

## NEW SCHISTOSOMIASIS CONTROL STRATEGY ENDORSED

On 8–13 November 1984 a World Health Organization Expert Committee on the Control of Schistosomiasis met in Geneva and endorsed a new strategy for controlling the disease. This strategy, which emphasizes treatment of infected people, basic sanitary measures, and health education, is based on the recent development of safe and effective treatment methods. It is also founded upon a conviction that the human behavior patterns responsible for schistosome transmission can be modified, and that the incidence of the heavy infections that cause most of the actual health problems for individuals can be substantially reduced.

### Background Information

Schistosomiasis, sometimes called biharziasis after Theodore Bilharz, a young German pathologist who discovered the disease agent in 1851, is one of the most widespread of all human parasitic diseases. Among the communicable diseases it ranks second—immediately behind malaria—in terms of its socioeconomic and public health importance in tropical and subtropical areas. The most prevalent of all waterborne diseases, it constitutes one of the major health risks in the rural areas of developing countries.

Schistosomiasis is now known to be endemic in 74 developing tropical countries. It is estimated that over 200 million people residing in rural and agricultural areas—one person in 20 worldwide—are infected already, while 500–600 million more run the risk of becoming infected, living as they do amid poverty, ignorance, and substandard hygiene in poorly constructed homes with few if any sanitary facilities.

Because the parasite is spread through contact with water contaminated by human waste, children (one of whose favorite pastimes in a hot climate is swimming) tend to have the heaviest infections. In some areas, 80

to 100% of all school-age children are infected. Typically, women and girls are infected while collecting water, bathing infants, or washing clothes or dishes at the water's edge; and men are infected while engaged in fishing or farming activities. Increased rates of population movement help to propagate the infection. Tourists also contract the disease occasionally, sometimes with severe results that can include paralysis of the legs.

The symptoms of schistosomiasis include rash, coughing, chest pains, cramps, diarrhea, fever, blood in the urine, and enlargement of the spleen and liver. With reinfections occurring over a period of years, the disease can become debilitating and sometimes fatal. A specific form of bladder cancer occurring in endemic areas is also linked with long-term schistosomiasis.

Although most people in the endemic areas have light infections with no obvious symptoms, the general economic and health effects of schistosomiasis should not be underestimated. In Northeastern Brazil, in Egypt, and in the Sudan, for example, rural inhabitants typically claim that their ability to work is severely reduced as a result of the weakness and lethargy induced by the disease.

### The Disease Agent

The major forms of human schistosomiasis are caused by several species of flatworms (blood flukes) called schistosomes. Intestinal schistosomiasis caused by the species *Schistosoma mansoni* occurs in 52 countries of Africa, the Eastern Mediterranean, and the Americas. Oriental or Asiatic intestinal schistosomiasis, caused by the *S. japonicum* group of parasites, is endemic in eight countries of South-East Asia and in the Western Pacific. Another form of intestinal schistosomiasis caused by the species *S. intercalatum* has been reported from six central African coun-

tries. In addition, urinary schistosomiasis caused by the species *S. haematobium* is endemic in 53 countries of Africa and the Eastern Mediterranean.

All of these parasites lay eggs that are excreted from an infected person's body. These eggs hatch upon contact with fresh water, releasing a small life-form of the parasite called a miracidium that swims through the water by means of cilia in search of a freshwater snail in which it can develop further. The parasite must find a freshwater snail "host" within eight to 12 hours or perish.

If it succeeds in finding and penetrating a snail host, the parasite multiplies inside the snail for a period ranging from four to seven weeks, depending on the parasite species, and eventually reemerges as thousands of small organisms with forked tails called cercariae that break out of the snail and reenter the water. Like the miracidium, the cercaria has a short life (no longer than 48 hours), and it must penetrate a person's skin within that time in order to continue the parasite's life-cycle.

Once a cercaria finds a suitable human host, it uses secretions from special glands to penetrate the skin; its tail falls off; and within 48 hours it has wriggled completely through the skin into the blood vessels. Sometimes this process causes itching, but most people never notice.

Within weeks, the young parasite then transforms itself into an adult worm—either a male or a female. It then seeks another adult parasite of the opposite sex. If the search is successful, the two adults will join and will remain joined together for life (less than five years on the average, though they can live up to 40 years), the more slender female being held permanently in a groove at the front of the male's body. In intestinal schistosomiasis, the worms attach themselves to the walls of the blood vessels lining the intestines; in urinary schistosomiasis, they live in the blood vessels of the bladder. Thus situated, the pair will produce fertilized eggs that can work their way into the intestinal tract or bladder

cavity; eggs will be excreted in the infected person's feces or urine; and the cycle will start again.

### **The New Control Strategy**

For several decades schistosomiasis control efforts concentrated on eliminating vector snails through chemical spraying. Such mollusciciding programs have several disadvantages: They require long-term efforts to be effective; they are expensive; they require hard currency, specialized equipment, and trained personnel; and they can have undesirable side-effects on the environment.

