

Frequently asked questions about malaria and malaria vaccines

What is malaria?

Malaria is a devastating parasitic disease transmitted through the bite of infected, female *Anopheles* mosquitoes. More than one-third of the world's population is at risk of contracting malaria, which sickens hundreds of millions of people annually and kills hundreds of thousands each year, the vast majority of them among African children under the age of five. Malaria accounts for approximately 10 percent of Africa's entire disease burden, with severe economic consequences: countries with a high incidence of malaria can suffer a 1.3 percent loss of annual economic growth. However, we are now closer than ever to introduction of the first malaria vaccine, which would be another important tool in the fight against this disease.

What are the symptoms of malaria?

Malaria causes cyclical fever and shivering, pain in the joints, headache, weakness, and repeated vomiting. In severe cases, convulsions and kidney failure can result. Complications of *Plasmodium falciparum* malaria, the most deadly strain, include acute anemia and cerebral malaria—the latter causing convulsions, coma, and death in 93 percent of children affected. In some patients who seemingly recover, another bout of malaria may occur if the treatment does not completely clear the parasite from the blood and liver.

How is malaria treated?

The World Health Organization recommends artemisinin-based combination therapy (ACT) as the front-line treatment for malaria, due to the increase of drug-resistant parasites that have rendered traditional anti-malarial drugs, such as chloroquine and sulfadoxine-pyrimethamine, ineffective. Artemisinin is a compound derived from the sweet wormwood plant and has been used for centuries in traditional Chinese medicine to treat fever. By combining artemisinin with two or more drugs that act differently and have different targets in the body, the potential for drug-resistance is delayed. This is important, as recent studies indicate that the malaria parasite might already be developing resistance to artemisinin.

What about a vaccine against malaria?

Developing a vaccine against malaria poses some unique challenges, due to it being caused by a parasite rather than a virus or bacterium. For example, a vaccine that protects against the adult form of a malaria parasite might not block the juvenile form, or it might block the parasite in the liver, but not the blood. Although a malaria vaccine is technically feasible, a vaccine against a parasite has not yet been approved for use in people, and significant human and financial

resources are needed to overcome the technical and scientific barriers to malaria vaccine development. New resources have led to considerable progress in recent years; additional resources would further accelerate progress.

What's the difference between drugs and vaccines?

Generally speaking, a vaccine is a product given to healthy people to prevent disease from occurring. It is designed to stimulate the body to develop immune responses that protect against disease. A drug, on the other hand, is a product designed to treat symptoms of a disease or act on a disease agent in the body.

How long until we have a malaria vaccine?

RTS,S, the malaria vaccine candidate the furthest along in the development process, completed Phase 3 clinical testing—typically one of the last steps before licensure. The World Health Organization has indicated that a policy recommendation for RTS,S is possible as early as 2015, paving the way for implementation in countries through their expanded program on immunization. This is much sooner than would have been likely without the renewed global interest and support for malaria vaccines witnessed over the past few years, particularly support from the US Government and other donors.

Results from a Phase 2 clinical study showed that RTS,S reduced the risk of clinical malaria by 53 percent in children aged 5 to 17 months. Another study showed that RTS,S decreased by 65 percent the risk of infection in infants over a six-month follow-up period. However, the success of the RTS,S vaccine candidate represents not an end, but a beginning for malaria vaccine development. Investment in malaria vaccine research and development must continue in order to reach the ultimate goal of eradication.

Why is a malaria vaccine important?

Many tools are needed to defeat this disease—tools that save lives today, and those with the potential to save lives in the future. A vaccine would be used along with drugs, insecticide-treated bednets, and other interventions to help reduce malaria's impact and defeat a parasite that is complex, adaptable, and has survived for millennia.

THE PATH MALARIA VACCINE INITIATIVE (MVI) is a global program established at PATH through an initial grant from the Bill & Melinda Gates Foundation. MVI's mission is to accelerate the development of malaria vaccines and ensure their availability and accessibility in the developing world. MVI's vision is a world free from malaria. For more information, visit www.malariavaccine.org.

PATH is an international nonprofit organization that creates sustainable, culturally relevant solutions, enabling communities worldwide to break longstanding cycles of poor health. By collaborating with diverse public- and private-sector partners, PATH helps provide appropriate health technologies and vital strategies that change the way people think and act. PATH's work improves global health and well-being. For more information, visit www.path.org.