Mathematical modelling of the immunio-pathogenesis of the within human-host dynamics of malaria parasites

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Abstract: One of the most complex features of the malaria parasite is it's complex life cycle and the dynamic interaction of the parasite's infection with human immunity. Thus, an understanding of this interaction is important for a greater understanding how to manipulate immunity with malaria vaccination developments at different stages of the life cycle of the parasite (pre-erythrocyte , erythrocyte-asexual and sexual) and transmission blocking vaccinations.

A non linear systems of deterministic differential equation model for the within human-host dynamics of malaria parasite infection that integrates the main actors of the plasimodium parasite life cycle within a human is derived and analysed theoretically and numerically. The model captures the pathogenesis, gametocytogenesis, immunology and behavioural life characteristics of the malaria infection within a human-host.

We investigate how the choice of the birth function affects the dynamical system properties of the model. We also study the effects of the parameters and their impact on a threshold number that determines persistence of the disease.