

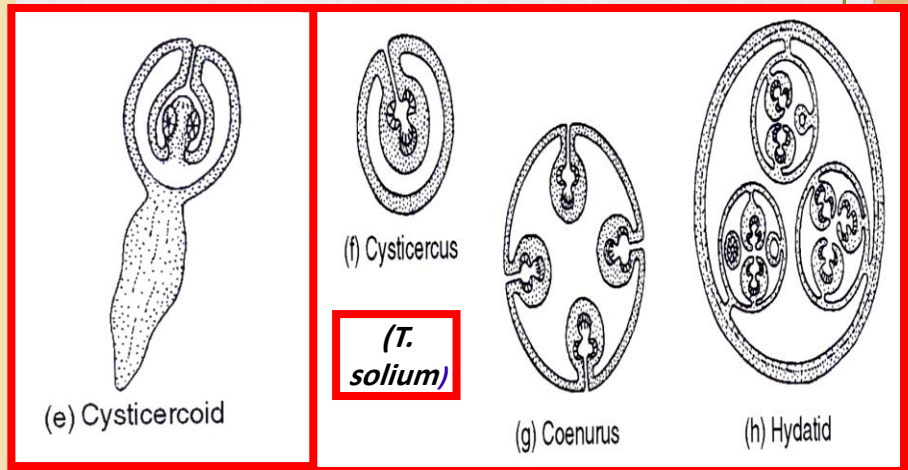
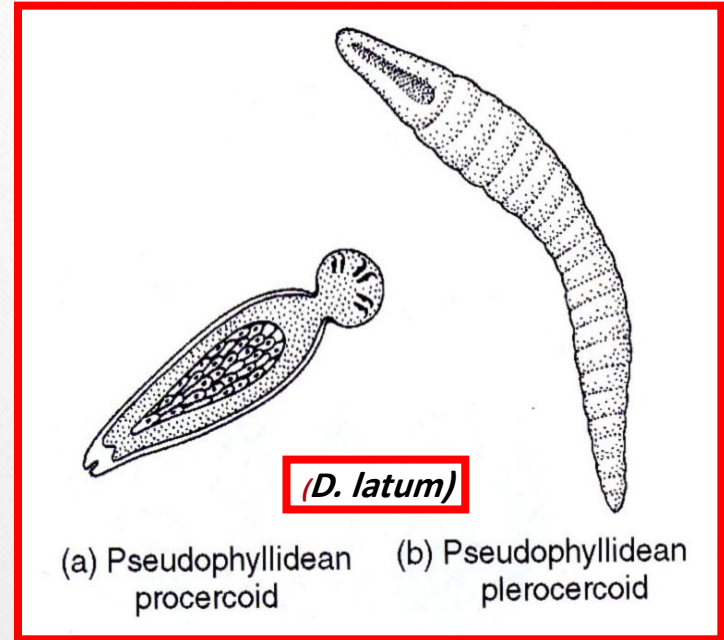
Cestodes

Tape worm

General features

- *Adult worm is flattened ribbon-like, without body cavity*
- *They are hermaphroditic. There is a set of female and male reproductive organs in every mature proglottid.*
- *Digestive tract is absent. Nutrition is absorbed by villi of body surface.*
- *All adult worms parasitize digestive tracts of mammals.*

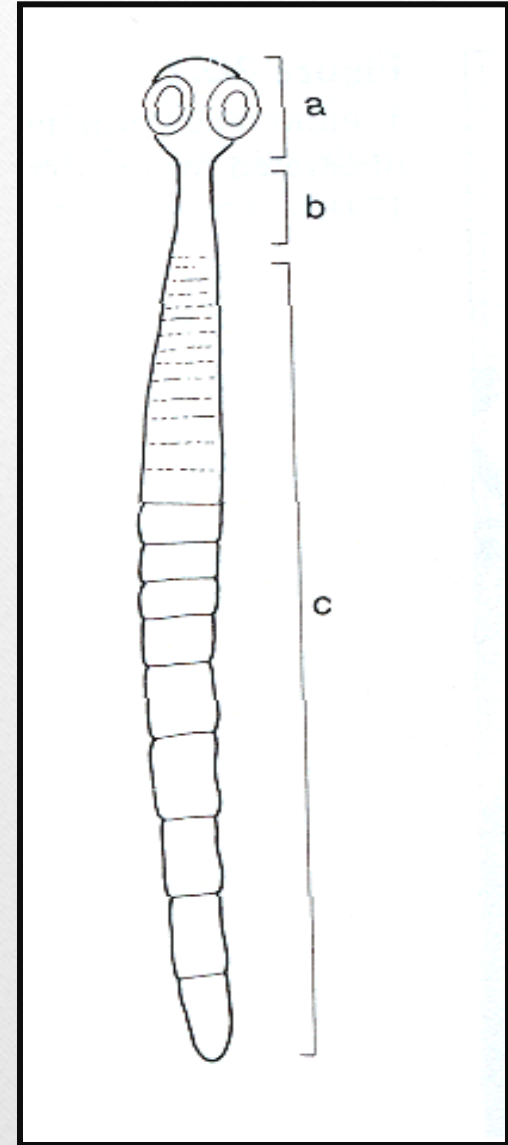
- The developing stages in intermediate hosts are called metacestode such as cysticercus, hydatid cyst, cysticercoid, proceroid, plerocercoid



Hymenolepis sp.)

