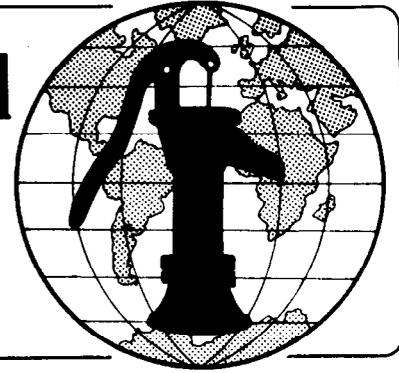


Water for the World



Methods of Controlling Onchocerciasis Technical Note No. DIS. 2.M.5

Onchocerciasis, commonly known as river blindness, is a disease that affects many people in Africa and South America. It can cause a series of eye ailments which can lead to blindness. Among people living in areas where river blindness is present, large numbers have lost their sight.

This technical note discusses the chain of transmission and suggests several ways to combat the spread of the disease. Generally, the most effective methods of control involve the use of chemicals.

Disease Transmission

Onchocerciasis is common in areas where specific types of blackflies (genus *simulium*) breed. Usually the best breeding grounds are fast-flowing rivers and streams. The blackfly spreads the disease in the following manner. See Figure 1 for the transmission chain.

- The blackfly bites a person who is infected with onchocerciasis.
- The larvae of the parasite are taken from the skin of the person and pass with the tissue juices into the blackfly.
- In the fly, the larvae become infective in about six to ten days. When the fly bites again the larvae pass from the fly into the person.
- Lumps form under the skin. These nodules contain adult round worms which produce large numbers of larvae that live in the skin waiting to be sucked up by a blackfly.

Useful Definitions

LARVAE - Young forms that come from the eggs of insects and worm parasites.

NODULE - A small round swelling or lump.

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

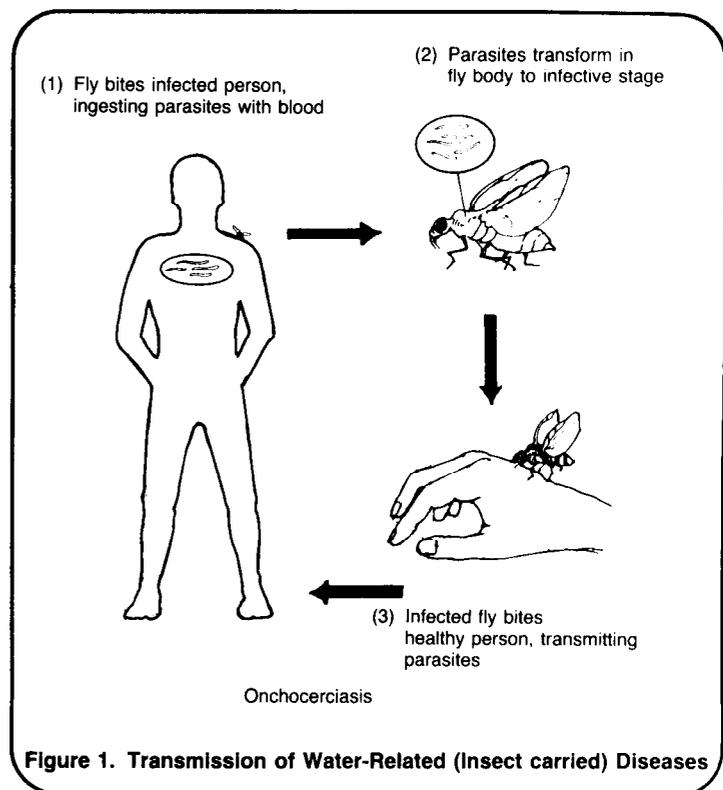


Figure 1. Transmission of Water-Related (Insect carried) Diseases

Of millions of larvae, only a few are taken in by blackflies. The rest wander through the host's tissues until they die in the human body. The body tries to fight the effects of the dead larvae by building scar tissue around them. These scars form in the body. Many larvae die in the lens and other parts of the eye. Eventually, the lens becomes so full of scar tissue that the person becomes blind.

The nodules containing the adult worms are not always easy to detect because they may be deep in the body. Generally the presence of nodules, patches on the skin and itchiness are symptoms of onchocerciasis.

