696	0.710963832	1.123769297
FURIN	T vs UT	2.13E-05	0.003427694	6.046924822
GAB1	T vs UT	0.715852258	0.811553728	1.09943457
GAB3	T vs UT	0.003611526	0.029677311	-2.153815978
GADD45A	T vs UT	0.000513137	0.011960263	3.339397938
GADD45B	T vs UT	0.457257214	0.607480748	1.212969674
GALNT12	T vs UT	0.024574607	0.087371655	-1.781401502
GALNT6	T vs UT	0.17528977	0.316770169	1.452816021
GAPDHL10	T vs UT	4.20E-06	0.002448332	2.599111214
GAPDHL18	T vs UT	0.001009871	0.015882283	2.919033175
GAPDHP1	T vs UT	4.53E-05	0.004761308	2.708264266
GAR1	T vs UT	0.005546092	0.036864318	2.025320049
GARS	T vs UT	1.16E-05	0.002559195	2.811772812
GART	T vs UT	0.000183106	0.008006036	2.114644055
GAS7	T vs UT	0.104402014	0.222761805	-1.828256215
GATS	T vs UT	0.855234174	0.90952539	-1.023046634
GBE1	T vs UT	0.000293617	0.009354762	2.287535229
GBP5	T vs UT	0.03193199	0.103670945	1.6340937
GCH1	T vs UT	0.008433439	0.046266346	1.434559423
GCHFR	T vs UT	0.169434292	0.30913633	-1.313529813
GCSH.1	T vs UT	0.017821353	0.071804634	2.282050893
GDAP1	T vs UT	0.001197704	0.017292376	3.159735659
GDPD5	T vs UT	0.004976685	0.035004293	-1.986368985
GFM1	T vs UT	0.003923572	0.030931994	1.709624629
GFPT1	T vs UT	0.431558684	0.584738305	1.131126987
GGCT	T vs UT	0.004459441	0.033023966	2.014877552
GGT7	T vs UT	0.129381912	0.257220087	-1.308073751
GHITM	T vs UT	0.000258524	0.008977807	1.710521968
GIMAP4	T vs UT	0.99661041	0.997670046	1.004206033
GIMAP6	T vs UT	0.997022733	0.997670046	1.005550505
GIMAP7	T vs UT	0.119554301	0.243774522	-1.282848327
GIMAP8	T vs UT	0.748750825	0.835635199	1.088734676
GINS3	T vs UT	0.063700544	0.162681794	1.379332461
GK	T vs UT	0.101174555	0.21889494	1.401574599
GK4P	T vs UT	0.058660552	0.154547993	1.45140967
GLA	T vs UT	0.001490421	0.019150991	1.705924666
GLRX2	T vs UT	0.226756287	0.377467938	1.458705131
GLS2	T vs UT	0.989659964	0.993795464	1.020635554
GM2A	T vs UT	0.689579687	0.795222367	-1.108880281

C vs UT	0.01872921	0.03211838	12.78822298
C vs UT	4.20E-05	0.00025525	-6.142582791
C vs UT	4.64E-06	6.23E-05	7.164903226
C vs UT	0.000454546	0.001468315	2.976491678
C vs UT	0.000450151	0.00145712	3.757353425
C vs UT	2.69E-05	0.000189912	-6.258076874
C vs UT	0.000903025	0.002536582	9.417753139
C vs UT	4.62E-05	0.000273315	19.73074141
C vs UT	2.05E-06	3.91E-05	-19.94326971
C vs UT	1.75E-06	3.58E-05	5.786736191
C vs UT	2.52E-06	4.42E-05	-17.08364654
C vs UT	1.84E-05	0.000147675	-2.443836045
C vs UT	8.66E-05	0.000427459	-5.007545967
C vs UT	1.07E-05	0.0001022	-6.117351535
C vs UT	0.003270284	0.007254877	-9.158960607
C vs UT	6.17E-05	0.000336351	-4.586781478
C vs UT	0.002282985	0.005378143	2.865374132
C vs UT	1.82E-05	0.000146708	-4.402713358
C vs UT	5.05E-08	8.90E-06	7.137988093
C vs UT	0.000376306	0.001276438	5.545940109
C vs UT	4.60E-06	6.21E-05	2.860091131
C vs UT	4.95E-06	6.53E-05	3.551567813
C vs UT	0.000124737	0.000557857	-5.369910699
C vs UT	2.01E-05	0.000157542	3.811566439
C vs UT	0.00010376	0.000488679	3.684031108
C vs UT	1.06E-07	9.93E-06	16.09526317
C vs UT	1.82E-05	0.000146623	3.791648972
C vs UT	0.00055612	0.00172763	-16.85656251
C vs UT	5.87E-05	0.000325357	-11.39384791
C vs UT	0.233949879	0.288662265	1.644774057
C vs UT	9.33E-07	2.64E-05	-12.4865075
C vs UT	1.26E-06	3.08E-05	5.648516587
C vs UT	0.575534406	0.629442897	-1.319963752
C vs UT	0.000418499	0.001378363	-10.97994421
C vs UT	0.001320509	0.00342993	-5.94960722
C vs UT	3.17E-06	4.95E-05	7.451987469
C vs UT	6.45E-06	7.60E-05	52.70243198
C vs UT	2.40E-05	0.000174997	61.76419501
C vs UT	2.99E-05	0.000204949	-3.924575337
C vs UT	8.31E-06	8.78E-05	7.347339744
C vs UT	0.000771639	0.002235282	4.466468525
C vs UT	2.71E-05	0.000190401	5.08047988
C vs UT	0.0008835	0.002494516	-4.224058625
C vs UT	9.11E-05	0.000444187	-4.49697461
C vs UT	0.046908917	0.070915516	-2.159369464
C vs UT	5.60E-08	9.01E-06	9.599632948
C vs UT	7.16E-05	0.000374736	-7.304296098
C vs UT	1.75E-06	3.58E-05	8.34256635
C vs UT	4.77E-05	0.000279214	-5.039938715
C vs UT	6.84E-07	2.34E-05	7.698951277
C vs UT	0.219468275	0.273227366	1.665535538
C vs UT	1.68E-05	0.000138683	62.47502227
C vs UT	6.93E-05	0.000366068	4.824834961
C vs UT	5.49E-08	9.01E-06	-8.167398453
C vs UT	9.90E-08	9.93E-06	11.19070836
C vs UT	0.012658505	0.02289923	4.483714264
C vs UT	8.20E-07	2.54E-05	9.750030086
C vs UT	8.72E-07	2.59E-05	9.905424617
C vs UT	9.73E-07	2.68E-05	9.852720083
C vs UT	2.81E-06	4.66E-05	10.24771078
C vs UT	1.40E-06	3.26E-05	9.573935997
C vs UT	3.12E-06	4.90E-05	9.498807657
C vs UT	2.30E-06	4.20E-05	9.886561694
C vs UT	3.58E-06	5.31E-05	10.77313722
C vs UT	1.91E-06	3.73E-05	11.47148299
C vs UT	0.000371713	0.001266083	7.193033466
C vs UT	7.24E-07	2.39E-05	9.2222149
C vs UT	2.37E-06	4.29E-05	8.867591149
C vs UT	2.07E-07	1.30E-05	24.63162473
C vs UT	0.116675302	0.157482919	-1.940094033
C vs UT	0.000539151	0.001689385	-2.87839161
C vs UT	0.000423941	0.001390581	3.57349686
C vs UT	1.82E-06	3.62E-05	13.99446226
C vs UT	3.06E-06	4.88E-05	-12.87608701
C vs UT	0.000116641	0.000536046	5.478400409
C vs UT	2.96E-08	7.35E-06	6.161680429
C vs UT	3.19E-05	0.00021506	6.254766882
C vs UT	5.08E-07	1.96E-05	6.09455112
C vs UT	0.000127957	0.000567523	3.794644903
C vs UT	4.70E-09	4.42E-06	16.26663264
C vs UT	2.94E-06	4.76E-05	3.683585736
C vs UT	8.36E-06	8.78E-05	-28.16767318
C vs UT	6.97E-05	0.000367247	-2.590188333
C vs UT	3.58E-07	1.60E-05	7.761969636
C vs UT	5.74E-05	0.000319614	4.556771131
C vs UT	1.03E-07	9.93E-06	6.417876599
C vs UT	1.68E-05	0.00013862	-7.18765724
C vs UT	0.003683149	0.008024956	3.370899443
C vs UT	6.23E-05	0.000339049	5.44395896
C vs UT	2.08E-05	0.000160618	-5.064629157
C vs UT	4.36E-05	0.000262454	2.977892846
C vs UT	7.66E-06	8.40E-05	4.987680409
C vs UT	0.000763357	0.002219333	2.634286356
C vs UT	7.61E-06	8.40E-05	-5.762738185
C vs UT	3.20E-07	1.53E-05	3.763962136
C vs UT	0.016033143	0.028112721	-2.068419569
C vs UT	0.003035219	0.006805646	-2.250999374
C vs UT	0.004646049	0.009730895	-1.772125853
C vs UT	0.00592996	0.012000067	-2.367515901
C vs UT	0.000110646	0.000514043	3.032808825
C vs UT	9.65E-08	9.93E-06	20.17254434
C vs UT	7.45E-08	9.50E-06	22.52601856
C vs UT	2.66E-06	4.55E-05	3.663146284
C vs UT	0.003847384	0.008331269	3.040595359
C vs UT	5.69E-05	0.000318033	-9.489830965
C vs UT	0.002052429	0.004935918	-3.530491911

TC vs UT	0.000585358	0.001636242	79.09663691
TC vs UT	6.34E-06	6.67E-05	-10.12656446
TC vs UT	1.14E-06	2.87E-05	10.48085919
TC vs UT	1.34E-05	0.000106327	5.636122412
TC vs UT	0.000248575	0.00082836	4.209408464
TC vs UT	7.72E-07	2.38E-05	-19.66213736
TC vs UT	0.000103451	0.000427895	21.64756135
TC vs UT	3.73E-06	5.02E-05	55.29982094
TC vs UT	4.98E-06	5.89E-05	-13.65324269
TC vs UT	3.45E-06	4.83E-05	4.934968777
TC vs UT	5.60E-06	6.22E-05	-13.03467933
TC vs UT	4.72E-07	1.92E-05	-4.280304158
TC vs UT	0.000302279	0.000965069	-3.753763393
TC vs UT	3.67E-06	4.99E-05	-7.902012302
TC vs UT	0.0002307	0.000779325	-29.5987257
TC vs UT	6.79E-05	0.000314412	-4.404944617
TC vs UT	0.007446367	0.013754862	2.303851456
TC vs UT	5.35E-06	6.10E-05	-5.639026216
TC vs UT	1.79E-05	0.000128932	2.479420819
TC vs UT	0.006810151	0.012751582	2.834314598
TC vs UT	2.40E-07	1.38E-05	4.642302836
TC vs UT	1.46E-06	3.17E-05	4.415066919
TC vs UT	2.09E-05	0.000142102	-8.46227821
TC vs UT	3.46E-06	4.83E-05	5.309368502
TC vs UT	1.34E-05	0.000106327	5.369380771
TC vs UT	1.44E-07	1.24E-05	14.37517334
TC vs UT	5.52E-06	6.17E-05	4.739012615
TC vs UT	0.0001579	0.000583431	-47.3480315
TC vs UT	4.91E-05	0.000250595	-12.67069915
TC vs UT	0.05613567	0.080797701	2.353343469
TC vs UT	1.20E-06	2.94E-05	-11.36591627
TC vs UT	5.31E-06	6.09E-05	4.199930629
TC vs UT	0.015591137	0.026151369	-4.709970126
TC vs UT	0.000356547	0.001102915	-10.75861804
TC vs UT	0.002999342	0.006352093	-6.04185323
TC vs UT	1.19E-06	2.93E-05	9.812741546
TC vs UT	1.25E-05	0.000101079	35.80601038
TC vs UT	0.00014258	0.000542764	26.31393436
TC vs UT	7.99E-06	7.65E-05	-5.206862999
TC vs UT	9.41E-05	0.000400353	4.235893821
TC vs UT	0.001325774	0.003219913	3.84094954
TC vs UT	6.33E-06	6.67E-05	6.987337443
TC vs UT	2.68E-05	0.000165598	-10.48223923
TC vs UT	0.003316227	0.006897617	-2.420006352
TC vs UT	0.002282903	0.005045384	-4.461154568
TC vs UT	1.56E-07	1.24E-05	7.282063045
TC vs UT	5.01E-05	0.000253886	-8.002137395
TC vs UT	2.21E-05	0.000146699	4.505940276
TC vs UT	5.68E-06	6.27E-05	-8.563120536
TC vs UT	1.92E-06	3.66E-05	5.979284682
TC vs UT	0.003346449	0.006948756	7.582619764
TC vs UT	9.56E-06	8.57E-05	95.75994878
TC vs UT	1.43E-05	0.000110777	7.164639569
TC vs UT	1.22E-07	1.20E-05	-6.568496099
TC vs UT	8.28E-08	1.06E-05	11.77116873
TC vs UT	0.002831844	0.006048265	7.794726586
TC vs UT	9.42E-06	8.52E-05	5.293736044
TC vs UT	8.13E-06	7.72E-05	5.524103499
TC vs UT	8.40E-06	7.84E-05	5.691381644
TC vs UT	4.94E-05	0.000251636	4.969467263
TC vs UT	1.12E-05	9.42E-05	5.628048248
TC vs UT	2.85E-05	0.00017254	5.331991494
TC vs UT	2.44E-05	0.000156125	5.353575983
TC vs UT	1.87E-05	0.000131668	6.932436451
TC vs UT	1.23E-05	0.000100052	6.799999178
TC vs UT	0.001008923	0.002561257	5.691421658
TC vs UT	7.39E-06	7.30E-05	5.165321156
TC vs UT	2.32E-05	0.000151895	5.051428122
TC vs UT	4.76E-07	1.92E-05	17.80735403
TC vs UT	0.001353241	0.003274869	-4.913823452
TC vs UT	2.38E-05	0.000153993	-5.466007116
TC vs UT	4.38E-05	0.000230823	5.51547028
TC vs UT	1.27E-06	3.00E-05	15.22456103
TC vs UT	1.35E-05	0.000106327	-8.056345647
TC vs UT	0.003688432	0.007550782	2.872782677
TC vs UT	8.63E-07	2.53E-05	9.238369449
TC vs UT	0.000555575	0.001572237	3.27315483
TC vs UT	1.12E-05	9.42E-05	3.328478545
TC vs UT	1.05E-05	9.02E-05	6.292683383
TC vs UT	2.07E-09	4.17E-06	22.01303675
TC vs UT	4.12E-07	1.81E-05	5.338379528
TC vs UT	6.45E-06	6.73E-05	-30.00422049
TC vs UT	2.86E-06	4.36E-05	-4.481905793
TC vs UT	1.75E-05	0.000126937	3.411984678
TC vs UT	0.000237368	0.000797479	3.32308567
TC vs UT	1.87E-07	1.28E-05	5.560208586
TC vs UT	7.18E-06	7.16E-05	-8.811041188
TC vs UT	0.00057135	0.001605822	4.648857454
TC vs UT	2.66E-05	0.000164679	6.73294421
TC vs UT	1.09E-06	2.83E-05	-10.7047145
TC vs UT	5.92E-06	6.41E-05	4.062969592
TC vs UT	3.94E-05	0.000214373	3.636291529
TC vs UT	2.90E-05	0.000174102	4.436763784
TC vs UT	5.23E-06	6.08E-05	-6.429113334
TC vs UT	2.12E-07	1.32E-05	4.011875735
TC vs UT	1.85E-05	0.00013109	-8.470916328
TC vs UT	1.51E-05	0.000115358	-6.524201741
TC vs UT	8.03E-06	7.65E-05	-4.366108124
TC vs UT	4.50E-05	0.000235285	-6.782186351
TC vs UT	1.30E-05	0.000104181	4.413962512
TC vs UT	1.32E-06	3.02E-05	8.454059796
TC vs UT	4.36E-07	1.86E-05	11.78420306
TC vs UT	9.07E-07	2.58E-05	4.486583717
TC vs UT	0.000285516	0.00092278	4.905123321
TC vs UT	0.006685945	0.012538054	-2.919954968
TC vs UT	0.000834617	0.00218814	-4.609744636

GNA15	T vs UT	0.116119016	0.239462697	3.258475128
GNAO1	T vs UT	0.182880068	0.327035713	-1.48199897
GNB5	T vs UT	0.180275251	0.323833602	-1.429852272
GNG2	T vs UT	0.039577524	0.1188391	1.4257021 59
GNG4	T vs UT	2.17E-05	0.003427694	506.6197353
GNG7	T vs UT	0.044715196	0.128937878	-2.280982241
GNL2	T vs UT	0.023052375	0.083830775	1.64502403
GNPNAT1	T vs UT	0.02767267	0.094490176	1.454534435
GOLGA2B	T vs UT	0.006708289	0.040917337	-3.410049805
GOLGA6L5	T vs UT	0.02992387	0.099263202	-2.489501087
GOLGA8A	T vs UT	0.009808727	0.050645561	-3.085173809
GOLGA8B	T vs UT	0.037372445	0.114798767	-2.373672562
GOLT1B	T vs UT	0.200227145	0.347065091	1.205021449
GOT1	T vs UT	1.94E-05	0.003333068	2.014522104
GPATCH4	T vs UT	0.002135422	0.023259504	2.668078244
GPC1	T vs UT	0.032720435	0.105227691	-2.028298223
GPN3	T vs UT	0.623481239	0.744410156	1.116415285
GPR155	T vs UT	0.02125382	0.079774613	-2.208279046
GPR160	T vs UT	0.598744877	0.726403198	1.268188103
GPT2	T vs UT	6.81E-05	0.005638775	7.595855516
GRAP	T vs UT	0.633112116	0.752554351	-1.215378032
GRASP	T vs UT	0.00311397	0.027777771	3.542186134
GRPEL1	T vs UT	0.013411994	0.060178271	1.419639822
GSDMB	T vs UT	0.050306203	0.139764643	-1.96888778
GSG2	T vs UT	0.800623298	0.871253518	-1.097907642
GTF2A2	T vs UT	0.001186612	0.017212853	1.729208675
GTF2F2	T vs UT	0.041210062	0.122056224	1.555922781
GTF3C6	T vs UT	0.000649219	0.013026517	2.288305256
GTPBP4	T vs UT	0.005485422	0.036783465	1.925666092
GZMB	T vs UT	0.257562065	0.412597483	1.278710291
GZMH	T vs UT	0.836970323	0.897135471	1.073156352
GZMK	T vs UT	0.340497606	0.499512498	-1.504805535
H2AFY2	T vs UT	0.702390396	0.803905466	-1.237583882
H3F3B	T vs UT	0.000357539	0.010419141	1.37565893
H6PD	T vs UT	0.29076983	0.448373187	-1.284721792
HAPLN3	T vs UT	0.006935304	0.041525208	2.125194547
HAX1	T vs UT	0.010242966	0.051675846	1.244936788
HBEGF	T vs UT	0.123643686	0.249350123	1.753634567
HCG4P7	T vs UT	0.711068538	0.809180902	-1.189997145
HDAC11	T vs UT	0.202909641	0.350479964	-1.548465156
HDAC5	T vs UT	0.605516142	0.730613771	-1.075620475
HELLS	T vs UT	0.940800516	0.964285322	-1.013732049
HERC2P2	T vs UT	0.012480568	0.05799973	-2.678992158
HERPUD1	T vs UT	0.003313038	0.028345336	1.524356649
HHAT	T vs UT	0.973575779	0.984845736	1.02537735
HIC1	T vs UT	0.004599514	0.033588553	5.166856419
HIVEP3	T vs UT	0.001251794	0.017740944	15.0525396
HK2	T vs UT	0.004230485	0.032076767	2.354990788
HLA-DPB1	T vs UT	0.570906812	0.706152229	-1.392427368
HLA-DRA	T vs UT	0.047365495	0.134164152	-2.721422662
HMGB3	T vs UT	0.165108531	0.303939711	1.429145566
HMGCS1	T vs UT	0.000111067	0.006680273	2.156632 88
HMOX1	T vs UT	0.544576137	0.682935697	1.140702285
HNRNPAB	T vs UT	0.013775644	0.061088367	1.650848835
HOMER1	T vs UT	0.001099043	0.016647665	3.518841435
HOXB9	T vs UT	0.000970241	0.015564746	8.656358495
HPCAL4	T vs UT	0.068350192	0.170529719	-2.03385611
HPDL	T vs UT	0.007118328	0.042101297	6.781785122
HPRT1	T vs UT	0.00177384	0.02102485	2.15674632
HS6ST1	T vs UT	0.004200853	0.031992908	1.791851145
HSBP1L1	T vs UT	0.173709277	0.314545242	-1.425529465
HSF5	T vs UT	0.968693189	0.981670668	-1.005144283
HSP90AA1	T vs UT	0.023019436	0.08377035	1.401459007
HSP90AA2	T vs UT	0.034785203	0.109805825	1.358548878
HSP90AA3P	T vs UT	0.971494669	0.98370118	1.003817213
HSP90AB1	T vs UT	7.72E-05	0.00608349	3.159617273
HSP90AB2P	T vs UT	4.34E-05	0.004674185	3.612422417
HSP90AB3P	T vs UT	0.000108718	0.006650528	3.243370029
HSPA13	T vs UT	0.186304879	0.330923536	1.21081286
HSPA2	T vs UT	0.019505188	0.075723858	3.232291665
HSPA5	T vs UT	0.019596093	0.075861799	1.81187388
HSPA9P1	T vs UT	0.003026651	0.027299642	1.847267104
HSPBP1	T vs UT	0.002403951	0.024435875	2.076520916
HSPD1	T vs UT	0.012466081	0.057958815	1.809399791
HSPD1P1	T vs UT	0.002238548	0.02365282	2.325868669
HSPD1P4	T vs UT	0.054004429	0.146474838	1.718086099
HSPE1P2	T vs UT	0.001806494	0.021314904	2.971205753
HSPH1	T vs UT	0.001418458	0.018732706	2.21684694
HUWE1	T vs UT	0.515603032	0.659616662	1.096212649
HYOU1	T vs UT	0.006292919	0.039744271	1.674463923
IARS	T vs UT	0.000133017	0.006920261	2.118402972
ICAM1	T vs UT	0.001281123	0.017924844	4.66691018
ICOS	T vs UT	0.066194944	0.167113772	1.86516998
ID2	T vs UT	0.001924898	0.022218881	3.542893279
ID3	T vs UT	0.00308386	0.027613647	6.926901792
IDH3A	T vs UT	0.007228589	0.042401707	1.550009992
IDI1	T vs UT	0.0157661	0.066338921	1.346752573
IDS	T vs UT	0.086702309	0.197756208	-1.464189043
IDUA	T vs UT	0.052970244	0.144560228	-1.528947454
IER3	T vs UT	4.11E-05	0.004529233	9.113627516
IER5	T vs UT	7.89E-06	0.002542857	3.683950503
IER5L	T vs UT	0.015854163	0.06660369	2.970778856
IFFO1	T vs UT	0.006130865	0.039179097	-2.030692354
IFI44L	T vs UT	0.495417606	0.641110316	-1.179658978
IFI6	T vs UT	0.553891391	0.691663039	-1.107319753
IFIT2	T vs UT	0.975631809	0.985747268	1.09967874
IFNG	T vs UT	0.587175624	0.71895486	1.150048298
IFRD2	T vs UT	0.003143315	0.027824135	1.915654259
IFT140	T vs UT	0.149307402	0.283200814	-1.637010301
IGFBP3	T vs UT	0.16363504	0.30199372	-3.312102102
IGFBP4	T vs UT	0.162742099	0.300795995	2.96700971
IGHV_	T vs UT	0.204148427	0.351999735	-1.621967831
IKBIP	T vs UT	0.005166769	0.035625734	1.628339597
IKZF4	T vs UT	0.081584427	0.190771095	1.53967457
IL12RB2	T vs UT	0.074375385	0.179602135	2.94958076
IL15RA	T vs UT	0.184782728	0.329335126	1.307668214

C vs UT	0.000212108	0.000825977	38.58395986
C vs UT	7.25E-05	0.00037791	-9.40997231
C vs UT	0.000305287	0.001088231	-4.617757446
C vs UT	3.40E-06	5.15E-05	5.117774059
C vs UT	0.067110777	0.097132983	4.247486741
C vs UT	0.000794999	0.00229348	-9.450833558
C vs UT	6.72E-05	0.000358247	3.853096178
C vs UT	2.21E-06	4.10E-05	5.354386994
C vs UT	2.65E-05	0.000188029	-17.87224319
C vs UT	0.000189025	0.000764371	-8.006520848
C vs UT	0.000464082	0.00149559	-6.218482037
C vs UT	0.002655178	0.006093121	-4.039277866
C vs UT	6.45E-06	7.60E-05	4.014363618
C vs UT	2.45E-09	3.69E-06	9.349902102
C vs UT	0.000244215	0.000919161	4.032515635
C vs UT	0.043764002	0.066766908	-1.999614879
C vs UT	8.14E-05	0.000409859	3.945937264
C vs UT	0.001402249	0.003602779	-3.923428091
C vs UT	0.004448965	0.009375447	5.550774337
C vs UT	2.77E-07	1.45E-05	58.66222965
C vs UT	0.007298618	0.014327649	-3.961687772
C vs UT	0.008871113	0.016900622	2.69185551
C vs UT	1.07E-06	2.83E-05	4.416071032
C vs UT	0.003911752	0.008441006	-3.725715009
C vs UT	2.17E-06	4.06E-05	19.6990646
C vs UT	1.72E-06	3.57E-05	4.058551856
C vs UT	7.00E-05	0.000368591	3.905129421
C vs UT	5.86E-06	7.17E-05	4.810747952
C vs UT	4.25E-05	0.000257701	4.146033853
C vs UT	2.89E-08	7.35E-06	245.0503404
C vs UT	1.26E-06	3.10E-05	130.4348409
C vs UT	0.291661432	0.350198214	-1.738954305
C vs UT	0.026697321	0.043553581	-3.589709572
C vs UT	5.00E-09	4.42E-06	4.055457269
C vs UT	0.000596504	0.001827303	-3.227995383
C vs UT	1.61E-06	3.47E-05	14.36442886
C vs UT	4.81E-09	4.42E-06	5.355564412
C vs UT	4.53E-07	1.82E-05	403.5155819
C vs UT	0.009771973	0.018319664	-3.251687591
C vs UT	0.003746444	0.008147029	-3.550749474
C vs UT	4.15E-06	5.85E-05	-4.489697953
C vs UT	0.062831912	0.091547603	1.757329738
C vs UT	0.000236949	0.000897293	-7.960204541
C vs UT	9.70E-07	2.68E-05	3.813917988
C vs UT	0.00048254	0.001545045	-2.668681966
C vs UT	0.016478697	0.028807931	3.016684038
C vs UT	0.953868057	0.961195909	1.048360744
C vs UT	3.98E-07	1.69E-05	27.12098393
C vs UT	0.022778336	0.0378973	-3.608186512
C vs UT	0.864221293	0.88562571	1.200104306
C vs UT	0.000131706	0.000579978	5.401657059
C vs UT	1.83E-07	1.26E-05	6.029827519
C vs UT	4.01E-05	0.000248183	19.67726954
C vs UT	1.94E-05	0.00015292	4.18675148
C vs UT	2.03E-05	0.000158118	8.566838427
C vs UT	3.45E-06	5.18E-05	142.1758213
C vs UT	0.007370059	0.01445753	-4.181831784
C vs UT	0.002001009	0.004833942	13.84305587
C vs UT	3.48E-05	0.000226065	4.002244984
C vs UT	3.71E-05	0.000236706	3.247476414
C vs UT	0.000164267	0.000682878	-5.028191367
C vs UT	0.000604578	0.001846073	4.611471363
C vs UT	2.70E-06	4.58E-05	4.086044436
C vs UT	2.99E-06	4.81E-05	3.954600176
C vs UT	7.98E-05	0.000404511	6.620000634
C vs UT	3.09E-06	4.90E-05	5.979472533
C vs UT	1.14E-06	2.91E-05	7.903040831
C vs UT	3.75E-06	5.51E-05	6.48770311
C vs UT	3.52E-07	1.59E-05	7.914319648
C vs UT	0.000280723	0.001020433	7.801186272
C vs UT	2.23E-05	0.000166991	6.232022289
C vs UT	2.43E-05	0.000176463	3.594207223
C vs UT	0.000215531	0.00083569	2.954464134
C vs UT	1.44E-05	0.000124255	5.714504956
C vs UT	6.09E-06	7.35E-05	7.539878617
C vs UT	9.74E-05	0.000467853	5.939464859
C vs UT	2.95E-05	0.000203117	7.036021035
C vs UT	3.70E-05	0.000236613	3.926567269
C vs UT	2.43E-07	1.37E-05	7.650967409
C vs UT	2.32E-06	4.23E-05	5.140464297
C vs UT	1.98E-07	1.27E-05	5.793656733
C vs UT	5.95E-06	7.23E-05	22.30527453
C vs UT	6.71E-06	7.79E-05	19.70054555
C vs UT	0.00019073	0.000768531	5.535671868
C vs UT	0.061108093	0.08932576	-6.813834016
C vs UT	9.77E-06	9.62E-05	3.387059855
C vs UT	3.75E-07	1.62E-05	4.344145872
C vs UT	0.004414857	0.00932526	-2.293916699
C vs UT	5.14E-05	0.000294858	-4.149389665
C vs UT	8.35E-08	9.70E-06	137.9954901
C vs UT	3.02E-07	1.49E-05	7.348160814
C vs UT	0.000145593	0.000626655	-14.98624703
C vs UT	5.88E-06	7.17E-05	-7.392089221
C vs UT	0.000396029	0.001322959	-3.080310309
C vs UT	0.0002662	0.000976135	-3.533879398
C vs UT	0.005186932	0.010673589	-10.63127846
C vs UT	5.28E-08	8.90E-06	396.9989314
C vs UT	1.43E-05	0.000123833	4.374338954
C vs UT	0.000328291	0.001152243	-8.959546204
C vs UT	0.005773913	0.011713121	-17.95595303
C vs UT	0.009439891	0.017797226	-6.389839466
C vs UT	0.000121629	0.000550747	10.57318328
C vs UT	1.94E-06	3.78E-05	4.676674863
C vs UT	0.002512718	0.005829128	2.624072099
C vs UT	0.000456498	0.001473845	14.07757667
C vs UT	7.96E-06	8.58E-05	5.257070647

TC vs UT	0.004760392	0.009385295	9.668921506
TC vs UT	0.000773761	0.002045004	-4.99318271
TC vs UT	3.42E-05	0.000195879	-8.774876873
TC vs UT	0.00033133	0.001039781	2.412245611
TC vs UT	0.000566355	0.001594425	40.33335828
TC vs UT	0.002796756	0.005984728	-5.781771866
TC vs UT	1.08E-05	9.15E-05	5.508115885
TC vs UT	8.99E-07	2.57E-05	6.456628774
TC vs UT	1.35E-05	0.000106327	-21.73505281
TC vs UT	0.000150001	0.000561993	-9.19033506
TC vs UT	0.002326006	0.005129611	-4.324019713
TC vs UT	0.001461112	0.003494765	-4.711878262
TC vs UT	7.86E-06	7.59E-05	3.803812469
TC vs UT	1.44E-09	3.56E-06	10.83442717
TC vs UT	1.63E-05	0.000121538	7.133553846
TC vs UT	0.001180952	0.002920405	-4.180277945
TC vs UT	4.18E-05	0.00022311	4.288402012
TC vs UT	0.000298014	0.000955163	-6.078064311
TC vs UT	0.045996598	0.067701809	2.740062987
TC vs UT	1.27E-07	1.20E-05	90.18169582
TC vs UT	0.003199173	0.0066914	-4.879861001
TC vs UT	0.001006717	0.002557234	4.206733212
TC vs UT	4.42E-07	1.87E-05	5.193070378
TC vs UT	0.001389353	0.00334977	-4.781150412
TC vs UT	2.98E-06	4.47E-05	16.8154686
TC vs UT	1.64E-06	3.38E-05	4.030834339
TC vs UT	2.40E-05	0.000154887	4.655816487
TC vs UT	2.87E-06	4.37E-05	5.593803938
TC vs UT	5.80E-06	6.35E-05	6.228546121
TC vs UT	2.21E-08	8.31E-06	301.2903863
TC vs UT	6.02E-07	2.15E-05	193.6394111
TC vs UT	0.005295768	0.010282473	-6.86141868
TC vs UT	0.009268657	0.016598772	-4.696901054
TC vs UT	5.28E-09	5.92E-06	4.019521236
TC vs UT	0.000167282	0.000610051	-4.201224346
TC vs UT	2.94E-06	4.43E-05	11.85884677
TC vs UT	4.88E-09	5.92E-06	5.334952742
TC vs UT	4.27E-06	5.36E-05	78.96088989
TC vs UT	0.002655141	0.005729416	-4.793921538
TC vs UT	0.000667022	0.00181674	-6.107328318
TC vs UT	1.81E-05	0.000129296	-3.417271244
TC vs UT	0.000226031	0.000767363	4.680292426
TC vs UT	0.000515993	0.001479235	-6.574461232
TC vs UT	5.86E-07	2.14E-05	4.168029962
TC vs UT	2.50E-05	0.000158803	-4.453043917
TC vs UT	0.045223164	0.066698758	2.381774449
TC vs UT	0.054896076	0.079175181	3.166918708
TC vs UT	3.69E-07	1.70E-05	28.04109834
TC vs UT	0.002022769	0.004559869	-6.659000284
TC vs UT	0.004075527	0.00822039	-4.662014059
TC vs UT	4.52E-05	0.000236287	6.981327659
TC vs UT	7.59E-07	2.36E-05	4.514260056
TC vs UT	2.00E-05	0.000138562	26.28850451
TC vs UT	2.04E-06	3.74E-05	6.682301792
TC vs UT	3.76E-06	5.03E-05	14.44327908
TC vs UT	1.67E-06	3.41E-05	239.771107
TC vs UT	0.404011511	0.460568547	-1.35883788
TC vs UT	0.000139805	0.000535674	42.80821106
TC vs UT	1.51E-05	0.000115358	4.651158359
TC vs UT	8.60E-06	7.97E-05	4.195955679
TC vs UT	0.000255723	0.000844872	-4.846709259
TC vs UT	4.96E-05	0.000252142	8.829657976
TC vs UT	1.13E-06	2.84E-05	4.784253843
TC vs UT	1.25E-06	2.99E-05	4.63588301
TC vs UT	0.000143402	0.000544883	5.428118709
TC vs UT	6.11E-07	2.16E-05	8.853257967
TC vs UT	4.18E-07	1.82E-05	10.50943781
TC vs UT	9.01E-07	2.57E-05	9.250049327
TC vs UT	3.36E-07	1.64E-05	7.937482022
TC vs UT	0.000274125	0.000893224	7.854566568
TC vs UT	1.62E-05	0.000120973	6.673629371
TC vs UT	5.46E-06	6.14E-05	4.675696559
TC vs UT	2.71E-05	0.000166548	4.135841217
TC vs UT	2.00E-06	3.72E-05	9.09734799
TC vs UT	1.03E-06	2.77E-05	12.17814956
TC vs UT	1.51E-05	0.000115518	9.119227723
TC vs UT	1.43E-05	0.000111019	8.508856756
TC vs UT	6.08E-06	6.51E-05	5.591592356
TC vs UT	4.58E-07	1.88E-05	6.413486373
TC vs UT	4.28E-05	0.000226686	8.153547528
TC vs UT	0.365073824	0.421042022	-2.90944858
TC vs UT	1.66E-06	3.40E-05	4.541856209
TC vs UT	7.30E-06	7.25E-05	2.684945206
TC vs UT	0.00015565	0.000577541	-4.143901236
TC vs UT	0.000149289	0.000560514	-3.480808748
TC vs UT	9.67E-08	1.14E-05	125.527434
TC vs UT	1.50E-06	3.20E-05	5.138937043
TC vs UT	0.000627303	0.001730345	-9.800634999
TC vs UT	2.70E-06	4.28E-05	-8.923125412
TC vs UT	2.32E-05	0.000151895	-5.39211403
TC vs UT	5.19E-05	0.000259626	-4.849319411
TC vs UT	0.004484173	0.008924915	-7.22247999
TC vs UT	7.89E-08	1.05E-05	282.2466428
TC vs UT	1.11E-06	2.83E-05	7.583822358
TC vs UT	0.001836673	0.004212458	-5.533902841
TC vs UT	0.001433858	0.003440256	-25.78599634
TC vs UT	0.006991387	0.013031566	-8.717092353
TC vs UT	0.000626948	0.001729871	6.24873562
TC vs UT	1.84E-05	0.000130938	3.147753763
TC vs UT	0.000153093	0.000569767	4.386143675
TC vs UT	0.000183894	0.000652119	20.37235025
TC vs UT	1.63E-06	3.37E-05	7.654260732

IL16	T vs UT	0.47777779	0.62570368	1.23655626
IL17F	T vs UT	0.607565957	0.732290288	1.095071957
IL17RE	T vs UT	0.178025131	0.320773033	1.827839148
IL21R	T vs UT	0.001310558	0.018136002	7.443102157
IL22	T vs UT	0.711869516	0.80949471	1.676160161
IL23A	T vs UT	0.056321871	0.150281037	1.582680585
IL23R	T vs UT	0.000164802	0.00763911	7.311252525
IL26	T vs UT	0.171444876	0.311603084	1.435017225
IL2RA	T vs UT	0.002003661	0.022706933	14.55496791
IL6ST	T vs UT	6.60E-05	0.005575504	1.342100901
IL7R	T vs UT	0.100013442	0.217336225	-1.866021953
ILF2	T vs UT	8.09E-05	0.006091408	2.204391032
INF2	T vs UT	0.282241519	0.438899978	1.204269605
INO80C	T vs UT	0.072321249	0.176578415	1.46219626
INPP4A	T vs UT	0.000916187	0.015183577	-1.603012233
INSIG1	T vs UT	0.767033846	0.847417178	-1.048842103
IQCG	T vs UT	0.050163103	0.139509116	2.387815411
IQSEC2	T vs UT	0.000256599	0.008937467	-2.456907616
IRAK2	T vs UT	0.012059916	0.056950886	2.350734306
IRF4	T vs UT	1.70E-06	0.002130399	45.56260872
IRF8	T vs UT	0.000421391	0.010961511	5.999572707
IRS2	T vs UT	0.021227442	0.079772741	-1.570196821
ISG20	T vs UT	0.745138896	0.833036774	-1.128829219
ISOC2	T vs UT	0.012939794	0.058895406	2.257485252
ITK	T vs UT	0.009712532	0.050444619	1.993507997
ITM2B	T vs UT	0.534925345	0.675228246	-1.10667228
ITM2C	T vs UT	0.504951376	0.650512012	-1.368651207
JAKMIP1	T vs UT	0.004336284	0.032520389	3.10562337
JMJD4	T vs UT	0.003290662	0.028313926	2.220824837
JMJD7-PLA2G	T vs UT	0.000298715	0.009366328	-2.717047313
JUN	T vs UT	0.263226894	0.41829973	1.42628985
JUNB	T vs UT	1.09E-05	0.002542857	3.395019969
KBTBD3	T vs UT	0.533565039	0.674325386	-1.105360565
KBTBD8	T vs UT	0.042553222	0.124834934	1.6407683
KCNK5	T vs UT	0.012990797	0.059004248	11.11352519
KCNN4	T vs UT	0.101615445	0.219348465	2.770151387
KCNQ5	T vs UT	0.016946643	0.069601743	4.365546577
KCTD15	T vs UT	0.115656266	0.238827961	1.723575211
KIAA0020	T vs UT	0.009607789	0.050078297	2.204081216
KIAA0513	T vs UT	0.560772951	0.697562457	-1.134880943
KIAA0664	T vs UT	0.072307041	0.176578415	1.591854899
KIAA1109	T vs UT	0.013214805	0.059619793	-1.696214151
KIAA1147	T vs UT	0.475778382	0.623880405	-1.138846687
KIAA1324	T vs UT	0.43234173	0.585477599	1.341931211
KIAA1609	T vs UT	0.696775118	0.799890167	-1.066631321
KIF3B	T vs UT	0.001771177	0.02102485	2.021844252
KIF3C	T vs UT	0.156490426	0.292441187	-1.400107448
KIFC2	T vs UT	0.112882228	0.234671703	-2.309180328
KIT	T vs UT	0.881230896	0.926282007	1.077894162
KLF10	T vs UT	0.004475172	0.033064267	4.774295752
KLF12	T vs UT	0.129687387	0.257536718	-1.244220479
KLF2	T vs UT	0.001447908	0.018883159	-3.860041195
KLHL24	T vs UT	0.090895226	0.203770571	-1.311103703
KLHL8	T vs UT	0.081616547	0.190810017	1.308348733
KLRB1	T vs UT	0.162682805	0.300731483	1.48572885
KLRG1	T vs UT	0.006206469	0.039425945	2.288420892
KPNA2	T vs UT	3.71E-05	0.004443589	3.619101098
LAG3	T vs UT	0.017948661	0.072098046	2.799561757
LAIR1	T vs UT	0.188954851	0.333592972	-1.998958695
LAPTM5	T vs UT	0.711544543	0.809370308	1.099390536
LARP4	T vs UT	0.010801855	0.053645751	1.521146127
LASS6	T vs UT	0.008113612	0.045144783	1.821597664
LAX1	T vs UT	0.004790632	0.034224318	1.705972189
LAYN	T vs UT	0.00619479	0.039372043	7.560189827
LDHA	T vs UT	0.005215287	0.035744572	1.937359727
LDHAL3	T vs UT	0.065160675	0.165213062	1.641772524
LDHAL4	T vs UT	0.018844718	0.07407949	1.784910342
LDHAL7	T vs UT	0.133582553	0.262607283	1.71203346
LDLR	T vs UT	0.088786781	0.200887156	1.233569725
LDLRAP1	T vs UT	0.043407288	0.126587478	-2.384224463
LEPREL2	T vs UT	0.062469644	0.160569253	-2.142960253
LGALS1	T vs UT	0.365022484	0.52388863	1.904385622
LGALS3	T vs UT	0.996907576	0.997670046	1.10390683
LGALS3BP	T vs UT	0.624383441	0.745161081	-1.319194432
LIF	T vs UT	0.003851199	0.030675247	7.690136901
LINGO4	T vs UT	0.00029639	0.009366328	17.58499406
LLGL2	T vs UT	0.006183703	0.039342132	-2.234286747
LMAN1	T vs UT	0.147243736	0.280648518	1.354656032
LMNA	T vs UT	0.287960004	0.445042222	1.295285036
LMNB1	T vs UT	0.907802541	0.944654007	-1.031736061
LMTK3	T vs UT	0.075357287	0.180778482	-1.811850215
LOC100049716	T vs UT	0.315884254	0.473826381	-1.499004197
LOC100127952	T vs UT	0.482267031	0.629613612	1.191100763
LOC100128887	T vs UT	0.361290092	0.520227354	1.344465729
LOC100129009	T vs UT	0.010105932	0.051278246	2.069340153
LOC100129096	T vs UT	0.702171171	0.803905466	1.103171467
LOC100129196	T vs UT	0.392475593	0.550287021	-1.442766458
LOC100129387	T vs UT	0.058098161	0.153531396	-1.796514676
LOC100129550	T vs UT	0.037841598	0.115737979	-1.980967498
LOC100129726	T vs UT	0.712729836	0.809881873	1.134169688
LOC100130003	T vs UT	1.29E-05	0.002739231	2.963952219
LOC100130139	T vs UT	0.216880042	0.366470991	1.323670133
LOC100130289	T vs UT	0.003134475	0.027824135	1.924925761
LOC100131564	T vs UT	0.134634628	0.26375039	-1.598501752
LOC100132062	T vs UT	0.043460752	0.126655684	-1.989018264
LOC100132715	T vs UT	3.61E-05	0.004409658	2.582806512
LOC100132840	T vs UT	0.029528076	0.098506811	1.796481894
LOC100132984	T vs UT	0.005544865	0.036864318	-3.299949354
LOC100133331	T vs UT	0.055210263	0.148666204	-2.025917617
LOC100287278	T vs UT	0.055479914	0.148977082	-1.963591274
LOC100287554	T vs UT	0.000260669	0.008977807	2.331279657
LOC100288178	T vs UT	0.00671498	0.040927187	4.988016219
LOC100289019	T vs UT	0.007039572	0.041866101	-3.682345724
LOC115110	T vs UT	0.415130711	0.570440396	1.572221237
LOC150417	T vs UT	0.002927922	0.026861074	2.125828581
LOC152594	T vs UT	0.028092767	0.095265076	1.984030344

C vs UT	0.00276957	0.006314497	-3.04018214
C vs UT	2.49E-06	4.40E-05	113.9114594
C vs UT	5.03E-05	0.000290904	-14.89367056
C vs UT	0.007627011	0.014872851	3.849119148
C vs UT	0.003942871	0.008496259	565.4577743
C vs UT	3.55E-06	5.28E-05	10.6687585
C vs UT	5.48E-05	0.000310029	9.036498359
C vs UT	1.20E-08	5.10E-06	217.6893767
C vs UT	8.29E-06	8.77E-05	176.6491094
C vs UT	3.19E-10	1.31E-06	4.215565319
C vs UT	0.000146204	0.000628115	-18.38278907
C vs UT	4.38E-07	1.78E-05	4.911630934
C vs UT	5.45E-05	0.000308724	4.564930474
C vs UT	6.08E-05	0.000333649	4.056228143
C vs UT	8.29E-07	2.54E-05	-3.52706363
C vs UT	7.97E-06	8.58E-05	9.523771388
C vs UT	5.97E-05	0.000329312	12.13372325
C vs UT	0.000763188	0.002219333	-2.192640642
C vs UT	1.44E-05	0.000124336	10.85608937
C vs UT	3.32E-07	1.55E-05	98.97687005
C vs UT	1.11E-07	9.93E-06	227.0822813
C vs UT	7.91E-06	8.56E-05	-5.275151243
C vs UT	0.011908502	0.021723899	-2.874939696
C vs UT	0.001637594	0.00410147	3.37048417
C vs UT	4.97E-05	0.00028808	4.731361653
C vs UT	0.000564751	0.001750033	-2.519236093
C vs UT	0.050971538	0.076188515	-2.598144614
C vs UT	6.43E-06	7.60E-05	15.47621739
C vs UT	6.11E-05	0.000334475	4.475312657
C vs UT	5.14E-07	1.97E-05	-10.58134979
C vs UT	0.007573751	0.014790046	5.818972339
C vs UT	4.59E-07	1.83E-05	6.41366769
C vs UT	1.40E-05	0.000121796	-3.950976817
C vs UT	3.37E-06	5.14E-05	10.7984349
C vs UT	0.072632103	0.103989065	4.809905213
C vs UT	0.001889883	0.004617051	11.3687503
C vs UT	0.043221624	0.066012959	3.828298412
C vs UT	0.004679689	0.009788052	3.425823937
C vs UT	3.86E-05	0.000242784	6.741712598
C vs UT	3.09E-05	0.000209348	-4.118907435
C vs UT	0.002929134	0.006618328	2.573601313
C vs UT	0.000125777	0.000560271	-3.091767408
C vs UT	3.33E-06	5.09E-05	-7.288834375
C vs UT	0.000188501	0.000763038	-7.511006134
C vs UT	0.037762376	0.058729831	-1.88684402
C vs UT	1.35E-06	3.18E-05	6.484545236
C vs UT	8.39E-05	0.000418447	-6.218867063
C vs UT	0.001348784	0.003482828	-7.43322235
C vs UT	0.00020368	0.000803897	-66.40495162
C vs UT	0.010632596	0.019726599	3.426561805
C vs UT	5.66E-05	0.000316808	-2.696313871
C vs UT	5.26E-06	6.74E-05	-28.62895837
C vs UT	9.12E-06	9.26E-05	-4.438549996
C vs UT	1.77E-05	0.000143686	3.353440097
C vs UT	0.002745982	0.00626767	-2.830201255
C vs UT	0.000251699	0.00093869	-3.962559647
C vs UT	6.75E-07	2.32E-05	9.016254658
C vs UT	1.24E-05	0.000112609	17.70845655
C vs UT	0.28845159	0.346952308	-1.644748347
C vs UT	8.38E-05	0.000418065	-4.150853105
C vs UT	1.50E-06	3.38E-05	4.856590577
C vs UT	1.29E-05	0.000116352	5.282329867
C vs UT	2.12E-06	4.00E-05	-5.278176819
C vs UT	0.080929146	0.114249641	-2.370000524
C vs UT	3.11E-06	4.90E-05	7.439462914
C vs UT	0.00012287	0.000554376	5.947830002
C vs UT	1.50E-05	0.00012819	6.576664509
C vs UT	0.000490941	0.001566433	5.386773012
C vs UT	7.48E-08	9.50E-06	6.838572034
C vs UT	0.000433764	0.001414148	-13.38275543
C vs UT	0.001051443	0.00285746	-6.182790368
C vs UT	0.003745768	0.008146996	15.94827035
C vs UT	0.003972086	0.00855174	4.1686676
C vs UT	0.013833635	0.024702204	-5.923795773
C vs UT	0.000151643	0.000643414	40.5321405
C vs UT	0.850035127	0.874228585	1.088764705
C vs UT	0.001113345	0.00299532	-2.818069655
C vs UT	9.38E-06	9.42E-05	6.722247492
C vs UT	0.012606401	0.022828157	2.248730102
C vs UT	0.000152158	0.000644711	4.044187634
C vs UT	1.72E-05	0.00014051	-13.11096488
C vs UT	0.007286438	0.014307303	-3.550158076
C vs UT	0.000149283	0.00063515	5.3779746
C vs UT	0.014074115	0.025062658	3.265909825
C vs UT	0.000125899	0.00056041	4.57718136
C vs UT	6.02E-07	2.16E-05	11.48830368
C vs UT	0.001379592	0.003548262	-6.361625897
C vs UT	4.71E-05	0.000276802	-6.588163078
C vs UT	1.03E-05	9.97E-05	-13.9953275
C vs UT	3.85E-05	0.000242239	-11.19325215
C vs UT	2.87E-07	1.45E-05	5.95249941
C vs UT	0.000177959	0.000728983	3.804351943
C vs UT	1.73E-05	0.000141842	4.137793244
C vs UT	0.000201408	0.000798508	-5.232177857
C vs UT	0.001551532	0.003915348	-3.961687344
C vs UT	4.97E-07	1.92E-05	5.324764864
C vs UT	0.000775334	0.002244627	2.972235191
C vs UT	0.001803192	0.004439568	-4.609670591
C vs UT	0.004208859	0.008979967	-3.68844618
C vs UT	0.024978455	0.041075534	-2.337479374
C vs UT	1.77E-06	3.58E-05	5.348337709
C vs UT	0.000558698	0.001734326	10.15889882
C vs UT	0.000146433	0.000628663	-9.544963899
C vs UT	0.003080515	0.006887413	-7.276040681
C vs UT	5.11E-06	6.65E-05	6.197223965
C vs UT	0.007670677	0.014932799	2.625381152

TC vs UT	4.39E-05	0.000231195	-7.999735455
TC vs UT	3.74E-07	1.71E-05	409.8282962
TC vs UT	4.06E-05	0.000219134	-14.69513866
TC vs UT	0.002720691	0.005841218	5.085782574
TC vs UT	0.01648282	0.027452812	187.5501584
TC vs UT	2.76E-07	1.53E-05	25.75219426
TC vs UT	1.39E-05	0.00010854	14.30730749
TC vs UT	3.17E-08	8.31E-06	113.8155214
TC vs UT	4.04E-06	5.23E-05	295.6105967
TC vs UT	6.74E-11	4.15E-07	5.746563669
TC vs UT	3.27E-05	0.00018921	-37.42944664
TC vs UT	2.04E-07	1.30E-05	5.70587776
TC vs UT	0.000138135	0.000530428	3.756172463
TC vs UT	0.00012182	0.000483905	3.461415619
TC vs UT	3.05E-07	1.61E-05	-4.204276445
TC vs UT	3.95E-05	0.000214707	6.500415456
TC vs UT	2.25E-05	0.000148645	17.2225763
TC vs UT	4.03E-06	5.23E-05	-5.151178884
TC vs UT	0.000337178	0.001053309	4.805616567
TC vs UT	9.92E-08	1.15E-05	210.3213393
TC vs UT	1.14E-07	1.19E-05	229.5736977
TC vs UT	3.76E-06	5.03E-05	-6.25237318
TC vs UT	0.000260407	0.000858507	-6.905004906
TC vs UT	0.000406471	0.001223582	4.185528097
TC vs UT	9.98E-05	0.000416578	4.077871898
TC vs UT	2.69E-05	0.000165754	-4.063614462
TC vs UT	0.00135462	0.00327692	-7.528105228
TC vs UT	1.26E-05	0.000101575	12.31527341
TC vs UT	3.86E-05	0.000211344	4.91796099
TC vs UT	2.39E-07	1.38E-05	-13.47869041
TC vs UT	0.00759372	0.013991418	6.130059378
TC vs UT	4.99E-07	1.97E-05	6.221013108
TC vs UT	1.32E-05	0.000105085	-4.031004314
TC vs UT	3.72E-06	5.02E-05	10.48375458
TC vs UT	0.003061637	0.006458508	18.87789669
TC vs UT	0.001172289	0.002903058	13.26802194
TC vs UT	0.000427444	0.001272426	17.03825671
TC vs UT	9.44E-05	0.000401395	11.03764578
TC vs UT	6.52E-06	6.75E-05	10.62532479
TC vs UT	2.22E-05	0.000147266	-4.377572716
TC vs UT	0.000123484	0.000488627	4.383890008
TC vs UT	2.84E-05	0.000172415	-4.179080427
TC vs UT	1.43E-05	0.000110741	-5.141587776
TC vs UT	4.13E-05	0.00022151	-11.59689865
TC vs UT	0.000656165	0.001793111	-4.33712529
TC vs UT	1.68E-06	3.41E-05	6.142768822
TC vs UT	1.56E-05	0.000117802	-10.45852773
TC vs UT	0.000879858	0.002283914	-8.778707549
TC vs UT	0.000102077	0.000423775	-80.57859957
TC vs UT	0.007138936	0.01327248	3.942988384
TC vs UT	4.78E-06	5.74E-05	-4.097861991
TC vs UT	2.71E-06	4.28E-05	-39.38732494
TC vs UT	8.21E-06	7.74E-05	-4.538967521
TC vs UT	5.53E-06	6.17E-05	4.037076116
TC vs UT	0.000168309	0.000612926	-4.886243965
TC vs UT	0.000101569	0.000422235	-4.680305275
TC vs UT	1.49E-07	1.24E-05	14.27104085
TC vs UT	3.64E-06	4.97E-05	29.57758861
TC vs UT	0.001058652	0.002664458	-8.90190195
TC vs UT	3.96E-06	5.20E-05	-8.572884192
TC vs UT	2.38E-07	1.38E-05	7.334464387
TC vs UT	1.68E-06	3.41E-05	8.391867005
TC vs UT	2.99E-06	4.47E-05	-4.909363862
TC vs UT	0.216293295	0.266104204	-1.548917216
TC vs UT	5.18E-05	0.000259461	3.948940971
TC vs UT	0.00088457	0.002293261	3.691867749
TC vs UT	0.00029836	0.000956024	3.45075186
TC vs UT	0.005852163	0.011216722	3.041202726
TC vs UT	6.68E-05	0.000311385	2.190496718
TC vs UT	0.000139036	0.000533057	-22.04255086
TC vs UT	0.001126951	0.002807854	-6.089010469
TC vs UT	0.33108375	0.386248712	2.864027627
TC vs UT	0.038909731	0.058435687	2.486527437
TC vs UT	0.001878486	0.004291594	-17.63264413
TC vs UT	2.62E-06	4.23E-05	428.4835622
TC vs UT	0.209103411	0.258341188	2.222849458
TC vs UT	0.000102073	0.000423775	-4.702269574
TC vs UT	1.55E-05	0.000117103	5.799943992
TC vs UT	6.02E-05	0.000288569	7.661420791
TC vs UT	8.51E-05	0.000369879	4.476349809
TC vs UT	7.71E-06	7.51E-05	-18.87687784
TC vs UT	0.001783095	0.00411022	-5.68423358
TC vs UT	0.000336811	0.001052694	4.493713179
TC vs UT	0.000700248	0.001890117	7.46969059
TC vs UT	5.65E-05	0.000275777	5.557675923
TC vs UT	8.96E-06	8.20E-05	5.522602939
TC vs UT	0.001310809	0.003192233	-5.957200662
TC vs UT	0.0012254	0.003012279	-3.303973186
TC vs UT	1.98E-05	0.000137353	-11.58482561
TC vs UT	9.62E-05	0.000406501	-8.303567809
TC vs UT	2.34E-07	1.38E-05	6.194778392
TC vs UT	7.96E-05	0.000351733	4.308447141
TC vs UT	1.35E-05	0.000106327	4.273338304
TC vs UT	0.000145672	0.000551132	-5.953560424
TC vs UT	0.000952246	0.002444389	-4.633495496
TC vs UT	2.00E-07	1.30E-05	6.544840253
TC vs UT	3.68E-05	0.000204687	5.470465825
TC vs UT	0.001027013	0.00260022	-5.269275532
TC vs UT	0.003306914	0.006880569	-4.07367508
TC vs UT	0.00019482	0.000683785	-7.431983491
TC vs UT	5.19E-07	1.99E-05	7.087273237
TC vs UT	0.001530834	0.003631239	7.245832806
TC vs UT	0.000776655	0.002051007	-6.520520117
TC vs UT	0.016565633	0.027579564	-4.436374085
TC vs UT	5.28E-06	6.09E-05	6.084343935
TC vs UT	0.000332789	0.001042456	4.536139187

