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## **The Gain in Antimalarial Vaccine**

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### **Author's contribution**

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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### **ABSTRACT**

With reference my article 'How Malaria is Practically Eradicated in Malaysia – A Reminiscence' (AJRID, Jan 6, 2020), me seem to have left out writing on the present availability, role and impact of vaccines against malaria.

The only approved vaccine RTS,S, known by the trade name Mosquirix is launched in 2019 in a WHO-led implementation program piloting the vaccine, among children aged not more than 2 years, in three high-malaria countries in Africa. The vaccine has a relatively low efficacy at 26 – 50% - thus, the WHO do not recommend the vaccine in infants aged 6 to 12 weeks. It is given in 3 doses between 5 and 9 months of age and the fourth-dose at around 2 years old.

Said the WHO Director-General, 'The malaria vaccine could save tens of thousands of children's lives'.

In spite of the low-efficacy, the vaccine is safe and prevents 30% of severe malaria causing death and prevents 60% of cases of severe malaria anaemia, the most common reason children die from malaria.

The pilot-programme aim to reach around 360,000 children annually in the three country, focusing on areas with moderate-to-high malaria-transmission.

The programme is designed to provide evidence and experience toward WHO policy-recommendations on the wider use of the vaccine. The programme aim to monitor reductions in child deaths, vaccine-uptake, including whether parents are compliant.

The author find a need to write on the result of the Phase III Trial of the vaccine to be used, the RTS,S, beside outlining the basic on malaria-vaccine development.

Finally, the remaining vaccine(s) in development are talked on.

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## 1. INTRODUCTION

With reference my article 'How Malaria is Practically Eradicated in Malaysia – A Reminiscence' (AJRID, Jan 6, 2020), me seem to have left out writing on the present availability, role and impact of vaccines against malaria.

## 2. THE WHO PILOT-PROGRAMME OF THE RTS,S IN AFRICA

The only approved vaccine RTS,S, known by the trade name Mosquirix is launched in 2019 in a WHO-led implementation program piloting the vaccine, among children aged not more than 2 years, in three high-malaria countries in Africa (Source:[https://en.wikipedia.org/wiki/Malaria\\_vaccine](https://en.wikipedia.org/wiki/Malaria_vaccine)). The vaccine has a relatively low efficacy at 26 – 50% [1]- thus, the WHO do not recommend the vaccine in infants aged 6 to 12 weeks [2]. It is given in 3 doses between 5 and 9 months of age and the fourth-dose at around 2 years old.

'Progress in measures to control malaria in the last 15 years has stalled and even reversed in some areas. We need new solutions, and this vaccine gives us a promising tool,' said WHO Director-General Dr Tedros Adhanom Ghebreyesus. "The malaria vaccine could save tens of thousands of children's lives" [1].

True, in a reason that in spite of the low-efficacy the vaccine is safe and prevents 30% of severe malaria causing death and prevents 60% of cases of severe malaria anaemia, the most common reason children die from malaria [1].

The pilot-programme aim to reach around 360,000 children annually in the three country, focusing on areas with moderate-to-high malaria-transmission, where the vaccine can find greatest impact. The country are selected based on well-functioning malaria and immunization programmes, and areas with moderate-to-high malaria-transmission [1–2].

The programme is designed to provide evidence and experience toward WHO policy-recommendations on the wider use of the vaccine. The programme aim to monitor reductions in child deaths, vaccine-uptake, including whether parents bring in children on

time on the required-doses beside vaccine-safety in the context of routine-use [1].

## 3. CHEMOPROPHYLAXIS VS. VACCINATION

Although here chemo-prophylaxis, both suppressive and causal, can be 100% effective, and fairly safe, including in children [3-5], when resistant anti-malarial are avoided, chemo-prophylaxis is not suitable used in a permanent manner on the populations in endemic areas – not more than suitably used by travelers to and through such areas and by adult to whom such areas are occupational hazards. The RTS,S would not be found superior to chemo-prophylaxis in such category of people.

## 4. THE RTS,S VACCINE

RTS,S (developed by PATH Malaria Vaccine Initiative (MVI) and GlaxoSmithKline (GSK)) is the most recently developed recombinant - vaccine (Source: <https://en.wikipedia.org/wiki/RTS,S>). It is made of the *P. falciparum* circumsporozoite protein (CSP) from the pre-erythrocytic phase. The CSP antigen causes antibody-release capable of preventing the invasion of the liver-cell, beside eliciting a cellular-response causing destruction of the infected liver-cell. The CSP-vaccine presented problems in trials due to poor immunogenicity. RTS,S avoids such by fusing the CSP with a surface-antigen from hepatitis B, thus creating better potency and immunogenicity. When tested in trials, as a emulsion of oil in water and the added adjuvants of monophosphoryl A and QS21 (SBAS2), the vaccine provided immunity to 7 out of 8 volunteers against *P. falciparum* [6].

Preliminary result of a phase-III clinical-trial indicated that RTS,S/AS01 reduced the number of cases among young children by almost 50 percent and among infants by around 25 percent in whom no significant protection is seen against severe malaria. The booster-dose helped, even though overall-efficacy seem to drop with time. After four years, reductions are seen at 36 percent for children who received three doses and a booster. Missing the booster-dose reduced the efficacy against severe malaria to a negligible effect [7].

## 5. MALARIA-VACCINE DEVELOPMENT

The task of developing a preventive vaccine for malaria is a complex process including factors such as parasite diversity, choosing to address the symptom or the source, potential targets, mix of antigenic-part(s) and delivery-system [8 -13].

In 2015, a repetitive antigen-display technology had been used to engineer a nanoparticle that displayed malaria-specific B-cell and T-cell epitope(s). The particle exhibited icosahedral-symmetry and carried on the surface up to 60 copies of the RTS,S protein. The researcher(s) claimed that the density of the protein is much bigger than the 14% of the GSK vaccine [13–14].

## 6. CANDIDATE VACCINE

The PfSPZ vaccine is a candidate malaria-vaccine developed by using radiation-attenuated sporozoites to elicit immune response. Clinical-trial(s) are promising, in Africa, Europe, and the US, protecting over 80%. Some criticism is that it need to be stored in liquid-nitrogen [15].

The PfSPZ vaccine-candidate is granted fast-track designation by the U.S. FDA in September 2016 [15].

SPf66 a synthetic peptide based vaccine. The CSP (Circum-Sporozoite Protein) vaccine, the NYVAC-Pf7 multi-stage vaccine and the [NANP]19-5.1 remain disappointments [11].

## CONSENT AND ETHICAL APPROVAL

It is not applicable.

## COMPETING INTEREST

The author here state that not any Conflict of Interest exist, including between the author and producers of the product. This Letter to the Editor is not funded by the vaccine-manufacturer or the distributor.

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