Medical Biology

1st Stage

Lab 16

Helminthology
‘Cestodes’
Taenia saginata, Taenia solium, Echinococcus granuloses

By
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Classification:

Kingdom: Animelia

Phylum: Platyhelminthes

Class: Cestoidea

Order: Cyclophyllidea

Family: Taeniiadae

Genus: Taenia

Species: Taenia solium, Taenia saginata

General Features of Cestodes:

1. Flat ribbon-like tapeworms reach up to several meters in length.
2. they don't have alimentary canal or body cavity
3. they are segmented into **scolex** (head with suckers and hooks), **neck** and **proglottids** **(strobila)**
4. they are hermaphrodite containing both male and female reproductive organs.
5. Excretory and nervous system are absent.
6. classified into intestinal tapeworms (adult worm) and tissue tapeworms (larva stage).
7. medically important species include: *Taenia saginata*, *Taenia solium* and *Echinococcus granulosus*

Taenia saginata (Intestinal tapeworms)

General Characteristics:

1. Adult worm is white ribbon shaped and flattened and segmented measuring about 5-10 meters in length.
2. The adult body consists of three parts: **scolex** with four muscular suckers, **neck** and **strobila** consisting of up to 2000 segment (proglottids).
3. They have male and female reproductive system in mature proglottid (~2 cm in length) which contains two ovaries and up to 400 testes follicle.
4. They cause the disease taeniasis

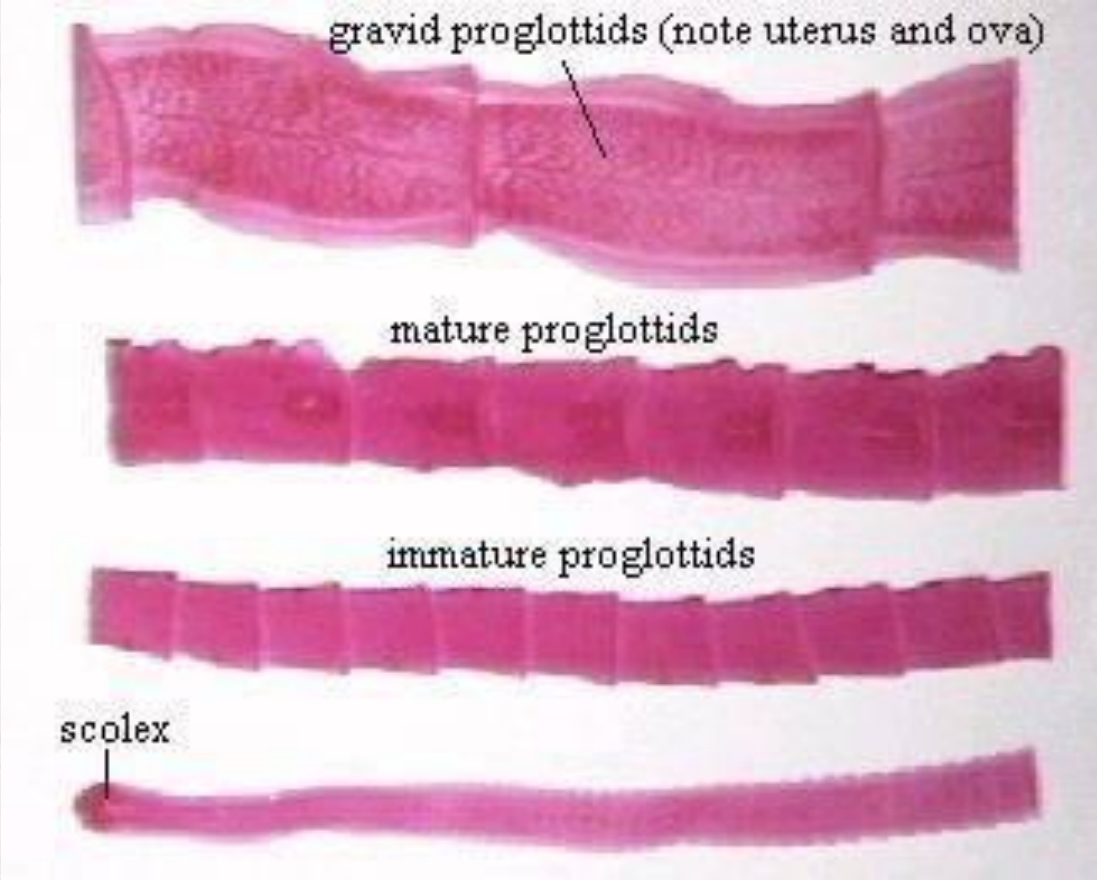
Adult morphology

Scolex

adult worm

Based on maturity of reproductive organs:

1. **immature proglottid**: male and female organs are not developed.
2. **mature proglottid**: male and female organs are developed with male organs appearing first.
3. **Gravid proglottid**: uteri filled with eggs and other organs atrophied or disappeared.