LOC153684	T vs UT	0.516528568	0.660252668	-1.35635844
LOC283014	T vs UT	0.003991804	0.031205613	2.485471176
LOC283070	T vs UT	0.017072159	0.06986383	-1.757183289
LOC283174	T vs UT	0.025727297	0.08978703	-1.797111429
LOC285591	T vs UT	0.000295836	0.009366328	3.438400202
LOC339192	T vs UT	0.089427602	0.201598391	2.604128062
LOC386597	T vs UT	0.997685611	0.99825234	-1.154976945
LOC387895	T vs UT	0.020746119	0.078605068	1.753487412
LOC388692	T vs UT	0.303700569	0.461388371	-1.392494421
LOC389333	T vs UT	0.699181601	0.801497688	1.345336155
LOC389465	T vs UT	0.043218918	0.126187369	1.712337192
LOC390595	T vs UT	0.005017791	0.035150403	-2.719210674
LOC399942	T vs UT	3.00E-05	0.003975318	2.219789193
LOC400685	T vs UT	0.427557046	0.581360651	-1.285180814
LOC400986	T vs UT	0.064144027	0.163374479	-2.713064812
LOC401010	T vs UT	0.008204697	0.045507833	1.627874623
LOC402152	T vs UT	0.011060299	0.054310428	2.004116642
LOC440104	T vs UT	0.703960024	0.805016581	-1.236744811
LOC442112	T vs UT	0.001446262	0.018883159	1.920191146
LOC541471	T vs UT	0.07091479	0.174491989	2.318898493
LOC613037	T vs UT	0.259998412	0.414924937	-1.765626699
LOC642590	T vs UT	0.000259701	0.008977807	3.084401869
LOC642852	T vs UT	0.156172629	0.292157262	-1.820130547
LOC642969	T vs UT	0.000143314	0.007212472	2.190511504
LOC643276	T vs UT	0.012310067	0.057453564	1.802247106
LOC643576	T vs UT	0.000424967	0.010974543	2.312014551
LOC643634	T vs UT	0.195306874	0.341627714	1.326027866
LOC643689	T vs UT	3.20E-06	0.002448332	2.73367273
LOC643733	T vs UT	0.055482787	0.148977082	-2.275027396
LOC644037	T vs UT	5.66E-06	0.002448332	4.287058869
LOC644422	T vs UT	0.020870691	0.07874407	1.718028925
LOC644563	T vs UT	9.86E-05	0.006595668	2.810399836
LOC644584	T vs UT	0.229403487	0.380197121	1.506531246
LOC644936	T vs UT	0.014024252	0.06160279	2.436809913
LOC645233	T vs UT	0.163972874	0.302382555	1.283584949
LOC645652	T vs UT	0.796022256	0.868408903	-1.05046947
LOC646347	T vs UT	0.00064059	0.012969584	3.539574241
LOC652276	T vs UT	0.006937707	0.041525208	1.75536525
LOC653080	T vs UT	0.08068474	0.189385655	-2.342742349
LOC653503	T vs UT	0.077490636	0.184175563	1.235332943
LOC653698	T vs UT	0.155721829	0.291535097	1.356504353
LOC678655	T vs UT	0.91308147	0.947588126	1.011583299
LOC727896	T vs UT	0.001374508	0.018624545	1.797869313
LOC727919	T vs UT	0.012146027	0.057164624	2.000570813
LOC728324	T vs UT	0.004415618	0.032857316	1.774264917
LOC728468	T vs UT	0.276984861	0.433586457	-1.731381138
LOC728535	T vs UT	0.044263372	0.12808434	-2.057689403
LOC729200	T vs UT	0.303909701	0.461635008	1.389503047
LOC729342	T vs UT	0.878981595	0.925046352	1.123357632
LOC729678	T vs UT	0.207303005	0.355747536	-1.279843799
LOC729683	T vs UT	0.671983468	0.78084593	1.080354653
LONP1	T vs UT	0.302101583	0.459865743	1.221312223
LONRF1	T vs UT	0.01914264	0.074837076	1.449650583
LPCAT4	T vs UT	0.037782094	0.115625025	-2.003063996
LRFN1	T vs UT	0.009735734	0.050501305	-1.779682821
LRMP	T vs UT	0.803987899	0.873769156	1.075837593
LRP11	T vs UT	0.159520562	0.296664937	-1.831206165
LRP8	T vs UT	0.938353082	0.962793834	1.006397006
LRRC37B	T vs UT	0.007130668	0.042101297	-2.053242454
LRRC45	T vs UT	0.128114388	0.255524167	-1.776043633
LRRC59	T vs UT	0.008717868	0.047230067	1.675197881
LRRC8B	T vs UT	0.004520291	0.033235053	2.642530826
LSP1	T vs UT	0.666092979	0.776703612	1.087336064
LSS	T vs UT	0.006561363	0.040511572	-1.848651282
LTA	T vs UT	0.000233028	0.008576827	3.522403954
LTB4R	T vs UT	0.000145321	0.007271939	-2.781710345
LTBP3	T vs UT	0.052526296	0.14392205	-1.372714657
LTK	T vs UT	0.002713221	0.025890935	-3.815261744
LY9	T vs UT	0.479069329	0.626811949	1.282579606
LYN	T vs UT	0.076019276	0.181791635	1.729270221
LYPLA1	T vs UT	0.031976259	0.103754545	1.620521327
LYRM1	T vs UT	0.036680546	0.113593631	1.26668461
LYRM4	T vs UT	2.30E-06	0.002130399	3.33032729
LZTS2	T vs UT	0.285909564	0.442816848	-1.2089993
MAFF	T vs UT	0.002060303	0.02288607	4.446222171
MAFG	T vs UT	0.103596789	0.221996062	1.160815818
MAGEE1	T vs UT	0.050744199	0.140538178	-1.566825562
MAGOHB	T vs UT	0.060610135	0.157430581	1.716592557
MAK16	T vs UT	0.006675008	0.040845087	1.75082571
MALAT1	T vs UT	0.034109128	0.108414193	-2.624868177
MAMLD1	T vs UT	0.05876591	0.154580388	2.387424923
MAN1B1	T vs UT	0.070582235	0.17395142	-1.388816317
MANBA	T vs UT	0.056462055	0.150492248	-1.44781242
MANF	T vs UT	0.017542484	0.071034099	1.507124826
MAP2K6	T vs UT	0.042658357	0.125001033	-2.216834812
MAP3K12	T vs UT	0.027365725	0.093831867	-1.624002262
MAP3K8	T vs UT	0.149173853	0.283046158	1.708747734
MAP4K1	T vs UT	0.019575305	0.075852769	-1.379872638
MAPK11	T vs UT	0.000222103	0.008416902	3.992262304
MAPK13	T vs UT	0.029032751	0.09726035	1.761793958
MAPK6	T vs UT	0.189819092	0.334591767	1.291546708
MAPK8IP3	T vs UT	0.008434056	0.046266346	-2.747320123
MARS	T vs UT	0.000470924	0.01143047	2.335405731
MBOAT1	T vs UT	0.853730444	0.90831792	-1.053789419
MCART6	T vs UT	0.046942201	0.133209975	-1.785212135
MCM4	T vs UT	0.123375236	0.249134729	1.230123243
MCM6	T vs UT	0.000245633	0.00882988	1.770335036
MDFIC	T vs UT	0.006878967	0.041334144	2.183893806
MDGA1	T vs UT	0.071828117	0.176001724	-2.674837639
MEGF6	T vs UT	0.106476425	0.225615109	-3.461537061
METRNL	T vs UT	0.736183965	0.825871011	1.0200263
METTL1	T vs UT	3.86E-05	0.004529233	6.562561802
MFGE8	T vs UT	0.049425244	0.138408645	-2.012645207
MFSD2A	T vs UT	0.000785799	0.014094902	31.76934645
MGC23284	T vs UT	0.058981094	0.154831694	-1.613030358
MGC39372	T vs UT	0.09890392	0.215532933	-1.902381208

C vs UT	0.005326625	0.010922549	-5.723357296
C vs UT	1.04E-05	9.97E-05	10.13821853
C vs UT	3.95E-05	0.000245948	-4.56241973
C vs UT	2.52E-06	4.42E-05	-12.00551477
C vs UT	0.000321256	0.001133681	3.566835432
C vs UT	0.001648732	0.004125942	-8.092360902
C vs UT	0.005560543	0.011330607	12.24119591
C vs UT	7.55E-05	0.000389866	-4.001295937
C vs UT	0.00021741	0.000841226	-6.314654704
C vs UT	0.001331612	0.003448597	5.706028143
C vs UT	0.000573527	0.001769225	3.527297344
C vs UT	0.000156084	0.000657505	-5.781891563
C vs UT	1.08E-08	5.10E-06	9.353755616
C vs UT	0.000710907	0.002098512	-8.026416231
C vs UT	0.009538133	0.017944032	-5.394554369
C vs UT	4.84E-05	0.000282921	3.109428819
C vs UT	0.000381625	0.00128844	3.366279006
C vs UT	0.003171437	0.007073772	-4.366093826
C vs UT	8.71E-06	9.03E-05	3.976734011
C vs UT	0.009287901	0.017567085	3.640767743
C vs UT	0.009245953	0.01749311	-4.712326114
C vs UT	1.35E-06	3.19E-05	10.28971131
C vs UT	0.002163366	0.005147237	-5.638213655
C vs UT	2.76E-07	1.45E-05	5.923148067
C vs UT	6.64E-05	0.00035627	4.013149355
C vs UT	1.58E-06	3.45E-05	5.910136668
C vs UT	9.33E-07	2.64E-05	10.95157269
C vs UT	1.08E-07	9.93E-06	4.714575236
C vs UT	0.000171605	0.000708605	-9.927969517
C vs UT	3.43E-05	0.000224575	3.106666689
C vs UT	0.000106636	0.000498225	3.619372113
C vs UT	7.98E-06	8.58E-05	4.308539616
C vs UT	0.001566682	0.003950346	4.000906681
C vs UT	0.000288031	0.001042083	6.639940138
C vs UT	5.12E-05	0.000294388	3.65987679
C vs UT	2.13E-05	0.000163169	4.129909533
C vs UT	3.76E-06	5.51E-05	12.65701311
C vs UT	0.000118957	0.000544081	2.957814566
C vs UT	0.02224431	0.037154205	-3.800186726
C vs UT	4.12E-07	1.71E-05	4.252018721
C vs UT	8.09E-05	0.00040799	4.281502603
C vs UT	0.003267205	0.007250655	-6.18545571
C vs UT	3.52E-06	5.26E-05	3.97236627
C vs UT	3.44E-05	0.000224846	5.792588445
C vs UT	2.30E-06	4.20E-05	5.626390885
C vs UT	0.018698419	0.032070039	-3.316236544
C vs UT	0.004954125	0.010273185	-4.114253101
C vs UT	0.00014023	0.000608172	5.248302393
C vs UT	0.012892109	0.023270341	2.546875813
C vs UT	0.000204807	0.000807311	-4.031039763
C vs UT	7.57E-06	8.38E-05	-5.047135292
C vs UT	2.29E-05	0.000169654	4.72073197
C vs UT	7.76E-06	8.45E-05	3.694511017
C vs UT	2.47E-05	0.000178843	-10.84443502
C vs UT	4.49E-06	6.14E-05	-7.171976016
C vs UT	4.79E-05	0.000279949	-8.062744091
C vs UT	0.266613499	0.323493844	1.684790832
C vs UT	1.12E-07	9.93E-06	4.780510998
C vs UT	6.99E-06	7.99E-05	-7.385230189
C vs UT	0.000231241	0.000881632	-8.493718353
C vs UT	6.09E-06	7.35E-05	4.930775891
C vs UT	0.00940791	0.017747787	2.308462446
C vs UT	0.000581765	0.001791947	-3.087213123
C vs UT	0.001438294	0.003679288	-2.244895378
C vs UT	2.98E-08	7.35E-06	65.9925324
C vs UT	4.07E-06	5.81E-05	-5.327278131
C vs UT	1.59E-06	3.45E-05	-6.004838393
C vs UT	2.30E-05	0.000170449	-17.24318757
C vs UT	5.97E-05	0.000329083	-11.01948833
C vs UT	6.57E-05	0.000353646	6.801357907
C vs UT	6.67E-05	0.000357107	4.051434683
C vs UT	8.60E-08	9.80E-06	5.642574815
C vs UT	5.96E-07	2.16E-05	4.179919282
C vs UT	5.89E-05	0.000325844	-3.42030256
C vs UT	1.78E-05	0.000143919	15.61354277
C vs UT	1.85E-08	5.89E-06	6.304651266
C vs UT	6.23E-05	0.000339049	-4.381589624
C vs UT	1.48E-05	0.000126874	8.484545962
C vs UT	8.30E-06	8.77E-05	4.742714028
C vs UT	0.001644467	0.004117846	-5.318233378
C vs UT	0.164755498	0.212471006	1.963969123
C vs UT	9.53E-06	9.49E-05	-5.077604975
C vs UT	1.20E-06	3.00E-05	-9.748388144
C vs UT	7.18E-07	2.39E-05	6.778347169
C vs UT	0.000998858	0.002745413	-5.349601684
C vs UT	4.09E-05	0.000251615	-4.159468169
C vs UT	9.60E-06	9.53E-05	22.5592471
C vs UT	0.000120779	0.000549318	-2.192011251
C vs UT	5.97E-06	7.25E-05	9.577305977
C vs UT	0.016693538	0.02913807	1.853212659
C vs UT	1.33E-05	0.000118463	5.790901815
C vs UT	0.000188202	0.000762579	-8.166847207
C vs UT	8.52E-07	2.58E-05	7.007838038
C vs UT	0.014927851	0.026407518	-2.567370048
C vs UT	0.000194889	0.000779616	-6.136489087
C vs UT	4.43E-06	6.11E-05	3.931810794
C vs UT	3.36E-07	1.55E-05	3.925604236
C vs UT	0.002200116	0.005210802	2.747953298
C vs UT	0.002073404	0.004979562	-11.43707604
C vs UT	0.000465536	0.001498839	-40.85615814
C vs UT	0.000364225	0.001248164	5.621444777
C vs UT	1.65E-05	0.000136595	8.089753983
C vs UT	3.14E-05	0.000212164	-13.87938321
C vs UT	0.000251218	0.000937788	50.62544306
C vs UT	3.29E-05	0.000218387	-7.316315852
C vs UT	0.007921192	0.015322921	-3.17510865

TC vs UT	0.000440115	0.001304163	-10.25020375
TC vs UT	1.29E-05	0.000103623	9.592961206
TC vs UT	3.03E-05	0.000179824	-5.001523528
TC vs UT	1.49E-05	0.000114441	-7.15736503
TC vs UT	2.14E-05	0.000144446	6.029345455
TC vs UT	0.005131055	0.010008845	-5.460862944
TC vs UT	0.009325596	0.016686199	9.082229506
TC vs UT	0.008565577	0.015522276	-1.935925552
TC vs UT	3.90E-05	0.000213083	-11.72692489
TC vs UT	0.003422621	0.007084258	4.448430017
TC vs UT	8.88E-05	0.00038256	5.124790736
TC vs UT	0.000173646	0.000626587	-5.44251664
TC vs UT	3.18E-08	8.31E-06	6.983029985
TC vs UT	0.000247872	0.000826465	-11.55411242
TC vs UT	0.003811757	0.007756884	-6.479264657
TC vs UT	6.94E-06	7.02E-05	4.375012307
TC vs UT	4.57E-05	0.000238148	5.159421732
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TC vs UT	1.44E-06	3.16E-05	5.621808679
TC vs UT	0.005620661	0.010838952	4.646117673
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TC vs UT	1.57E-06	3.30E-05	9.782561975
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TC vs UT	4.95E-07	1.97E-05	5.224886696
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TC vs UT	1.56E-07	1.24E-05	4.399396377
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TC vs UT	7.05E-06	7.08E-05	4.061757991
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TC vs UT	0.00075612	0.002008392	4.732721873
TC vs UT	0.009053468	0.016272486	2.703467376
TC vs UT	1.67E-05	0.000122934	4.590846246
TC vs UT	0.005955	0.011366123	1.792923636
TC vs UT	2.69E-06	4.28E-05	13.96008764
TC vs UT	1.48E-05	0.000113887	4.336507317
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TC vs UT	6.97E-07	2.28E-05	5.529606377
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TC vs UT	6.89E-06	7.00E-05	-15.40356668
TC vs UT	3.98E-06	5.20E-05	-7.310883638
TC vs UT	2.58E-06	4.19E-05	-23.21305327
TC vs UT	0.001266092	0.003096175	6.221833497
TC vs UT	6.00E-08	9.59E-06	5.416955873
TC vs UT	4.54E-06	5.57E-05	-8.647670874
TC vs UT	0.000720547	0.001934323	-6.703701584
TC vs UT	4.67E-06	5.67E-05	5.159197359
TC vs UT	0.000125231	0.000492646	5.82927065
TC vs UT	9.34E-05	0.000398193	-4.145662483
TC vs UT	1.73E-05	0.000125792	-4.766180291
TC vs UT	8.23E-09	6.15E-06	130.775966
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TC vs UT	1.05E-06	2.78E-05	-6.590322193
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TC vs UT	1.06E-05	9.04E-05	-23.85935382
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TC vs UT	3.93E-05	0.000214068	4.466097223
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TC vs UT	1.69E-07	1.24E-05	5.368969023
TC vs UT	1.70E-05	0.000124214	-4.447400861
TC vs UT	0.000102002	0.000423775	8.64571895
TC vs UT	2.07E-08	8.31E-06	6.146803142
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TC vs UT	2.24E-05	0.000148126	7.282527193
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TC vs UT	0.00190108	0.004332776	-6.083907546
TC vs UT	0.000778667	0.002055002	6.880584738
TC vs UT	6.74E-06	6.91E-05	-5.520637721
TC vs UT	2.80E-06	4.33E-05	-7.658490178
TC vs UT	1.11E-06	2.83E-05	6.031737432
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TC vs UT	4.75E-05	0.000244463	-4.107807472
TC vs UT	2.61E-05	0.000162929	15.02618403
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TC vs UT	1.75E-05	0.000127189	7.016521555
TC vs UT	7.15E-05	0.000326301	4.753468668
TC vs UT	1.07E-05	9.10E-05	5.959596681
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TC vs UT	0.000388844	0.001181481	-5.208866592
TC vs UT	0.000191459	0.000673522	-6.234115906
TC vs UT	1.97E-06	3.71E-05	4.520966923
TC vs UT	6.22E-08	9.59E-06	5.452321622
TC vs UT	0.000102252	0.000424106	4.579081461
TC vs UT	0.001121267	0.002798062	-14.56210601
TC vs UT	0.000145849	0.000551293	-61.17515249
TC vs UT	0.000125797	0.000493816	7.168836788
TC vs UT	1.54E-06	3.26E-05	16.64499261
TC vs UT	8.27E-06	7.75E-05	-25.04794404
TC vs UT	3.06E-05	0.000180719	191.6472519
TC vs UT	5.16E-06	6.02E-05	-12.78273084
TC vs UT	0.000262515	0.00086384	-8.242770267

MGST3	T vs UT	0.333174551	0.491981103	-1.4015908
MIAT	T vs UT	0.025865756	0.090091745	-4.764076036
MIB2	T vs UT	0.063564894	0.16240264	-1.507790088
MICAL2	T vs UT	0.804614871	0.874025639	1.072214091
MIR146A	T vs UT	6.69E-05	0.00560884	89.00819895
MIR155HG	T vs UT	0.001121904	0.016747069	5.309980941
MIR17HG	T vs UT	0.683072979	0.790305887	-1.092842133
MKI67IP	T vs UT	0.001301636	0.018073396	1.972653398
MKX	T vs UT	0.000621453	0.012832278	5.514660474
MLLT3	T vs UT	0.598796602	0.726403198	1.091337952
MMD	T vs UT	0.057731941	0.152928343	1.311174932
MMP24	T vs UT	0.579736046	0.713340165	-1.440146837
MMP25	T vs UT	0.472058134	0.620387635	-1.393813912
MOV10	T vs UT	0.643255631	0.759802781	-1.135270565
MPDU1	T vs UT	0.001621885	0.020118549	2.055442216
MPP1	T vs UT	0.07254475	0.177018952	-1.890479689
MPP6	T vs UT	0.000761425	0.013937313	3.077796976
MPP7	T vs UT	0.153541293	0.288548108	-1.565075901
MPPE1	T vs UT	0.003607383	0.029676329	-1.47735891
MRPL1	T vs UT	0.016990535	0.06966854	2.021907108
MRPL13	T vs UT	0.008435259	0.046266346	1.725932433
MRPL15	T vs UT	0.003067594	0.027506845	1.931608904
MRPL17	T vs UT	0.054818765	0.147779618	1.439811217
MRPL24	T vs UT	0.000791733	0.014127447	2.368058927
MRPL3	T vs UT	0.013672656	0.060970652	1.751636025
MRPL3P1	T vs UT	0.000958759	0.015514983	2.259275149
MRPS23	T vs UT	0.003040707	0.027383289	1.874452879
MRPS36	T vs UT	0.023188497	0.084018269	1.470371994
MRRF	T vs UT	0.002623717	0.025593698	2.057567195
MRTO4	T vs UT	0.000625487	0.012840597	3.620387697
MSC	T vs UT	0.872322386	0.920867724	1.113663996
MSX2P1	T vs UT	0.005502467	0.036792523	-2.143820366
MT2P1	T vs UT	0.672926669	0.781720919	1.267586619
MTHFD1	T vs UT	0.019961684	0.07659812	1.916275006
MTHFD1L	T vs UT	6.18E-06	0.002448332	7.018847248
MTHFD2	T vs UT	0.00034292	0.010180374	3.981258702
MTRNR2L2	T vs UT	0.107099047	0.226394151	-1.714397485
MTSS1	T vs UT	0.543952887	0.682362305	-1.20610391
MTX1P1	T vs UT	0.001436609	0.018818887	2.650296424
MX1	T vs UT	0.34929513	0.508778375	-1.580575171
MXD4	T vs UT	0.015392828	0.065468635	-1.529185628
MYB	T vs UT	0.001974395	0.02252016	26.46729328
MYBL1	T vs UT	0.169342818	0.309058162	-1.64862539
MYC	T vs UT	0.189448942	0.334178176	1.374165441
MYO1B	T vs UT	4.53E-06	0.002448332	9.257981611
MYO1F	T vs UT	0.030326168	0.100193369	-1.91202537
MYO1G	T vs UT	0.318164047	0.476492494	-1.269206677
MZF1	T vs UT	0.013493578	0.060456329	-1.73204252
MZT1	T vs UT	0.078864655	0.186390874	1.509672074
NAA15	T vs UT	0.006274216	0.039678679	1.848859709
NAA20	T vs UT	0.001960218	0.02246658	1.82382892
NAMPT	T vs UT	0.002195969	0.0234604	4.005928467
NAMPTL	T vs UT	0.000625888	0.012840597	4.347213368
NANS	T vs UT	0.109792628	0.230266284	1.463614732
NAPSA	T vs UT	0.001382737	0.018624545	8.012360967
NARS	T vs UT	0.00090648	0.015097852	1.793898984
NBPF15	T vs UT	0.006781228	0.041121492	-2.617859711
NCAPH	T vs UT	0.020079368	0.076834759	-2.260946273
NCRNA00263	T vs UT	0.167321654	0.306778523	1.844436855
NCS1	T vs UT	0.0001294	0.006920261	4.705942584
NDFIP2	T vs UT	2.42E-06	0.002130399	13.39019971
NDRG2	T vs UT	0.119470191	0.243748199	-1.415236784
NDRG3	T vs UT	0.366067507	0.524899682	-1.126074598
NDUFAB1	T vs UT	0.017687297	0.07143281	1.863590041
NDUFAF1	T vs UT	0.012635392	0.058265875	1.957815842
NDUFAF2	T vs UT	0.0062991	0.039744271	1.988513368
NDUFAF4	T vs UT	0.019281336	0.075233821	1.610668507
NDUFV2	T vs UT	0.014360744	0.062723335	1.659009553
NDUFV2P1	T vs UT	0.005095758	0.035357735	1.961078076
NEDD4	T vs UT	0.285675758	0.442510313	1.207156097
NEFH	T vs UT	0.016649721	0.068728176	2.418359006
NELF	T vs UT	0.12355981	0.249322489	1.673754783
NELL2	T vs UT	0.115499483	0.238701428	2.166243884
NEO1	T vs UT	0.627687533	0.747983694	1.067127669
NFAT5	T vs UT	0.170141841	0.309839765	1.424485151
NFE2L1	T vs UT	0.350991877	0.510405689	1.083276022
NFE2L3	T vs UT	0.00036095	0.010437981	3.096777688
NFIL3	T vs UT	0.000152733	0.00747299	2.890973124
NFKB1	T vs UT	0.000183036	0.008006036	4.076535032
NFKB2	T vs UT	4.64E-05	0.004764748	6.017250052
NFKBIA	T vs UT	1.35E-05	0.002739231	6.092260632
NFKBID	T vs UT	3.54E-05	0.004409658	4.467362192
NFKBIZ	T vs UT	0.037566277	0.115123763	2.56981037
NHP2	T vs UT	0.000740295	0.013877139	2.26914705
NHP2P1	T vs UT	0.000625819	0.012840597	3.477354873
NINJ1	T vs UT	0.002202577	0.0234604	4.429950101
NIP7	T vs UT	0.001754415	0.020945283	1.852160426
NKD1	T vs UT	0.040940075	0.121607113	-2.61363593
NLGN2	T vs UT	0.001461192	0.018916514	-1.686377815
NLN	T vs UT	0.011569702	0.055615761	2.570600479
NLRC3	T vs UT	0.011533308	0.055505731	-1.866791356
NLRP6	T vs UT	0.622650361	0.744138699	1.399559152
NME1-NME2	T vs UT	0.000604655	0.012636166	2.906104609
NME2P1	T vs UT	6.12E-05	0.005364207	2.655191579
NMT2	T vs UT	0.093921116	0.208394343	-1.625019791
NOC2L	T vs UT	0.030259936	0.10002894	1.494537805
NOC3L	T vs UT	0.004039915	0.031328401	2.00352529
NOC4L	T vs UT	0.002701308	0.025890935	1.754963838
NOD1	T vs UT	0.040650251	0.121008592	-1.426722564
NOL10	T vs UT	0.000406081	0.010837606	1.818738921
NOLC1	T vs UT	0.005059062	0.03526186	2.006497439
NOP10	T vs UT	0.001089792	0.016568603	1.744376777
NOP14	T vs UT	0.012828305	0.058626017	2.573263825
NOP16	T vs UT	0.009724721	0.050465408	2.321594789
NPC2	T vs UT	0.211401024	0.36032273	-1.318257714
NPM1	T vs UT	0.002229015	0.023620626	1.889674398

C vs UT	0.020392202	0.034523665	-2.379160454
C vs UT	0.002622777	0.006034491	-7.277330886
C vs UT	1.96E-05	0.000154509	-5.173620585
C vs UT	0.00059671	0.001827479	-4.600918804
C vs UT	1.15E-05	0.00010731	231.2602203
C vs UT	6.75E-07	2.32E-05	103.5919676
C vs UT	0.131312503	0.174338663	2.185314476
C vs UT	2.02E-05	0.000157574	3.594885547
C vs UT	2.28E-07	1.34E-05	144.0362388
C vs UT	4.38E-05	0.000263263	-4.332790348
C vs UT	6.35E-08	9.50E-06	9.362735492
C vs UT	0.002698083	0.006175491	-10.10305221
C vs UT	0.004324934	0.009176808	7.456290144
C vs UT	0.001358041	0.003501598	-3.220058252
C vs UT	3.21E-06	4.97E-05	5.703271203
C vs UT	0.001857001	0.004552051	-4.321336228
C vs UT	0.000769834	0.002232373	3.246173594
C vs UT	9.12E-05	0.000444283	-9.020238671
C vs UT	1.83E-07	1.26E-05	-4.763941581
C vs UT	0.000292154	0.001053292	4.252294123
C vs UT	1.10E-05	0.000103404	4.454075068
C vs UT	6.92E-05	0.000365794	3.31957449
C vs UT	7.43E-05	0.000385052	3.259401401
C vs UT	0.000102703	0.000484995	3.250472533
C vs UT	8.52E-05	0.000422629	3.772714848
C vs UT	1.14E-05	0.000106695	4.903338307
C vs UT	7.83E-05	0.000399386	3.107975315
C vs UT	5.62E-06	7.00E-05	4.252154545
C vs UT	0.000109711	0.000510466	3.097401401
C vs UT	3.63E-05	0.000233255	7.324974559
C vs UT	0.000293105	0.001055795	8.86942349
C vs UT	8.64E-05	0.000426623	-4.715796083
C vs UT	0.000771743	0.002235282	15.81786955
C vs UT	0.009544232	0.017952766	2.148566025
C vs UT	5.89E-08	9.20E-06	35.08929012
C vs UT	5.27E-08	8.90E-06	71.63596045
C vs UT	0.001459206	0.003724285	-5.713984281
C vs UT	0.000245028	0.000921656	-9.754344996
C vs UT	0.000106048	0.000496232	4.211661093
C vs UT	0.075248773	0.107274526	-2.579944311
C vs UT	8.47E-07	2.58E-05	-7.055016092
C vs UT	0.000263633	0.000970037	78.0733182
C vs UT	0.00187784	0.004594913	4.21818437
C vs UT	0.016396116	0.028686859	2.095049305
C vs UT	9.35E-09	5.10E-06	148.3694551
C vs UT	0.000372565	0.001268284	-4.018745022
C vs UT	0.000266426	0.000976328	4.427346446
C vs UT	1.31E-05	0.000117599	-4.920966079
C vs UT	2.34E-05	0.000172161	6.182216923
C vs UT	5.31E-05	0.000302667	3.749332968
C vs UT	8.33E-06	8.78E-05	3.853542666
C vs UT	2.45E-07	1.38E-05	102.1693158
C vs UT	8.39E-08	9.70E-06	111.1857276
C vs UT	3.95E-05	0.000245977	5.731827521
C vs UT	0.193763638	0.245162202	2.065836276
C vs UT	1.04E-06	2.77E-05	4.352268502
C vs UT	0.000269023	0.000983703	-4.741614793
C vs UT	0.002731005	0.00623695	-3.701926408
C vs UT	0.000540388	0.00169283	6.146032822
C vs UT	4.53E-06	6.15E-05	12.35798124
C vs UT	1.86E-08	5.89E-06	129.8592809
C vs UT	5.52E-06	6.93E-05	-8.980657999
C vs UT	2.19E-05	0.000165425	-3.49760356
C vs UT	0.00014829	0.000633373	4.415368943
C vs UT	0.000179628	0.000735328	4.005183717
C vs UT	4.19E-05	0.000254815	4.827454785
C vs UT	3.53E-05	0.000228933	3.945512055
C vs UT	6.42E-07	2.26E-05	9.350062974
C vs UT	8.63E-07	2.58E-05	10.34756789
C vs UT	2.70E-06	4.58E-05	5.369821056
C vs UT	0.014967665	0.026470353	2.323568441
C vs UT	3.97E-05	0.000246448	9.196236769
C vs UT	0.00519195	0.010680138	-5.536036545
C vs UT	3.41E-06	5.15E-05	-4.092452302
C vs UT	0.000172944	0.000713222	3.91916604
C vs UT	1.76E-08	5.89E-06	6.193802039
C vs UT	3.39E-06	5.15E-05	8.418365877
C vs UT	1.69E-06	3.55E-05	7.002595911
C vs UT	8.97E-05	0.000439214	4.781569406
C vs UT	1.95E-06	3.79E-05	14.57910272
C vs UT	6.34E-08	9.50E-06	36.79647684
C vs UT	0.024837143	0.040864956	1.613465993
C vs UT	6.53E-06	7.65E-05	32.92425206
C vs UT	6.57E-05	0.000353646	3.311114789
C vs UT	7.16E-05	0.000374899	5.82244671
C vs UT	0.692463921	0.736485823	-1.1366505
C vs UT	2.63E-05	0.000187159	3.185953313
C vs UT	0.000606427	0.001850344	-22.27475574
C vs UT	1.22E-06	3.03E-05	-4.18213092
C vs UT	0.000212155	0.000825977	7.575328025
C vs UT	3.87E-05	0.000242894	-4.88560596
C vs UT	0.013335796	0.023938035	-7.416805619
C vs UT	1.21E-05	0.000110782	6.646413074
C vs UT	2.70E-06	4.58E-05	4.439323977
C vs UT	1.77E-05	0.000143239	-13.85497758
C vs UT	0.000123601	0.000555422	2.845022259
C vs UT	0.000556271	0.001727662	2.602873516
C vs UT	5.13E-05	0.000294388	2.79719259
C vs UT	1.03E-05	9.93E-05	-4.006113155
C vs UT	1.10E-06	2.88E-05	3.910728436
C vs UT	0.00019403	0.000777717	3.288956247
C vs UT	8.53E-07	2.58E-05	4.538360011
C vs UT	0.002136496	0.005096343	3.544066334
C vs UT	3.88E-05	0.000243062	7.073286177
C vs UT	0.019933691	0.033854326	-2.070564399
C vs UT	2.65E-05	0.000187696	3.503457323

TC vs UT	0.000926216	0.002385179	-4.955427008
TC vs UT	0.001027396	0.002600655	-17.49377806
TC vs UT	3.27E-05	0.00018921	-4.548069502
TC vs UT	0.007933504	0.014521986	-2.610745011
TC vs UT	1.35E-05	0.000106327	202.7387249
TC vs UT	2.03E-07	1.30E-05	209.5699303
TC vs UT	0.008321703	0.015133716	6.048013304
TC vs UT	1.69E-06	3.42E-05	5.664690814
TC vs UT	1.18E-07	1.20E-05	235.3957367
TC vs UT	0.000166903	0.00060885	-3.480357824
TC vs UT	3.59E-07	1.67E-05	6.056575896
TC vs UT	0.000811436	0.002135997	-25.0140979
TC vs UT	0.172651051	0.217890221	2.684898237
TC vs UT	9.04E-05	0.00038818	-6.1938564
TC vs UT	1.15E-06	2.87E-05	7.196618476
TC vs UT	0.00365989	0.00750107	-3.865694009
TC vs UT	3.45E-05	0.000197053	5.888062362
TC vs UT	2.26E-05	0.000148866	-13.53143392
TC vs UT	6.21E-07	2.18E-05	-3.818603554
TC vs UT	3.07E-05	0.000181081	6.826429411
TC vs UT	5.04E-06	5.91E-05	5.136590464
TC vs UT	3.91E-06	5.15E-05	5.693934789
TC vs UT	1.12E-05	9.42E-05	4.522953785
TC vs UT	1.08E-05	9.17E-05	4.828135827
TC vs UT	1.30E-05	0.000104181	5.301610012
TC vs UT	2.41E-06	4.07E-05	6.703173845
TC vs UT	7.13E-06	7.13E-05	4.627640602
TC vs UT	1.06E-05	9.04E-05	3.70350667
TC vs UT	9.47E-06	8.53E-05	4.907069067
TC vs UT	3.87E-06	5.12E-05	13.50624672
TC vs UT	0.000557171	0.001576031	7.338916857
TC vs UT	7.07E-06	7.10E-05	-8.634829989
TC vs UT	0.019803974	0.032243893	4.475951223
TC vs UT	0.000166579	0.000607849	4.164842562
TC vs UT	2.62E-08	8.31E-06	51.31844254
TC vs UT	3.30E-08	8.31E-06	91.94863722
TC vs UT	0.004449433	0.008861494	-4.24185824
TC vs UT	9.72E-05	0.000409362	-14.37567261
TC vs UT	2.34E-05	0.000152702	5.636231154
TC vs UT	0.006234036	0.011809136	-4.36132212
TC vs UT	1.63E-07	1.24E-05	-11.13460414
TC vs UT	0.00026882	0.000879657	61.8747994
TC vs UT	0.726631025	0.765495604	1.193181872
TC vs UT	2.66E-05	0.000164679	6.871987489
TC vs UT	2.15E-08	8.31E-06	90.94607204
TC vs UT	7.95E-06	7.64E-05	-11.53010359
TC vs UT	0.000420003	0.001254514	3.912487885
TC vs UT	3.84E-05	0.000211084	-3.999456512
TC vs UT	2.94E-05	0.000175847	5.694178189
TC vs UT	1.45E-05	0.000111911	4.715996537
TC vs UT	3.81E-06	5.07E-05	4.344135193
TC vs UT	5.11E-07	1.98E-05	67.16103641
TC vs UT	1.69E-07	1.24E-05	74.51835473
TC vs UT	4.07E-05	0.000219301	5.534768737
TC vs UT	0.053279789	0.077069427	2.541461359
TC vs UT	4.35E-07	1.86E-05	5.162559242
TC vs UT	0.000170739	0.000617712	-5.82102544
TC vs UT	8.37E-05	0.000365268	-8.864293351
TC vs UT	0.000908978	0.002348145	5.438881632
TC vs UT	5.42E-06	6.11E-05	11.50952367
TC vs UT	1.88E-08	8.31E-06	127.5733316
TC vs UT	2.71E-06	4.28E-05	-11.40909336
TC vs UT	7.86E-06	7.59E-05	-4.227152483
TC vs UT	6.92E-05	0.000317941	4.950128564
TC vs UT	0.000126477	0.000495695	4.116096035
TC vs UT	1.03E-05	8.98E-05	6.381691456
TC vs UT	7.76E-06	7.53E-05	5.172212898
TC vs UT	3.84E-06	5.10E-05	5.805883944
TC vs UT	4.54E-06	5.57E-05	6.464395223
TC vs UT	2.64E-06	4.23E-05	5.346367292
TC vs UT	0.00039671	0.001200942	5.280871563
TC vs UT	4.68E-05	0.000242457	8.735249921
TC vs UT	0.007082898	0.013180218	-4.915638601
TC vs UT	3.39E-06	4.79E-05	-4.210489061
TC vs UT	0.000129051	0.000503496	4.132752277
TC vs UT	1.61E-08	8.29E-06	6.269484497
TC vs UT	2.64E-06	4.23E-05	9.024329926
TC vs UT	1.78E-06	3.50E-05	6.90585932
TC vs UT	2.71E-05	0.000166603	6.461695602
TC vs UT	2.78E-06	4.33E-05	13.01759381
TC vs UT	2.06E-07	1.30E-05	22.69245706
TC vs UT	0.000711634	0.001914566	2.564056876
TC vs UT	8.51E-06	7.91E-05	29.12157317
TC vs UT	5.32E-06	6.09E-05	5.138999988
TC vs UT	1.81E-05	0.000129688	8.040445475
TC vs UT	0.362665396	0.418852036	1.421712696
TC vs UT	3.16E-06	4.62E-05	4.541129699
TC vs UT	0.00285818	0.006096066	-11.45108444
TC vs UT	1.94E-05	0.000135333	-2.664026611
TC vs UT	5.07E-05	0.000255921	11.64643098
TC vs UT	5.28E-06	6.09E-05	-8.292411316
TC vs UT	0.000884815	0.002293413	-15.44705469
TC vs UT	3.18E-06	4.63E-05	9.109898609
TC vs UT	9.75E-07	2.71E-05	5.44590676
TC vs UT	1.64E-05	0.000121911	-14.50919821
TC vs UT	1.36E-05	0.000106726	4.030323374
TC vs UT	3.01E-05	0.00017918	4.403137717
TC vs UT	4.23E-06	5.34E-05	4.164560044
TC vs UT	2.16E-06	3.88E-05	-5.540203712
TC vs UT	2.70E-07	1.52E-05	5.036798316
TC vs UT	7.49E-06	7.37E-05	6.08037199
TC vs UT	1.70E-06	3.43E-05	3.997933444
TC vs UT	9.33E-05	0.000397744	7.117842358
TC vs UT	4.86E-06	5.80E-05	12.77169441
TC vs UT	0.000519586	0.00148746	-4.039831736
TC vs UT	1.94E-06	3.66E-05	5.683064571

NPM1P5	T vs UT	0.000855387	0.014668872	2.27379848
NPM1P6	T vs UT	0.003764713	0.03022932	1.89602402
NPM3	T vs UT	0.001072792	0.016472414	3.458305092
NPTXR	T vs UT	0.293161191	0.450651725	-1.50546455
NQO1	T vs UT	0.223980641	0.374629324	1.545561445
NR1D1	T vs UT	0.050323631	0.139765726	-1.646698965
NR3C2	T vs UT	0.027037151	0.093067581	-1.315103106
NR4A1	T vs UT	4.23E-06	0.002448332	97.55860441
NR4A2	T vs UT	0.004813254	0.034285048	9.1859141
NR4A3	T vs UT	0.002256405	0.02373846	13.09120101
NRBP2	T vs UT	0.079903798	0.188089695	-2.187132865
NRIP3	T vs UT	0.236579986	0.388212833	1.349969034
NS3BP	T vs UT	0.17748463	0.320032975	-2.109079517
NTN4	T vs UT	0.072439756	0.176797742	-2.341781439
NTNG2	T vs UT	0.098531052	0.214986352	-1.885364512
NUAK2	T vs UT	0.017599783	0.071172622	-1.78341951
NUDCD1	T vs UT	0.027299062	0.09373362	1.710018404
NUDCP2	T vs UT	0.008432065	0.046266346	2.050523107
NUDT15	T vs UT	0.092809842	0.206560534	1.543994453
NUDT7	T vs UT	0.453380015	0.604114999	1.441049947
NUP35	T vs UT	0.009341253	0.049174702	1.537106285
NUPL1	T vs UT	0.001809444	0.021319452	1.496188801
NUS1	T vs UT	0.094064144	0.208524072	1.453045401
OAS1	T vs UT	0.931388872	0.958279772	1.17461811
OBFC1	T vs UT	0.013855009	0.061213968	-1.548764813
OBFC2A	T vs UT	0.169761852	0.309404112	1.532763977
OBSCN	T vs UT	0.002702	0.025890935	-2.400272864
ODC1	T vs UT	0.002024918	0.022821972	2.867282539
ORAI3	T vs UT	0.581348674	0.714302855	-1.096498647
OSBPL7	T vs UT	0.002128011	0.023252102	-2.014159331
OSM	T vs UT	0.477978628	0.625900221	1.209528375
OSTC	T vs UT	0.003797684	0.030383079	1.740141076
OTUD6B	T vs UT	0.131541675	0.260088013	1.5047005
P2RY10	T vs UT	0.160273819	0.297508466	1.415144472
P2RY14	T vs UT	0.12289329	0.248446346	1.572139184
PA2G4P4	T vs UT	0.002688159	0.025890935	1.556899672
PA2G4P5	T vs UT	0.020927483	0.078934188	1.531655978
PAICS	T vs UT	0.000533541	0.012210215	3.379397549
PAICSP4	T vs UT	0.010252423	0.051702401	2.621486403
PAIP2B	T vs UT	0.055503813	0.149001093	-1.658805843
PAK1IP1	T vs UT	2.35E-05	0.003427694	2.780266064
PARP10	T vs UT	0.130836723	0.259026461	-1.386718719
PARP15	T vs UT	0.020731118	0.07857814	-1.935021959
PARP4	T vs UT	0.110055018	0.230582561	-1.268234627
PARP8	T vs UT	0.051052089	0.141215555	-1.357647335
PARVB	T vs UT	0.030858379	0.101543585	2.5999157
PARVG	T vs UT	0.062290798	0.16031007	-1.540417719
PASK	T vs UT	0.584537925	0.716507866	-1.193211371
PATL2	T vs UT	0.595937343	0.724552872	-1.184027266
PCK2	T vs UT	0.012550054	0.058086399	2.118069961
PCMTD2	T vs UT	0.017624615	0.071249671	-1.578580574
PCNXL2	T vs UT	0.00399295	0.031205613	-1.896354994
PCYOX1	T vs UT	0.214783932	0.364025551	-1.356049323
PDCD1	T vs UT	0.000930558	0.015297592	3.373903582
PDGFA	T vs UT	0.016488404	0.068359793	7.412004429
PDGFB	T vs UT	0.69704389	0.800088546	1.0507702
PDIA6	T vs UT	0.017334181	0.070552715	1.748831923
PDK1	T vs UT	0.348737874	0.508266901	1.182964753
PDXDC2	T vs UT	0.131592691	0.260147166	-2.358127875
PECAM1	T vs UT	0.730873468	0.822007649	1.192563501
PES1	T vs UT	0.000450854	0.011246955	2.281060924
PFAS	T vs UT	0.000765261	0.01393748	3.033054661
PFDN2	T vs UT	0.04923795	0.137946812	1.385528979
PFDN4	T vs UT	0.063140048	0.161786533	2.062099654
PFDN6	T vs UT	0.004715675	0.034046633	1.916995064
PFKFB3	T vs UT	0.455653848	0.606325486	1.287852483
PGAM1	T vs UT	0.000132435	0.006920261	2.143657877
PGAM4	T vs UT	0.000617453	0.012781001	2.18327748
PGAP1	T vs UT	0.801412957	0.871608164	1.039267126
PGAP3	T vs UT	0.60475177	0.730317064	-1.08457565
PGK1	T vs UT	0.003315002	0.028345336	1.470960237
PGK1P1	T vs UT	0.023134071	0.083870359	2.136574727
PGK1P2	T vs UT	0.096378183	0.211606727	1.359844941
PHB	T vs UT	0.001194005	0.017287215	2.042011832
PHF5A	T vs UT	0.004862457	0.034496029	1.613665686
PHF7	T vs UT	0.166980065	0.306515438	-1.572406699
PHGDH	T vs UT	0.134405812	0.263515585	3.073680108
PHLDA1	T vs UT	0.023565156	0.084983439	2.738800747
PIGW	T vs UT	0.000688419	0.013406099	3.634757831
PIK3IP1	T vs UT	0.42848465	0.582108388	-1.20221105
PILRB	T vs UT	0.002763845	0.026101379	-2.434034674
PIM1	T vs UT	0.252230327	0.406376575	-1.178640118
PIM2	T vs UT	6.55E-06	0.002448332	3.755773912
PIM3	T vs UT	1.09E-05	0.002542857	3.08626745
PINK1	T vs UT	0.856646065	0.910519348	-1.020454564
PKD1P4	T vs UT	0.068652089	0.170937048	-2.216041452
PKD1P6	T vs UT	0.01229288	0.05741798	-2.406951576
PKM2	T vs UT	9.16E-06	0.002542857	5.93235247
PLA2G16	T vs UT	0.151650691	0.286381022	-1.431562298
PLA2G6	T vs UT	0.000999263	0.015796037	-2.545484012
PLAC8	T vs UT	0.169072572	0.308860987	-1.305613343
PLAGL2	T vs UT	0.006349818	0.039880172	2.031691874
PLAUR	T vs UT	0.900419671	0.939588231	1.015257759
PLCD1	T vs UT	0.018509199	0.073405732	-2.084381146
PLCD3	T vs UT	0.27928832	0.43601228	-1.636295105
PLCG1	T vs UT	0.282772812	0.439504447	-1.171078339
PLCL1	T vs UT	0.022130189	0.081729115	-2.163297332
PLD1	T vs UT	0.367229398	0.52615112	-1.304581695
PLEC	T vs UT	0.140621692	0.271340447	-1.973413139
PLEK	T vs UT	0.008508702	0.046523376	2.565166305
PLEKHA7	T vs UT	0.071981507	0.176132562	-1.446585692
PLEKHB1	T vs UT	0.37599408	0.535058376	-1.271268386
PLEKHF1	T vs UT	0.068146552	0.170193838	-1.565918254
PLEKHG3	T vs UT	0.006082173	0.038951631	-2.149695109
PLEKHM1P	T vs UT	0.074153898	0.179242809	-1.824357179
PLXND1	T vs UT	0.090157256	0.202521217	-1.801544593

C vs UT	3.72E-05	0.000236879	3.658946399
C vs UT	4.00E-05	0.000247805	3.732425124
C vs UT	0.000201488	0.000798569	5.437202502
C vs UT	0.001871603	0.00458147	-6.167531254
C vs UT	0.004220179	0.008999448	3.574126272
C vs UT	2.29E-05	0.000170097	-8.221281988
C vs UT	2.42E-06	4.36E-05	-3.480136345
C vs UT	0.553959756	0.609904794	1.174123688
C vs UT	0.259706646	0.316389975	1.934852819
C vs UT	0.441427637	0.500211632	1.599744198
C vs UT	0.003801204	0.008249312	-4.721313905
C vs UT	0.000275911	0.001005901	7.029529819
C vs UT	0.020643484	0.034886808	-4.108681554
C vs UT	0.009755155	0.018290915	-3.767720802
C vs UT	8.42E-05	0.000418991	-9.487178691
C vs UT	2.38E-07	1.36E-05	-23.18581837
C vs UT	3.96E-06	5.69E-05	9.091237998
C vs UT	0.000121488	0.000550309	4.537066304
C vs UT	0.000340399	0.001183956	4.091914777
C vs UT	0.007040824	0.013896808	-4.02270954
C vs UT	5.77E-05	0.000320819	2.715575682
C vs UT	3.88E-08	8.69E-06	5.879078408
C vs UT	2.31E-05	0.000170857	5.727559116
C vs UT	0.010011681	0.018706475	-8.252729798
C vs UT	1.90E-05	0.000150823	-3.548969058
C vs UT	5.49E-05	0.000310415	6.8433159
C vs UT	9.95E-07	2.70E-05	-14.50487529
C vs UT	7.78E-06	8.46E-05	10.63443841
C vs UT	0.000113126	0.000523588	-3.039952376
C vs UT	2.23E-07	1.33E-05	-13.43230967
C vs UT	2.77E-07	1.45E-05	80.86938379
C vs UT	7.21E-06	8.15E-05	4.109286624
C vs UT	0.000870972	0.002468187	4.031883746
C vs UT	0.002173233	0.005161319	-2.544819924
C vs UT	0.000299847	0.001072872	5.274003783
C vs UT	2.88E-06	4.72E-05	3.298362736
C vs UT	2.79E-05	0.000195066	3.431275353
C vs UT	3.11E-06	4.90E-05	11.74209355
C vs UT	9.15E-05	0.000445602	8.61199273
C vs UT	0.000159273	0.000666837	-5.05493039
C vs UT	9.16E-07	2.64E-05	4.856553964
C vs UT	5.45E-05	0.000308476	-4.381482104
C vs UT	0.000220679	0.000850513	-4.001175419
C vs UT	2.87E-05	0.000199614	-3.045132439
C vs UT	9.83E-06	9.64E-05	-3.787134242
C vs UT	0.002245073	0.005299972	4.512303086
C vs UT	0.000136777	0.000596556	-3.647828822
C vs UT	1.23E-05	0.00011229	-14.23760106
C vs UT	0.000257191	0.000952875	-5.598705299
C vs UT	2.91E-06	4.74E-05	14.42617974
C vs UT	2.42E-06	4.36E-05	-6.4611842
C vs UT	7.98E-07	2.50E-05	-8.70765146
C vs UT	0.000119267	0.000545057	-6.268003738
C vs UT	5.51E-05	0.000311104	6.391697992
C vs UT	0.001004652	0.002760722	23.35060784
C vs UT	0.011070647	0.020440413	-9.945096409
C vs UT	4.11E-05	0.000252234	4.485594446
C vs UT	8.61E-06	8.97E-05	4.413076444
C vs UT	0.007393419	0.014490679	-5.241358714
C vs UT	0.020500997	0.034679282	-7.426674604
C vs UT	2.40E-05	0.000175008	3.517979752
C vs UT	0.000425282	0.001394236	3.367906672
C vs UT	1.48E-06	3.35E-05	6.294749583
C vs UT	0.00096085	0.00265634	4.518811785
C vs UT	0.000189783	0.000765642	3.115382411
C vs UT	0.001883671	0.004604612	5.284049329
C vs UT	2.26E-07	1.33E-05	5.898114395
C vs UT	2.71E-06	4.58E-05	5.286062773
C vs UT	0.001212818	0.003206957	2.888345533
C vs UT	3.75E-06	5.51E-05	-4.991960865
C vs UT	1.15E-08	5.10E-06	8.885116222
C vs UT	4.66E-05	0.000275223	10.57180272
C vs UT	6.84E-07	2.34E-05	7.899906233
C vs UT	1.17E-05	0.000108509	4.04077455
C vs UT	1.20E-05	0.000110542	3.296637409
C vs UT	0.005636751	0.01146316	-3.198495946
C vs UT	0.000296977	0.001065695	45.04677794
C vs UT	0.000127056	0.00056393	11.38267437
C vs UT	0.0001861	0.000756051	5.067704748
C vs UT	2.92E-05	0.000201398	-14.03062503
C vs UT	1.04E-05	9.97E-05	-7.927493147
C vs UT	4.62E-07	1.83E-05	11.0261273
C vs UT	1.54E-08	5.89E-06	17.15745636
C vs UT	1.91E-07	1.27E-05	6.723147833
C vs UT	1.44E-05	0.000124184	-3.554226584
C vs UT	0.006156503	0.012411654	-4.051968003
C vs UT	0.00010175	0.000481972	-7.035231333
C vs UT	3.13E-07	1.51E-05	14.72978416
C vs UT	0.02009377	0.034074568	-1.916558541
C vs UT	1.28E-06	3.11E-05	-11.66940956
C vs UT	1.74E-05	0.000142114	-5.387554864
C vs UT	0.000481336	0.00154243	2.892739864
C vs UT	6.51E-05	0.000351899	4.716758085
C vs UT	3.61E-05	0.000232453	-8.122364316
C vs UT	0.030944312	0.049454746	-2.595669479
C vs UT	4.68E-05	0.000275846	-2.915027895
C vs UT	0.000173645	0.000715589	-7.210623876
C vs UT	0.000522425	0.00164534	-4.364238384
C vs UT	0.001855367	0.004549856	-7.1676107
C vs UT	2.03E-05	0.0001579	10.56116055
C vs UT	1.75E-06	3.58E-05	-10.07009356
C vs UT	3.47E-05	0.000225452	-14.29857386
C vs UT	0.000239057	0.000904163	-4.269532168
C vs UT	4.56E-05	0.000270802	-5.232258135
C vs UT	0.001930951	0.00469413	-3.559313393
C vs UT	7.47E-06	8.32E-05	-20.94226361

