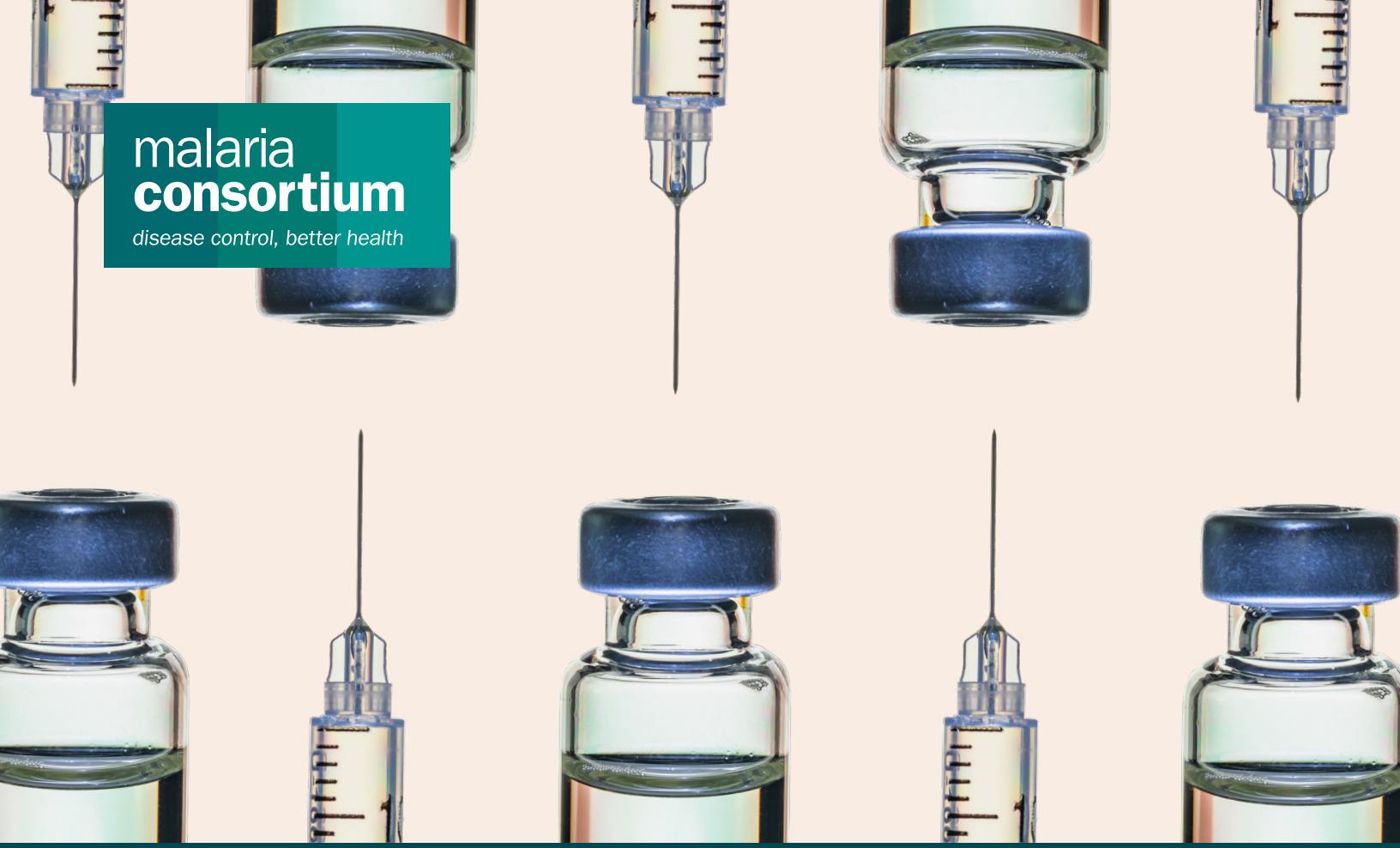


malaria consortium
disease control, better health

Vaccines: The cornerstone of disease burden reduction

Context

Infectious diseases are the leading cause of death globally of children under five and are responsible for nearly half of all child deaths annually.[1] Immunisation against these illnesses is one of the most effective means of preventing their spread and severity, and of saving lives. Vaccines are a critical tool in preventing and controlling infectious disease outbreaks and are estimated to avert 3.5–5 million deaths every year.[2] The World Health Organization (WHO) recognises immunisation as a key component of primary healthcare and an indisputable human right.[2]

Today, although we have effective vaccines for more than 20 life-threatening diseases, gaps remain. Global vaccination coverage has stalled in recent years, despite being one of the most cost-effective and relatively easy to deliver health interventions.[2] With several vaccines still under development, and limited availability of many existing ones, diseases such as Ebola and malaria continue to pose a threat to peoples' lives.

