ally make a dent in the toll from malaria. "The people who need treatment for malaria are so poor that they can't even buy one drug," says Win L. Kilama, director-general of the National Institute for Medical Research in Dar es Salaam, Tanzania. "Why would you now expect them to buy two drugs?"

Although most scientists deferred comment until the results are published, several pointed to the potential payoff from the dual-drug approach. "Chloroquine was such a marvelous drug, and everyone was desperate when it was lost," says Wallace Peters, head of malaria chemotherapy at the International Institute of Parasitology in Herts, United Kingdom. "If this combination drug is safe and it works, it would have greatly restored the value of chloroquine."

Malaria-Free *Anopheles* Mosquitoes

Even better than an effective treatment for malaria, or even a vaccine, would be eliminating the vector itself. But because eradicating mosquitoes is a Sisyphean challenge, the next best thing may be to genetically engineer the *Anopheles* mosquito so that it can't carry the malarial parasite. Scientists have now taken the first step toward that goal, by successfully transferring foreign genes into a mosquito.

These particular genes don't affect the mosquito's ability to transmit disease, and the work was done in *Aedes aegypti*, a mosquito that transmits yellow fever and other diseases but not malaria. Still, says Vinod Prakash Sharma, director of the Malaria Research Center in New Delhi, "this is an important milestone in our understanding of the basic research behind inserting alien genes into mosquitoes."

JAMES GATHANY/CDC

Free lunch. Blocking the parasite would make *Anopheles* just another pest.

Medical entomologist Frank H. Collins of the University of Notre Dame in Indiana and Anthony James, a vector biologist at the University of California, Irvine, used genetically modified transposable elements—stretches of DNA that readily move around in the genome—to introduce foreign eye-color genes into mosquito embryos. The result: eight stably transformed lines of mosquitoes sporting altered eye colors. "Until now people always thought this could be done, but we have provided the proof to the principle," says James, who presented the work at the conference.

The next step is to identify and sequence the major genes that make certain mosquitoes resistant to carrying malaria. Once that is done, a similar technique could be used to breed a mutant of the *Anopheles* mosquito that would not transmit the parasite.

To be an effective deterrent, of course, the modified mosquitoes must also be able to establish themselves in the general population. Then there are the environmental safety issues that would surround what would be the first release of a transgenic animal species into the wild. "It's a one-way street," says Louis Miller, chief of the Laboratory of Parasitic Diseases at the U.S. National Institute of Allergy and Infectious Diseases, in Bethesda, Maryland. "You may not be able to pull the genes back once they have been pushed into the wild."

Even so, Miller and others see genetically altered mosquitoes as a promising approach in their age-old battle against the disease. "It gives you a quantum leap in technology and, at a very low cost, the hope of eliminating malaria," says Miller.

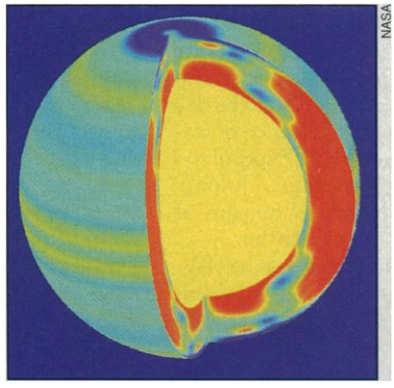
–Pallava Bagla

Pallava Bagla is a science writer in New Delhi.

SOLAR PHYSICS

SOHO Traces the Sun's Hot Currents

The mostly ionized gases of the sun's outer layers, at temperatures of hundreds of thousands of degrees, have little in common with Earth's chilly upper atmosphere. But last week researchers announced that data from the Solar and Heliospheric Observatory (SOHO) spacecraft, which watches the sun continuously from a vantage point 1.5 million kilometers sunward of Earth, have revealed rivers of solar material flowing beneath the surface of the sun near its north and south poles. The rivers look somewhat like the jet streams—narrow, high-speed air flows that encircle Earth high in the atmosphere.



NASA

Weather map. On this image of the sun, red and yellow represent faster rotation. Red ovals near the poles are "jet streams."

Reported last week at a NASA press conference, the solar jet streams are just one of several glimpses of large-scale circulation in the sun described by the SOHO team. The findings, says Douglas Gough, a Cambridge University astrophysicist, "herald what I believe will be a new era of solar meteorology." SOHO also detected other slower bands of gas flow encircling the sun, which Gough and other researchers—extending the meteorological metaphor—compared to Earth's trade winds. These complex circulation patterns, the solar researchers hope, may prove key to unraveling the mystery of the sun's 11-year cycle of magnetic activity.

The results come from SOHO's Michelson Doppler Imager (MDI), one of 12 instruments on board the European Space Agency craft. The MDI makes sensitive measurements of the undulations on the sun's surface at about 700,000 points at once. These undulations show where acoustic waves traveling through the sun reach the surface, and their frequencies and patterns hold clues to conditions in the subsurface regions probed by the waves. Although Earth-based instruments can also study these oscillations, "we would never have seen [the rivers]" from Earth, says Gough, because of the high sensitivity required to detect them.

These rivers are about 30,000 kilometers across, flowing 40,000 kilometers beneath the sun's visible surface at 140 kilometers an hour, 10% faster than the surrounding gases. The trade-wind-like bands circulate more slowly, at 30 km/hour, at depths ranging from at least 18,000 km all the way to the surface. Astronomer John Harvey of the National Solar Observatory in Tucson, Arizona, says the bands had been glimpsed from Earth as patterns on the sun's visible surface, but the SOHO data confirm "that the surface effect actually does go deeper into the sun; it's not some skin effect."

The SOHO results also confirm that the bands coincide with collections of sunspots, which are a manifestation of the sun's magnetic activity. That raises researchers' hopes that the newly discovered circulation patterns will prove key to understanding the sun's magnetic cycle. Says Gough, "We're getting these fantastic measurements, and if things go the way they went with terrestrial meteorology, this is going to enable us to have a much deeper understanding of the dynamics of the sun."

–David Ehrenstein