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Protection against heterologous *Plasmodium cynomolgi* infection in $MSP1_{inv}$ immunized toque monkeys

The merozoite surface protein-1 (MSP1) is one of the leading vaccine candidates against blood stages of malaria. The *Plasmodium cynomolgi ceylonensis* MSP1 p 19 recombinant antigen (now referred to as $MSP1_{inv}$ [1}) proved highly successful in a vaccine trial with toque monkeys [2]. As reported previously [3], we have confirmed this finding in a second trial, where 4 animals received the vaccine with Freunds complete and incomplete adjuvant, and were completely protected against a homologous challenge infection.

The objective of the present study was to examine the protective efficacy against a heterologous strain of *Plasmodium cynomolgi* after a long duration. The 4 vaccinated animals were divided into two and were challenged with asexual blood stage parasites of either *Plasmodium cynomolgi ceylonerisis* or *P. cynomolgi* Gombak six months after the first challenge. Both groups showed significant protection compared to the new unvaccinated control groups ($p<0.001$ and 0.009 respectively). Just before re-challenge the anti $MSP1_{inv}$ antibody ELISA titres were comparatively lower ($10^{4-5)}$ than at the time of challenge (10^{6}).

The IFA titres remained at ($10^{4-6)}$ against *Plasmodium cynomolgi ceylonensis* parasites which were used for the first Challenge, but were however lower against the heterologus strain *P.cynomolgi* Gombak, showing IFA titres of (10^{4-}). This indicates that there was very significant long-term protection against parasites of the heterologous (Gombak) strain as well as the heterologous (ceylonensis) strain, despite consideration of clinical trials with the analogous vaccine candidate of *Plasmodium vivax* and protection against natural infection.