(E. granulosus)

- The body is composed of a *head*, *neck* and *segmented strobilus*
- The head has *suckers*, *rostellum* and *hooklets* or *sucking grooves* .
- The neck is the budding zone from which segments are formed.
- The *strobilus* consists of *immature*, *mature* and *pregnant proglottides*.



- Sucker like Organs of Scolex:

- **Bothria** – with slit-like groove with weak suction powers and usually two in number



- **Neck:**

Undifferentiated stem cells that give rise to proglottids in strobila.

- **Proglottids:**

a. Immature: contain undeveloped male & female reproductive organ.

b. Mature: contain differentiated male and female reproductive organ.

c. Gravid: contain uterus filled with eggs.



Tapeworms are classified into two orders:

Cyclophyllidea *The head is spherical with suckers, hooklets. The uterus has no opening. One intermediate host is required. The eggs contain an oncosphere .They are medically important, such as Taenia solium ,Taenia saginata and Echinococcus granulosus*

Pseudophyllidea *:The head is spear-like with sucking grooves. The uterus has an opening. Two or more intermediate hosts are required. The eggs contain a coracidium and have to get into water to develop. Human being occasionally get infection. This worms include Diphyllbothrium latum.*

Classification

- **Order Pseudophyllidea**
 - Family Diphylobothriidae
 - *Diphylobothrium latum*
- **Order Cyclophyllidea**
 - Family Taeniidae
 - *Taenia saginata*, *T. solium*, *T. multiceps*,
 - *Echinococcus granulosus*
 - Family Dilepididae
 - *Dipylidium caninum*
 - - *Hymenlepididea*
 - *Hymenolepsis nana*
 - *Hymenolepsis diminuta*

Echinococcus

- ***Echinococcus multilocularis***:
alveolar echinococcosis.
Invasive solid lesions of firm consistency, full of connective tissue and a jelly-like material.
- ***Echinococcus granulosus***:
cystic echinococcosis. Produces cystic lesions

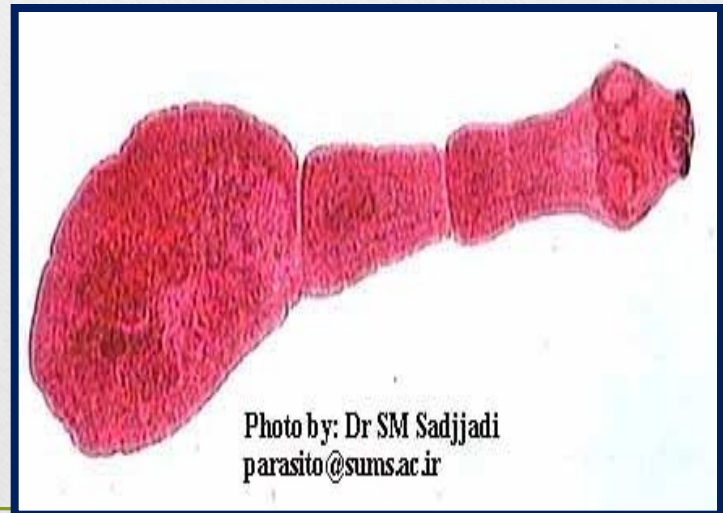
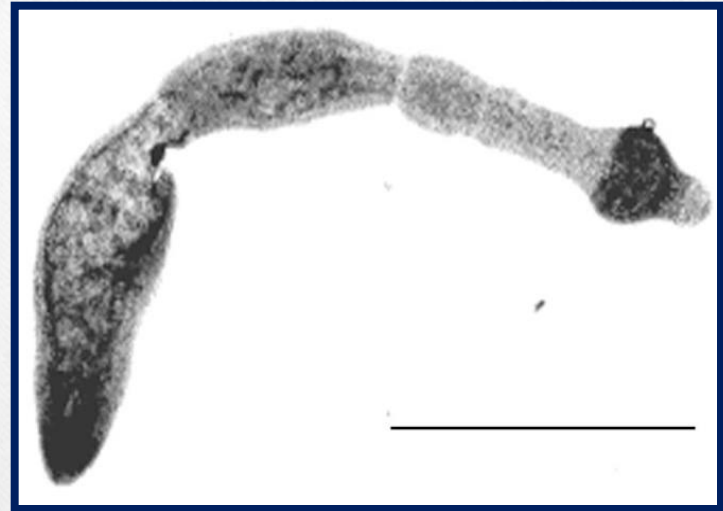


