بسم الله الرحمن الرحيم

MEDICAL HELMINTHOLOGY

Medical helminthology is a branch of Parasitology that applies for the study of a group of a vastly numerous and different worms that are parasitic to humans and animals. They are grouped in two main phyla which are divided as usual to classes, subclasses, families, genera and species.

1- **Phylum Platyhelminths**, which includes two medically important classes; **Trematoda** and **Cestoda**.

2- **Phylum Nemathelminths**, which includes the medically important class **Nematoda**.

INTRODUCTION TO PHYLUM PLATYHELMINTHS

1-They are bilaterally symmetrical.

2-They have a definite 'head end', with associated sensory and motor elements.

3-All are dorsoventrally flattened and have no body cavity.

4-They are leaf shaped or oval, but some are elongate such as tapeworms.

5-Their size varies from nearly microscopic to over 5 meters in length.

6-The body covering (tegument) varies in structure among classes.

7-Locomotion occurs by muscle fibers which are arranged in one or two layers near the body surface.

8-The nervous system is simple, of ‘‘ladder type’’ and there are also tactile cells, chemoreceptors and eyespots.

9-The digestive system is started with the mouth opening and ended by the intestinal coeca.

10-The osmoregulatory and excretory system is based on the protonephridium (flame cell). It is a single cell with a tuft of cilia that extend to a delicate tubule. This is joined to other tubules that form excretory channels opening in one or more excretory pores.

11-The reproductive system follows a main pattern but has vast variation amongst different groups. Almost all are hermaphroditic. Self-fertilization is common though cross fertilization can happen also.

CLASS TREMATODA

GENERAL CHARACTERS

12-Parasites of all classes of vertebrates

13-In many cases they need more than one intermediate host to complete their life cycle.

13-Have special different developmental stages in the intermediate host where they reproduce asexually.

14-Body is dorsoventrally flattened and oval in shape, some are filiform.

15-There is a powerful oral sucker surrounding the oral opening, most have another ventral sucker (acetabulum) and some have a genital sucker as well.

16-The digestive system started with the mouth opening which is surrounded by the oral suckers,then the oesophygus which is surrounded by the muscular pharynx. The oesophygus is devided just above the ventral sucker into two simple intestinal coeca.

17-Muscular and nervous system:

Musculature is mainly a subtegumental or suprficial muscle layers. The **nervous system** consists of two anterior ganglia connected by a commissure.

18-**The excretory system** is based on the **flame cell** .Their ductules collect in larger collecting ducts. These on each side end into excretory bladder in the posterior end of the trematode

Reproductive system

Is composed of both male and female genital systems in the same worm (hermaphrodite).

The **male genital system** is formed of two testes; each gives out a vas eferens. The two ducts join to form one vas deferens that dilates distally to form a seminal vesicle. The seminal vesicle is surrounded by prostatic glandular cells, and opens in the cirrus, which is the male copulatory organ. The cirrus opens through the male genital orifice that lies besides the female genital orifice in the genital atrium.

