IMMUNOGENICITY EVALUATION OF AN MRNA-LNP VACCINE ENCODING *PLASMODIUM VIVAX* RBP2B PROTEIN.

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ABSTRACT

Introduction:

Malaria, a life-threatening disease caused by *Plasmodium* parasites, continues to be a significant global health threat, with nearly 250 million infections and over 600,000 deaths reported annually by the WHO. Fighting malaria is particularly challenging due to the parasite's complex life cycle. However, recent technological breakthroughs such as the development of the nucleoside-modified mRNA lipid nanoparticle (mRNA-LNP) vaccine platform and the discovery of novel, conserved *Plasmodium* antigens, present new opportunities in malaria prevention. *Plasmodium vivax* Reticulocyte Binding Protein 2b (PvRBP2b), which is expressed during the merozoite stage when the parasite invades red blood cells, binds to the transferrin receptor on the surface of reticulocytes and is considered a promising vaccine candidate.

Objectives

Immunogenicity evaluation of an mRNA-LNP vaccine encoding *Plasmodium vivax* RBP2b protein as a potential *P. vivax* vaccine candidate

Methods

6-8 weeks old female Balb/c mice were immunized with one, two, and three doses of 5 µg mRNA-LNP encoding the *Plasmodium vivax* RBP2b protein administered at 28-days intervals. The antibody response was assessed by ELISA using purified recombinant RBP2b protein as the antigen, with analysis conducted up to 90 days after the final dose.

Results

After two doses of the vaccine, antibody titers exceeded log 1x10^8 in the ELISA, demonstrating that our formulation is highly immunogenic. Total IgG titers remained stable even three months after the final dose. The predominant subclasses were IgG1 and IgG2a, followed by IgG2b and IgG3. The IgG1/IgG2a ratio was 1.07, indicating a balanced Th1/Th2 immune response.

Conclusions

Our results indicate that the RBP2b-mRNA-LNP formulation is highly immunogenic, inducing a robust and sustained antibody response, with a balanced IgG subclass profile, suggesting a promising potential for the development of an effective vaccine against *Plasmodium vivax*.

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