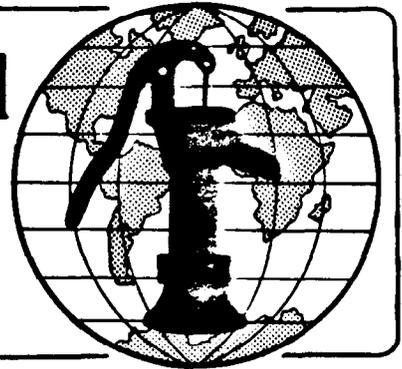


Water for the World

Methods of Improving Environmental Health Conditions

Technical Note No. DIS. 1.M.2



The improvement of people's health may require that certain changes be made in the environment. Local conditions which contribute to the transmission of disease must be changed or eliminated. Water supplies have to be protected, improved or treated. Methods for the sanitary disposal of wastes must be used, insect vectors must be controlled, destroyed or guarded against, and educational programs must be instituted to make people aware of the need to prevent disease and teach them how to do so.

In the technical note, "Means of Disease Transmission," DIS.1.M.1, several categories of diseases were outlined and the specific mode of transmission of each was discussed. This technical note describes measures that can be taken to prevent the spread of water- and sanitation-related diseases.

Useful Definitions

HABITAT - A region or area where a plant or animal grows, lives or is ordinarily found.

SPILLWAY - A channel built to control the level of water in a dam reservoir; flood water is drained from a dam through spillways.

VECTOR - An animal or insect that transmits a disease-producing organism from one host to another.

Waterborne Diseases (Water Quality Related)

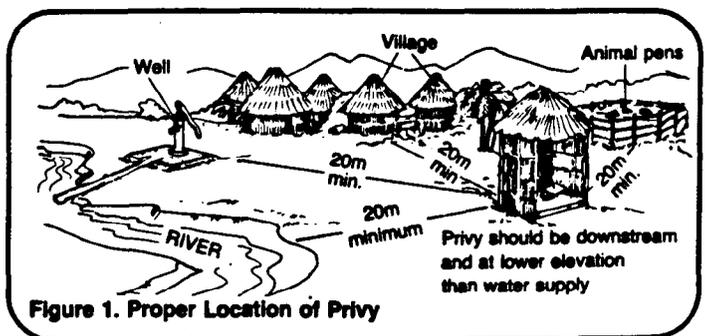
Waterborne diseases are those which are spread when the microorganisms causing them are consumed with contaminated water. Several methods of preventing water contamination and for improving the quality of water can be used. The need to biologically test

the water for evidence of fecal contamination is of great importance. Water can be tested by collecting samples and taking them to a central laboratory or by performing tests in the field using special kits. (These methods are discussed in "Taking a Water Sample," RWS.3.P.2 and "Analyzing a Water Sample," RWS.3.P.3.)

In some locations, there may not be a way to test water because of long distance to testing laboratories and lack of field equipment. If testing is impossible, the assumption that the water is contaminated should be made if conditions at the water site are such that the source is not fully protected. Furthermore, measures to improve those conditions and prevent the spread of disease should be assumed to be needed. The following measures are important for improving local environmental conditions.

- Make sure that people have and use sanitary latrines. The community members should be educated about the need for latrines and how their use can reduce the spread of serious disease.

- Educate the people in where to locate latrines and how to construct them properly. All latrines should be located at least 15m from the nearest source of water. They should be at a lower elevation than the water source to ensure that contamination through seepage is prevented. See Figure 1.



- Be sure that the pit does not puncture an aquifer. Latrine seepage that enters an aquifer can contaminate ground water (wells) and spring water supplies.

- Protect all wells and springs against contamination from surface runoff. Cap springs with spring boxes. Finish wells with a well head. Make sure that the well shaft is cased with concrete rings, pipe or brick. No surface water should seep into wells. See Figure 2.

- Control the breeding of flies by disposing of garbage and animal manure in a sanitary manner, and covering latrine openings when not in use. All community garbage should be disposed of in a sanitary landfill, while individual disposal can be achieved by digging small pits where rubbish can be burned and garbage buried. See Figure 3.

