FASCIOLOIDES MAGNA

AETIOLOGY

Classification of the causative agent

Fascioloides magna, also known as the giant liver fluke or large American liver fluke, is a liver parasite with a multi-host life cycle that infects a variety of wild ruminants. Snails are intermediate hosts and deer serve as the reservoir host. The parasite is flat and ovoid in shape and up to 100 mm long and 11-26 mm wide.

Resistance to physical and chemical action

Temperature:	Sensitive to heat, sterilise by autoclave; environmental temperatures of <10°C inhibit development of the 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 the survival of the metacercariae of *F. magna*. *F. magna* thrives in wet environments.

EPIDEMIOLOGY

Hosts

Definitive Hosts

- Elk *(Cervus canadensis)*
- White-tailed deer *(Odocoileus virginianus)*
- Mule deer *(Odocoileus hemionus)*
- Black-tailed deer *(Odocoileus hemionus sitkensis)*
- Red deer *(Cervus elaphus)*
- Fallow deer *(Dama dama)*
- Caribou *(Rangifer tarandus)*
- Moose *(Alces alces)*
- Yak *(Bos grunniens)*
- Domestic cattle (*Bos taurus*)
- Roe deer *(Capreolus capreolus)*

Intermediate Hosts

- Freshwater snails
    - *Lymnaea humilis*
    - *Lymnaea palustris*
    - *Lymnaea stagnalis*
    - *Lymnaea trucatula*

Transmission

- Within ruminants, established liver flukes release thousands of eggs per day, which travel through bile ducts to the small intestine before being shed in faeces.
- Eggs hatch in water where they release free-swimming larvae that seek out a suitable snail to infect; this is where maturation takes place.
- Upon maturation within the snail, larvae are released and encyst on aquatic plants where they are then ingested by a grazing ruminant host.

Sources

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

Occurrence

F. magna infection occurs most often in spring and late summer into autumn and is an important disease of cervids in southeastern Europe. The parasite is of North American origin, but was introduced to Europe with imported game.

For more recent, detailed information on the occurrence of this disease worldwide, see the OIE World Animal Health Information System - Wild (WAHIS-Wild) Interface [http://www.oie.int/wahis_2/public/wahidwild.php/Index].

DIAGNOSIS

The parasite establishes patent infections in elk, white-tailed deer, and caribou and is diagnosed via faecal examination for the parasite's characteristic ova. However, other ruminants such as moose and domestic cattle are dead-end hosts in which the eggs are not shed in faeces. Infection in a dead-end host can cause significant liver damage and in some cases illness and death.

Clinical diagnosis

There are usually no clinical signs. Fluke infection of dead-end hosts is diagnosed via necropsy and visual examination of the liver for parasites.

Lesions

- Hepatitis developing into hepatic necrosis and fibrosis
- Liver fluke migration tracts within liver
    - Cholangitis leading to fibrosis and calcification of bile ducts
    - Enlarged, dark, friable spleen

Differential diagnoses

- Cholestasis
- Dirofilariasis
- Dracunculiasis
- *Fasciola hepatica*
- *Fasciola gigantica*
- Giardiasis
- Hookworm infection
- Intestinal protozoal diseases

- Leptospirosis

Laboratory diagnosis

Samples

For isolation of agent/Parasite identification

- During chronic disease in the definitive host, 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.
- At necropsy, adult flukes are readily seen in the bile ducts, and immature stages can be seen on cut surface.
- Samples of liver can be taken for histopathology.

Serological tests

- Serum samples (10–20 ml)

Procedures

Identification of the agent

- A definitive diagnosis depends on the identification of the parasite within faecal samples and/or tissues by biopsy.
- Microscopic identification includes identification of eggs in faeces or flukes in faeces or biopsies.
- Hepatic histopathology - Infected livers will demonstrate black, tortuous tracts formed by migrations of *F. magna* flukes.

Serological tests

- Antibodies to *F. magna* can be detected with an enzyme-linked immunosorbent assay (ELISA) approximately 2-3 weeks after infection.
- Indirect fluorescent antibody test (IFA)
- Eosinophilia, haemorrhagica, and neutrophilia in the 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.
    - Rotational grazing aids in diminishing fluke infestations.

Medical prophylaxis

- No vaccines are available against *F. magna*.

POTENTIAL IMPACTS OF DISEASE AGENT BEYOND CLINICAL ILLNESS

Risks to public health

- Human cases have been reported and are believed to be due to ingestion of contaminated water, vegetation, or organs (food-borne trematodiases). Potential sources include:
    - Uncooked vegetation (ex: watercress)
    - Uncooked liver containing metacercariae
    - Unboiled water
- *F. magna* cannot be transmitted between humans
- *F. magna* can be transmitted from infected intermediate hosts (zoonotic & food-borne potential)

Risks to agriculture

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

REFERENCES AND OTHER INFORMATION

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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 Scientific Department (scientific.dept@oie.int). Last updated 2019. Written by Marie Bucko and Samantha Gieger with assistance from the USGS National Wildlife Health Center.