

# Water for the World



## Methods of Controlling Schistosomiasis Technical Note No. DIS. 2.M.1

Schistosomiasis or bilharziasis is a disease that is common throughout the world. It results from poor sanitary practices and from the development of projects to promote irrigation and provide hydroelectric power to growing communities. Although schistosomiasis is not a fatal disease, it does cause a great deal of pain and discomfort. Furthermore, people are weakened by the disease and cannot be as productive as when they are healthy.

This technical note gives a brief description of schistosomiasis and discusses methods that should be taken to control its spread. Both environmental and chemical measures for controlling schistosomiasis are mentioned.

### Useful Definitions

**PARASITE** - Worms, insects or mites which live in or on other animals.

**RESERVOIR** - A natural or artificial lake where water is stored.

### Disease Transmission

Schistosomiasis which is caused by a parasitic worm that lives inside the veins of the intestine or urinary bladder affects many people who live near fresh water or irrigation projects. The parasite must spend part of its life in a snail. It is spread in the following manner:

- A person with schistosomiasis passes worm eggs in urine or feces that get into water.

- In the water, the eggs hatch as larvae which seek and enter specific types of snails.

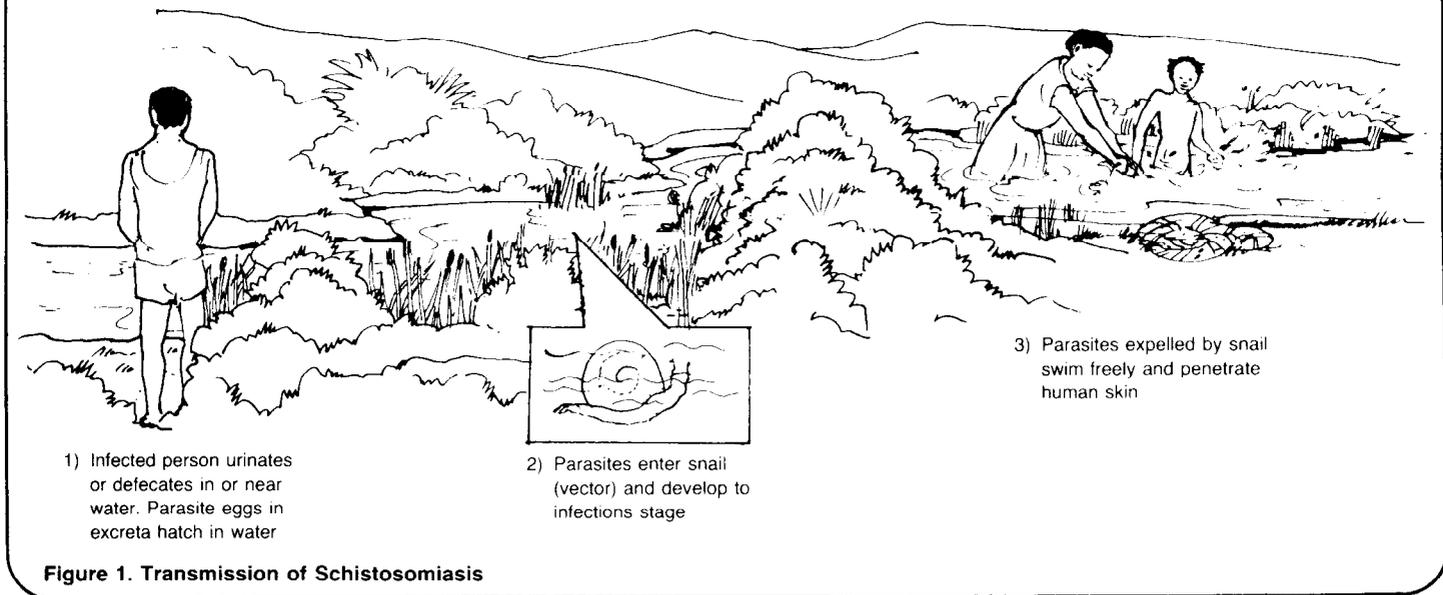
- In the snail, they form a sac in the liver where forked-tailed larvae are produced.

- Each day many scores of the larvae escape from the cyst into water where they seek contact with a person.

