# Malaria and Genetic Susceptibility

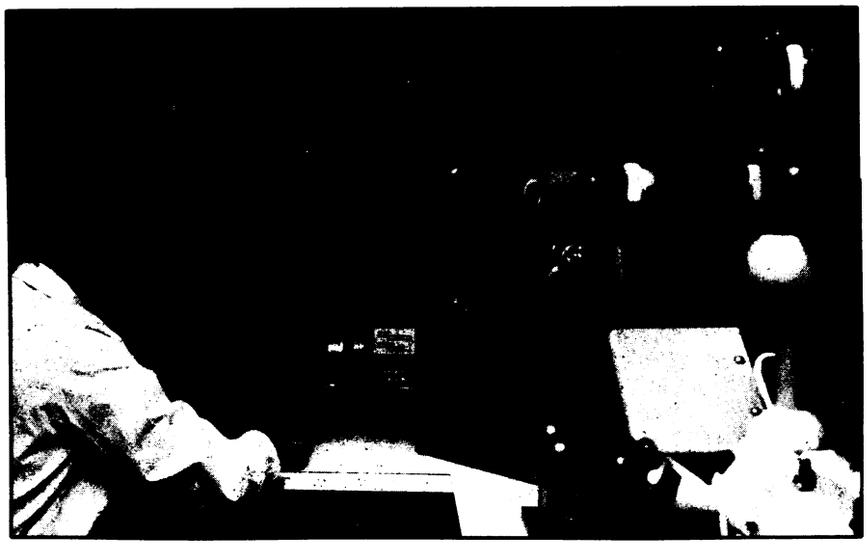
In spite of intense efforts throughout the world to combat mosquitoes that transmit malaria, the disease still kills one million people a year and debilitates 99 million others. Scientists are working feverishly from various angles to conquer the problem, and one of their approaches is to better understand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

Health Administration has set strict exposure levels for workers in asbestos-related industries, but there are no such standards for consumers in their home workshops. And home handypersons may be getting, through the use of these spackling and jointing compounds, exposure to asbestos that exceeds by several times the permissible industrial exposure.

A.N. Rohl, A.M. Langer, I.J. Selikoff and W.J. Nicholson report tests on 15 consumer spackling and jointing compounds and 10 industrial drywall taping compounds (sometimes used by consumers) in the Aug. 15 SCIENCE. They found that the two major types of asbestos fibers, talc, quartz, feldspar, mica, clay, calcite, dolomite and Plaster of Paris together constitute 80 to 90 percent of the weight of most of the products. All of these minerals, Rohl says, have been implicated in respiratory diseases or, in the case of asbestos and talc, tumor induction. Nine of the 10 industrial drywall taping compounds tested contained asbestos fibers, and most had one or more of the other suspicious mineral particulates.

Measurements of asbestos fibers in the air during three home repair tasks—mixing the powdered compounds with water, sanding the hardened compounds and cleaning up the work area—showed concentrations of asbestos frequently in excess of the current occupational standard of 5 fibers (longer than 5 micrometers) per milliliter of air. Fiber counts during mixing were 7 to 12 times greater than the standards, the team reports.

Would exposure to even high levels of asbestos fibers over, say, just a weekend, really be a significant exposure? Rohl says yes. "Even the incidental exposure—for example, of a day or so—to levels *less* than occupational exposures have been shown to produce fatal tumors," he says. "Our problem is that we haven't come to grips with the lower end of the dose-response curve. We just don't know exactly how low an exposure level can induce tumor formation, so we have to look at exposure very conservatively." Also, he says, the genetic susceptibility factors are still unknown.

