

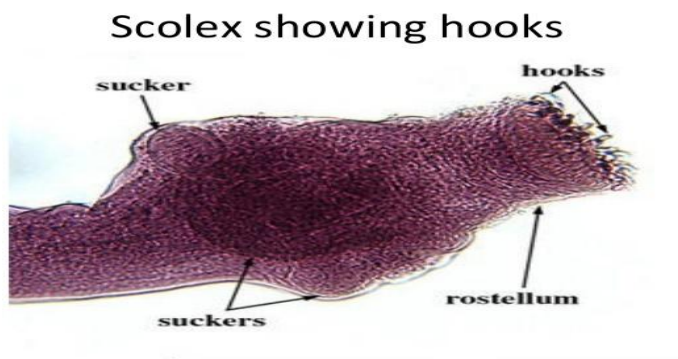
CESTODES: INTRODUCTION

Platyhelminthes (platy means flat; helminth means worm) are divided into two classes: 1- Cestoda (tapeworms) and

2-Trematoda (flukes)

Cestoda (Tapeworms) consist of two main parts:

1- a rounded head called a **scolex** and the scolex has specialized means of attaching to the intestinal wall, namely, suckers, hooks, or sucking grooves.



2- a flat body of multiple segments called **proglottids**. The worm grows by adding new proglottids from its germinal center next to the scolex. The oldest proglottids at the distal end are gravid and produce many eggs, which are excreted in the feces and transmitted to various intermediate hosts such as cattle, pigs, and fish.



Humans usually acquire the infection when **undercooked flesh containing the larvae** is ingested. However, in two important human diseases, cysticercosis and hydatid disease, it is the eggs that are ingested and the resulting larvae cause the disease.