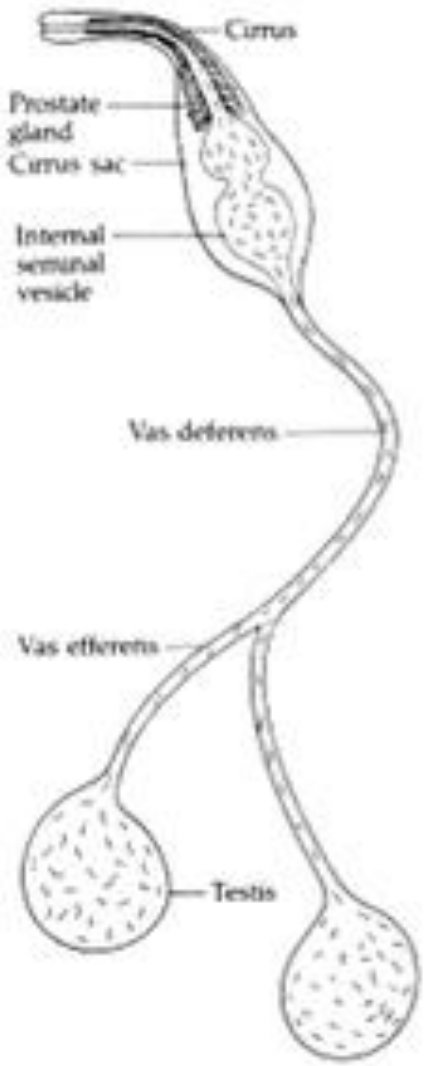
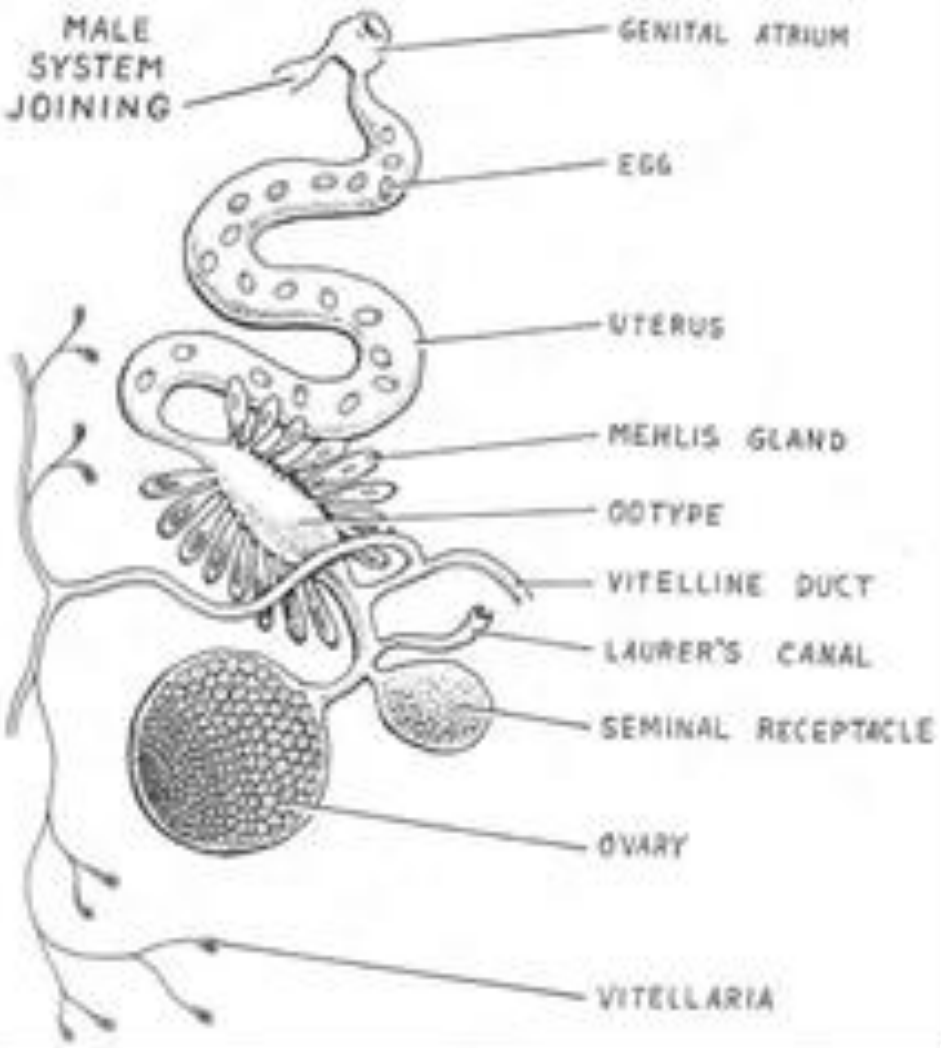


FIGURE 9-10
Male reproductive system of a digenetic trematode.

