DEATH BY MOSQUITO

Malaria, like AIDS, is killing millions. But unlike AIDS, it can be cured. Why isn't that happening?

By CHRISTINE GORMAN

As current trends make clear, AIDS is surpassing the Black Death as the most devastating plague ever to afflict the human race. That helps explain the sense of desperation that permeated the 15th International Conference on HIV and AIDS in Bangkok last week. But in a cruel irony, all the well-deserved attention paid to AIDS over the past few years has overshadowed the rapid comeback of a second, nearly-as-deadly plague—malaria. The latest figures suggest that malaria sickened 300 million people last year and killed 3 million—most of them under age 5. (AIDS last year killed just over 3 million people.) What makes the malaria deaths particularly tragic is that malaria, unlike AIDS, can be cured.

Countries in sub-Saharan Africa have suffered the brunt of this renewed assault, but nations in temperate zones are not immune. A malaria outbreak in Florida last summer that hospitalized seven people was the first extended case of local transmission on U.S. soil in nearly 20 years. The cause was almost certainly a parasite that hopped a ride in a human or a mosquito on an international flight or ocean vessel, since none of the patients had recently ventured overseas.

Despite these setbacks, there is reason for hope. Doctors have made remarkable progress over the past few years in the treatment of drug-resistant malaria by combining several compounds—the most powerful of which is derived from an ancient Chinese herbal remedy that cures 90% of patients in three days. Meanwhile, community groups, nonprofit organizations and governments are redoubling efforts to control the mosquitoes that cause the disease through the sale and distribution of insecticide-treated bed nets and the indoor spraying of antimosquito pesticides. And after a few notably fiery fits and starts, there appears to be a real consensus among health officials about how to proceed. Certainly, the need for action has never been clearer.

Doctors have long suspected that the malaria problem was getting worse, but the most searing proof has come to light in just the past year. Researchers believe the average number of cases of malaria per year in Africa has quadrupled since the 1980s. A study in the journal Lancet last June reported that the death rate due to malaria has at least doubled among children in eastern and southern Africa; some rural areas have seen a heartbreaking 11-fold jump in mortality. "The death rates from malaria are as high as those from HIV," says Dr. Christa Hook, coordinator of the malaria working group for Doctors Without Borders. "In many ways, it's a kind of Silent Holocaust.'"

Recognition of malaria's toll on the global economy is growing. Economist Jeffrey Sachs, director of Columbia University's Earth Institute, estimates that countries hit hardest by the most severe form of malaria have annual economic growth rates 1.3 percentage points lower than those in which malaria is not a serious problem. Sachs points out that the economies of Greece, Portugal and Spain expanded rapidly only after malaria was eradicated in those countries in the 1950s. In other words, fighting malaria is good for business—as many companies with overseas operations have long understood. By the end of this year, ExxonMobil, which plans to expand activities in the sub-Saharan

THE GROWING THREAT

While the malaria problem has been de Africa has grown fourfold since the 19 doubled since then

Malaria mortality per 100,000

Sub-Saharan Africa

Worldwide

1900 1930 1950 1970 1990
THE CULPRIT

The female mosquito needs blond to produce eggs. It transmits malaria parasites when it bites.

The death rate among African children has nearly tripled its funding for antimalaria projects and research, from $2 million to $6 million. But the malaria problem is bigger than Exxon Mobil or even Bill and Melinda Gates. Government action is needed.

To better understand why malaria has become such a threat and what can be done to stop the disease, it helps to know a little biology. Malaria is caused by four closely related parasites, the deadliest of which is Plasmodium falciparum, which has a particular fondness for anopheles mosquitoes. The parasites enter the bloodstream when an infected mosquito bites a human. Then they multiply inside the host's liver and red blond tells. (That's why pregnant women, who make lots of blond to nourish their growing fetus, are especially vulnerable.) Eventually the red blond tells burst with a new generation of parasites, causing fever, shivering, pain and sometimes death. The cycle of transmission is complete when another mosquito bites an infected person and picks up more parasites.

You might expect that one bout of malaria would lead to lifelong protection against the disease. But for complicated reasons, that is not the case. The illness tends to be less severe in adults who are continually exposed to the parasites. But when young children become infected, they are much more likely to suffer severe anemia and convulsions that may lead to permanent brain damage and death.

For decades, the best treatment for malaria was an inexpensive medication called chloroquine, first discovered in Germany in 1934 by a researcher working for Bayer. Chloroquine was so effective that it seemed it might vanquish malaria forever. But by the 1970s, the drug had been used so widely to treat all kinds of fevers, not just those caused by malaria, that the malaria parasites became resistant and doctors had to turn to a second medication, called sulfadoxine-pyrimethamine, or SP. But within five years, the parasites started to develop resistance to SP as well. Today resistance to both drugs is rampant in many parts of Africa, where resistant malaria parasites are the leading cause of death.

At the same time, efforts to control anopheles mosquitoes have been more or less abandoned. Part of the problem was the realization that malaria could never be completely eradicated from tropical regions the way it had been in the U.S. and other countries in temperate zones. There was also a growing backlash against DDT, a
pesticide that is highly effective at attacking mosquitoes but whose indiscriminate use in agriculture killed many fish, beneficial insects and birds. Although only small amounts of DDT are needed to control malaria—usually in indoor-spraying campaigns—its toxic reputation made cash-starved governments in Africa, which often must rely heavily on international donors, hesitant to use it.