ECHINOCOCCUS

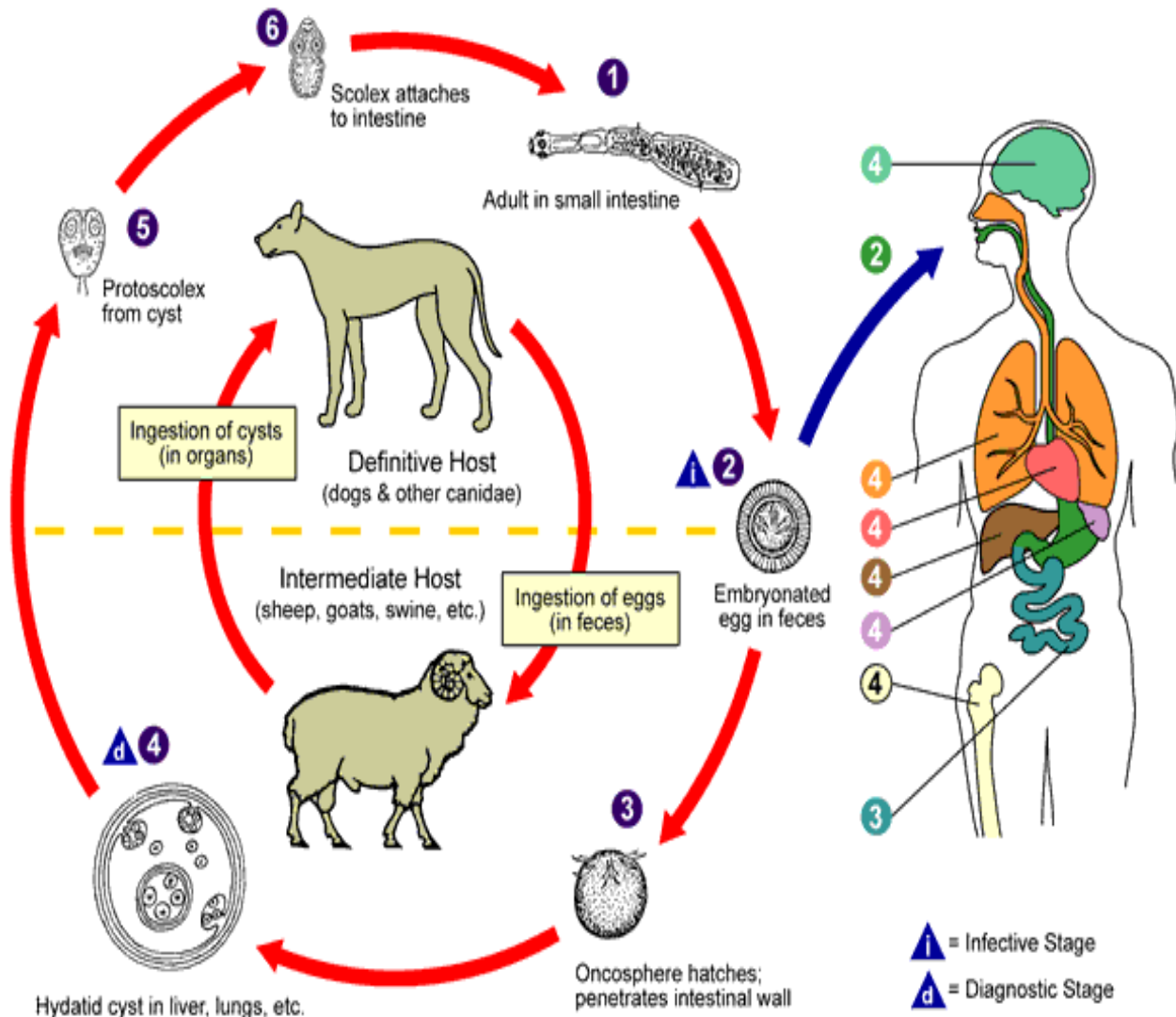
Disease

- 1- The larva of *Echinococcus granulosus* (dog tapeworm) causes unilocular hydatid cyst disease.
- 2- Multilocular hydatid disease is caused by *E. multilocularis*,

Important Properties

E. granulosus is composed of a **scolex** and only three **proglottids**, making it **one of the smallest tapeworms**. The scolex has a circle of hooks and four suckers. **Dogs** are the most important definitive hosts. The intermediate hosts are usually **sheep**. **Humans** are almost always dead-end intermediate hosts.

In the typical **life cycle**, worms in the dog's intestine liberate thousands of eggs, which are ingested by sheep (or humans). The **oncosphere** embryos emerge in the small **intestine** and migrate primarily to the **liver** but also to the **lungs, bones, and brain**. The embryos develop into large fluid-filled **hydatid cysts**, the inner germinal layer of which generates many protoscoleces within "brood capsules." The life cycle is completed when the **entrails** (e.g., liver containing hydatid cysts) of slaughtered sheep are eaten by dogs.



Pathogenesis & Epidemiology

- E. granulosus* usually forms **one large fluid-filled** cyst (**unilocular**) that contains thousands of individual scoleces as well as many daughter cysts within the large cyst.
- Individual scoleces lying at the bottom of the large cyst are called "**hydatid sand**."
- The cyst acts as a space-occupying lesion, putting pressure on adjacent tissue. The **outer layer** of the cyst is thick, fibrous tissue produced by the host. The cyst fluid contains parasite **antigens**, which can sensitize the host.
- Later, if the **cyst ruptures** spontaneously or during trauma or surgical removal, life-threatening **anaphylaxis** can occur. Rupture of a cyst can also spread protoscoleces

widely.

-The disease is **found** primarily in shepherds living in the Mediterranean region, the Middle East, and Australia.

Clinical Findings

- 1- The **incubation period** for all species of *Echinococcus* can be months to years, or even decades.
- 2- Forms **one large fluid-filled cyst** (unilocular) contains individual scoleces and daughter cysts.
- 3- Many individuals with hydatid cysts are **asymptomatic**, but **liver cysts** may cause hepatic dysfunction.
- 4- Cysts in the **lungs** can erode into a bronchus, causing bloody sputum,
- 5- **Cerebral** cysts can cause headache and focal neurologic signs.
- 6- **Rupture** of the cyst can cause **fatal anaphylactic shock**.

Laboratory Diagnosis

- 1- **imaging techniques**, the imaging technique of choice for cystic echinococcosis is ultrasonography **computer tomography** (CT) or **magnetic resonance** imaging (MRI)
- 2- **Histological** examination of a tissue biopsy from the patient.
- 3- **Serologic** tests, e.g., the indirect hemagglutination test.
- 4- Nucleic acid detection (**PCR**).

Treatment

the most common form of treatment is:

- Open **surgical** removal of the cysts combined with
- Chemotherapy using **albendazole** and/or mebendazole before and after surgery.

A protoscolicidal agent, e.g., hypertonic saline, should be injected into the cyst to kill the organisms and prevent accidental dissemination.

Prevention: Prevention of human disease involves not feeding the entrails of slaughtered sheep to dogs.

NEMATODES: INTRODUCTION

Nematodes (also known as Nemathelminthes) are roundworms with a cylindrical body and a complete digestive tract, including a mouth and an anus. The body is covered with a noncellular, highly resistant coating called a **cuticle**. Nematodes have **separate sexes**; the female is usually larger than the male. The male typically has a coiled tail.