- On contact with skin, the parasite actively penetrates and travels through the bloodstream to the veins of the intestine or bladder. The parasites grow and lay eggs which are passed in urine or feces to continue the process of transmission. Figure 1 shows how schistosomiasis is transmitted.

Although an itchy rash can develop around the place on the skin where the parasites enter, and an affected person can have a fever and cough for two to four weeks afterwards, serious damage comes later when the worms reach adulthood and begin laying eggs. The body reacts to the eggs as they migrate through the wall of the intestine or bladder or are carried by the blood flow to other parts of the body. A person with schistosomiasis can have tumors, sores that do not heal, internal bleeding, diarrhea, a bloated abdomen caused by accumulated fluids, liver and spleen damage, and other symptoms. Sometimes the eggs can even cause heart, lung, and brain damage. Schistosomiasis is a very serious health problem. Even people who have a mild infestation can feel tired all the time, be drowsy and unable to concentrate on work, have stomach cramps and lose weight. While few people die from schistosomiasis, many people suffer a great deal because of it and die of other diseases because of their weakened condition. Since so many symptoms can indicate schistosomiasis, it can only be positively diagnosed when living eggs of the parasite are found in a stool or urine specimen, or when some other medical test is performed.

## SCHISTOSOMIASIS



If schistosomiasis is found in an area, it can be fought by interrupting the life cycle of the parasite. This can be done through: environmental control, chemical control and treatment.

### Control of Schistosomiasis

Environmental Control. Changing local conditions and practices are very important in controlling the spread of schistosomiasis. Great progress can be made with improved sanitation and more appropriate irrigation methods. The following measures are extremely useful in controlling the spread of schistosomiasis.

- Educate the people about the disease. Develop an education program that adequately explains the link between poor sanitation and the spread of the disease. Teach preventive measures.

- Encourage people to build and use latrines for both urinating and defecating. Neither urine or feces should ever be passed directly into a stream or other body of water. If health education persists people will be aware of the need to use latrines and will build them. Instruct families in the use and care of latrines so that conditions are sanitary.

- Make sure that there is an adequate supply of good quality (uncontaminated) water near the community. A protected source should provide sufficient water for drinking, bathing and washing clothes, especially in areas where there is schistosomiasis. People should be encouraged to develop good water sources and to avoid entering infected waters. Generally this is easier said than done.

- Where water supplies are contaminated with schistosomiasis, treatment is necessary to remove the schistosomes. Treatment practices such as boiling and chlorination will kill the parasites in the water. Information on water treatment is available in "Methods of Water Treatment," RWS.3. Water treatment can be done on both an individual or household level or it can be community-wide.

- Where water supplies are provided, measures should be taken to ensure that the water does not become infected. Wells should be properly constructed, cased, capped and sealed from surface run-off. Springs should be well-capped and latrines should be built down hill from water sources and at least 15m away. See Figure 2.