The **female genital system** is formed of a single ovary which is usually round or oval, but may be lobated or even branched. The ovary gives out a short oviduct has a seminal receptacle. At the base of seminal receptacle there is slender tube called Laurer's canal which ends either blindly in the parenchyma or opens through the tegument and is considered vestigial vagina. The oviduct is joined by the vitelline duct which provides the ovum with yolk cells coming from the vitelline glands. Vitelline glands are numerous, and give out vitelline ductules which collect to form one duct on each side, these join to form a central common duct which joins the oviduct. After junction with the vitelline duct the oviduct expands to form the ootype which is surrounded by numerous monocellular Mehli's glands that produce the shell material of the egg in the ootype. The ootype opens into the uterus where the eggs are completely formed in its proximal part and are sent distally to be expelled through the female genital pore in the genital atrium.


MALE SYSTEM JOINING
GENITAL ATRIUM
EGG
UTERUS
MEHLIS GLAND
OOTYPE
VITELLINE DUCT
LAURER'S CANAL
SEMINAL RECEPTACLE
OVARY
VITELLARIA

Development:

- At least two hosts share in the life cycle of trematodes. One is a vertebrate where sexual reproduction takes place, and the other is a mollusc (snail) where asexual reproduction occurs.

*Egg: has an operculum at one end (except schistosomes) through which the first larval stage escapes when it reaches water.

*The miracidium: (1st. larval stage) is a tiny, ciliated pyriform organism. It has nerve endings and penetration glands which secrete histeolytic enzymes. There is a variety of sensory organs and endings in the miracidium like chemoreceptors, photoreceptors (eye spots), thermo- and statoreceptors. Miracidia survive only for few hours so they rapidly seek their snail host and penetrate its soft body attracted by its mucus secretions.

*Sporocyst; is the 2nd. larval stage that forms inside the snail. The embryonic cells inside the sporocyst may develop into another sporocyst generation (daughter sporocyst) or into the next stages – redia or cercaria.

.

*__The redia__: (3rd. larval stage) feed on snail tissue and grow in size. Their embryonic cells develop into either daughter rediae or cercariae.

*__Cercariae__: represent the juvenile stage of the vertebrate-inhabiting adult.

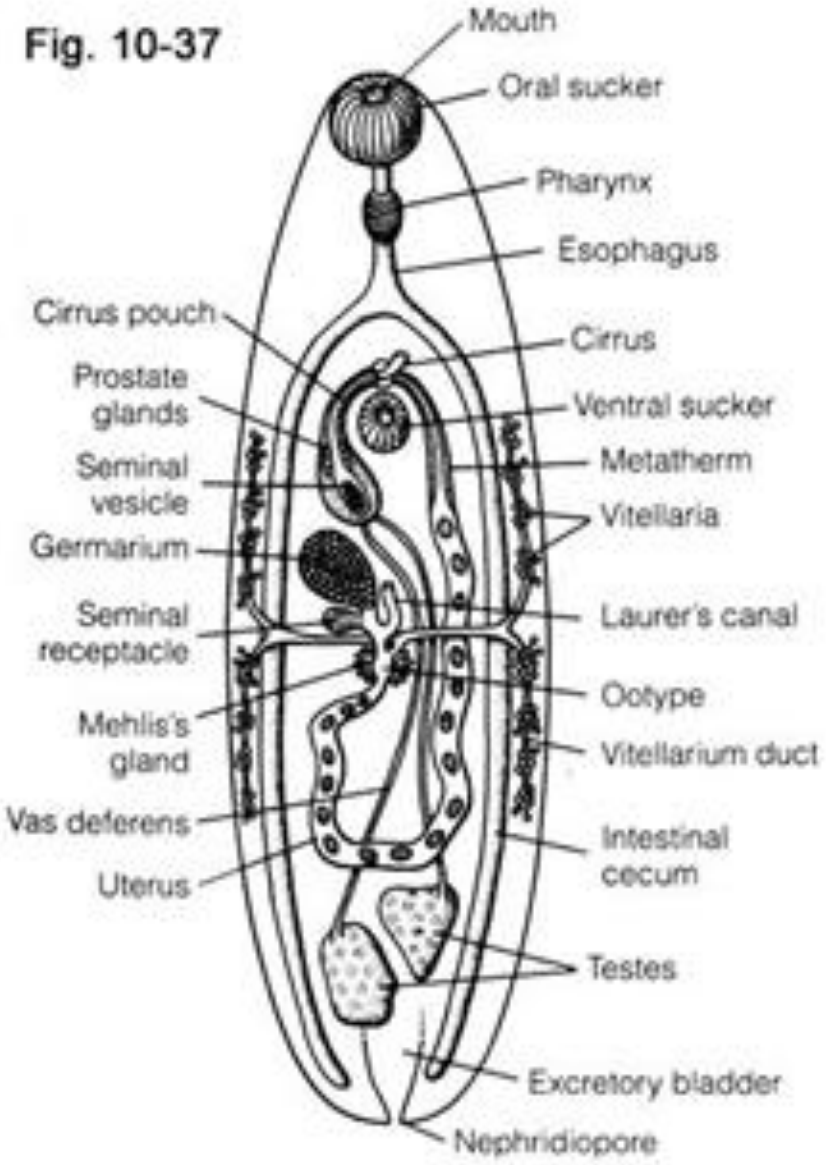
Some have a stylet in the anterior margin of the oral sucker (__xiphidocercaria__).