Recently, the development of safe and effective drug therapy and low-cost diagnostic techniques easily applied in rural areas has made it possible to wage a "people-oriented" campaign against the disease. It is this approach, which has produced dramatic results in Brazil, Egypt, and Sudan, that lies at the heart of the WHO expert committee's new strategy—a strategy that does not abandon the concept of snail control when used in combination with other measures, but one that shifts the focus to diagnosis, treatment, and health education for the human populations involved. Specific elements of this strategy include the following: (1) health education, (2) widespread diagnosis and treatment, (3) access to latrines and safe water, (4) modification and management of the environment, (5) snail control, and (6) intersectoral cooperation in agricultural and water resource development projects. Another key point about this strategy is that it does not seek to eradicate the infection. Rather, it seeks to cure a high proportion of cases and to substantially reduce the parasite burden of the human host population.

### **Diagnosis and Treatment**

Today's techniques for detecting schistosome eggs under the microscope are cheap and simple. For diagnosis of urinary schisto-

somiasis, a simple syringe filtration technique is now recommended (using filter paper or polycarbonate or nylon filters) that makes it possible to estimate the severity of the infection by counting the number of eggs in each 10cc of urine filtered. A team of five workers can examine up to 200 children in an hour and a half.

Researchers using this technique in Ghana, Kenya, Liberia, Niger, Tanzania, and Zambia report that children with more than 50 *S. haematobium* parasite eggs per 10cc of urine nearly always exhibit hematuria. This sign, evidence of bladder disease caused by urinary schistosomiasis, can be used by primary health care workers to identify children needing treatment.

The diagnosis of intestinal schistosomiasis, performed by counting the eggs in fecal specimens, has also been simplified. A small amount of feces, pressed through a fine nylon or steel screen to remove large debris and placed under a piece of cellophane soaked in glycerine or between glass slides, can be examined quickly by a trained microscopist.

Regarding treatment, three new drugs (praziquantel, oxamniquine, and metrifonate), all of which can be taken orally, have proven safe and effective, and have revolutionized treatment of this disease.

Praziquantel, which is effective against all forms of schistosomiasis, became available thanks to a unique form of collaboration between the WHO Parasitic Diseases Program and the manufacturer. The drug was thoroughly tested in laboratories collaborating with the WHO International Agency for Research on Cancer. No mutagenic changes occurred in human or animal cells, bacteria, or yeasts exposed to the drug, and no cancer developed in experimental animals that received it constantly throughout their lives. As of mid-1984, over a million people had been treated with this drug. With respect to the other two drugs, oxamniquine is used exclusively to treat intestinal schistosomiasis in Africa and South America; and metrifonate, originally developed as an insecticide, has re-

cently proven safe and effective for the treatment of urinary schistosomiasis.

At the time the new approach based on widespread diagnosis and treatment was introduced, many physicians feared that reinfection would quickly eliminate any benefit from treatment, but these fears proved groundless. On the contrary, rapid identification of infected people and prompt treatment of all cases quickly reduced environmental contamination with parasite eggs. In most areas involved, a reduction in the overall number of cases was maintained for one-and-a-half to two years without further intervention. During this period other measures could be taken, and patients who remained infected could be re-treated.

In Brazil, over seven million doses of oxamniquine have been administered for intestinal schistosomiasis since 1975, and the prevalence of the infection in the northeastern part of the country has dropped sharply. More important, independent evaluation by Brazilian specialists in tropical medicine has demonstrated a reduction in the incidence of liver and spleen enlargement, a symptom often found in children with heavy infections.

### Health Education

It is often difficult for people to understand that their own behavior patterns—in this case patterns of human waste disposal and water use—can cause disease in themselves, their families, their friends, and others. Nevertheless, the new strategy is directed at controlling the amount of disease in human communities, and so the part played by people in the disease becomes all-important. Therefore, the strategy depends heavily on health education activities in schools and the community at large that are designed to bring about a change in behavior patterns.

Specifically, in order to control schistosomiasis, it is essential to reduce people's contacts with infected water, and to provide a potable water supply as a public health amenity

if necessary. The allocation of resources for water supplies in the endemic areas has traditionally been ruled by developmental considerations, rather than by health priorities, though there are exceptions. In 1983, for example, the budget for water supply programs in northeastern Brazil was administered for the first time by the Ministry of Health.

### **Coordination of Development Projects**

It is also true that the increasing number of water resource projects vitally needed in developing countries for industrial and agricultural expansion is a matter of great concern to schistosomiasis experts. Water impoundments of all sizes, including "man-made" lakes and irrigation systems, provide the intermediate snail host of schistosomiasis with excellent habitats and encourage close and frequent contacts between people and in-

fectured water. Of course, this is not solely a health problem. Schistosomiasis and other waterborne diseases, whether introduced by development projects or spread by them, can also hold up the completion of such projects when the construction workers or people living nearby become infected.

However, given the recent advances in diagnosis and treatment, it is possible to control schistosomiasis effectively from the moment a water development project is planned. Specifically, diagnosis and treatment of the indigenous population in the project area, of all employees of the development project and their families, and of potential migrant populations, can be used to reduce the risk that schistosomiasis will become a major public health problem.

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*Sources:* World Health Organization, "In Point of Fact," No. 21, 1984; and Press Release WHO/18, 13 November 1984.