Control of Onchocerciasis

Control of the disease is focused on the control of the blackfly population through environmental and chemical means. Treatment is not very effective since sometimes the disease is difficult to detect. However, early treatment that kills the adult worms will help prevent blindness. The following control measures are recommended for fighting the spread of onchocerciasis.

Environmental Control. Environmental control of onchocerciasis involves eliminating the breeding sites of the blackflies. However, it is very difficult to control the disease just by environmental means. Some measures that are useful are also expensive and will be beyond the means of most rural people. Environmental measures that can be used to control onchocerciasis should be included in development projects. For example:

- Because most species of blackflies, particularly in Latin America, require fast-flowing water in which to breed, changing the stream flow can greatly help to reduce the numbers of blackflies. To eliminate the breeding places of blackflies upstream, a dam can be built. The backed-up water floods the fast-water breeding grounds.

- The design of dam spillways so that new breeding places are not created in them is not easy. Professional help should be sought in such design from specialists with experience in controlling blackfly

breeding. Do not build spillways in a series of steps because this design will only increase the reproduction of the flies, and succeed in moving the breeding place from one point to another.

- Build covered canals when developing an irrigation project. Covered canals are expensive and, in most cases, existing canals cannot be covered. When designing new systems, engineers should consider the added cost of covering in order to control blackfly breeding.

- Remove brush from the edges of fast-flowing rivers and streams.

Generally, little environmental control can be carried out where structures are already in place. Changing dams or canal design is economically impossible. Only where new projects are in the design stage can effective measures be included in a project. Where new communities are being proposed, an attempt should be made to locate them away from areas where blackflies breed. To more effectively fight the spread of onchocerciasis, a good program of chemical control should be established.

Chemical Control. By placing chemicals into breeding water, large numbers of blackflies can be destroyed. The larva stage of blackfly development is the time when control is effective. Chemicals kill blackfly larvae before they can mature.

Chemicals kill the larvae in three ways:

- The larvae eat the chemicals and are poisoned.

- The chemicals kill the larvae through contact.

- The larvae starve or smother when the chemical forces them to move away from their habitat.

Several chemicals are available for use in controlling blackfly populations. DDT has been used but because of the danger it presents to fish and animals, its use has been limited. Other effective, less dangerous chemicals are available.

Abate is the most commonly used chemical for blackfly control. Generally, it is applied to streams or other bodies of water where blackflies are known to breed using an airplane or helicopter. Methoxychlor is less commonly used than Abate because it is less powerful and a less effective killer. Methoxychlor is much less expensive than Abate and for that reason is often used. Both chemicals appear to be safer than DDT but both of them affect fish.

The choice of a chemical will depend on availability and price. Chemicals can be applied by pouring them directly into the water or by constructing a drop applicator as shown in Figure 2.

The chemicals are lighter than water and float at the top where blackfly larvae live. This also protects fish and plants that generally live below water. Where rivers have a continuous rate of flow over long stretches, single doses at a specific point can be applied. If the river has rapids and pools, the chemical will have to be applied at the headwaters of each set of rapids.

Treatment and Education

Where onchocerciasis is suspected, a medical skin test is necessary to determine its presence. Also, the disease can be detected with an eye examination.

When the nodules appear on the body, they can be removed by surgery. Early removal lowers the number of worms in the body. However, when the nodules are inside the body and not easily detected, this measure is not useful. Removal of nodules from all people with the disease would be very time-consuming and virtually impossible.

Another possibility is to use drugs to treat people with the disease. There are drugs which kill the larval parasites in the body and drugs that kill the adult worm. No drug does both. The problem with drug use is:

- Drugs have severe side effects.
- Drug treatment can only stop the symptoms and prevent further damage.
- Drug treatment is expensive and not practical over large areas.

To control river blindness, it is very important to eliminate breeding places. People should be taught about the disease and how it is spread. Once an awareness of the disease is created, people will be more interested in cooperating in blackfly control programs. Community members should participate in and take responsibility for spraying programs and brush clearing. Instruct people in the importance of using netting when sleeping outdoors, especially during the daytime when the flies bite. Above all, help people to recognize the symptoms of the disease so that they can get medical help quickly.