Some cercariae have cystogenous glands which form a cyst wall around the cercaria which loses its tail and becomes an __encysted metacrcaria__

According to the tail shape cercaria :

1-**Leptocercous**, with simple tail.
Lophocercous (cercaria ornatatae), with membranous tail.
2-**Furcocercous**, with forked tail.
3-**Microcercous** with small knob-like tail.
4-**Cercariaium** without a tail.
Metacercaria: It is a quiescent stage between cercaria and adult.
Juvenile stage: This begins when the definitive host is reached either by penetration (schistosomes) or after being swallowed then excystation occurs.

Fig. 10-37


Mouth
Oral sucker
Pharynx
Esophagus
Cirrus pouch
Cirrus
Prostate glands
Ventral sucker
Seminal vesicle
Metatherm
Vitellaria
Germarium
Seminal receptacle
Laurer's canal
Ootype
Mehlis's gland
Vitellarium duct
Vas deferens
Intestinal cecum
Uterus
Testes
Excretory bladder
Nephridiopore

LIVER FLUKES

GENUS FASCIOLA

Fasciola hepatica, *F. gigantic* and an intermediate form, a hybrid of both.

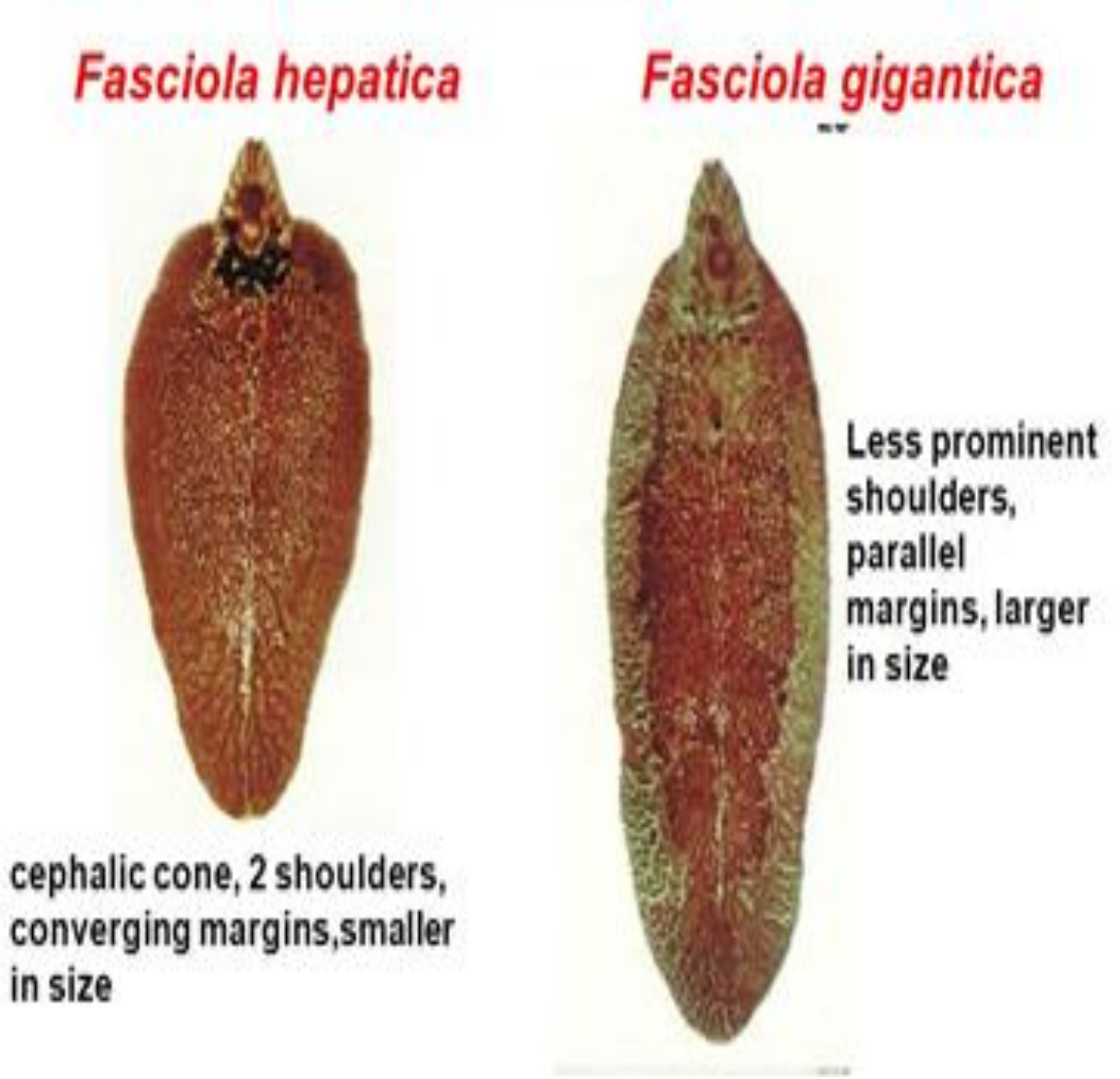
Distribution

Hosts:

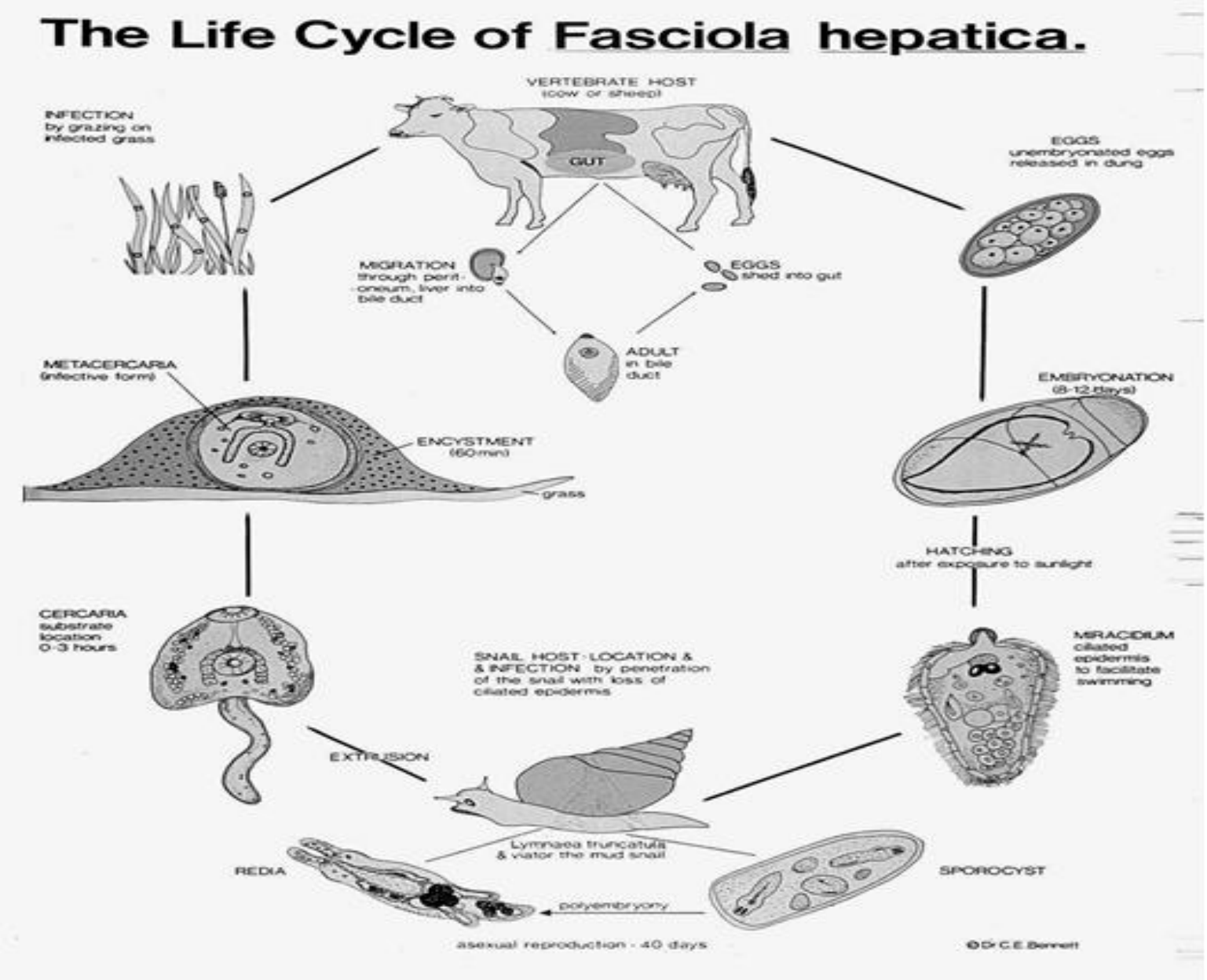
Habitat

Morphology:

Fasciola sp. cont.

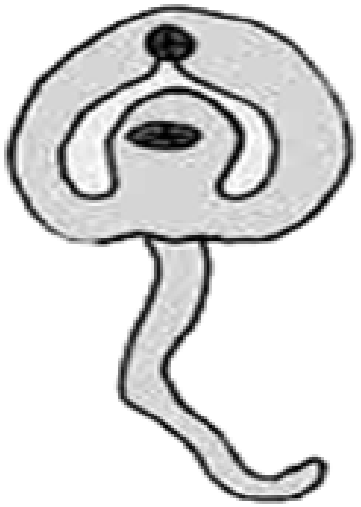


Life cycle:

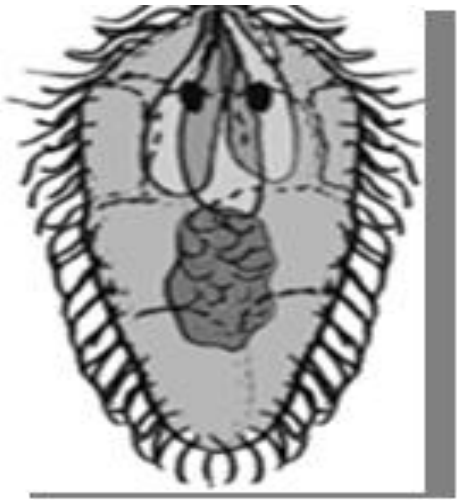

The Life Cycle of Fasciola hepatica.
VERTEBRATE HOST
(cow or sheep)
INFECTION
by grazing on
infected grass
GUT
EGGS
unembryonated eggs
released in dung
MIGRATION
through perit-
oneum, liver into
bile duct
EGGS
shed into gut
ADULT
in bile
duct
METACERCARIA
(infective form)
EMBRYONATION
(8-12 days)
ENCYSTMENT
(60 min)
grass
HATCHING
after exposure to sunlight
CERCARIA
substrate
location
0-3 hours
SNAIL HOST - LOCATION &
& INFECTION by penetration
of the snail with loss of
ciliated epiderms
MIRACIDIUM
ciliated
epidermis
to facilitate
swimming
EXTRUSION
Lymnaea truncatula
& viator the mud snail
REDIA
SPOROCYST
polyembryony
asexual reproduction - 40 days
©Dr C.E.Bennett

Pathogenesis
Clinical manifestations:

1-Acute stage
2-Chronic phase
3-Ectopic infection



Diagnosis



Treatment
Prevention and control

Halzoun: in endemic areas of fascioliasis, nasopharyngeal infection called halzoun in Lebanon or **marara** in Sudan is caused by eating raw liver of mutton. The juveniles in the liver parenchyma attach themselves to the pharyngeal mucosa causing severe irritation which may lead to suffocation. This case is known there to be treated by gargling with wine or alcohol. It has a relaxing effect on the suckers, so the worm leaves the mucosa and is swallowed. This case is also caused by the intrahepatic larval stages of *Lingatula serrata*, a parasite of reptiles and its eggs could be swallowed by cattle during grazing.