To control Guinea worm, eliminate all step-wells where the skin of water carriers can come into contact with

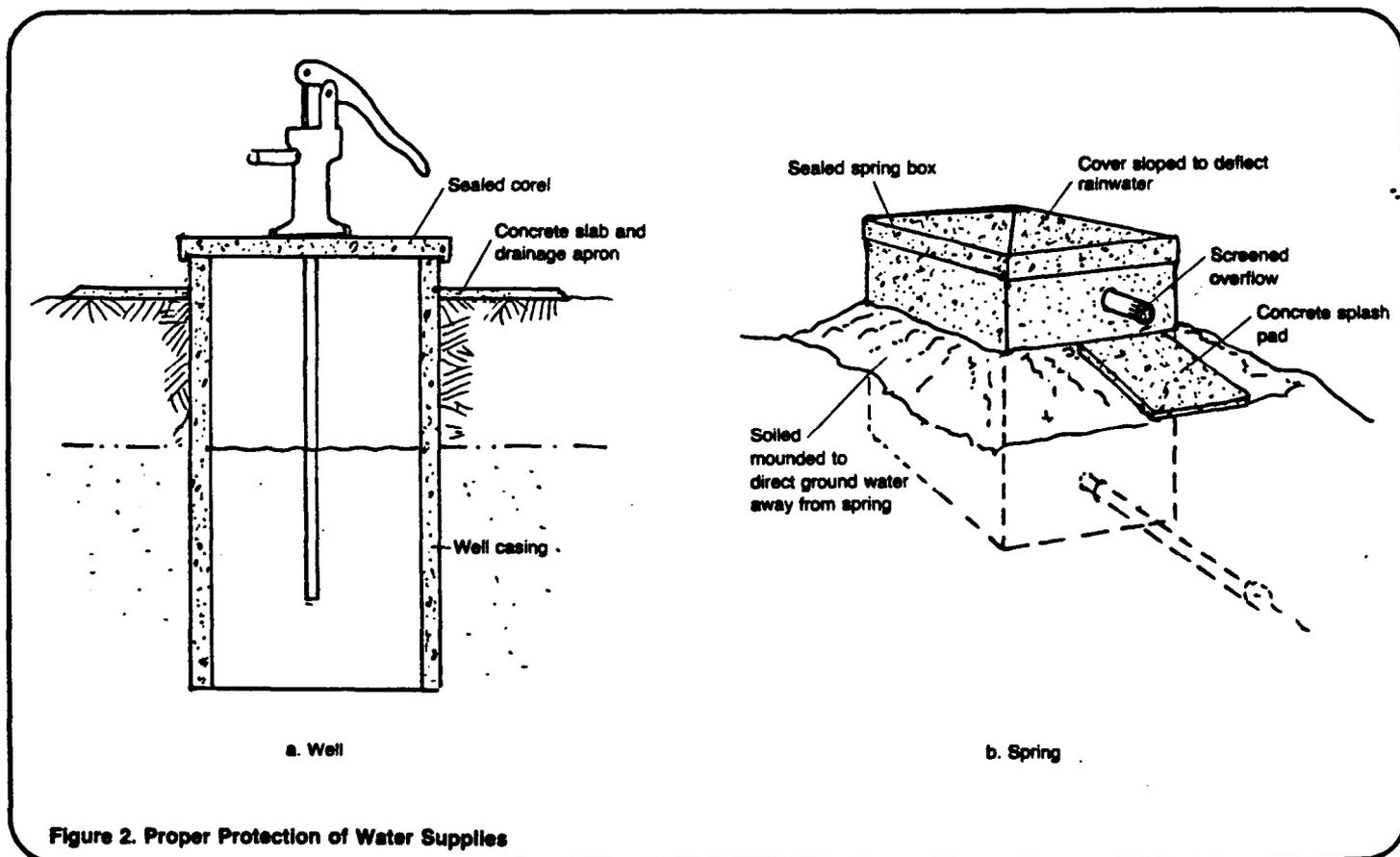


Figure 2. Proper Protection of Water Supplies

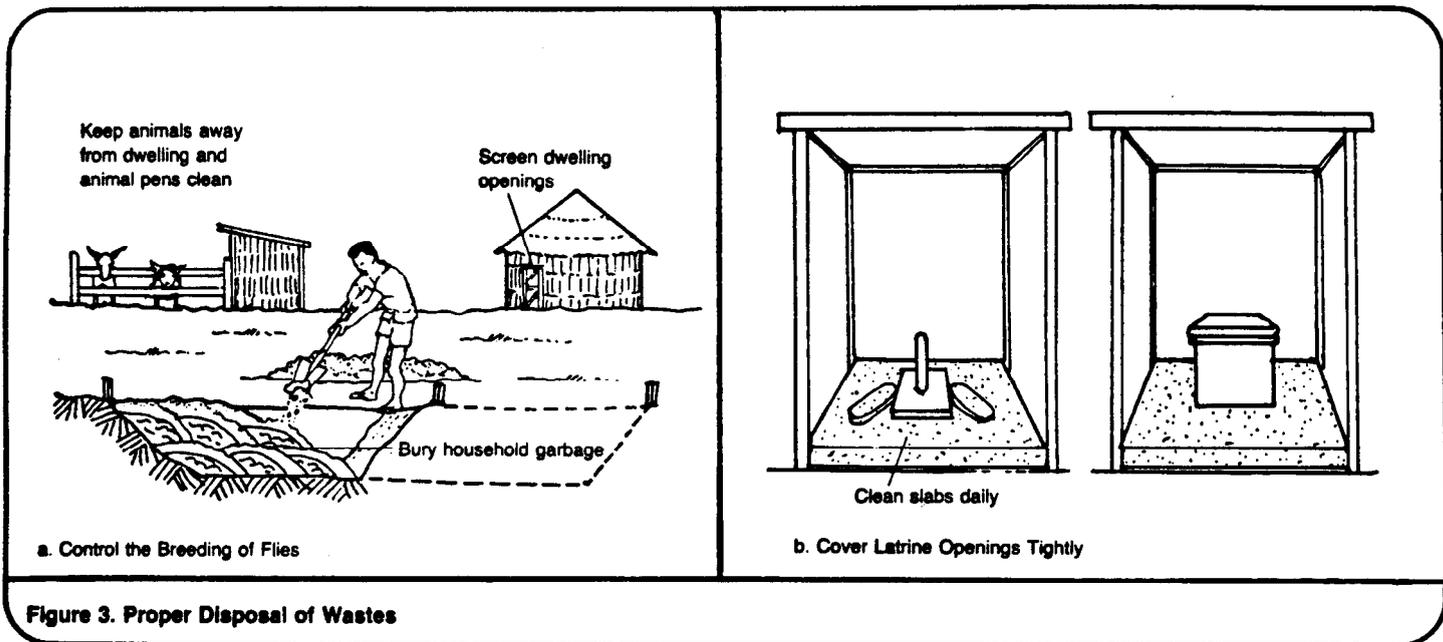
- For surface sources, especially those providing large quantities of water, set up an intake that allows for filtration of water before it enters storage. Filtration may not be sufficient to purify water and some form of treatment may be needed.

- Provide for treatment (further filtration or chlorination, for example) to purify water if needed. For household supplies, water can be boiled or chlorinated and stored in clean containers.

the water in the well thereby permitting the release of worm larvae into the water. Treat all water taken from open ponds or wells that might be contaminated with infected water fleas by filtering, chlorinating, or boiling it before drinking. These treatments will kill the larvae before they can infect a person.

Water-Washed Diseases (Water Quantity and Accessibility Related)

These diseases are ones which can be prevented by the provision of sufficient quantities of safe water. To



prevent the spread of water-washed diseases, people should be educated and motivated to practice personal and family hygiene. Washing of hands and bathing in clean water are very important. Clothes and dishes should also be washed to ensure that skin diseases are not passed to people by contaminated hands, clothing, or utensils. The same wash water should not be used by more than one person. Common use of towels should be avoided.

In order to improve hygiene practices, sufficient, convenient quantities of water are needed. A method of developing a water supply of sufficient quantity, adequate quality and easy accessibility and reliability should be chosen with the involvement of the community. The source should be well-protected to prevent contamination of the water supply.

Water-Contact Diseases (Body-of-Water Related)

Water-contact diseases are those which people get from having skin contact with water containing larval worms. There are both environmental and chemical means for controlling the spread of water-contact diseases.

