

## **DETECTION OF EARLY OSTEOARTHRITIS BY *IN VIVO* OPTICAL IMAGING OF AN ANTIBODY SPECIFIC TO TYPE II COLLAGEN DAMAGED BY REACTIVE OXIDANTS**

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**Purpose:** To determine if the 1-11E single chain fragment variable (scFv) or monoclonal antibody (mAb) which recognises type II collagen modified by reactive oxidant species, could serve as an imaging biomarker for early disease in experimental osteoarthritis (OA).

**Methods:** Murine OA was induced by destabilisation of the medial meniscus (DMM) in adult male mice. Immunohistochemistry of destabilised or sham-operated knees was performed at 4 and 8 weeks post-surgery with Cy5.5-labelled-1-11E scFv and compared with the negative control C7 scFv, which recognises hen egg lysozyme. Prospective *in vivo* fluorescent optical images were taken 4 and 8 weeks post DMM following intra-articular injection of Cy5.5-labeled scFvs, or intra-venous injection of Cy5.5-labelled mAbs.

**Results:** Specific staining of damaged cartilage with 1-11E in histological sections was apparent as early as 4 weeks post-DMM. There was specific *in vivo* retention of Cys5.5-1-11E scFv following local administration into the knee joint (tissue half-life>78hr, signal to noise ratio (SNR)>2.1) and specific localization of Cys-5.5-1-11E-mAb following systemic administration in the DMM-knees (SNR>1.65). In both cases, the SNR increased with time post DMM.

**Conclusions:** 1-11E binds specifically to osteoarthritic cartilage and may serve as a radiographic biomarker for OA following local or systemic delivery