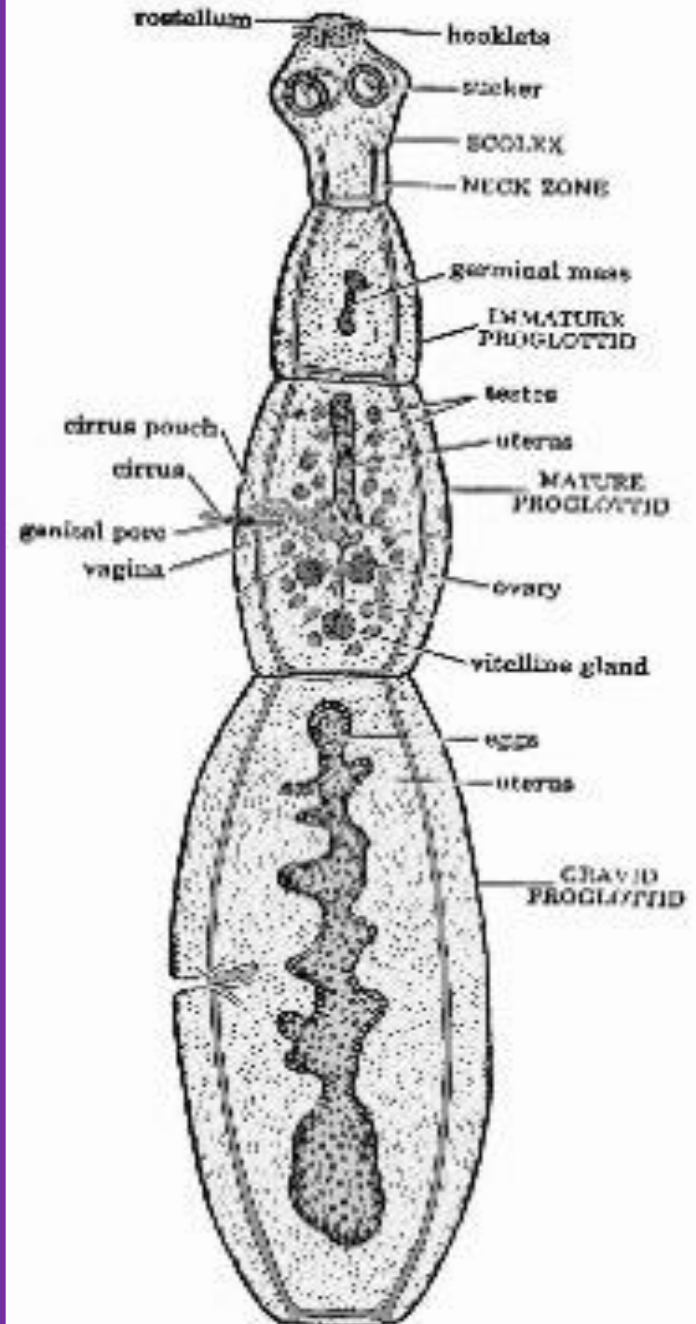
Photo by: Dr SM Sadjjadi
parasito@sums.ac.ir

➤ ***Scolex:*** Four sucker, rostellum and hooks.

