

A Medicine to Control Bilharzia

Part 1: How can we control bilharzia?

Contents: Reading, questions and discussion concerning the nature of a tropical disease, and approaches to its control.

Time: 1 to 2 periods, depending on amount of discussion.

Intended use: GCSE Biology and Integrated Science. Links with work on parasitism and prevention and cure of disease.

Aims:

- To complement and revise work on parasitism and disease
- To develop awareness of the scale and impact of a major tropical disease
- To develop awareness of various approaches to the prevention and cure of tropical disease
- To provide opportunities to practise skills in reading, comprehension and application of knowledge to solving problems.

Requirements: Students' worksheets No. 304

This passage of reading and associated questions could be done for homework or in class. The advantage of class use is that students could discuss some of the questions in small groups.

Notes on some of the questions

Q.1 Students should attempt to answer this themselves before going on to the next section, which gives answers.

Q.5 This question is intended to raise the problem of economic effects on a community of a debilitating disease like bilharzia.

Q.6 It is hoped that students will realize that disease control is best approached on several fronts. Education and improved hygiene are the best hope in the long run, but in the shorter term, treatment with medicine is important.

Q.11 This question is intended to bring out the point that increased irrigation, which is vital for the improvement of agriculture, is also likely to increase the amount of infected water.

Acknowledgements Figure 1 is adapted from *Manson's Tropical Diseases* (18th edn) by P.E.C. Manson-Bahr and F.I.C. Apted (Bailliere Tindall); Figure 5: photo provided by Professor G. Webbe, London School of Hygiene and Tropical Medicine.

A MEDICINE TO CONTROL BILHARZIA — Part 1

What is bilharzia?

This unit is about a disease which is very common in tropical countries. Doctors call the disease **schistosomiasis** or **bilharzia**. It is sometimes called 'snail fever', because water snails play a part in spreading the disease.

The map in Figure 1 shows the parts of the world where bilharzia is common. You can see that most of the countries affected are in the poorer, developing parts of the world.

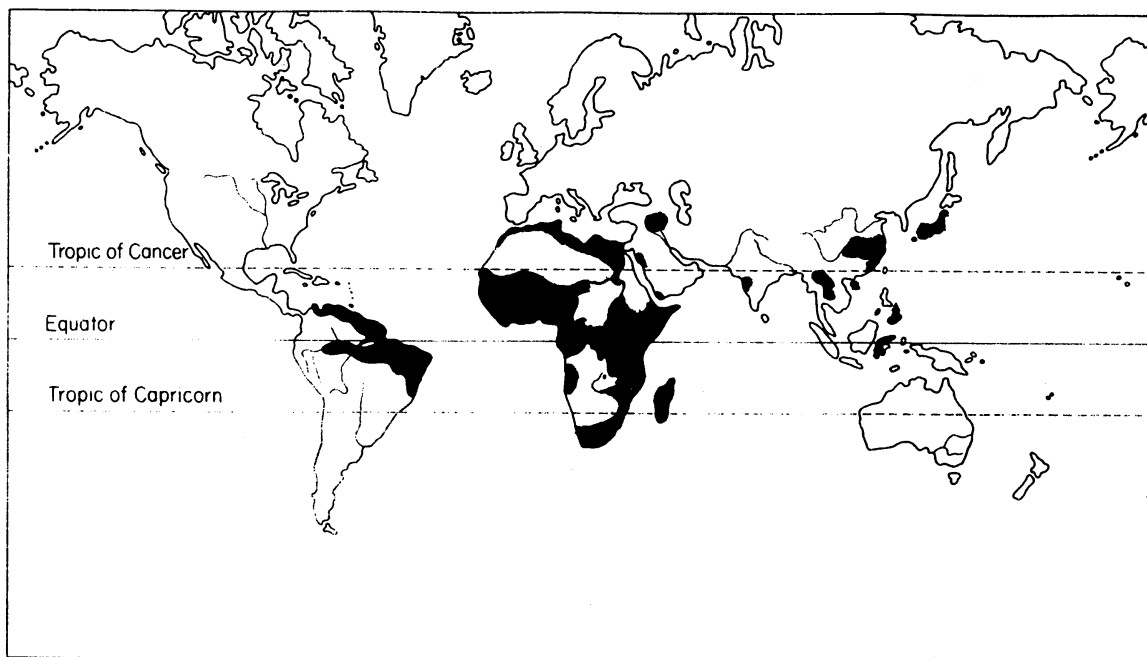


Figure 1 The parts of the world where bilharzia occurs are shown in black

Doctors believe that throughout the world about 200 million people are infected with bilharzia. This is nearly one in 20 of the world's population.

