Mosquitoes deliver malaria 'vaccine' through bites

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In a daring experiment in Europe, scientists used mosquitoes as flying needles to deliver a "vaccine" of live malaria parasites through their bites. The results were astounding: Everyone in the vaccine group acquired immunity to malaria; everyone in a non-vaccinated comparison group did not, and developed malaria when exposed to the parasites later.

The study was only a small proof-of-principle test, and its approach is not practical on a large scale. However, it shows that scientists may finally be on the right track to developing an effective vaccine against one of mankind's top killers. A vaccine that uses modified live parasites just entered human testing.

"Malaria vaccines are moving from the laboratory into the real world," Dr. Carlos Campbell wrote in an editorial accompanying the study in Thursday's New England Journal of Medicine. He works for PATH, the Program for Appropriate Technology in Health, a Seattle-based global health foundation.

The new study "reminds us that the whole malaria parasite is the most potent immunizing" agent, even though it is harder to develop a vaccine this way and other leading candidates take a different approach, he wrote.

Malaria kills nearly a million people each year, mostly children under 5 and especially in Africa. Infected mosquitoes inject immature malaria

parasites into the skin when they bite; these travel to the liver where they mature and multiply. From there, they enter the bloodstream and attack red blood cells - the phase that makes people sick.

People can develop immunity to malaria if exposed to it many times. The drug chloroquine can kill parasites in the final bloodstream phase, when they are most dangerous.

Scientists tried to take advantage of these two factors, by using chloroquine to protect people while gradually exposing them to malaria parasites and letting immunity develop.

They assigned 10 volunteers to a "vaccine" group and five others to a comparison group. All were given chloroquine for three months, and exposed once a month to about a dozen mosquitoes - malaria-infected ones in the vaccine group and non-infected mosquitoes in the comparison group.

That was to allow the "vaccine" effect to develop. Next came a test to see if it was working.

All 15 stopped taking chloroquine. Two months later, all were bitten by malaria-infected mosquitoes. None of the 10 in the vaccine group developed parasites in their bloodstreams; all five in the comparison group did.

The study was done in a lab at Radboud University in Nijmegen, the Netherlands, and was funded by two foundations and a French government grant.

"This is not a vaccine" as in a commercial product, but a way to show how whole parasites can be used like a vaccine to protect against disease, said one of the Dutch researchers, Dr. Robert Sauerwein.

"It's more of an in-depth study of the immune factors that might be able to generate a very protective type of response," said Dr. John Treanor, a vaccine specialist at the University of Rochester Medical Center in Rochester, N.Y., who had no role in the study.

The concept already is in commercial development. A company in Rockville, Md. - Sanaria Inc. - is testing a vaccine using whole parasites that have been irradiated to weaken them, hopefully keeping them in an immature stage in the liver to generate immunity but not cause illness.

Two other reports in the New England Journal show that resistance is growing to artemisinin, the main drug used against malaria in the many areas where chloroquine is no longer effective. Studies in Thailand and Cambodia found the malaria parasite is less susceptible to artemisinin, underscoring the urgent need to develop a vaccine.

On the Net:

New England Journal: www.nejm.org

WHO report: apps.who.int/malaria/wmr2008/malaria2008.pdf