TC vs UT	1.36E-06	3.08E-05	7.336345944
TC vs UT	3.55E-06	4.91E-05	5.911699529
TC vs UT	1.49E-05	0.000114441	10.11058506
TC vs UT	0.003468789	0.007159386	-5.275348855
TC vs UT	0.00137918	0.003327845	4.399447227
TC vs UT	0.000135902	0.000523156	-5.222422958
TC vs UT	7.60E-07	2.36E-05	-4.235868867
TC vs UT	0.000180018	0.000641719	14.83207362
TC vs UT	0.081985601	0.112746203	2.387095323
TC vs UT	0.001582345	0.003726188	16.57860276
TC vs UT	9.47E-05	0.000402097	-14.77566016
TC vs UT	0.001844965	0.004229116	4.231540411
TC vs UT	0.009406088	0.016815582	-5.941554383
TC vs UT	0.000381096	0.001162809	-9.842074886
TC vs UT	8.93E-06	8.19E-05	-25.48480182
TC vs UT	1.82E-07	1.26E-05	-25.26279038
TC vs UT	3.54E-06	4.91E-05	9.086356497
TC vs UT	4.11E-05	0.000220546	5.624801495
TC vs UT	3.19E-05	0.000186221	6.727626265
TC vs UT	0.028474983	0.044363981	-3.460529928
TC vs UT	2.20E-06	3.92E-05	4.638907853
TC vs UT	6.21E-08	9.59E-06	5.291385612
TC vs UT	9.55E-06	8.57E-05	6.976226607
TC vs UT	0.004106895	0.008278244	-6.805088477
TC vs UT	3.06E-06	4.51E-05	-5.195904726
TC vs UT	0.001033998	0.002613075	3.471880565
TC vs UT	1.29E-06	3.01E-05	-13.02484941
TC vs UT	2.50E-06	4.14E-05	15.04426454
TC vs UT	8.48E-06	7.90E-05	-5.056572216
TC vs UT	8.64E-08	1.07E-05	-18.74692901
TC vs UT	1.55E-07	1.24E-05	118.1345564
TC vs UT	1.14E-05	9.50E-05	3.684688342
TC vs UT	0.00012667	0.000496138	6.048726199
TC vs UT	2.82E-05	0.000171347	-5.819676016
TC vs UT	0.972399331	0.97699509	1.006882555
TC vs UT	4.82E-07	1.94E-05	4.453343895
TC vs UT	6.04E-06	6.48E-05	4.566380025
TC vs UT	7.00E-07	2.28E-05	19.03298256
TC vs UT	1.88E-05	0.000132462	14.37394954
TC vs UT	0.000120831	0.000480594	-5.640201184
TC vs UT	1.65E-07	1.24E-05	7.06858604
TC vs UT	1.35E-05	0.000106327	-5.851591211
TC vs UT	3.86E-05	0.000211344	-5.939604135
TC vs UT	2.29E-06	4.02E-05	-4.817966106
TC vs UT	2.35E-06	4.05E-05	-4.988838729
TC vs UT	0.000393003	0.001191476	7.206296281
TC vs UT	3.48E-05	0.000198023	-4.899502801
TC vs UT	3.04E-05	0.000179898	-10.49586469
TC vs UT	0.000148822	0.000559468	-5.986784428
TC vs UT	1.11E-06	2.83E-05	20.60901731
TC vs UT	1.04E-05	9.02E-05	-4.7155249
TC vs UT	1.45E-06	3.16E-05	-7.419535773
TC vs UT	9.87E-05	0.000413285	-6.975983817
TC vs UT	0.00014839	0.000558672	5.043103443
TC vs UT	0.000315891	0.001000241	40.56894514
TC vs UT	0.005615241	0.010831652	-11.59340294
TC vs UT	5.00E-05	0.00025349	4.247383247
TC vs UT	0.000395336	0.00119737	2.379645785
TC vs UT	0.012552544	0.021640502	-3.846024332
TC vs UT	0.003141391	0.006591788	-14.13512731
TC vs UT	3.17E-06	4.62E-05	5.093329837
TC vs UT	1.14E-05	9.50E-05	7.216602743
TC vs UT	1.25E-06	2.99E-05	6.476482928
TC vs UT	0.000451172	0.001329895	5.168108291
TC vs UT	2.18E-05	0.000145713	4.421425349
TC vs UT	0.535119821	0.587902289	1.315321394
TC vs UT	5.92E-07	2.14E-05	4.825823751
TC vs UT	6.42E-06	6.73E-05	4.506210377
TC vs UT	0.000178264	0.000636917	4.122749061
TC vs UT	3.59E-05	0.000201692	-3.203238678
TC vs UT	3.60E-07	1.67E-05	4.067992976
TC vs UT	0.000856601	0.002235783	4.432907775
TC vs UT	4.68E-05	0.000242457	3.232145353
TC vs UT	2.04E-06	3.74E-05	5.672062858
TC vs UT	1.98E-06	3.71E-05	4.44505948
TC vs UT	0.002718906	0.00583942	-4.199049427
TC vs UT	0.000161343	0.000592954	65.4417033
TC vs UT	0.006287726	0.011892255	3.503174544
TC vs UT	2.00E-05	0.000138369	8.482793387
TC vs UT	5.66E-06	6.26E-05	-27.24108474
TC vs UT	2.82E-05	0.000171212	-6.056606216
TC vs UT	3.29E-06	4.73E-05	6.405691063
TC vs UT	1.02E-08	6.96E-06	19.96579774
TC vs UT	1.40E-08	7.50E-06	14.23805559
TC vs UT	3.27E-06	4.72E-05	-4.686710151
TC vs UT	0.077055568	0.106740271	-2.089643872
TC vs UT	0.006246472	0.011829059	-2.754390413
TC vs UT	1.40E-06	3.11E-05	9.15328596
TC vs UT	0.000115334	0.000463968	-5.39340426
TC vs UT	5.23E-06	6.08E-05	-7.779445256
TC vs UT	2.05E-06	3.74E-05	-9.605701552
TC vs UT	2.67E-06	4.26E-05	8.682354291
TC vs UT	0.008428506	0.015296361	2.001207756
TC vs UT	1.98E-06	3.71E-05	-19.86942036
TC vs UT	0.00661421	0.012428103	-4.794080524
TC vs UT	3.86E-06	5.11E-05	-4.468297556
TC vs UT	7.64E-05	0.000341512	-8.596244807
TC vs UT	2.07E-05	0.000141189	-10.5195812
TC vs UT	0.000739421	0.001973817	-9.518705077
TC vs UT	0.000527951	0.001508256	4.230149098
TC vs UT	2.72E-06	4.28E-05	-8.810165817
TC vs UT	4.16E-05	0.00022249	-14.45340116
TC vs UT	4.96E-05	0.000252142	-6.202761728
TC vs UT	1.85E-05	0.000130938	-6.513597609
TC vs UT	0.000719062	0.001930757	-4.763656622
TC vs UT	8.51E-06	7.91E-05	-21.27241132

PMAIP1	T vs UT	2.65E-05	0.003712955	4.777295577
PMVK	T vs UT	0.024351032	0.086751871	1.453304635
PNO1	T vs UT	0.004429339	0.032919682	2.41292781
PNPT1	T vs UT	0.078462828	0.18569034	1.562472971
POFUT1	T vs UT	0.000732194	0.0138042	1.852576346
POLD2	T vs UT	0.001238984	0.017620151	2.003951075
POLG2	T vs UT	0.29758345	0.454953991	-1.295000187
POLI	T vs UT	0.002631476	0.025628831	-2.80377276
POLR1B	T vs UT	0.000476501	0.01143047	1.892598362
POLR1C	T vs UT	0.003654734	0.029749805	1.98865538
POLR2H	T vs UT	0.098365364	0.214700821	1.306845898
POLR2K	T vs UT	0.001617862	0.020088858	1.614472506
POLR3D	T vs UT	0.54753736	0.685881911	1.125555501
POLR3G	T vs UT	0.15445829	0.289741474	1.901174083
POMP	T vs UT	0.024646746	0.087527182	1.687857841
POP1	T vs UT	0.000103622	0.006620025	2.795882144
POU2F2	T vs UT	0.004039227	0.031328401	4.139942745
POU6F1	T vs UT	0.005759957	0.037676537	-2.013177618
PP1P	T vs UT	0.001139865	0.016933174	2.988248266
PPA1	T vs UT	0.000409343	0.010854186	3.808370172
PPAT	T vs UT	0.073749336	0.178790664	1.42698884
PPIF	T vs UT	0.016944853	0.069601743	1.501507819
PPIL1	T vs UT	0.000269285	0.009012964	2.46993969
PPP2R2B	T vs UT	0.103701771	0.222048092	-1.651789634
PPPDE2	T vs UT	0.209595141	0.358237977	1.267128733
PQLC3	T vs UT	0.835868887	0.896517521	-1.029665694
PRDM1	T vs UT	0.898804636	0.938141129	1.01142652
PRDX1	T vs UT	0.000117523	0.00686928	2.255361481
PRDX3	T vs UT	0.001629066	0.020187325	1.730279914
PRDX4	T vs UT	0.008273605	0.045704996	1.788293555
PRIC285	T vs UT	0.267517997	0.423427073	-1.426633533
PRKCA	T vs UT	0.33847298	0.497600077	1.120635149
PRMT2	T vs UT	0.003554992	0.029445636	-1.568628679
PRMT5	T vs UT	0.027981673	0.095097583	1.562188522
PRR5-ARHGAI	T vs UT	0.014520031	0.063216932	-1.93080136
PRSS35	T vs UT	0.190955319	0.335874335	-1.821070488
PRX	T vs UT	0.496527186	0.642038339	-1.234106827
PSAT1	T vs UT	1.95E-05	0.003333068	6.038196192
PSMA6P1	T vs UT	0.0007556	0.013933748	2.155148586
PSMB2	T vs UT	0.010425381	0.052317844	1.515159594
PSMB3	T vs UT	0.00015741	0.007536055	1.724995527
PSMB5	T vs UT	0.002853219	0.026491109	1.876672481
PSMB6	T vs UT	0.003359779	0.028490489	1.771068795
PSMC1P	T vs UT	0.000807203	0.014317169	1.771933966
PSMC2	T vs UT	0.007132977	0.042101297	1.455199354
PSMC3	T vs UT	0.000659951	0.013103372	1.984692422
PSMC4	T vs UT	0.000243459	0.00881624	1.874302322
PSMC6P1	T vs UT	0.033522256	0.107107907	1.437363323
PSMD1	T vs UT	0.00013851	0.007115973	1.825430185
PSMD11	T vs UT	0.01181659	0.056384888	1.368990048
PSMD12	T vs UT	0.029579231	0.09857079	1.552503009
PSMD14	T vs UT	0.000126263	0.00686928	2.423920636
PSMD2P1	T vs UT	0.000987292	0.015687257	1.648497544
PSMD3	T vs UT	0.017158674	0.070101539	1.60590645
PSMD8	T vs UT	0.000813931	0.014357316	1.719976106
PSME2P1	T vs UT	0.000226633	0.008493553	2.270362056
PSME2P2	T vs UT	9.47E-05	0.006524635	2.177053721
PSPH	T vs UT	0.117189502	0.240784296	1.405591725
PSTPIP1	T vs UT	0.222424423	0.373036354	-1.370971499
PTCH1	T vs UT	0.536213711	0.676093164	-1.113986725
PTGDR	T vs UT	0.676378127	0.784769201	-1.105035595
PTGER4	T vs UT	0.017524763	0.070985654	1.443621433
PTMS	T vs UT	0.073967149	0.179017166	1.693393498
PTPLAD2	T vs UT	0.904461087	0.942391832	-1.023427599
PTPN22	T vs UT	0.411883665	0.568004205	1.186811026
PTPN6	T vs UT	0.000188129	0.008017603	4.447570256
PTPN7	T vs UT	0.001751901	0.020945283	4.11089339
PTS	T vs UT	0.573226141	0.70827521	-1.147150369
PTTG1	T vs UT	0.103590119	0.221996062	1.661487141
PUS1	T vs UT	0.004321548	0.032470786	1.94597857
PUS7	T vs UT	0.007039926	0.041866101	2.830258544
PYCARD	T vs UT	0.588040767	0.719544912	-1.296025096
PYHIN1	T vs UT	0.192177767	0.337543002	1.200875024
QTRT1	T vs UT	0.005081251	0.035296803	2.298324891
RAB33A	T vs UT	0.953075242	0.971271818	1.046248892
RAB37	T vs UT	0.358000867	0.517121684	1.320564623
RAB40B	T vs UT	0.081494265	0.190677167	-1.453575988
RAB7L1	T vs UT	0.874637002	0.922126912	1.010565793
RABGAP1L	T vs UT	0.653018304	0.766544171	1.05752442
RAD54B	T vs UT	0.119516725	0.243748199	-1.240969253
RALGPS1	T vs UT	0.035771319	0.111830721	-2.206804631
RALGPS2	T vs UT	0.560795971	0.697562457	-1.25596294
RAN	T vs UT	0.000452432	0.011246955	2.066947997
RANBP1	T vs UT	0.006609808	0.040587117	2.113739675
RANP1	T vs UT	0.000278131	0.009093597	2.003434286
RAP1B	T vs UT	0.00265263	0.025753482	1.620686987
RAPH1	T vs UT	0.002029884	0.022840549	3.065639228
RARRES3	T vs UT	0.315761082	0.47369925	-1.258133591
RASA3	T vs UT	0.001725525	0.020797385	-2.412648595
RASGEF1A	T vs UT	0.224958388	0.375590646	2.237803932
RASGRP2	T vs UT	0.00876061	0.047371288	-5.40441305
RASSF7	T vs UT	0.046417988	0.13211768	-1.704053822
RBBP8	T vs UT	0.006659942	0.040813663	3.470092104
RBKS	T vs UT	0.116985857	0.240486099	1.761465172
RBL2	T vs UT	0.105523091	0.224352119	-1.397142654
RBM28	T vs UT	0.023561037	0.084983439	1.658792254
RBM43	T vs UT	0.110927215	0.231776383	-1.460310938
RBM8A	T vs UT	0.005418022	0.036584999	1.694019965
RBM9	T vs UT	0.126736378	0.253678496	-1.601205182
RBMS2	T vs UT	0.834409566	0.895691675	-1.051349409
RBPJ	T vs UT	1.15E-06	0.002130399	6.481411457
RBPMS	T vs UT	0.063875087	0.162899084	-2.285820916
RCL1	T vs UT	0.036605012	0.113497495	1.58872888
RCN1	T vs UT	9.72E-05	0.006584622	3.400928503
RCSD1	T vs UT	0.828784171	0.891857988	1.075745856
RDH10	T vs UT	0.216279242	0.365906016	2.018876706

C vs UT	5.63E-08	9.01E-06	30.26924991
C vs UT	2.85E-06	4.69E-05	4.513372655
C vs UT	6.66E-05	0.00035695	5.827833532
C vs UT	0.002580557	0.005961827	2.553532855
C vs UT	7.96E-05	0.000404128	2.312894516
C vs UT	2.37E-05	0.000173455	3.49821313
C vs UT	7.35E-05	0.000381872	-5.415640248
C vs UT	0.000240317	0.000907672	-4.88087386
C vs UT	6.05E-05	0.000332153	2.395902675
C vs UT	0.000684587	0.002033626	2.496677826
C vs UT	2.25E-05	0.000168166	3.577889211
C vs UT	1.11E-06	2.88E-05	3.821130629
C vs UT	0.000125107	0.000558405	3.91600847
C vs UT	0.000928515	0.00259135	9.209971597
C vs UT	4.49E-05	0.00026777	4.669782452
C vs UT	4.59E-06	6.21E-05	4.994949253
C vs UT	0.002197757	0.005209216	4.465349846
C vs UT	2.54E-05	0.000182471	-5.118140703
C vs UT	0.000185408	0.000754203	4.12844165
C vs UT	6.97E-05	0.000367247	5.540477077
C vs UT	0.001176577	0.003132627	2.465400013
C vs UT	8.69E-07	2.59E-05	5.757590573
C vs UT	1.04E-05	9.97E-05	4.208477351
C vs UT	0.004276534	0.009099165	-2.848955666
C vs UT	1.29E-06	3.11E-05	8.244914132
C vs UT	0.00040312	0.001340834	-3.891165592
C vs UT	7.63E-08	9.50E-06	6.656871785
C vs UT	4.21E-07	1.74E-05	5.511924014
C vs UT	2.63E-06	4.53E-05	3.901969323
C vs UT	3.74E-06	5.50E-05	6.068652345
C vs UT	0.054509752	0.080831825	-1.859563905
C vs UT	1.03E-06	2.77E-05	-4.428673187
C vs UT	3.57E-05	0.000231065	-2.500638912
C vs UT	0.000159992	0.000668939	3.145805591
C vs UT	0.000386038	0.001298732	-3.353963831
C vs UT	0.000123607	0.000555422	-113.1153511
C vs UT	0.000337655	0.001178398	-6.87238263
C vs UT	1.30E-08	5.33E-06	91.7896364
C vs UT	1.19E-07	1.01E-05	12.84530378
C vs UT	1.24E-06	3.05E-05	4.942960905
C vs UT	1.31E-07	1.06E-05	4.034053499
C vs UT	4.69E-06	6.27E-05	4.951182293
C vs UT	5.99E-06	7.27E-05	4.26206139
C vs UT	2.26E-07	1.33E-05	5.801034082
C vs UT	7.93E-07	2.50E-05	4.222228918
C vs UT	1.71E-06	3.57E-05	4.790862769
C vs UT	1.37E-07	1.09E-05	5.484387054
C vs UT	9.57E-06	9.52E-05	4.024262042
C vs UT	8.84E-08	9.80E-06	4.981198874
C vs UT	5.58E-07	2.09E-05	3.983148393
C vs UT	7.73E-06	8.43E-05	5.421375121
C vs UT	7.04E-08	9.50E-06	11.0799454
C vs UT	6.03E-07	2.16E-05	4.042952067
C vs UT	1.22E-05	0.000111476	4.367955547
C vs UT	9.19E-07	2.64E-05	4.058583612
C vs UT	7.01E-07	2.37E-05	5.737398715
C vs UT	2.05E-07	1.30E-05	5.640839496
C vs UT	3.44E-05	0.00022486	5.804085886
C vs UT	0.000545911	0.001704497	-3.454899329
C vs UT	2.63E-05	0.000187272	-3.948275362
C vs UT	5.06E-05	0.000291982	-8.701252761
C vs UT	4.71E-07	1.84E-05	6.485226492
C vs UT	2.30E-06	4.20E-05	14.7443651
C vs UT	0.006752546	0.013424523	-2.578478099
C vs UT	0.000181866	0.000742518	-3.83901257
C vs UT	0.021747926	0.036468884	-1.842354879
C vs UT	0.002389865	0.005594652	3.411173968
C vs UT	6.45E-05	0.000349134	4.389244482
C vs UT	9.13E-05	0.000444822	5.584169537
C vs UT	0.000795759	0.00229412	2.404842169
C vs UT	0.001265279	0.003314402	4.071034868
C vs UT	0.004328437	0.009181082	-5.848964164
C vs UT	0.000195688	0.000781863	-2.294910963
C vs UT	0.001182871	0.003146667	2.800618361
C vs UT	2.82E-05	0.000196527	10.09730476
C vs UT	0.000595372	0.001824736	-4.265271759
C vs UT	8.54E-05	0.000423081	-4.629544055
C vs UT	1.07E-07	9.93E-06	4.94934039
C vs UT	2.51E-06	4.41E-05	-4.183277185
C vs UT	3.27E-06	5.04E-05	-4.136935034
C vs UT	0.000380267	0.001285981	-6.70684922
C vs UT	0.063382039	0.09229958	-2.749223344
C vs UT	3.34E-06	5.11E-05	4.240235565
C vs UT	9.35E-05	0.000453216	4.304839845
C vs UT	1.34E-06	3.18E-05	4.252747339
C vs UT	1.45E-06	3.31E-05	4.175626817
C vs UT	0.000359715	0.001235111	4.199659189
C vs UT	6.29E-06	7.47E-05	-11.04884779
C vs UT	4.82E-06	6.42E-05	-8.429353916
C vs UT	0.000457912	0.001478026	-16.93272905
C vs UT	0.000113443	0.000524665	-26.84066535
C vs UT	0.001145578	0.003066292	-2.9533354717
C vs UT	3.71E-05	0.000236613	13.04482163
C vs UT	0.003583099	0.007836042	4.07320473
C vs UT	5.71E-05	0.000318515	-4.138832921
C vs UT	0.000141278	0.000612072	3.355820461
C vs UT	0.000196036	0.000782241	-3.89731287
C vs UT	2.52E-06	4.42E-05	5.337439269
C vs UT	1.09E-05	0.000102866	-12.77153544
C vs UT	0.01876272	0.032162428	-2.455322898
C vs UT	9.42E-05	0.000455788	2.832721017
C vs UT	0.001154957	0.003085725	-6.612025089
C vs UT	0.011523143	0.021149204	1.905378562
C vs UT	6.01E-07	2.16E-05	10.54298021
C vs UT	0.043167031	0.065945916	-2.060339566
C vs UT	0.474035984	0.53202837	-1.372916723

TC vs UT	3.63E-08	8.60E-06	36.6667203
TC vs UT	3.48E-05	0.000198023	2.926468902
TC vs UT	1.04E-05	8.98E-05	9.099354044
TC vs UT	0.000100712	0.000419519	4.379923353
TC vs UT	5.27E-07	2.00E-05	5.150522737
TC vs UT	2.79E-06	4.33E-05	5.190762396
TC vs UT	0.027579988	0.043149506	-1.892943918
TC vs UT	0.00044662	0.001320582	-4.362356266
TC vs UT	1.08E-06	2.83E-05	4.368769115
TC vs UT	2.76E-05	0.000168662	4.129646759
TC vs UT	8.19E-06	7.74E-05	4.249938142
TC vs UT	7.39E-07	2.36E-05	4.069216729
TC vs UT	2.80E-05	0.000170324	5.247132124
TC vs UT	0.000109128	0.000443929	16.17491982
TC vs UT	2.49E-05	0.000158297	5.216552698
TC vs UT	5.90E-07	2.14E-05	7.902341174
TC vs UT	0.001927242	0.004375418	4.59948607
TC vs UT	1.39E-05	0.000108678	-6.065030602
TC vs UT	1.45E-05	0.000112255	7.214773884
TC vs UT	1.05E-05	9.02E-05	8.780032766
TC vs UT	1.79E-05	0.000128766	4.824979123
TC vs UT	2.37E-06	4.05E-05	4.630528664
TC vs UT	1.82E-06	3.55E-05	5.9083976
TC vs UT	0.000127383	0.000498182	-6.518310116
TC vs UT	1.01E-06	2.76E-05	8.70623711
TC vs UT	0.000208104	0.000720563	-4.304819655
TC vs UT	2.09E-07	1.31E-05	5.25613826
TC vs UT	2.18E-07	1.35E-05	6.363702015
TC vs UT	2.18E-06	3.91E-05	4.004751571
TC vs UT	4.33E-06	5.41E-05	5.814442553
TC vs UT	0.000370157	0.001137311	-5.179497469
TC vs UT	1.49E-06	3.19E-05	-4.174190951
TC vs UT	8.35E-07	2.49E-05	-4.564975699
TC vs UT	5.28E-06	6.09E-05	5.903561619
TC vs UT	8.22E-05	0.00036007	-4.67225642
TC vs UT	0.00045507	0.001339756	-49.24467214
TC vs UT	0.000239202	0.00080233	-6.291419515
TC vs UT	7.45E-09	6.12E-06	127.7508876
TC vs UT	3.05E-07	1.61E-05	9.500577265
TC vs UT	8.04E-07	2.42E-05	5.40460982
TC vs UT	8.46E-08	1.06E-05	4.367020245
TC vs UT	1.71E-06	3.43E-05	6.150295754
TC vs UT	8.84E-06	8.14E-05	3.884090278
TC vs UT	2.35E-07	1.38E-05	5.725487083
TC vs UT	1.08E-06	2.83E-05	3.959370796
TC vs UT	1.39E-06	3.09E-05	4.972306147
TC vs UT	1.81E-07	1.26E-05	5.145713817
TC vs UT	9.04E-06	8.24E-05	4.024558727
TC vs UT	1.09E-07	1.19E-05	4.766895318
TC vs UT	4.49E-07	1.88E-05	4.126975383
TC vs UT	4.23E-06	5.34E-05	6.137240937
TC vs UT	7.17E-08	1.04E-05	10.91429914
TC vs UT	6.41E-07	2.23E-05	4.037407477
TC vs UT	1.00E-05	8.81E-05	4.45130611
TC vs UT	6.78E-07	2.28E-05	4.266770193
TC vs UT	7.74E-07	2.38E-05	5.602940056
TC vs UT	1.59E-07	1.24E-05	5.950742893
TC vs UT	1.14E-06	2.86E-05	15.80091591
TC vs UT	6.35E-05	0.000300115	-5.768768341
TC vs UT	2.03E-05	0.000139501	-4.305535018
TC vs UT	2.91E-05	0.000174633	-10.55114959
TC vs UT	2.45E-06	4.12E-05	4.507776244
TC vs UT	2.70E-06	4.28E-05	13.99437181
TC vs UT	0.000227382	0.000770562	-5.014540444
TC vs UT	3.68E-05	0.00020474	-5.522861668
TC vs UT	0.588435521	0.638804326	1.131141935
TC vs UT	0.001215542	0.002993337	3.932449765
TC vs UT	4.31E-05	0.000227762	4.695003584
TC vs UT	5.58E-05	0.000273661	6.194284917
TC vs UT	2.33E-05	0.000152093	4.190225675
TC vs UT	5.95E-05	0.000285879	8.466301625
TC vs UT	0.001728446	0.0039992	-9.384265781
TC vs UT	3.09E-06	4.53E-05	-4.304729442
TC vs UT	0.000126018	0.00049437	4.189702986
TC vs UT	5.77E-05	0.000279583	8.19963041
TC vs UT	5.28E-05	0.000262748	-7.890199065
TC vs UT	0.008834451	0.01593691	-2.037731183
TC vs UT	2.87E-07	1.56E-05	4.058906307
TC vs UT	1.64E-06	3.38E-05	-4.545887011
TC vs UT	7.62E-06	7.45E-05	-3.540311659
TC vs UT	8.14E-05	0.000357916	-9.843163596
TC vs UT	0.001783737	0.004110931	-7.814625373
TC vs UT	4.71E-07	1.92E-05	6.323234414
TC vs UT	1.19E-05	9.78E-05	6.628647718
TC vs UT	1.74E-07	1.24E-05	6.462514872
TC vs UT	2.69E-06	4.28E-05	3.681112433
TC vs UT	5.80E-05	0.000280328	6.671990667
TC vs UT	1.37E-06	3.09E-05	-17.3138224
TC vs UT	3.57E-06	4.91E-05	-8.925778986
TC vs UT	0.003090438	0.006502576	-10.16539253
TC vs UT	3.45E-05	0.000197037	-51.80213011
TC vs UT	0.000142415	0.000542764	-4.247406395
TC vs UT	9.36E-06	8.48E-05	22.23634509
TC vs UT	0.191261201	0.239052266	1.612934122
TC vs UT	1.68E-05	0.00012341	-5.326460971
TC vs UT	2.05E-05	0.000140406	4.809973123
TC vs UT	1.69E-05	0.000123862	-6.971353546
TC vs UT	1.05E-06	2.78E-05	6.402003251
TC vs UT	0.003264519	0.006807291	-3.123021335
TC vs UT	0.001938378	0.004396653	-4.268178635
TC vs UT	2.82E-06	4.33E-05	5.240475048
TC vs UT	0.00059247	0.001650884	-9.067661525
TC vs UT	7.19E-05	0.00032767	4.037655656
TC vs UT	2.02E-07	1.30E-05	15.00544665
TC vs UT	0.000853654	0.002229518	-4.742052082
TC vs UT	0.000952764	0.002444389	9.671604802

RDX	T vs UT	0.217019691	0.36648512	1.159783894
REEP6	T vs UT	0.365152066	0.523988826	-1.131201338
REL	T vs UT	0.00078538	0.014094902	5.090869283
RELB	T vs UT	2.07E-05	0.003420999	7.638313745
RGS1	T vs UT	0.5734147	0.7084372	1.443703007
RGS14	T vs UT	0.03317915	0.106141404	-1.592190465
RGS16	T vs UT	9.95E-05	0.006595668	39.18122585
RHOB	T vs UT	0.006508044	0.040343984	1.936169853
RHPN1	T vs UT	0.058904657	0.154728254	-1.938943191
RIMBP3	T vs UT	0.121568736	0.246536598	-2.324236297
RIMBP3B	T vs UT	0.017711331	0.071462813	-3.505695689
RIOK1	T vs UT	0.008834132	0.047522155	1.742688237
RNASEL	T vs UT	0.387948793	0.545801987	-1.118858949
RND1	T vs UT	0.013762224	0.061088367	2.783919644
RNF145	T vs UT	0.050236362	0.13960206	1.146335128
RNF166	T vs UT	0.023367867	0.084519155	-2.157937413
RNF168	T vs UT	0.881157477	0.926282007	-1.021612763
RORC	T vs UT	0.000585545	0.012447885	3.62148723
RPF2	T vs UT	0.00016468	0.00763911	2.612648546
RPF2P	T vs UT	0.135814565	0.265135147	1.716710777
RPIA	T vs UT	0.006353819	0.039880172	1.566331595
RPL22L1	T vs UT	0.02062064	0.078376229	1.808334836
RPL26L1	T vs UT	0.001268659	0.017856812	2.281959615
RPL26P30	T vs UT	0.007920536	0.044473967	2.049960409
RPL7L1	T vs UT	0.319658603	0.477744312	1.146162049
RPP40	T vs UT	0.039704614	0.119029204	2.517012834
RRAS2	T vs UT	0.252332471	0.406434928	1.260539808
RRBP1	T vs UT	0.747945079	0.834962682	1.125741794
RRN3P1	T vs UT	0.22476683	0.375321644	-1.825766079
RRP15	T vs UT	0.008767338	0.047371288	1.828240115
RRP9	T vs UT	0.314628365	0.472648881	1.392324954
RSL24D1	T vs UT	0.000206126	0.008215303	1.898338884
RSL24D1P1	T vs UT	0.10616509	0.225091966	1.262748183
RTN4R	T vs UT	0.077094527	0.183650602	-2.461148183
RUVBL2	T vs UT	0.000455561	0.011256646	1.928262789
RWDD2A	T vs UT	0.034151657	0.108472419	-1.553026184
S1PR1	T vs UT	0.050606456	0.140251203	-2.035135147
S1PR4	T vs UT	0.152072127	0.2868867	-1.366678811
S1PR5	T vs UT	0.013755952	0.061088367	-1.561420701
SALL2	T vs UT	0.625382155	0.745957431	-1.224592079
SAMD12	T vs UT	0.559628397	0.69677501	-1.171300059
SAMD3	T vs UT	0.523605492	0.665504146	-1.195157752
SAMSN1	T vs UT	0.655303082	0.768007166	1.119732402
SAP30	T vs UT	0.030527174	0.10072252	1.878445732
SARS	T vs UT	0.001126558	0.016775923	1.454373271
SATB1	T vs UT	0.510052164	0.655007072	1.092550198
SBK1	T vs UT	0.074774519	0.17995705	-1.737990051
SBNO2	T vs UT	0.000402509	0.010817054	-1.438345061
SCD	T vs UT	0.000321538	0.00986211	2.931067419
SCFD2	T vs UT	0.004362153	0.032557714	2.810096636
SCML2	T vs UT	0.190707771	0.335534439	1.382888437
SCML4	T vs UT	0.513214981	0.657707997	-1.246713222
SCRN2	T vs UT	0.037927402	0.115897118	-1.416220948
SDC4	T vs UT	4.00E-06	0.002448332	12.24519923
SDF2L1	T vs UT	0.019921359	0.076555409	2.151839143
SEC13	T vs UT	0.021837499	0.081037591	1.479472501
SEC23B	T vs UT	0.013220133	0.059621155	1.510317647
SEC24A	T vs UT	0.007250028	0.042401707	1.491304657
SEC24D	T vs UT	0.509414923	0.654552523	1.201782987
SEC61B	T vs UT	0.010855324	0.053645751	1.719518403
SEC61G	T vs UT	0.801158706	0.871562277	1.101996577
SEH1L	T vs UT	0.002254276	0.02373846	1.926852018
SELK	T vs UT	0.011016265	0.054202131	1.562290144
SELPLG	T vs UT	0.061308684	0.158593921	-1.843325503
SELS	T vs UT	0.291867452	0.449335208	1.223735503
SEMA4A	T vs UT	0.010925086	0.053894666	3.372444638
SEMA4B	T vs UT	0.120573873	0.245144455	-1.317198778
SEMA4C	T vs UT	0.04175425	0.12322441	-1.878880305
SEMA7A	T vs UT	5.56E-07	0.002130399	6.537687114
SENP3_	T vs UT	0.001238951	0.017620151	1.542963506
SENP7	T vs UT	0.00512543	0.035447912	-1.74124193
SEPW1	T vs UT	0.013594946	0.060755956	-1.548269708
SERBP1	T vs UT	0.003555925	0.029445636	1.877002906
SERBP1P1	T vs UT	0.001970007	0.022496506	1.932693805
SERPINE2	T vs UT	0.000585506	0.012447885	19.77123252
SESN1	T vs UT	0.410403523	0.566723646	1.129674279
SESN2	T vs UT	0.178105635	0.320871199	1.185346292
SESN3	T vs UT	0.275616936	0.432141	-1.219502613
SF3B5	T vs UT	0.006703594	0.040917337	1.505108227
SFXN1	T vs UT	0.002391696	0.024388027	1.908855449
SFXN3	T vs UT	0.311879629	0.469868909	1.292744162
SGK1	T vs UT	0.00270597	0.025890935	6.595162614
SGK223	T vs UT	0.782611993	0.858964382	-1.078193516
SGPP2	T vs UT	0.003367266	0.028515375	6.982947422
SGSH	T vs UT	0.005522886	0.036849123	-2.531232176
SGSM2	T vs UT	0.000602835	0.012619617	-2.245072554
SH3BP5	T vs UT	0.76699197	0.847417178	1.060900864
SHF	T vs UT	1.03E-05	0.002542857	13.42750643
SHMT2	T vs UT	5.17E-06	0.002448332	7.519434672
SIAH2	T vs UT	0.008983464	0.047867812	1.837202303
SIDT2	T vs UT	0.303379221	0.461182583	-1.16653594
SIGIRR	T vs UT	0.002510553	0.025105534	-2.2351197
SIPA1	T vs UT	0.000509383	0.011925119	-1.540295918
SIRPG	T vs UT	0.007881181	0.044372126	2.818897205
SIT1	T vs UT	0.364027118	0.522947031	-1.211769293
SLA2	T vs UT	0.372792628	0.532067729	-1.19860388
SLAMF1	T vs UT	0.101662332	0.219363939	1.55118659
SLAMF6	T vs UT	0.752312541	0.837749224	-1.030248758
SLAMF7	T vs UT	0.056541525	0.150671493	1.644034055
SLC16A1	T vs UT	2.70E-05	0.003735954	2.587098257
SLC16A3	T vs UT	0.005057616	0.03526186	2.755975309
SLC16A6	T vs UT	0.097609729	0.213505048	2.011952978
SLC17A9	T vs UT	0.94279467	0.96550318	-1.08911152
SLC19A1	T vs UT	0.879822882	0.925687686	1.086951698
SLC19A2	T vs UT	0.61274426	0.736471985	1.135461782
SLC1A4	T vs UT	0.112467843	0.234094156	1.462817377

C vs UT	1.50E-06	3.38E-05	4.00866948
C vs UT	4.52E-06	6.15E-05	-5.918297487
C vs UT	0.119772709	0.161064184	1.628301665
C vs UT	4.26E-05	0.000257701	6.175635407
C vs UT	0.000323961	0.001139989	29.21132375
C vs UT	0.000946794	0.002625725	-2.483761742
C vs UT	7.06E-05	0.000370831	56.43226493
C vs UT	0.00074962	0.00219135	2.515766516
C vs UT	0.000164804	0.000684416	-6.442512025
C vs UT	0.002827589	0.006420657	-11.61504972
C vs UT	0.000542276	0.001695301	-12.17490159
C vs UT	1.65E-05	0.000136595	4.196015826
C vs UT	9.34E-06	9.42E-05	-3.416815022
C vs UT	0.001104318	0.002978718	5.150527534
C vs UT	1.19E-08	5.10E-06	4.031750254
C vs UT	1.51E-05	0.000128773	-16.87560606
C vs UT	3.95E-06	5.69E-05	-4.923991992
C vs UT	0.000134363	0.000588105	-4.669374675
C vs UT	1.15E-06	2.92E-05	6.659448055
C vs UT	0.000122444	0.000553573	7.10218332
C vs UT	8.10E-06	8.63E-05	3.453927412
C vs UT	0.000201955	0.000799393	3.882121528
C vs UT	6.43E-05	0.000348646	3.509230928
C vs UT	0.000425925	0.001395973	3.330466434
C vs UT	5.66E-05	0.000316808	2.628856191
C vs UT	0.023242777	0.038571123	2.86343031
C vs UT	4.91E-05	0.000285534	4.197786524
C vs UT	0.0005148	0.001626308	4.689258333
C vs UT	0.004640295	0.0097238	-5.412214166
C vs UT	0.000275991	0.001005901	3.060439835
C vs UT	0.012594163	0.022809346	2.752795686
C vs UT	7.23E-08	9.50E-06	6.388801893
C vs UT	1.59E-06	3.45E-05	4.856539465
C vs UT	0.000358426	0.001231371	-15.10046228
C vs UT	3.12E-06	4.90E-05	3.717034932
C vs UT	0.003506394	0.007695593	-1.982929508
C vs UT	0.001805859	0.004444567	-6.227059485
C vs UT	0.003268724	0.007252721	-2.456897016
C vs UT	1.13E-07	9.93E-06	-12.45063093
C vs UT	2.08E-05	0.000160605	-36.12022923
C vs UT	0.005677596	0.011542416	-5.642972486
C vs UT	0.000135584	0.000592188	-6.960767395
C vs UT	3.73E-05	0.000237498	10.36474385
C vs UT	0.000461907	0.00148897	4.07823079
C vs UT	1.86E-08	5.89E-06	5.136392972
C vs UT	1.16E-06	2.93E-05	5.445901319
C vs UT	0.000353395	0.0012168	-6.056930295
C vs UT	1.02E-08	5.10E-06	4.459364303
C vs UT	3.39E-07	1.55E-05	14.37202903
C vs UT	0.000198749	0.000790255	5.252375005
C vs UT	0.00077585	0.002245593	5.354299803
C vs UT	3.06E-07	1.50E-05	-127.0638927
C vs UT	1.86E-06	3.67E-05	-5.485680722
C vs UT	7.07E-05	0.000371064	5.224139602
C vs UT	0.00016094	0.000671538	6.260517688
C vs UT	4.92E-06	6.53E-05	4.543854683
C vs UT	1.01E-06	2.73E-05	5.631160714
C vs UT	3.44E-07	1.57E-05	5.392975974
C vs UT	3.00E-05	0.000205414	7.588496872
C vs UT	2.53E-06	4.42E-05	6.908838004
C vs UT	2.38E-05	0.000174117	6.162638079
C vs UT	7.31E-06	8.21E-05	4.660076559
C vs UT	1.70E-07	1.23E-05	9.758331607
C vs UT	0.005171381	0.010646707	-3.099638415
C vs UT	2.14E-06	4.02E-05	9.003616465
C vs UT	0.005488382	0.011211357	4.031750436
C vs UT	0.000133408	0.000585379	-2.867451971
C vs UT	0.001249006	0.003280138	-4.133354656
C vs UT	3.84E-08	8.69E-06	14.09752407
C vs UT	3.64E-07	1.60E-05	3.826392706
C vs UT	8.98E-05	0.000439342	-2.861099933
C vs UT	3.66E-05	0.000234791	-3.313742086
C vs UT	2.73E-05	0.000191717	3.772027115
C vs UT	1.23E-05	0.00011239	3.988106666
C vs UT	0.007452847	0.014595553	6.379000911
C vs UT	8.13E-07	2.53E-05	-6.173735398
C vs UT	1.09E-08	5.10E-06	13.09390252
C vs UT	3.99E-06	5.72E-05	-8.687341999
C vs UT	1.74E-06	3.58E-05	4.081274645
C vs UT	1.37E-05	0.000120958	3.783214113
C vs UT	0.000115441	0.000532109	-4.560800704
C vs UT	2.19E-06	4.08E-05	127.9217301
C vs UT	3.00E-06	4.82E-05	-26.08620382
C vs UT	0.01274374	0.023029506	5.119466745
C vs UT	0.002146563	0.005114798	-2.96753119
C vs UT	9.73E-07	2.68E-05	-6.971587261
C vs UT	0.000132827	0.000583872	9.216224507
C vs UT	1.01E-07	9.93E-06	25.96503653
C vs UT	0.002187902	0.005191845	2.10186348
C vs UT	4.53E-05	0.000269704	-3.391178603
C vs UT	3.12E-06	4.90E-05	-8.509985035
C vs UT	1.87E-06	3.68E-05	-2.558761547
C vs UT	9.33E-05	0.000452518	-7.087544211
C vs UT	0.246401808	0.301821407	-1.247554997
C vs UT	6.02E-05	0.000331132	-4.224837329
C vs UT	5.17E-05	0.000295835	6.730810128
C vs UT	1.12E-07	9.93E-06	-6.478958582
C vs UT	1.57E-05	0.000132164	7.562925655
C vs UT	8.51E-09	5.10E-06	14.63320152
C vs UT	2.16E-05	0.000163943	10.70754883
C vs UT	0.000227935	0.000873077	7.248331742
C vs UT	0.00321583	0.007159839	3.741763643
C vs UT	0.000368328	0.001258029	2.982363415
C vs UT	0.003146452	0.007025672	2.627295619
C vs UT	2.69E-06	4.58E-05	10.13414236

TC vs UT	3.46E-06	4.83E-05	3.47764363
TC vs UT	1.61E-05	0.000120313	-4.485464787
TC vs UT	0.001726499	0.003996195	3.835942624
TC vs UT	7.61E-05	0.000340883	5.323604926
TC vs UT	0.011905309	0.020625609	7.07688384
TC vs UT	1.98E-05	0.00013748	-4.853690646
TC vs UT	5.89E-06	6.40E-05	263.5176103
TC vs UT	7.68E-06	7.49E-05	5.994080029
TC vs UT	8.30E-05	0.000362907	-8.006670372
TC vs UT	0.00039766	0.001202338	-22.39785389
TC vs UT	0.000565189	0.00159239	-12.97651214
TC vs UT	1.85E-06	3.58E-05	6.705541439
TC vs UT	2.08E-06	3.79E-05	-4.42013187
TC vs UT	0.002540199	0.005521005	4.13688666
TC vs UT	3.42E-07	1.66E-05	2.488015562
TC vs UT	6.24E-06	6.62E-05	-24.07489824
TC vs UT	8.74E-06	8.07E-05	-4.14547044
TC vs UT	0.001916203	0.004354365	-2.705271597
TC vs UT	3.33E-07	1.64E-05	9.040937007
TC vs UT	2.76E-05	0.000168662	10.75338805
TC vs UT	1.38E-06	3.09E-05	4.675373581
TC vs UT	2.41E-05	0.000155328	5.88476762
TC vs UT	1.61E-05	0.000120717	4.536299704
TC vs UT	0.000116488	0.000467392	4.026463166
TC vs UT	3.53E-06	4.90E-05	4.019832869
TC vs UT	0.0006354	0.001746039	6.885345664
TC vs UT	3.47E-05	0.000197829	4.564572021
TC vs UT	0.003687662	0.007550461	3.001613197
TC vs UT	0.018460899	0.030313342	-3.535476297
TC vs UT	1.84E-05	0.000130864	4.83097142
TC vs UT	0.000341788	0.001065239	5.45776495
TC vs UT	2.16E-08	8.31E-06	8.604909772
TC vs UT	3.39E-07	1.65E-05	6.876991597
TC vs UT	2.92E-05	0.00017497	-50.5706494
TC vs UT	9.83E-07	2.73E-05	4.529183255
TC vs UT	2.59E-05	0.000162264	-4.536531832
TC vs UT	0.048562205	0.071011859	-2.572905652
TC vs UT	0.000109744	0.000445534	-4.622148905
TC vs UT	3.14E-08	8.31E-06	-19.74577365
TC vs UT	8.71E-05	0.000377434	-19.38754642
TC vs UT	0.001307808	0.003185554	-8.069539546
TC vs UT	7.68E-06	7.49E-05	-16.24137957
TC vs UT	3.09E-05	0.00018198	10.76948099
TC vs UT	0.000161161	0.000592463	4.857056946
TC vs UT	1.31E-08	7.50E-06	5.52734638
TC vs UT	6.32E-06	6.66E-05	3.896432982
TC vs UT	0.000182166	0.000647763	-7.395164965
TC vs UT	6.10E-08	9.59E-06	3.28607928
TC vs UT	2.74E-06	4.30E-05	7.763669799
TC vs UT	4.42E-05	0.000232468	7.390119372
TC vs UT	0.00047501	0.001384602	6.136274732
TC vs UT	1.67E-06	3.41E-05	-50.12958131
TC vs UT	2.54E-06	4.15E-05	-5.087706657
TC vs UT	7.78E-06	7.53E-05	9.295555912
TC vs UT	0.000420396	0.001255253	4.624163265
TC vs UT	1.13E-05	9.45E-05	3.843132659
TC vs UT	3.30E-06	4.73E-05	4.36783556
TC vs UT	5.79E-06	6.35E-05	3.195544121
TC vs UT	0.000215251	0.000739906	4.649414783
TC vs UT	3.85E-06	5.10E-05	6.128841549
TC vs UT	0.000112389	0.00045446	4.275931821
TC vs UT	5.69E-07	2.11E-05	8.178411387
TC vs UT	6.04E-07	2.15E-05	6.827404524
TC vs UT	0.000122234	0.000484925	-7.890617968
TC vs UT	1.60E-05	0.000120141	5.316234295
TC vs UT	0.001992953	0.004502218	5.966784158
TC vs UT	8.09E-06	7.70E-05	-4.918106935
TC vs UT	0.002278947	0.005039473	-3.680805066
TC vs UT	2.49E-08	8.31E-06	16.31903902
TC vs UT	1.38E-07	1.24E-05	4.530953827
TC vs UT	1.73E-06	3.44E-05	-5.974610484
TC vs UT	1.19E-05	9.78E-05	-4.061059269
TC vs UT	4.57E-06	5.59E-05	5.260628746
TC vs UT	2.35E-06	4.05E-05	5.4421609
TC vs UT	0.000295277	0.000947869	28.54894855
TC vs UT	5.99E-07	2.15E-05	-6.46334566
TC vs UT	6.27E-09	6.10E-06	15.75291586
TC vs UT	2.04E-06	3.74E-05	-10.3743666
TC vs UT	2.70E-06	4.28E-05	3.715430984
TC vs UT	5.32E-06	6.09E-05	4.55952706
TC vs UT	5.77E-06	6.34E-05	-10.18714607
TC vs UT	2.80E-05	0.000170505	32.62124264
TC vs UT	2.89E-05	0.000174063	-10.36291663
TC vs UT	0.002887571	0.006149179	7.3853894
TC vs UT	6.76E-05	0.000313674	-6.09067667
TC vs UT	4.17E-07	1.82E-05	-8.733082978
TC vs UT	0.00500454	0.009803937	3.596979467
TC vs UT	0.000567884	0.001598268	4.674492609
TC vs UT	6.20E-08	9.59E-06	32.07969626
TC vs UT	3.51E-05	0.000199153	4.018857487
TC vs UT	1.10E-05	9.30E-05	-4.463907061
TC vs UT	5.76E-07	2.12E-05	-15.04921577
TC vs UT	3.17E-08	8.31E-06	-4.927018486
TC vs UT	4.13E-05	0.00022151	-8.804152156
TC vs UT	2.01E-05	0.000138562	-5.595214956
TC vs UT	6.39E-05	0.00030137	-3.962513488
TC vs UT	0.000332859	0.001042456	4.305561768
TC vs UT	3.29E-08	8.31E-06	-8.73091561
TC vs UT	2.09E-05	0.000142102	6.94766306
TC vs UT	1.39E-08	7.50E-06	12.53041743
TC vs UT	0.002547021	0.005531931	3.419362412
TC vs UT	8.96E-05	0.000385323	9.652934075
TC vs UT	0.001062176	0.002671147	4.510387526
TC vs UT	3.20E-05	0.0001867	4.696034956
TC vs UT	7.42E-05	0.00033453	5.662032336
TC vs UT	5.06E-06	5.93E-05	8.507850944

SLC1A5	T vs UT	2.99E-05	0.003975318	5.467672175
SLC25A19	T vs UT	0.015442164	0.065572112	1.881543445
SLC25A22	T vs UT	0.793786936	0.867395908	1.13130918
SLC25A23	T vs UT	0.103195034	0.221478637	-1.532103162
SLC25A32	T vs UT	0.010792126	0.053645751	1.641399253
SLC25A33	T vs UT	0.341197583	0.50014852	1.67333131
SLC25A45	T vs UT	0.056023833	0.149745039	-1.650481563
SLC25A5	T vs UT	0.000491478	0.011609044	2.025954979
SLC27A1	T vs UT	0.623380652	0.744410156	-1.204162481
SLC27A2	T vs UT	0.642328115	0.759120642	1.914396004
SLC27A3	T vs UT	0.020971507	0.079076051	-1.993625821
SLC29A1	T vs UT	0.169507419	0.309177878	1.788434971
SLC2A3	T vs UT	0.658799394	0.770755909	-1.043344541
SLC31A1	T vs UT	0.351132816	0.510490228	1.243676326
SLC35E2	T vs UT	0.01110129	0.054396095	-1.743305147
SLC35E2B	T vs UT	0.048238618	0.135826023	-1.411987595
SLC35E3	T vs UT	0.121606484	0.246572594	-1.422484705
SLC35F2	T vs UT	0.000898495	0.015035702	3.057558516
SLC38A5	T vs UT	0.089011545	0.201120094	1.475653702
SLC39A14	T vs UT	0.000760566	0.013937313	2.185904421
SLC3A2	T vs UT	0.001523137	0.019441279	1.889019585
SLC41A2	T vs UT	1.30E-05	0.002739231	9.652725862
SLC43A2	T vs UT	0.000224479	0.008438482	9.1109579
SLC4A10	T vs UT	0.94961908	0.969833783	1.001486067
SLC6A9	T vs UT	0.000572527	0.012425163	8.717458117
SLC7A1	T vs UT	4.11E-05	0.004529233	3.334087555
SLC7A5	T vs UT	0.001430436	0.018786948	3.224224966
SLC9A9	T vs UT	0.3398402	0.499042588	-1.373164196
SLCO4A1	T vs UT	0.013550099	0.060643454	3.255576385
SMAD3	T vs UT	0.352037917	0.511297039	1.320531397
SMARCD3	T vs UT	0.088994281	0.20111794	-2.057956739
SMS	T vs UT	0.000556279	0.012365268	4.246169247
SMTN	T vs UT	0.423100843	0.577581599	1.176506149
SNAI3	T vs UT	0.107493093	0.226833791	-1.834592266
SNED1	T vs UT	0.064989885	0.164847826	-1.92664574
SNHG3_	T vs UT	0.001410225	0.018696854	2.112344351
SNN	T vs UT	0.57139139	0.706645521	-1.248066986
SNRPA	T vs UT	0.000706822	0.013553827	1.765014051
SNRPB2	T vs UT	0.012198427	0.057263225	1.722557808
SNRPD1	T vs UT	0.004951086	0.034883937	2.362968278
SNRPE	T vs UT	0.001053964	0.016325842	2.054249695
SNRPEL1	T vs UT	0.001039426	0.01619884	1.734912807
SNRPF	T vs UT	0.002008415	0.022719039	2.041517982
SNRPG	T vs UT	0.054114298	0.14663115	1.931730133
SNRPG.1	T vs UT	0.000576156	0.012425163	1.981013436
SNTA1	T vs UT	0.519513261	0.662419701	-1.204480366
SNX10	T vs UT	0.029717394	0.098761724	1.835138634
SNX30	T vs UT	0.392558272	0.550340363	-1.184468233
SNX33	T vs UT	0.048194705	0.135733375	1.800606819
SNX9	T vs UT	0.001040323	0.01619884	4.664018294
SOCS1	T vs UT	0.389871586	0.547881998	-1.223243346
SOCS2	T vs UT	0.015028697	0.064475935	-2.067766132
SOCS3	T vs UT	0.14182425	0.273019985	-1.554475703
SOD2	T vs UT	0.808276226	0.876600765	1.064881405
SORBS3	T vs UT	0.022706298	0.083139543	-1.799764809
SORL1	T vs UT	0.079268855	0.187062542	-1.719067659
SOX12	T vs UT	0.316297384	0.474330668	-1.524768037
SPAG1	T vs UT	0.085097545	0.195537222	1.801303133
SPATA7	T vs UT	0.375143863	0.534063484	1.174273828
SPC24	T vs UT	0.362947825	0.521822142	1.204302393
SPHK1	T vs UT	0.000854326	0.014668872	4.647327937
SPINT1	T vs UT	0.009652314	0.050195287	2.605402196
SPNS3	T vs UT	0.840096031	0.899243343	1.057891195
SPOCK2	T vs UT	0.71180407	0.80949471	1.149131698
SPON1	T vs UT	0.18689986	0.331579176	-1.878517728
SPPL2A	T vs UT	0.002043341	0.022841701	2.379085909
SPRED2	T vs UT	0.00836525	0.046067404	5.510659557
SPRY2	T vs UT	0.000503798	0.011854638	34.56705264
SPRY4	T vs UT	4.56E-05	0.004761308	43.51950028
SPSB2	T vs UT	0.027671664	0.094490176	1.575414429
SPTY2D1	T vs UT	0.000478091	0.011446325	1.496340522
SRD5A3	T vs UT	0.005154276	0.035603484	2.106624655
SREBF1	T vs UT	0.013916842	0.061349541	2.101823157
SRFBP1	T vs UT	0.000744859	0.01391532	2.406267132
SRM	T vs UT	0.002690261	0.025890935	2.280623694
SRP54	T vs UT	0.077615562	0.184357519	1.393027223
SRPRB	T vs UT	0.003621071	0.029693997	1.821486547
SRSF1	T vs UT	0.006864932	0.041290053	1.727936868
SSX2IP	T vs UT	0.241323578	0.393847745	-1.320595672
ST3GAL5	T vs UT	0.386387963	0.544227048	1.193804485
ST8SIA4	T vs UT	0.00973997	0.050502031	1.849737505
STARD4	T vs UT	0.030604577	0.100896907	2.694993125
STARD5	T vs UT	0.05301146	0.144588661	-1.46021406
STARD9	T vs UT	0.007271309	0.042401707	-2.159507215
STAT4	T vs UT	0.072792854	0.177413695	1.413986387
STAT5A	T vs UT	0.005340311	0.036278809	2.115329006
STIP1	T vs UT	0.003407344	0.028744442	1.676476722
STK38	T vs UT	0.001407742	0.018694049	-1.987215333
STMN3	T vs UT	0.151356562	0.286011711	-1.619371306
STON1-GTF2A	T vs UT	0.459933073	0.609605858	-1.425348758
STX11	T vs UT	0.000110791	0.006680273	5.284830051
SUB1	T vs UT	0.012559448	0.058108066	1.510151258
SUB1P1	T vs UT	0.090646961	0.203398914	1.47759832
SURF4	T vs UT	0.002785083	0.026233825	1.510965604
SUSD1	T vs UT	0.000898728	0.015035702	-2.835464227
SUSD3	T vs UT	0.079450779	0.187341019	-2.680319928
SUV39H2	T vs UT	0.001206656	0.017325005	2.676902822
SUV420H2	T vs UT	0.44707483	0.598709103	-1.345565003
SYNE1	T vs UT	0.150275303	0.284535394	-1.449814559
SYNE2	T vs UT	0.028502809	0.09625846	-2.372919014
SYNM	T vs UT	0.028841592	0.096924727	-2.378591209
SYP	T vs UT	0.021281778	0.07985524	2.93498036
SYTL3	T vs UT	0.166323538	0.305537727	-1.346972519
TACC3	T vs UT	0.014000953	0.061555421	-1.737751075
TAF13	T vs UT	0.099276895	0.216116545	1.545725031
TAF1B	T vs UT	0.002688126	0.025890935	1.872666645