Bilharzia does not often kill, but it weakens the sufferers and makes them lethargic and short of energy. The symptoms of the disease include a swollen abdomen, diarrhoea and loss of blood. Because adult sufferers feel lethargic, it is hard for them to work. This makes it difficult for them to support their families. In some communities, 95 per cent of the population may be infected. This drags down the whole community.

This unit looks at the causes of the disease, and different ways of controlling it. Unit 305, *A Medicine to Control Bilharzia — Part 2*, looks at how a particular medicine was developed to treat the disease.

How can we control bilharzia?

What causes bilharzia?

Bilharzia is an infective disease. Like all infective diseases, it is caused by a living organism. Most common diseases are caused by bacteria or viruses, but bilharzia is caused by a blood fluke.

The blood fluke is a parasite. It lives in the blood vessels of the sufferer (called the host). Scientists call these parasites **schistosomes** (pronounced *shis-toe-soams*).

There are several different kinds of blood fluke. Each causes a different type of bilharzia. In the type of disease described here, the blood fluke lives in the blood vessels of the walls of the intestine of humans. The male and female live together. They are about 1cm long. The male wraps itself like a thin leaf around the female as shown in Figure 2.

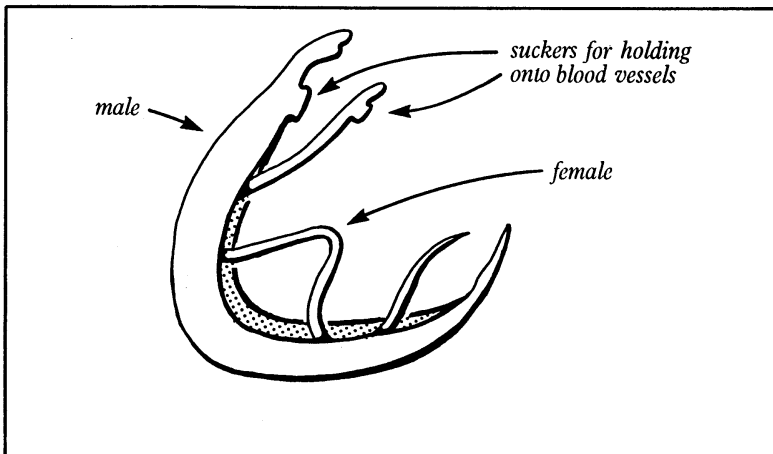


Figure 2 A male and female schistosome

The female continuously releases eggs into the bloodstream. Some of the eggs work their way through the walls of the intestines. This irritates the intestines, and may cause diarrhoea and bleeding. Other eggs settle in the liver and reduce its efficiency. The eggs which manage to get into the intestines are eventually passed out in the faeces. If the faeces reach fresh water, the eggs hatch out.

The life cycle of the blood fluke

The blood fluke which lives in humans is only one part of a fascinating life cycle. The blood fluke is the adult stage. The rest of the cycle occurs in water. Figure 3 summarizes the cycle.

