

Plasmodium falciparum merozoite production and selectivity in red blood cell invasion in newly-adapted clones

*Nyirongo, J.¹, Pradhan S.¹, Modrzynska K.² and Ranford-Cartwright L.¹

¹School of Biodiversity, One Health and Veterinary Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, Graham Kerr Building, Glasgow, G12 8QQ, United Kingdom.

²School of Infection and Immunity, College of Medical, Veterinary and Life Sciences, University of Glasgow, Sir Graeme Davies Building, Glasgow, G12 8QQ, United Kingdom

* joyce.nyirongo@glasgow.ac.uk / 2901572n@student.gla.ac.uk

Abstract

The asexual growth rate of *Plasmodium falciparum* is linked to the pathology and severity of infection in patients. Here, two known growth rate factors, selectivity index (SI) and merozoites per schizont (MPS), have been investigated *in vitro*, using parasites recently adapted to culture from naturally infected patients from two regions in Mali. We hypothesized that parasites with higher *in vitro* growth rates would have lower SI and higher MPS values.

When *P. falciparum* parasites invade red blood cells, some cells contain single parasites, whereas others have multiple parasites. The propensity for multiple invasion of red blood cells can be defined by selectivity index (SI), which compares the observed number of multiple-infected RBCs to the number expected from a random Poisson distribution. An SI of >1 indicates more multiple-infected RBCs than expected by chance alone, and has been associated with lower parasite growth rates and virulence. To determine SI, synchronised schizont-rich cultures were allowed to re-invade red blood cells under both shaking and stationary incubation conditions, and the number of single and multiply invaded ring stages were then read by microscopy. A second factor influencing parasite growth is merozoites produced per schizont (MPS), which measures the number of new merozoites produced within a red blood cell. High MPS values indicate the potential for faster growth. To determine MPS, merozoites in mature schizonts were counted by fluorescent microscopy. We also investigated the number of merozoites produced in a red blood cell invaded by more than one merozoite compared to single invasion events, to investigate if productivity is affected in multiple invasion events. We also investigated the impact of the differences in MPS and SI on the bulk growth rate using GLM for each clone. This phenotyping data will be combined with the genotyping data for each clone to investigate how individual candidate genes contribute to each phenotype.