

Fasciola and Fascioliasis

FASCIOLIASIS is an infection of sheep and cattle. Human infection is not common, and transmission from man to man, rather than from animal to man, is probably very rare. Fascioliasis transmission is not affected, therefore, by excreta disposal practices, and it is included in this book for completeness only.

Description of Pathogen and Disease

The literature on fascioliasis is chiefly veterinary, and little is known of the epidemiology of human infections.

Identification

Fascioliasis is an infection of the bile ducts by the trematode *Fasciola hepatica* that results in inflammation and fibrosis. In heavy infections small abscesses may be produced in the liver parenchyma. There is an early acute phase, when the larvae migrate through the liver, and a late chronic phase caused by the adult flukes in the bile ducts.

Symptoms recorded from human cases in the acute phase include dyspepsia, nausea and vomiting, abdominal pain, and irregular high fever. Allergic symptoms can also occur. Anemia occurs in a proportion of cases, as does leucocytosis and eosinophilia. In the chronic phase there is often painful liver enlargement, and occasionally an obstructive jaundice develops.

Diagnosis is by recovery of eggs from the feces or from bile duct aspirate. In about 30 percent of cases, however, eggs cannot be found in either feces or bile. Fever, liver enlargement, and high eosinophilia are very suggestive of fascioliasis, especially if there is a concomitant history of eating homegrown watercress. Treatment is by oral drug therapy with bithionol or by intramuscular injection of dihydroemetine. Both drugs are toxic and of limited effectiveness. Praziquantel, a newer drug, has been effective in some recent trials.

Occurrence

Fascioliasis (or liver rot) is a disease of sheep and cattle throughout the world. Human infection is not common and has been mainly reported from Central and South America, Cuba, southern France, western England, Wales, and North America. It is to be expected that sporadic human infection will occur wherever fascioliasis is endemic in the local sheep flocks.

Infectious agent

Fasciola hepatica, a trematode, is also known as the liver fluke. The adult is a moderately fleshy, flat, hermaphroditic fluke measuring 20–30 millimeters in length by 13 millimeters in breadth (figure 27–1). The eggs are large and ovoid, measuring 130–150 micrometers by 60–85 micrometers.

The related fluke, *F. gigantica*, measuring 25–75 millimeters by 12 millimeters, is a common parasite of cattle, camels, and other herbivores in Africa, Asia, and some Pacific islands and has been reported from man in Africa, Iran, and Hawaii.

Reservoirs

The main reservoirs of *Fasciola hepatica* are sheep and cattle. Infections of rabbits, horses, donkeys, camels, pigs, and deer are also reported. Human infection is infrequent.

Transmission

The eggs are laid in the proximal biliary tract of the host and are evacuated in the feces. They mature in water or in moist conditions within 9–15 days at an optimal temperature of 22–25°C. The miracidia hatch and within 8 hours invade an amphibious snail, usually a species of *Lymnaea*. During 30–40 days the larvae develop into sporocysts followed by two redial stages,



Figure 27-1. An adult *Fasciola hepatica* under a light microscope. Scale bar = 5 millimeters. (Photo: Wellcome Museum of Medical Science)

and cercariae emerge. The cercariae swim in the water for up to 8 hours and then encyst as metacercariae on aquatic vegetation. Sheep and cattle become infected when they eat encysted metacercariae on grass. People become infected when they eat encysted metacercariae on watercress, salad vegetables, or any water plant eaten raw. When the cysts are ingested, the larvae excyst in the duodenum, migrate through the intestinal wall, and reach the bile ducts by eating their way through the surface of the liver and through the liver parenchyma.

The life cycle of *F. gigantica* is similar, except that the snail hosts are aquatic, not amphibious.

Prepatent and incubation periods

The adult fluke matures 3–4 months after ingestion of the encysted metacercariae. Acute symptoms due to the migrating larvae in the liver may be experienced soon after the ingestion of metacercariae.

Epidemiology

Fascioliasis is an infection of herbivores, principally sheep and cattle. Man sometimes accidentally takes the place of the herbivore as the vertebrate host in the parasitic life cycle. Small foci of human fascioliasis have been reported, but it is a rare infection in man. There is no firm evidence of man-to-man transmission, and it is probable that human infections only occur where there is endemic fascioliasis among sheep or cattle.