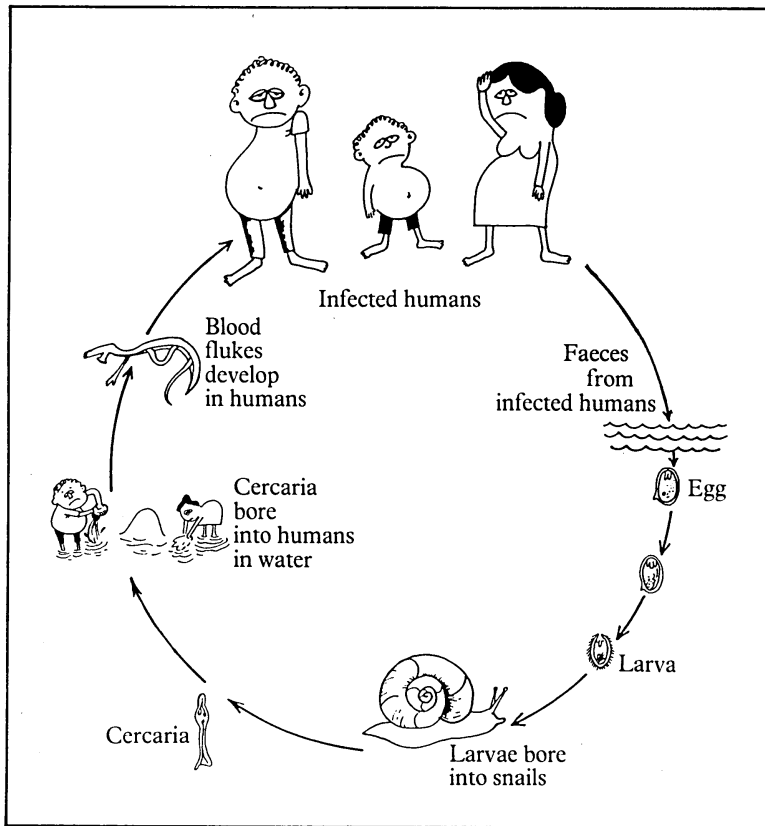


Figure 3 The life cycle of the bilharzia blood fluke

When eggs from an infected human reach fresh water, they hatch out. Tiny larvae are formed, which can swim in the water. They swim around in search of a particular kind of water snail, which is the **intermediate host**. Without the snail, the life cycle cannot continue.

The larvae bore their way into the snail. Inside, they reproduce to form thousands of little second-stage larvae called **cercariae**. These are yet another stage in the life cycle. Cercariae have a muscular tail which makes them able to swim. They wriggle out of the snail into the water. Then they go in search of a human host. This person might be wading in the water to wash, bathe or plant rice.

When they find a human host, the cercariae bore through the skin into the bloodstream. When they reach the blood vessels of the hosts's intestine, they feed and grow into adult blood flukes. These adults produce eggs, and the whole life cycle begins again.

Before you go on, try to answer question 1.

Question

- 1 Now that you have read about the blood fluke's life cycle, you may have thought of some ways of solving the problem of how to control bilharzia. There are several possible solutions. Suggest as many different ones as you can.

Solving the snail fever problem

There are several possible ways of controlling the disease. They work on different parts of the life cycle (Figure 4).