C vs UT	1.03E-07	9.93E-06	33.89487156
C vs UT	0.000601092	0.001837706	3.19723627
C vs UT	0.000467939	0.001505659	4.023673209
C vs UT	0.000276497	0.001006558	-4.164317746
C vs UT	1.49E-05	0.000127487	4.107048777
C vs UT	0.006904666	0.013669642	3.732473487
C vs UT	0.000142665	0.000616133	-4.395882259
C vs UT	4.33E-06	6.03E-05	3.887388666
C vs UT	0.000298607	0.001070166	-4.994472764
C vs UT	0.001416823	0.003634921	32.10254832
C vs UT	0.000135835	0.000593074	-4.75258476
C vs UT	0.001309268	0.003405753	6.86063541
C vs UT	1.38E-07	1.09E-05	5.472590926
C vs UT	0.000164069	0.000682283	4.379023722
C vs UT	4.88E-06	6.48E-05	-6.631787425
C vs UT	8.41E-06	8.80E-05	-4.701333536
C vs UT	0.021984031	0.036783072	-1.827055581
C vs UT	0.001813883	0.004459656	2.655036108
C vs UT	0.000941069	0.002614551	2.866170951
C vs UT	7.95E-06	8.58E-05	4.451424582
C vs UT	6.42E-07	2.26E-05	6.885116799
C vs UT	5.90E-07	2.16E-05	31.83668046
C vs UT	0.383489086	0.443629942	1.282604334
C vs UT	1.79E-07	1.25E-05	5.323046174
C vs UT	2.79E-06	4.65E-05	113.7724922
C vs UT	1.29E-07	1.05E-05	12.76248408
C vs UT	1.62E-06	3.47E-05	24.46284128
C vs UT	0.001470799	0.00374844	-3.68085708
C vs UT	0.000642073	0.001932802	10.52278036
C vs UT	0.000346531	0.001198523	-5.118556852
C vs UT	0.00018298	0.000746328	-14.68269978
C vs UT	6.68E-06	7.77E-05	13.48842629
C vs UT	0.004331179	0.009184689	2.693812055
C vs UT	3.61E-05	0.000232739	-21.37037165
C vs UT	0.000438717	0.001427653	-6.997625667
C vs UT	0.001120767	0.003012001	2.239672662
C vs UT	0.010457245	0.01943591	-3.320826442
C vs UT	1.40E-06	3.26E-05	3.716643327
C vs UT	8.67E-06	9.00E-05	5.274134109
C vs UT	4.91E-05	0.000285566	5.752563308
C vs UT	4.96E-05	0.000288018	3.151131329
C vs UT	8.29E-06	8.77E-05	3.014653873
C vs UT	4.41E-05	0.0002646	3.691562953
C vs UT	0.000554759	0.001724705	4.597490853
C vs UT	2.45E-06	4.36E-05	4.358225669
C vs UT	0.122891556	0.164611937	-2.113399724
C vs UT	9.95E-05	0.000474421	5.210172892
C vs UT	0.001270756	0.003328043	-3.480246209
C vs UT	0.000198979	0.000790911	-4.895303657
C vs UT	0.00655055	0.013088362	2.800964017
C vs UT	6.95E-07	2.37E-05	23.61176916
C vs UT	4.53E-06	6.15E-05	12.752586
C vs UT	5.84E-08	9.20E-06	79.03956113
C vs UT	1.91E-06	3.73E-05	11.10621041
C vs UT	0.003675512	0.008011147	-2.345010752
C vs UT	3.09E-06	4.90E-05	-27.83748734
C vs UT	0.000155044	0.000653794	-11.16036943
C vs UT	8.54E-05	0.000423081	6.847293463
C vs UT	0.00495221	0.010270941	-2.249983637
C vs UT	3.71E-06	5.47E-05	6.799047363
C vs UT	1.92E-05	0.000151989	16.3667743
C vs UT	0.018532456	0.031834102	2.341703629
C vs UT	0.003801508	0.008249312	5.58156613
C vs UT	0.001167265	0.003111822	-5.890636054
C vs UT	0.000123731	0.000555427	-39.63992753
C vs UT	6.09E-05	0.000333958	4.068502353
C vs UT	0.000181865	0.000742518	19.81100895
C vs UT	0.556562184	0.611942235	1.439874689
C vs UT	4.09E-06	5.81E-05	184.703022
C vs UT	5.14E-06	6.65E-05	5.584530094
C vs UT	4.86E-08	8.90E-06	4.120465438
C vs UT	3.70E-05	0.000236613	4.687394151
C vs UT	2.31E-05	0.000170929	8.062825052
C vs UT	3.03E-05	0.000207201	4.028337615
C vs UT	5.08E-05	0.000292674	4.644551658
C vs UT	1.20E-05	0.000110296	4.668039895
C vs UT	1.73E-06	3.57E-05	6.229522138
C vs UT	1.99E-05	0.000156145	3.769880191
C vs UT	0.00040528	0.001345335	-3.774889947
C vs UT	0.005932569	0.012003376	-1.900925183
C vs UT	3.45E-05	0.00022486	4.2933906
C vs UT	0.001200556	0.00318478	5.366263164
C vs UT	1.06E-05	0.000100948	-4.967754802
C vs UT	4.08E-05	0.000251216	-5.390410628
C vs UT	2.09E-05	0.000160803	4.143501197
C vs UT	0.164514641	0.212204783	1.357415258
C vs UT	2.71E-07	1.45E-05	7.04821949
C vs UT	3.51E-05	0.000227471	-3.4163899
C vs UT	0.000104836	0.000492279	-12.10387319
C vs UT	0.002348415	0.005512402	-8.539221673
C vs UT	3.29E-06	5.06E-05	13.30104457
C vs UT	1.48E-06	3.35E-05	4.743206681
C vs UT	0.000332147	0.001164121	3.313317356
C vs UT	8.91E-08	9.80E-06	5.881127256
C vs UT	7.65E-06	8.40E-05	8.356099514
C vs UT	0.002122568	0.005072932	-15.04697916
C vs UT	0.000148256	0.000633373	3.826351488
C vs UT	0.001406083	0.003611122	-5.13000073
C vs UT	3.70E-05	0.000236613	-6.075825028
C vs UT	0.001763069	0.004359006	-4.037083733
C vs UT	9.97E-06	9.75E-05	-20.03333924
C vs UT	0.000202456	0.00080086	9.667535066
C vs UT	9.68E-06	9.57E-05	6.699580321
C vs UT	2.38E-05	0.000174055	-4.998546144
C vs UT	4.76E-05	0.000279208	6.300052714
C vs UT	7.31E-06	8.21E-05	4.506502734

TC vs UT	5.22E-08	9.20E-06	46.76015238
TC vs UT	2.16E-05	0.000145197	6.347733815
TC vs UT	0.000121746	0.000483765	5.249783327
TC vs UT	2.45E-05	0.000156862	-8.106794421
TC vs UT	4.73E-06	5.69E-05	5.10036534
TC vs UT	0.000682732	0.001854204	6.613422329
TC vs UT	0.000994866	0.002535064	-3.089680361
TC vs UT	2.37E-06	4.05E-05	4.309165216
TC vs UT	0.000122758	0.000486533	-6.449592633
TC vs UT	0.002946051	0.006254272	18.28203652
TC vs UT	1.51E-05	0.000115573	-8.554544991
TC vs UT	7.28E-05	0.000329979	16.33595696
TC vs UT	3.03E-06	4.49E-05	3.130648034
TC vs UT	0.00012043	0.000479309	4.719455813
TC vs UT	6.48E-06	6.73E-05	-6.137195044
TC vs UT	5.64E-06	6.24E-05	-5.046718262
TC vs UT	1.85E-05	0.000130938	-6.93579035
TC vs UT	6.48E-05	0.000304808	4.816566257
TC vs UT	3.59E-05	0.000201692	5.047269945
TC vs UT	1.04E-06	2.78E-05	6.957534468
TC vs UT	3.18E-07	1.62E-05	8.256672965
TC vs UT	1.09E-06	2.83E-05	24.55011512
TC vs UT	0.001667921	0.003889082	4.539437595
TC vs UT	6.25E-06	6.62E-05	2.892099032
TC vs UT	1.17E-06	2.91E-05	204.3263882
TC vs UT	5.88E-08	9.59E-06	16.6670481
TC vs UT	1.24E-06	2.99E-05	27.39236496
TC vs UT	0.000112589	0.000455007	-7.84543485
TC vs UT	0.000877632	0.002281509	8.640822749
TC vs UT	2.88E-05	0.000173584	-10.09931209
TC vs UT	5.85E-05	0.000281502	-26.25249438
TC vs UT	3.96E-06	5.20E-05	15.82256328
TC vs UT	0.000305094	0.000971039	4.645898828
TC vs UT	8.32E-06	7.78E-05	-41.71477241
TC vs UT	0.002609122	0.005642953	-4.55586955
TC vs UT	9.56E-06	8.57E-05	4.65365726
TC vs UT	0.001427123	0.003426096	-6.556545361
TC vs UT	7.22E-07	2.34E-05	4.178982047
TC vs UT	1.19E-05	9.76E-05	4.845472541
TC vs UT	1.03E-05	8.98E-05	8.282520124
TC vs UT	8.36E-06	7.81E-05	4.266560632
TC vs UT	1.09E-06	2.83E-05	4.173134722
TC vs UT	1.65E-05	0.000122265	4.280871092
TC vs UT	0.000407307	0.001225024	4.693884493
TC vs UT	2.81E-06	4.33E-05	4.193649324
TC vs UT	0.005125225	0.010000637	-5.479814004
TC vs UT	0.000535733	0.001526244	3.802754421
TC vs UT	0.000292069	0.000939774	-4.613335008
TC vs UT	0.002389353	0.005241188	-2.79564039
TC vs UT	0.003520647	0.007253062	3.168691415
TC vs UT	8.86E-06	8.15E-05	10.52967603
TC vs UT	1.89E-06	3.64E-05	17.97602931
TC vs UT	1.61E-07	1.24E-05	45.07108068
TC vs UT	1.06E-05	9.04E-05	7.104686019
TC vs UT	7.28E-05	0.000329979	-4.955943914
TC vs UT	1.45E-06	3.16E-05	-39.94782117
TC vs UT	0.020943722	0.03387147	-3.120590355
TC vs UT	0.000110284	0.000447158	6.372235629
TC vs UT	0.000111698	0.000452295	-4.295194657
TC vs UT	0.001316184	0.003202161	2.289084517
TC vs UT	3.59E-06	4.92E-05	34.05059447
TC vs UT	0.001111236	0.002777528	4.007765845
TC vs UT	0.000502381	0.001445928	10.1527049
TC vs UT	0.000127524	0.000498532	-11.34151177
TC vs UT	0.000101123	0.000420947	-51.7892118
TC vs UT	0.000160217	0.000590047	3.393425432
TC vs UT	0.000361132	0.001113466	14.19099298
TC vs UT	0.01697137	0.02818276	5.661410946
TC vs UT	6.83E-06	6.97E-05	133.6579936
TC vs UT	0.000179113	0.000639024	2.881302549
TC vs UT	3.85E-07	1.75E-05	2.955425028
TC vs UT	1.11E-05	9.36E-05	6.135659086
TC vs UT	4.19E-05	0.000223242	6.838581556
TC vs UT	3.73E-06	5.02E-05	6.193831419
TC vs UT	6.50E-06	6.74E-05	7.148650929
TC vs UT	5.39E-05	0.000266767	3.483860927
TC vs UT	6.47E-07	2.24E-05	7.735330873
TC vs UT	6.10E-06	6.52E-05	4.683128854
TC vs UT	2.83E-05	0.000171832	-6.601658998
TC vs UT	3.14E-05	0.000184301	-4.387061091
TC vs UT	0.001019741	0.002586056	2.419542749
TC vs UT	0.006863926	0.012837942	3.395671156
TC vs UT	9.23E-06	8.38E-05	-5.140186287
TC vs UT	7.42E-05	0.00033453	-5.005947314
TC vs UT	0.000124973	0.000491991	3.109800269
TC vs UT	9.77E-05	0.000410842	4.1043426
TC vs UT	2.29E-07	1.38E-05	7.318326627
TC vs UT	4.94E-06	5.87E-05	-4.998776213
TC vs UT	0.000169305	0.000614926	-10.06394433
TC vs UT	0.000264053	0.000866821	-23.85708894
TC vs UT	3.90E-06	5.15E-05	12.56650299
TC vs UT	7.68E-07	2.38E-05	5.399982752
TC vs UT	0.000106913	0.000437807	4.086903728
TC vs UT	1.37E-07	1.24E-05	5.353276833
TC vs UT	0.003664706	0.007508446	2.340266364
TC vs UT	0.000841536	0.002203002	-25.24656224
TC vs UT	3.37E-05	0.000194018	5.153717012
TC vs UT	0.001877533	0.004290211	-5.300487003
TC vs UT	9.53E-06	8.57E-05	-9.828281237
TC vs UT	0.00044006	0.001304163	-6.322537804
TC vs UT	9.94E-06	8.78E-05	-20.38862903
TC vs UT	3.57E-05	0.000201081	18.18629105
TC vs UT	5.66E-06	6.26E-05	7.908384903
TC vs UT	4.15E-05	0.000222334	-4.360790821
TC vs UT	5.79E-05	0.000280276	5.851974916
TC vs UT	5.99E-05	0.000287202	3.148843604

TAF4B	T vs UT	0.015446509	0.065572112	2.037762556
TAGAP	T vs UT	2.32E-05	0.003427694	5.981402646
TAGLN	T vs UT	0.096675471	0.211950313	-2.281118673
TANC2	T vs UT	0.116400799	0.239763089	-1.682344469
TANK	T vs UT	0.000366488	0.010437981	2.229742228
TAP1	T vs UT	0.004740712	0.034049093	1.543723166
TARBP1	T vs UT	0.083292229	0.193298172	-1.546589211
TARS	T vs UT	7.84E-05	0.00608349	3.026361799
TBC1D10C	T vs UT	0.039599612	0.118845659	-1.592794579
TBC1D5	T vs UT	0.155683036	0.291506732	-1.344418953
TBCD	T vs UT	0.010200131	0.051556528	-1.926324967
TBX21	T vs UT	0.166507969	0.305824487	1.379454545
TBXAS1	T vs UT	0.05816734	0.153555844	1.766138907
TC2N	T vs UT	0.036227732	0.112686161	-1.750784234
TCEB1	T vs UT	0.005529868	0.036864318	1.403158186
TCEB1P2	T vs UT	0.169280689	0.309036259	1.475333309
TCF7	T vs UT	0.852144802	0.907178847	-1.037468017
TCP11L2	T vs UT	0.417781053	0.572801689	-1.112888474
TCP1P1	T vs UT	0.103362928	0.221723192	1.380209111
TCTN1	T vs UT	0.912490851	0.947294114	1.038029014
TEF	T vs UT	0.108711001	0.228504372	-1.715529442
TFB2M	T vs UT	0.01315824	0.059528043	1.854879544
TFDP2	T vs UT	0.054750849	0.147719469	-1.584485356
TFRC	T vs UT	0.00200578	0.022710076	3.237095185
THAP8	T vs UT	0.085202413	0.195566676	-1.631177128
THBS1	T vs UT	0.713798991	0.810304831	1.091999991
THBS3	T vs UT	0.105060907	0.223730739	-1.740041219
THOC4	T vs UT	0.000540892	0.01228667	2.423430915
THOC6	T vs UT	0.00448901	0.033143411	1.645769542
THRA	T vs UT	0.003288449	0.028313926	-1.866271692
TICAM1	T vs UT	0.001124426	0.016764422	1.588841574
TIFA	T vs UT	0.002835332	0.026452733	2.455274958
TIMM10	T vs UT	0.001543456	0.019525272	2.474830316
TIMM17A	T vs UT	0.017124932	0.069986878	1.666338756
TIMM44	T vs UT	0.035483665	0.111185157	1.362524563
TIMM8A	T vs UT	0.00111701	0.016734982	2.909804936
TIMM8AP1	T vs UT	0.406463176	0.562795167	1.275981836
TIMM9	T vs UT	0.017864727	0.071855942	1.50186828
TJP3	T vs UT	0.533689904	0.674359143	-1.214462333
TK2	T vs UT	0.022101615	0.081688522	-2.318243003
TLE1	T vs UT	0.160882322	0.298297598	1.372175542
TLE2	T vs UT	0.301350832	0.45906298	-1.269083962
TMC6	T vs UT	0.062590238	0.160845694	-1.435730101
TMC8	T vs UT	0.03654338	0.11341049	-1.932362639
TMED9	T vs UT	0.002051166	0.02288607	1.610516607
TMEM107	T vs UT	0.284253329	0.440916285	-1.517695642
TMEM121	T vs UT	0.034777732	0.109805825	2.078300934
TMEM143	T vs UT	0.076959867	0.183400688	-1.638564568
TMEM170B	T vs UT	0.112190503	0.233765811	-1.406986172
TMEM187	T vs UT	0.074658416	0.179898039	-1.52881453
TMEM204	T vs UT	0.034376743	0.109018837	-1.698720919
TMEM208	T vs UT	0.007920825	0.044473967	1.663797429
TMEM217	T vs UT	2.47E-05	0.003498972	11.2941036
TMEM22	T vs UT	0.112553491	0.234185714	3.027563779
TMEM229B	T vs UT	0.793705779	0.867395908	-1.075231962
TMEM63A	T vs UT	0.004351877	0.032520389	-2.351230962
TMEM64	T vs UT	0.004285324	0.03230949	2.066790251
TMEM65	T vs UT	0.350744954	0.510195629	-1.14942232
TMEM71	T vs UT	0.044625811	0.128811699	-1.39066463
TMEM8B	T vs UT	0.046775941	0.132799299	-1.37523252
TMIGD2	T vs UT	0.348565613	0.508075896	-1.391287083
TMSB10	T vs UT	4.96E-05	0.004888338	1.820194913
TNF	T vs UT	3.45E-05	0.00438493	9.037336401
TNFAIP8	T vs UT	0.000555276	0.012365268	2.459529281
TNFRSF12A	T vs UT	0.004649509	0.033710288	2.496910724
TNFRSF13C	T vs UT	0.000263127	0.009012964	5.984195327
TNFRSF18	T vs UT	5.76E-06	0.002448332	25.39740849
TNFRSF1B	T vs UT	0.038217398	0.11639912	1.973165217
TNFRSF4	T vs UT	0.00892561	0.04772453	71.06408913
TNFRSF8	T vs UT	0.040375481	0.120365008	4.18253169
TNFRSF9	T vs UT	1.92E-06	0.002130999	97.22828542
TNFSF13B	T vs UT	0.613003503	0.736607854	-1.139762521
TNFSF4	T vs UT	0.017653774	0.071320785	3.418379974
TNK1	T vs UT	0.472803715	0.621036519	-1.460318293
TNK2	T vs UT	0.648386386	0.76313518	-1.092719376
TOMM34	T vs UT	0.000100447	0.006620025	3.075455982
TOMM40	T vs UT	0.017403504	0.070699915	1.633895156
TP53INP1	T vs UT	0.176332849	0.318235366	1.512211317
TP53INP2	T vs UT	0.018561098	0.073495399	2.512493567
TP53TG1	T vs UT	0.81436314	0.881070688	-1.0682554
TPCN1	T vs UT	0.013931233	0.061369099	-1.854264964
TPI1	T vs UT	3.95E-05	0.004529233	2.477784076
TPI1P1	T vs UT	4.36E-05	0.004674185	2.370325414
TPM1	T vs UT	0.003894796	0.03079057	-2.583747153
TPM4	T vs UT	0.52907706	0.670523194	1.186404652
TPPP	T vs UT	0.456345423	0.606918247	-1.496791242
TPRG1	T vs UT	0.445172666	0.597212378	-1.286690716
TPX2	T vs UT	0.47271348	0.621036519	1.014280825
TRAF1	T vs UT	0.000204059	0.008190814	7.587259519
TRAF3IP2	T vs UT	0.684110846	0.791283934	1.099563151
TRAF4	T vs UT	5.68E-05	0.005291355	16.74257859
TRAF5	T vs UT	0.01300199	0.059004248	-1.482973603
TRAM2	T vs UT	0.006159325	0.039308734	-2.452687375
TRANK1	T vs UT	0.193247752	0.338987734	-1.512140391
TRAP1	T vs UT	0.039830556	0.119327244	1.595204307
TRBV_	T vs UT	0.103742954	0.222048092	1.416007138
TREML2	T vs UT	0.03398275	0.108158829	2.620280489
TRERF1	T vs UT	0.299017329	0.45658002	-1.581047184
TRGV	T vs UT	0.281625097	0.438439071	1.273841929
TRIB1	T vs UT	0.001006579	0.015870994	19.01564235
TRIB2	T vs UT	0.834453388	0.895691675	-1.120827716
TRIB3	T vs UT	0.603333581	0.730039554	1.098779895
TRIM3	T vs UT	0.024079366	0.086207487	-2.688126929
TRIM52	T vs UT	0.002953151	0.026912305	-1.789648513
TRIM6-TRIM34	T vs UT	0.460942356	0.610332824	-1.115405118
TRIM66	T vs UT	0.20971046	0.358332867	-1.672618806

C vs UT	0.004305828	0.009145713	2.670236055
C vs UT	0.000365139	0.001249908	-3.220850656
C vs UT	0.001129062	0.003030097	-7.727020619
C vs UT	0.000578259	0.001782039	-5.147554277
C vs UT	5.73E-07	2.13E-05	6.792671144
C vs UT	1.33E-06	3.16E-05	4.189050117
C vs UT	8.29E-05	0.000415252	-4.555249398
C vs UT	1.64E-07	1.20E-05	11.39199348
C vs UT	2.15E-05	0.000163687	-5.294905039
C vs UT	0.000249635	0.000933519	-3.242435124
C vs UT	9.32E-05	0.000452011	-4.39754401
C vs UT	1.03E-05	9.93E-05	7.316821363
C vs UT	0.000108963	0.000507753	6.284601994
C vs UT	0.001012786	0.002779356	-3.479127816
C vs UT	4.96E-08	8.90E-06	5.843183335
C vs UT	6.66E-05	0.000356843	5.549731631
C vs UT	9.39E-08	9.92E-06	-37.9330414
C vs UT	2.39E-06	4.30E-05	-4.835775971
C vs UT	2.23E-05	0.00016693	4.946110436
C vs UT	6.68E-05	0.000357107	-5.427882185
C vs UT	0.001458675	0.003724285	-8.747714797
C vs UT	0.002451778	0.005711396	2.461753392
C vs UT	5.27E-05	0.000300482	-4.579075078
C vs UT	1.04E-06	2.77E-05	24.90554491
C vs UT	0.00036914	0.001260104	-4.011506509
C vs UT	1.16E-06	2.93E-05	-14.49584453
C vs UT	0.000228892	0.00087484	-6.368754688
C vs UT	2.12E-05	0.000162202	4.161879313
C vs UT	1.12E-06	2.88E-05	5.193300759
C vs UT	2.72E-06	4.58E-05	-6.394335907
C vs UT	6.85E-08	9.50E-06	5.520176218
C vs UT	1.43E-06	3.29E-05	15.08457272
C vs UT	5.63E-06	7.00E-05	7.247872193
C vs UT	9.30E-06	9.39E-05	5.457884212
C vs UT	2.39E-05	0.000174181	2.838817369
C vs UT	0.000320405	0.001131328	3.75093368
C vs UT	0.003599982	0.007867384	3.367893646
C vs UT	3.05E-05	0.000208098	3.283460656
C vs UT	0.000600557	0.001836848	-5.511278767
C vs UT	0.001792937	0.004416967	-4.31929076
C vs UT	2.88E-06	4.72E-05	-8.771843359
C vs UT	0.000936501	0.002605383	-4.226800294
C vs UT	9.60E-06	9.53E-05	-4.885886993
C vs UT	7.91E-05	0.0004021	-6.188673225
C vs UT	8.26E-07	2.54E-05	4.246226777
C vs UT	0.002717317	0.006210235	-5.078440696
C vs UT	0.020623041	0.034857039	2.555780185
C vs UT	0.000511052	0.001616547	-3.639507083
C vs UT	0.000102641	0.00048489	-3.616497221
C vs UT	0.001475811	0.003758106	-2.941875879
C vs UT	3.24E-05	0.000216531	-6.780484999
C vs UT	3.04E-06	4.88E-05	5.388606254
C vs UT	1.71E-05	0.000140487	12.67834574
C vs UT	0.009368684	0.017698157	8.160121215
C vs UT	0.004008063	0.008615659	-3.544822494
C vs UT	1.43E-06	3.29E-05	-16.41524814
C vs UT	2.11E-05	0.000162025	4.751980482
C vs UT	1.83E-06	3.62E-05	5.734498926
C vs UT	1.46E-06	3.31E-05	-6.544177535
C vs UT	2.85E-07	1.45E-05	-8.283322995
C vs UT	0.00081791	0.002345854	-8.288645311
C vs UT	2.65E-08	7.09E-06	4.905750745
C vs UT	1.41E-06	3.27E-05	30.94375926
C vs UT	5.26E-06	6.74E-05	5.457401046
C vs UT	0.000146414	0.000628663	4.923651552
C vs UT	8.90E-05	0.00043733	-7.167719537
C vs UT	9.55E-07	2.66E-05	57.98599708
C vs UT	1.56E-05	0.000131381	11.28562961
C vs UT	0.015355127	0.027085653	33.70769015
C vs UT	1.08E-05	0.000102496	234.4714879
C vs UT	1.56E-06	3.43E-05	98.42496241
C vs UT	0.004693007	0.009810914	-33.60227354
C vs UT	0.011466508	0.021064071	4.002740388
C vs UT	0.004882111	0.010139199	-6.108996738
C vs UT	6.60E-06	7.71E-05	-6.675138233
C vs UT	0.000125653	0.000560271	2.926561104
C vs UT	1.09E-05	0.000102866	4.815234961
C vs UT	0.001345025	0.003475325	-3.366306812
C vs UT	0.000331156	0.001160975	7.125985921
C vs UT	0.001361296	0.003507057	-4.171760056
C vs UT	3.32E-05	0.000219909	-5.125406721
C vs UT	9.74E-09	5.10E-06	14.04304344
C vs UT	1.07E-08	5.10E-06	12.49768148
C vs UT	5.52E-06	6.93E-05	-11.52984333
C vs UT	8.58E-07	2.58E-05	12.85912355
C vs UT	0.011096488	0.020478925	-4.763532594
C vs UT	0.000695285	0.002059794	-4.145954868
C vs UT	0.000702113	0.002076032	8.005398745
C vs UT	7.78E-05	0.000397342	9.224697156
C vs UT	0.000485351	0.001551162	4.219478465
C vs UT	5.57E-05	0.000313423	14.83037754
C vs UT	1.57E-05	0.000131637	-3.075443722
C vs UT	0.000271399	0.000991512	-5.499977707
C vs UT	6.35E-05	0.000345087	-10.3972266
C vs UT	0.006603751	0.01318308	2.102516553
C vs UT	0.000142319	0.000615285	-3.615385539
C vs UT	5.75E-06	7.10E-05	35.78536649
C vs UT	0.00305316	0.006838413	-4.470168566
C vs UT	0.000502603	0.001596778	-3.208986708
C vs UT	0.000994334	0.002734893	14.77637724
C vs UT	0.09008326	0.125548388	-2.125888508
C vs UT	2.91E-06	4.74E-05	4.98420198
C vs UT	0.002979788	0.0067033	-4.341473471
C vs UT	6.23E-06	7.46E-05	-4.039792266
C vs UT	2.64E-05	0.000187656	-3.329951176
C vs UT	0.00092538	0.002583771	-5.609786373

TC vs UT	8.71E-05	0.000377434	5.436279626
TC vs UT	0.057384987	0.082341078	-1.532837541
TC vs UT	0.00139776	0.003367405	-6.179630292
TC vs UT	0.000232188	0.000782847	-7.410388045
TC vs UT	2.00E-06	3.72E-05	5.046189787
TC vs UT	3.20E-07	1.62E-05	5.566698336
TC vs UT	0.030390492	0.046980286	-1.778856785
TC vs UT	1.27E-07	1.20E-05	12.31037996
TC vs UT	1.36E-06	3.08E-05	-10.75384284
TC vs UT	6.76E-05	0.000313674	-4.220153127
TC vs UT	9.81E-05	0.000411773	-4.359025281
TC vs UT	4.27E-06	5.36E-05	9.052216291
TC vs UT	0.000283415	0.000917181	4.704538852
TC vs UT	0.000128312	0.000501297	-5.236542314
TC vs UT	6.17E-08	9.59E-06	5.513705878
TC vs UT	0.000122756	0.000486533	4.750785479
TC vs UT	4.75E-08	9.20E-06	-49.36923474
TC vs UT	9.98E-07	2.75E-05	-5.800221053
TC vs UT	7.16E-06	7.15E-05	6.212582115
TC vs UT	0.006929972	0.012936647	-2.232106265
TC vs UT	0.000415764	0.001246381	-13.20496776
TC vs UT	5.46E-05	0.000269156	4.652748542
TC vs UT	4.38E-05	0.000230823	-4.755500633
TC vs UT	4.56E-07	1.88E-05	35.51392318
TC vs UT	8.40E-06	7.84E-05	-12.68452031
TC vs UT	6.89E-07	2.28E-05	-16.76905345
TC vs UT	0.000680265	0.00184791	-4.944003591
TC vs UT	9.95E-06	8.78E-05	4.758546596
TC vs UT	8.93E-07	2.57E-05	5.472524574
TC vs UT	6.06E-07	2.15E-05	-9.565031926
TC vs UT	7.25E-08	1.04E-05	5.451469652
TC vs UT	3.59E-06	4.92E-05	11.1049521
TC vs UT	2.71E-06	4.28E-05	8.646801143
TC vs UT	3.30E-06	4.73E-05	6.813554336
TC vs UT	1.69E-06	3.42E-05	4.349631103
TC vs UT	1.17E-05	9.71E-05	7.657985299
TC vs UT	0.001260427	0.003084769	4.144566541
TC vs UT	3.99E-06	5.20E-05	4.61773447
TC vs UT	2.73E-05	0.000167666	-14.48879453
TC vs UT	0.000155972	0.000578214	-8.670969399
TC vs UT	2.40E-06	4.06E-05	-9.277038309
TC vs UT	0.003862873	0.007846659	-3.019493477
TC vs UT	5.04E-07	1.97E-05	-10.39997925
TC vs UT	1.72E-05	0.000125174	-9.724911113
TC vs UT	1.58E-06	3.30E-05	3.737264224
TC vs UT	0.000149904	0.000561993	-12.73432848
TC vs UT	0.000398692	0.001204281	5.49154019
TC vs UT	0.000134788	0.000520657	-4.678741454
TC vs UT	5.82E-05	0.000280945	-4.156214795
TC vs UT	0.00012429	0.000490711	-4.839972139
TC vs UT	2.38E-05	0.000153993	-7.409635415
TC vs UT	3.18E-06	4.62E-05	5.301119704
TC vs UT	1.09E-06	2.83E-05	36.74607052
TC vs UT	0.047167353	0.069234936	4.156503493
TC vs UT	0.000107478	0.000439174	-8.468202685
TC vs UT	7.29E-07	2.35E-05	-22.35824592
TC vs UT	5.88E-05	0.000282641	3.839375004
TC vs UT	9.63E-05	0.000406501	2.804250763
TC vs UT	9.47E-08	1.12E-05	-14.5514899
TC vs UT	4.82E-08	9.20E-06	-13.9273862
TC vs UT	0.000209204	0.000723357	-12.48366553
TC vs UT	6.77E-07	2.28E-05	2.862975278
TC vs UT	3.96E-07	1.79E-05	56.50431917
TC vs UT	1.49E-06	3.19E-05	7.278709478
TC vs UT	0.071704834	0.100354212	1.70163983
TC vs UT	0.23245295	0.283327884	-1.431111545
TC vs UT	8.35E-07	2.49E-05	61.72098486
TC vs UT	0.001677743	0.003903864	3.467460047
TC vs UT	0.00791721	0.014504897	78.27360352
TC vs UT	4.16E-06	5.31E-05	419.0395571
TC vs UT	2.33E-07	1.38E-05	341.5024118
TC vs UT	0.003521876	0.007254382	-25.73384259
TC vs UT	0.009201528	0.016488132	4.891116593
TC vs UT	0.056848426	0.081675727	-3.243025252
TC vs UT	1.20E-05	9.85E-05	-5.811736709
TC vs UT	4.45E-06	5.50E-05	5.504764395
TC vs UT	1.53E-06	3.24E-05	7.374544558
TC vs UT	2.55E-05	0.0001602	-10.58899036
TC vs UT	0.017618481	0.029112286	2.472172077
TC vs UT	0.000252848	0.000838269	-7.15613986
TC vs UT	0.000609276	0.001686278	-3.021525762
TC vs UT	1.01E-07	1.15E-05	7.130474277
TC vs UT	1.14E-07	1.19E-05	6.504626571
TC vs UT	2.47E-05	0.000157371	-7.669369574
TC vs UT	1.16E-05	9.57E-05	6.140408734
TC vs UT	0.008817214	0.015908143	-5.49447582
TC vs UT	0.001590394	0.003741569	-3.688582549
TC vs UT	0.00222486	0.004938347	5.227519042
TC vs UT	4.25E-05	0.000225763	11.23195134
TC vs UT	0.01602079	0.026776076	2.181259139
TC vs UT	1.59E-05	0.000119551	25.32226607
TC vs UT	2.50E-06	4.14E-05	-4.202924213
TC vs UT	0.001192885	0.002946369	-3.880677639
TC vs UT	5.31E-06	6.09E-05	-26.42441725
TC vs UT	9.74E-05	0.000409774	4.145298592
TC vs UT	3.32E-05	0.000191688	-4.747653909
TC vs UT	1.58E-05	0.00011898	23.48974011
TC vs UT	0.000742217	0.001979994	-8.22374568
TC vs UT	6.11E-05	0.000291171	-4.85850996
TC vs UT	0.000151964	0.000567105	34.21731252
TC vs UT	0.004248698	0.008525052	-7.815672413
TC vs UT	1.90E-06	3.65E-05	5.466337755
TC vs UT	0.000304571	0.000969877	-7.34057427
TC vs UT	7.35E-06	7.28E-05	-3.956254776
TC vs UT	5.51E-06	6.17E-05	-4.402868386
TC vs UT	0.006482651	0.012210676	-3.82632029

TRIP10	T vs UT	0.008845365	0.047522155	1.661652853
TRMT6	T vs UT	0.019705899	0.076071925	1.668657764
TRMT61A	T vs UT	0.004088641	0.031587061	2.020368735
TRNAN34P	T vs UT	0.850374785	0.906625257	1.106842838
TRNAN35	T vs UT	0.582747358	0.715451053	-1.094302574
TSC22D1	T vs UT	0.009584168	0.050036656	-1.64633826
TSC22D3	T vs UT	0.031312455	0.102311166	-1.405529624
TSEN15	T vs UT	0.000689356	0.013406099	1.738640702
TSHZ3	T vs UT	0.093397114	0.207493047	2.405908201
TSPAN9	T vs UT	0.779531637	0.856397112	-1.098063786
TSR1	T vs UT	0.004749345	0.034049093	1.88176042
TTC12	T vs UT	0.037735525	0.115539861	-1.752269865
TTC16	T vs UT	0.04575987	0.130970101	-2.857164615
TTC22	T vs UT	0.272915296	0.429145001	-1.482980892
TTC26	T vs UT	0.002691106	0.025890935	2.444433568
TTC27	T vs UT	0.003789102	0.030337418	2.357052638
TTC7B	T vs UT	0.675075973	0.783627071	-1.09572386
TUBA1B	T vs UT	0.00164089	0.020272713	2.171294133
TUBA1C	T vs UT	0.000645734	0.012991708	2.138511404
TUBB2A	T vs UT	0.067936	0.169839999	1.649833991
TUBB2C	T vs UT	0.002200801	0.0234604	1.780964287
TUBB4	T vs UT	0.738872294	0.827606776	-1.07874493
TUBE1	T vs UT	0.41992964	0.574473811	1.10382427
TWISTNB	T vs UT	0.000191347	0.008017603	2.210206175
TWSG1	T vs UT	0.131975263	0.26065273	1.225343789
TXK	T vs UT	0.385147286	0.542913689	-1.254095461
TXN	T vs UT	0.006295932	0.039744271	1.539044206
TXNDC16	T vs UT	0.043349199	0.126488846	-1.537819915
TXNDC17	T vs UT	0.018634626	0.073689845	2.145588904
TXNRD1	T vs UT	0.007488632	0.043206486	1.790049003
UBA7	T vs UT	0.402633722	0.559629555	-1.528699909
UBE2MP1	T vs UT	0.013813612	0.061178821	1.470042379
UBE2N	T vs UT	0.000297992	0.009366328	1.725912255
UBE2S	T vs UT	0.078403787	0.185660213	1.39442608
UBE2SP1	T vs UT	0.766464842	0.847380467	-1.048157423
UBXN11	T vs UT	0.092272192	0.205735286	-1.781122467
UBXN8	T vs UT	0.001611455	0.020029479	3.588705185
UCHL3	T vs UT	0.018037467	0.07234937	1.767128118
UCK2	T vs UT	0.009222544	0.048741522	1.749165075
UFM1	T vs UT	0.380829046	0.539230838	1.155534516
ULBP1	T vs UT	0.000278782	0.009093597	7.106533516
UPP1	T vs UT	0.006022983	0.038739371	-1.741892863
USP12	T vs UT	0.172400026	0.31287788	1.325579631
USP12PX	T vs UT	0.058721683	0.154580388	1.886698635
USP13	T vs UT	0.041625829	0.123023109	-1.35723561
UTP11L	T vs UT	0.002844978	0.026454429	1.835154877
UTP15	T vs UT	0.016315454	0.067893872	1.721322021
UTRN	T vs UT	0.156392826	0.292391982	-1.443213468
UTS2	T vs UT	0.001362384	0.018572413	14.49557176
VAMP1	T vs UT	0.16043312	0.297688543	-1.486615835
VARS	T vs UT	0.007538702	0.043354566	2.230073437
VASP	T vs UT	0.003881805	0.030762752	1.443524647
VAV1	T vs UT	0.460361948	0.610088437	-1.091133791
VCP	T vs UT	0.000356473	0.010415434	1.598503049
VDAC1	T vs UT	4.08E-05	0.004529233	2.376685877
VDAC1P1	T vs UT	0.000363832	0.010437981	2.080984589
VDR	T vs UT	2.73E-05	0.003735954	33.11299964
VEGFA	T vs UT	0.000305811	0.009535793	6.352725276
VIPR1	T vs UT	0.187638321	0.332602142	-2.219217372
VLDLR	T vs UT	0.319303466	0.477593494	1.416718551
VNN2	T vs UT	0.46340098	0.61233888	-1.368133314
WARS	T vs UT	0.001246697	0.017709411	6.279224605
WARS2	T vs UT	0.009450991	0.049545375	1.904131004
WASH5P	T vs UT	0.083140042	0.193090359	-2.812567762
WDFY2	T vs UT	0.08110326	0.190114675	-1.427335397
WDR12	T vs UT	0.001540183	0.019525272	2.6220354
WDR27	T vs UT	0.000474425	0.01143047	-2.48567914
WDR3	T vs UT	0.020076503	0.076834759	1.616972844
WDR36	T vs UT	0.005960364	0.038484164	2.115614634
WDR43	T vs UT	0.012625853	0.058262264	1.864473108
WDR46	T vs UT	0.003243761	0.028223034	1.988609185
WDR52	T vs UT	0.006275659	0.039678679	-2.559234074
WDR86	T vs UT	0.001080346	0.01650373	-2.502964805
WIPI1	T vs UT	0.138513098	0.268363686	-1.304242423
XAF1	T vs UT	0.606095123	0.730942182	-1.21560539
XBP1	T vs UT	0.061387661	0.158681312	1.321478585
XPO5	T vs UT	0.002960652	0.026940845	1.57575373
XRCC4	T vs UT	0.002075972	0.022974343	2.056574026
XYLT1	T vs UT	0.916246038	0.949145	-1.066027251
YARS	T vs UT	0.000247384	0.008841287	2.952518811
YBX1	T vs UT	0.00169879	0.020636908	1.795064637
YBX1P1	T vs UT	0.000764295	0.01393748	1.893820829
YPEL1	T vs UT	0.006504717	0.04034364	-2.564460052
YPEL2	T vs UT	0.379557867	0.538149324	-1.256091999
YPEL3	T vs UT	0.032183232	0.104152035	-1.737279391
YRDC	T vs UT	0.077680921	0.184428234	1.498214778
YWHAE	T vs UT	0.017550383	0.071042754	1.485539654
ZAK	T vs UT	0.022281318	0.082155696	2.001348632
ZBED2	T vs UT	0.000189591	0.008017603	41.28012933
ZBTB32	T vs UT	0.976842063	0.986038693	-1.004691812
ZBTB4	T vs UT	0.169544258	0.309177878	-1.198687224
ZC3H12A	T vs UT	0.046655683	0.132610551	1.881226427
ZC3H12B	T vs UT	0.03318575	0.106141404	-1.653096186
ZC3H6	T vs UT	0.013874097	0.061248699	-2.001537159
ZC3HAV1L	T vs UT	0.105770286	0.224669906	-1.946234575
ZCCHC18	T vs UT	0.02041206	0.07779929	-1.976416516
ZCCHC24	T vs UT	0.368369079	0.527341315	-1.260180422
ZDHHC23	T vs UT	0.989213859	0.993646182	1.009458348
ZFHX2	T vs UT	0.000700081	0.013487496	10.69916843
ZFP14	T vs UT	0.168387879	0.307925277	-1.308253877
ZFP36	T vs UT	0.75337856	0.838674399	-1.061094737
ZFP36L2	T vs UT	0.25057818	0.404401696	-1.197280765
ZFYVE9	T vs UT	0.494718422	0.640407154	1.218080952
ZIK1	T vs UT	0.46410442	0.613071299	-1.179556567
ZKSCAN3	T vs UT	0.160600341	0.297953988	-1.406886917
ZMAT1	T vs UT	0.003438628	0.028932553	-2.896727302

C vs UT	1.77E-06	3.58E-05	6.141341487
C vs UT	3.27E-05	0.000217734	4.178210293
C vs UT	0.002265772	0.005341676	2.204503825
C vs UT	0.000333207	0.001166508	-7.4513433
C vs UT	1.83E-05	0.000147382	-4.75462835
C vs UT	7.81E-07	2.48E-05	-8.081203985
C vs UT	4.48E-06	6.14E-05	-4.325071447
C vs UT	5.13E-07	1.97E-05	4.393809187
C vs UT	0.00020883	0.000817422	13.45459878
C vs UT	0.012621167	0.02284483	-2.252546536
C vs UT	3.85E-05	0.000242239	3.751311024
C vs UT	8.43E-05	0.000419053	-5.065781778
C vs UT	0.005832501	0.011822249	-4.341302424
C vs UT	0.020459023	0.034632037	-2.570708104
C vs UT	0.000906449	0.002543585	3.012683626
C vs UT	0.000655954	0.001966905	3.122094953
C vs UT	0.002131963	0.005088484	6.45601543
C vs UT	9.54E-07	2.66E-05	9.659241588
C vs UT	3.77E-07	1.62E-05	8.508100195
C vs UT	0.000264954	0.000973369	5.247375712
C vs UT	9.20E-07	2.64E-05	5.9195621
C vs UT	0.033402077	0.05279117	-3.659328847
C vs UT	2.22E-07	1.33E-05	5.448718692
C vs UT	9.68E-06	9.57E-05	3.297152824
C vs UT	1.44E-07	1.11E-05	7.137953383
C vs UT	0.026891723	0.043806968	-1.819314783
C vs UT	7.23E-09	5.10E-06	16.45419335
C vs UT	0.000123054	0.000554376	-3.491947865
C vs UT	0.000291961	0.001053212	5.327203545
C vs UT	6.87E-06	7.90E-05	5.317208634
C vs UT	0.000366442	0.001253322	-11.87852754
C vs UT	1.57E-06	3.44E-05	4.786137542
C vs UT	1.16E-07	9.93E-06	4.700948385
C vs UT	7.21E-06	8.15E-05	5.393889032
C vs UT	9.56E-07	2.66E-05	4.793482098
C vs UT	8.43E-05	0.000419053	-7.292867565
C vs UT	0.000148031	0.00063332	6.332125512
C vs UT	1.92E-05	0.000151989	6.018966616
C vs UT	0.000519745	0.001638285	2.573895729
C vs UT	2.20E-05	0.000165515	4.102481133
C vs UT	1.90E-07	1.27E-05	174.1537955
C vs UT	8.95E-06	9.16E-05	4.064992637
C vs UT	5.20E-05	0.000296976	4.619742792
C vs UT	0.000256263	0.000951571	6.866403237
C vs UT	2.97E-07	1.48E-05	-7.135320822
C vs UT	6.79E-06	7.84E-05	4.483124732
C vs UT	0.000677352	0.002015872	2.748221245
C vs UT	0.043637492	0.066615114	-1.692205153
C vs UT	0.003431646	0.007547662	8.266790231
C vs UT	5.03E-05	0.000290874	-8.551751421
C vs UT	4.00E-05	0.000247861	5.686021974
C vs UT	1.72E-08	5.89E-06	7.455826399
C vs UT	8.23E-07	2.54E-05	4.106709365
C vs UT	1.74E-08	5.89E-06	5.815876795
C vs UT	1.16E-07	9.93E-06	6.423430312
C vs UT	7.03E-07	2.37E-05	5.608195036
C vs UT	0.000727992	0.002142339	8.328746215
C vs UT	9.18E-08	9.92E-06	197.7808834
C vs UT	0.000662331	0.001980729	-21.86221998
C vs UT	6.23E-05	0.000339049	11.79473999
C vs UT	0.008062369	0.015542372	-3.851767665
C vs UT	8.82E-06	9.07E-05	33.16262467
C vs UT	5.13E-05	0.000294388	4.466175387
C vs UT	0.001367135	0.003519894	-9.331658539
C vs UT	0.000846501	0.002411032	-2.691650916
C vs UT	7.99E-06	8.59E-05	8.230621422
C vs UT	1.47E-05	0.000126389	-4.673737085
C vs UT	0.001189217	0.003161501	2.32365854
C vs UT	0.001328107	0.003442413	2.646093711
C vs UT	0.000293402	0.001055976	3.384064824
C vs UT	8.90E-05	0.000437226	3.371945001
C vs UT	9.85E-06	9.65E-05	-12.02339894
C vs UT	1.76E-06	3.58E-05	-9.445545235
C vs UT	6.49E-06	7.62E-05	5.353968579
C vs UT	0.079716186	0.112705031	-2.296042683
C vs UT	2.40E-07	1.36E-05	7.007105662
C vs UT	2.87E-07	1.45E-05	5.336721123
C vs UT	1.39E-05	0.000121728	4.502223699
C vs UT	0.072845282	0.104245859	-2.329252633
C vs UT	7.29E-06	8.21E-05	5.644119787
C vs UT	8.35E-06	8.78E-05	3.531173953
C vs UT	6.14E-06	7.37E-05	3.562269011
C vs UT	4.02E-05	0.000248451	-9.268922339
C vs UT	0.00133557	0.00345667	-4.839069213
C vs UT	2.12E-06	4.00E-05	-13.73651651
C vs UT	2.92E-06	4.74E-05	9.471185817
C vs UT	2.28E-06	4.20E-05	5.033894271
C vs UT	0.000114009	0.000526887	6.181577146
C vs UT	0.003726623	0.008111078	12.23400177
C vs UT	8.98E-08	9.80E-06	240.1586615
C vs UT	0.000214427	0.000832913	-2.162844647
C vs UT	9.63E-06	9.54E-05	11.0775112
C vs UT	0.000211325	0.000824047	-3.604359727
C vs UT	2.59E-05	0.000184963	-7.900273928
C vs UT	0.004338364	0.009195811	-5.690167685
C vs UT	3.54E-06	5.27E-05	-21.42837344
C vs UT	0.00307383	0.006877214	-2.907505962
C vs UT	0.073147514	0.104626543	-2.065488315
C vs UT	0.004425229	0.009335	5.003526332
C vs UT	0.000416763	0.001374716	-2.892827944
C vs UT	0.193085592	0.244379527	-1.297772159
C vs UT	6.05E-07	2.16E-05	-8.728400453
C vs UT	0.000256326	0.000951571	-5.857311307
C vs UT	0.001108381	0.002985581	-2.856352702
C vs UT	0.000964502	0.002662856	-3.6021834
C vs UT	1.05E-05	0.000100319	-12.53787478

TC vs UT	5.38E-06	6.10E-05	4.8182068
TC vs UT	1.37E-05	0.000107253	4.855035989
TC vs UT	2.30E-05	0.000150787	4.531260134
TC vs UT	0.00010406	0.000429404	-10.5843557
TC vs UT	9.47E-06	8.53E-05	-5.42735173
TC vs UT	4.43E-07	1.87E-05	-9.454559141
TC vs UT	6.85E-06	6.98E-05	-4.012232103
TC vs UT	1.39E-07	1.24E-05	5.736372317
TC vs UT	0.003457101	0.007138846	5.694887072
TC vs UT	0.001537779	0.003642108	-4.131086825
TC vs UT	2.89E-06	4.38E-05	6.299319935
TC vs UT	2.88E-05	0.000173584	-6.399623899
TC vs UT	0.001138077	0.002830844	-7.782025071
TC vs UT	0.000586946	0.001638824	-5.310707503
TC vs UT	0.000151504	0.00056659	4.202625047
TC vs UT	9.78E-05	0.000410998	4.348326771
TC vs UT	0.11360485	0.150485289	2.062692608
TC vs UT	2.29E-06	4.02E-05	7.47975023
TC vs UT	4.24E-07	1.83E-05	8.213762434
TC vs UT	0.002227866	0.004944129	3.181961836
TC vs UT	6.79E-06	6.95E-05	3.898155082
TC vs UT	0.004252971	0.008530779	-5.786220997
TC vs UT	4.13E-08	8.94E-06	8.145179108
TC vs UT	1.85E-06	3.58E-05	4.366547162
TC vs UT	1.11E-07	1.19E-05	7.538983114
TC vs UT	0.000133238	0.000516285	-5.074261121
TC vs UT	5.09E-09	5.92E-06	18.65384833
TC vs UT	4.44E-05	0.000233312	-4.178548923
TC vs UT	0.000329143	0.001034235	4.853607793
TC vs UT	2.89E-06	4.38E-05	6.478326433
TC vs UT	0.000411496	0.001235691	-11.83391527
TC vs UT	4.14E-06	5.29E-05	3.912188666
TC vs UT	1.85E-07	1.27E-05	4.28029216
TC vs UT	7.00E-06	7.06E-05	5.325801632
TC vs UT	1.32E-06	3.02E-05	4.537532241
TC vs UT	6.40E-05	0.000301598	-7.929830648
TC vs UT	4.17E-05	0.000222917	8.319540136
TC vs UT	1.11E-05	9.38E-05	6.437862284
TC vs UT	6.93E-06	7.02E-05	5.459562207
TC vs UT	1.77E-05	0.000127817	4.189742319
TC vs UT	1.52E-07	1.24E-05	201.2510293
TC vs UT	3.42E-05	0.000196038	3.214954159
TC vs UT	9.96E-06	8.78E-05	6.569476542
TC vs UT	9.68E-05	0.000408091	8.90658469
TC vs UT	2.80E-06	4.33E-05	-4.357499791
TC vs UT	2.50E-06	4.14E-05	5.405078023
TC vs UT	3.17E-05	0.000185679	4.51980921
TC vs UT	0.000197792	0.000692046	-4.661534506
TC vs UT	0.00020996	0.000725564	29.66138602
TC vs UT	0.000162577	0.000596243	-6.49233413
TC vs UT	1.33E-05	0.000106083	7.345894023
TC vs UT	1.12E-07	1.19E-05	4.8581595
TC vs UT	5.88E-06	6.40E-05	3.000093549
TC vs UT	4.80E-08	9.20E-06	4.698917947
TC vs UT	1.69E-07	1.24E-05	5.866749665
TC vs UT	6.81E-07	2.28E-05	5.639207266
TC vs UT	3.03E-05	0.000179898	27.63309271
TC vs UT	1.15E-07	1.19E-05	169.3717994
TC vs UT	0.003492262	0.00720542	-9.524494788
TC vs UT	9.91E-05	0.000414624	9.981105357
TC vs UT	0.000532041	0.00151748	-8.113366521
TC vs UT	3.72E-06	5.02E-05	50.32441656
TC vs UT	2.69E-05	0.000165754	5.024443577
TC vs UT	0.004580994	0.009080974	-7.168308681
TC vs UT	4.95E-05	0.000251713	-4.545251918
TC vs UT	1.05E-06	2.78E-05	14.88582582
TC vs UT	2.51E-06	4.14E-05	-6.985664808
TC vs UT	2.22E-05	0.000147266	4.243670547
TC vs UT	4.53E-05	0.000236861	4.802242262
TC vs UT	1.04E-05	8.98E-05	6.526130334
TC vs UT	9.94E-06	8.78E-05	4.962821859
TC vs UT	2.55E-05	0.00016025	-8.972464378
TC vs UT	9.98E-07	2.75E-05	-11.31855125
TC vs UT	0.000330801	0.001038649	2.608842884
TC vs UT	0.007709968	0.014182293	-5.483031928
TC vs UT	1.32E-06	3.02E-05	4.754642125
TC vs UT	6.33E-08	9.63E-06	7.607000066
TC vs UT	1.94E-05	0.000135333	4.119563774
TC vs UT	0.009030265	0.016240251	-4.138577595
TC vs UT	3.62E-06	4.95E-05	6.679635466
TC vs UT	3.32E-06	4.73E-05	4.092919556
TC vs UT	1.94E-06	3.66E-05	4.306882487
TC vs UT	3.14E-06	4.61E-05	-23.39972409
TC vs UT	0.003037972	0.006419571	-4.097753905
TC vs UT	7.37E-07	2.36E-05	-21.16647299
TC vs UT	1.06E-06	2.80E-05	12.51466882
TC vs UT	1.39E-06	3.09E-05	5.552166112
TC vs UT	5.12E-05	0.00025772	7.78751017
TC vs UT	1.69E-05	0.000123504	153.3415659
TC vs UT	9.04E-08	1.09E-05	236.0018887
TC vs UT	3.30E-06	4.73E-05	-4.022515654
TC vs UT	4.78E-05	0.000245248	6.926764442
TC vs UT	6.71E-05	0.000312281	-4.770338023
TC vs UT	1.77E-05	0.000127817	-8.558917912
TC vs UT	0.007857733	0.014415392	-5.256104212
TC vs UT	2.70E-05	0.000166048	-10.12481534
TC vs UT	0.000346455	0.001076559	-4.159316973
TC vs UT	0.005599325	0.010807714	-4.207359917
TC vs UT	0.002118765	0.004734392	6.388974662
TC vs UT	4.34E-05	0.000229311	-4.277573843
TC vs UT	0.000124874	0.000491955	-4.450679109
TC vs UT	5.80E-07	2.12E-05	-8.990900055
TC vs UT	0.000615421	0.001700995	-4.25933448
TC vs UT	0.000143182	0.000544382	-4.259608478
TC vs UT	0.000451083	0.001329895	-4.070820114
TC vs UT	7.01E-06	7.06E-05	-14.6124206

ZMYM1	T vs UT	0.329610017	0.488364621	-1.29339956	C vs UT	0.00896358	0.017053068	-2.43273542	TC vs UT	0.000279859	0.000909504	-4.504718237
ZMYM3	T vs UT	0.017235096	0.07030169	-1.345352559	C vs UT	7.78E-07	2.48E-05	-4.082478641	TC vs UT	6.91E-07	2.28E-05	-4.183272804
ZNF204P	T vs UT	0.003682541	0.029884557	-2.137659743	C vs UT	9.82E-06	9.64E-05	-6.418532806	TC vs UT	2.17E-05	0.000145242	-5.516711076
ZNF226	T vs UT	0.022022128	0.081492448	-1.359460986	C vs UT	2.24E-07	1.33E-05	-5.910024359	TC vs UT	7.29E-08	1.04E-05	-7.81231324
ZNF238	T vs UT	0.477513167	0.625640149	-1.304682937	C vs UT	0.006797038	0.013504267	-3.808085742	TC vs UT	0.006104252	0.01160787	-4.246481815
ZNF276	T vs UT	0.000109494	0.006650528	-2.431078922	C vs UT	1.27E-06	3.10E-05	-5.319826218	TC vs UT	1.52E-06	3.24E-05	-5.12472463
ZNF33B	T vs UT	0.075241779	0.180601416	-1.568039113	C vs UT	0.002396531	0.005604913	-2.784105922	TC vs UT	0.000114225	0.000460562	-5.208054708
ZNF446	T vs UT	0.042660531	0.125001033	-1.567743699	C vs UT	6.42E-05	0.000348023	-4.173591714	TC vs UT	0.000187248	0.000661539	-3.26839135
ZNF449	T vs UT	0.006548075	0.04046554	-2.240628942	C vs UT	0.021970165	0.036771024	-1.945807005	TC vs UT	0.00010712	0.000438072	-5.552135736
ZNF528	T vs UT	0.355226009	0.514560232	-1.346663888	C vs UT	0.000872493	0.002470794	-4.381509073	TC vs UT	0.000218892	0.000748667	-6.589689962
ZNF554	T vs UT	0.155313906	0.29094811	-1.440971902	C vs UT	0.00012306	0.000554376	-5.265471682	TC vs UT	0.000354782	0.001098546	-4.274474221
ZNF593	T vs UT	0.002523878	0.025200832	3.284501184	C vs UT	0.000127157	0.000564175	6.656912431	TC vs UT	2.16E-05	0.000145082	10.93766602
ZNF652	T vs UT	0.291700353	0.449237102	-1.350988526	C vs UT	0.00549519	0.011221546	-2.642616021	TC vs UT	0.000144505	0.000547893	-6.240241969
ZNF692	T vs UT	0.012841514	0.058648001	-1.857475835	C vs UT	6.09E-05	0.000333958	-4.215227165	TC vs UT	0.002643469	0.005708226	-2.288581209
ZNF767	T vs UT	0.091701185	0.204913856	-2.091131546	C vs UT	0.009594098	0.01803281	-4.044565382	TC vs UT	0.005766761	0.01107714	-4.583924685
ZNF792	T vs UT	0.39414293	0.551746404	-1.32533568	C vs UT	0.002721241	0.006215803	-5.925655063	TC vs UT	0.000538266	0.00153211	-10.06648645
ZNF799	T vs UT	0.022758403	0.083164325	-1.678107872	C vs UT	0.000729318	0.002145667	-2.639530554	TC vs UT	5.20E-05	0.000260106	-4.020233631
ZNF821	T vs UT	0.106648747	0.225786238	-1.422657514	C vs UT	0.000603123	0.001842545	-2.88144378	TC vs UT	9.46E-05	0.000401599	-4.067609296
ZNF83	T vs UT	0.119448021	0.243748199	-1.462427158	C vs UT	0.000126604	0.000562127	-3.831165578	TC vs UT	2.21E-05	0.000146691	-5.40142071
ZNF831	T vs UT	0.260044084	0.414924937	1.355027399	C vs UT	0.000153877	0.00065043	-4.558237497	TC vs UT	1.26E-05	0.000101546	-9.073705218
ZNF846	T vs UT	0.523992461	0.665858708	-1.355282001	C vs UT	0.008716941	0.016640329	-4.726790545	TC vs UT	0.006925618	0.012930476	-4.835049783
ZNF862	T vs UT	0.015472546	0.065649171	-1.692100185	C vs UT	3.08E-05	0.000209327	-4.047576909	TC vs UT	2.30E-05	0.00015087	-4.45684084
ZNHIT6	T vs UT	0.002059062	0.02288607	1.635616207	C vs UT	1.00E-05	9.76E-05	2.923145925	TC vs UT	6.91E-07	2.28E-05	4.51290042
ZNRF1	T vs UT	0.662436699	0.773957099	1.061512895	C vs UT	0.000122922	0.000554376	4.23780919	TC vs UT	0.002062991	0.004634964	2.553556203

Appendix Table 7. Expression values of genes shown in Appendix Table 6.