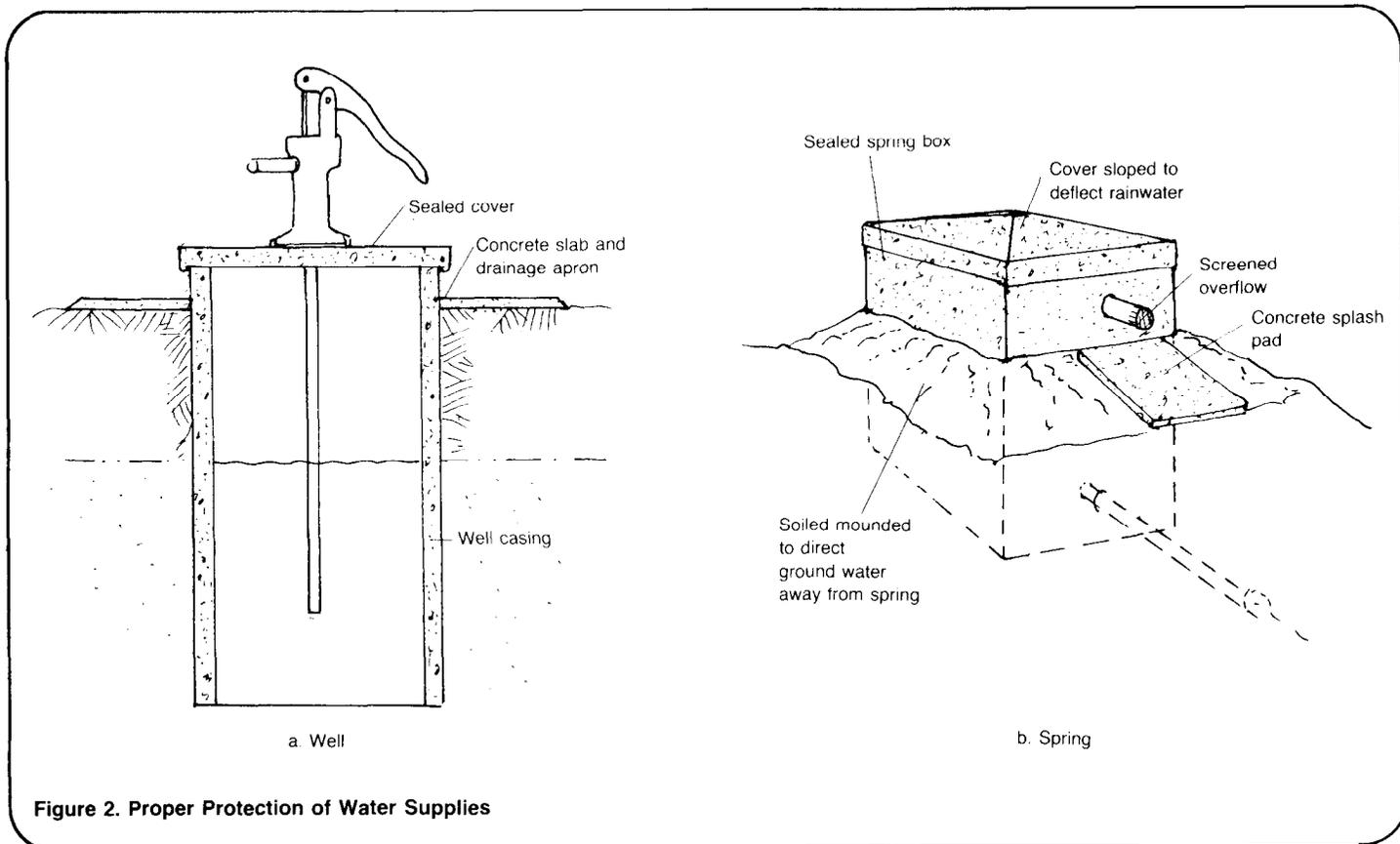


Figure 2. Proper Protection of Water Supplies

Where irrigation is used, the following procedures to limit and control snails are very important in controlling schistosomiasis.

- Eliminate standing water where snails can breed. Level the land to make irrigation more effective and reduce the chances of water forming pools. Standing water can also be channeled into a single pond which can be treated with chemicals to destroy snails. Small depressions where water can collect should be filled in.

- Build adequate drainage facilities. Either open ditch drainage or underground tile drains can be used. Underground drains are better for controlling the spread of disease, but are not generally possible for rural communities because of their cost. Open drains invite snail breeding, but control through spraying is possible. Open ditches which can be chemically treated are preferable to many small stagnant pools or wet areas that breed snails and cannot be treated. Good drainage also improves crop yields.

- Clean weeds and vegetation from streams and irrigation ditches as shown in Figure 3. Snails cling to vegetation and breed.