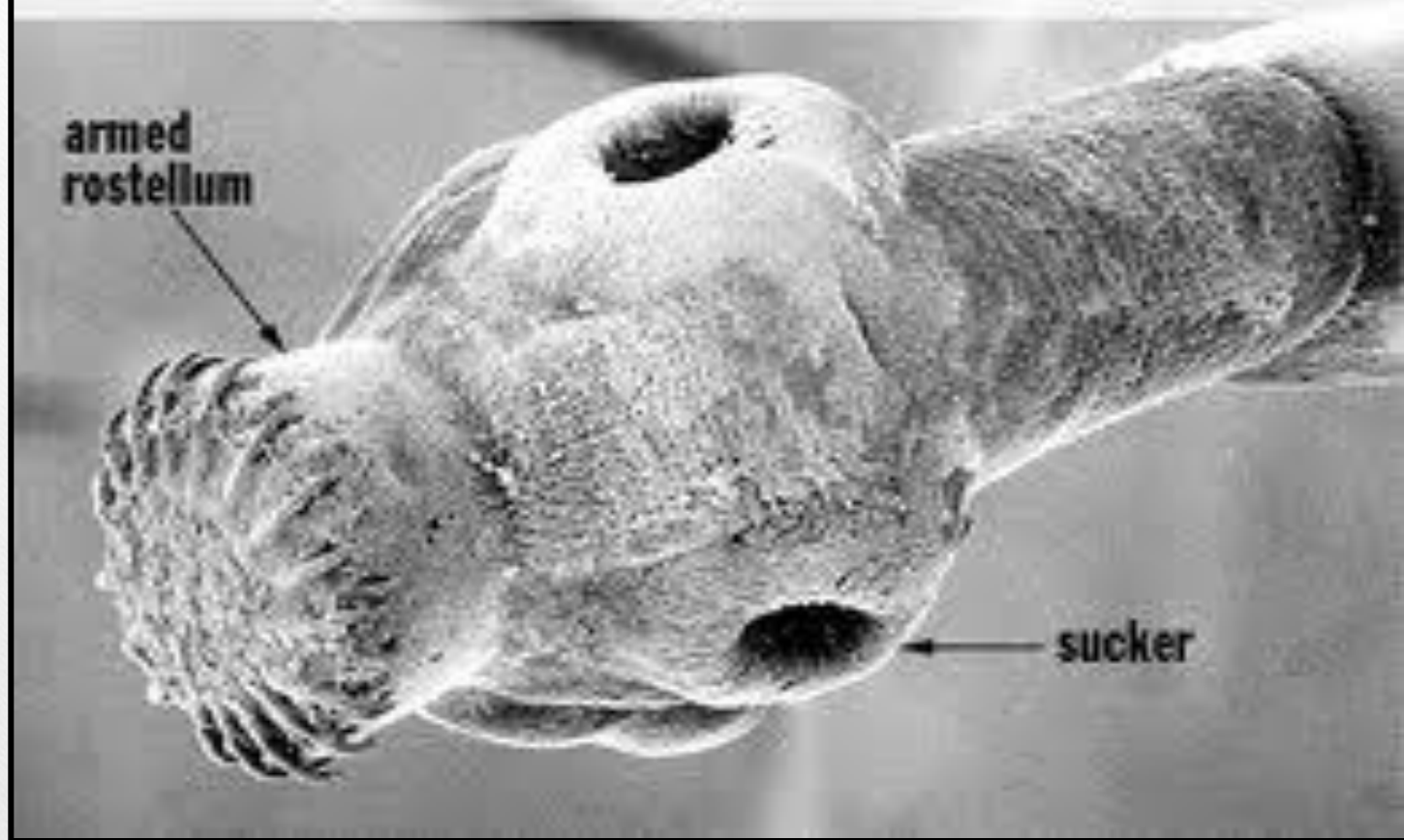
➤ ***Immature segment***

➤ ***Mature segment***(contain vitelline gland, ovary, uterus, testis, lateral genital pore)

➤ ***Gravid segment***(contain



Scanning electron micrograph: *Echinococcus* sp. adult



Echinococcus granulosus - the dog tape worm

- *Adult E. granulosus adult worms live in the intestine of dogs*
