

Mass Treatment Targets Parasitic Infection

Lymphatic Filariasis, Found in 80 Countries, Rarely Kills but Destroys Lives by Causing Deformities

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One of the first things that Marc S. Micozzi did when he became director of the National Museum of Health and Medicine in the early 1990s was to move the elephantiasis leg.

Grotesquely swollen and covered with folds of thickened skin, the leg was probably the most notorious item displayed in what was once called the Army Medical Museum. For several generations of Americans, it was a vivid memory of the customary childhood trip to Washington. Even children who had only been told about it could picture the leg in their minds.

Micozzi, a physician and anthropologist who is now a professor at Jefferson Medical College in Philadelphia, didn't take the specimen off the display area entirely. But he moved the oversized glass jar that held it into an elevated case so that any child younger than about 8 would have to be lifted by an adult to see it.

That anecdote says a lot about where lymphatic filariasis—the parasitic infection that leads to the deformity known as elephantiasis—falls in the pantheon of human afflictions. It is right up there with leprosy in its ability to elicit revulsion and pity. However, unlike leprosy, which is nearly gone from the world, lymphatic filariasis (LF) remains prevalent to an extent unimagined by people in wealthy, temperate countries, where it does not exist.

Worldwide, about 40 million people have symptoms of the disease, about the same number of people infected with the AIDS virus. Blood tests show that about 120 million people are infected. About 1 billion people live in countries—about 80 in all—where there is a risk of getting the infection, which is transmitted by mosquito bites.

The disease is rarely fatal, but it nevertheless destroys lives. In the substantial minority of people who develop swelling—a condition called lymphedema—the deformity begins in young adulthood, ruining marriage prospects and stigmatizing the afflicted. In men, the swelling often occurs in the scrotum, swelling it to a size that makes sexual activity impossible.

"It is a disease of the poorest of the poor, and diseases like it tend to fall off the politicians' agendas," said David Molyneux, an expert on lymphatic filariasis at the University of Liverpool School of Tropical Medicine.

Since 2000, however, there has been a



PHOTOS FROM WORLD HEALTH ORGANIZATION

Lymphatic filariasis, a parasitic infection, causes the deformity known as elephantiasis.

concerted effort to reduce the burden of the disease through an annual, mass treatment program in areas where the infection is endemic. The goal is to eliminate lymphatic filariasis as a major public health problem over the next two decades. Eradication—getting rid of every single case, as was done with smallpox—is probably not realistic.

The strategy consists of giving people two drugs once a year. Everyone gets albendazole and one other drug—either ivermectin or diethylcarbamazine (DEC).

In parts of Africa where lymphatic filariasis coexists with river blindness, ivermectin is used. That is because ivermectin also treats the latter infection, while DEC can cause severe reactions in people with river blindness.

In other parts of the world, DEC, a chemical developed after World War II, is used. Several decades ago, China added DEC to salt and was able to eliminate LF from the country entirely.

One dose of the two drugs kills the microscopic offspring of the LF worms, called microfilaria, which circulate in the blood in concentrations as high as hundreds per milliliter. The drugs also appear to suppress for many months reproduction by the adult worms, which are about four inches long and sometimes show up in ultrasound pictures in "nests" of two or three inside vessels of the lymphatic system.

Although the drugs do not cure the disease, they have a profound effect on its spread.

When a whole population is treated at one time, the number of parasites that mosquitoes can acquire by biting people falls steeply. This, in turn, massively cuts transmission because it usually takes thousands of bites by infected insects to infect a person. (Malaria, on the other hand, is transmitted with just a few bites, which is why people traveling through malaria-infested areas readily get that disease. Those visiting LF-endemic regions almost never get filariasis.)

The plan is to treat at least 80 percent of people in LF-endemic areas for at least five years—believed to be the lifespan of the adult worms.

"The adult worms die of old age. In the meantime, we are keeping the microfilaria in the blood low enough so that there are no new infections and, therefore, no new adult worms," said Anne Haddix, a health economist who founded the Lymphatic Filariasis Support Center at Emory University in Atlanta.

Treatment costs from 10 cents to \$2 per person per year, depending largely on how well organized the program is and whether the pills are distributed by volunteers or paid workers. The cost is so low in part because GlaxoSmithKline is supplying alben-

dazole and Merck is providing ivermectin free for an indefinite period.

GlaxoSmithKline expects to donate more than \$1 billion in medicine and cash over two decades. Merck is already providing ivermectin for a similar program against river blindness.

Last year, 99 million people were treated in 32 countries, up sharply from the 34 million people treated in half as many countries in 2000. The program has generally been well accepted, organizers say, although there have been some stumbles.

In a coastal area of Haiti called Leogane Commune, about half the 150,000 residents are infected. About 1 percent of the population has elephantiasis, and about a quarter of infected men have some scrotal swelling. When the filariasis program began several years ago, 72 percent of people older than 2 took the medicines.

However, when microfilaria in great numbers are killed in the blood, their death can trigger fever, headache and nausea. That happened to many people in Leogane, and the next year only 52 percent showed up for treatment.

"So there had to be a tremendous emphasis on health education after this problem became evident," said Patrick Lammie, a researcher in the division of parasitic diseases at the Centers for Disease Control and Prevention, who helped set up the Haiti program. After an intense campaign of "social mobilization," participation rose to 78 percent in the third year.

But there have also been unanticipated benefits from the elimination of the disease.



This Ghanaian has elephantiasis in her right leg and lymphedema in her left because of lymphatic filariasis, caused by worm, insect.

The drugs that kill the LF worms also kill many other parasites (including hookworm, roundworm and whipworm) that cause anemia, lassitude and poor growth in children. A study published in January in the journal *Econometrica* found that a deworming program in Kenya led to a 7.5 percent increase in school attendance and was by far the cheapest way of decreasing absenteeism ever tried.

■ Lymphatic filariasis endemic countries and territories in 2003



SOURCE: World Health Organization