Gene Name	UT1	UT2	UT3	T1	T2	T3	C1	C2	C3	TC1	TC2	TC3
AARS	16.89	18.32	23.09	75.12	49.58	44.58	103.31	111.78	114.38	114.64	128.50	130.83
ABCA2	81.39	55.75	56.08	25.46	34.14	41.14	7.18	7.80	7.96	8.09	7.25	12.39
ABCA7	29.41	19.06	13.37	4.25	7.48	7.88	1.05	1.03	2.13	0.63	0.85	1.09
ABCD2	8.76	12.08	9.55	13.57	15.07	11.03	3.64	2.51	1.94	1.08	1.06	2.02
ABCE1	29.62	35.02	29.00	69.78	72.98	47.54	84.49	171.49	86.55	173.59	223.52	181.80
ABCF2	32.98	32.97	37.10	60.24	50.31	47.25	87.27	120.65	95.81	148.97	156.83	133.51
ABHD15	89.18	80.73	101.26	75.76	72.26	100.83	18.73	13.12	21.72	14.61	11.92	17.91
ABLIM1	6.48	7.28	9.89	3.21	4.83	7.01	0.72	1.34	0.93	0.41	1.61	0.83
ABTB1	55.43	42.43	42.90	23.29	23.89	29.72	5.36	2.73	3.05	4.38	3.77	3.89
ABTB2	0.50	0.25	0.59	0.85	0.97	0.73	25.58	26.46	26.05	16.94	20.03	21.78
ACACB	12.03	6.01	9.95	2.78	2.37	3.98	0.43	0.22	0.37	0.72	0.04	0.32
ACBD4	7.83	3.39	4.38	3.60	2.81	4.41	1.63	0.76	1.11	0.86	0.85	0.97
ACER2	3.09	2.71	3.14	0.82	1.19	1.99	0.48	0.67	0.51	0.63	0.38	0.61
ACO2	15.79	18.23	14.95	26.96	22.33	23.07	67.87	75.06	64.78	57.45	56.17	47.56
ACOT7	1.41	1.57	1.66	4.71	2.57	2.68	7.23	7.44	9.90	12.96	10.90	12.55
ACP6	9.63	5.45	6.69	10.15	5.42	6.44	2.39	1.70	1.62	1.54	0.98	1.66
ACSL6	17.29	13.09	12.79	4.47	5.06	8.13	0.43	0.54	0.97	0.68	0.59	0.89
ACSS1	51.92	45.50	34.79	32.61	33.94	35.07	14.85	7.26	8.84	9.76	7.21	6.11
ACSS2	2.25	5.35	3.79	1.39	2.65	3.33	1.44	1.97	2.73	0.59	1.06	0.81
ACTN1	0.45	0.46	1.42	9.94	4.55	2.68	18.82	15.86	5.14	16.49	16.07	9.76
ACTR3	83.38	83.91	83.51	201.07	147.57	137.75	517.61	506.20	409.11	312.60	332.43	322.18
ACVR1B	14.62	13.55	19.29	18.69	14.91	18.33	60.11	62.45	74.30	57.77	72.20	70.28
ADAM1	4.38	3.66	2.65	2.08	1.90	0.94	1.01	0.63	0.46	1.45	1.10	1.50
ADAM19	13.17	3.62	23.11	11.28	4.11	18.55	482.04	599.17	541.26	276.27	321.51	359.20
ADAM22	2.81	2.74	2.82	2.43	2.27	2.06	0.20	0.40	1.02	0.87	1.08	0.22
ADCY7	63.14	57.30	69.92	15.37	19.25	42.46	25.06	17.56	30.57	13.56	11.87	13.03
ADM2	3.51	3.26	4.41	9.37	5.62	4.74	57.86	37.86	51.77	45.35	42.65	53.48
ADPRH	6.18	5.91	4.59	36.43	20.73	7.81	32.52	19.62	24.80	17.30	12.42	18.78
ADRB2	38.77	45.21	34.17	19.73	29.98	30.80	9.10	8.92	7.45	2.48	3.82	4.49
ADSL	6.75	7.61	7.06	15.09	14.36	12.84	28.64	38.93	32.20	32.34	36.08	29.63
AEBP1	0.30	0.46	0.99	0.82	1.62	1.34	0.81	2.28	2.04	2.98	4.07	5.14
AGAP1	19.45	17.36	25.85	11.88	12.97	22.52	3.50	2.51	4.72	2.98	5.60	6.36
AGK	5.22	4.77	4.64	20.77	11.47	6.49	23.97	29.98	21.13	46.99	43.85	29.34
AGMAT	0.69	0.75	0.37	8.93	4.83	3.07	3.16	6.14	3.42	10.75	11.53	8.50
AGPAT5	13.89	14.49	16.09	42.85	32.08	26.47	36.74	52.10	33.96	61.16	62.54	54.73
AGRN	1.14	1.57	1.42	8.20	10.09	5.86	1.44	1.61	2.08	0.99	0.98	3.81
AHCY	9.72	11.23	13.81	36.08	24.76	28.63	23.13	44.98	38.31	63.29	61.94	60.76
AHNAK	2397.63	1878.97	1707.08	620.87	724.80	1032.77	336.86	58.87	356.89	69.88	51.01	130.35
AHSA2	66.68	48.26	29.16	16.23	22.56	16.60	7.26	4.65	11.61	10.11	7.52	8.99
AK2	51.66	47.81	46.63	102.86	85.31	68.26	226.10	359.24	197.98	334.90	367.44	249.01
AK2P1	6.98	5.95	8.26	17.92	15.75	12.37	49.75	70.04	38.53	71.51	72.73	45.25
AK3P1	1.04	1.27	1.22	0.42	0.68	1.60	22.21	19.18	28.45	5.47	2.29	14.39
AK4	0.29	0.22	0.28	1.19	0.63	2.34	83.05	66.81	122.90	21.39	15.17	55.92
AKAP5	2.52	3.23	3.30	5.94	6.33	4.52	0.29	0.09	0.56	0.18	0.51	0.85
AKAP7	12.24	11.85	9.52	13.23	8.74	13.09	6.08	3.90	2.64	3.52	2.54	1.82
AKAP8L	26.17	26.68	21.43	11.40	17.68	17.96	6.09	5.42	4.90	6.82	7.31	5.63
AKR1A1	8.73	7.90	7.55	21.34	12.89	13.41	31.52	39.16	29.10	33.02	35.06	33.76
ALOX5AP	66.17	79.28	55.71	77.59	84.45	95.77	50.77	21.19	50.61	10.89	7.25	30.04
ALS2CR8	5.49	5.37	4.24	2.42	3.89	2.43	0.91	0.18	0.65	0.95	0.94	0.49
AMDHD2	7.16	7.46	6.46	4.89	4.69	5.57	1.20	1.46	1.55	1.04	2.28	1.41
AMICA1	495.27	392.16	395.67	316.29	311.05	441.67	21.94	14.61	34.37	28.14	18.74	47.32
AMIGO1	19.84	22.36	31.99	10.54	13.88	23.50	0.72	0.85	2.41	2.89	2.04	2.47
AMOT	4.83	5.45	6.47	4.12	4.31	6.40	1.34	0.58	2.04	0.50	0.55	0.45
ANAPC10	2.13	2.67	1.64	3.69	3.36	3.18	8.00	13.29	8.43	8.48	10.00	7.52
ANAPC10P1	0.78	0.14	0.68	1.00	0.79	1.12	2.63	2.39	2.31	2.59	2.34	1.71
ANGPTL6	9.98	6.78	6.65	7.34	6.43	4.90	1.76	1.45	3.37	2.16	1.37	1.08
ANK3	10.26	10.06	7.39	4.86	4.74	5.35	33.00	43.25	14.33	44.62	51.59	18.70
ANKAR	5.72	4.84	3.77	3.05	2.93	1.68	1.08	1.03	1.03	1.78	2.29	1.78
ANKRD13B	1.17	0.70	0.50	1.44	0.83	0.80	1.53	2.40	1.25	3.32	4.22	2.43
ANKRD13D	40.42	29.83	28.94	13.10	17.32	15.55	15.57	11.29	13.51	9.31	6.44	8.83
ANKRD32	3.42	4.31	4.25	4.25	4.07	3.04	18.68	16.44	16.56	10.57	9.07	11.58
ANKRD33B	2.31	3.36	3.64	33.83	22.78	13.67	39.95	24.19	42.80	42.96	34.26	49.23
ANO8	8.36	5.71	3.93	2.89	2.89	4.15	1.55	1.26	1.44	1.52	1.10	0.81
ANO9	21.34	8.29	7.98	5.07	5.46	4.30	1.39	0.54	1.99	1.04	0.47	1.74
ANXA1	65.60	63.74	44.74	30.92	32.51	43.21	13.99	5.60	15.08	4.07	3.86	8.95
ANXA2	24.49	28.60	24.79	34.61	21.85	30.44	125.94	104.04	147.67	49.63	47.17	71.89
ANXA2P2	67.51	63.49	66.05	81.00	57.60	75.60	294.67	282.43	359.14	115.95	130.13	183.41
APOB48R	30.61	27.94	42.90	35.81	25.15	33.62	17.52	7.39	34.00	2.89	1.99	12.06
AQP3	80.73	97.46	147.24	37.25	45.92	157.17	10.92	11.11	28.78	6.14	6.83	27.65
ARAP3	10.95	8.09	7.77	10.45	9.89	6.72	5.89	3.90	3.93	1.63	1.61	2.11
ARCN1	122.35	138.52	127.64	154.05	147.74	153.95	521.04	595.47	451.72	389.85	459.93	356.20
ARF4	31.72	37.83	32.63	67.35	50.79	47.54	195.09	265.67	140.05	158.87	182.74	125.98
ARHGAP12	10.38	11.52	10.60	4.73	4.59	9.26	3.40	3.18	3.15	2.12	1.53	1.62
ARHGAP31	6.15	5.39	10.66	92.38	76.14	38.40	69.31	68.28	72.13	83.34	84.67	104.12
ARHGAP32	5.28	9.14	8.41	4.03	6.37	6.22	1.39	1.97	3.10	1.49	1.65	2.31
ARHGAP9	23.78	23.13	20.32	38.53	26.77	15.08	7.19	4.93	5.14	6.95	4.49	3.76
ARHGEF2	34.76	35.70	46.35	118.47	98.58	56.38	107.67	112.07	105.76	167.50	172.41	164.11
ARID3A	3.42	2.28	2.47	1.52	1.31	2.39	19.30	15.64	8.24	8.04	6.23	4.25
ARID5B	6.33	5.71	5.49	15.27	11.27	9.33	36.93	16.35	76.43	44.72	29.17	66.71
ARMC6	7.04	7.61	7.36	17.32	14.38	13.53	15.18	23.91	18.81	32.42	36.16	29.29
ARPC5L	25.48	27.58	20.81	45.80	35.71	28.12	128.75	139.15	103.91	133.48	130.72	117.44
ARRB2	61.10	48.57	39.51	29.53	27.53	31.20	149.58	299.62	169.56	93.46	229.89	182.33
ARSA	16.99	12.50	10.97	11.75	11.79	12.11	5.56	3.76	7.82	2.39	1.91	4.01
ARSB	6.96	6.04	7.58	7.42	7.36	9.76	33.00	39.65	37.43	36.36	42.44	41.53
ASB13	9.96	6.53	11.86	5.59	4.03	10.52	0.81	0.49	1.85	2.62	1.27	2.23
ASB2	1.08	0.72	0.46	55.95	18.23	2.02	7.42	3.99	1.99	3.93	1.74	2.79
ASPH	5.46	6.33	6.38	2.91	3.01	5.32	1.01	1.41	1.39	2.26	2.59	2.19
ATAD3A	4.23	6.64	4.06	10.41	10.73	5.24	12.33	28.48	13.30	26.41	34.81	28.44
ATF3	2.19	6.63	1.63	7.46	8.46	3.83	37.50	33.73	52.93	47.11	49.56	53.19
ATF4	122.48	179.42	112.93	242.66	203.20	136.21	844.23	840.75	706.53	758.73	792.34	619.87
ATF4C	0.12	1.36	0.17	1.83	1.50	0.91	5.31	5.89	6.40	7.21	3.92	4.50
ATG16L2	31.27	18.19	11.71	9.33	12.44	5.39	5.97	4.16	6.10	4.23	2.73	5.12
ATG9B	3.07	3.50	2.96	3.05	3.32	2.76	1.06	1.48	0.88	0.40	0.58	0.53
ATHL1	111.76	46.25	29.03	34.56	38.53	19.49	6.08	3.90	6.57	3.25	3.10	5.91
ATM	197.14	189.02	160.63	109.76	145.89	135.48	38.48	19.76	28.22	19.83	18.62	26.41
ATP10A	6.72	5.84	6.19	4.03	4.19	5.35	1.39	0.72	1.25	1.94	1.91	1.38
ATP1A3	4.68	5.91	7.03	5.07	6.29	5.64	0.38	1.34	0.97	1.76	2.42	1.78
ATP1B3	20.68	27.65	19.69	55.34	48.18	35.58	112.94	188.70	121.26	192.75	211.78	126.59
ATP2A2	58.28	62.41	64.96	89.04	76.70	72.31	265.12	280.23	263.15	280.29	298.57	241.20
ATP5G1	6.87	6.50	6.04	19.77	15.11	11.50	20.37	33.10	23.96	30.07	27.90	28.46
ATP6V0B	14.38	17.53	14.45	18.48	17.92	20.72	59.30	80.78	46.03	64.87	60.93	47.08
ATP6V1C2	5.22	4.20	4.31	7.04	8.12	6.29	19.25	23.48	15.69	18.64	20.44	11.81
ATP8A1	66.02	70.99	58.37	36.78	48.26	46.28	8.53	6.90	6.57	17.30	21.16	8.91
ATXN7L1	12.45	14.07	19.17	6.07	6.45	13.02	1.77	0.72	3.42	0.59	0.59	2.51
AUTS2	82.74	106.70	121.66	39.38	57.87	79.07	30.03	28.27	20.68	16.80	16.28	23.93

B3GALT2	136.77	100.89	128.93	105.27	93.59	159.38	48.95	18.73	42.42	19.74	11.83	45.96
B3GALT4	17.29	14.72	16.12	12.36	9.69	14.43	8.29	2.69	6.71	1.22	1.27	2.35
B3GNT1	8.04	6.92	12.73	4.21	3.84	12.37	1.29	0.72	1.90	1.45	1.57	1.90
B3GNT8	31.18	26.11	36.15	19.26	14.83	31.64	13.03	4.48	8.37	1.67	0.98	4.25
B3GNTL1	8.54	3.57	7.20	4.10	3.16	3.35	1.15	0.78	1.64	1.94	1.85	2.09
B4GALT2	2.79	2.74	3.20	8.50	5.18	5.50	14.70	25.40	14.25	21.55	23.11	22.83
B4GALT4	11.76	9.50	6.90	20.04	13.17	8.68	42.92	30.78	18.27	58.90	36.08	20.48
B4GALT5	37.99	33.00	41.11	63.67	55.93	67.39	240.49	207.38	287.07	155.25	160.48	213.38
BACH2	33.37	34.92	44.07	205.73	181.31	103.90	8.86	5.38	15.04	16.44	18.95	44.17
BAK1	31.20	29.34	30.16	49.94	29.66	36.38	181.73	156.79	122.11	161.67	121.10	113.57
BAK1P1	6.32	9.56	8.98	7.35	7.88	10.19	35.54	46.47	41.43	30.49	35.01	32.69
BATF	9.24	10.77	9.83	37.86	34.18	25.96	219.85	236.64	295.49	194.73	162.73	260.63
BATF3	0.27	0.39	0.83	10.06	5.70	2.71	39.85	51.12	125.56	69.38	65.76	172.78
BBS2	22.93	15.54	17.11	8.38	8.07	11.90	1.97	1.79	2.41	2.99	1.32	3.36
BCAS3	9.12	10.33	11.86	9.28	9.64	14.46	4.17	2.60	3.98	2.12	2.71	2.63
BCAT1	0.15	0.23	0.34	5.77	1.94	0.98	25.29	26.21	15.64	89.21	50.54	34.21
BCCIP	11.05	10.82	10.97	24.85	21.01	13.04	22.00	39.96	25.17	42.75	50.50	40.52
BCL2	50.60	61.69	31.40	216.46	202.13	57.96	375.39	286.02	246.45	308.16	295.44	273.09
BCL2A1	3.33	4.05	3.79	35.91	21.56	5.50	79.75	72.93	66.07	68.66	58.76	47.77
BCL2L1	35.98	42.89	39.91	164.11	148.53	84.53	231.30	264.72	296.57	304.54	378.27	487.04
BCL3	7.59	12.44	6.84	22.12	27.09	17.86	61.93	52.46	78.79	34.33	30.57	51.17
BCL9L	207.60	221.94	368.62	112.37	135.36	211.68	33.89	25.98	43.04	27.39	35.70	44.51
BEND3	2.13	2.35	2.37	9.19	6.33	6.58	5.94	8.74	9.72	13.78	12.34	16.96
BHLHE40	80.91	97.23	102.18	555.73	508.33	166.57	1268.63	1054.87	1177.77	947.22	1050.01	1157.45
BLK	49.35	14.81	45.31	60.34	11.33	43.35	9.37	3.12	7.24	5.37	1.70	6.98
BLM	5.22	4.24	6.59	16.83	16.81	8.82	86.36	45.29	65.14	49.73	38.54	53.36
BMP8B	5.54	4.30	5.02	4.58	2.96	2.91	1.10	0.72	2.13	0.72	0.58	2.02
BNIP1	3.12	2.74	2.65	5.98	4.15	3.51	11.74	13.62	7.08	13.91	13.36	10.65
BNIP3P	1.72	1.49	2.24	1.43	0.47	2.42	16.88	9.30	13.26	2.52	1.94	3.43
BOLA2B	6.30	5.22	7.06	15.80	10.14	14.74	26.80	34.99	22.75	35.84	29.56	31.78
BOLA3	1.02	1.27	1.63	2.65	2.89	2.02	7.18	9.05	5.88	7.90	6.53	7.89
BOP1	3.09	3.84	5.11	13.27	10.30	6.72	12.61	27.39	16.40	36.41	29.88	33.31
BRIX1	9.57	9.86	7.21	14.11	12.64	11.01	25.35	44.65	22.39	48.27	52.04	41.36
BTBD11	28.99	31.04	27.86	45.23	37.96	27.72	5.99	3.85	4.72	3.66	3.73	5.63
BTBD2	37.89	37.44	41.25	18.58	19.78	31.62	8.13	4.78	6.63	4.73	5.12	6.37
BTG2	157.88	137.44	192.01	882.89	761.70	552.23	507.43	324.93	440.44	466.80	325.45	444.57
BTG3	5.36	9.73	4.32	10.24	12.37	7.69	33.42	45.35	22.26	28.99	35.38	22.88
BTLA	3.48	4.73	3.91	7.98	6.76	5.10	0.57	0.45	1.53	0.86	0.55	1.13
BYSL	5.16	7.08	3.39	14.75	11.75	9.29	38.03	62.27	46.13	66.90	74.92	70.97
BZRAP1	9.69	5.09	5.92	11.06	13.33	7.45	2.39	0.99	1.62	1.58	1.48	2.02
BZW1	55.88	70.79	59.94	210.97	172.51	137.17	281.90	342.66	258.37	289.05	315.07	272.01
BZW1L1	92.48	110.74	105.54	321.92	264.71	228.55	429.79	530.83	390.99	449.51	483.74	413.19
BZW2	6.42	4.67	6.44	18.82	12.85	11.90	20.12	43.50	27.02	54.56	56.56	46.31
C1QBP	17.96	18.68	19.94	48.64	31.00	39.99	55.40	121.24	69.05	143.80	150.66	124.49
C2CD4A	0.18	0.20	0.22	87.04	17.48	6.15	76.11	4.88	8.70	50.41	9.96	24.53
C3AR1	38.80	38.16	46.22	30.23	29.78	46.93	7.57	8.60	7.77	4.38	4.45	3.85
CA11	4.63	4.71	5.24	4.76	4.00	6.28	0.53	1.08	0.87	1.42	1.43	1.52
CACNA2D2	10.60	12.13	7.31	8.59	12.70	5.75	2.16	1.84	1.48	1.54	0.89	0.90
CACNB3	5.22	5.09	3.20	2.43	2.81	2.31	3.26	1.16	2.68	1.45	0.68	1.17
CALHM2	52.54	50.49	64.74	27.52	22.08	57.07	16.18	4.33	11.11	3.94	2.45	5.30
CALR	104.86	115.97	130.29	317.27	223.10	223.82	479.55	609.43	401.49	460.40	487.63	371.88
CALU	22.57	27.38	25.48	30.01	29.23	31.64	142.35	185.92	104.79	128.92	150.64	91.49
CAMK2D	33.01	41.32	27.40	68.65	68.23	33.52	83.58	140.72	86.70	148.25	187.07	108.78
CAMK2G	39.10	34.01	31.96	12.14	14.91	26.18	7.25	7.21	8.46	7.10	6.51	7.86
CAMKK1	2.82	4.99	4.25	1.39	2.18	3.15	0.48	1.25	0.74	1.31	0.85	1.26
CAMTA2	35.83	31.74	33.00	77.18	52.53	32.97	123.46	110.81	111.21	178.96	176.24	145.88
CAND2	2.89	1.00	5.22	2.33	1.39	5.29	0.48	0.40	0.19	0.83	0.68	1.32
CAPN12	30.96	25.49	21.36	20.66	15.76	18.20	8.56	2.98	3.25	1.38	1.46	3.40
CAPRIN2	18.16	13.19	11.96	5.07	6.41	8.32	2.35	1.30	2.96	1.31	0.98	2.27
CARD16	7.74	6.97	8.80	15.05	10.23	10.66	8.90	4.92	4.84	1.16	1.60	2.99
CARHSP1	23.99	28.14	27.53	16.53	14.58	25.48	11.33	5.41	11.14	5.34	4.73	7.38
CARS	13.44	11.59	12.36	30.79	25.63	18.01	78.36	72.22	70.65	78.46	73.99	85.46
CBFA2T2	63.92	65.47	69.27	32.01	36.67	45.81	21.12	11.11	17.21	12.47	9.75	13.89
CBWD1	2.51	1.24	1.22	4.00	1.69	2.94	9.24	4.88	10.04	10.92	2.87	8.69
CBWD3	1.75	1.16	0.67	2.63	1.09	1.82	4.61	5.50	8.81	4.92	4.03	6.64
CBWD6	0.93	2.05	2.42	3.04	3.26	2.71	5.24	9.32	6.31	4.67	9.98	11.42
CCDC109B	18.09	18.86	19.18	14.76	14.71	21.11	2.32	1.72	3.38	1.70	1.78	5.22
CCDC124	10.98	11.95	12.02	24.72	18.99	18.95	29.12	46.91	28.31	44.99	48.46	46.80
CCDC136	5.31	4.93	4.10	3.73	3.28	2.71	1.63	0.27	0.51	0.77	0.85	0.32
CCDC58	0.39	1.18	0.80	2.39	2.25	1.37	4.69	9.05	4.12	8.40	9.58	8.50
CCDC59	11.55	11.58	12.10	13.18	13.93	14.84	31.81	46.18	30.12	47.06	53.68	46.38
CCDC6	23.28	28.83	26.13	42.27	46.52	33.78	86.49	130.31	141.35	153.54	219.12	242.34
CCDC64	41.26	50.46	26.04	85.58	94.25	38.29	9.53	5.73	6.43	16.89	12.47	11.29
CCDC85C	20.26	19.36	19.82	15.04	13.25	21.78	3.36	5.60	5.79	4.76	6.03	8.56
CCDC86	7.23	7.45	7.64	26.91	22.78	13.81	29.44	74.73	41.67	82.98	95.60	67.20
CCL20	2.61	4.57	5.33	42.85	47.27	18.11	125.40	197.48	220.41	176.89	194.36	202.54
CCL3	3.67	4.93	12.38	176.56	114.94	33.16	279.23	142.95	76.82	4410.82	2302.45	484.92
CCL3L1	4.91	3.65	6.23	189.18	36.26	73.48	139.50	18.84	55.67	1576.64	247.47	343.50
CCL4	23.75	21.06	30.28	356.95	267.36	172.49	37.03	20.90	23.53	2042.08	1194.74	395.44
CCL4L1	8.42	1.72	7.49	465.93	50.93	163.02	7.67	1.51	3.90	948.65	110.68	225.06
CCL4L2	4.74	0.88	6.17	156.86	54.80	64.18	3.87	2.50	3.71	301.62	94.24	77.31
CCL5	1004.99	1100.43	1062.65	925.31	929.01	1252.56	286.72	177.73	292.39	137.14	101.16	267.58
CCM2	49.61	48.85	58.82	28.73	26.21	37.25	19.87	8.35	14.16	9.59	8.35	11.90
CCND2	95.79	91.29	102.65	86.87	67.76	97.40	353.29	304.29	603.50	345.69	336.36	773.35
CCND3	78.12	83.33	95.28	93.29	81.56	104.96	356.50	262.17	515.28	109.27	110.36	222.97
CCR1	28.99	27.38	20.18	19.08	12.70	17.03	407.08	479.90	247.79	77.24	92.34	96.10
CCR4	1.20	1.14	0.99	6.81	3.32	8.21	17.20	28.99	40.02	56.42	52.79	154.56
CCRN4L	0.84	0.88	0.32	2.04	2.93	0.98	4.98	5.82	5.69	8.13	8.18	8.74
CCT2	17.14	17.69	18.40	37.77	27.97	25.56	74.48	124.32	76.06	123.81	136.57	103.68
CCT3	30.88	31.73	39.78	78.19	58.30	57.70	97.57	157.87	117.79	169.26	187.61	146.67
CCT4	33.38	35.75	44.36	73.03	57.61	76.72	112.64	184.22	118.92	153.58	185.74	159.85
CCT5	40.24	35.27	40.58	87.17	63.48	70.21	163.71	244.12	171.20	261.13	281.24	234.68
CCT6A	34.57	34.70	39.81	85.17	60.64	65.19	122.43	176.78	122.23	189.36	207.12	173.55
CCT7	38.44	36.26	43.60	74.33	61.74	69.71	125.49	203.13	150.17	189.63	214.91	180.88
CD101	2.37	8.84	3.41	1.47	6.48	3.22	0.81	1.03	1.28	0.36	1.44	0.68
CD200R1	6.63	5.29	8.07	5.72	4.23	9.22	5.65	2.78	1.90	0.90	0.42	1.46
CD226	12.12	21.22	12.88	13.79	19.22	13.38	39.52	102.91	54.41	82.93	123.51	60.84
CD244	8.04	9.89	4.41	10.58	15.23	8.21	2.83	6.18	2.45	0.59	1.87	1.34
CD27	19.69	37.97	30.56	68.33	70.25	48.58	1.34	0.25	1.74	1.45	0.72	1.06
CD274	5.79	6.14	5.52	10.41	9.89	8.21	246.63	226.15	252.56	194.64	208.90	203.34
CD300A	10.50	11.82	11.80	2.99	4.03	9.58	1.87	1.21	4.44	0.72	0.98	1.30
CD3EAP	3.93	2.05	4.62	8.53	7.03	7.14	6.11	15.76	15.44	33.72	32.17	35.60
CD40LG	21.46	15.05	23.70	20.30	11.27	29.00	447.75	278.35	402.23	231.00	190.33	280.62
CD5	64.34	92.56	70.69	169.70	146.39	87.31	16.52	11.87	23.13	5.24	6.53	10.53
CD52	192.11	183.75	220.58	306.89	248.57	270.04	10.87	6.18	15.78	4.47	4.20	10.49
CD55	17.02	17.04	15.56	16.00	14.36	18.04	48.62	64.15	39.42	69.20	87.81	55.91
CD69	29.92	38.71	20.95	229.29	211.54	96.64	385.01	311.60	199.63	184.79	233.41	256.25
CD70	2.07	5.94	1.63	8.46	16.22	2.42	17.48	21.77	14.57	8.18	16.54	13.76
CD80	0.59	0.39	0.70	1.09	0.89	0.89	6.75	4.37	3.74	4.57	5.28	8.67
CD82	4.36	5.27	13.83	62.57	28.74	36.33	6.22	4.14	12.03	13.63	7.71	39.81
CD83	2.85	3.17	5.42	55.47	45.41	38.54	30.18	39.07	48.25	51.40	71.23	155.13
CD84	61.46	45.66	107.73	63.28	53.00	135.44	9.39	5.87	9.25	4.34	2.42	6.76
CDC14B	9.65	9.60	13.25	4.99	4.09	9.53	3.73	1.57	2.63	1.16	1.57	2.28
CDC25B	118.72	91.03	119.81	27.80	27.33	74.05	11.74	11.83	16.84	21.59	16.92	18.30
CDC6	0.45	0.36	0.22	0.22	0.44	0.65	7.38	13.75	3.89	6.73	7.08	4.94
CDHR1	9.87	13.55	6.69	4.51	9.57	5.39	1.15	1.84	2.59	1.54	2.08	1.05
CDK4	13.46	12.48	17.53	32.99	26.87	29.43	43.03	79.27	63.79	103.91	102.49	99.79
CDK6	35.44	56.14	33.71	42.28	60.08	42.70	431.35	764.01	373.09	946.49	1288.80	724.92
CDK7PS	1.28	1.68	0.92	2.29	2.45	1.65	4.34	6.72	5.60	5.84	5.62	6.49
CDKN1A	2.76	6.59	4.68	17.69	17.68	20.28	166.49	174.03	177.36	35.46	60.55	80.56
CDKN2B	0.27	0.16	0.22	0.56	0.99	0.58	9.44	13.84	11.52	1.22	1.91	5.99

CDYL2	0.99	0.42	1.05	1.82	0.95	1.19	5.99	5.69	6.75	3.66	1.48	3.32
CEBPB	9.05	8.68	9.84	8.15	6.43	9.72	49.68	50.50	34.04	43.08	40.60	41.14
CEBPG	28.66	35.28	35.93	42.67	38.92	46.64	102.98	122.66	109.56	115.37	141.40	147.84
CECR1	73.59	65.57	67.80	33.57	39.08	61.17	8.14	4.35	7.40	2.03	1.95	3.89
CELSR2	11.97	9.04	15.13	5.38	4.43	10.34	1.25	0.40	1.53	0.59	0.68	1.46
CENPM	0.69	0.75	0.86	5.77	6.33	2.53	0.14	0.40	0.19	1.49	1.53	1.66
CENPN	1.68	1.67	2.14	6.93	5.65	3.69	6.01	5.52	3.82	11.99	9.72	8.13
CEP68	24.67	25.20	25.92	14.73	16.26	21.31	3.13	2.51	5.49	3.29	4.79	6.20
CERK	325.40	323.26	462.39	378.61	325.81	472.36	105.14	85.66	89.06	88.40	84.37	76.39
CG030	4.53	4.47	3.05	0.91	2.02	2.39	0.77	0.04	0.79	1.17	0.72	0.49
CHAC1	0.30	0.85	0.59	12.92	6.61	5.71	153.03	145.29	162.25	185.97	182.40	204.44
CHAC2	0.75	1.01	1.85	4.16	2.29	2.06	5.89	16.85	7.12	12.83	14.46	14.13
CHCHD2	36.82	51.08	45.77	90.22	76.60	68.37	236.45	311.42	174.33	223.14	220.65	176.33
CHCHD8	12.39	12.76	12.88	26.45	18.12	17.75	39.90	62.59	37.34	59.76	58.64	57.04
CHCHD9	4.30	3.89	5.11	14.75	6.14	10.82	32.00	32.84	23.69	29.91	21.47	26.50
CHN2	4.77	5.45	3.70	7.16	7.36	3.04	1.48	0.72	0.83	0.45	0.93	1.26
CHPF	10.74	11.06	11.37	35.11	19.50	13.99	99.70	121.76	73.75	72.22	77.37	56.42
CHST12	23.08	21.97	21.94	15.05	15.82	21.84	10.20	8.83	7.50	4.70	5.51	5.10
CIRH1A	5.64	6.79	6.38	14.88	14.64	11.90	15.14	26.79	19.89	42.28	42.10	37.08
CISD1	3.51	4.28	4.10	6.59	5.85	5.10	16.09	24.82	14.34	20.96	21.71	16.31
CISH	10.52	11.52	20.77	8.02	8.31	16.59	143.98	98.69	153.03	175.55	146.57	219.40
CKAP2	14.33	13.34	24.67	12.01	11.82	24.41	3.98	3.40	4.12	2.71	4.41	4.74
CKS1B	3.12	2.41	3.14	3.96	3.28	3.84	11.00	11.98	10.00	12.12	13.61	13.93
CKS1BP3	0.88	0.72	1.81	1.73	2.00	2.78	6.63	9.09	6.38	7.67	7.23	6.27
CKS2	2.19	1.89	1.60	3.38	2.65	2.42	5.55	11.47	8.19	13.09	12.68	13.81
CLDN15	14.05	12.81	7.79	4.67	8.50	5.19	2.72	2.12	3.10	3.69	3.11	3.96
CLEC2B	33.15	39.98	18.80	28.84	27.64	17.38	19.15	13.39	10.09	5.06	5.85	6.80
CLIC1	59.90	69.00	53.37	149.92	97.07	84.42	351.10	295.91	295.14	181.63	153.73	160.39
CLIC4	0.18	0.49	0.83	8.15	6.72	6.33	45.33	42.54	72.77	50.15	56.29	80.17
CLIC5	39.88	40.86	45.61	27.97	28.76	51.34	14.85	7.93	16.70	8.40	5.85	13.72
CLIP2	9.06	8.19	11.16	8.63	8.19	9.40	4.22	1.79	4.49	2.08	1.91	2.75
CLK4	20.68	21.48	15.25	11.80	16.53	12.40	4.26	4.52	4.53	5.65	5.64	6.44
CLPB	3.30	2.48	2.28	5.90	5.89	2.89	12.98	11.51	9.76	14.68	17.77	14.41
CLSTN3	53.02	50.13	54.02	58.89	56.01	50.94	16.91	9.86	9.81	5.33	6.83	5.83
CLU	2.22	4.15	3.14	0.82	0.59	2.21	1.48	1.57	1.02	0.18	0.47	0.36
CMAH	10.56	10.61	5.76	7.85	9.41	3.36	52.64	59.58	42.61	55.74	61.35	41.21
CNN2	203.18	236.53	350.79	100.88	87.06	237.90	111.79	83.11	123.67	31.94	31.88	43.03
CNNM3	60.33	60.51	66.07	37.86	37.02	61.33	15.65	15.59	14.92	22.53	21.63	21.00
CNR2	10.14	4.80	7.24	3.21	2.69	6.25	0.38	0.09	1.99	0.27	0.13	1.26
COL5A1	24.00	18.51	12.60	7.11	7.85	9.33	3.35	0.67	3.52	1.45	0.85	2.35
COL6A2	23.18	20.17	13.77	19.17	27.49	18.66	11.30	6.00	9.67	3.12	4.54	5.34
COX17P1	2.02	2.82	2.60	4.31	4.08	3.74	13.53	17.99	14.32	12.95	11.99	12.49
CPD	47.03	64.92	62.77	85.35	77.37	80.12	428.03	331.03	571.99	190.17	174.89	293.57
CPEB4	12.96	14.52	12.85	14.44	17.40	13.02	65.24	54.57	49.73	38.35	49.69	36.23
CPNE2	3.36	6.69	3.64	3.47	5.14	4.34	1.87	1.43	2.27	0.54	0.98	1.30
CPNE7	22.36	35.84	53.47	7.85	17.64	48.30	0.53	1.25	0.37	0.23	0.76	0.61
CPT1A	34.90	37.96	25.55	16.31	19.86	11.43	5.46	4.93	5.41	5.78	5.47	6.52
CRAT	15.55	16.06	22.56	11.10	8.94	19.34	7.28	4.48	8.79	4.61	2.97	5.10
CREB3L4	2.35	1.53	2.07	2.17	1.50	2.43	0.38	0.46	0.60	0.86	0.99	0.67
CRELD2	6.51	3.75	3.30	11.73	7.36	7.03	20.87	25.90	16.36	16.26	17.33	15.78
CREM	9.15	13.15	8.66	48.37	33.54	18.33	115.75	131.44	107.61	131.84	130.42	156.70
CRIM1	9.15	11.51	15.79	24.71	19.86	25.05	1.58	1.84	3.97	6.87	6.02	6.86
CROCC	15.72	11.88	14.47	9.54	7.87	9.69	2.72	1.45	3.39	2.12	1.53	3.51
CROCCP2	62.12	30.39	24.44	22.58	21.99	12.26	11.20	3.62	8.45	12.42	5.34	9.18
CROCCP3	12.07	8.14	4.52	2.77	2.63	2.28	0.99	0.54	0.87	0.54	0.17	1.31
CRTAM	5.61	6.95	4.38	105.04	148.65	43.57	0.81	0.81	0.83	5.01	8.56	17.33
CRTAP	49.04	46.61	59.29	28.23	21.60	54.16	7.33	5.33	8.37	6.78	4.92	8.30
CRTC1	10.92	12.57	12.36	8.72	9.18	8.93	2.30	3.05	2.82	2.89	2.20	2.87
CSDA	0.42	0.52	0.77	1.34	0.67	0.40	9.91	18.82	9.54	23.09	23.03	16.15
CSF1	6.24	5.29	2.87	49.87	21.24	9.22	37.50	49.41	78.42	72.72	67.33	149.99
CSTF2	7.74	8.94	6.72	17.43	12.42	11.97	44.07	53.76	36.36	43.45	38.75	43.64
CTDSP2	336.47	354.66	404.56	309.39	319.28	401.90	113.95	71.77	97.43	78.06	77.93	77.69
CTH	0.99	0.91	0.92	1.04	0.95	0.90	28.93	27.28	18.92	50.95	48.12	31.66
CTLA4	1.50	1.86	1.42	31.92	22.70	2.02	202.28	270.15	89.57	318.74	232.85	147.07
CTNNBIP1	7.07	9.01	10.08	5.38	5.78	7.90	2.58	2.51	3.33	1.63	1.18	1.70
CTPS	5.91	4.96	4.53	10.67	8.50	7.66	18.54	34.05	22.35	50.09	54.10	39.92
CTPS2	4.32	3.59	4.22	1.82	2.89	4.12	0.24	0.40	0.60	0.63	0.51	0.65
CTSA	47.28	42.28	77.52	42.27	34.86	67.70	7.63	7.10	11.66	8.97	7.00	10.97
CTSH	21.52	16.71	17.29	43.72	43.04	21.40	82.24	93.36	51.63	71.19	81.24	50.64
CTSO	29.83	28.98	34.21	23.51	23.65	32.36	11.88	7.44	10.36	6.82	5.38	10.93
CXCL16	5.17	7.56	4.68	2.04	2.94	4.05	16.86	46.11	37.05	4.34	20.41	25.24
CXCR3	24.22	37.99	105.73	6.94	16.69	77.66	0.38	0.13	1.71	0.86	0.55	1.90
CXCR4	439.83	654.35	689.65	247.58	504.88	858.80	56.95	38.30	96.46	26.11	21.84	61.70
CXCR7	6.42	6.20	7.37	1.91	3.16	5.86	0.81	0.22	0.32	0.14	0.51	1.17
CXXC5	20.08	26.70	37.75	91.73	93.59	89.23	5.13	5.33	7.73	3.25	4.79	11.05
CYBA	115.78	94.33	82.80	86.13	59.41	81.28	44.50	34.05	40.53	15.27	9.45	23.52
CYCS	30.52	42.27	30.82	66.35	64.75	47.58	280.01	437.07	241.13	341.67	401.59	332.03
CYCSP45	0.18	0.36	0.31	0.61	0.44	0.54	2.97	4.94	2.23	3.99	4.07	3.86
CYP27B1	1.50	1.57	2.25	4.12	2.85	2.46	3.83	4.70	3.19	9.40	8.31	7.29
CYP2U1	8.27	9.07	12.81	5.40	5.02	10.30	1.15	1.84	2.41	1.63	2.25	2.52
CYP4F22	7.08	5.78	11.12	8.20	5.14	10.67	1.87	0.45	1.20	0.90	0.55	1.58
CYP51A1	19.69	20.50	25.58	46.84	40.34	47.60	79.75	98.37	99.95	54.93	77.70	57.63
CYP51P2	0.38	0.56	0.43	0.96	0.71	1.39	2.25	1.79	2.21	2.55	2.41	1.77
CYTH4	59.00	55.68	54.98	47.45	48.06	45.63	15.57	13.08	25.08	8.27	8.65	9.59
CYTIP	90.87	98.00	108.72	124.58	109.49	149.84	1547.81	1420.70	1326.69	826.71	909.24	988.34
D4S234E	33.01	34.73	61.80	8.46	10.17	41.80	3.81	3.58	7.53	1.52	2.01	4.38
DAB2IP	0.93	3.04	2.06	3.82	4.71	4.19	8.77	9.99	6.62	2.53	4.28	3.00
DBP	29.57	27.65	41.54	5.28	7.15	25.37	0.60	0.49	1.26	0.44	0.95	0.90
DCAF13	8.15	10.18	9.15	19.81	16.86	15.26	25.79	40.07	24.60	45.34	41.91	35.30
DCTPP1	10.59	8.64	9.80	30.57	24.04	22.60	38.17	70.47	46.96	67.12	72.16	71.49
DCUN1D5	7.17	8.26	7.70	13.23	12.06	9.80	20.26	36.65	22.48	38.44	48.46	36.19
DDB2	22.53	23.14	19.40	25.71	20.24	13.31	4.60	4.61	4.97	7.36	6.91	6.62
DDIT4	43.87	49.94	29.89	128.80	76.38	41.43	670.31	509.36	1011.27	445.66	367.30	908.18
DDX1	7.38	6.82	6.63	14.66	9.69	9.00	20.21	25.85	17.30	28.86	32.90	23.20
DDX10	7.20	7.12	6.66	18.07	12.46	9.98	14.56	32.30	18.09	37.85	40.36	32.48
DDX21	73.53	83.03	69.03	205.26	174.00	122.53	585.63	903.27	614.66	980.17	1136.39	972.63
DDX49	5.55	7.12	5.30	11.28	8.15	9.62	14.47	15.59	14.67	30.72	20.10	26.35
DDX60	22.09	23.53	22.06	20.12	17.68	26.57	12.36	8.42	14.06	3.52	2.63	10.61
DDX60L	26.62	23.66	16.06	24.98	24.13	17.75	15.81	8.87	7.68	3.21	2.29	5.14
DFNB31	42.73	22.52	12.94	71.34	36.67	18.40	5.22	2.87	2.13	6.05	4.07	3.12
DHRS1	5.78	4.67	4.24	4.12	3.92	3.69	0.57	0.75	1.37	0.73	0.48	0.81
DHRS12	4.92	5.39	4.07	4.21	2.89	3.33	2.06	1.70	2.50	1.17	0.98	1.34
DHX33	14.43	11.99	12.36	19.66	17.62	13.92	20.00	39.10	25.26	65.75	69.20	52.59
DHX58	10.95	11.10	7.70	4.34	8.86	6.22	1.58	2.37	2.41	0.59	1.10	1.94
DIP2A	57.62	43.77	41.11	30.49	44.38	35.03	16.14	10.30	13.65	9.76	7.89	10.57
DLD	12.21	14.72	13.93	35.82	31.68	22.89	46.17	61.74	42.89	50.68	66.69	48.58
DLEU2	0.90	1.35	0.86	3.05	3.40	1.16	13.24	14.36	10.44	8.87	11.13	8.27
DNAJA1	37.27	40.44	46.75	123.90	94.89	96.89	186.33	243.76	179.00	241.76	252.95	224.23
DNAJB11	23.36	25.84	24.12	42.83	35.79	34.78	97.54	147.05	68.76	88.04	111.87	71.59
DNAJB5	2.13	3.36	6.75	14.62	20.25	14.21	5.17	9.27	6.66	2.62	6.91	6.32
DNAJB9	28.38	31.40	27.01	33.22	32.72	35.95	143.90	201.26	120.59	110.73	135.48	96.77
DNAJC25-GNG	9.48	11.43	8.21	14.40	14.41	9.93	36.55	50.78	34.56	28.71	36.23	29.09
DNAJC3	40.36	48.60	45.85	66.09	57.47	54.08	182.01	242.59	141.75	139.80	180.53	120.88
DOCK10	32.77	29.67	23.97	35.48	35.12	22.52	186.99	117.15	73.61	109.45	103.54	86.79
DPH2	15.31	14.59	12.67	44.93	35.56	26.65	42.63	83.82	48.72	116.32	119.90	96.79
DPY19L1	20.53	24.25	24.38	33.00	32.67	25.89	103.41	131.94	74.81	60.98	82.72	51.82
DPYD	21.34	23.40	27.24	14.31	21.40	30.04	5.84	4.79	7.77	3.43	4.03	7.98
DPYSL2	7.59	10.25	9.09	3.73	5.22	7.74	2.25	2.02	2.45	1.49	1.40	1.30
DTX4	3.99	5.31	6.11	2.82	3.60	5.97	0.24	0.13	0.46	0.18	0.59	1.09
DUSP1	30.55	31.33	49.49	43.72	28.64	57.01	8.09	8.33	9.25	8.72	7.17	8.73
DUSP4	3.03	14.91	11.62	77.07	88.44	63.70	41.24	119.04	58.39	263.80	308.03	267.23

