

populations at risk. As part of the study of the burden of chikungunya and dengue in Kenya, we have been monitoring various climate variables (including rainfall and temperature) by satellite remote sensing and *in situ* measurements at four study locations in Kenya: inland near Lake Victoria and at the south coast of Kenya. The *in situ* measurements are to inform proximate conditions at the study locations while satellite measurements provide a broader regional view of the conditions. We compare the two sets of measurements and find a good temporal correspondence in the evolution of monthly and daily time series especially over the coastal locations. However, we find that in some instances satellite measurements may overestimate rainfall amounts at inland locations and “underestimate” over the coastal locations. This can be attributed to (a) the different rainfall types: orographic vs convective, (b) area (satellite) versus *in situ* (point) measurements and (c) the random nature of daily rainfall. When aggregated at the monthly time scale, we find a high correlation ($r = \sim 0.9$) overall for between satellite estimates of rainfall and *in situ* rainfall measurements at all sites. We also compare these measurements to vector collections and find a good agreement between rainfall and vector population peaks at all locations; however, there is a time lag (~ 1 month) between peak rainfall and the peak in vectors numbers collected. We conclude for large area surveillance, satellite derived rainfall measurements can be used to monitor conditions for vector emergence especially areas without surface observations.

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TIME COURSE OF *PLASMODIUM FALCIPARUM* GAMETOCYTE DEVELOPMENT 1 (PFGDV1) EXPRESSION AND ACTIVITY

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The development of malaria parasite sexual stages is critical for transmission, yet much remains unknown about how this process is regulated. Recently, epigenetic repression and expression of the transcription factor AP2-G have been shown to play important roles in regulating sexual commitment. However, the mechanisms that release repression and consequently allow gametocyte production are still a mystery. Our previous work demonstrated that *Pfgdv1* is required for gametocyte production. Here, we investigate the temporal relationship between PFGDV1 protein expression and gametocyte production by tagging the 3' end of the endogenous *Pfgdv1* gene with green fluorescent protein (GFP) and a ligand (Shield-1)-stabilized degradation domain (DD). Growing tightly synchronized PFGDV1-GFP-DD parasite in the presence of the stabilizing ligand, GFP expression was observed in a majority of parasites from ~ 33 -42 hours post invasion, while in the ligand's absence no GFP expression was observed along with a drastic reduction in gametocyte production and lower transcript levels for AP2-G. To determine when PFGDV1 expression is required for sexual commitment and gametocyte production, PFGDV1-GFP-DD expression was stabilized for discrete time periods and gametocyte production evaluated. Expression was only required during schizogony for optimal gametocyte production following the next cycle of RBC invasion. To evaluate PFGDV1-conditional transcriptional responses during sexual commitment, single cell RNA-seq of developing late asexual blood-stages in the presence or absence of Shield-1 ligand was performed. Using single cell resolution, we identified transcript levels of 27 genes that were significantly up-regulated upon PFGDV1 stabilization. Only two, AP2-G and MSP7-like protein (MSRP1) have previously been associated with gametocytogenesis, while five are predicted to localize to the nucleus, including ALBA1 and DNA-binding chaperone, PF3D7_1216900. Together these data suggest that PFGDV1 acts upstream of the regulation of AP2-G, prior to the release of gametocyte-committed merozoites.

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LONG-TERM *IN VITRO* CULTURE OF *PLASMODIUM VIVAX* ISOLATES FROM MADAGASCAR MAINTAINED IN *SAIMIRI BOLIVIENSIS* BLOOD

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Plasmodium vivax is the most prevalent human malaria parasite and is likely to increase proportionally as malaria control efforts reduce the impact and prevalence of *P. falciparum*. Despite the prominence of *P. vivax* as a major human pathogen, *vivax* malaria qualifies as a neglected and under-studied tropical disease. Significant challenges bringing *P. vivax* into the laboratory have limited the study of this parasite's red blood cell (RBC) invasion mechanism, blood stage development, gene expression and genetic manipulation. Patient isolates of *P. vivax* have been collected and cryopreserved in the rural community of Ampasimpotsy, located in the Tsiroanomandidy Health District of Madagascar. Periodic, these cryopreserved isolates are transported to the country's National Malaria Control Program laboratory in Antananarivo preceded onward sample transfer to laboratories at Case Western Reserve University, USA. There, the *P. vivax* isolates have been cultured through propagation in RBCs of *Saimiri boliviensis*. For the four patient isolates studied to-date the average time interval between sample collection and *in vitro* culture has been 509 days (range 166 to 961 days). The average time in culture, continuously documented by light microscopy, has been 111 days; Pv AMP2014.01 was continuously propagated for 233 days. Further studies show that the *P. vivax* parasites propagated in *Saimiri* RBC retain their ability to invade human RBCs. Long-term culture of *P. vivax* is possible in RBCs of *Saimiri boliviensis*. These studies provide an alternative to propagation of *P. vivax* in live animals that are becoming more restricted. *In vitro* culture of *P. vivax* in *Saimiri* RBC provide new strategies for investigating the molecular and cellular biology of this important malaria parasite.

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AN EX VIVO GAMETOCYTE CULTURE METHOD TO DETERMINE *PLASMODIUM FALCIPARUM* GAMETOCYTE COMMITMENT IN THE PATIENT'S PERIPHERAL BLOOD

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Malaria transmission via mosquito is vital to spread the disease, however the factors influencing the production of the sexual stage parasites required have been challenging to define. *In vitro*, commitment to sexual differentiation in *P. falciparum* begins during the trophozoite to schizont transition and leads to the production of gametocyte-committed merozoites. However, distinct gametocyte-specific morphological differences are not apparent for 4-5 days after red blood cell (RBC) invasion. By this time in the human host the early gametocyte stages have already sequestered and cannot be observed in the peripheral blood. Consequently, currently there is no way to monitor gametocyte production until 10-12 days after invasion when mature stage V gametocytes are released into the circulation. To begin to investigate this hidden stage and identify early gametocyte specific biomarkers, we developed an ex