The COVID-19 pandemic illuminated the importance of investing not only in vaccine research and development, but also in vaccine manufacturing to ensure global equity across high-, middle- and low-income countries. If we are to achieve the vision outlined in the Immunisation Agenda 2030, then research and innovation, improved supply systems and country ownership are needed to develop sustainable and evidence-based decision-making for more equitable global vaccine coverage.[3]

Malaria vaccine development

In October 2021, after nearly three decades of research and development, the WHO finally announced its recommendation of the world's first malaria vaccine, Mosquirix RTS,S/AS01, for wider usage alongside current malaria prevention and control tools.[4] RTS,S/AS01 targets the exoerythrocytic cycle of the *Plasmodium falciparum* parasite (Figure 1), the species responsible for the majority of malaria deaths.[5] This vaccine is one of the first to protect against a parasitic disease in humans — all other vaccines in use today protect people against either viral or bacterial illnesses.

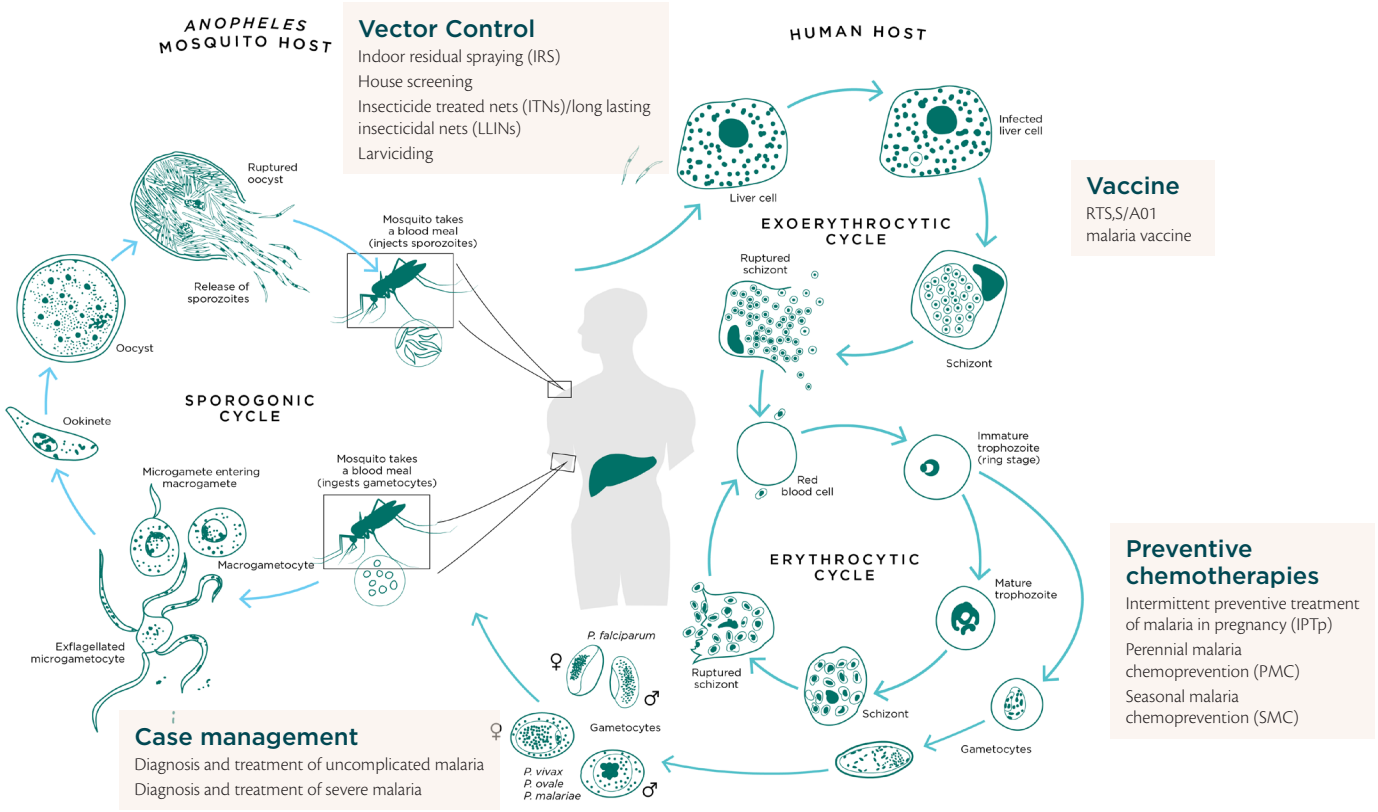
The search for a malaria vaccine — particularly one that contains antibodies that can attack the malaria parasite at multiple points in its life cycle — has remained a high priority on the global malaria agenda. Its development has been particularly challenging, however, given the complex life cycle of malaria parasites (Figure 1), along with limited understanding of the immune response to malaria infection (which varies by population and age group).[6] Not only are there many potential antigens to tackle and harness, but exposure to malaria parasites also does not confer lifelong protection.[7]