A stool survey of 1,011 schoolchildren from six villages in the Peruvian Andes showed a 9 percent

prevalence of fascioliasis (Stork and others 1973). Watercress was not consumed in this area, and it was considered that lettuce and alfalfa were the sources of human infections. Other accounts of fascioliasis include those from Australia (Wood, Stephens and Porter 1975), Britain (Anon 1978), Dominican Republic (Ueno and others 1973), Egypt (Farg and others 1979), France (Rondeland, Amat-Frut and Pestre-Alexandre 1982), Iran (Farid 1971), Japan (Ueno and others 1975), Madagascar (Moreau and others 1975), Norway (Brandt 1974), and Switzerland (Boray 1971). *F. gigantica* infection in animals in West Africa was reviewed by Schillhorn van Veen (1980).

Control Measures

Because the animal reservoir is more important for transmission of fascioliasis than the human reservoir, excreta disposal will have little effect on the control of the infection. Snail control, though difficult to achieve, can be attempted by the use of molluscicides and by drainage of pasture. Watercress beds should be protected from contamination by animal feces, and the public should be informed of the danger of eating watercress, or other salad vegetables, grown in wet land where sheep or cattle have access.

Occurrence and Survival in the Environment

There is a substantial literature on the survival and development of *Fasciola* eggs, and this information has

been used to explain the seasonal pattern of fascioliasis in animals in Europe. Eggs survive for many months below 10°C but do not develop. Therefore, in temperate climates many eggs overwinter, and the miracidia hatch out in spring. The development in snails takes place over the summer, and the encysted metacercariae on herbage build up in early autumn. These metacercariae can also survive over winter.

Fasciola eggs must be free of feces and surrounded by moisture to develop. They are rapidly killed by desiccation. They develop most rapidly at 25–30°C; they do not develop below 10°C and they are killed at –5°C (Becejac and Lui 1959; Rowcliffe and Ollerenshaw 1960; Tunker 1940; Valenzuela 1979).

Fasciola eggs survive in slightly brackish water but not in seawater (Saint Guillain and Pecheur 1967; Styczeńska-Jurewicz 1965*b*). In anaerobic water, eggs survive but do not develop. Development recommences when oxygen is supplied (Becejac and Lui 1959; Styczeńska-Jurewicz 1965*a*). Eggs develop in waters with pH between 4.2 and 9.0, a wider pH range than is tolerated by the snail host (Rowcliffe and Ollerenshaw 1960; Saint Guillain and Pecheur 1967).

Fasciola eggs develop not only in water, but also in a 1:1 mixture of water and liquid manure. The survival times in this medium are 70 days at 15–18°C and 101 days at 4–8°C (Six and Hoffman 1970).

Miracidia usually survive in water for only a few hours. Survival is enhanced by cool water temperatures, by darkness, by high oxygen levels, and by neutral pH (Dwaronats 1966; Gebauer 1958).

Encysted metacercariae of *F. hepatica* can survive for several months, especially if conditions are cool and moist. They survive on a wet surface for 12 hours at –20°C, 4 weeks at –10°C, 13 weeks at –2°C, and 19 weeks at 10–20°C. Survival times decrease at temperatures above 25°C or at lower humidities (Boray and Enigk 1964; Kakatchéva-Avramova 1963). Metacercariae of *F. gigantica* are more resistant to warm temperatures but more susceptible to desiccation (Boray and Enigk 1964).

Inactivation by Sewage Treatment Processes

Fasciola eggs rarely occur in sewage and in very low concentrations. Their removal during sewage treatment is of no interest, since it is *Fasciola* eggs in sheep and cattle feces that are responsible for the maintenance of transmission.

Inactivation by Night Soil and Sludge Treatment Processes

Fasciola eggs in night soil and sludge are of no interest because transmission is maintained by eggs in sheep and cattle feces. *Fasciola* eggs in manure and farm slurry are important, and it may be assumed that any processes that eliminate *Ascaris* eggs (chapter 23) will also eliminate *Fasciola* eggs.

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