So much for how things got so bad. The silver lining to all this heartache is that the outlines of a workable solution have at last long emerged. No one is promising an end to all deaths from malaria. But doctors estimate that hundreds of millions of people could be spared the illness and the mortality rate could be cut in half. The catch: although astonishingly inexpensive (at least by the industrial world’s standards), an effective response is still beyond the financial resources of the poorest nations of the world, particularly those in Africa. There simply can be no progress without help from the developed world.

To be successful, any antimalaria campaign must do two things: treat the illness and the mortality rate could be cut in half. The catch: although astonishingly inexpensive (at least by the industrial world’s standards), an effective response is still beyond the financial resources of the poorest nations of the world, particularly those in Africa. There simply can be no progress without help from the developed world.

To be successful, any antimalaria campaign must do two things: treat the illness and prevent the transmission of parasites. Several pilot studies conducted in Africa have proved that combination therapy, in which at least one of the medications is derived from a plant called Artemisia annua, or sweet wormwood, easily destroys drug-resistant malarial parasites in the bloodstream. Using several drugs at once, often in the saure pill, greatly decreases the risk that the parasites will become resistant. As an added bonus, artemisinin, the active ingredient in Artemisia annua, acts very quickly, further decreasing the chances of drug resistance.

The full three-day course of treatment with artemisinin-based combination therapy costs from $1 to $10 a person, depending on whether it is purchased in the public or private sector. Unfortunately, that’s at least 10 times the price of current, albeit ineffective, treatment programs. Most impoverished African governments simply cannot afford to foot the entire bill for combination therapy and the training required to give it, and the saure holds true for the majority of their private citizens, many of whom already spend a third of their income on malaria treatment.

Although nearly every developed country and most major international aid organizations have said they are ready to help finance artemisinin-based treatment

The tools for fighting malaria are already at hand; it's just a matter of deploying them

**TREATED NETS** Impregnated with insecticide, they can be used for decades.

**Artemisia** A drug made from this Chinese herb cures 90% of patients within three days, but it is in short supply.

**DDT** When the poison is sprayed on or inside a hut, it kills mosquitoes without doing a lot of harm to the environment.

in Africa, that support has not always been forthcoming. Some health experts believe a report on artemisinin-containing therapy due out from the U.S. Institute of Medicine this week will dissolve any lingering reluctance.

And what about prevention? Many African countries are working to sell or distribute low-cost insecticide-impregnated mosquito nets. These function as traps for mosquitoes, which are attracted by the carbon dioxide that sleepers exhale and are then killed by the insecticide. The nets are portable, so they can be taken along by their owners if they need to move. In villages where at least 80% of pregnant women and children under age 5 deep beneath insecticide-impregnated mosquito nets, the rate of illness for all residents has dropped dramatically. Unfortunately, only 1% or 2% of people in malarial zones deep under mosquito nets. Also, most nets need to be retreated every six months, and they are less effective in areas where anopheles mosquitoes bite all day long instead of just at night.

A more controversial but nonetheless effective method of reducing transmission is to spray DDT inside buts and other buildings. Intriguingly, DDT is often better at repelling mosquitoes than killing them. This requires much less pesticide than was once sprayed on crops and swamps. Indeed, if DDT had been used only for medicinal purposes, it might never have acquired its toxic reputation. An international antipesticide treaty that took effect last May makes an exception for the use of DDT in malarial areas, but some health experts are worried that the bureaucratic headache of applying for an exemption will limit the effectiveness of DDT.

Recent experience in South Africa shows just how well DDT can work. In 1996 the South African government, under pressure from international and domestic environmental groups, decided to phase out its use of DDT in residential spraying and rely instead on pesticides containing pyrethroid chemicals. Unfortunately, it turned out that many anopheles mosquitoes in South Africa were resistant to pyrethroids. The number of cases of malaria, which had been hovering between 8,000 and 13,000 a year, grew steadily worse, and by the year 2000 it had reached 64,000 cases, with 423 deaths. When the government reintroduced DDT spraying in the middle of that year, the results were dramatic. The number of cases fell almost immediately.

By the end of 2001, when doctors began treating their patients with Coartem, a single, multidrug pill that includes an artemisinin derivative, the number of cases had been cut in half. In 2003 the number of deaths was down to 146.

Even environmentalists had to admit that DDT was necessary. "I wasn’t very happy about it, but we are what you’d call pragmatic conservationists," says Gerhard Verdoorn, chairman of South Africa’s Endangered Wildlife Trust, which had carried the South African government to court, arguing that it could not drop the pesticide and now helps train the 350 sprayers who are employed each year. "We can’t just look after animals and not care if people die."

That’s the kind of attitude that will make a difference in the battle against malaria. The know-how to control the disease already exists. What is not so clear is whether there is the necessary commitment-financial and political-to make it happen. -With reporting by Simon Robinson/Johannesburg

**MalariA Struck 300 Million Last Year, Killing As Many As 3 Million**