- *They produce eggs which are shed with the feces*
- *Eggs are infective to herbivores (and humans)*

Organism: Echinococcus granulosus

*Organism: Echinococcus granulosus is smallest tapeworm [3 segments]

3 segments:

scolex

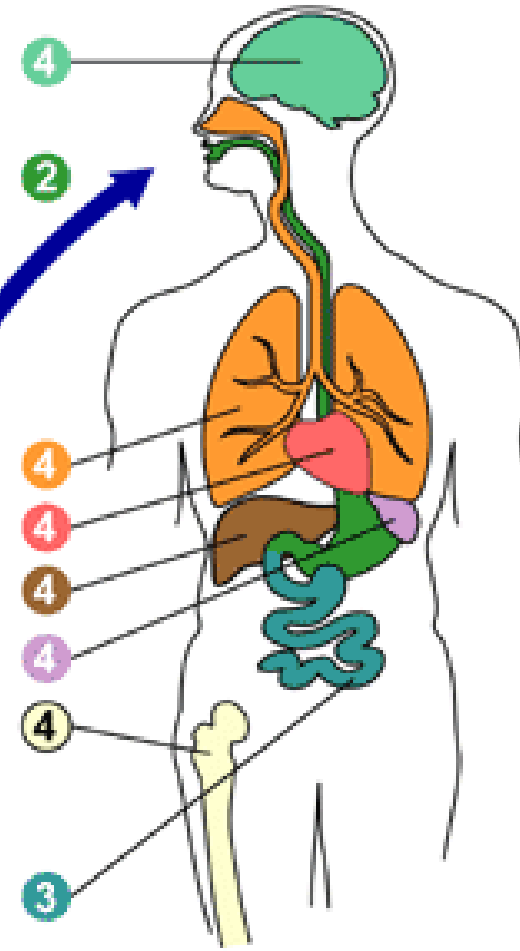
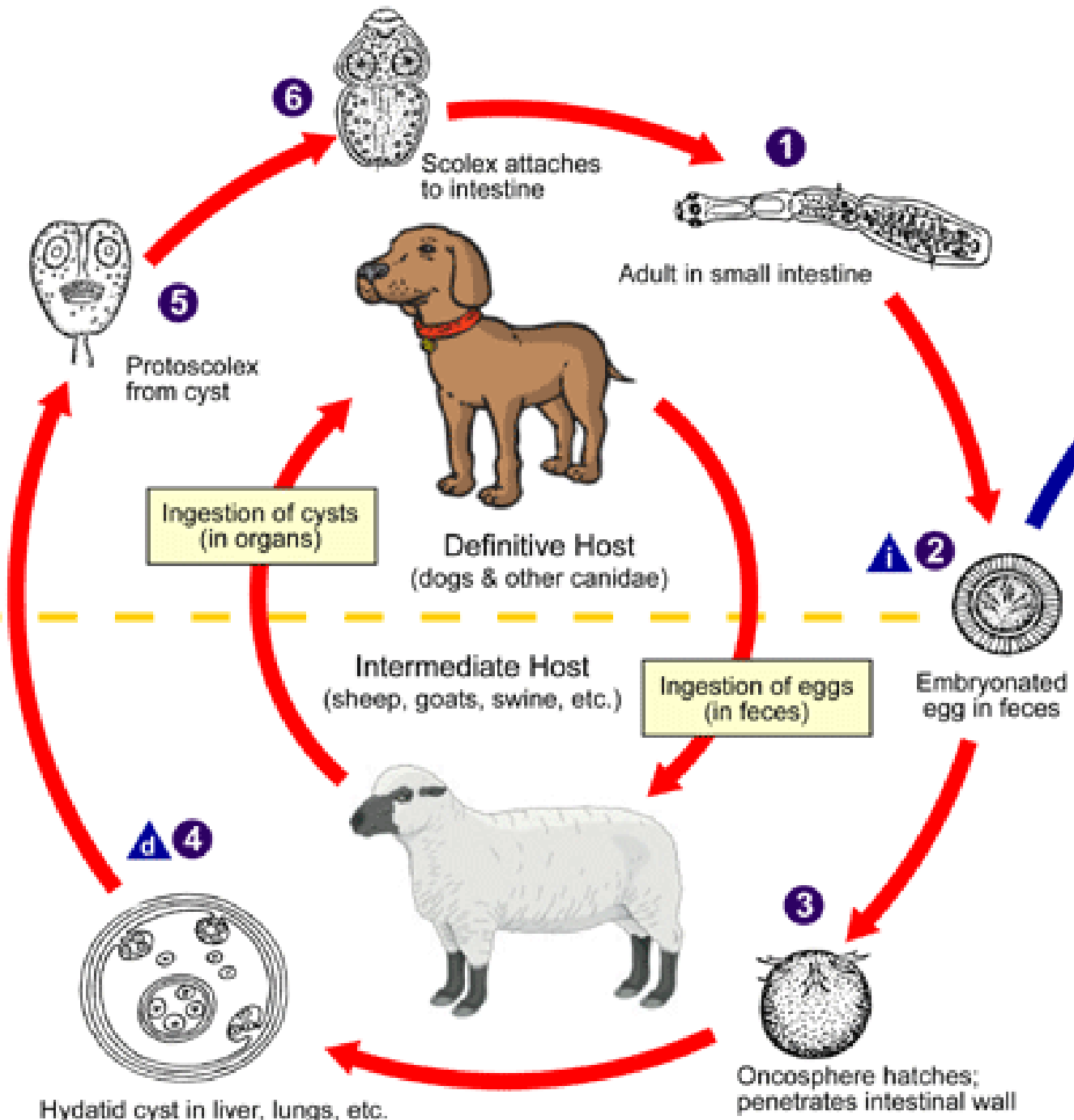
geminated zone

