Fasciola gigantica (Infection with)

AETIOLOGY

Classification of the causative agent

Also known as the “common liver fluke” and “sheep liver fluke,” *Fasciola gigantica*, is one of two *Fasciola* trematode species to infect the livers of both animals and humans (*F. hepatica* is the other species); *F. gigantica* is primarily found in domestic and wild ruminants. *F. gigantica* flukes are approximately 75mm by 15mm in size. Fascioliasis, the term used for clinical disease caused by *F. gigantica*, is considered a neglected tropical disease. *F. gigantica* has demonstrated long-term survival due to their adaptivity to the host's immune system.

Resistance to physical and chemical action

Temperature:	Sensitive to heat, sterilise by autoclave; <10°C and humidity of <25% inhibit development of the miracidia larvae stage
pH:	Not determined
Chemicals/Disinfectants:	Flukes are susceptible to 1000-5000 ppm sodium hypochlorite, formaldehyde, and 2% glutaraldehyde.
Survival:	Exposure to direct sunlight & dry environments inhibit survival of the metacercariae of *F. gigantica*. *F. gigantica* thrives in lighter, wet environments.

EPIDEMIOLOGY

Hosts

Definitive Hosts

- African buffalo (*Syncerus caffer*)
- Domestic cattle (*Bos taurus*)
- Domestic goats (*Capra aegagrus hircus*)
- Domestic pigs (S*us scrofa domesticus*)
- Domestic sheep (*Ovis aries*)
- Jackson’s hartebeest (*Alcelaphus buselaphus jacksoni)*
- Uganda kob (*Adenota (Kobus) kob)*
- Wildebeest (*Connochaetes spp.*)
- Wild boar (*Sus scrofa*)
- Humans

Intermediate Hosts

- Egyptian freshwater snails (*Radix natalensis*)
- European ear snail *(Radix auricularia)*

Transmission and life cycle

- The habitat of *F. gigantica* changes with the stage of its life cycle, which is approximately 17 weeks.
- Unembryonated eggs are passed in faeces and embryonate in freshwater over the course of approximately 2 weeks; subsequently, they mature and release miracidia.
- Miracidia seek out snails, which serve as the intermediate host, and undergo several developmental stages (sporocyst → rediae → cercariae) before departing from the snail and become free-swimming cercariae.
- Humans and animals become infected by ingesting the infective *Fasciola* larvae (metacercariae) through contaminated vegetation or water; the duodenum is the primary location where metacercariae penetrate through the intestinal wall into the peritoneal cavity of the definitive host.
    - After approximately 7-8 weeks, metacercariae migrate through the parenchyma of the liver into the biliary ducts, where maturation into adult flukes occurs (occurs over approximately 3 to 4 months).
    - Adult flukes can survive in their definitive host for several years.

Sources

- Contaminated water (commonly marshy areas, ponds or flooded pastures)
- Contaminated water plants and vegetation
- Infected intermediate hosts (zoonotic & food-borne potential)

Occurrence

Metacercariae are found in the waters of tropical and subtropical locations of the Middle East, Africa, Europe, South and Southeast Asia, and Hawaii of the United States. Ideal ecosystems include abundant light, high moisture content (humidity, rainfall accumulation, poor drainage), and irrigated pastures.

DIAGNOSIS

The incubation period is 3-11 weeks after ingestion of the metacercariae. Acute disease can last 2-4 months, and can vary depending on the infectious dose. Chronic disease occurs when the metacercariae migrate to the bile ducts and mature into adult flukes.

Clinical diagnosis

Although documentation in wildlife is limited, clinical signs from domestic ruminants can be considered for wild ruminants. Acute symptoms include fever, skin rashes, and browning of the hair coat. Chronic symptoms include anaemia, jaundice, and continued browning of the hair coat.