Starting in April 2019, the WHO coordinated a pilot — the Malaria Vaccine Implementation Programme (MVIP) — in Kenya, Ghana and Malawi that sought to assess the feasibility of delivering four doses of RTS,S/AS01; gauge the vaccine's potential role in reducing childhood deaths; and evaluate its safety in the context of routine use. Due to conclude in 2023/4, the country-led pilot aims to deliver RTS,S/AS01 via existing national routine immunisation programmes to 360,000 children annually. Excitingly, after just two years of implementation, the WHO announced its approval of the vaccine. So far, findings show that after the fourth dose of Mosquirix RTS,S/AS01, hospitalisations from severe malaria have declined by 30 percent.[8] Research conducted by the London School of Hygiene & Tropical Medicine in Burkina Faso and Mali (April 2017 – March 2020) indicates a decrease of more than 70 percent in severe malaria cases in children when the vaccine is seasonally administered in combination with seasonal malaria chemoprevention, compared to either measure alone.[9]

While the WHO and Gavi — the Vaccine Alliance — work to finetune the framework for allocation of limited supplies of Mosquirix RTS,S/AS01,[10] several other promising malaria vaccine candidates are currently in development. Sanaria's PfSPZ, which also targets the pre-erythrocytic stage of the *P. falciparum* parasite, has been found to be safe, well tolerated and protective against malaria.[11] Other vaccines on the horizon include the R21/Matrix-M vaccine, for which a phase 3 trial is kicking off in Burkina Faso.[12] And, in 2021, BioNTech announced[13] that the company had started work on the saRNA vaccine, for which GSK and Yale University have already submitted a patent application[14] in the United States of America.

While the global malaria community welcomes these breakthroughs in vaccine research and development, the question of how to ensure equitable distribution has emerged in the face of an extremely limited vaccine supply.

Figure 1: Life cycle of the malaria parasite and current malaria prevention and control tools



Sources: npj Vaccines,[7] CDC,[15] InTechOpen,[16] and EdX[17]

Interventions

Our position

As a leading technical organisation specialising in the prevention, control and treatment of malaria and other communicable diseases, Malaria Consortium fully recognises the immense value of immunisation in controlling and eliminating some of the world's deadliest diseases. To keep populations healthy and save lives, we believe it is crucial that the global community continues to support and invest in vaccine development.

- We urge the global and malaria vaccine communities to address **vaccine supply constraints** and manufacturing capacity issues to ensure production matches accrual needs. Working with manufacturers and procurement/financial schemes to increase supply capacity could address these constraints. Alongside this, we encourage support for vaccine manufacturing facilities in Africa, which currently imports 99 percent of all vaccines.[18]

- We believe that the effective targeting and implementation of vaccines requires **strong partnerships** at both country and global levels, backed by political commitment. Effective reciprocal knowledge sharing should be encouraged between national governments, national health programmes (such as those for malaria and immunisation), non-governmental organisations, donors and other agencies, civil society organisations, the private sector and communities.

- We support **country ownership** of vaccine interventions to ensure their sustainability, and we applaud current global efforts in this regard, as outlined in the Immunization Agenda 2030.[3] Drawing on appropriate partnerships, countries can increase the resilience of their health systems through the co-development of context-appropriate tools and solutions that will facilitate local ownership and community buy-in.

- We believe technical expertise, innovative digital health solutions and technologies, training capacities and community engagement programmes can be used effectively to support countries to ensure **widespread availability and acceptability of vaccines and equitable coverage**. We are conscious of the potential operational and reporting challenges of vaccine distribution, especially among marginalised communities and those living in vulnerable circumstances, or in remote/hard-to-reach areas. Additionally, integration of vaccine delivery for both malaria and other diseases with well-established delivery platforms — such as SMC, LLINs, IPTp, PMC and the Expanded Programme on Immunization — will further maximise the impact of existing resources and sustainability.

- We advocate for **strong, clear communications** around vaccines and their benefits to all stakeholders and communities. Approaches such as targeted social and behaviour change communications and social mobilisation will play a key role in this.

- We recommend **targeted investment into vaccine research and development**. We acknowledge that the recent malaria vaccine developments (and vaccine development for other diseases), have taken place against the backdrop of a global pandemic. We commend global efforts thus far to advance the vaccine pipeline alongside WHO's guidance on a set of preferred product characteristics.[19] We believe that the next generation of malaria vaccines will not only be more effective as a result, but will also contribute to increased availability and address equity gaps.

- We encourage the scientific community to continue to promote the **development of vaccines for other species of the malaria parasite**, such as *P. vivax*, which is most prevalent in the Americas and southeast Asia.

- We believe that the **COVID-19 vaccine development process can offer insights** into how vaccine research, development and access for malaria and other diseases, can be strengthened moving forward. We are acutely aware that development of the malaria vaccine has taken more than 30 years, while the development for a COVID-19 vaccine was successfully accelerated. We welcome the use of mRNA technology[20] to develop malaria vaccines as an important step.

- Similarly, we trust that the **lessons learnt from the RTS,S/AS01 development process** are likely to result in better, more rapid decision-making around distribution of future vaccines. Country-level decision-making processes and subnational stratification should be informed by evidence and streamlined to determine where vaccine delivery is most needed and to avoid unnecessary delays in reaching target groups.

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