mature proglottids



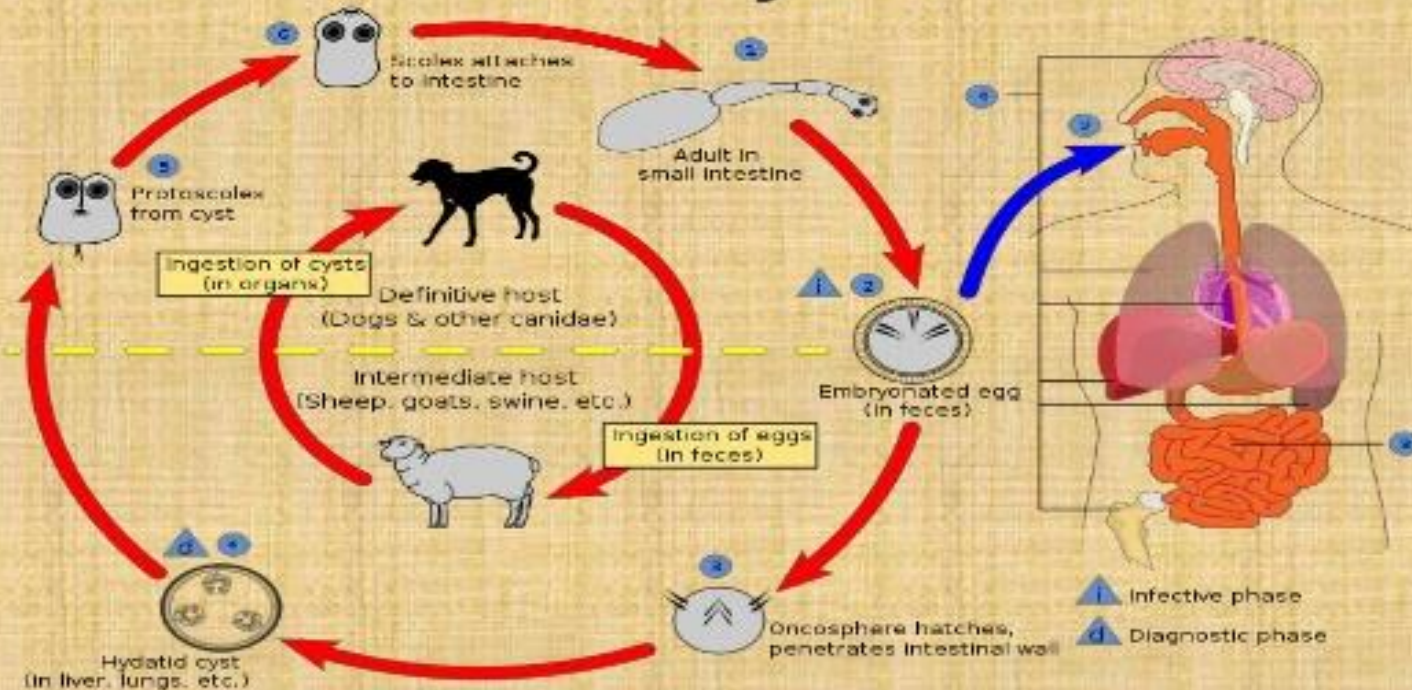


Echinococcus egg in feces



i = Infective Stage
d = Diagnostic Stage

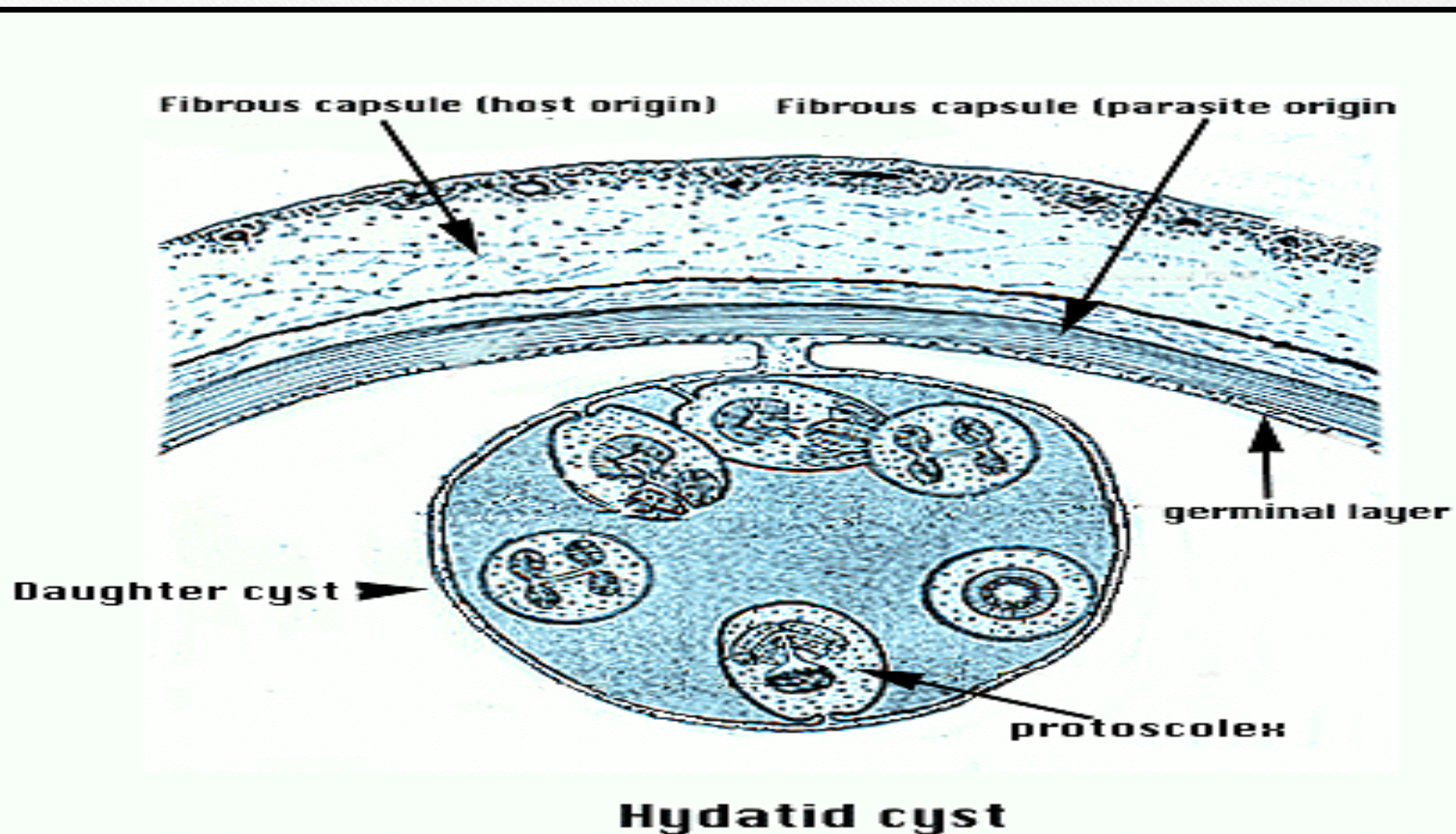
Life Cycle



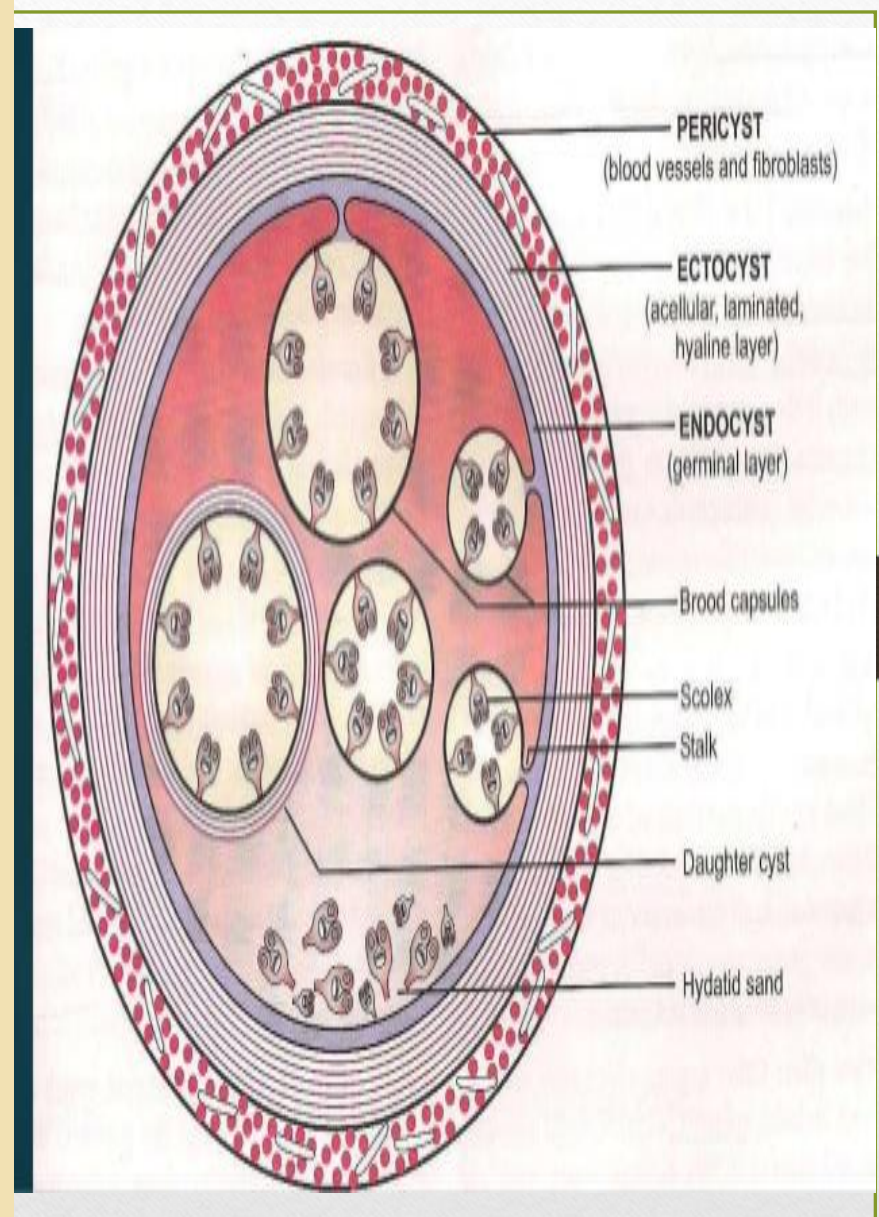
- The adult form of *Echinococcus granulosus* resides in the small intestine of dogs. The ova from the adult worm are shed through the canine feces into the environment, where the intermediate host sheep and humans ingest