Lesions

- Pale or icteric mucous membranes, subcutaneous tissues, abdominal fat, omenta
- Hepatitis developing into hepatic necrosis and fibrosis
- Swollen liver with a pale, orange-brown colour
- Cholangitis leading to fibrosis and calcification of bile ducts
- Enlarged, dark, friable spleen

Differential diagnoses

- Cholestasis
- Dirofilariasis
- Dracunculiasis
- *Fasciola hepatica*
- *Fascioloides magna*
- Giardiasis
- Hookworm infection
- Intestinal protozoal diseases
- Leptospirosis

Laboratory diagnosis

Samples

For isolation of agent/Parasite identification

- During chronic disease, microscopic identification of Fasciola eggs in faecal samples is considered the gold standard; repeated faecal sedimentation may be required
    - Occasionally, duodenal contents or bile aspirates can be used to detect Fasciola eggs
- Several thick and thin blood smears collected of live animals during the acute phase of the disease
    - Thin blood films should be air-dried, fixed in absolute methanol for 1 minute and stained with 10% Giemsa stain for 20–30 minutes
        - blood films should be stained as soon as possible after preparation to ensure proper stain definition
    - Thick films are made by placing a small drop (approximately 50 µl) of blood onto a clean glass slide and spreading this over a small area using a circular motion with the corner of another slide. The droplet is air-dried, heat-fixed at 80°C for 5 minutes, and stained (without fixing in methanol) in 10% Giemsa for 15 minutes
    - Unstained blood films should not be stored with or near formalin solutions as formalin fumes may affect staining quality; moisture also affects staining quality
- If it is not possible to make fresh films from capillary blood, sterile jugular blood should be collected into an anticoagulant such as lithium heparin or ethylene diamine tetra-acetic acid (EDTA)
    - The sample should be kept cool, preferably at 5°C, until delivery to the laboratory.
- At necropsy, adult flukes are readily seen in the bile ducts and immature stages can be seen on cut surface

Serological tests

- Serum samples (10–20 ml)

Procedures

Identification of the agent

A definitive diagnosis depends on the identification of the parasite within faecal sample and/or tissues by biopsy.

Microscopic identification:

- Identification of the eggs in faeces
- Identification of the worms in faeces or biopsies

Serological tests

- Antibodies to *F. gigantica* can be detected with an enzyme-linked immunosorbent assay (ELISA) approximately 2-3 weeks after infection
- Indirect fluorescent antibody test (IFA)
- Eosinophilia in blood is consistent with infection
- Plasma concentrations of γ-glutamyltransferase (GGT) are increased with bile duct damage; increased values are consistent with the late maturation period when flukes are in the bile ducts.

PREVENTION AND CONTROL

Sanitary prophylaxis

- Controlling gastropod vectors and preventing access to host species is important in preventing new infections. This may be difficult in wild free-ranging populations
- In captivity, copper sulphate can be applied to pastures. Effective but toxic to sheep, who would need to be kept off for at least 6 weeks upon application.
    - Rotational grazing aids in diminishing fluke infestations.

Medical prophylaxis

- No vaccines are available for mammals against *F. gigantica*.

POTENTIAL IMPACTS OF DISEASE AGENT BEYOND CLINICAL ILLNESS

Risks to public health

- No vaccine is available for humans against *Fasciola*
- Human cases have been reported in Asia, Africa and Hawaii and are believed to be due to ingestion of contaminated water, vegetation, or organs (food-borne trematodiases):
    - Uncooked vegetation (ex: watercress)
    - Uncooked liver containing metacercariae
    - Unboiled water
- *F. gigantica* cannot be transmitted between humans

Risks to agriculture

- If livestock facilities are infected, *F. gigantica* can cause severe economic loss due to decreased thriftiness (muscle production, milk production), liver disease, and mortality. Developing countries are particularly at risk of economic consequences.

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The OIE will periodically update the OIE Technical Disease Cards. Please send relevant new references and proposed modifications to the OIE Science Department (scientific.dept@oie.int). Last updated 2019. Written by Marie Bucko and Samantha Gieger with assistance from the USGS National Wildlife Health Center.