Egg morphology

31 – 43 µm in length, covered with outer membrane and brown shell. The embryo is hexacanth (oncospheres) with three pairs of lancet shaped hooklets (pointed at with the red arrow). Found in feces of human host.

Cysticercus bovis (Larvae) morphology

7-10 mm in length present in the muscle of beef and contains inner engulfed scolex which appears as they grow as shown below.

Life cycle

T. saginata passes its life cycle in 2 hosts.

Definitive host: Humans harboring the adult worm.

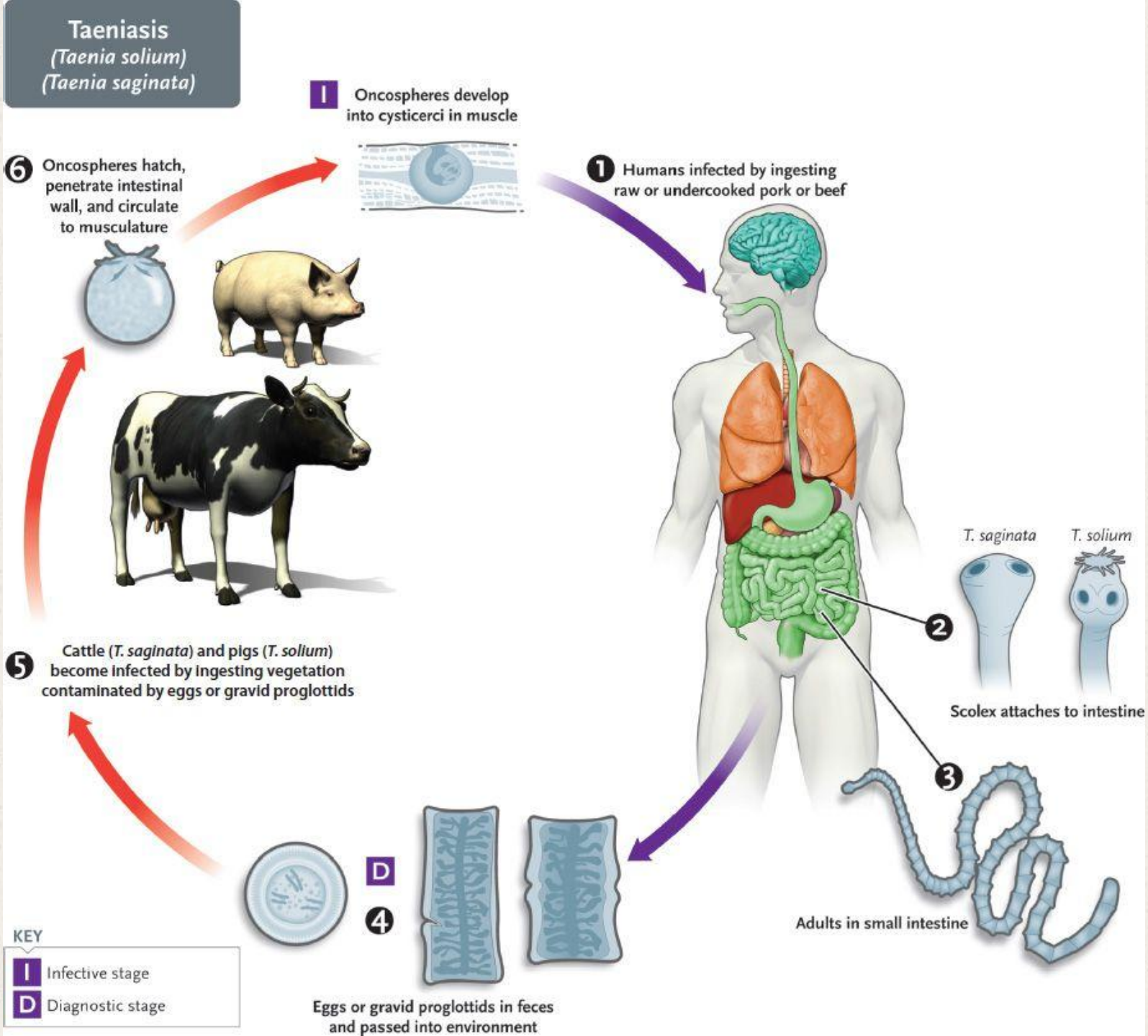
Intermediate host: Cattle (cow or buffalo) harboring the larval stage of the worm.