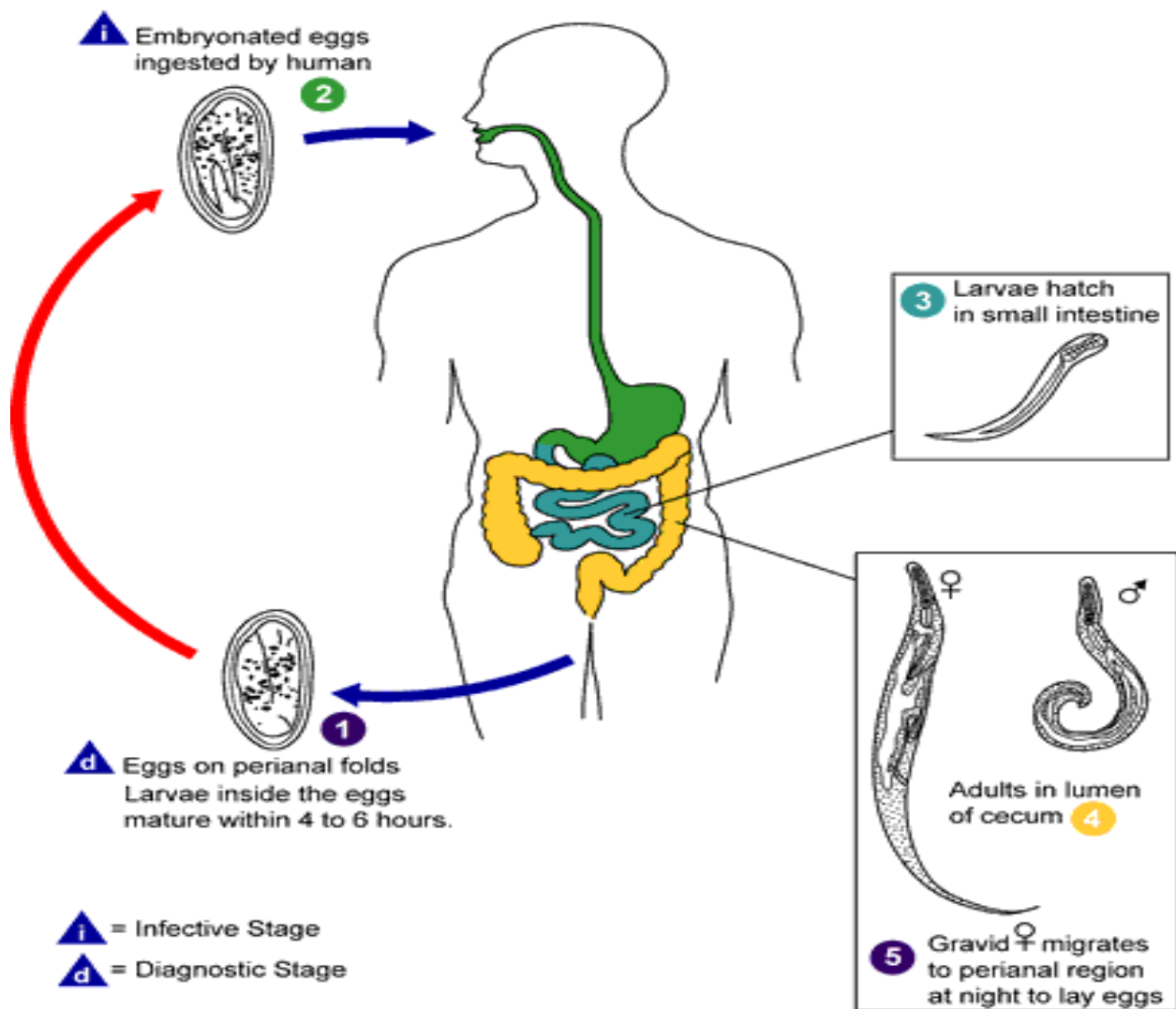
ENTEROBIUS

Disease

Enterobius vermicularis causes **pinworm infection (enterobiasis)**.

Important Properties

- The life cycle is **confined to humans**.
- The infection is acquired by ingesting the worm **eggs**. The eggs hatch in the **small intestine**, where the **larvae** differentiate into adults and migrate to the **colon**. The adult male and female worms live in the colon, where mating occurs.
- At night**, the female migrates from the anus and releases thousands of fertilized eggs on the perianal skin and into the environment.
- Within 6 hours**, the eggs develop into larvae and become infectious.
- Reinfection** can occur if they are carried to the mouth by fingers after scratching the itching skin.



Pathogenesis & Clinical Findings

Perianal pruritus is the most prominent symptom. Pruritus is thought to be an allergic reaction to the presence of either the adult female or the eggs. Scratching predisposes to **secondary bacterial infection**.

Epidemiology

Enterobius is found worldwide and Children younger than 12 years of age are the most commonly affected group.

Laboratory Diagnosis

The eggs are recovered from perianal skin by using the **Scotch tape** technique and can be observed microscopically. **Unlike those of other intestinal nematodes, these eggs**

are not found in the stools. The small, **whitish adult worms** can be found in the stools or near the anus of diapered children. No serologic tests are available.

Treatment

Either **mebendazole** or pyrantel pamoate is effective. They kill the adult worms in the colon but not the eggs, so that **retreatment** in 2 weeks is suggested. **Reinfection** is very common.

Prevention

There are no means of prevention.