Malaria and Genetic Susceptibility

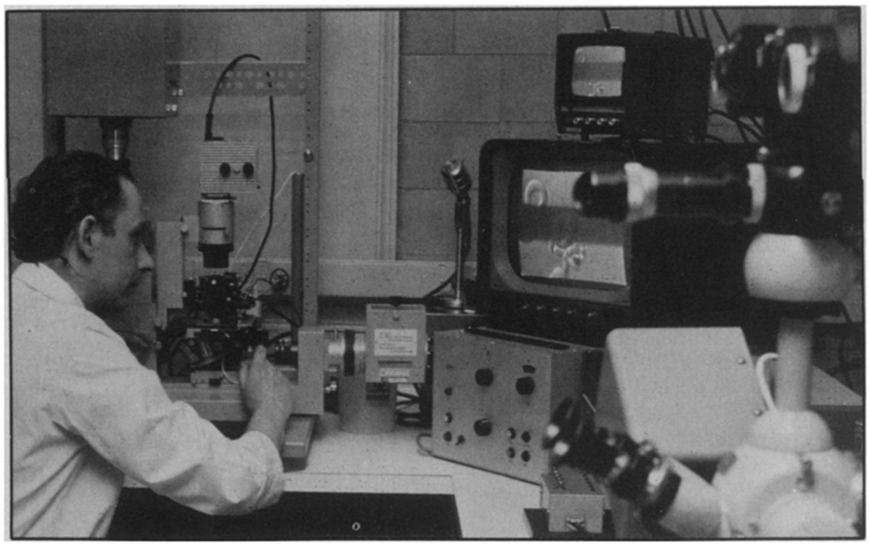
In spite of intense efforts throughout the world to combat mosquitoes that transmit malaria, the disease still kills one million people a year and debilitates 99 million others. Scientists are working feverishly from various angles to conquer the problem, and one of their approaches is to better understand how malarial parasites cause disease, with a goal of making vaccines against them.

A potentially valuable advance in this direction is reported in the Aug. 15 SCIENCE by Louis H. Miller, a parasitic disease specialist at the National Institute of Allergy and Infectious Diseases. Miller and his colleagues have come up with tough evidence that whether persons succumb to malaria is largely determined by genetics—specifically, by whether they have inherited certain receptors on their red blood cells that allow malarial parasites to invade the cells and infect them. Their findings reinforce strong primate evidence and limited clinical evidence that malarial vaccines are a practical idea. They also suggest that vaccines might eventually be made from those parts of parasites that hook up to the receptors on red cells.

West Africa is a hotbed for malarial parasites, but most West Africans are resistant to one kind that causes human disease, *Plasmodium vivax*. What's more, about 90 percent of West Africans are known to have red blood cells that lack certain types of surface receptors known as Duffy antigens a and b. This led Miller and his co-workers to suspect that West Africans' resistance to one kind of malaria might well be genetic. In other words, West Africans might lack the gene that codes for those chemical molecules on the surface of red blood cells that serve as receptors for the *vivax* parasite.

To test their hypothesis, Miller and his team took red blood cells from 11 blacks who did not have the Duffy a and b antigens, and from five whites and five blacks who did. All the cells were mixed with the malarial parasite that causes malaria in monkeys, *Plasmodium knowlesi*, and incubated. (The monkey parasite had to be used because human malarial parasites cannot yet be cultured.) Of those red cells with the Duffy a and b antigens, 80.3 percent were invaded by the parasite. In contrast, only 2.2 percent of the red cells without the antigens were.

Miller and his colleagues then used an enzyme technique to remove the Duffy a and b antigens from some of the red cells that had them. These cells were then put in the presence of the malarial parasite. The parasite couldn't get inside them, suggesting that the antigens were indeed parasite receptors. Then the team took other red cells with the antigens and coated the cells with antibodies against the antigens. These cells were also exposed to the malarial parasite. The antibody coating protected them from parasite invasion, again suggesting that the antigens were culprits in letting the parasites inside cells.



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James Dvorak watching television view of malaria parasites invading red cells.

These findings, Miller and his colleagues conclude, are strong evidence that whether people are susceptible to malaria largely depends on whether they have inherited red cell receptors for malarial parasites. The findings are not surprising, since there is increasing evidence that cell membrane receptors play critical roles in a host of diseases (see p. 110). The monkey parasite is not identical to human parasites, of course, so the evidence is not total proof.

Miller and his co-workers are now trying to work out the chemistry of the Duffy a and b antigens. "That's a big job," Miller told SCIENCE NEWS. They're also going to try to see whether there are other receptors on red cells that allow malarial parasites to enter. "Proving that there is a parasite receptor," Miller says, "gives us hope that we may be able to block parasite attachment to it through a vaccine. In fact, it might eventually be possible to isolate the substance from the parasite that attaches to the red cell receptor and to make a vaccine from it."

However, "from this statement to doing it is a long haul," Miller admits. The major obstacle is that the monkey parasite cannot be used to vaccinate people, and no one has yet been able to culture human malarial parasites. "The big breakthrough in making a polio vaccine," Miller points out, "was growing the polio virus in culture." So, only when the parasites that cause human malaria can be cultured will scientists be able to turn them or specific parts of them into massive amounts of vaccine. □

Asbestos in adhesives: Health hazard

Home repairs have their hidden costs. The weekend handyperson is exposed to various hazards in the basement, garage and workshop—electric shocks, sharp power tools, chemical sprays, ignitable liquids. Even the most seemingly benign tools and supplies can turn on you—take consumer spackling, patching and jointing compounds, for example. These mild, white adhesives, it was reported this week, might turn out to be among the most insidious of all.

Many of the commercially available compounds, used to fill in cracks and seal joints, contain asbestos fibers. This is the finding of a team from the Environmental Science Laboratory of Mount Sinai School of Medicine in New York City, headed by Irving J. Selikoff. Selikoff and his colleagues have studied the health effects of exposure to asbestos over a number of years and have determined, with diminishing room for question, that asbestos is a dangerous carcinogen. It is capable, they have shown, of inducing several kinds of tumors as well as fibrous growths in the respiratory tract.

The U.S. Occupational Safety and