DUSP5	2.76	4.70	2.03	113.97	116.84	24.22	200.31	174.85	146.48	180.05	181.68	151.20
DUSP6	1.17	1.73	1.97	12.79	6.01	2.06	70.07	50.13	66.57	31.66	20.14	47.24
DUXAP8	0.71	1.25	0.38	2.49	1.80	1.26	4.55	6.90	2.53	9.50	9.81	7.02
DYNC2H1	4.17	4.50	1.97	2.30	3.68	2.96	1.10	0.49	1.06	0.32	0.51	0.69
DYRK1B	11.97	13.22	12.91	9.28	11.47	11.10	7.09	3.99	7.22	3.07	2.33	3.89
DYRK2	194.19	203.34	216.76	109.98	115.78	174.74	45.74	34.09	43.95	38.53	42.82	42.18
EBI3	0.00	0.03	0.06	3.82	5.66	1.55	3.21	9.45	5.46	16.58	19.67	14.70
EBNA1BP2	4.14	6.14	5.23	14.88	12.74	9.00	28.45	58.20	29.79	54.21	64.36	43.92
ECE2	1.64	1.21	1.14	4.79	3.96	3.44	9.04	13.98	8.59	18.32	18.67	16.12
ECHDC2	21.22	14.31	12.82	7.98	9.89	8.06	2.78	2.02	2.68	3.12	1.95	2.63
EED	6.72	8.19	5.98	12.71	13.37	8.89	12.98	34.27	18.27	70.83	86.79	56.31
EGR1	0.79	1.81	3.03	155.60	126.81	83.47	1.67	1.59	4.74	30.76	28.51	48.35
EGR2	0.54	2.28	2.22	397.92	450.31	173.83	10.92	21.81	28.08	112.79	113.67	132.34
EGR3	0.69	1.60	1.29	282.67	257.22	199.03	0.57	0.99	0.28	56.37	35.28	74.37
EHD4	13.54	13.55	24.39	36.86	28.48	42.76	76.76	95.57	113.20	66.26	66.33	82.25
EIF1	239.69	295.97	254.73	384.24	329.41	357.71	1307.76	1250.61	1066.25	1167.20	1080.87	963.32
EIF1AXP1	20.47	30.59	21.41	35.75	45.88	35.85	70.93	176.64	68.92	112.75	193.53	97.15
EIF2B3	1.50	1.34	1.94	3.86	2.10	3.04	7.81	12.19	5.64	12.47	12.17	8.91
EIF2C4	98.94	105.59	84.13	36.78	51.93	60.31	29.94	16.44	18.78	13.05	12.51	12.27
EIF2S1	34.46	34.11	36.18	64.26	53.42	50.42	112.00	166.30	109.69	151.23	169.28	151.79
EIF2S2	23.63	22.38	22.80	46.53	35.60	35.09	161.19	170.02	138.77	165.17	174.94	173.73
EIF2S2P4	26.94	25.72	28.00	61.64	40.82	41.64	193.37	227.51	178.40	207.45	217.13	220.96
EIF3C	41.20	51.09	59.70	105.63	80.28	83.34	143.81	218.41	200.66	243.41	283.94	262.92
EIF3CL	26.12	24.17	36.28	63.02	55.07	53.87	91.65	146.67	131.98	118.67	158.87	170.33
EIF3J	33.48	40.29	34.53	65.83	61.73	47.08	126.86	176.66	124.26	185.36	193.01	177.24
EIF4A1	63.89	58.94	68.11	144.05	110.65	111.71	287.16	416.00	316.23	436.52	431.47	380.28
EIF4A1P2	16.88	14.14	16.43	38.22	26.48	28.45	76.46	107.67	82.70	102.37	99.87	96.34
EIF4A1P4	2.32	2.23	2.89	5.00	3.98	4.49	12.76	16.68	12.86	14.09	18.50	15.09
EIF4EBP1	4.62	5.03	10.39	8.67	8.07	11.06	62.22	58.87	61.58	86.01	67.80	80.24
EIF4G1	87.87	89.72	85.02	169.96	141.60	96.79	307.69	321.31	293.23	358.88	370.94	331.92
EIF5A	68.74	77.18	76.66	261.74	195.07	171.79	444.96	677.89	479.96	698.41	725.71	633.44
EIF5AL1	30.85	35.77	33.70	110.47	92.38	84.22	207.63	319.43	232.49	349.58	342.74	312.33
EIF5AL3	6.79	5.09	7.90	26.90	19.27	12.79	45.87	71.02	56.06	74.07	81.23	67.90
ELL2	7.46	9.91	7.37	18.00	17.31	11.97	38.89	44.61	43.07	77.20	69.86	42.79
ELOVL6	19.30	14.05	6.35	25.50	16.70	7.40	88.85	39.93	45.09	41.99	21.77	24.73
EML5	11.67	12.69	9.09	11.94	8.07	8.17	142.84	98.81	131.39	92.42	88.55	140.15
ENG	9.60	6.37	12.54	5.09	4.61	6.98	2.33	1.71	2.07	2.64	3.09	1.35
ENGASE	23.08	14.39	11.16	8.89	10.24	7.92	3.45	4.12	3.79	5.78	5.77	4.70
ENO1	134.51	142.24	138.22	423.17	287.38	263.24	2023.55	1811.09	2177.76	1470.73	1350.99	1457.18
ENPP5	6.33	8.00	9.09	1.86	5.22	8.03	0.14	0.63	0.56	0.05	0.55	0.16
EPAS1	0.30	1.18	0.52	7.98	10.24	6.07	9.24	23.25	5.14	28.68	33.28	10.44
EPB49	3.60	5.59	2.84	2.68	1.72	2.50	2.75	2.80	3.65	0.09	0.35	1.80
EPHA1	8.02	9.09	28.09	1.88	4.47	10.88	0.69	0.21	0.26	0.24	0.20	0.32
EPHA4	51.14	50.69	85.36	8.98	15.15	50.76	10.63	4.66	19.57	11.02	8.23	13.77
EPHB6	10.05	15.01	10.25	8.89	12.93	9.26	1.44	1.93	1.62	1.45	2.67	1.50
EPRS	36.46	39.30	42.31	66.05	55.49	59.44	153.22	179.02	146.43	189.72	210.72	178.93
EPT1	21.82	22.29	19.22	33.74	35.64	24.19	83.85	133.82	101.55	127.20	146.11	114.28
ERMP1	57.90	70.94	50.17	35.49	53.03	46.24	17.42	12.91	17.13	9.32	9.25	11.22
ERRFI1	1.71	1.31	2.50	6.20	4.07	3.98	5.99	5.11	7.73	9.80	9.45	11.90
ESF1	6.69	5.06	4.10	9.45	9.49	5.42	19.25	32.30	13.69	29.18	34.77	26.19
ESPL1	0.09	0.07	0.25	11.19	15.15	1.59	0.91	0.81	0.79	3.84	3.52	3.60
ESPN	4.22	3.49	11.50	15.11	12.08	20.65	45.65	61.88	39.16	53.29	51.71	60.56
ESYT1	125.26	111.43	161.26	136.48	95.56	156.48	70.07	34.32	93.36	25.21	22.98	48.13
ETF1	42.55	47.65	43.97	96.93	77.45	72.85	161.51	226.20	165.86	247.22	271.61	214.60
ETFA	5.07	5.12	3.45	11.15	7.83	5.57	14.94	20.74	11.89	19.29	20.73	16.19
ETV3	31.69	35.45	37.50	42.07	39.08	37.22	162.01	142.89	134.71	76.02	88.25	83.99
ETV5	0.06	0.10	0.15	0.52	0.24	0.33	54.99	37.95	21.70	5.47	5.47	4.21
EVI5	0.15	0.23	0.25	0.43	0.55	0.51	1.44	5.96	0.60	22.99	24.08	2.39
EVL	177.40	133.12	102.28	97.82	112.28	76.33	28.15	18.14	20.91	12.51	9.11	19.14
EXOSC4	2.35	2.45	2.71	9.45	6.65	4.59	15.85	22.80	15.18	25.66	29.04	24.05
EXOSC5	2.52	3.04	3.14	6.94	5.38	4.52	5.94	12.28	7.68	16.62	17.55	14.86
EZH2	2.43	2.35	1.82	2.17	3.68	1.41	10.20	7.88	6.71	10.39	9.45	7.93
F2R	123.58	139.60	116.76	39.42	56.72	93.24	27.21	16.67	16.84	7.18	6.19	5.95
FABP5	0.36	0.37	0.13	2.36	0.67	0.54	1.79	4.00	2.31	5.84	7.71	5.08
FABP5L7	1.08	1.00	1.72	23.42	13.58	10.09	11.52	43.65	19.80	78.20	80.60	51.34
FAIM3	190.56	198.64	177.07	287.77	244.32	192.06	11.83	9.90	6.66	17.98	16.21	7.29
FAM100B	29.02	35.87	28.38	40.94	33.54	24.84	216.59	173.11	150.04	167.90	148.48	143.91
FAM102A	258.30	332.34	508.70	223.05	304.41	467.86	18.22	18.14	27.98	25.47	25.10	33.78
FAM117A	74.80	79.22	68.81	60.86	61.52	59.05	36.36	27.16	27.66	15.60	15.62	20.84
FAM117B	19.69	22.68	23.42	11.19	14.64	24.95	3.59	5.20	4.35	5.10	7.93	4.49
FAM125B	54.71	67.73	81.20	59.59	67.12	79.14	11.74	8.69	12.86	8.13	6.02	11.62
FAM13AOS	7.29	7.75	4.35	1.67	3.07	2.71	1.39	0.36	0.37	0.05	0.33	0.28
FAM159A	6.21	6.10	9.49	4.51	4.03	6.80	1.39	1.79	1.57	1.17	2.04	1.74
FAM167A	1.65	1.57	4.65	13.83	12.74	12.51	8.38	6.68	7.50	6.05	4.83	7.25
FAM46A	16.12	20.46	11.12	10.89	11.75	9.83	3.83	3.72	3.28	2.17	3.05	3.24
FAM46C	52.01	65.05	46.13	47.79	42.17	57.31	416.63	378.57	369.65	128.38	143.94	132.30
FAM57A	3.97	4.38	3.92	7.83	3.40	6.06	24.85	12.71	30.47	14.08	8.22	12.46
FAM60A	37.06	40.04	39.75	51.02	39.35	46.23	97.44	131.81	104.96	192.05	191.38	159.05
FAM89A	5.36	4.75	5.08	10.44	7.71	6.92	16.65	21.04	16.29	22.13	25.06	19.89
FAM8A1	45.44	48.37	31.65	16.31	24.13	25.42	10.06	7.71	5.60	7.00	4.71	3.12
FARSA	10.26	8.55	10.94	25.07	17.64	16.67	29.17	48.29	35.95	49.69	52.87	55.42
FARSB	5.79	5.61	4.87	14.14	12.26	9.49	15.23	28.67	16.05	28.37	33.45	25.57
FASLG	14.31	11.39	17.16	31.92	28.32	31.78	202.03	296.44	191.54	212.80	242.39	161.08
FASN	21.55	23.99	24.96	42.54	32.95	26.75	68.73	99.01	99.56	110.80	128.68	94.61
FBLN5	11.73	7.15	11.09	7.81	5.93	12.44	0.67	0.09	1.02	0.14	0.25	0.24
FBXL16	15.00	13.31	18.15	5.59	6.46	13.23	1.01	0.85	2.22	0.86	1.03	1.78
FBXO27	0.60	0.49	0.77	8.89	6.21	1.74	0.96	0.81	1.30	1.81	1.36	1.21
FBXO32	28.51	32.48	26.56	12.79	15.43	24.44	2.59	1.93	2.50	2.62	3.18	1.90
FBXO6	3.40	4.79	3.28	5.37	4.00	6.11	22.52	20.99	21.30	17.13	13.66	17.39
FCGBP	3.87	12.21	7.03	53.17	83.50	48.45	6.42	1.97	9.11	0.59	0.59	3.72
FCGRT	4.56	4.28	5.98	2.65	2.14	4.41	0.43	0.22	0.69	0.45	0.76	0.16
FDXR	3.06	3.23	2.90	1.56	2.81	2.42	0.14	1.03	0.37	0.41	0.47	0.65
FERMT2	2.52	3.13	2.50	5.20	4.79	3.62	25.53	15.55	19.66	31.62	19.33	29.03
FES	0.21	0.10	0.18	1.08	0.44	0.29	13.03	5.38	7.59	6.69	4.54	6.44
FEZ1	4.38	6.92	2.56	58.29	53.99	12.00	250.36	225.75	379.88	82.03	81.62	201.04
FGD3	108.81	99.95	125.65	58.92	63.82	89.69	32.36	20.52	32.33	19.91	18.57	25.74
FICD	2.51	3.58	3.60	5.31	6.14	3.23	23.91	26.33	20.94	16.25	14.89	9.89
FKBP14	4.73	4.02	2.53	2.98	3.66	2.25	17.48	23.21	9.67	14.77	18.65	9.89
FKBP4	16.23	18.21	24.41	28.84	19.30	30.48	70.36	131.76	96.88	138.27	148.31	124.64
FLJ32255	62.45	76.64	92.73	40.07	52.88	74.33	21.79	12.54	20.54	6.01	4.37	11.74
FLJ35390	7.14	5.63	6.33	6.98	5.50	4.95	1.53	1.91	0.81	2.37	2.28	3.24
FLJ35776	11.19	9.86	8.47	9.63	10.84	9.29	6.95	2.24	4.49	2.53	0.89	3.20
FLJ36031	14.16	16.84	17.04	21.38	16.97	21.87	149.06	180.05	132.13	138.54	111.76	99.59
FLJ46020	24.42	17.17	24.78	11.97	13.21	24.73	4.22	2.46	2.41	3.98	2.37	1.94
FLOT1	16.12	17.01	9.77	13.70	10.32	8.64	136.41	105.64	115.75	64.96	55.80	72.50
FLT4	58.70	51.15	44.81	16.96	21.08	27.73	10.39	7.66	12.63	4.11	5.89	8.06
FNDC3B	4.02	5.74	4.47	10.84	12.42	7.45	34.53	39.20	35.86	23.76	30.02	31.33
FOSB	1.02	4.83	0.77	2.52	6.45	2.57	2.49	6.32	2.22	14.45	26.16	9.59
FOXP3	0.09	0.26	0.12	0.60	0.40	0.88	6.73	6.81	16.22	9.33	7.38	28.91
FOXP4	10.47	11.95	22.93	52.52	39.67	29.03	72.47	81.18	65.14	103.76	119.61	101.53
FRAT1	15.49	15.34	14.85	10.58	12.22	14.14	1.77	2.02	1.80	2.17	2.88	1.90
FRMD4B	15.94	13.48	17.07	17.22	10.68	16.81	198.15	171.72	150.36	178.74	194.44	174.03
FRMD6	0.21	0.26	0.96	0.61	1.66	2.57	1.20	2.28	2.91	2.17	5.51	3.44
FTH1	219.61	200.03	227.50	336.94	187.32	260.25	2424.68	1923.82	1961.16	1100.22	883.94	1441.65
FTHL10	29.86	26.36	28.36	40.24	27.90	38.64	342.02	202.76	293.07	156.68	120.10	190.47
FTHL11	19.54	18.74	19.39	27.70	17.56	21.56	231.24	154.54	182.42	102.86	81.49	143.87
FTHL12	0.62	0.42	0.64	0.98	0.57	0.57	5.93	5.37	5.85	2.64	2.02	3.66
FTHL16	7.30	5.40	7.78	9.59	6.54	8.22	80.56	56.90	58.68	37.12	28.46	49.72
FTHL2	29.54	24.09	32.18	42.61	24.80	28.67	348.35	206.76	260.00	151.66	116.01	189.88
FTHL20	17.95	19.22	23.31	30.26	18.10	26.30	248.62	151.42	197.93	102.97	82.00	138.83
FTHL3	1.78	1.41	1.51	2.45	1.75	3.02	20.81	14.27	15.62	11.91	6.85	13.87

FTHL4	0.33	0.39	0.31	1.08	0.71	0.51	4.52	3.41	3.89	2.76	1.74	2.51
FTHL5	0.39	0.60	0.48	0.33	0.22	0.67	4.53	2.68	3.39	3.37	1.49	3.53
FTHL7	33.30	29.81	36.92	43.42	29.76	36.43	358.77	234.48	329.18	180.46	130.29	205.90
FTHL8	23.48	21.76	22.63	30.55	21.40	24.31	252.91	147.30	201.61	122.52	79.01	141.29
FURIN	77.94	84.28	88.41	631.67	600.80	283.02	2276.54	1816.36	2080.31	1420.67	1352.42	1689.82
GAB1	1.53	3.07	1.94	2.26	2.37	2.57	0.91	1.08	1.39	0.41	0.76	0.16
GAB3	52.34	43.44	42.09	16.57	18.23	29.21	20.36	10.84	16.70	8.13	7.38	9.72
GADD45A	4.80	7.93	5.61	25.33	20.01	15.91	23.28	28.94	13.32	34.24	34.17	32.75
GADD45B	29.80	33.72	36.95	27.50	44.18	50.18	448.97	650.08	306.90	438.63	547.58	543.32
GALNT12	6.99	4.83	6.13	2.52	2.61	4.95	0.53	0.36	0.51	0.95	0.55	0.73
GALNT6	1.80	1.57	1.29	2.69	1.66	2.42	9.10	6.63	9.81	3.30	3.01	7.08
GAPDHL10	7.15	9.64	7.17	22.74	20.45	19.08	48.32	45.46	53.86	26.70	24.74	26.15
GAPDHL18	1.06	0.78	1.37	3.41	2.70	3.25	7.81	4.07	8.20	4.14	2.82	3.54
GAPDHP1	31.71	41.24	44.93	122.94	87.75	108.57	238.41	212.58	267.46	127.47	114.46	150.45
GAR1	3.96	4.99	3.30	8.98	8.86	6.98	13.03	22.13	11.34	26.38	29.51	21.21
GARS	20.14	19.68	17.93	68.96	49.32	44.11	300.71	341.12	297.62	427.18	448.07	396.08
GART	21.90	19.65	21.04	53.98	43.04	35.34	67.25	90.81	72.50	107.79	119.33	107.01
GAS7	10.26	11.16	22.68	5.98	5.78	12.37	0.38	0.63	0.56	0.36	0.34	0.77
GATS	30.45	27.57	24.77	25.37	30.92	24.64	14.06	8.73	9.17	6.57	5.62	6.29
GBE1	3.60	4.50	3.14	10.41	7.08	8.24	32.71	25.27	29.33	12.38	11.07	14.94
GBP5	202.57	160.33	128.50	302.15	275.73	225.10	1073.54	529.04	636.61	618.18	487.75	527.02
GCH1	25.18	27.48	21.14	38.95	35.80	31.13	167.40	176.61	129.64	123.54	144.79	142.01
GCHFR	19.99	20.95	22.54	11.10	13.39	23.83	2.78	3.09	2.96	1.58	2.59	3.04
GCSH.1	1.61	2.47	2.81	6.32	5.35	4.05	4.66	12.90	5.65	8.79	13.38	9.85
GDAP1	2.22	1.31	1.57	7.94	5.06	3.11	10.15	9.32	8.28	11.07	11.24	12.02
GDPD5	14.31	14.33	11.99	5.25	6.57	8.64	2.73	2.28	3.01	1.04	0.98	1.78
GFM1	14.26	14.22	15.86	28.29	24.70	22.81	36.46	58.93	36.66	57.07	68.60	54.49
GFPT1	22.18	29.15	28.60	30.31	28.99	31.09	135.60	162.49	100.53	96.53	121.26	72.83
GGCT	6.11	6.51	5.39	14.79	11.70	9.80	11.40	22.67	13.37	28.37	26.84	24.69
GGT7	4.84	5.54	4.01	3.08	5.06	2.86	0.67	0.76	1.06	0.77	0.74	0.73
GHITM	64.70	69.29	68.60	132.58	105.10	108.86	265.54	286.68	210.32	278.93	272.24	261.60
GIMAP4	227.90	231.86	214.93	214.15	203.08	260.31	131.72	75.85	118.63	16.58	19.67	43.40
GIMAP6	232.18	243.98	237.83	225.25	214.42	278.28	128.41	63.30	125.47	32.39	28.92	48.13
GIMAP7	110.62	122.72	99.72	70.43	85.36	103.84	72.57	55.37	60.01	19.42	24.68	32.18
GIMAP8	54.44	49.19	56.30	54.08	53.87	66.16	24.81	13.04	29.70	5.74	6.06	11.78
GINS3	2.97	1.99	3.45	4.34	3.80	3.47	6.56	8.92	10.04	11.34	11.91	13.89
GK	0.95	0.78	0.70	0.78	1.51	1.11	17.92	18.00	13.12	7.13	6.96	6.47
GK4P	1.53	1.26	1.19	1.98	2.22	1.57	37.28	31.68	20.66	18.55	13.73	14.59
GLA	4.08	5.16	4.78	9.37	8.07	6.47	17.00	18.19	16.15	24.39	20.35	18.14
GLRX2	1.35	1.24	0.92	2.39	1.62	1.12	3.59	5.11	1.99	6.05	5.77	5.42
GLS2	2.57	3.87	2.22	1.98	4.11	2.75	0.18	0.45	0.28	1.28	1.02	0.67
GM2A	12.80	17.14	24.93	11.12	14.27	24.10	2.94	5.25	7.36	3.43	4.11	4.36
GNA15	1.80	0.91	2.53	9.76	1.50	5.82	72.71	34.09	95.44	16.85	6.95	26.88
GNAO1	12.99	14.75	18.27	6.51	8.82	15.73	1.77	0.85	2.27	2.76	2.33	4.13
GNB5	16.90	18.34	17.26	10.45	9.41	16.85	3.16	2.28	5.92	2.03	1.40	2.55
GNG2	97.24	120.53	86.31	152.21	160.86	120.46	534.46	545.92	475.84	177.91	262.21	293.40
GNG4	0.09	0.20	0.12	117.70	80.61	9.11	0.34	0.94	0.46	3.12	4.41	8.99
GNG7	3.99	4.28	6.53	0.82	1.54	4.12	0.43	0.67	0.46	0.41	1.06	1.09
GNL2	10.38	12.24	8.47	20.60	16.89	13.67	34.44	54.25	31.14	54.79	66.95	49.55
GNPNAT1	12.40	12.55	13.65	20.17	16.34	19.62	59.41	91.91	55.34	88.76	91.29	69.16
GOLGA2B	12.48	10.25	4.59	2.60	3.64	1.77	0.53	0.49	0.51	0.63	0.38	0.24
GOLGA6L5	4.32	5.14	2.80	1.68	1.57	1.68	0.49	0.23	0.81	0.66	0.39	0.29
GOLGA8A	47.89	23.00	36.70	7.90	12.67	14.30	6.88	2.73	7.70	10.40	5.72	8.77
GOLGA8B	49.20	32.99	26.90	12.40	16.30	17.26	11.75	4.44	10.81	7.67	4.08	11.40
GOLT1B	17.23	19.65	15.19	22.03	23.14	17.57	63.85	89.51	55.66	64.10	72.54	61.41
GOT1	6.99	7.84	6.90	16.26	13.92	13.59	68.49	77.01	57.69	81.04	78.48	75.94
GPATCH4	12.14	12.50	12.09	41.23	34.06	22.72	37.34	74.10	36.68	83.49	101.69	76.85
GPC1	3.06	3.88	4.50	1.17	1.54	2.93	2.16	1.25	2.31	0.54	1.10	1.09
GPN3	4.47	4.43	4.09	3.69	4.90	5.92	13.87	24.82	12.59	17.91	19.56	18.26
GPR155	12.33	9.33	9.09	3.34	3.32	7.27	3.31	1.39	3.15	1.81	1.23	2.02
GPR160	2.64	3.95	2.10	4.90	3.84	2.28	16.38	25.40	6.43	8.94	10.73	4.13
GPT2	0.54	0.72	0.99	8.59	5.50	2.96	48.90	38.08	44.69	66.18	58.81	77.44
GRAP	25.11	12.65	36.70	22.07	10.64	28.56	8.48	4.21	6.11	6.86	3.18	5.22
GRASP	0.72	1.30	1.14	5.16	4.17	1.84	2.06	3.63	2.81	4.34	5.24	3.70
GRPEL1	19.33	24.74	22.10	33.65	29.47	30.80	82.82	124.19	85.17	116.40	120.79	106.39
GSDMB	5.81	9.30	4.48	1.91	5.62	2.42	1.25	1.84	2.17	0.95	1.57	1.58
GSG2	0.75	0.63	1.14	0.74	0.85	0.71	18.92	21.28	9.44	15.72	16.45	10.20
GTF2A2	6.56	5.98	5.52	10.90	10.19	10.14	22.02	31.27	20.02	23.58	27.14	22.09
GTF2F2	6.18	6.40	6.69	11.36	10.88	7.74	19.83	35.89	19.52	28.46	34.81	26.44
GTF3C6	4.47	4.05	5.27	13.96	9.65	7.94	18.82	25.63	21.88	26.74	27.52	22.87
GTPBP4	13.95	19.12	14.81	33.86	33.37	24.98	51.59	91.91	55.03	92.10	117.75	88.41
GZMB	5.70	8.00	14.70	11.93	11.99	12.40	1690.98	2843.96	2423.98	3540.57	3174.33	1841.13
GZMH	0.51	0.69	0.65	0.69	0.63	0.65	35.88	145.94	58.57	97.95	190.51	68.43
GZMK	112.75	171.55	159.81	33.96	83.14	178.03	69.02	40.63	145.73	8.18	8.86	47.69
H2AFY2	2.34	1.86	4.01	1.82	1.70	3.11	0.86	0.31	1.11	0.77	0.17	0.81
H3F3B	191.31	201.98	212.22	305.29	256.62	271.07	783.11	863.66	808.86	866.15	806.93	760.79
H6PD	70.43	57.31	74.60	53.86	44.85	58.79	24.43	12.81	25.45	15.76	11.07	21.33
HAPLN3	6.60	3.23	4.10	12.53	8.11	8.97	65.38	55.82	78.93	50.86	42.91	71.45
HAX1	22.84	23.37	23.33	27.19	26.15	33.23	120.99	134.58	116.82	123.68	117.57	129.71
HBEGF	0.06	0.26	0.09	0.35	0.20	0.18	76.06	64.02	26.93	9.31	10.22	13.16
HCG4P7	7.00	4.03	4.41	4.24	4.73	4.00	2.23	0.63	1.89	1.10	0.54	1.59
HDAC11	7.38	4.24	6.38	3.64	2.45	5.53	1.58	0.81	2.68	1.17	0.72	1.05
HDAC5	21.37	30.07	25.18	23.03	28.20	19.99	5.80	4.88	6.38	8.63	7.76	6.03
HELLS	0.87	0.46	0.80	0.69	0.79	0.61	1.39	1.66	0.69	3.52	3.65	2.79
HERC2P2	14.66	12.87	7.13	2.86	7.44	2.64	1.78	0.89	1.68	1.46	1.96	1.85
HERPUD1	38.98	45.11	40.00	75.55	55.22	58.39	147.14	180.99	145.13	170.11	191.68	155.41
HHAT	3.66	3.62	3.45	2.73	3.32	4.95	1.39	1.52	1.11	0.59	0.93	0.89
HIC1	5.16	7.48	4.55	53.24	25.72	9.81	19.23	16.94	15.66	15.06	14.83	11.03
HIVEP3	9.87	6.36	7.09	189.48	136.62	25.02	8.67	5.42	10.36	34.65	23.23	15.99
HK2	5.19	5.03	10.57	19.82	18.08	11.06	170.36	178.95	214.49	168.97	206.47	207.49
HLA-DPB1	22.06	7.61	7.18	13.31	6.13	7.01	4.76	2.44	3.01	3.25	1.19	1.09
HLA-DRA	3.00	2.48	3.45	1.34	0.67	1.27	2.83	1.93	5.97	0.41	0.25	1.26
HMGB3	0.33	0.59	0.71	0.56	0.79	0.98	1.98	3.15	3.66	3.84	3.10	4.41
HMGCS1	24.88	24.68	28.38	65.05	49.25	53.80	150.87	150.99	168.13	124.85	134.95	92.05
HMOX1	0.21	0.52	0.99	0.43	0.51	1.01	7.86	12.45	13.51	16.31	15.48	13.40
HNRNPAB	26.47	28.85	32.30	57.81	40.15	46.70	96.78	166.39	103.68	207.70	211.15	166.67
HOMER1	1.89	2.64	2.10	10.63	8.58	4.12	14.99	24.55	17.26	29.95	34.68	31.13
HOXB9	0.03	0.20	0.15	1.65	1.03	0.61	17.63	17.74	18.69	30.17	32.82	28.18
HPCAL4	4.68	3.62	4.01	1.00	1.19	3.87	0.48	1.03	1.43	4.70	2.46	1.90
HPDL	0.42	0.07	0.18	2.34	1.27	0.94	0.91	5.69	2.68	9.17	13.10	6.44
HPRT1	5.49	5.68	3.88	13.44	10.17	8.86	15.38	25.54	19.34	20.33	24.63	25.06
HS6ST1	8.04	7.16	10.06	19.58	13.77	11.92	24.59	25.50	31.95	38.82	31.85	35.33
HSBP1L1	5.02	3.86	5.31	2.22	3.72	4.02	0.50	1.19	1.14	1.05	1.00	0.87
HSF5	1.02	0.85	0.55	1.13	0.63	0.65	3.26	5.38	2.54	8.31	8.40	4.70
HSP90AA1	308.33	339.56	352.01	504.52	412.34	484.47	1171.56	1736.47	1177.65	1588.29	1814.98	1380.55
HSP90AA2	23.25	25.37	27.04	37.35	28.77	36.67	85.20	122.37	91.62	115.71	134.40	100.63
HSP90AA3P	0.30	0.56	0.48	0.50	0.28	0.57	2.05	4.28	2.52	2.60	2.28	2.38
HSP90AB1	211.14	232.17	274.12	916.63	743.07	607.11	1011.78	1732.28	1545.80	1993.03	2235.41	2123.18
HSP90AB2P	0.93	0.92	0.99	4.09	3.69	2.47	6.05	8.98	7.37	8.48	12.20	9.12
HSP90AB3P	18.53	21.25	25.62	86.78	69.98	55.35	99.30	173.70	151.28	189.24	213.51	202.17
HSPA13	30.25	38.35	31.77	41.76	41.77	38.00	254.29	334.40	205.69	264.25	313.24	219.21
HSPA2	0.93	0.59	0.55	4.34	0.99	1.37	5.46	4.97	5.74	5.15	5.34	5.79
HSPA5	150.80	167.47	183.60	344.17	281.31	283.85	869.92	1494.80	762.94	1073.20	1485.61	790.47
HSPA9P1	2.32	2.58	1.88	4.65	4.49	3.37	7.05	10.59	6.71	10.19	11.65	9.85
HSPBP1	7.23	8.68	10.14	22.20	16.06	15.84	18.73	34.05	24.20	31.66	38.96	37.12
HSPD1	41.60	39.12	39.57	87.73	65.41	64.50	163.31	335.37	188.69	377.53	409.61	307.14
HSPD1P1	8.49	7.99	8.85	23.97	16.55	18.38	43.88	92.28	54.78	111.40	113.15	83.86
HSPD1P4	3.70	4.84	4.65	8.34	6.09	8.23	15.19	40.99	22.17	41.66	46.66	31.98
HSPE1P2	0.79	0.88	1.02	2.29	1.84	3.88	5.13	8.61	5.22	9.76	7.24	5.93
HSPH1	21.91	25.00	25.89	68.05	48.53	44.80	80.95	128.04	76.85	142.11	152.55	112.38
HUWE1	100.75	100.82	92.23	109.59	121.04	91.44	888.66	549.25	809.93	694.94	597.13	592.20

HYOU1	57.95	59.47	62.46	121.87	96.51	82.83	290.36	370.09	264.22	282.72	373.24	248.48
IARS	28.75	27.71	24.90	71.12	56.72	44.51	146.43	173.29	151.65	213.02	224.46	214.44
ICAM1	8.03	10.17	6.28	53.45	44.67	16.13	168.96	162.36	214.76	159.85	159.64	217.40
ICOS	14.16	22.42	15.75	38.60	38.41	20.61	290.56	527.83	212.64	482.30	592.08	336.85
ID2	43.96	52.16	34.82	218.23	168.82	76.86	221.09	311.81	191.95	344.66	404.34	318.64
ID3	1.71	1.37	15.13	42.85	34.14	49.17	0.67	1.03	0.97	1.17	1.44	3.64
IDH3A	13.86	15.00	13.10	24.24	20.75	20.05	36.81	61.97	43.36	59.61	67.14	63.84
IDI1	49.45	54.77	54.74	70.86	64.45	78.77	255.30	254.51	180.73	144.40	149.01	133.39
IDS	361.28	389.11	435.41	186.62	242.89	380.36	183.37	126.65	206.92	78.33	79.93	127.90
IDUA	9.03	5.20	6.48	3.60	5.44	4.50	1.34	1.43	2.21	1.85	1.98	2.11
IER3	1.75	0.79	1.40	16.08	13.20	6.62	176.54	216.85	150.13	146.37	196.35	151.68
IER5	30.50	37.63	39.23	148.45	133.87	113.20	276.14	239.76	273.04	158.91	155.39	237.45
IER5L	2.43	1.37	5.18	7.51	7.36	11.81	0.10	0.18	0.32	0.23	0.34	0.35
IFFO1	26.26	20.53	14.51	10.06	12.06	8.06	2.83	2.60	2.87	3.03	1.74	2.11
IFI44L	46.61	26.44	25.79	33.05	23.69	27.04	13.60	9.18	9.30	6.28	5.09	6.96
IFI6	8.16	7.83	8.41	6.85	5.54	9.65	2.16	1.84	2.91	1.58	1.14	2.31
IFIT2	11.07	11.26	18.00	8.63	11.35	24.37	0.72	0.76	2.31	0.59	0.38	4.62
IFNG	182.82	255.30	366.65	320.32	261.77	343.44	106691.00	157774.00	55028.00	78401.50	100549.00	48193.10
IFRD2	10.53	10.55	8.47	20.82	20.33	15.47	30.85	58.11	40.34	74.26	76.51	73.39
IFT140	4.64	7.53	11.95	3.19	2.62	8.93	1.25	0.73	0.71	1.55	1.24	1.57
IGFBP3	6.63	17.85	5.08	1.00	4.35	3.58	0.43	1.03	0.19	0.09	0.98	0.08
IGFBP4	8.16	12.21	13.37	40.29	35.68	24.15	0.57	0.40	4.30	0.32	0.72	2.83
IGHV_	5.22	2.45	2.85	2.99	1.54	1.95	59.27	27.23	24.76	32.33	13.97	19.46
IKBIP	8.94	8.32	8.23	15.79	14.12	11.61	38.75	47.40	33.08	28.64	30.36	21.25
IKZF4	2.91	2.32	3.51	5.46	3.84	4.16	8.62	5.02	9.30	10.98	9.84	17.53
IL12RB2	7.77	18.11	6.19	35.56	49.92	9.15	125.30	219.92	106.41	210.54	283.86	159.17
IL15RA	10.56	8.91	8.41	16.26	11.73	8.46	48.42	58.19	39.91	73.71	74.15	65.48
IL16	313.98	289.26	320.99	457.63	366.07	319.16	125.67	62.38	115.96	27.96	24.63	62.95
IL17F	1.53	2.51	5.49	3.17	2.97	4.30	161.66	443.21	480.62	1839.15	1246.75	819.45
IL17RE	9.36	7.90	9.74	24.94	16.10	8.32	0.67	0.45	0.69	0.32	0.51	1.01
IL21R	7.09	8.45	13.02	111.23	77.82	23.52	26.64	40.39	42.89	36.07	52.25	56.92
IL22	0.18	0.23	0.09	0.26	0.44	0.14	12.45	4.84	266.16	2.53	1.70	89.79
IL23A	5.46	6.23	6.07	8.98	9.02	10.12	41.24	92.42	55.89	111.53	150.56	195.45
IL23R	2.19	2.97	3.88	30.79	25.75	9.58	26.06	25.09	30.58	43.73	39.60	46.07
IL26	0.72	0.65	0.52	1.04	0.63	1.05	131.10	192.15	89.75	61.52	93.32	61.09
IL2RA	5.58	5.84	8.26	151.45	119.10	15.94	968.33	1296.48	1212.21	1897.07	2078.43	1843.07
IL6ST	26.92	29.71	28.06	39.24	38.38	36.02	116.38	114.01	126.58	156.11	169.18	161.32
IL7R	3699.82	3292.54	4121.08	882.21	1228.30	3845.18	186.04	102.95	315.57	67.67	65.38	163.87
ILF2	30.88	32.28	32.81	80.81	69.37	61.36	142.19	195.91	133.22	184.31	195.46	167.76
INF2	2.39	1.11	1.14	2.25	1.42	1.91	7.03	6.72	7.43	5.69	5.47	6.27
INO80C	2.04	2.38	1.54	2.69	3.72	2.31	5.70	10.30	8.19	6.64	7.12	6.88
INPP4A	110.86	103.60	102.09	56.68	71.91	68.88	34.34	26.12	29.29	24.03	22.60	28.66
INSIG1	43.40	53.15	57.36	41.55	39.37	65.82	458.27	499.65	507.91	190.98	359.37	450.14
IQCG	9.12	8.53	5.25	30.08	16.88	7.71	68.10	105.67	104.07	119.57	119.54	155.25
IQSEC2	2.85	2.25	2.62	0.74	1.07	1.34	1.20	1.08	1.25	0.59	0.47	0.45
IRAK2	8.01	10.71	12.08	32.27	24.41	15.73	125.35	85.61	123.39	44.36	31.63	72.02
IRF4	3.90	4.24	6.16	328.17	229.30	94.44	351.19	492.93	572.03	938.83	954.68	1115.73
IRF8	0.39	0.85	0.86	5.46	2.37	4.77	145.71	132.70	198.90	111.53	144.20	226.82
IRS2	24.13	24.19	28.41	11.93	16.26	20.68	5.60	3.90	5.04	3.57	3.56	5.14
ISG20	35.23	39.23	26.72	31.92	25.79	31.92	13.22	7.12	14.85	2.57	3.01	9.07
ISOC2	3.81	4.57	5.24	14.31	8.23	8.21	13.22	23.39	9.30	19.06	21.75	16.19
ITK	97.80	100.43	106.59	241.91	230.68	135.08	483.44	355.98	602.81	342.63	374.06	526.35
ITM2B	210.74	225.27	217.25	177.47	178.94	233.88	93.64	72.40	93.27	37.85	47.49	75.42
ITM2C	56.18	75.98	136.67	55.86	43.23	97.33	37.31	15.59	50.57	8.09	6.61	21.01
JAKMIP1	1.38	1.93	2.00	9.28	3.52	3.69	32.43	26.61	23.13	21.00	17.34	27.04
JMJD4	4.25	2.22	4.76	10.36	7.71	6.86	14.95	19.98	15.32	17.13	19.19	18.90
JMJD7-PLA2G4	38.68	31.73	20.18	8.76	12.58	12.00	2.73	2.78	3.05	2.17	2.20	2.35
JUN	0.15	1.58	0.80	0.87	1.64	1.09	5.42	6.45	2.86	3.39	8.78	3.35
JUNB	52.91	55.45	55.56	207.53	195.95	153.05	282.78	329.98	438.59	309.59	315.68	394.50
KBTBD3	5.50	6.19	4.41	4.21	4.90	5.46	1.58	1.48	1.02	1.36	1.10	1.54
KBTBD8	5.22	6.89	4.56	10.32	9.26	7.77	50.15	82.34	47.51	65.09	70.81	38.86
KCNK5	0.39	1.50	0.21	9.08	12.70	1.55	1.25	7.33	1.53	13.81	18.99	6.84
KCNN4	0.57	1.70	1.02	2.13	5.42	1.55	4.65	14.56	18.14	6.37	19.89	17.33
KCNQ5	0.33	0.49	0.80	2.04	3.52	1.52	0.57	3.23	2.41	5.42	13.82	8.38
KCTD15	1.83	0.62	2.40	2.73	1.62	4.01	5.41	4.97	6.25	20.78	16.45	16.35
KIAA0020	5.25	4.77	4.19	12.71	11.23	7.38	22.90	48.74	24.15	46.48	61.86	42.63
KIAA0513	25.12	24.58	41.31	26.24	23.89	30.07	8.85	6.72	6.52	8.54	6.32	5.94
KIAA0664	17.57	15.98	13.18	30.02	27.31	17.06	26.61	57.02	36.63	67.05	77.49	60.32
KIAA1109	56.51	47.95	48.04	24.42	32.95	32.54	19.88	10.66	18.78	11.79	10.90	13.80
KIAA1147	111.37	96.67	99.42	82.40	84.51	103.06	13.68	9.94	18.57	16.92	16.39	26.48
KIAA1324	11.19	10.31	12.60	19.65	15.86	10.27	1.25	1.08	2.22	0.81	0.51	1.62
KIAA1609	10.35	8.85	11.12	12.36	5.66	10.41	5.03	3.32	7.73	2.71	1.57	2.71
KIF3B	34.00	39.26	34.30	91.46	77.17	48.85	257.02	212.41	228.08	230.59	231.67	198.49
KIF3C	14.04	11.78	13.19	8.59	5.58	13.70	2.11	1.34	2.82	1.17	1.02	1.54
KIFC2	7.71	3.49	2.71	2.00	2.44	1.59	0.86	0.27	0.74	0.72	0.25	0.61
KIT	52.07	41.91	189.55	56.77	48.69	200.15	1.20	0.85	2.22	0.54	0.47	2.51
KLF10	4.80	5.52	18.58	29.10	31.72	77.15	31.23	24.86	42.93	37.54	23.83	52.59
KLF12	92.73	110.48	100.21	70.56	83.10	90.21	44.59	27.55	40.39	22.77	23.02	28.26
KLF2	57.41	51.47	42.46	8.20	7.04	23.97	2.16	1.88	1.25	1.49	0.98	1.38
KLHL24	70.19	92.33	88.35	48.48	59.49	83.37	22.08	17.69	16.75	18.29	20.95	16.03
KLHL8	10.26	11.23	11.43	15.70	11.87	15.51	33.82	47.35	29.24	45.08	49.05	38.78
KLRB1	180.57	160.03	226.10	284.89	203.55	353.52	88.85	51.70	59.68	34.10	24.59	57.28
KLRG1	52.04	66.00	42.19	144.07	143.62	78.96	12.17	15.59	12.68	7.72	14.16	12.35
KPNA2	6.80	7.61	7.64	31.96	25.20	22.59	58.14	86.95	53.61	108.58	123.63	82.29
LAG3	18.28	18.25	17.01	81.75	46.28	21.84	306.59	384.75	256.63	580.57	613.93	388.85
LAIR1	42.91	22.42	15.10	19.39	10.60	10.25	25.24	7.93	15.73	2.62	1.31	5.10
LAPTM5	756.57	911.69	1137.84	842.98	817.27	1424.75	273.22	192.92	209.90	103.40	86.41	137.52
LARP4	15.75	18.76	18.41	31.25	27.23	22.01	71.65	106.04	79.28	119.02	145.65	123.42
LASS6	7.76	7.53	7.71	15.09	13.71	13.10	26.40	56.42	38.68	60.21	76.47	56.34
LAX1	41.62	54.28	38.37	81.23	87.02	60.81	9.24	7.03	9.16	9.35	7.72	10.28
LAYN	1.35	1.44	1.39	13.91	9.33	8.31	0.34	0.27	1.16	0.90	0.21	1.58
LDHA	114.73	122.26	198.67	302.10	215.56	326.37	1119.56	960.43	1161.08	554.64	466.43	699.34
LDHAL3	1.24	0.92	2.50	2.18	2.29	3.17	6.71	10.50	10.47	4.27	6.06	6.85
LDHAL4	10.99	15.13	23.19	26.59	24.65	36.79	98.92	104.12	121.31	46.74	49.40	74.04
LDHAL7	1.20	1.93	3.13	2.34	2.52	5.87	10.20	12.34	11.23	4.56	6.42	8.09
LDLR	22.68	23.47	24.30	29.31	23.90	33.70	170.82	135.05	175.90	48.92	58.12	47.27
LDLRAP1	57.41	56.43	77.13	11.84	13.45	54.81	4.36	2.51	7.40	1.63	2.54	4.49
LEPREL2	4.20	2.71	3.05	0.87	1.50	2.28	0.53	0.81	0.28	0.27	0.64	0.73
LGALS1	2.58	1.99	3.42	6.55	2.89	5.78	50.77	11.60	65.09	4.07	1.82	17.00
LGALS3	41.44	23.57	43.57	34.91	18.39	66.56	162.03	109.76	180.85	94.41	53.17	122.42
LGALS3BP	14.68	10.64	19.01	10.02	5.58	18.01	1.34	0.50	5.64	0.40	0.25	1.86
LIF	0.42	0.42	1.33	8.46	4.03	4.19	7.04	27.87	53.04	262.64	349.15	317.91
LINGO4	0.84	0.88	1.05	15.66	22.31	10.74	0.34	1.52	1.16	0.90	1.57	3.68
LLGL2	17.44	12.70	11.65	4.99	6.84	6.87	6.08	2.87	5.88	3.39	2.50	3.00
LMAN1	67.22	60.61	56.02	91.07	83.62	74.37	393.34	570.97	271.62	337.16	449.51	279.69
LMNA	4.68	12.96	5.98	6.85	9.93	13.81	13.56	21.28	18.27	60.26	54.86	65.82
LMNB1	11.67	8.58	16.42	14.75	8.23	12.58	40.67	42.96	64.72	56.06	50.62	57.53
LMTK3	5.76	5.12	4.31	2.21	2.89	3.29	0.29	0.22	0.65	0.27	0.17	0.36
LOC100049716	12.63	6.35	6.69	8.37	4.03	4.72	3.98	1.08	2.17	2.19	1.23	1.09
LOC100127952	1.69	1.91	0.85	2.03	2.16	1.10	8.26	8.59	7.07	8.20	6.76	5.03
LOC100128881	1.16	1.18	0.34	1.19	1.65	0.76	1.68	4.38	2.68	4.83	6.91	8.26
LOC100129009	0.39	0.46	0.75	1.26	0.83	1.20	1.87	2.96	2.45	3.17	3.60	2.08
LOC100129096	7.33	5.67	6.55	8.79	4.71	8.07	90.16	65.43	68.99	34.90	31.83	41.23
LOC100129196	3.18	4.71	2.12	2.01	3.19	1.74	0.57	0.31	0.69	0.71	0.22	0.75
LOC100129387	27.48	11.06	12.96	10.83	9.12	8.71	3.14	2.61	2.08	5.63	5.64	4.32
LOC100129550	8.85	9.04	7.43	3.25	4.87	4.66	0.48	0.36	0.97	0.50	0.64	1.05
LOC100129726	8.79	7.70	7.28	9.00	10.69	7.27	1.00	0.75	0.37	0.50	1.04	1.32
LOC100130003	2.95	2.40	2.28	9.21	6.71	6.70	14.72	17.75	12.96	16.33	15.30	15.64
LOC100130139	0.49	0.59	0.40	0.56	0.53	0.86	2.12	2.30	1.20	2.34	2.00	2.02
LOC100130289	4.73	5.73	3.94	11.70	7.50	8.51	18.62	25.08	15.87	19.92	19.65	21.95
LOC100131564	10.90	7.42	6.18	5.19	4.80	5.33	2.49	1.08	1.11	1.59	0.91	1.62

LOC100132062	10.44	11.30	5.67	5.65	5.57	2.57	2.52	1.41	3.00	2.26	1.75	1.91
LOC100132715	2.47	2.76	3.48	8.81	6.26	7.42	13.72	17.46	15.18	20.42	19.05	17.52
LOC100132840	1.68	1.63	1.08	3.21	3.12	1.55	3.74	5.15	4.16	8.13	8.56	7.33
LOC100132984	8.19	7.02	2.90	1.08	2.85	1.55	1.15	1.34	1.43	0.95	1.31	1.17
LOC100133331	15.60	13.79	7.64	4.26	9.97	4.04	5.16	2.31	2.57	2.12	3.50	3.48
LOC100287278	6.15	7.12	6.26	2.04	3.20	4.70	2.92	3.72	1.71	0.50	1.44	0.69
LOC100287554	5.85	7.70	7.97	20.61	15.04	14.52	34.39	46.81	33.90	51.17	56.19	45.16
LOC100288175	1.11	0.85	0.31	6.24	3.48	1.59	9.15	5.42	8.47	6.28	3.35	6.80
LOC100289019	9.39	7.64	4.71	1.69	2.33	1.88	0.62	0.31	1.34	1.36	0.81	1.17
LOC115110	10.26	5.89	3.69	13.23	13.49	4.47	1.65	0.41	0.66	1.64	0.73	2.10
LOC150417	3.79	3.40	3.58	10.14	7.75	5.01	21.42	26.95	18.40	20.97	23.71	20.87
LOC152594	1.32	1.35	0.96	3.07	2.04	2.09	1.60	4.08	3.84	4.88	6.51	5.05
LOC153684	4.74	3.59	3.30	2.13	3.09	3.36	0.57	0.72	0.74	0.36	0.08	0.69
LOC283014	0.25	0.30	0.63	0.81	1.19	0.93	4.72	3.71	3.53	3.11	3.30	4.91
LOC283070	38.23	40.70	37.32	17.74	21.56	26.86	10.11	5.24	10.13	8.27	6.23	8.74
LOC283174	5.19	4.57	4.07	2.95	2.22	2.53	0.24	0.40	0.51	0.86	0.47	0.61
LOC285591	1.28	1.99	1.25	5.90	5.04	4.62	3.53	7.91	4.70	9.33	9.42	8.52
LOC339192	17.09	11.35	6.36	30.50	49.68	10.46	1.37	1.01	1.92	1.36	1.88	3.14
LOC386597	0.24	1.50	2.06	0.39	0.99	1.92	6.04	27.33	13.23	4.79	17.64	12.14
LOC387895	3.48	3.98	3.05	6.42	7.32	4.70	0.57	0.90	1.16	1.72	1.57	2.15
LOC388692	89.97	69.33	73.85	52.01	47.26	68.17	15.68	5.26	15.98	5.69	4.96	9.22
LOC389333	3.75	2.55	2.06	6.07	3.88	1.30	17.15	17.43	13.14	13.51	14.54	9.15
LOC389465	0.60	0.85	0.40	1.11	1.32	0.74	1.52	2.79	2.22	3.12	3.22	3.14
LOC390595	7.32	4.73	3.45	1.30	2.41	1.99	0.77	0.85	1.06	1.36	0.81	0.69
LOC399942	2.06	1.87	2.31	5.19	3.95	4.71	16.40	19.87	22.11	14.69	14.64	14.26
LOC400685	9.23	10.34	12.13	5.43	5.53	13.71	0.88	0.81	2.27	0.70	0.46	1.58
LOC400986	18.50	12.66	5.48	4.15	7.29	2.06	2.82	1.69	2.28	2.90	1.99	0.77
LOC401010	1.07	1.46	1.84	2.61	2.38	2.12	4.60	5.26	3.72	6.84	6.63	5.64
LOC402152	1.01	0.74	0.67	2.02	1.73	1.10	1.98	3.15	3.00	5.14	3.40	3.92
LOC440104	8.28	4.18	3.35	4.96	4.41	3.42	1.51	0.45	1.66	1.80	1.55	1.23
LOC442112	25.93	28.07	34.06	66.36	54.03	48.69	94.68	151.97	103.53	160.61	178.41	156.03
LOC541471	0.90	1.00	0.34	2.37	1.98	0.84	2.84	2.56	2.75	5.02	3.76	1.61
LOC613037	15.01	11.58	4.32	4.89	9.08	3.54	3.02	2.05	1.49	6.35	2.12	2.82
LOC642590	0.41	0.22	0.41	0.94	0.90	1.35	3.25	4.12	3.30	3.13	3.61	3.40
LOC642852	8.34	10.28	9.92	2.65	4.47	8.57	1.10	0.54	3.42	1.40	1.44	1.54
LOC642969	38.97	41.66	46.02	118.03	80.61	78.78	240.59	267.32	242.22	238.37	233.12	190.21
LOC643276	1.69	2.20	1.96	4.30	3.35	2.89	5.38	9.98	8.12	10.90	12.64	8.54
LOC643576	18.94	21.38	20.44	61.48	38.66	40.35	113.90	139.51	105.72	110.08	115.02	83.32
LOC643634	5.58	4.78	6.94	10.69	5.41	6.84	75.23	56.65	57.63	35.45	29.29	35.69
LOC643689	6.25	5.27	6.59	19.16	14.18	16.17	26.97	28.66	29.76	23.98	27.52	28.18
LOC643733	13.74	9.56	6.10	4.08	5.38	3.47	0.72	0.72	1.53	0.63	0.72	1.82
LOC644037	0.60	0.54	0.59	2.83	2.76	1.82	1.52	1.77	2.08	2.02	2.31	2.69
LOC644422	2.38	2.59	1.49	4.54	4.13	2.43	7.66	8.29	7.43	8.68	9.21	9.36
LOC644563	1.68	2.51	1.79	6.68	4.51	5.62	6.95	10.04	8.79	11.02	11.07	9.63
LOC644584	0.76	0.99	0.40	1.56	1.11	0.58	2.14	3.47	2.99	3.20	4.06	2.92
LOC644936	0.73	0.23	0.95	1.59	1.32	1.72	3.37	4.16	5.11	1.65	1.43	2.07
LOC645233	1.92	2.08	2.25	2.58	2.84	2.59	6.41	9.79	6.67	9.46	12.50	6.71
LOC645652	0.56	0.82	0.65	0.56	0.63	0.73	2.11	3.68	2.57	1.39	1.06	1.17
LOC646347	5.45	4.34	6.59	23.84	22.74	11.39	56.04	91.42	59.83	70.65	90.03	67.95
LOC652276	1.81	1.41	1.56	3.21	2.79	2.40	5.55	4.01	4.60	9.33	5.51	5.92
LOC653080	17.26	14.39	6.86	5.42	8.53	2.49	3.15	3.97	3.02	4.11	1.86	0.92
LOC653503	4.96	5.61	5.14	7.33	4.93	7.14	22.17	23.50	21.09	18.50	17.53	17.43
LOC653698	2.18	4.33	2.69	5.54	3.07	3.86	10.91	15.60	12.85	19.54	20.60	19.04
LOC678655	6.56	4.20	3.13	5.40	3.93	4.72	0.77	0.44	1.04	0.68	0.18	1.00
LOC727896	1.96	2.92	2.17	4.80	3.51	4.36	8.73	10.33	8.93	14.27	13.46	11.24
LOC727919	1.34	1.51	1.68	3.05	3.90	2.12	6.88	12.84	6.53	10.68	12.43	10.47
LOC728324	6.15	6.20	6.43	13.56	9.79	9.97	35.04	44.45	26.19	38.89	30.30	30.95
LOC728468	1.82	5.14	1.93	1.39	2.10	1.65	0.62	0.87	1.19	0.27	0.47	0.90
LOC728535	24.42	33.64	15.09	6.77	22.45	6.32	7.15	5.31	5.32	5.33	8.00	4.95
LOC729200	0.99	1.44	0.86	2.43	0.95	1.20	5.92	6.86	4.51	5.20	5.96	5.00
LOC729342	0.84	1.02	0.97	1.45	0.56	1.16	2.47	3.29	1.42	4.24	5.14	4.04
LOC729678	51.95	45.70	61.30	29.89	31.42	62.89	15.87	9.76	13.81	9.87	9.92	13.43
LOC729683	32.19	29.43	42.23	34.53	30.06	47.61	6.09	5.65	8.84	8.71	8.27	9.58
LONP1	14.28	12.24	13.31	19.13	15.86	13.67	70.12	74.73	43.21	77.60	75.98	50.52
LONRF1	5.55	6.10	3.85	8.72	7.44	6.33	20.93	19.89	16.47	21.68	20.31	21.70
LPCAT4	37.81	27.87	27.06	13.88	15.47	16.96	3.21	2.15	3.19	1.81	0.98	3.24
LRFN1	12.54	13.45	17.44	6.07	6.76	11.57	1.92	2.15	1.99	1.99	2.37	1.58
LRMP	14.85	14.59	13.19	14.92	17.17	13.77	2.73	1.08	1.48	0.77	0.34	0.73
LRP11	0.64	1.57	1.02	0.61	0.36	0.80	1.14	1.10	3.19	7.18	4.24	8.62
LRP8	12.15	10.44	10.37	12.05	10.73	10.40	49.18	61.64	46.76	64.89	60.98	52.69
LRRC37B	16.29	16.50	12.23	6.55	7.53	7.85	2.79	1.26	2.04	2.15	1.60	1.46
LRRC45	5.79	5.48	4.13	3.64	1.74	3.29	0.91	0.67	0.23	0.63	1.02	0.65
LRRC59	23.99	30.48	28.57	48.14	43.01	47.97	115.66	181.57	112.27	151.91	165.55	111.01
LRRC8B	5.07	7.38	11.80	24.27	24.07	15.73	14.33	19.73	21.91	56.97	53.51	30.86
LSP1	120.97	147.04	169.58	149.36	158.57	167.87	49.77	38.21	53.76	22.77	29.55	53.23
LSS	29.42	26.11	24.51	11.92	12.69	18.69	13.36	8.78	13.51	5.42	4.41	6.96
LTA	12.14	14.34	15.31	54.42	38.91	53.88	665.85	1381.80	710.29	1666.72	2152.99	1645.65
LTB4R	23.91	22.60	15.63	5.90	7.76	8.68	3.22	3.95	4.49	2.53	2.12	2.71
LTBP3	31.59	34.01	33.67	19.35	24.62	28.34	6.03	4.41	6.08	4.34	4.29	6.43
LTK	54.59	35.12	26.72	5.72	8.70	16.09	2.73	1.52	2.50	0.72	0.51	1.05
LY9	92.67	88.13	96.33	120.56	106.16	128.71	12.02	3.23	9.90	2.98	2.93	5.71
LYN	10.56	8.16	7.80	22.33	12.06	11.46	53.89	42.52	83.97	36.59	35.23	60.24
LYPLA1	14.22	14.95	11.12	26.57	21.60	17.14	50.24	71.57	41.45	55.47	75.77	48.74
LYRM1	11.19	12.14	10.88	15.27	13.65	14.43	72.53	71.11	49.41	44.96	44.22	43.28
LYRM4	4.26	3.88	4.35	16.48	13.01	12.11	17.05	19.89	15.27	25.43	20.95	20.69
LZTS2	21.62	17.03	20.53	16.05	14.84	18.05	5.56	3.99	7.75	3.84	4.20	5.27
MAFF	4.98	6.07	4.13	37.08	20.81	9.62	94.31	73.29	69.44	52.76	41.34	37.16
MAFG	19.30	26.14	21.32	28.71	25.51	23.28	145.61	140.00	135.32	147.70	135.46	127.23
MAGEE1	12.33	8.03	10.35	6.51	5.18	7.92	2.35	1.70	2.96	0.99	1.44	1.58
MAGOHB	2.22	2.29	2.19	4.55	4.63	2.31	19.11	25.40	12.31	15.63	18.57	14.57
MAK16	12.38	15.00	10.50	26.99	20.48	18.86	46.35	78.12	55.19	95.66	106.49	94.36
MALAT1	70.26	74.63	37.21	15.43	36.19	17.74	7.69	5.21	21.35	11.68	8.94	9.32
MAMLD1	1.17	1.14	1.54	2.95	4.59	1.66	1.29	1.93	4.35	6.41	7.67	12.43
MAN1B1	40.33	38.12	38.57	21.38	27.85	35.03	8.09	5.69	9.26	6.06	6.32	8.82
MANBA	11.46	10.35	9.40	5.81	6.09	9.65	1.29	1.08	0.83	1.36	1.06	1.66
MANF	16.57	17.63	14.58	27.97	22.78	22.74	100.73	142.07	87.76	105.93	107.95	80.28
MAP2K6	5.28	6.07	8.69	2.43	2.06	4.56	2.01	0.72	1.02	0.14	0.17	0.32
MAP3K12	13.81	9.95	10.42	7.67	7.61	5.77	3.75	2.14	2.33	3.39	2.70	2.23
MAP3K8	11.64	11.62	4.87	20.77	19.74	7.56	215.64	244.97	174.00	118.93	155.43	148.33
MAP4K1	12.78	10.93	10.39	9.93	6.68	8.10	5.99	4.44	5.14	2.80	2.54	2.87
MAPK11	0.84	0.62	0.52	3.34	2.85	1.74	6.95	4.66	7.40	5.42	3.65	4.86
MAPK13	8.48	11.53	7.51	19.02	18.67	10.78	14.02	18.70	18.26	32.41	56.92	41.45
MAPK6	20.98	26.80	26.72	33.13	31.37	31.71	131.62	199.77	99.98	161.30	172.48	110.15
MAPK8IP3	43.02	35.02	19.12	7.73	20.97	6.66	4.51	3.70	3.68	4.97	4.21	5.43
MARS	28.93	32.86	25.18	92.96	61.29	48.85	198.42	208.37	202.65	247.47	246.86	250.07
MBOAT1	17.77	15.50	15.07	12.49	17.36	16.02	5.94	4.84	8.05	1.58	1.95	5.75
MCART6	24.64	26.14	44.74	10.02	13.84	29.65	4.22	5.15	6.20	5.47	4.92	4.94
MCM4	6.06	5.29	7.49	7.59	7.16	8.42	31.28	21.37	21.42	31.39	27.14	26.64
MCM6	18.01	20.20	20.15	42.37	31.49	29.47	72.76	82.70	73.65	109.58	101.84	106.79
MDFIC	56.00	72.30	77.87	153.53	178.35	118.37	127.36	290.67	148.51	290.86	355.85	297.34
MDGA1	7.59	16.32	3.94	1.21	6.92	2.28	0.67	1.21	0.56	0.45	0.98	0.49
MEGF6	28.87	13.84	16.39	4.60	4.67	7.81	0.53	0.18	0.74	0.32	0.04	0.61
METRNL	8.22	11.49	22.19	13.75	12.97	16.02	61.17	121.77	52.60	101.23	122.96	76.19
METTL1	2.02	1.72	1.72	16.61	11.99	7.20	11.06	20.76	12.31	28.59	31.76	30.46
MFGE8	11.19	11.26	12.30	3.99	4.71	8.57	0.62	0.49	1.39	0.27	0.51	0.61
MFSD2A	0.09	0.69	0.28	16.78	14.36	2.31	8.57	28.27	16.47	60.03	78.40	63.40
MGC23284	9.64	8.79	10.20	3.60	5.94	8.21	1.01	1.66	1.25	0.50	0.93	0.81
MGC39372	4.47	3.43	3.48	1.39	2.14	2.46	1.20	0.58	1.80	0.23	0.47	0.69
MGST3	6.99	8.39	6.56	4.55	4.67	6.44	2.25	1.84	5.14	0.86	1.06	2.51
MIAT	116.59	75.97	65.70	11.25	17.68	25.28	3.41	3.34	28.73	4.15	2.93	7.68
MIB2	13.65	11.11	7.93	6.83	6.50	8.36	1.87	2.51	1.94	2.17	1.83	3.19

