Malaria Vaccine: Hope And Hurdles

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Abstract
Malaria is one of the most serious infectious diseases of humans, with 300–600 million clinical cases and 1-2 million deaths annually. Efforts to develop vaccines against malaria still represent a substantial focus of current research activities. There are several categories of candidate vaccines currently being developed against malaria. However, no formulations so far have induced substantial (>50%) protection in humans. This contrasts with the full protection that has been obtained with whole parasite formulations. Indeed, full protection from Plasmodium falciparum sporozoite challenge has been induced in human volunteers immunized with radiation-attenuated sporozoites. However, the requirement for 1000 or more infective bites has precluded this method for routine vaccination. We recently showed that inoculation of mice with Plasmodium sporozoites under drug cover induced a much more potent protection than injection of radiation-attenuated sporozoites of P. falciparum in humans. The protection in humans as in mice was long lasting since 66% of volunteers rechallenged 29 months after the first challenge were still completely protected. Protection resulted from a combined effect against both liver and blood stage parasites and involved both B and T cells.

Naturally-acquired immunity to blood stage parasites develops over time in the majority of infected patients. Initially it controls parasite density and prevents pathologies with efficiency increasing overtime, and eventually leads to parasite elimination. However, this immunity develops slowly. Thus, although experimental and epidemiological data have clearly demonstrated that a protective immune response can develop against malaria, most of subunit vaccines so far have not been capable of inducing protection with sufficient efficacy. We will review and discuss what is known and what is missing to design new efficient malaria vaccines.

Selected Publications