Infective stage: Cysticercus bovis (larval stage)

Mode of transmission : ingestion of beef meat containing Cysticercus bovis (larvae).

Ingestion of *T. saginata* eggs does not result in cysticercosis.

Taeniasis
(Taenia solium)
(Taenia saginata)



Taenia solium

- When *T. solium* causes intestinal taeniasis, its life cycle is similar to that of T. saginata except.
- **Definitive host**: human
- **Intermediate host:** Pig
- **Infective stage**: Cysticercus cellulosae (larva)
- -Humans are infected by consuming inadequately cooked pork containing cysticercus cellulosae.

Scolex with hooks

adult worm

Cysticercosis

- When Taenia leads to cysticercosis, the life cycle is as follows:
- **Definitive host and Intermediate host**: Both human
- **Infective stage**: Eggs of *T. solium* (not larva)
- **Mode of infection**: human acquires infection by ingesting eggs with contaminated food and water.
- **Autoinfection**: A human harboring adult worm may autoinfect oneself, either by unhygenic personal habits or by reverse peristalsis of the intestine.

- -The further development of the eggs is similar in man and pigs.
- -The oncospheres are released in the duodenum or jejunum and penetrate the intestinal wall.
- -They enter the mesenteric venules or lymphatics and are carried in systemic circulation to the different parts of the body.
- They are filtered out principally in the muscles, where they develop into the larval stage, cysticercus cellulosae in about 60–70 days.
- -In humans, it is a dead end and the larvae die without further development.

- ***Laboratory diagnosis***

1. Stool Examination for detection of:

Eggs

- Microscopic examination of feces shows characteristic eggs of *Taenia* in 20–
80% of patients.
- Formal ether sedimentation method of stool concentration is useful.
- Eggs can also be detected by **cellophane swab method** (NIH Swab) in 85–
95% patients.
- Species identification cannot be made from the eggs, since the eggs of *T. saginata* and *T. Solium* are Similar.

- **Proglottids**
- • Species identification can be done by examining with a hand lens, the gravid proglotlid pressed between 2 slides, when branching can be made out. (15–20
- lateral branches in *T saginata*; under 13 in *T. Solium*).
- **Scolex**
- • Definitive diagnosis can also be established by demonstration of unarmed scolex in case of *T. saginata* after antihelmenthic treatment.
- Larva can not be found in stool

2.Elevated levels of eosinophiles(eosinophilia)

3. Antibody detection in serum

Feature	*Taenia saginata*	*Taenia solium*
Adult worm Length	5-10 meters	2-3 meters
Scolex (head)	Only suckers without hooks	Suckers with several hooks
Number of Proglottids	1000-2000 piece	Below 1000
Larva	Cysticercus bovis present only in cows	Cysticercus cellulosae present in pig and human
Eggs	Not infective to human	Infective to human
Definitive host	Human	Human
Intermediate host	Cows	Pigs and humans
Disease	Intestinal Taeniasis	Intestinal Taeniasis and cysticercosis