Schistosomiasis is the major disease in this category. Schistosomiasis is controlled by breaking the chain of transmission at several points. The

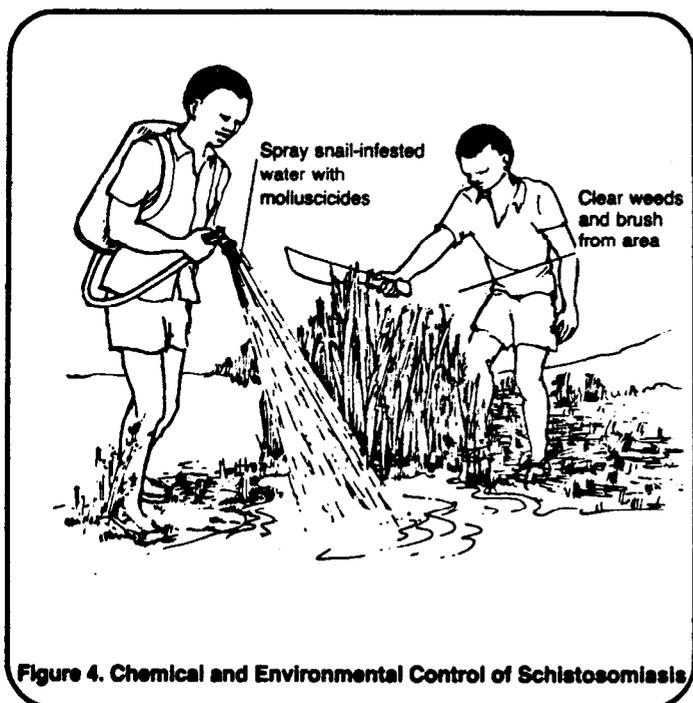
following measures should be followed when attempting to control the spread of schistosomiasis.

- Encourage people to build sanitary facilities and use them. If the eggs in the feces and urine do not reach water they will die, preventing the infection of the snails. This method is useful but is only truly successful if everyone uses latrines for both urinating and defecating. Assurance that everyone over a large area would use them is impossible. Therefore, this method must be combined with a reduction of the snail population and by limiting human contact with infected waters.

- Reduce the snail population. In irrigation schemes, drainage ditches are better environments for snails than irrigation canals. Where drainage ditches are necessary, they must be treated regularly with chemicals that kill snails. When canals are built, line them with a smooth surface like concrete and provide for a rapid flow rate. Smooth surfaces are not attractive to snails and a fast flow of water removes them.

- Maintain the banks of all irrigation canals and bodies of water. Vegetation slows water flow and provides a good environment for snail

growth. Keep vegetation and weeds away from canals and beach areas. See Figure 4.



Water-Related Insect Vectors (Water Site Related)

Diseases that fall into this category are caused and spread by insects that breed in water or in damp, high humidity environments near water sources. Several measures can be taken to control the populations of mosquitoes, tsetse flies, and blackflies which spread malaria, yellow fever, sleeping sickness (trypanosomiasis) and river blindness (onchocerciasis).

Control of virtually all these diseases involves the elimination of the mosquitoes and flies through environmental or chemical means. Although the application of both aerial and ground spraying of insecticides has proved very effective, there are questions about the environmental effects of using them on a large-scale for a long time. Chemical control is sure to continue, but other methods should also be incorporated into vector control plans.

- Drain large standing pools of water and fill in swampy areas to prevent the snails from breeding. Whenever possible, avoid the creation of small reservoirs or pools of water. These environments are very attractive to snails.

- Use chemicals that kill snails molluscicides. They are quite effective in controlling the snail population. Local spraying is the common method of applying molluscicides to water and is quite successful for irrigation projects. See Figure 4. Aerial spraying has also proved effective in many places. The application of molluscicides is less successful in large bodies of water because the water volume dilutes the molluscicides. Only if a specific local site on a large water body is treated with chemicals will success be achieved.

Swimming, bathing and clothes washing in infected water should be avoided. Whenever possible, houses and settlements should be located away from infected waters. In all settlements, both new and existing, potable, piped water systems should be developed. Safe water should be provided in sufficient quantities for drinking, bathing and washing.