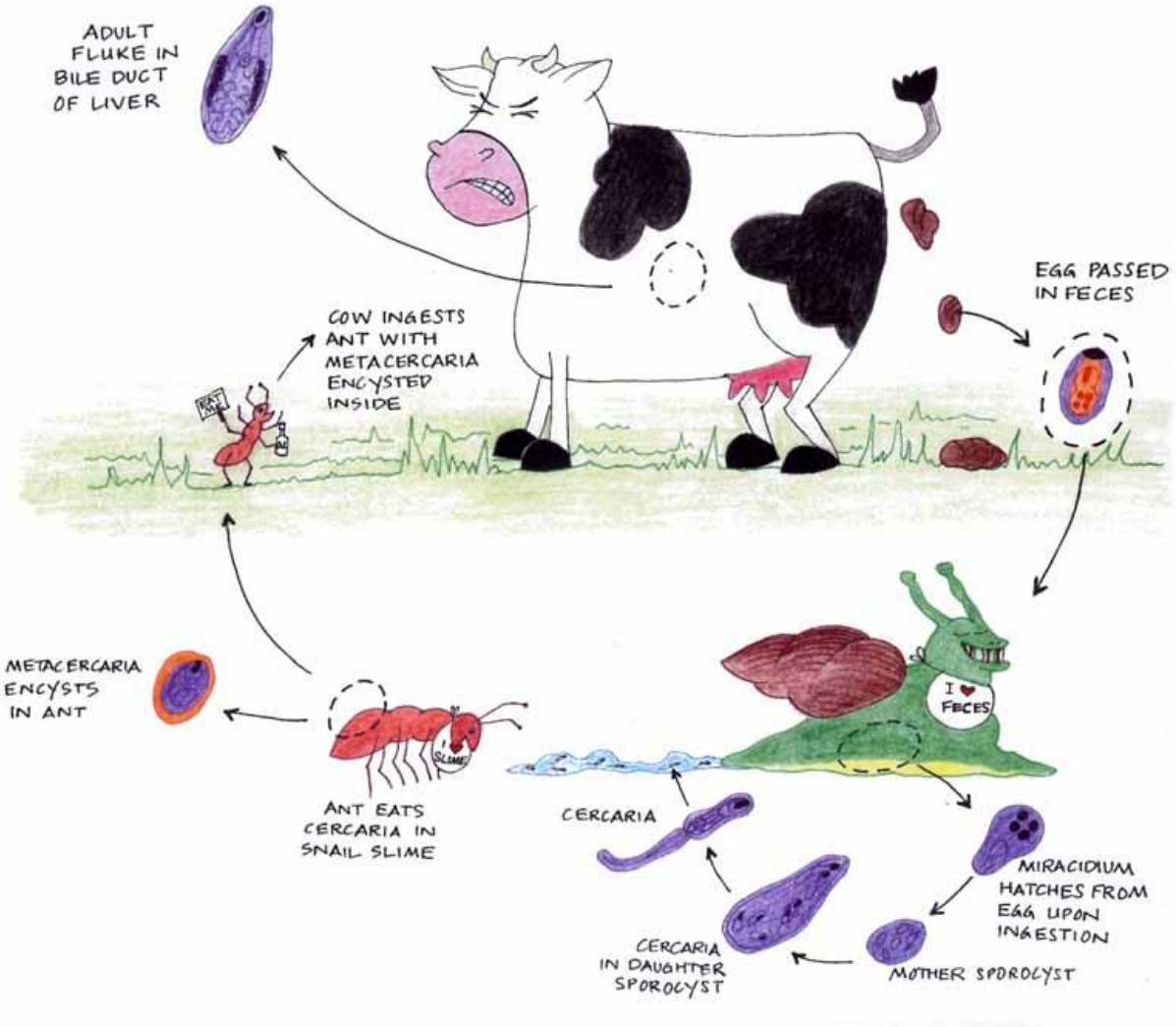
Vaccination

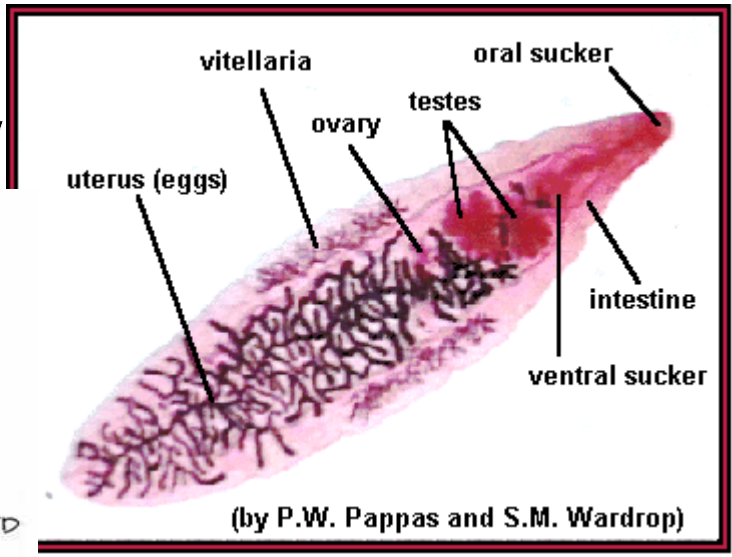
Cysteine proteinases released by *F. hepatica* play a key role in parasite feeding, migration through host tissues and in immune evasion. A recombinant cysteine proteinase expressed as inclusion bodies in *Escherichia coli* was used for enteral vaccination of rats against fascioliasis. This oral vaccination reduced the parasite burden by 78–80 %.

Immunity in fascioliasis

In the course of fascioliasis, many Eexecretory/Sescretory (E/S) antigens cause **antigenic stimulation.** (E/S) components of *F. hepatica* also exert direct **immune suppressive effects** through the activity of proteinase on immunoglobulin molecules. It has been well documented that parasitic infection is frequently accompanied by **down-regulation of cell-mediated immunity. Inhibition of lymphocyte proliferative responses** has been also reported during infections.

DICROCILIUM DENDRITICUM





Thank you