Echinococcus granulosus
Hydatid worm/ dog tapeworm

Domain: Eukaryota

Kingdom: Animalia

Phylum: Platyhelminthes

Class: Cestoda

Order: Cyclophyllidea

Family: Taeniidae

Genus: Echinococcus

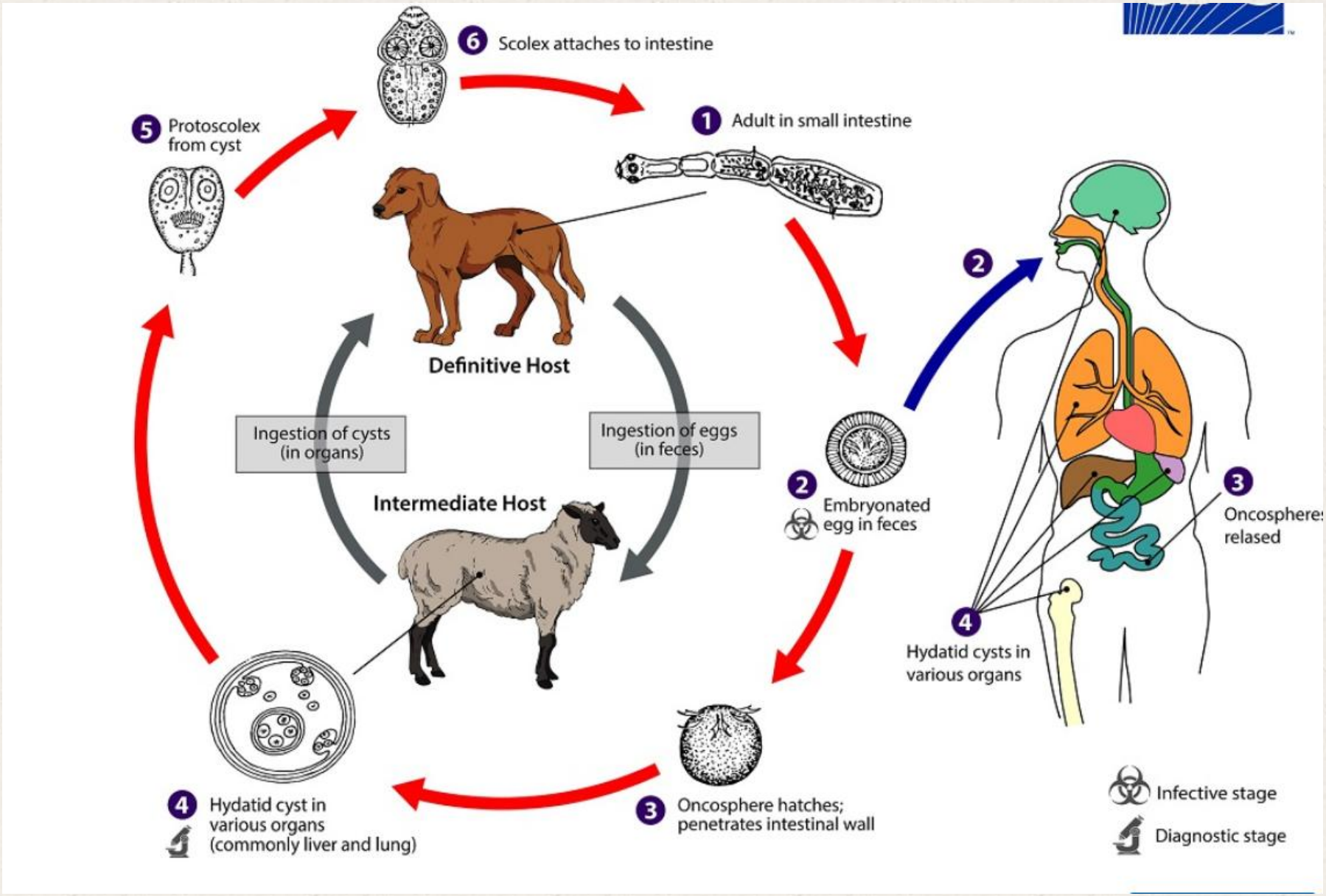
Species: *E. granulosus*

Adult morphology

- The adult tapeworm ranges in length from 3 mm to 6 mm
- it has three proglottids as shown in the next slide
  - immature proglottid
  - mature proglottid
  - gravid proglottid

- The average number of eggs per gravid proglottid is 823.
- The scolex has four suckers and a rostellum with hooks.