MICAL2	88.14	61.66	120.58	107.12	63.33	119.46	20.60	14.11	24.06	46.62	35.57	21.37
MIR146A	0.15	0.03	0.18	17.43	12.82	2.49	29.27	20.74	35.07	25.93	20.52	28.14
MIR155HG	1.65	2.87	1.82	16.18	11.31	6.18	133.87	352.36	170.67	406.40	578.11	344.42
MIR17HG	1.47	0.95	0.43	1.08	1.31	0.22	1.63	2.33	2.27	6.64	7.67	2.91
MKI67IP	11.91	13.69	13.49	28.83	24.97	23.30	35.93	64.69	39.88	70.53	76.78	74.09
MKX	0.03	0.07	0.06	0.35	0.16	0.36	6.47	8.92	7.26	8.31	10.64	18.06
MLLT3	12.32	13.71	19.79	14.57	16.06	19.38	4.41	3.88	2.29	4.31	4.62	4.24
MMD	6.33	6.17	5.55	9.32	7.83	6.51	59.54	50.18	59.27	31.98	32.39	44.94
MMP24	19.24	18.26	19.15	10.76	13.87	14.71	3.00	2.37	0.23	0.31	0.71	1.24
MMP25	3.01	2.69	3.50	2.90	1.54	2.16	20.71	9.84	38.01	3.71	3.74	17.23
MOV10	29.94	22.62	25.43	21.92	21.09	25.68	8.46	4.40	11.36	4.06	2.78	5.75
MPDU1	6.19	7.24	6.01	15.65	14.28	10.02	33.04	47.74	30.06	49.16	49.84	40.87
MPP1	2.73	2.42	2.53	2.04	0.79	1.23	0.77	0.27	0.74	0.90	0.64	0.45
MPP6	0.69	1.24	0.92	2.60	3.40	2.78	2.25	4.70	2.31	5.74	5.89	5.18
MPP7	26.23	32.80	24.99	11.75	17.17	24.77	3.78	2.06	3.47	1.58	1.19	3.44
MPPE1	11.47	8.99	10.78	6.89	6.89	7.37	1.81	2.52	2.24	2.92	2.46	2.81
MRPL1	1.44	1.93	1.20	3.86	3.24	2.13	5.13	9.77	4.53	10.30	10.68	10.20
MRPL13	3.03	2.84	3.45	6.59	4.07	5.42	12.45	17.97	11.10	16.85	16.71	14.33
MRPL15	6.57	6.40	8.23	15.70	11.47	13.78	16.76	30.29	23.32	44.63	41.25	34.81
MRPL17	11.25	10.09	12.14	19.82	15.62	12.76	29.27	47.85	32.02	53.93	55.03	42.47
MRPL24	4.89	4.05	5.12	13.44	8.70	11.14	12.26	20.65	12.77	23.94	24.04	19.88
MRPL3	20.55	23.88	19.37	44.23	35.58	31.96	59.65	116.23	64.86	104.07	129.64	104.59
MRPL3P1	2.10	1.87	1.73	4.52	4.37	4.01	7.17	13.55	7.27	11.89	14.26	12.12
MRPS23	6.27	6.66	8.32	15.14	13.09	11.61	17.72	30.37	17.95	32.93	33.88	31.54
MRPS36	3.33	3.36	3.48	5.62	5.22	4.12	16.08	16.97	10.21	13.16	12.88	11.65
MRRF	7.20	6.59	5.55	17.48	13.17	9.15	18.82	22.35	18.74	36.49	26.96	31.45
MRTO4	6.30	5.96	8.87	32.79	24.29	19.43	31.82	79.01	43.95	95.89	101.66	87.85
MSC	9.07	4.13	4.66	10.93	5.45	3.51	74.19	41.23	42.96	53.75	25.61	51.68
MSX2P1	4.47	3.49	3.39	1.34	1.38	2.57	0.86	0.85	0.69	0.32	0.59	0.40
MT2P1	0.73	0.74	0.62	0.99	1.06	0.60	11.09	18.85	2.99	3.19	4.70	1.43
MTHFD1	5.36	4.45	3.45	11.53	7.82	6.06	6.78	13.47	8.23	16.86	19.50	18.86
MTHFD1L	0.84	1.24	1.54	11.16	7.44	6.83	35.17	51.39	40.55	55.43	68.33	62.15
MTHFD2	10.50	13.86	12.26	74.84	42.01	28.93	827.21	1069.76	726.13	1116.09	1194.71	1056.09
MTRNR2L2	3.13	3.96	4.38	1.03	1.67	3.99	0.37	0.89	0.74	0.80	0.61	1.30
MTSS1	28.90	24.84	13.56	28.41	17.92	9.47	2.63	1.16	3.10	1.72	1.10	1.86
MTX1P1	2.43	2.41	2.06	8.45	4.74	5.09	7.56	13.77	7.71	14.52	12.55	11.79
MX1	17.95	17.02	19.62	9.45	8.35	16.74	5.75	4.12	11.29	1.22	1.95	9.35
MXD4	111.79	106.99	146.37	62.10	71.47	105.21	18.15	16.49	17.12	11.65	11.83	9.31
MYB	0.18	0.26	0.62	16.35	9.73	1.92	37.94	38.08	6.57	22.99	28.49	13.97
MYBL1	34.18	43.64	20.03	13.27	26.74	19.34	147.62	108.02	157.12	22.59	28.79	65.38
MYC	71.09	56.99	89.34	118.31	94.73	85.72	82.29	203.97	169.24	478.23	515.17	500.69
MYO1B	0.18	0.39	0.37	3.21	2.69	2.82	50.72	42.47	46.54	23.04	25.78	36.84
MYO1F	108.76	87.55	78.16	43.56	44.13	55.86	32.20	13.45	22.64	6.13	6.31	11.37
MYO1G	24.70	19.19	12.97	21.38	13.80	9.62	108.68	61.51	81.56	79.46	74.32	68.70
MZF1	15.96	10.27	8.34	6.08	8.07	5.80	2.75	2.21	2.07	2.76	2.96	2.92
MZT1	5.04	4.93	5.73	7.42	9.06	7.23	26.97	47.62	22.48	25.52	39.60	24.29
NAA15	26.78	36.19	26.70	60.61	60.95	44.25	91.48	152.93	91.83	136.09	161.22	125.60
NAA20	13.37	13.06	12.95	27.66	22.02	22.16	41.91	68.13	41.75	54.35	62.97	53.79
NAMPT	14.34	19.30	17.80	115.49	51.88	38.72	2190.00	1235.33	1830.68	1393.34	827.10	1234.61
NAMPTL	12.24	14.64	15.11	96.67	43.21	42.67	1825.22	1103.77	1739.98	1237.40	722.65	1169.17
NANS	4.98	5.46	3.35	7.91	5.00	7.27	22.33	37.06	19.66	25.12	30.22	21.00
NAPSA	0.78	0.72	0.65	9.63	5.14	2.42	0.96	2.69	0.79	1.63	1.48	2.34
NARS	33.04	34.63	31.86	72.17	60.00	46.39	131.91	167.91	133.38	162.07	184.31	167.48
NBPF15	61.32	39.27	42.26	15.56	16.38	22.63	13.32	4.78	12.03	8.57	8.10	7.87
NCAPH	4.77	5.22	2.90	0.95	2.65	2.10	1.34	1.03	1.11	0.45	0.68	0.32
NCRNA00263	0.42	0.59	0.37	1.43	0.71	0.40	3.40	2.11	2.96	1.81	2.20	3.48
NCS1	2.43	6.95	5.21	20.95	23.06	24.66	48.23	69.44	62.64	53.30	54.40	60.24
NDFIP2	0.42	0.88	0.80	11.15	10.32	6.69	73.48	112.54	87.07	78.96	95.40	93.92
NDRG2	6.18	4.67	5.33	3.56	2.89	4.99	0.43	0.54	0.83	0.59	0.47	0.36
NDRG3	39.55	34.14	47.57	30.44	29.23	48.01	10.97	10.53	13.17	9.98	8.99	9.72
NDUFAB1	5.34	3.72	5.86	9.58	8.35	9.87	19.73	32.30	13.83	25.70	27.98	20.16
NDUFAF1	4.08	3.82	4.56	10.15	8.03	6.22	16.38	23.07	10.46	17.12	19.80	14.37
NDUFAF2	1.51	2.25	2.54	4.54	3.70	4.28	7.73	14.75	7.90	12.76	14.11	13.29
NDUFAF4	7.11	7.44	6.59	13.05	10.56	10.45	22.46	39.56	21.42	37.58	40.96	30.85
NDUFV2	8.87	9.35	7.12	17.76	13.29	10.99	89.30	88.46	59.17	55.38	43.01	48.74
NDUFV2P1	11.78	14.51	13.18	33.86	22.12	21.42	163.60	148.22	96.60	99.91	76.26	78.97
NEDD4	7.89	9.01	7.46	13.14	8.35	7.92	48.86	35.03	46.91	45.94	40.49	43.80
NEFH	2.52	1.17	3.48	8.98	4.11	4.27	5.46	6.45	4.77	14.36	11.15	12.39
NELF	4.56	4.18	2.10	8.98	6.01	3.15	30.94	35.48	33.22	30.72	29.76	34.17
NELL2	60.35	36.20	96.61	132.62	102.61	183.19	13.99	4.48	16.42	10.16	5.89	23.24
NEO1	55.67	54.21	53.40	54.60	59.85	59.80	16.14	9.18	14.57	13.05	12.08	13.64
NFAT5	67.83	80.29	50.60	89.99	134.55	58.55	306.19	221.56	251.09	256.63	301.60	263.05
NFE2L1	79.53	84.01	91.16	97.01	88.72	90.17	626.62	454.36	496.54	574.36	496.35	526.10
NFE2L3	6.19	9.18	8.22	29.67	26.84	16.55	68.69	77.58	52.33	75.53	80.48	56.89
NFIL3	4.65	6.46	4.53	18.30	15.61	11.32	42.22	30.60	36.73	39.89	29.96	38.19
NFKB1	30.70	42.37	42.46	185.62	164.62	120.72	160.07	149.41	242.93	199.52	190.03	356.97
NFKB2	11.28	18.18	10.69	103.48	91.41	46.75	196.57	197.39	191.49	147.03	168.37	207.35
NFKBIA	37.00	50.07	52.36	339.32	308.33	201.78	1529.63	1582.39	2018.40	796.17	962.60	1405.17
NFKBID	6.06	7.31	4.50	31.39	31.03	17.40	8.72	9.95	10.16	15.98	13.31	16.52
NFKBIZ	10.74	11.92	5.60	27.91	35.37	9.32	338.47	320.01	271.68	238.56	301.89	282.28
NHP2	14.23	13.07	16.22	39.00	30.76	29.02	35.13	66.33	42.66	75.29	73.65	74.75
NHP2P1	3.42	2.51	1.76	11.01	8.06	7.65	11.81	22.02	10.91	22.08	22.97	16.73
NINJ1	19.63	17.89	41.76	128.41	122.70	100.04	15.04	16.58	38.12	25.02	26.58	61.09
NIP7	21.17	20.57	25.33	48.53	40.70	35.00	58.48	92.96	62.25	100.44	107.91	96.23
NKD1	4.95	4.99	11.59	0.82	0.87	6.54	0.19	0.36	0.42	0.77	0.42	0.69
NLGN2	9.84	11.13	11.09	5.46	6.65	6.91	2.25	2.73	2.68	3.84	4.92	3.28
NLN	1.02	0.36	1.20	2.21	2.25	2.17	3.83	8.69	7.03	8.81	9.03	12.23
NLRC3	159.21	129.66	150.13	60.41	69.58	105.17	40.47	20.65	28.73	19.06	14.29	19.59
NLRP6	6.36	5.97	7.33	10.58	9.14	7.81	1.25	0.85	0.56	0.05	0.30	0.93
NME1-NME2	19.78	17.69	24.52	75.56	52.68	51.90	98.44	200.32	113.23	192.10	206.48	166.11
NME2P1	1.80	1.58	2.35	6.06	4.32	4.83	6.94	9.39	9.09	10.40	10.52	10.27
NMT2	37.03	51.48	57.50	16.74	26.32	46.78	3.51	2.29	4.73	2.97	2.71	4.38
NOC2L	19.90	18.28	20.05	33.43	30.97	22.64	42.95	72.22	50.52	74.05	89.65	71.01
NOC3L	5.49	3.32	5.02	11.08	7.30	9.34	11.16	11.31	13.54	22.36	15.07	23.48
NOC4L	2.25	2.06	2.03	4.25	3.05	3.83	4.55	7.03	6.15	9.85	9.03	7.53
NOD1	24.52	19.13	18.77	13.44	14.75	15.55	6.13	3.94	5.51	4.29	2.93	4.05
NOL10	5.91	5.74	5.67	11.45	10.01	10.05	18.20	28.40	21.14	27.69	31.71	27.85
NOLC1	67.55	66.49	69.40	163.59	142.00	102.61	162.61	318.27	188.21	387.70	450.14	399.13
NOP10	17.35	21.57	21.82	40.81	33.11	32.03	93.74	101.83	80.08	90.34	85.73	66.76
NOP14	24.37	23.15	22.31	76.39	72.73	30.58	64.76	122.95	59.77	158.49	192.77	145.78
NOP16	4.74	4.86	3.48	14.61	9.18	6.57	22.92	43.79	25.79	60.33	60.10	46.60
NPC2	8.66	9.73	14.79	7.03	4.95	13.20	5.99	4.30	5.74	2.71	2.63	2.87
NPM1	106.28	109.88	119.18	241.71	181.96	210.01	296.01	530.29	348.56	651.04	682.03	572.70
NPM1P5	0.69	0.54	0.70	1.57	1.10	1.71	1.78	2.95	2.32	4.69	5.13	4.32
NPM1P6	16.23	15.21	19.38	36.81	28.64	30.90	46.69	88.53	54.45	99.21	108.96	92.26
NPM3	1.29	2.06	1.88	6.98	5.81	5.28	5.03	14.78	8.61	18.79	18.10	15.95
NPTXR	20.17	12.93	28.91	9.58	8.39	23.21	2.30	2.02	5.74	2.89	2.59	6.27
NQO1	2.42	1.44	1.91	2.17	4.41	2.34	5.39	4.27	10.95	7.07	6.51	11.79
NR1D1	33.85	49.54	48.92	15.08	26.50	38.77	4.08	5.48	6.53	7.17	9.48	8.68
NR3C2	30.34	32.44	34.58	21.51	22.15	30.37	9.77	9.23	8.98	8.45	6.36	8.18
NR4A1	0.96	3.26	0.92	206.78	194.96	100.58	1.20	3.14	1.71	19.56	17.34	39.47
NR4A2	3.45	19.81	2.06	92.25	104.22	36.19	9.15	34.68	5.18	15.95	22.94	21.58
NR4A3	1.35	7.44	0.77	30.01	42.28	52.89	2.35	11.42	1.53	37.22	37.44	83.88
NRBP2	7.32	5.39	3.98	2.00	2.02	3.62	1.15	0.67	1.71	0.27	0.17	0.69
NRIP3	0.75	1.96	0.52	1.34	1.90	1.12	8.91	7.62	6.20	4.24	6.36	3.08
NS3BP	4.32	2.97	3.54	0.87	1.31	2.96	0.38	0.40	1.85	0.72	0.17	0.93
NTN4	31.39	27.68	17.35	7.50	10.96	14.17	9.00	3.18	8.10	2.17	1.10	4.49
NTNG2	7.20	8.42	5.02	3.43	3.84	3.69	0.43	0.40	1.34	0.23	0.38	0.20
NUAK2	13.56	15.99	13.34	6.51	9.85	7.70	0.67	0.72	0.46	0.41	0.81	0.49
NUDCD1	4.49	5.54	6.46	11.33	9.68	7.20	49.28	67.28	33.34	52.41	55.54	41.88
NUDCP2	0.43	0.75	0.44	1.13	1.13	1.08	1.54	3.21	2.63	3.45	3.28	2.42

NUDT15	5.50	4.33	4.03	8.19	7.42	5.78	15.42	28.89	12.39	30.02	39.02	24.20
NUDT7	2.76	1.43	2.71	4.83	2.50	2.60	0.17	0.39	1.16	0.63	0.51	0.85
NUP35	3.90	4.70	3.17	5.59	6.68	5.82	9.15	13.53	9.30	18.25	19.33	17.04
NUPL1	22.51	28.89	23.73	38.82	41.29	32.29	158.25	152.28	131.12	136.73	136.61	124.16
NUS1	44.68	47.16	41.90	73.57	62.95	57.83	214.47	367.15	184.42	270.93	415.97	246.15
OAS1	10.47	6.07	12.48	8.46	5.50	20.14	1.01	1.03	1.48	0.36	0.38	3.52
OBFC1	25.03	24.09	24.01	13.66	13.92	19.63	7.86	4.84	7.91	4.43	4.75	4.90
OBFC2A	24.04	19.55	13.87	43.98	27.13	16.96	141.58	106.98	144.62	62.11	54.95	82.42
OBSCN	34.95	18.04	22.86	10.20	8.58	12.82	1.92	1.54	1.77	2.34	1.40	2.08
ODC1	13.11	21.90	12.67	59.15	47.62	29.94	119.31	230.68	157.07	233.67	250.96	232.69
ORAI3	14.77	13.71	17.14	13.62	12.18	15.80	6.14	3.40	5.46	2.62	2.76	3.64
OSBPL7	19.06	15.86	12.85	5.72	10.36	7.63	1.10	1.34	1.11	0.81	0.76	0.97
OSM	0.36	0.75	0.55	0.78	0.47	0.76	40.76	34.36	59.59	54.02	43.54	99.22
OSTC	25.12	25.03	26.62	52.43	38.76	42.41	95.51	139.96	80.04	91.16	100.82	90.92
OTUD6B	4.80	4.18	2.53	5.59	6.37	5.35	12.07	24.24	10.09	22.04	30.23	17.33
P2RY10	35.41	33.85	39.51	46.45	41.85	65.62	17.34	11.29	14.11	3.93	5.89	8.87
P2RY14	15.31	14.98	8.07	20.04	24.76	15.51	91.73	50.53	60.05	12.15	8.01	18.46
PA2G4P4	12.68	13.11	12.81	22.74	19.52	17.84	36.61	52.26	38.44	58.70	62.13	51.06
PA2G4P5	4.19	4.74	5.56	9.19	7.23	5.78	14.53	19.34	15.86	22.11	25.83	18.24
PAICS	13.68	12.65	11.12	57.67	40.46	28.47	102.40	205.75	131.73	236.18	262.00	214.84
PAICSP4	0.42	1.19	0.83	2.87	1.99	1.53	5.08	10.01	5.91	11.26	14.56	9.24
PAIP2B	11.34	14.79	15.41	6.42	5.93	12.69	2.15	4.03	2.04	2.03	2.54	2.79
PAK1IP1	2.43	2.74	3.08	8.93	7.00	7.01	11.16	16.62	12.31	19.02	21.07	18.26
PARP10	43.36	37.89	36.21	29.40	28.04	27.26	11.26	6.81	8.74	6.69	4.24	9.15
PARP15	40.36	25.52	18.09	15.35	15.86	12.18	8.53	5.15	7.31	4.56	4.07	5.51
PARP4	77.97	74.42	60.55	49.53	53.87	64.50	27.54	18.19	24.20	13.01	13.78	17.41
PARP8	104.68	120.45	92.97	62.09	83.52	88.69	32.15	23.65	28.19	17.93	20.10	25.73
PARVB	1.68	0.88	1.97	5.51	4.51	1.77	4.45	8.56	7.45	10.57	13.48	8.62
PARVG	45.02	30.84	24.31	24.85	22.43	17.75	11.30	9.59	6.57	7.50	6.11	6.84
PASK	59.05	40.17	23.46	41.81	40.29	20.72	2.68	2.46	3.47	4.02	3.05	4.62
PATL2	4.02	2.28	2.22	1.78	2.93	2.49	0.43	0.58	0.51	0.27	0.42	0.73
PCK2	6.57	3.92	7.02	16.08	8.23	12.78	85.66	63.66	103.27	121.14	94.33	145.39
PCMTD2	69.59	61.26	64.69	31.53	40.14	52.20	9.15	7.93	13.19	13.25	12.34	15.88
PCNXL2	42.35	38.41	33.04	17.77	21.16	21.08	4.60	3.17	5.30	4.93	3.99	6.42
PCYOX1	47.18	52.66	66.54	28.56	30.15	64.00	8.02	5.49	13.03	7.40	7.12	9.34
PDCD1	8.25	5.52	9.40	32.14	18.99	27.04	66.48	37.14	44.46	54.39	30.19	32.26
PDGFA	0.15	0.10	0.65	3.51	2.69	0.43	4.98	3.90	12.03	14.45	12.76	9.11
PDGFB	3.51	7.57	23.36	8.28	8.78	19.13	0.53	0.76	2.17	0.32	0.51	2.15
PDIA6	33.53	31.70	31.62	69.47	45.55	54.34	136.71	193.93	103.76	142.62	164.51	104.21
PDK1	8.88	10.58	9.09	13.21	12.54	8.03	49.94	36.82	39.22	21.49	19.93	26.52
PDXDC2	10.52	3.92	3.88	3.15	2.50	2.13	1.37	0.66	1.46	2.92	0.58	1.26
PECAM1	2.73	14.39	11.83	4.34	19.03	11.17	0.86	1.93	1.11	0.18	1.02	0.85
PES1	10.65	13.45	13.68	34.52	28.60	23.07	35.49	56.76	40.67	63.10	68.94	60.40
PFAS	8.02	6.07	6.00	26.45	20.61	13.89	14.92	28.61	24.15	51.77	49.94	43.30
PFDN2	4.41	6.98	5.39	8.54	8.03	6.69	33.05	43.90	28.73	39.52	37.31	31.90
PFDN4	1.26	1.36	1.59	2.66	1.45	4.56	3.91	8.42	6.69	7.11	7.12	7.51
PFDN6	6.92	5.40	5.54	12.30	11.48	10.47	16.66	26.25	12.76	25.05	29.87	24.08
PFKFB3	72.68	73.67	118.33	106.64	98.65	135.58	423.28	218.81	756.52	95.54	71.70	180.92
PGAM1	64.61	75.70	72.05	182.49	136.14	136.59	422.15	453.32	377.02	373.47	373.93	277.39
PGAM4	1.60	2.08	2.24	4.92	4.41	3.61	10.24	10.21	10.87	9.38	10.80	6.53
PGAP1	3.27	5.48	5.61	3.99	5.26	5.68	18.78	11.51	11.20	26.15	16.75	16.31
PGAP3	12.54	10.19	11.70	10.67	10.19	10.88	2.06	2.72	2.12	2.47	3.95	4.33
PGK1	88.31	86.94	102.05	145.81	116.33	145.75	871.98	683.95	907.85	361.91	364.21	401.90
PGK1P1	0.30	1.04	0.93	1.45	1.34	2.05	9.77	7.42	6.81	3.84	2.86	3.37
PGK1P2	2.03	1.79	1.84	2.93	1.74	3.03	15.23	12.56	16.97	6.18	5.58	6.55
PHB	26.35	25.75	27.95	66.92	48.53	48.01	83.77	141.39	98.31	154.84	166.84	132.37
PHF5A	14.41	15.60	14.51	27.28	20.85	23.72	39.61	63.44	43.72	72.00	66.18	59.71
PHF7	3.53	3.26	2.72	1.15	2.91	1.99	1.29	1.25	0.43	0.95	0.59	0.73
PHGDH	0.09	0.05	0.31	0.87	0.10	0.40	10.59	3.67	5.78	15.76	6.11	7.25
PHLDA1	54.13	58.46	22.64	173.22	136.10	61.05	735.61	449.90	353.79	201.16	126.78	145.81
PIGW	4.80	3.49	4.38	18.35	16.14	11.57	12.21	31.36	20.63	29.45	43.37	34.65
PIK3IP1	149.94	153.35	229.56	88.20	111.78	243.24	11.25	8.74	17.99	5.30	4.92	9.34
PILRB	52.55	41.53	32.75	14.26	24.00	13.85	5.25	4.22	6.53	8.19	5.03	7.72
PIM1	91.59	101.90	119.50	67.66	70.53	127.37	1274.16	1043.27	1133.67	672.21	606.65	726.08
PIM2	43.73	41.58	36.79	179.33	172.02	107.24	717.54	647.13	730.27	812.81	837.47	787.56
PIM3	22.90	24.54	25.92	90.51	70.52	65.37	136.56	175.80	180.85	395.36	356.71	292.41
PINK1	21.34	30.64	27.40	19.80	27.65	30.35	6.84	8.50	7.00	6.05	4.98	5.91
PKD1P4	14.00	6.36	5.43	4.29	5.07	2.28	2.67	1.58	2.11	4.17	2.13	6.03
PKD1P6	16.47	15.12	8.06	4.32	7.84	4.31	2.44	1.44	1.76	6.07	3.28	5.05
PKM2	105.67	109.15	111.74	907.09	629.69	400.55	1528.89	1500.52	1780.90	929.37	986.75	1073.07
PLA2G16	6.93	6.01	4.81	5.55	3.92	2.93	3.78	3.72	1.76	1.13	1.23	0.93
PLA2G6	12.99	10.64	8.14	2.73	5.74	4.01	0.81	1.08	0.83	1.31	1.36	1.42
PLAC8	9.79	10.60	11.53	6.91	6.96	10.58	2.44	2.13	1.36	0.84	1.27	1.21
PLAGL2	41.89	52.78	47.61	112.37	113.36	63.34	103.56	169.84	138.19	415.39	466.51	353.45
PLAUR	1.26	2.09	2.03	1.91	1.42	2.13	5.80	9.09	10.50	2.94	4.11	3.72
PLCD1	22.87	22.03	21.05	8.24	10.17	13.23	3.07	2.51	2.54	0.90	0.59	1.82
PLCD3	2.60	3.94	2.92	1.81	1.28	2.69	0.94	0.40	2.30	0.35	0.63	1.00
PLCG1	88.02	75.85	83.14	65.75	73.41	71.77	32.90	22.18	29.66	14.82	16.66	23.80
PLCL1	13.65	15.50	14.24	4.42	4.83	10.81	2.25	2.24	1.53	1.04	2.71	1.30
PLD1	18.37	27.45	25.85	15.18	18.79	20.97	3.98	4.21	8.24	1.81	1.48	3.52
PLEC	288.25	408.04	558.16	107.60	210.67	317.41	44.74	31.23	99.05	23.53	26.97	81.29
PLEK	59.81	86.66	53.06	208.78	205.29	97.76	1022.60	591.75	492.93	266.29	256.35	321.41
PLEKHA7	15.19	17.66	13.99	8.02	10.32	14.03	1.82	1.16	1.67	2.26	1.36	1.70
PLEKHB1	17.26	16.94	23.45	10.50	10.48	24.37	0.96	0.81	2.27	1.36	0.93	1.70
PLEKHF1	31.09	32.48	46.32	18.21	16.85	35.11	8.09	6.63	11.01	5.56	4.79	7.37
PLEKHG3	36.64	30.40	28.80	13.34	12.06	19.18	7.63	6.48	4.21	6.60	4.58	3.54
PLEKHM1P	22.21	16.35	10.86	8.40	12.08	6.61	5.93	2.41	5.54	3.30	3.00	4.08
PLXND1	248.40	179.35	217.28	115.19	94.69	148.16	16.62	4.97	9.21	14.68	7.50	8.14
PMAIP1	5.34	6.30	4.90	36.86	24.84	17.32	162.03	193.62	145.04	181.35	207.74	217.42
PMVK	8.28	10.77	11.28	18.69	11.47	13.92	45.36	50.00	41.55	32.03	27.43	29.31
PNO1	5.67	10.07	7.59	22.08	18.66	15.54	27.51	65.61	42.81	64.36	79.97	67.90
PNPT1	6.27	5.25	5.08	10.89	9.18	5.89	11.35	20.52	10.55	27.33	23.49	21.94
POFUT1	30.16	29.83	35.93	73.42	57.35	46.93	65.05	75.67	81.15	158.32	158.87	176.87
POLD2	8.97	11.85	12.76	26.45	22.07	18.76	31.61	49.95	35.90	54.79	61.01	58.50
POLG2	12.36	9.33	6.90	6.98	9.57	5.53	1.29	2.55	1.43	5.92	4.54	4.66
POLI	12.72	12.53	10.08	2.13	5.38	5.10	2.06	1.85	3.33	2.62	3.01	2.47
POLR1B	23.92	22.39	27.18	50.65	47.86	40.57	44.83	69.74	61.50	102.92	109.56	108.57
POLR1C	5.16	5.98	5.22	13.63	10.02	8.88	9.44	16.96	14.45	25.24	22.96	19.36
POLR2H	9.09	6.36	7.09	11.67	8.94	8.86	26.10	33.51	21.05	35.46	32.22	28.14
POLR2K	13.20	15.99	14.64	26.45	24.29	20.03	52.83	67.16	47.51	56.92	60.29	61.17
POLR3D	7.20	11.10	7.89	11.47	10.27	7.74	28.07	47.47	27.02	46.60	53.96	36.85
POLR3G	0.84	0.55	0.62	1.65	1.34	0.83	2.35	11.92	4.26	9.40	14.68	8.46
POMP	4.17	5.74	3.57	9.24	7.28	6.25	20.50	27.46	15.04	24.21	27.18	18.99
POP1	3.06	3.17	2.43	7.68	8.62	7.92	10.15	18.86	14.25	22.63	24.89	20.93
POU2F2	17.92	15.99	9.24	81.62	70.64	26.39	88.90	51.52	52.28	86.82	64.02	47.65
POU6F1	17.11	14.88	12.39	5.46	6.96	9.62	3.93	2.11	2.64	2.80	2.29	2.23
PP1P	2.06	2.15	1.71	8.07	5.91	3.73	6.11	11.30	7.05	14.17	13.56	15.01
PPA1	6.60	7.87	6.23	33.46	29.31	16.06	26.51	53.12	35.07	54.00	65.43	62.32
PPAT	8.27	9.17	7.59	12.67	11.84	11.21	13.91	29.89	17.91	37.38	46.42	36.97
PPIF	20.20	21.41	18.00	36.08	31.29	22.13	117.30	128.31	97.57	97.39	96.84	81.78
PPIL1	11.37	10.54	11.40	32.90	26.78	22.60	34.51	61.27	44.41	60.91	70.82	65.08
PPP2R2B	10.11	9.92	7.98	4.99	4.71	7.27	3.83	1.79	4.21	1.22	0.93	2.15
PPPDE2	15.79	15.11	13.53	21.08	21.04	14.17	132.73	145.29	88.27	142.42	139.83	104.53
PQLC3	20.29	17.49	24.71	17.52	15.62	27.55	5.51	4.12	6.43	3.79	3.48	7.25
PRDM1	51.86	65.70	49.58	48.36	62.38	58.32	382.12	313.12	417.40	290.67	304.47	283.38
PRDX1	19.06	20.53	22.03	58.04	37.30	43.64	101.07	133.20	105.37	125.36	132.82	133.94
PRDX3	18.25	20.17	21.14	40.85	33.78	28.42	69.88	94.08	68.43	77.65	88.36	72.50
PRDX4	2.82	3.23	3.45	7.37	4.27	5.35	15.66	23.92	18.09	19.69	20.18	15.38
PRIC285	32.35	32.31	30.75	19.82	23.02	24.04	19.11	9.90	22.30	3.75	3.99	10.69
PRKCA	78.99	88.13	67.52	82.27	99.68	80.99	17.87	14.20	20.91	17.84	17.68	20.69
PRMT2	113.50	90.48	89.98	52.78	59.89	74.73	43.63	32.97	40.94	20.46	20.78	23.16

PRMT5	10.52	9.80	10.17	16.16	17.10	14.37	24.98	45.97	24.98	61.86	69.28	48.88
PRR5-ARHGAP	99.75	58.42	76.30	43.41	31.21	46.82	24.62	15.64	29.66	16.53	13.69	19.96
PRSS35	28.18	63.81	94.88	5.55	21.75	75.31	0.24	0.67	0.74	0.90	2.16	0.73
PRX	3.90	4.24	3.94	3.04	4.19	2.57	0.62	0.63	0.51	1.22	0.30	0.40
PSAT1	3.15	4.28	4.87	37.64	18.23	18.37	372.16	393.42	363.06	497.64	503.36	569.83
PSMA6P1	5.83	7.73	7.67	16.01	12.64	17.11	81.12	116.87	74.74	60.17	78.40	63.14
PSMB2	25.65	32.93	24.67	50.34	40.85	34.96	128.08	160.92	122.51	155.39	163.15	131.41
PSMB3	11.82	12.96	11.71	24.59	18.91	19.45	46.51	54.30	46.40	58.41	50.88	50.08
PSMB5	11.67	11.13	15.50	26.24	18.31	27.33	55.27	78.49	55.89	81.67	84.20	69.71
PSMB6	10.20	10.05	11.43	22.90	16.81	16.41	38.13	59.14	37.80	43.27	42.53	37.28
PSMC1P	37.23	36.76	42.50	79.85	63.33	63.22	222.21	265.48	188.06	231.61	244.48	190.85
PSMC2	14.10	14.39	13.41	21.55	19.10	20.32	56.18	72.44	48.30	57.86	60.93	47.12
PSMC3	7.83	9.63	8.69	20.95	15.62	15.33	39.13	50.85	35.30	46.84	46.38	36.80
PSMC4	12.66	14.46	15.16	31.70	24.92	22.63	80.13	85.57	66.21	74.85	74.28	68.46
PSMC6P1	16.30	19.13	20.92	29.85	22.15	29.00	74.85	93.19	58.76	81.78	81.71	63.32
PSMD1	15.97	16.16	16.95	32.92	28.76	27.91	77.96	95.11	71.39	81.22	85.60	67.12
PSMD11	29.92	28.46	28.41	43.59	39.08	36.16	108.30	137.72	99.70	122.28	133.17	102.74
PSMD12	12.27	16.09	12.60	24.03	22.59	16.99	71.27	95.83	55.01	87.50	95.57	68.37
PSMD14	5.45	5.44	5.47	15.03	12.41	12.22	55.52	77.04	48.77	61.56	68.23	48.84
PSMD2P1	6.49	6.46	6.84	12.01	10.49	10.12	25.38	29.70	24.93	28.07	30.81	21.02
PSMD3	19.54	20.53	20.52	39.77	32.51	25.02	75.82	116.66	72.17	89.08	101.12	79.51
PSMD8	25.09	25.72	22.46	46.79	38.49	40.75	88.47	120.78	88.13	108.37	114.65	89.63
PSME2P1	4.16	4.43	4.33	13.06	8.23	8.06	22.53	27.69	23.95	24.84	21.80	25.79
PSME2P2	4.08	4.45	4.19	11.34	7.18	9.17	21.60	26.94	23.18	24.76	25.91	24.99
PSPH	0.90	1.31	1.97	1.86	1.62	2.39	5.70	8.51	10.04	22.00	21.03	22.99
PSTPIP1	35.89	24.71	23.67	24.11	19.82	17.54	12.02	5.20	7.17	6.37	4.03	4.21
PTCH1	41.16	41.57	34.10	38.47	33.07	33.34	14.10	8.04	7.45	10.37	9.03	7.74
PTGDR	9.72	7.74	5.15	9.58	6.61	4.27	1.10	0.94	0.56	0.77	0.85	0.53
PTGER4	33.19	48.70	56.15	75.03	59.49	64.75	303.87	278.57	312.76	191.16	200.97	230.10
PTMS	14.44	11.00	12.48	33.22	15.98	15.00	228.29	175.57	155.17	214.38	180.36	135.86
PTPLAD2	19.16	18.18	21.93	17.86	16.27	23.79	7.76	5.28	9.95	3.40	2.16	6.26
PTPN22	67.22	76.38	44.31	85.39	82.23	55.39	20.31	11.29	17.35	11.20	9.62	13.20
PTPN6	19.27	18.54	17.75	119.39	83.66	44.04	10.49	8.42	11.24	22.40	20.48	19.96
PTPN7	51.62	60.32	56.05	338.66	255.71	96.21	195.62	213.92	163.50	242.66	217.80	200.15
PTS	1.95	1.66	1.02	1.65	1.31	1.08	6.32	8.74	5.27	7.77	7.46	6.52
PTTG1	0.72	0.52	0.55	1.56	0.59	0.83	3.74	3.85	2.45	3.93	3.56	3.64
PUS1	9.09	6.85	7.53	19.69	14.42	11.57	15.81	24.73	15.92	35.23	32.60	30.52
PUS7	2.58	1.60	1.66	6.64	6.72	3.18	4.93	11.83	7.03	15.36	19.63	14.49
PYCARD	7.69	7.57	8.99	5.38	4.49	8.85	0.80	0.43	2.91	0.58	0.36	1.65
PYHIN1	26.59	33.52	25.08	37.25	37.14	27.91	13.75	12.37	11.01	5.47	7.93	6.40
QTRT1	3.42	2.22	2.19	7.98	6.29	3.72	5.80	9.00	7.12	10.71	10.56	11.54
RAB33A	6.18	4.18	6.44	7.42	2.97	7.19	69.12	45.56	54.96	60.94	36.46	40.36
RAB37	3.87	2.72	2.16	5.42	3.60	2.53	0.91	0.49	0.65	0.32	0.51	0.28
RAB40B	2.31	2.09	2.43	1.69	0.95	2.06	0.38	0.54	0.56	1.13	0.85	1.38
RAB7L1	72.47	62.37	55.25	69.56	59.92	62.62	346.35	334.57	259.96	258.37	258.47	254.76
RABGAP1L	62.15	73.89	92.81	67.28	75.95	98.79	20.07	16.96	17.68	16.28	16.82	17.25
RAD54B	9.42	10.15	8.04	6.20	7.99	8.06	2.54	2.24	1.90	2.08	3.01	2.71
RALGPS1	8.09	7.98	6.37	2.12	3.64	4.41	1.15	0.76	1.43	0.54	0.41	1.34
RALGPS2	3.15	9.43	8.78	2.26	5.93	8.82	2.01	2.15	3.61	0.54	1.02	1.17
RAN	54.03	54.67	61.54	139.33	103.74	108.81	194.19	307.00	220.67	372.84	383.24	320.39
RANBP1	8.26	7.01	8.54	22.29	16.09	11.98	26.41	48.58	27.56	51.71	58.76	47.44
RANP1	23.01	24.58	26.13	57.48	43.80	46.40	84.67	129.66	99.16	167.13	162.55	146.70
RAP1B	69.36	72.34	61.13	115.13	118.38	95.22	320.17	313.81	212.97	253.58	240.65	252.42
RAPH1	0.39	0.69	0.83	1.34	2.77	1.74	2.54	2.37	3.10	5.56	3.77	3.40
RARRES3	46.25	47.75	42.25	30.53	31.45	46.31	4.45	3.90	3.98	1.49	2.29	4.09
RASA3	69.26	76.51	66.69	22.51	24.84	40.71	9.20	7.08	8.93	10.80	7.42	5.59
RASGEF1A	9.03	5.81	7.89	21.55	19.70	9.62	0.14	0.13	1.06	0.72	0.34	1.17
RASGRP2	25.30	16.78	17.29	2.34	3.80	4.84	1.34	0.27	0.60	0.45	0.13	0.57
RASSF7	20.05	13.22	15.81	9.89	9.69	9.22	5.60	4.21	6.80	3.84	2.29	5.42
RBBP8	0.78	1.27	0.62	4.60	3.40	1.27	11.97	12.81	10.04	18.79	19.97	20.61
RBKS	0.84	2.02	0.56	1.78	2.89	1.36	5.66	3.90	4.40	1.49	1.11	2.93
RBL2	216.31	241.77	185.58	124.21	156.98	179.49	49.11	40.13	66.27	31.33	34.34	55.18
RBM28	5.01	4.99	3.76	8.28	9.02	5.53	14.23	19.85	12.12	21.64	26.03	18.54
RBM43	19.69	21.08	13.71	12.75	15.27	9.29	6.47	3.67	3.84	3.07	1.95	2.79
RBM8A	14.78	19.29	20.00	33.64	28.94	29.00	82.63	127.39	78.53	119.14	126.53	100.45
RBM9	4.56	4.83	5.45	3.12	3.40	2.75	0.34	0.18	0.65	1.90	1.40	1.46
RBMS2	7.57	6.24	12.62	6.30	6.01	12.82	2.87	2.29	5.59	2.19	1.50	2.50
RBPJ	62.09	75.85	95.55	549.96	527.05	436.39	190.59	285.86	184.99	379.40	414.03	430.21
RBPMS	5.76	4.93	2.53	1.69	3.01	1.08	0.57	0.31	1.11	0.63	0.34	0.49
RCL1	4.90	5.19	7.41	10.79	8.53	8.47	7.26	15.30	10.78	24.10	24.99	21.54
RCN1	3.57	4.11	3.19	14.54	14.61	7.80	36.20	43.41	34.95	50.13	54.08	58.84
RCSD1	157.98	154.25	183.61	183.80	159.84	189.77	95.56	43.37	101.74	23.80	18.70	62.06
RDH10	5.67	7.05	3.82	15.74	13.61	4.05	3.31	5.64	3.10	82.21	52.53	25.26
RDX	14.13	17.53	13.71	18.52	14.87	19.23	52.69	64.02	65.19	45.85	50.54	61.41
REEP6	2.67	2.77	3.33	3.17	1.66	2.93	0.48	0.45	0.56	0.59	0.72	0.65
REL	5.25	10.80	5.79	42.42	51.46	17.35	10.15	14.87	10.55	24.98	31.59	27.24
RELB	5.85	14.36	5.67	78.63	67.56	51.52	50.39	51.07	58.39	46.03	41.00	50.76
RGS1	8.55	4.28	6.47	12.79	4.55	10.52	346.43	86.24	131.11	37.99	13.95	84.65
RGS14	47.21	49.19	41.23	29.66	25.35	31.42	21.12	14.02	20.26	6.37	9.03	12.95
RGS16	0.21	0.59	1.76	28.32	29.82	41.94	16.43	51.48	76.24	157.60	243.20	272.32
RHOB	2.70	2.68	4.22	8.54	4.94	5.10	7.04	8.78	8.33	16.85	21.62	19.07
RHPN1	6.36	4.21	3.63	2.39	2.37	2.57	0.38	0.90	0.93	0.54	0.38	0.85
RIMBP3	10.07	4.48	12.83	2.63	1.59	7.56	0.61	0.90	0.84	0.49	0.11	0.62
RIMBP3B	5.99	6.30	7.66	1.62	0.74	3.32	0.92	0.22	0.50	0.73	0.54	0.27
RIOK1	6.69	7.87	6.50	15.43	12.30	8.97	24.86	37.09	26.42	51.72	48.29	41.21
RNASEL	22.57	22.36	23.33	19.04	22.15	19.81	7.52	6.76	5.69	3.75	6.11	5.59
RND1	0.15	0.46	0.68	1.73	0.83	1.01	2.25	2.24	2.13	2.21	1.48	1.62
RNF145	44.24	44.75	48.13	52.61	53.20	51.38	194.85	187.40	170.58	103.53	129.57	108.05
RNF166	91.05	101.41	141.11	30.05	38.33	86.19	7.28	4.44	8.05	4.56	3.18	6.11
RNF168	47.30	48.53	49.74	49.18	49.13	44.18	11.97	9.68	7.91	14.14	12.68	8.30
RORC	86.37	76.38	84.07	357.03	333.64	203.16	12.55	18.05	22.25	24.26	22.81	44.17
RPF2	4.86	4.70	6.26	16.65	12.86	11.82	26.63	44.75	33.96	45.68	47.72	49.60
RPF2P	0.48	0.75	0.52	1.00	1.50	0.51	3.16	5.83	3.47	6.76	6.25	5.86
RPIA	11.88	10.18	12.20	20.82	16.38	16.49	30.85	49.86	37.66	51.90	56.35	51.98
RPL22L1	4.65	7.08	6.07	13.44	9.97	8.79	15.18	32.75	21.19	31.85	33.71	39.23
RPL26L1	1.89	2.00	1.38	5.27	3.90	2.84	6.05	7.21	5.21	8.24	8.16	7.49
RPL26P30	1.96	2.21	2.35	5.09	4.96	3.31	4.82	10.62	6.26	7.84	9.61	8.79
RPL7L1	93.62	89.61	83.38	113.83	105.50	86.25	218.66	291.78	190.45	381.12	388.86	301.77
RPP40	0.54	0.88	0.40	1.69	2.14	0.76	1.05	2.82	1.34	5.06	4.45	3.04
RRAS2	8.12	12.33	9.05	10.38	16.16	10.64	34.33	46.97	42.51	32.66	49.38	52.57
RRBP1	19.24	13.87	9.98	23.07	15.82	9.62	83.82	73.65	44.60	45.53	50.54	33.28
RRN3P1	9.01	6.91	2.70	3.39	4.86	1.95	0.91	0.81	1.72	1.63	0.94	2.70
RRP15	8.97	10.35	8.81	18.17	18.51	14.75	21.36	42.07	22.67	38.89	50.67	46.35
RRP9	2.13	2.58	1.82	4.21	2.53	2.35	3.11	9.77	5.09	12.51	13.40	9.72
RSL24D1	34.51	42.10	40.43	86.52	66.84	68.83	244.99	293.07	209.71	341.61	330.54	335.02
RSL24D1P1	2.52	2.80	3.62	4.45	2.97	3.87	13.20	16.62	13.62	21.89	19.25	20.37
RTN4R	8.70	12.21	12.63	2.86	3.28	7.48	0.53	0.35	1.34	0.08	0.38	0.20
RUVBL2	5.13	4.60	4.99	11.23	9.14	8.03	15.23	22.76	16.75	21.68	23.28	21.74
RWDD2A	6.33	6.63	6.75	3.60	3.96	5.13	3.69	4.12	2.13	1.31	1.74	1.30
S1PR1	201.82	198.32	309.87	47.62	67.40	233.85	33.00	25.22	55.80	120.79	76.06	79.10
S1PR4	107.86	97.36	117.35	64.71	59.05	112.26	45.26	31.94	54.08	18.52	19.16	32.10
S1PR5	78.24	106.27	89.65	48.53	54.27	72.78	9.20	6.85	5.97	4.38	5.13	4.37
SALL2	4.80	4.96	10.11	4.12	3.72	8.39	0.14	0.31	0.09	0.27	0.55	0.20
SAMD12	9.18	9.66	16.42	6.38	5.26	18.48	1.58	1.52	3.15	0.86	0.68	2.83
SAMD3	34.33	31.14	31.77	23.16	24.33	33.88	6.04	3.54	4.40	1.45	1.06	3.48
SAMSN1	12.12	16.87	6.96	11.15	19.14	9.98	153.46	140.36	78.93	156.38	130.21	100.72
SAP30	0.75	1.14	1.20	2.43	1.94	1.45	4.12	6.00	2.50	4.61	5.81	4.62
SARS	43.63	48.53	44.10	78.76	57.27	62.15	232.16	241.34	226.42	241.66	256.89	254.64
SATB1	164.31	187.67	181.17	183.41	203.27	195.82	758.58	990.81	1154.08	550.05	675.68	851.65
SBK1	35.20	32.77	38.98	14.27	13.65	33.62	5.70	3.58	8.37	3.43	3.99	7.04
SBNO2	18.34	17.56	15.99	11.28	13.01	11.79	81.52	68.68	81.19	60.89	54.57	55.06