the eggs, in humans after entering proximal portion of the small intestine, the larvae burrow through the mucosa, enter the portal circulation and travel to liver. The cycle is completed when dogs eat the carcass of animals infected with the hydatid cysts.

Cyst structure

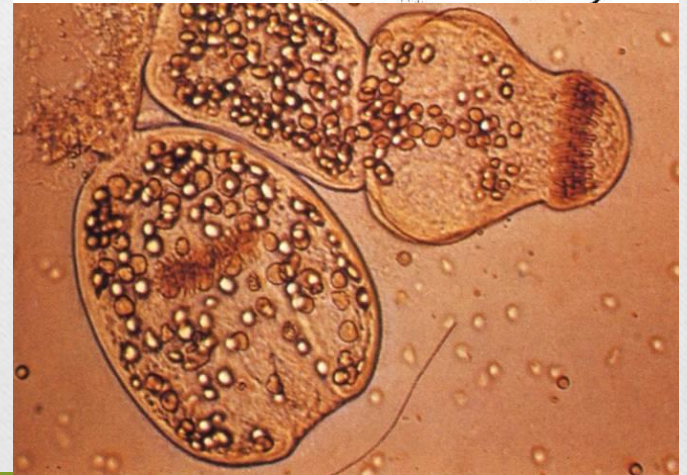
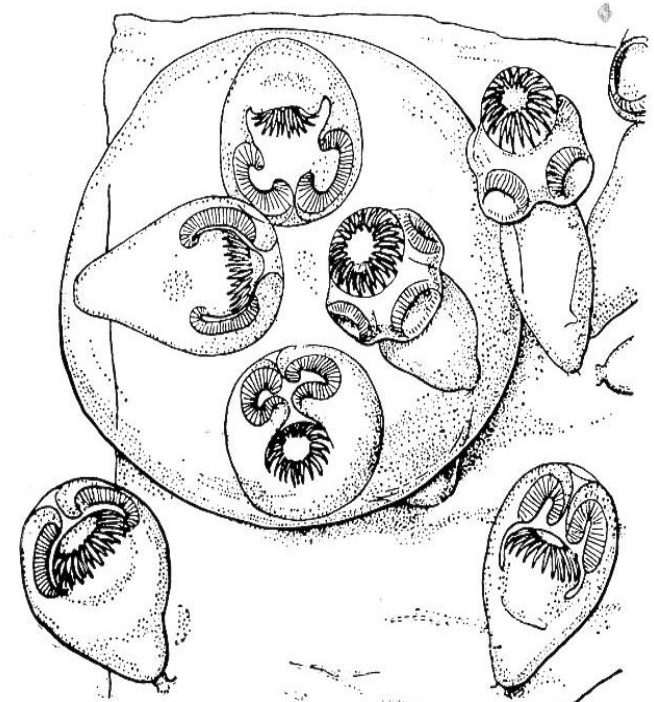
- Hydatides are spherical fluid-filled cysts surrounded by a granuloma formed by the host