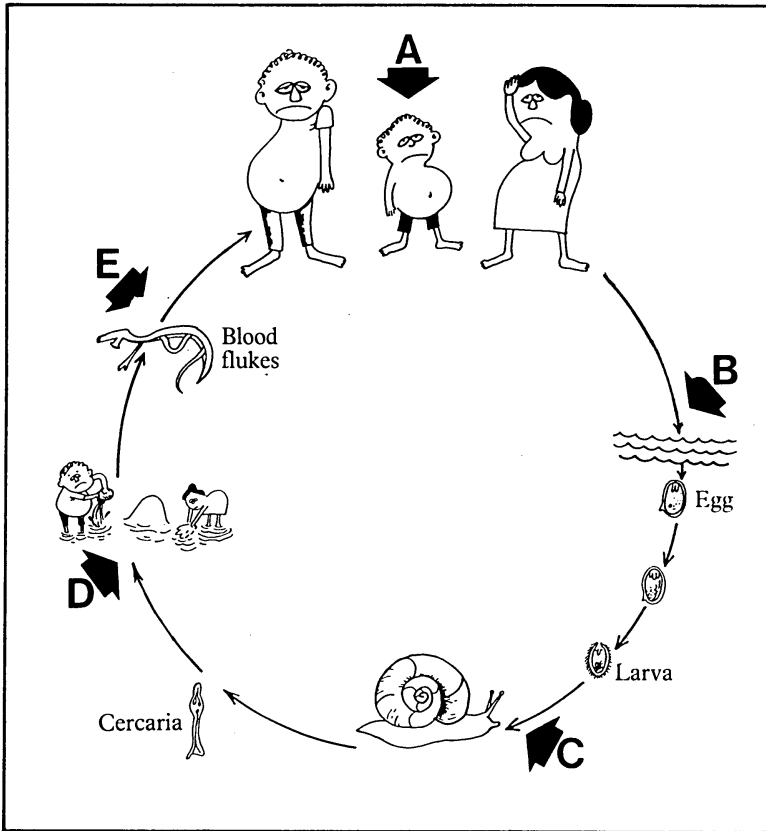


Figure 4 *Bilharzia can be controlled at different parts of the life cycle*

- A Immunization** One possibility would be to immunize (vaccinate) people against the disease by giving them an injection.
- B Better sanitation** The eggs get into the water when the faeces from infected people are allowed to pollute water. Better toilet arrangements help stop the spread of eggs.
- C Getting rid of the snails** Water snails are the intermediate host in the life cycle. Without them, the disease cannot spread. If the snails can be killed, the disease can be controlled.
- D Keeping people away from infected water** If snail-free water can be provided for washing and bathing, this helps cut down infection.
- E Using medicines to treat infected people** These medicines work by killing the blood flukes in the host's blood vessels. In *A medicine to Control Bilharzia — Part 2* you can find out more about one such medicine, called 'Compound X'.

Questions

- 2 For each of the control methods, suggest one disadvantage which you think that method might have.
- 3 Which method or combination of methods do you think would be best to use in the long run? Explain why you think this is best.
- 4 Can you think of any other control methods not mentioned here?

However, experience shows that no single method will wipe out the disease. Several methods have to be used together.

Before you go any further, try to answer questions 2 to 4.



Figure 5 Washing in a river in West Africa. But the water could be infected with bilharzia

Which methods actually work?

We will look at each of the methods **A** to **E** in turn.

- A** Doctors have tried to develop ways to immunize people against bilharzia, but they have not yet been successful.
- B** Providing good toilet arrangements can be expensive. However, it is very important because it helps control other diseases such as typhoid and dysentery as well as bilharzia.
- C** Scientists have tried many different ways of getting rid of the water snails. Some chemicals will do this, but they have to be used in large quantities to treat all the water. This can be very expensive. There is also the problem that the chemicals may affect other forms of life as well, for example, fish. Biological control has been tried. For example, some larger species of snails will feed on the smaller intermediate host snail. So far, attempts to control the snails chemically or biologically have not been very successful.
- D** Keeping people out of infected water would be very effective. Education is important. If people know what causes the disease, they will know the importance of keeping away from infected water. Irrigation systems are often infected. As a country develops its agriculture, it is likely to build more irrigation systems, which increase the problem.
- E** Medicines can be very effective in controlling the disease. 'Compound X' cures about 85 per cent of patients treated. Once patients have been cured, they no longer produce eggs in their faeces. This helps cut down the disease still further. One problem with medicines is that they can have unpleasant side-effects. As new medicines are developed, attempts are made to cut down the side-effects.

Answer questions 5 to 11. You may like to discuss them in small groups or with the rest of the class.

Questions

- 5 Why is it important to control bilharzia, even though it does not usually kill people?
- 6 Suppose you are Minister of Health in a developing country. You are determined to control bilharzia, but you only have a small amount of money to spend. What would you do? Suggest a 'ten-year plan', aiming to control the disease in ten years.
- 7 Why is it important for a country to eradicate diseases such as bilharzia if it is to develop its economy?
- 8 The snails and blood flukes which cause bilharzia do not occur in Britain. Suggest one reason why not.
- 9 Suppose the snails and blood flukes which cause bilharzia did occur in Britain. Do you think the disease would spread quickly? Explain your answer.
- 10 Explain in your own words how education can help control bilharzia.
- 11 Explain in your own words how agricultural development can help to spread bilharzia.