SCD	15.34	18.11	21.39	72.51	47.98	40.24	261.62	259.87	266.62	145.99	174.39	105.35
SCFD2	3.27	3.59	3.48	13.36	9.89	5.82	14.08	26.97	13.28	23.99	31.16	21.29
SCML2	0.48	1.47	0.34	1.26	1.15	0.76	3.50	5.33	3.42	3.79	5.47	4.78
SCML4	43.78	34.99	39.94	30.92	29.19	35.11	0.38	0.13	0.42	0.77	0.47	1.13
SCRN2	14.46	13.84	13.69	9.38	10.55	9.72	2.49	3.14	2.03	3.59	2.19	2.47
SDC4	8.73	7.83	7.98	150.18	93.47	56.94	44.07	34.77	49.41	87.81	66.78	73.60
SDF2L1	6.99	8.03	8.60	20.73	15.31	14.79	38.37	80.82	28.68	34.19	47.74	27.29
SEC13	16.05	19.61	15.72	27.17	24.22	24.63	80.02	95.61	57.84	67.17	76.67	53.62
SEC23B	13.08	14.43	15.01	22.94	22.55	18.73	77.88	99.37	62.18	57.23	74.15	54.33
SEC24A	14.27	19.50	14.23	25.21	27.53	18.84	88.02	83.98	86.84	49.73	53.62	50.02
SEC24D	18.25	17.17	13.13	24.85	19.86	13.63	135.17	152.23	80.96	77.11	97.09	51.49
SEC61B	14.89	17.85	12.14	31.96	22.90	22.31	104.37	128.58	77.12	93.19	102.77	79.10
SEC61G	3.30	3.36	3.14	4.81	3.68	2.31	22.18	24.19	14.06	14.32	16.20	11.42
SEH1L	10.10	10.40	9.93	22.77	17.87	18.00	33.77	64.79	43.27	81.78	87.58	79.55
SELK	10.05	10.67	10.97	16.70	17.60	15.22	108.25	127.50	73.56	72.27	82.80	61.33
SELPLG	297.09	293.80	324.67	115.58	128.11	253.00	127.89	59.18	108.31	29.27	25.23	61.53
SELS	11.52	13.61	11.31	16.18	13.92	14.50	113.61	141.97	72.54	69.74	76.23	47.77
SEMA4A	1.50	3.43	3.45	6.68	12.14	9.44	7.81	12.10	13.88	7.00	16.20	26.80
SEMA4B	11.94	12.40	14.18	8.72	10.01	10.52	4.74	3.00	5.69	2.76	2.16	2.91
SEMA4C	15.76	13.41	27.12	6.94	6.17	16.85	5.13	3.45	5.04	5.15	4.96	5.18
SEMA7A	2.97	4.37	3.02	21.42	26.78	19.56	51.78	53.54	40.81	58.68	59.82	50.64
SENP3_	155.85	139.91	153.56	263.85	213.90	215.53	501.56	684.15	533.57	688.53	703.79	643.53
SENP7	38.08	39.85	39.54	19.17	24.83	23.46	15.14	10.93	14.99	5.83	5.13	8.70
SEPW1	23.59	21.44	25.55	11.32	14.20	20.07	7.47	5.87	7.96	5.65	5.22	6.52
SERBP1	103.07	118.78	129.16	264.79	208.61	185.44	349.18	591.36	383.48	559.13	704.53	582.86
SERBP1P1	13.94	14.20	13.45	33.54	23.14	23.68	45.50	73.66	46.66	71.35	81.39	73.54
SERPINE2	0.03	0.20	0.37	4.86	4.43	2.49	0.62	1.84	1.34	7.14	6.23	3.64
SESN1	72.80	79.63	74.85	72.56	95.28	88.92	12.69	11.56	12.56	9.03	10.42	15.71
SESN2	13.71	17.53	14.02	22.47	15.82	15.37	216.06	180.63	195.98	241.03	235.91	236.09
SESN3	34.42	44.26	44.53	26.80	26.98	47.25	4.69	4.12	5.37	3.98	2.84	5.06
SF3B5	39.64	43.25	40.58	66.61	58.78	60.45	150.97	216.34	136.62	155.43	167.39	135.94
SFXN1	22.63	22.81	22.65	58.33	37.30	34.35	78.12	84.18	95.31	93.82	91.96	124.69
SFXN3	39.56	41.44	30.85	57.40	53.25	33.94	10.59	5.37	8.57	4.79	2.89	3.30
SGK1	2.88	3.62	2.53	35.52	15.98	8.06	449.94	228.84	476.49	78.19	62.58	153.83
SGK223	21.61	22.26	26.41	25.85	18.04	21.30	0.86	0.58	1.25	3.66	1.91	1.21
SGPP2	2.37	1.34	1.85	20.77	9.65	8.39	8.67	3.32	16.47	14.14	6.95	19.96
SGSH	36.27	27.16	20.43	10.31	9.04	13.79	12.21	8.83	7.22	6.84	3.60	3.32
SGSM2	47.50	32.43	31.11	14.90	18.23	16.34	5.25	4.39	6.29	4.68	4.60	3.44
SH3BP5	8.49	17.47	18.40	11.98	17.03	18.05	119.92	92.09	196.81	33.16	40.52	85.88
SHF	1.71	1.80	1.45	24.46	25.43	16.63	1.39	2.64	1.80	6.19	4.66	12.31
SHMT2	16.02	14.59	17.41	180.93	103.47	76.71	429.67	410.11	407.17	523.26	484.04	533.31
SIAH2	35.47	37.40	38.95	94.28	61.74	49.42	75.06	87.54	72.45	169.35	165.23	114.85
SIDT2	17.12	19.66	22.44	14.01	14.62	22.14	5.84	4.55	7.08	3.98	4.34	4.96
SIGIRR	38.98	34.08	32.33	12.71	13.73	20.72	4.79	2.64	4.95	2.17	2.16	2.67
SIPA1	74.76	77.06	68.94	52.30	45.17	45.84	33.29	26.57	26.42	14.14	16.58	14.09
SIRPG	10.32	11.68	10.14	40.07	34.10	16.45	1.25	1.25	2.04	0.86	1.78	1.01
SIT1	25.45	28.82	19.97	23.38	17.64	20.25	25.39	13.44	20.68	4.29	3.35	5.63
SLA2	52.61	62.27	68.49	52.61	46.43	53.95	13.70	15.91	13.80	19.10	18.23	8.95
SLAMF1	52.34	45.96	44.68	82.88	69.81	69.09	310.67	195.60	456.08	183.04	139.96	292.60
SLAMF6	84.06	83.98	84.04	75.72	75.71	93.24	13.32	12.54	13.05	7.68	12.08	9.11
SLAMF7	142.67	168.48	86.90	271.05	243.22	140.14	944.58	1228.82	837.02	818.97	1042.80	903.74
SLC16A1	10.71	11.16	11.46	35.09	25.31	25.85	180.14	157.92	149.81	117.67	135.08	165.01
SLC16A3	14.58	15.14	20.68	54.04	43.19	41.68	197.84	119.48	222.37	45.66	34.25	92.44
SLC16A6	1.89	1.95	1.23	4.12	4.70	1.37	10.97	15.08	10.69	13.33	19.45	16.15
SLC17A9	2.16	0.82	1.05	1.60	1.19	0.90	4.22	7.93	2.91	6.23	6.66	5.26
SLC19A1	3.94	3.40	4.26	6.33	2.99	3.29	9.81	12.72	12.07	18.29	16.54	19.66
SLC19A2	5.34	6.07	4.16	6.98	6.29	4.41	11.02	18.05	11.84	35.78	34.39	18.01
SLC1A4	12.24	11.06	15.59	19.00	12.86	25.06	124.49	112.40	157.35	83.70	108.46	138.81
SLC1A5	11.28	21.18	18.02	132.10	77.45	66.49	546.99	563.94	600.29	807.74	756.95	796.03
SLC25A19	2.00	3.51	3.17	6.68	4.86	4.80	7.12	12.88	7.76	20.83	19.89	14.40
SLC25A22	6.97	7.46	5.75	11.49	6.41	4.93	21.65	38.41	21.12	36.14	40.08	29.70
SLC25A23	17.98	24.68	23.94	10.50	14.28	18.69	3.11	5.15	7.73	2.26	2.80	3.16
SLC25A32	14.84	20.17	15.74	31.14	28.42	23.75	60.13	91.46	56.87	87.18	98.85	72.85
SLC25A33	2.80	2.98	2.24	5.65	6.23	1.56	8.01	14.50	7.46	17.64	16.97	18.49
SLC25A45	5.77	3.12	3.83	2.20	3.34	2.16	1.29	0.69	0.91	1.65	1.20	1.27
SLC25A5	50.12	48.71	61.48	130.15	85.53	109.11	181.34	249.24	192.62	224.69	244.37	221.76
SLC27A1	14.00	5.78	12.30	8.51	7.14	10.98	3.02	1.56	1.85	1.63	1.48	1.86
SLC27A2	0.36	0.98	0.46	2.08	1.19	0.18	15.16	36.48	6.20	11.11	15.59	6.23
SLC27A3	14.45	13.18	8.99	5.98	6.29	6.09	3.81	1.81	2.09	1.29	1.03	1.96
SLC29A1	0.69	0.62	1.29	1.91	0.87	1.88	2.30	7.66	7.91	16.26	13.86	12.43
SLC2A3	93.39	99.88	97.84	100.66	82.95	95.41	601.97	446.35	544.80	291.16	263.05	357.16
SLC31A1	9.93	8.06	8.81	12.70	10.92	9.72	40.95	50.30	26.14	53.70	46.59	26.23
SLC35E2	38.37	32.05	34.56	14.03	21.79	24.39	4.36	5.16	6.31	4.23	6.33	6.54
SLC35E2B	130.33	127.18	139.14	71.55	96.63	112.73	24.82	26.59	32.96	19.43	26.70	32.47
SLC35E3	9.06	7.05	8.26	4.29	5.10	7.74	5.75	4.12	3.47	1.13	0.81	1.58
SLC35F2	11.88	11.49	11.16	43.15	41.85	20.57	22.61	39.83	29.24	52.90	56.94	56.47
SLC38A5	5.40	5.12	6.01	7.76	6.80	9.83	10.87	23.52	13.00	25.16	33.24	25.06
SLC39A14	14.65	20.27	20.49	50.83	35.76	34.53	69.21	101.92	75.51	136.51	132.96	116.02
SLC3A2	49.76	76.34	67.33	133.23	110.44	121.73	424.19	375.48	532.14	525.43	451.29	620.38
SLC41A2	0.63	1.73	0.71	9.28	11.23	9.11	29.03	33.11	35.58	19.15	28.79	27.41
SLC43A2	0.51	1.31	0.96	11.06	10.72	3.47	1.01	1.30	1.25	4.11	3.77	4.70
SLC4A10	105.10	116.10	89.06	97.93	107.43	105.35	585.65	528.33	537.50	244.55	291.49	361.24
SLC6A9	0.21	0.07	0.40	2.95	1.46	1.48	22.70	20.83	33.40	41.96	40.79	55.43
SLC7A1	32.41	35.19	48.94	169.31	119.57	99.64	457.47	472.78	556.98	628.87	658.45	654.92
SLC7A5	51.65	62.81	151.49	335.58	205.05	316.85	2152.73	1906.28	2446.84	2611.47	2216.92	2456.56
SLC9A9	5.64	3.82	4.01	3.30	3.40	3.11	2.06	0.63	0.97	0.77	0.38	0.57
SLCO4A1	1.14	0.75	5.55	9.99	6.18	8.06	18.97	17.34	42.03	18.38	19.24	26.71
SMAD3	200.74	188.92	145.63	225.52	278.19	203.16	44.88	20.74	38.96	14.23	10.56	28.22
SMARCD3	9.04	4.76	12.18	2.86	2.12	7.64	0.48	0.31	0.98	0.41	0.30	0.28
SMS	2.85	3.02	3.72	17.81	15.76	7.14	34.35	59.03	35.92	47.46	58.62	45.60
SMTN	0.63	0.91	0.40	0.78	0.71	0.80	1.29	2.42	1.53	3.03	3.99	2.02
SNAI3	23.74	22.87	27.24	7.41	11.94	20.90	1.48	0.58	1.39	0.54	0.30	0.93
SNED1	7.65	4.84	5.01	1.51	2.61	4.96	0.90	0.42	1.18	1.12	1.13	1.59
SNHG3_	15.40	14.22	17.45	36.07	34.92	28.42	23.19	38.07	44.15	70.11	69.39	79.52
SNN	4.35	4.26	6.18	2.65	4.15	5.05	1.46	0.54	2.45	0.76	0.40	1.10
SNRPA	15.01	15.44	13.71	33.05	23.81	21.08	51.68	59.18	53.25	61.66	59.27	63.60
SNRPB2	12.54	12.63	9.49	25.28	18.63	15.80	59.75	76.96	46.11	60.57	58.99	48.39
SNRPD1	4.53	5.91	6.50	17.91	12.76	9.36	24.19	47.13	26.14	49.19	49.92	41.21
SNRPE	4.92	7.05	7.97	15.91	12.26	12.79	17.34	26.05	19.44	28.58	29.66	26.83
SNRPEL1	5.43	6.18	6.90	12.49	9.23	10.38	16.25	22.62	16.90	26.78	25.43	25.00
SNRPF	5.70	4.47	4.44	9.11	9.73	10.99	12.36	24.42	17.16	19.33	22.85	20.36
SNRPG	0.90	0.92	1.07	2.74	1.70	1.15	4.06	6.49	2.74	5.47	3.75	4.35
SNRPG.1	8.27	8.33	6.54	18.00	13.90	13.94	30.96	41.87	28.04	33.72	34.18	29.16
SNTA1	15.97	20.82	33.64	11.36	10.64	36.47	13.54	5.24	14.55	3.93	2.16	6.76
SNX10	9.21	9.37	9.80	19.08	18.39	14.61	42.53	38.53	66.80	24.21	27.73	55.99
SNX30	24.76	21.97	31.15	12.97	19.74	33.05	8.33	6.32	7.73	4.25	4.58	8.06
SNX33	13.80	10.89	9.70	26.70	18.75	16.47	2.92	2.35	1.76	5.75	4.21	2.34
SNX9	22.21	28.10	20.49	163.55	120.36	46.31	74.67	64.29	59.36	82.53	67.50	74.33
SOCS1	2.40	2.41	2.68	2.07	2.30	1.75	65.99	52.89	58.01	20.32	15.65	42.91
SOCS2	1.62	2.01	1.42	0.78	0.83	0.83	24.09	14.52	25.82	25.07	19.67	46.07
SOCS3	5.79	7.51	3.05	3.30	3.68	3.54	372.34	333.82	586.13	256.13	215.91	264.87
SOD2	60.02	64.06	69.38	61.20	58.69	86.12	741.78	572.95	833.86	366.14	333.85	674.47
SORBS3	27.25	29.76	31.62	14.75	12.48	22.02	13.84	8.32	15.64	4.70	5.13	8.06
SORL1	517.58	468.04	542.60	211.16	236.51	441.31	21.51	10.17	23.22	9.31	9.96	18.99
SOX12	4.83	6.82	7.12	3.08	4.35	4.88	0.19	1.12	0.37	1.85	2.54	1.62
SPAG1	1.17	1.93	1.69	2.65	4.43	1.55	8.48	11.51	12.82	8.99	9.07	12.47
SPATA7	2.37	1.73	1.20	1.86	2.37	1.99	0.81	0.94	0.60	0.45	0.30	0.49
SPC24	5.95	5.65	6.64	9.68	6.24	6.04	50.37	30.58	43.03	15.67	14.85	11.22
SPHK1	0.18	0.78	0.31	2.34	1.98	1.59	5.65	8.83	6.34	13.87	16.32	13.12
SPINT1	0.48	0.65	1.23	2.82	1.90	1.45	1.20	1.61	2.73	3.34	3.26	2.87
SPNS3	1.11	1.99	1.94	1.95	1.50	1.88	11.06	3.67	13.42	20.28	7.84	23.08

SPOCK2	1438.38	1431.47	2405.85	1723.50	1609.23	2729.73	325.37	159.35	410.88	106.56	82.72	275.89
SPON1	30.78	28.55	46.94	8.01	12.26	36.30	1.15	0.22	1.31	0.45	0.47	1.13
SPPL2A	6.73	6.38	5.17	19.70	14.71	9.10	28.59	23.13	22.68	20.96	18.07	23.02
SPRED2	0.90	1.83	0.46	9.84	5.89	1.84	29.41	19.00	14.80	16.71	15.77	12.79
SPRY2	0.51	0.75	0.43	34.43	20.82	3.25	0.67	1.16	0.60	4.20	3.52	1.86
SPRY4	0.09	0.23	0.03	6.90	5.93	2.39	22.51	23.79	18.27	17.80	19.42	9.51
SPSB2	30.70	26.29	29.65	60.71	35.90	39.88	195.34	140.71	147.78	88.27	65.81	95.55
SPTY2D1	52.87	73.47	66.86	95.66	93.79	99.65	276.33	264.20	255.56	190.44	195.09	185.48
SRD5A3	3.81	4.37	3.91	10.11	9.81	5.57	17.10	15.64	23.97	20.42	23.44	30.36
SREBF1	4.59	9.77	4.19	13.14	17.41	8.44	50.82	47.18	51.56	39.71	48.80	38.34
SRFBP1	3.30	4.83	4.16	12.36	9.77	7.45	14.18	21.46	13.88	24.71	26.29	25.14
SRM	11.07	10.84	10.20	30.53	21.04	21.66	33.91	72.80	42.43	76.43	86.24	66.88
SRP54	13.89	15.18	11.25	22.51	18.91	14.75	64.75	75.62	47.84	45.49	55.75	39.23
SRPRB	25.07	24.68	27.13	54.61	39.64	45.78	128.01	218.87	132.01	200.09	215.11	179.45
SRSF1	108.97	118.97	87.12	216.82	192.84	134.75	341.98	489.52	356.22	483.72	534.42	457.32
SSX2IP	6.42	7.64	5.86	4.29	4.35	6.44	1.58	1.61	2.08	1.13	0.55	1.34
ST3GAL5	25.99	27.25	22.37	32.44	35.12	22.71	16.62	13.40	9.76	4.56	5.43	7.25
ST8SIA4	29.77	29.54	25.79	68.52	51.18	37.71	154.85	112.76	97.76	71.78	55.80	78.33
STARD4	15.58	18.80	9.61	50.18	52.25	16.13	88.47	94.53	53.07	48.60	61.18	39.59
STARD5	6.94	5.17	5.45	3.72	4.71	3.59	0.90	1.13	1.50	1.38	0.87	1.17
STARD9	13.89	11.58	12.10	4.73	6.52	6.15	2.16	1.34	3.47	2.31	2.93	2.27
STAT4	26.15	26.99	21.89	36.72	42.63	26.74	102.39	99.13	109.38	63.89	64.01	105.43
STAT5A	57.33	53.45	68.58	145.10	142.14	92.16	62.81	86.91	93.75	174.88	234.32	326.95
STIP1	29.53	36.13	33.74	67.09	52.45	47.11	234.17	273.91	192.55	262.49	258.08	206.91
STK38	191.34	168.64	151.95	64.40	77.45	115.77	58.10	42.29	49.46	34.15	31.59	36.68
STMN3	36.22	19.87	39.20	16.19	10.08	32.57	3.10	1.79	2.98	3.86	1.90	3.71
STON1-GTF2A	14.68	13.71	15.10	7.16	7.52	15.84	1.87	0.45	2.78	1.08	0.21	0.53
STX11	9.87	14.07	8.26	79.67	59.81	30.70	148.44	138.75	141.11	132.08	127.87	144.68
SUB1	23.38	23.76	22.53	43.80	34.25	27.15	106.81	130.50	93.13	124.11	133.72	118.36
SUB1P1	1.47	1.27	2.03	3.12	2.02	1.92	5.84	6.14	3.84	8.06	5.30	6.16
SURF4	50.67	60.83	52.68	85.93	82.31	79.85	304.93	375.51	285.19	313.23	324.31	241.43
SUSD1	1.05	0.85	0.99	0.26	0.40	0.36	11.26	7.30	5.55	2.71	1.65	2.39
SUSD3	14.29	16.08	28.33	1.99	4.02	15.89	0.50	0.81	2.59	0.32	0.55	1.46
SUV39H2	2.24	3.33	1.88	7.58	7.86	4.49	7.83	12.12	8.55	11.89	13.91	12.58
SUV420H2	5.03	4.08	5.52	2.95	4.31	3.62	1.27	1.25	0.32	0.54	1.06	1.16
SYNE1	119.08	121.32	95.96	71.41	86.11	74.48	30.75	12.86	11.75	13.01	10.77	10.44
SYNE2	211.56	206.37	97.69	59.98	97.33	59.98	67.01	22.27	38.45	28.77	23.96	28.82
SYNM	47.24	43.34	24.05	15.69	16.38	16.13	2.78	1.93	1.02	2.85	1.53	1.25
SYP	0.24	0.13	0.34	1.21	0.44	0.43	2.11	3.14	1.62	3.34	5.68	3.89
SYTL3	17.91	13.67	12.63	10.80	12.70	9.32	88.91	122.86	84.42	127.60	146.96	75.08
TACC3	23.92	17.43	23.91	11.58	9.02	16.96	4.22	4.12	4.72	5.29	3.69	5.99
TAF13	6.48	8.39	4.98	13.01	10.40	7.27	39.40	57.04	28.62	37.22	47.75	31.20
TAF1B	2.22	2.45	3.20	5.55	4.75	4.45	11.26	13.22	11.01	5.92	9.20	9.68
TAF4B	3.51	5.61	4.90	10.02	10.68	7.88	6.56	16.08	14.80	24.57	27.22	24.45
TAGAP	81.84	86.22	77.65	591.58	595.38	282.74	26.31	26.68	23.29	41.20	59.72	59.37
TAGLN	10.74	8.65	3.96	3.46	3.96	2.82	0.85	1.23	0.94	1.60	0.43	1.74
TANC2	42.68	48.10	50.72	18.65	25.91	39.55	8.33	4.21	14.94	5.15	5.60	8.35
TANK	22.81	25.98	20.22	62.71	51.78	39.37	169.27	174.81	124.64	109.99	121.30	116.91
TAP1	123.90	116.31	110.52	199.55	158.37	183.50	450.37	595.61	423.21	684.28	726.80	541.28
TARBP1	16.12	10.84	9.09	6.46	8.35	8.50	1.63	3.09	3.19	6.41	6.32	7.53
TARS	14.89	15.57	16.30	65.96	40.90	34.64	174.21	198.91	159.52	189.81	192.91	192.86
TBC1D10C	97.82	75.48	92.44	57.08	47.47	62.29	19.21	13.22	17.77	7.50	5.55	11.66
TBC1D5	65.03	62.89	67.43	42.59	44.66	58.06	22.27	12.99	24.98	14.64	11.57	20.08
TBCD	38.41	26.78	48.93	14.21	16.17	28.87	8.03	8.37	9.55	8.67	8.32	9.20
TBX21	30.88	40.70	27.36	47.84	56.84	31.82	171.52	326.91	225.54	296.73	329.10	269.86
TBXAS1	3.03	2.32	1.54	5.03	2.69	4.45	20.21	14.20	8.88	11.38	11.15	9.88
TC2N	278.92	276.51	291.53	99.27	145.68	238.81	80.37	72.76	90.31	33.02	55.20	73.52
TCEB1	6.02	6.37	6.78	9.66	8.70	8.55	36.63	44.70	30.71	35.46	37.69	32.57
TCEB1P2	1.27	1.95	1.54	2.88	1.31	2.84	8.44	10.94	7.04	7.41	8.40	6.82
TCF7	312.29	325.37	307.05	281.00	332.49	297.10	7.42	8.74	8.74	3.48	6.95	8.70
TCP11L2	9.90	9.96	13.31	7.85	9.77	12.18	2.44	2.20	2.22	1.63	1.87	2.23
TCP1P1	0.63	0.74	1.00	1.01	0.95	1.31	3.31	5.43	2.96	5.36	4.57	4.77
TCTN1	1.75	1.95	2.34	2.65	1.93	1.68	0.24	0.50	0.37	1.02	1.08	0.61
TEF	21.07	20.17	30.05	5.12	7.04	29.39	1.87	3.18	3.10	1.08	1.40	2.91
TFB2M	4.32	5.81	5.15	9.97	9.22	9.15	10.68	18.32	8.61	24.57	28.58	17.93
TFDP2	32.32	32.05	20.43	17.61	19.03	16.88	8.19	5.33	5.00	6.37	7.29	4.17
TFRC	15.58	16.32	12.70	69.13	50.63	24.59	290.63	421.56	398.37	457.40	540.84	585.37
THAP8	3.45	3.07	3.73	1.69	2.10	2.49	0.72	0.45	1.39	0.31	0.25	0.24
THBS1	23.59	20.86	23.57	27.32	27.21	19.74	1.72	1.21	1.76	1.26	0.85	1.94
THBS3	4.69	3.65	1.76	2.09	2.50	1.21	0.48	0.41	0.69	0.63	0.64	0.77
THOC4	3.57	5.47	5.36	13.96	10.92	10.04	17.04	26.04	16.88	21.51	25.06	21.98
THOC6	1.36	1.46	1.87	2.96	2.03	2.73	8.00	7.37	9.00	8.84	7.33	9.50
THRA	51.80	55.23	56.44	20.53	27.02	40.04	7.85	7.78	9.94	6.51	5.65	4.92
TICAM1	13.89	13.68	12.97	25.76	21.12	17.54	80.90	73.61	69.30	80.04	71.27	69.71
TIFA	20.35	39.40	19.08	71.43	77.37	44.72	368.28	421.35	399.30	244.32	279.61	351.34
TIMM10	3.90	3.56	3.33	11.10	9.81	5.78	20.84	34.54	22.81	34.15	30.06	29.07
TIMM17A	9.66	11.00	7.55	18.56	15.94	12.51	44.02	69.62	40.34	64.64	70.51	57.08
TIMM44	9.12	8.75	7.43	13.79	11.31	9.36	19.97	28.99	22.85	36.95	37.01	36.07
TIMM8A	1.80	2.55	1.73	7.62	5.57	4.48	5.25	11.10	6.43	15.27	17.03	14.21
TIMM8AP1	0.72	0.67	0.28	1.04	0.61	0.48	2.42	2.01	1.20	2.15	2.65	2.13
TIMM9	4.65	4.24	5.37	7.32	7.23	6.86	12.88	21.26	12.67	19.18	22.99	23.66
TJP3	5.14	4.89	3.49	3.91	2.57	4.66	1.23	0.73	0.50	0.27	0.17	0.49
TK2	12.21	10.67	10.69	3.51	2.95	8.03	2.83	1.48	3.47	1.04	0.89	1.94
TLE1	11.77	15.13	11.00	18.63	21.86	11.53	1.63	1.12	1.57	1.45	1.10	1.54
TLE2	4.95	3.66	5.52	1.91	3.80	5.42	1.20	0.94	1.20	0.99	1.78	1.90
TMC6	167.24	136.30	109.00	94.04	105.75	87.55	36.22	24.33	23.89	12.03	11.03	16.61
TMC8	182.82	137.63	83.66	78.68	73.26	57.18	29.47	21.40	14.43	16.19	10.51	14.85
TMED9	43.99	48.24	44.28	83.66	69.54	66.67	179.91	238.88	160.91	173.55	182.95	153.71
TMEM107	8.82	8.39	9.21	4.55	4.47	8.39	1.53	0.94	2.73	0.77	0.25	1.05
TMEM121	1.02	1.86	1.23	3.51	2.65	2.39	2.06	6.05	2.41	6.37	9.58	6.64
TMEM143	4.29	2.55	2.71	2.08	1.94	1.81	0.72	1.16	0.74	0.50	1.02	0.53
TMEM170B	9.42	12.21	7.64	6.25	7.87	6.69	3.07	3.27	1.76	2.17	2.16	2.71
TMEM187	7.29	6.43	9.37	3.47	4.11	7.52	2.01	2.60	3.24	1.76	1.19	1.82
TMEM204	61.64	45.63	55.50	31.27	18.67	45.88	9.82	6.18	8.00	8.27	5.77	7.93
TMEM208	5.34	6.23	4.31	10.15	8.23	8.06	27.97	35.12	22.53	31.30	30.06	22.87
TMEM217	0.15	0.24	0.13	2.34	2.44	1.12	2.34	2.94	1.34	6.59	6.82	5.81
TMEM22	1.69	0.69	0.50	4.73	2.93	1.05	12.36	8.52	2.59	4.57	5.89	1.50
TMEM229B	42.34	44.68	49.37	41.24	33.15	52.46	13.22	8.60	16.66	2.57	3.82	9.72
TMEM63A	137.16	100.77	102.35	34.11	44.80	65.81	8.54	4.13	8.06	5.09	5.01	5.11
TMEM64	27.13	30.26	24.07	73.03	58.58	36.73	151.02	103.35	132.69	113.11	92.30	107.32
TMEM65	6.42	6.76	6.75	5.98	5.46	5.89	34.25	48.47	31.55	14.36	23.79	17.73
TMEM71	30.67	33.03	33.84	17.22	22.59	30.33	5.94	4.57	4.40	2.53	1.87	2.31
TMEM8B	5.52	4.96	5.98	3.64	3.92	4.41	0.57	0.67	0.74	0.32	0.34	0.53
TMIGD2	40.42	28.72	67.15	22.68	18.16	57.12	6.75	3.63	6.06	2.89	2.04	5.99
TMSB10	60.32	59.64	57.61	127.11	96.89	99.24	307.72	284.55	278.90	155.15	167.61	185.66
TNF	15.58	32.15	16.15	219.96	208.33	148.95	565.06	943.84	467.55	1295.48	1496.05	817.54
TNFAIP8	100.68	101.77	113.83	339.96	251.28	186.67	465.57	725.09	535.45	725.01	815.25	761.90
TNFRSF12A	1.32	1.57	0.86	3.51	2.45	3.40	7.09	5.82	5.55	2.03	1.27	3.08
TNFRSF13C	1.65	1.93	1.42	13.10	12.34	4.45	0.29	0.22	0.19	1.17	1.06	1.26
TNFRSF18	3.75	1.66	2.06	89.12	65.19	35.68	109.16	198.74	125.89	114.42	151.53	195.77
TNFRSF1B	135.65	132.35	123.17	358.49	230.84	182.51	1598.25	925.56	1890.77	432.43	296.07	627.86
TNFRSF4	0.15	0.00	0.37	18.65	12.86	5.46	3.78	5.42	8.33	9.94	10.05	20.73
TNFRSF8	0.09	0.16	0.43	0.48	0.44	1.95	20.50	91.71	48.39	80.72	114.73	91.57
TNFRSF9	2.01	2.90	4.68	511.66	296.22	125.49	223.87	450.07	270.93	1067.98	1139.80	1070.60
TNFSF13B	19.54	5.29	34.42	9.06	2.53	40.39	0.53	0.40	0.83	0.23	0.25	1.82
TNFSF4	4.98	4.18	4.28	13.88	20.69	11.39	10.06	17.47	26.28	8.54	15.52	41.70
TNK1	4.86	2.93	4.59	2.16	2.03	4.29	0.13	0.84	1.06	1.06	0.80	1.96
TNK2	41.85	33.31	30.12	33.40	36.45	26.51	6.55	3.63	5.60	4.92	5.43	7.77
TOMM34	6.66	7.87	10.26	31.66	25.28	19.31	21.31	27.69	23.55	52.71	44.60	39.15
TOMM40	13.11	14.28	13.85	27.34	22.46	17.59	52.63	91.06	54.93	106.17	107.04	90.98
TP53INP1	29.41	28.46	32.17	52.17	44.22	39.77	10.73	3.90	12.12	2.44	2.50	3.56

TP53INP2	2.19	2.68	0.83	6.07	5.10	3.15	18.87	8.56	13.19	5.60	4.20	4.29
TP53TG1	4.41	3.33	4.59	2.91	3.76	4.88	1.72	0.54	0.69	0.41	0.47	0.85
TPCN1	14.92	15.11	17.29	6.77	7.83	10.92	1.82	4.03	3.38	5.01	5.68	4.96
TPI1	48.13	44.10	50.59	148.52	100.55	104.80	720.12	592.32	693.14	335.40	305.44	377.51
TPI1P1	36.61	38.33	43.96	115.87	83.11	82.84	529.37	449.17	507.36	258.51	226.39	288.46
TPM1	8.49	8.16	7.36	2.60	3.12	3.57	0.48	0.49	1.11	1.36	0.76	1.01
TPM4	70.99	61.85	77.94	115.78	52.37	81.92	1038.79	850.31	821.37	442.05	359.06	493.18
TPPP	5.19	14.26	3.48	3.71	8.86	2.75	1.20	2.60	1.02	1.49	1.61	1.07
TPRG1	4.71	5.06	2.74	2.91	3.20	3.62	1.39	1.12	0.51	1.45	0.98	0.97
TPX2	0.18	0.98	0.15	0.61	0.44	0.29	3.26	4.39	2.87	1.94	2.37	2.55
TRAF1	65.00	74.45	40.68	618.37	545.45	202.86	435.57	581.85	644.21	530.98	738.64	753.57
TRAF3IP2	10.38	10.90	14.61	14.01	11.83	13.63	44.74	31.90	74.81	28.28	16.49	33.52
TRAF4	6.57	13.06	5.36	177.14	186.45	54.96	107.26	126.24	137.24	180.51	179.64	272.88
TRAF5	67.43	52.29	51.12	41.07	34.69	39.44	20.84	15.05	19.66	14.73	11.07	14.86
TRAM2	22.66	17.66	21.42	5.94	4.55	14.68	3.74	3.05	4.44	6.23	5.34	4.33
TRANK1	169.38	173.09	219.78	90.99	104.94	175.89	24.67	10.39	19.01	5.33	4.41	11.54
TRAP1	8.98	4.89	5.36	11.66	9.55	9.48	8.95	17.84	13.66	25.39	29.27	25.09
TRBV_	769.82	753.57	976.80	1220.10	1063.12	1257.05	245.48	169.26	276.81	146.63	128.51	251.48
TREML2	0.66	0.39	0.43	2.17	1.07	0.65	20.84	12.45	19.80	7.77	9.79	17.29
TRERF1	48.83	46.22	42.77	25.24	30.22	31.71	7.86	3.40	19.57	3.75	3.90	9.11
TRGV_	177.11	214.28	163.41	253.31	244.20	209.22	71.11	38.61	63.16	32.26	27.02	54.91
TRIB1	0.54	0.75	0.68	19.56	15.43	2.46	13.22	10.39	5.48	26.15	26.63	14.60
TRIB2	45.38	47.10	56.39	45.19	33.11	54.52	10.11	6.90	53.02	3.12	2.25	13.68
TRIB3	10.02	12.27	9.80	15.09	8.82	11.35	58.87	54.75	46.36	58.45	65.38	51.62
TRIM3	8.43	6.36	6.63	3.04	2.29	2.64	1.92	1.08	1.94	1.45	0.34	1.13
TRIM52	39.46	28.54	23.63	16.71	17.43	17.06	9.03	6.29	7.36	8.37	7.51	7.28
TRIM6-TRIM34	7.32	4.83	7.15	4.77	5.34	7.19	2.11	1.79	1.90	1.49	1.31	1.58
TRIM66	21.55	12.40	8.97	10.02	9.93	5.71	4.36	1.21	2.08	4.16	3.05	4.01
TRIP10	4.34	3.13	4.25	7.85	5.65	5.97	25.52	19.85	26.60	14.82	19.65	21.99
TRMT6	8.49	7.93	7.52	16.09	14.32	9.54	30.75	44.31	24.98	40.02	41.13	35.10
TRMT61A	8.40	8.29	6.53	18.87	16.45	11.61	15.14	23.25	12.82	35.87	36.55	32.83
TRNAN34P	16.53	22.11	28.09	14.35	26.29	33.22	1.80	3.12	4.04	1.06	2.56	2.68
TRNAN35	24.90	36.37	27.88	19.88	28.95	32.64	5.64	5.85	7.26	4.82	4.57	7.03
TSC22D1	38.43	38.42	45.08	19.65	22.25	32.17	4.60	4.43	6.06	3.70	3.90	5.29
TSC22D3	119.62	152.39	110.75	71.56	86.27	114.50	34.06	25.76	28.68	29.77	31.59	34.05
TSEN15	28.27	27.91	27.09	57.20	45.37	42.19	104.90	141.03	119.92	143.28	153.23	181.12
TSHZ3	0.36	0.39	0.25	1.13	0.95	0.33	6.04	4.30	3.10	2.85	1.95	0.89
TSPAN9	1.59	2.06	2.50	1.69	1.66	2.24	0.48	0.58	1.67	0.45	0.51	0.53
TSR1	14.36	16.60	13.73	34.47	28.08	21.54	41.94	73.15	52.57	91.72	103.80	86.01
TTC12	3.99	2.71	2.22	1.30	2.02	1.77	0.67	0.63	0.46	0.41	0.34	0.65
TTC16	12.16	5.63	3.18	3.00	2.09	2.25	2.50	1.60	0.73	1.00	0.90	0.80
TTC22	16.54	11.82	12.33	8.85	7.55	11.03	6.08	3.49	6.25	1.40	1.44	4.82
TTC26	1.05	1.70	0.68	2.47	3.05	2.86	2.44	3.85	4.03	4.92	4.49	4.98
TTC27	4.17	4.34	4.19	13.27	9.73	6.94	10.06	18.59	11.01	19.56	20.94	14.74
TTC7B	1.11	0.78	0.49	1.00	0.28	0.90	5.51	2.78	7.12	1.17	1.44	2.31
TUBA1B	71.85	88.21	139.81	222.52	172.82	255.77	831.07	948.73	1116.73	722.61	761.20	759.15
TUBA1C	30.29	45.34	52.50	107.74	77.20	89.07	321.82	393.34	374.94	375.13	346.17	331.09
TUBB2A	1.75	4.05	5.32	5.98	5.22	7.15	16.00	17.06	25.31	8.97	13.44	12.98
TUBB2C	45.56	65.60	79.43	119.81	94.71	124.93	359.20	363.32	405.71	241.66	240.74	260.57
TUBB4	4.19	5.15	8.06	3.37	3.23	9.53	1.40	1.28	2.07	0.26	1.67	1.08
TUBE1	6.51	7.07	6.10	6.98	8.70	6.04	34.72	40.98	31.54	48.84	59.19	52.30
TWISTNB	14.53	16.81	15.59	42.85	31.80	29.07	44.50	62.90	47.33	62.92	73.77	68.21
TWSG1	8.94	7.77	8.51	9.11	9.14	12.65	49.81	72.44	57.74	59.63	65.55	64.93
TXK	16.48	15.18	12.82	12.84	10.84	11.79	12.17	5.11	7.17	3.30	1.82	3.64
TXN	4.20	3.75	3.91	7.46	4.59	6.22	58.82	71.01	65.46	76.97	69.04	75.39
TXNDC16	4.53	4.44	4.84	2.43	3.44	3.11	1.58	0.99	1.39	0.77	1.48	1.05
TXNDC17	3.19	4.44	2.08	7.55	7.96	5.34	15.09	26.26	10.40	17.04	17.31	12.79
TXNRD1	46.04	48.37	63.14	92.98	73.41	115.62	230.44	258.81	348.47	303.32	304.50	412.83
UBA7	31.12	17.69	19.66	14.92	13.13	16.74	1.48	0.72	3.56	0.99	1.23	3.56
UBE2MP1	6.74	5.45	6.51	9.51	8.89	9.10	32.56	35.13	21.83	27.61	23.12	22.43
UBE2N	40.72	43.67	39.01	86.02	64.75	62.22	189.25	216.56	174.33	178.65	176.84	172.73
UBE2S	5.27	6.63	6.72	9.72	6.98	9.27	28.69	45.13	26.66	34.22	37.65	27.33
UBE2SP1	5.89	7.33	8.62	6.49	7.36	6.98	34.21	37.86	32.58	38.25	34.52	26.30
UBXN11	14.58	7.51	5.73	5.48	5.93	4.21	1.73	1.10	0.98	1.51	1.11	0.89
UBXN8	0.78	0.85	0.77	4.16	2.53	1.92	4.98	7.44	2.78	7.18	6.91	5.87
UCHL3	0.99	1.14	1.17	1.91	1.98	1.95	5.46	10.17	4.26	7.32	7.76	6.19
UCK2	7.26	10.77	10.60	19.39	15.98	14.72	17.42	32.12	24.15	50.91	55.41	49.99
UFM1	57.08	51.21	42.74	63.19	61.15	50.18	187.33	276.55	155.73	207.52	247.19	178.08
ULBP1	0.12	0.13	0.31	1.98	1.34	0.65	38.17	29.03	30.16	37.94	36.76	37.81
UPP1	13.31	14.44	8.49	6.53	6.80	7.47	52.85	42.65	51.84	44.15	32.80	39.58
USP12	27.79	37.76	33.03	38.99	47.15	44.54	130.68	216.86	107.87	213.13	267.73	166.75
USP12PX	0.32	0.70	0.91	0.86	1.26	1.53	4.08	6.40	2.84	5.19	7.34	4.73
USP13	38.20	28.10	26.93	21.68	19.07	27.95	3.83	4.79	4.44	6.55	7.84	7.00
UTP11L	5.37	7.28	6.53	13.31	11.51	10.38	22.51	38.04	25.45	32.39	38.54	32.75
UTP15	8.43	8.85	6.47	14.97	13.73	12.18	14.27	30.78	20.22	35.28	39.56	32.51
UTRN	82.35	79.87	53.53	50.57	62.26	36.66	64.52	32.35	30.63	12.47	15.48	18.34
UTS2	0.86	0.17	1.15	17.73	10.58	3.36	5.86	8.24	3.96	21.50	24.89	18.42
VAMP1	16.55	19.13	11.96	8.05	16.03	7.96	1.40	1.24	2.93	3.02	2.08	2.23
VARS	8.56	9.35	11.19	30.36	21.21	13.31	43.88	72.99	48.55	71.30	77.59	64.81
VASP	40.48	41.39	41.02	69.09	52.81	55.50	319.14	338.60	258.48	188.00	219.54	189.46
VAV1	10.56	10.90	14.02	11.80	10.21	10.52	47.85	45.70	52.19	32.43	31.08	42.95
VCP	90.40	100.04	104.34	177.51	146.11	147.58	546.28	641.87	526.25	459.89	505.90	419.35
VDAC1	25.48	26.03	32.98	82.51	58.44	59.84	160.51	190.78	191.38	162.29	167.23	166.12
VDAC1P1	7.43	5.99	9.50	19.34	13.59	14.77	40.69	41.10	46.76	44.34	41.78	43.14
VDR	1.71	2.51	4.19	139.39	103.83	35.43	14.94	19.98	35.16	67.53	66.18	98.82
VEGFA	0.93	0.55	0.55	7.24	3.01	2.71	158.35	94.89	150.27	126.25	85.98	133.31
VIPR1	5.13	6.50	10.45	1.78	2.49	5.68	0.10	0.36	0.56	0.23	0.59	1.50
VLDLR	7.68	8.62	3.11	14.31	7.95	5.24	90.44	56.65	81.87	61.27	53.15	79.34
VNN2	7.74	4.80	5.52	5.46	3.32	4.41	2.16	1.79	0.74	1.40	0.34	0.49
WARS	26.64	29.93	28.26	299.33	156.03	77.34	1080.52	1147.00	585.82	1693.52	1666.97	908.77
WARS2	4.92	6.68	4.81	11.15	12.12	7.98	18.77	33.49	21.04	22.88	33.41	26.17
WASH5P	19.31	10.57	5.12	4.51	5.40	2.53	1.94	0.40	1.41	1.25	1.49	2.15
WDFY2	41.74	43.63	44.96	23.03	26.33	41.95	16.66	11.96	19.80	7.89	8.32	12.47
WDR12	3.24	2.30	2.08	7.86	6.91	5.21	16.48	30.69	15.55	37.13	42.57	33.72
WDR27	7.05	5.35	5.15	1.56	2.57	2.93	1.34	1.16	1.25	0.77	0.98	0.77
WDR3	10.74	10.97	13.07	21.81	18.39	16.02	19.45	37.71	23.64	44.60	54.99	47.96
WDR36	14.80	19.16	15.16	41.16	38.57	24.19	30.42	56.99	42.56	72.45	94.59	68.82
WDR43	15.79	19.16	17.87	38.08	33.90	26.50	38.85	85.26	54.64	99.56	133.93	111.21
WDR46	9.84	11.62	9.74	25.20	19.86	16.99	27.73	48.70	28.78	53.12	56.26	45.46
WDR52	6.42	5.51	5.79	1.86	2.90	2.17	0.29	0.49	0.69	0.72	0.85	0.40
WDR86	23.07	13.99	14.99	5.84	6.45	8.51	2.04	1.36	2.11	1.74	1.26	1.60
WIPI1	5.91	5.14	4.08	4.40	4.08	3.12	35.22	22.53	23.26	13.87	10.89	14.72
XAF1	18.13	11.59	8.17	13.87	12.92	4.39	9.79	4.71	2.01	1.29	2.49	3.13
XBP1	102.46	91.49	109.67	153.96	101.38	145.89	825.00	648.09	654.39	467.19	439.71	536.69
XPO5	17.68	17.43	20.01	31.30	30.96	24.59	98.76	113.14	82.25	142.52	157.02	119.74
XRCC4	1.41	1.14	1.20	3.17	2.53	2.02	7.23	5.56	4.12	5.74	4.83	4.90
XYLT1	61.90	30.11	69.94	57.91	31.10	62.91	31.42	10.36	27.75	13.21	5.88	20.05
YARS	31.21	49.57	34.33	141.08	122.96	75.80	196.57	233.37	219.72	243.24	268.26	257.34
YBX1	93.07	105.38	106.95	222.03	155.86	170.33	313.79	455.61	309.02	414.54	446.59	388.86
YBX1P1	51.35	52.07	57.89	116.86	85.02	103.62	166.81	244.86	162.99	230.51	247.05	217.22
YPEL1	54.15	48.87	48.19	12.74	15.07	31.15	6.66	3.53	6.12	1.43	2.86	2.17
YPEL2	29.56	23.79	45.36	19.77	14.42	44.40	9.34	4.12	6.94	7.32	6.77	10.01
YPEL3	81.55	70.26	92.30	37.58	39.92	63.01	8.04	3.64	6.09	3.42	3.40	4.71
YRDC	8.76	9.19	9.50	16.07	14.76	10.29	69.59	124.98	65.40	121.13	130.51	91.86
YWHAE	32.17	49.57	38.79	68.60	57.62	52.83	169.35	247.96	189.40	228.59	239.09	201.50
ZAK	0.60	1.11	1.73	1.73	2.61	2.53	5.51	8.47	7.26	6.64	10.68	9.43
ZBED2	0.57	0.59	0.40	40.03	14.04	10.27	1.53	5.64	11.89	84.02	47.78	107.20
ZBTB32	0.60	0.39	0.65	0.65	0.47	0.51	145.65	177.99	70.05	158.64	155.69	72.55
ZBTB4	179.67	178.20	202.82	144.81	141.45	181.49	98.91	65.99	94.33	41.83	43.80	53.76
ZC3H12A	28.27	32.21	20.15	59.98	65.15	26.57	338.63	252.94	301.70	177.79	154.80	225.97
ZC3H12B	2.73	3.16	3.05	1.27	2.38	1.76	0.53	1.12	0.83	0.58	0.70	0.60

ZC3H6	28.18	29.21	29.49	8.59	13.92	20.90	3.78	2.96	4.26	2.62	2.71	4.82
ZC3HAV1L	23.30	13.05	27.19	6.31	4.79	21.55	3.54	1.61	6.01	3.84	3.09	5.16
ZCCHC18	7.44	7.12	10.26	2.47	2.93	7.16	0.38	0.36	0.42	0.59	0.93	0.93
ZCCHC24	5.82	6.40	6.32	4.77	3.93	6.01	2.13	1.75	2.49	0.77	1.30	2.39
ZDHHC23	3.51	3.49	2.50	2.69	2.89	4.01	1.20	0.67	2.73	0.54	0.34	1.38
ZFHX2	0.12	0.47	0.18	3.78	3.48	1.01	1.15	1.70	1.02	1.94	1.87	1.13
ZFP14	16.63	14.13	17.90	11.10	10.40	15.69	6.37	4.39	6.06	2.89	3.22	5.26
ZFP36	94.38	96.48	110.01	92.03	76.26	115.26	99.58	45.61	86.65	27.42	16.66	23.52
ZFP36L2	432.01	493.78	445.86	316.70	361.31	467.62	51.16	38.68	67.31	44.04	49.16	59.36
ZFYVE9	7.26	9.27	10.66	11.32	9.69	12.11	1.53	1.12	1.99	1.13	1.61	3.64
ZIK1	13.62	12.37	16.18	10.71	10.76	14.28	5.60	3.09	6.07	2.53	2.76	4.62
ZKSCAN3	4.79	5.11	6.77	2.33	4.03	5.49	1.54	1.34	1.74	1.67	0.85	1.58
ZMAT1	12.51	11.29	7.09	2.34	3.88	4.45	0.86	0.54	1.06	0.50	0.85	0.77
ZMYM1	9.45	9.33	6.41	5.29	8.62	5.57	4.02	2.96	3.38	1.54	1.10	2.96
ZMYM3	23.32	20.11	25.02	14.66	15.03	21.19	5.46	5.15	6.15	5.47	5.51	5.38
ZNF204P	9.48	7.47	8.84	3.17	3.48	5.42	0.96	1.16	1.90	1.49	1.53	1.66
ZNF226	15.97	14.98	15.93	9.54	12.14	12.80	2.25	3.14	2.54	2.08	1.70	2.23
ZNF238	25.78	23.37	36.55	14.05	19.38	32.25	6.23	3.09	13.19	4.29	4.92	10.97
ZNF276	60.07	57.01	59.02	16.75	26.58	29.10	12.22	10.90	9.98	11.66	10.75	11.95
ZNF33B	37.73	33.97	30.74	16.65	17.09	31.59	14.89	8.26	13.65	5.38	5.11	9.19
ZNF446	10.76	10.14	8.87	5.22	6.61	7.16	2.37	2.01	2.74	3.13	1.89	4.09
ZNF449	12.00	10.61	11.28	2.84	4.55	7.74	7.38	4.17	5.88	1.76	2.04	2.31
ZNF528	18.31	16.78	16.52	11.58	12.42	14.32	5.17	1.79	4.81	2.62	1.53	3.68
ZNF554	6.33	8.98	8.14	3.60	6.49	6.18	1.10	2.24	1.11	1.49	2.37	1.62
ZNF593	2.04	1.04	2.34	8.46	5.24	4.13	7.90	16.41	11.82	19.04	18.43	21.89
ZNF652	74.64	68.80	88.47	51.87	47.23	72.56	38.70	15.10	33.96	10.62	8.78	17.77
ZNF692	9.06	6.53	6.29	3.64	4.63	3.51	1.25	2.46	1.48	3.88	2.84	2.83
ZNF767	17.94	14.12	5.35	5.48	9.52	2.90	3.56	3.28	2.41	3.32	2.85	2.00
ZNF792	24.82	22.88	56.05	16.44	13.29	48.56	6.75	3.58	7.17	3.52	2.29	4.49
ZNF799	6.36	8.82	10.48	4.43	4.86	6.01	2.97	3.48	3.27	1.48	2.14	2.77
ZNF821	1.95	3.23	3.17	1.43	2.02	2.43	0.75	0.94	1.20	0.77	0.68	0.61
ZNF83	42.46	25.92	19.11	21.34	19.54	18.95	7.95	7.48	7.40	6.01	4.20	5.99
ZNF831	86.10	93.64	86.90	143.72	127.92	89.66	20.88	11.33	26.28	8.76	7.55	13.08
ZNF846	3.72	2.51	2.40	1.43	1.98	2.96	1.10	0.45	0.28	0.18	0.59	1.01
ZNF862	46.04	36.75	36.46	21.75	22.45	26.27	10.71	6.23	12.52	9.45	7.77	9.54
ZNHIT6	11.88	12.66	13.34	22.20	22.63	17.14	31.33	45.74	33.68	53.84	59.53	57.61
ZNRF1	11.07	9.86	18.09	14.31	13.37	13.74	44.59	47.67	73.10	26.79	27.43	45.42

Appendix Table 8. GSEA reference gene list used to probe tissue repair functions of activated MAIT cells

ANGPT1	DEFB1	HGF	MMP28	VEGFB	WNT9B
ANGPT2	DEFB6	HIF1A	MMP3	VEGFC	
ANGPT4	DHH	HMGB1	NGF	WNT1	
AREG	DISP1	IGF1	NRG1	WNT10A	
BMP2	DLL1	IGF2	NRG2	WNT10B	
BMP4	DLL3	IHH	NRG3	WNT11	
BMP7	DLL4	IL1A	NRG4	WNT16	
BTC	EGF	IL1B	PDGFA	WNT2	
CCL2	EPGN	IL6	PDGFB	WNT2B	
CCL3	EREG	INHBA	PDGFC	WNT3	
CHAT	FGF1	INHBB	PGF	WNT3A	
CSF1	FGF10	JAG1	PTGES2	WNT4	
CSF2	FGF2	JAG2	SHH	WNT5A	
CTGF	FGF22	LEP	TGFA	WNT5B	
CXCL1	FGF7	MMP10	TGFB1	WNT6	
CXCL10	FIGF	MMP13	TGFB2	WNT7A	
CXCL12	FLG	MMP15	TGFB3	WNT7B	
CXCL15	FLG2	MMP1A	THBS1	WNT8A	
CXCL2	FURIN	MMP2	TNF	WNT8B	
CYR61	HBEGF	MMP25	VEGFA	WNT9A	

C. Appendix Tables summarising key results in Chapter 4 & 5

Key findings regarding CD161-expressing cells in the gut are summarised in the following tables.

Table 6-1. The phenotype of CD161++ cells in comparison with those in healthy blood

		CD161	MAIT (of CD161++)	% of Tem	Integrin β7	CD103	CD39	PD-1
CD8+ CD161++	IBD blood	–	–	–	↓	–	–	–
	Healthy gut	–	↓	–	NA	NA	↑	↑
	IBD gut	↓	↓	–	NA	NA	↑	↑
CD4+ CD161++	IBD blood	–	NA	–	↓	–	–	–
	Healthy gut	↑	NA	↑	NA	NA	↑	↑
	IBD gut	↑	NA	↑	NA	NA	↑	↑

		PLZF	IL-18Rα	RORγt
CD8+ CD161++	IBD blood	–	–	–
	Healthy gut	↓	–	↓
	IBD gut	↓	–	↓
CD4+ CD161++	IBD blood	–	–	–
	Healthy gut	–	↑	–
	IBD gut	–	↑	–

Table 6-2. Effector functions of of CD161++ cells in comparison with those in healthy blood

		CD8+CD161++					CD4+CD161++			
		IFN-γ	TNF-α	GrB	IL-17A		IFN-γ	TNF-α	GrB	IL-17A
IBD blood	PMA/ionomycin	↑	↑	–	↑		–	–	–	↑
	E. coli	–	–	–	–		–	–	–	–
	IL-12/-15/-18/TL1A	–	–	↓	–		–	–	↓	–
Healthy gut	PMA/ionomycin	–	↑(ns)	↓	–		–	–	↓	–
	E. coli	↓	↓(ns)	↓	–		–	–	–	–
	IL-12/-15/-18/TL1A	↓	↓	↓	–		–	↓	–	–
IBD gut	PMA/ionomycin	↓	↑(ns)	↓	–		↓	–	↓	–
	E. coli	–	–	↓	–		–	–	–	–
	IL-12/-15/-18/TL1A	↓	↓	↓	–		↓	↓	↓(ns)	–

Table 6-3. The phenotype of gut CD161++ cells from inflamed tissues compared with those from healthy tissues

	CD161	MAIT (of CD161++)	% of Tem	CD39	PD-1	PLZF	IL-18Rα	RORγt
CD4+CD161++	↓	NA	–	↑	↑	–	↓	–
CD8+CD161++	↓(ns)	↓(ns)	–	↑(ns)	↑(ns)	–	–	–

Table 6-4. Effector functions of CD161++ cells from inflamed tissues compared with those from healthy tissues

	CD8+CD161++					CD4+CD161++			
	IFN-γ	TNF-α	GrB	IL-17A		IFN-γ	TNF-α	GrB	IL-17A
PMA/ionomycin	↓(ns)	–	↓(ns)	–		↓	–	–	–
E. coli	↑(ns)	–	–	–		–	–	–	–
IL-12/-15/-18/TL1A	–	–	↓(ns)	–		↓	–	↓	–

↓	Decrease
↑	Increase

D. Conference oral presentations

1. 9th CD1-MR1 Conference, Lorne, Australia, November, 2017

Title: TCR-dependent and -independent activation of human MAIT cells

2. British and Dutch Society for Immunology Congress, Liverpool, UK, December, 2016

Title: MAIT cells possess distinct cytokine- and TCR- driven effector functions

E. Conference posters

1. 9th CD1-MR1 Conference, Lorne, Australia, November, 2017

Title: TCR-dependent and -independent signals synergistically enhance human MAIT cell activation

2. European Congress of Immunology, Amsterdam, Netherlands, September, 2018

Title: Activation of human MAIT cells in the blood and gut