

Master Project Proposal

Title: Impact of host-associated factors on the immunogenicity and efficacy of malaria vaccination

Synopsis:

Vaccination is one of the most effective ways to prevent disease, and a major contributor to global health. However, several factors, including nutrition, previous infections, or age, influence the immune system's ability to elicit protective immunity through vaccination.

Malaria, a mosquito-borne disease caused by *Plasmodium* parasites, is one of the most prevalent infectious diseases in the world, with almost 250 million global cases reported in 2022, and children under 5 years old representing more than two-thirds of the ensuing 608,000 deaths. Two vaccines, RTS,S/AS01 and R21/Matrix-M, have been recently recommended by WHO for the prevention of malaria in children living in endemic areas, with moderate to high reported efficacy. Other malaria vaccine candidates are currently in the pipeline for potential deployment by the WHO for use in malaria endemic countries. Among these candidates, whole-organism vaccination strategies, such as those utilizing radiation-attenuated parasites, have demonstrated remarkable efficacy, conferring sterile protection against malaria in various animal models and in human subjects.

In this project we will investigate the impact of specific host-associated factors on the formation of efficient immune responses that ensure effective vaccine-induced protection against malaria. We will evaluate the immunogenicity of whole-organism malaria vaccination in different experimental settings using murine models and rodent *Plasmodium* parasites. The methodologies employed will include *Anopheles* mosquito dissection, *in vivo* infection and immunization procedures in mice, together with multiple cellular and molecular biology techniques, such as spectral flow cytometry, real time PCR, tissue clearing, and confocal and lightsheet microscopy.

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