Life cycle simplified

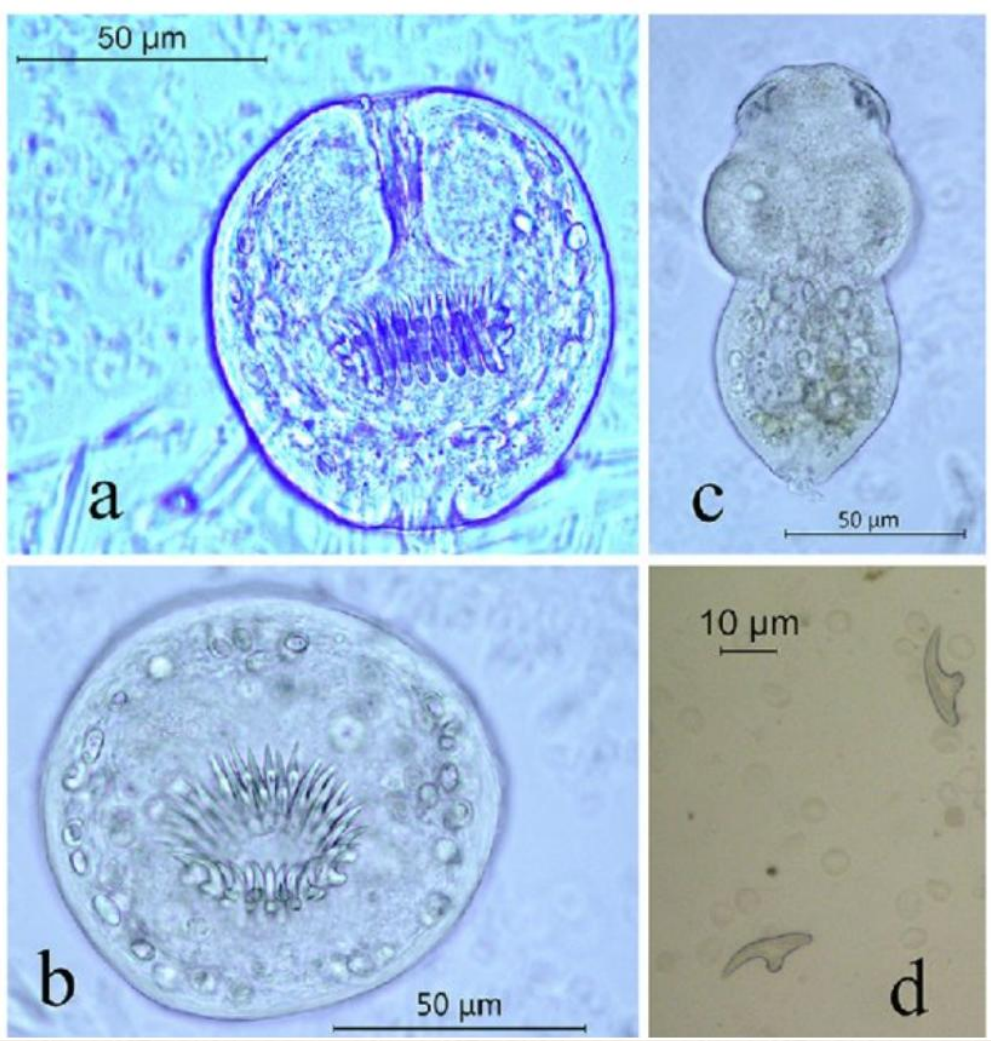


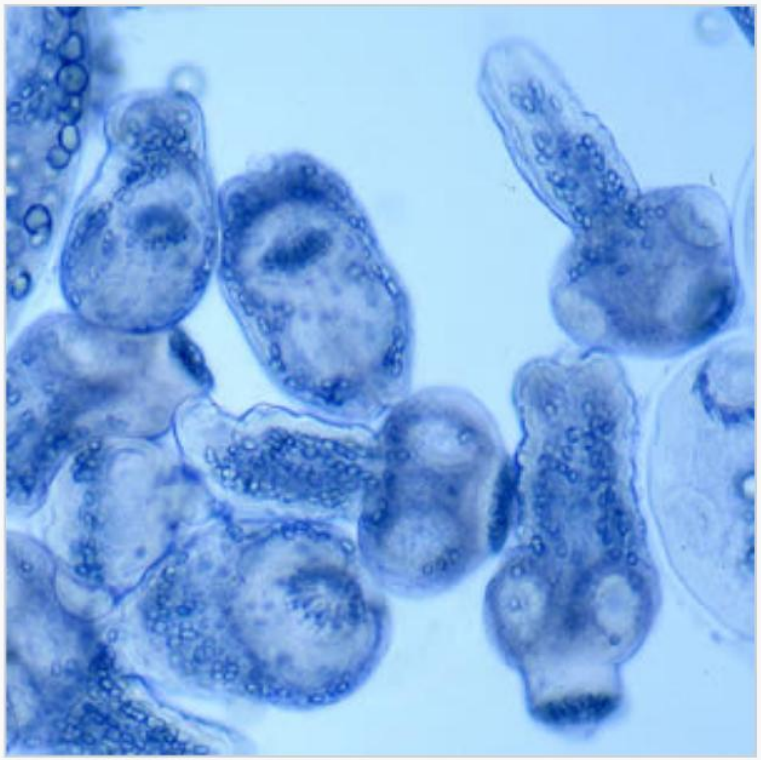
Definitive host: dogs

Intermediate host: sheep, cattle, horses, pigs, goats, and camels

Accidental host: Human.

- **Echinococcosis** is infection with larvae of the tapeworm *Echinococcus granulosus* (cystic echinococcosis, hydatid cyst disease)





Protoscolices being released from a hydatid cyst

Protoscoleces and hooklets of Echinococcus

a.Invaginated scolices observed by microscopy (40×).

b.Evaginated scolices (40×).

c. Evaginated scolices of the protoscolices (40×).

d.Hooks of the larvae (40×)

Pathogenicity

The cyst can cause pressure on surrounding tissue which may lead to abnormal organ function, spontaneous fracture of bones, and other neurological effects

Diagnosis

Diagnosis in humans can be done by x-rays, CAT scans, and ultrasounds.

Thank you