- Control of the tsetse fly which transmits sleeping sickness can be achieved by changing the environment where flies breed. One method is bush clearing along water courses and around villages. An attempt should be made to use cleared areas for permanent agriculture or settlement and thereby keep the land clean of bush.

- Blackflies, which spread river blindness (onchocerciasis), breed in rapidly flowing rivers. Chemical means are the best control for blackflies but some alternative measures can be developed. When dams are built in fast-flowing streams and rivers, the upstream lakes cover the rapids and destroy the breeding areas of the blackfly. Spillways should be built on the vertical face of the dam to avoid creating a new breeding place for the flies.

Mosquitoes transmit both malaria and yellow fever. The control of these insects is important both on a large-scale and an individual household basis.

Large-scale measures other than spraying chemicals include the draining and filling of wet, swampy places where mosquitoes breed.

Smaller-scale and individual measures should also be taken to control the breeding of mosquitoes. All possible standing water where mosquitoes could breed should be covered. Water storage jars and wells are particularly attractive breeding places for mosquitoes. Standing water in gutters should be removed and gutters should be sloped to remove water. At well sites, do not permit water to pool. Some sort of drainage should be built to move water away from the site and measures should be taken to prevent pools of water from developing. Remove any garbage where pools of water can collect and cover latrines so that mosquitoes cannot breed inside. Figure 5 shows some individual preventive measures.

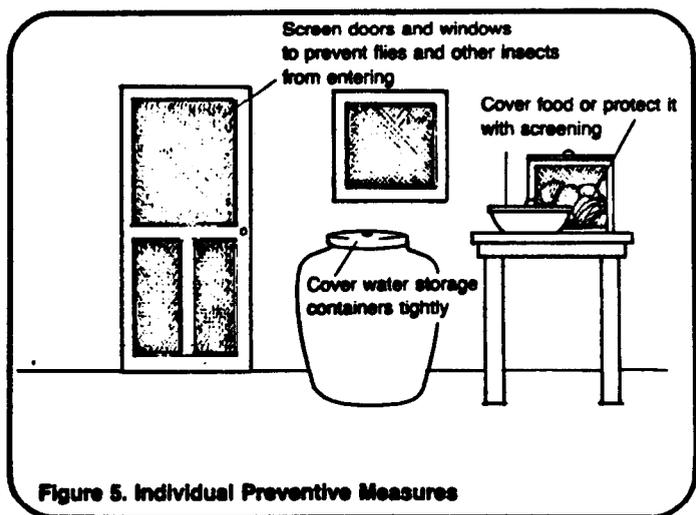


Figure 5. Individual Preventive Measures

These measures, coupled with spraying and a program of health, education will greatly help reduce the growth of the mosquito population.

Sanitation-Related Diseases (Fecal polluted soil related)

Diseases in this category, such as hookworm and roundworm, are a direct result in fecal pollution of soil and the lack of knowledge about good hygiene practices. These diseases can be controlled by relatively simple environmental improvements.

- Educate people on the need to use latrines and train children to use them at a very early age. Diseases are sure to be spread where human wastes are deposited on the ground or in rivers and streams.

- Make sure that all latrines have covers to prevent insects from breeding in the latrine pit.

- Provide sufficient quantities of water to ensure that people can practice personal hygiene. Make sure that people understand the need to wash their hands before eating and after defecating.

- Develop ways to keep flies off food. Screen areas where food is stored. Spraying the home periodically will keep flies and cockroaches away from food.

- Keep animals from entering the home and from coming into close contact with young children. Feces from animals can also spread disease.

Summary

Methods for controlling the spread of disease range from very simple and inexpensive family-oriented approaches to large-scale, more expensive community, regional and national programs. The choice of method will greatly depend on the circumstances, the problems to be remedied and the resources available. Generally, no single method will prove sufficient and a combination of methods is necessary.

The simplest methods of control are those which can be instituted by the construction of simple water systems and sanitary waste disposal systems. These systems are discussed at length in the technical notes on rural water supply and sanitation. See "How to Use Technical Notes," HR.G, for a full list of technical notes.

No successful control program can be developed unless people are educated about the need for a system. A thorough health education program must be developed so that people recognize the problem themselves and are stimulated to search for the appropriate solutions. Community participation is discussed in greater detail in the technical notes on human resources.