The team has called for warning labels (none of the 25 tested products had warning labels) and for the elimination of potentially toxic or hazardous minerals from the compounds. In the meantime, though, Rohl says consumers should take these precautions:

- Avoid raising dust while working with spackling, patching and jointing compounds. If possible, buy premixed products.
- Smooth over moist compounds with a wet cloth instead of sanding them smooth after they harden.
- Small amounts of dust will be raised regardless of precautions. Therefore, approved respirators (white, molded face masks available commercially) should be worn. □

# An end to the 'Little Ice Age?'

One of the chief factors determining whether the world can stave off famine until population can be brought under control is the weather. After decades in which the climate over the Northern Hemisphere's critical grain growing regions had remained unusually benign, temperatures suddenly began cooling off, renewing fears that a new ice age might be upon us (SN: 3/1/75, p. 138). Average hemispheric temperatures reached a peak in 1940; having risen nearly 1.1 degrees C. in 55 years, the temperatures then plummeted nearly 0.6 degrees C. in just over two decades. By the late sixties, sea ice was threatening navigation in northern Icelandic waters, England's growing season had decreased by two weeks, and spring production of the ocean's vital phytoplankton had been markedly delayed.

Now a team of British and Icelandic researchers (R.R. Dickson, H.H. Lamb, S.-A. Malmberg, and J.M. Colebrook) report that the cooling trend seems to have reversed, at least for the North Atlantic region. The results of their studies of air pressure, temperature and ocean salinity around Iceland and Greenland are reported in the Aug. 7 NATURE.

In general, a cooling trend in the weather is accompanied by "meridional circulation" of winds in the northern temperate latitudes—a breaking up of prevailing westerlies into stagnant pressure cells that may cause abnormally long hot or cold spells for particular areas. The problem over the North Atlantic has been a stationary high pressure area over Greenland that resulted in increasing northerly winds over the Norwegian-Greenland Sea and a sharp decline in mean winter air temperature. This high pressure region almost entirely collapsed, however, in the winter of 1970-71, say the authors, apparently leading to the succession of mild winters throughout most of Europe since then.

Why the "Greenland ridge" weakened so dramatically (or formed in the first place) still remains a mystery. The change has been accompanied by increasing salinity of the ocean as measured along north-eastern Iceland, and by a general warming trend of the water, which presumably reflects "changes both in the heat loss from the sea to the atmosphere and changes in the poleward transport of warm water by the principal Atlantic current branches." Sea ice has retreated and chilling northerlies have been weakened. Conclude the authors:

"The 'little ice age' observed in northern Icelandic waters in recent years seems to have ended with an amelioration of the marine climate during 1972-74. It should be stressed, however, that this conclusion is diagnostic rather than prognostic." □

# Baboons cast the first stone

As if the rigors of research weren't enough, it now appears that some baboons have made a granite-like resolve not to be observed and have entered the stone age—with a vengeance—in order to protect their privacy. Researchers back from the Kuiseb Canyon in South West Africa bring with them the strange tale of being stoned by their research subjects—three troops of baboons. The report, by William J. Hamilton III, Ruth E. Buskirk and William H. Buskirk of the University of California at Davis, is in the Aug. 7 NATURE.

Tool use by chimpanzees and baboons has been well documented, but the use of offensive or defensive weapons by such animals has been noted in only a few accounts of chimps throwing branches at predators (including humans). Anecdotal accounts of stone throwing by baboons have generally been dismissed, say the researchers, because of the unreliability of the correspondents but mainly because of the improbability of well-aimed shots coming from an animal anatomically incapable of overhand throwing. Nevertheless, say the researchers, during the course of a one-year study of baboons, "we observed numerous incidents of stone release directed towards us."

The baboons overcame their anatomical handicap by retreating up the side of a steep canyon. From such heights, they were able to pick up stones and tumble them over the side of the cliff. Stones were "aimed" in the sense that they were released in such a way that they fell toward the observer, the stoning baboon having moved into position directly above the targeted observer. "This," say the researchers, "frequently resulted in stones whizzing over our heads. Usually we could dodge, but occasionally two or more individuals released stones at approximately the same time, complicating evasion." The mean weight of 22 stones thrown was 583 grams (more than one pound). The average weight of the stones found directly below the cliff was only 88 grams. Evidently, the baboons select relatively large stones to release toward intruders. The baboons could be persistent. When they ran out of stones, they sometimes worked vigorously to free loose rocky material from the canyon walls.

The stoning activities were accompanied by typical "wahoo" alarm and barking calls. This further identified the stone throwing as a predator-directed activity.

It appears that the safest place to observe baboons is from above. □