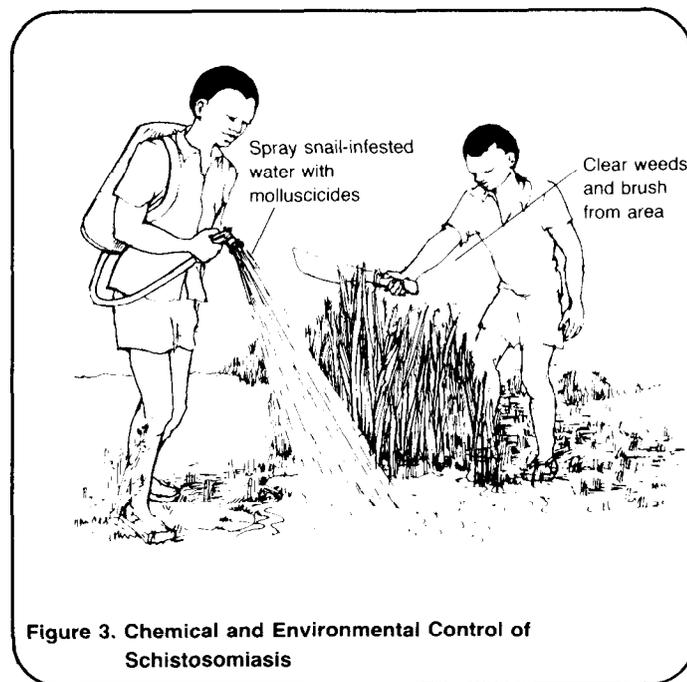


Figure 3. Chemical and Environmental Control of Schistosomiasis

- Provide for increased water flow when designing canals or line canals with concrete to increase the flow in them. Snails cannot attach themselves to canal walls when the velocity of water exceeds 0.3m/second.

- Provide a system for raising and lowering the water level in canals.

When the water level falls, many snails are stranded on the sides of canals. Many will die or be eaten by predators.

- Do not use small reservoirs to store irrigation water overnight. These reservoirs quickly become breeding grounds for snails and thus for schistosomiasis. If overnight storage is necessary, use a large reservoir and make sure it is drained completely each day.

- During high snail breeding times, plant crops do not require large amounts of water. Attempt to identify that period of time or season when the snail population seems to be the greatest.

These control measures are very important in stopping the spread of disease. They should complement a well-organized public education program stressing health and improved irrigation practices. People must be educated about the problem and definite steps must be taken to solve it.

## Chemical Control

Along with environmental methods of control, chemical control plays a very important role in reducing the spread of schistosomiasis. Chemical control of schistosomiasis depends upon the use of molluscicides, chemicals that kill snails. There are several types of molluscicides, listed in Table 1 which can be placed in the reservoirs or irrigation canals to kill the snails. The use of molluscicides has the following advantages:

- the chemicals can be put in the water by one agency, and a small group of people can treat an entire area;

- the snails are completely, or almost completely, gone for a time, so a high level of control is possible; and

- the technology for putting chemicals into the water to control snails is well known and not difficult.

There are some disadvantages to chemical use, however:

- some chemicals that kill snails also can kill fish, or water plants;

- it is possible that the snails in an area may eventually become resistant to the chemical used to kill them, though this has not happened yet;

- improper use of a chemical-- putting far too much in the water, for example--can be harmful to people; and

- chemical application must be repeated.

The following chemicals are most commonly used. Bayluscide kills snails and snail eggs. It will not harm people or animals but it does kill fish. The chemical comes in liquid or powder form. Bayluscide is used often in controlling snails because it is not difficult to use and it is powerful so that only small quantities need to be used.

Frescon (N-tritylmorpholine) kills snails but not their eggs and therefore does not provide the amount of control that Bayluscide does. Frescon does not kill fish.

Copper sulfate kills snails but is not effective in killing snail eggs. It is also safe for fish. Because of its low cost and general availability, it is widely used for killing snails.

Sodium Pentachlorophenate (NaPCP) kills snails and snail eggs. The chemical does not work well against snails which live partly on land and partly in water as sunlight dilutes its strength.

Yurimin kills both snails and their eggs.

Table 1 lists the various molluscicides and specific information on them. The choice of chemical depends upon local availability and price. Usually, mixing instructions and strength applications are given by the manufacturer. Follow all instructions carefully when using chemicals. The amount to use and the frequency of application will greatly depend on the extent of the snail problem and its reoccurrence. Chemical control should be combined with effective environmental measures to provide for a complete and safe control program.

**Table 1. Molluscicides and Their Properties**

	BAYLUSCIDE (Niclosamide)	FRESCON (N-tritylmorpholine)	COPPER SULFATE	SODIUM PENTACHLORPHENATE	YURIMIN
Does it usually kill fish?	Yes	No	No	No	No
Does it kill plants?	No	No	Yes	No	No
Does it kill snail eggs as well as adult snails?	Yes	No	No	No	Yes
Is it affected by sunlight?	Yes	---	No	Yes	No
Is it affected by whether the water is running?	Yes	No	Yes	No	---
What forms are available?	Powder, emulsion	Emulsion	Powder	Flakes, pellets, briquettes	Granules
How soluble is it?	230 ppm* (pH dependent)**	---	32%	33%	Very slight

