Mosquito bites deliver potential new malaria vaccine

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Feeding mosquitoes.

This study suggests that genetically engineered malaria parasites that are stunted through precise gene deletions (genetically attenuated parasites, or "GAP") could be used as a vaccine that protects against malaria infection. This means that the harmless (attenuated) version of the parasite would interact with the body in the same way as the infective version, but without possibility of causing disease. GAP-vaccination would induce robust immune responses that protect against future infection with malaria.

According to the World Health Organization, there were 219 million documented cases of malaria in 2010, causing the deaths of up to 1.2 million people worldwide. Antimalarial treatments are available to reduce the risk of infection, but as yet there is no effective vaccine against the disease.

Last month, a team of scientists announced the results of a trial with a new kind of malaria vaccine, a whole-parasite preparation weakened by radiation. The trial showed promising results, but the method of vaccination was not optimal, requiring intravenous administration and multiple high doses. This current paper outlines a method of attenuation through genetic engineering rather than radiation, which offers hope for a more consistent vaccine that gives better protection.

"Malaria is one of the world's biggest killers, and threatens 40 percent of the world's population, yet still no effective vaccine exists," said Stefan Kappe, Ph.D., lead author of the paper and professor at Seattle BioMed. "In this paper we show that genetically engineered parasites are a promising, viable option for developing a malaria vaccine, and we are currently engineering the next generation of attenuated parasite strains with the aim to enter clinical studies soon."

For the first time, researchers created a weakened version of the human malaria parasite by altering its DNA. They tested the safety of the new modified parasite by injecting six human volunteers through mosquito bites. Five of the six volunteers showed no infection with the parasite, suggesting that the new genetic technique has potential as the basis for a malaria vaccine.

"Our approach offers a new path to make a protective malaria vaccine that might overcome the limitations of previous development attempts. Genetically engineered parasites potentially provide us with a potent, scalable approach to malaria vaccination," said Kappe. "Our results are very encouraging, providing a strong rationale for the further development of live-attenuated strains using genetic engineering."

More information: Kappe, S. et al. First-in-human evaluation of genetically attenuated Plasmodium falciparum sporozoites administered by bite of Anopheles mosquitoes to adult volunteers, *Vaccine*.

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