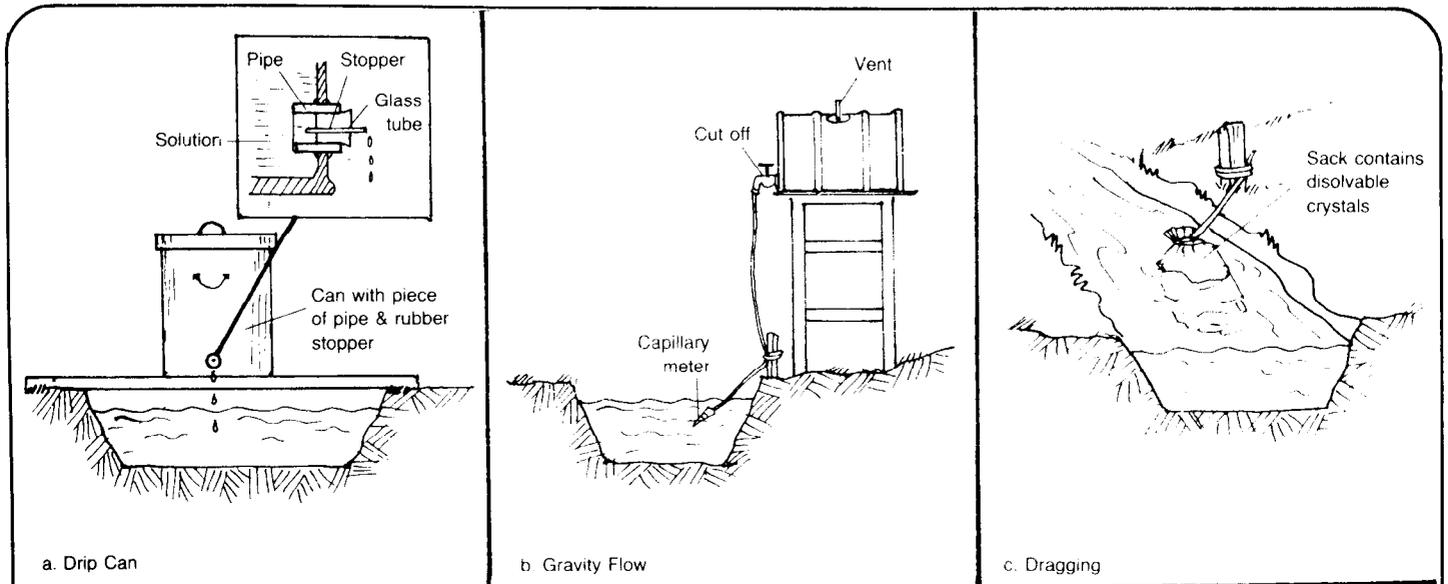
\* parts per million

\*\* how alkaline or acid the water is

Figure 4 shows various types of equipment needed to apply the molluscicides. Most require the use of a pump for spray application or else a drip feeder can be installed. A drip bag can also be developed and left to float in the water.

### Herbal Control

Endod is an Ethiopian plant which is poisonous to snails. The plant is very similar to a pomegranate. Snails avoid areas where endod grows, and those



**Figure 4. Means of Applying Molluscicides to Irrigation Ditches or Streams**

areas are generally free from schistosomiasis. In certain areas, growing endod for natural control of schistosomiasis may be possible and its use should be investigated. Endod seeds or plants could be imported and test growths done in agricultural research areas to check its suitability and effectiveness for snail-infested regions.

### **Individual Treatment**

Treatment of individuals can greatly reduce the weakening effects of schistosomiasis and help prevent further transmission of the disease. The drug Niridazole is commonly used for treatment but it does have certain bad side effects. However, treatment does not have to be stopped because of them. Niridazole is only effective in killing the adult worms and does not kill the eggs which are laid in the body and which may continue the chain of transmission.

Treatment of individuals is thus relatively ineffective unless combined with other measures. Treatment on a mass scale should only begin when the appropriate environmental and chemical control measures have been taken. A disease control program should embody all aspects of control. Latrines, water supply and other projects should be implemented along with the introduction of mollusciciding. Once there is positive evidence of people's awareness of the problem and their willingness to do something about it and control measures have been instituted, treatment should begin on a mass scale. Only then will it have a positive effect.