- The cyst is lined by a multilayer parasite tissue with the innermost layer being the **germinal layer**
- This layer is a undifferentiated “**stem cell**” layer that can spawn the formation of “brood capsules” which are themselves lined by GL
- The **daughter cysts** (the encircled body) "bud" into the center of the fluid-filled cyst.
- This is a very small portion of the cyst which may become quite large.
- Each of the smaller bodies will develop into diminutive tapeworms should this be eaten by a definitive or final host such as a canine.



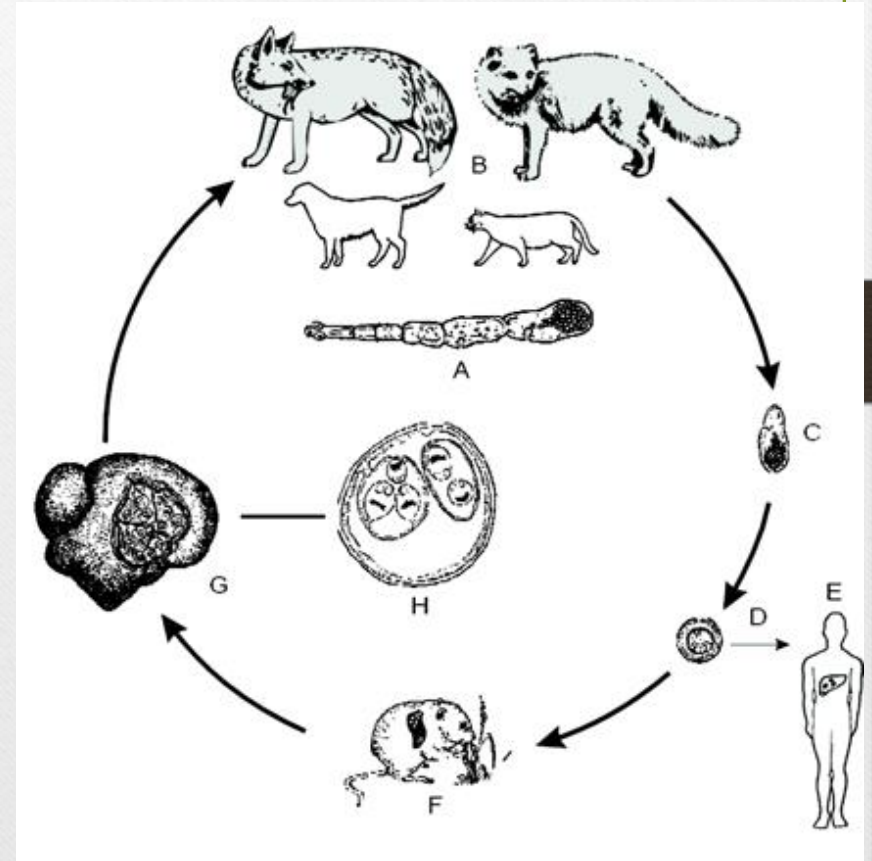
- Thousands of **protoscolices** can fill the hydatid (hydatide sand)
- The protoscolices generally settle down at the bottom of the cyst and are known as **hydatid sand**.
- Protoscolices are the infective stage for dogs
- Hydatides usually grow slowly but steadily (1-5 cm per year)
- They are usually well tolerated until their size becomes a problem or they rupture
- Cyst rupture or leakage can result in allergic reactions and metastasis





Echinococcus multilocularis

- Alveolar or multilocular hydatid
- Hydatid grows like a sponge through entire liver
- Humans get infected by eating contaminated berries and mushrooms collected in forests populated by foxes



Larvae Stage

- *E. granulosus*

- Hydatid cysts are large, roughly spherical, fluid filled hollow bladders containing numerous protoscolices.
- They vary in size; those found in the liver are approx. 20 cm in diameter, but those found in the peritoneal cavity are usually larger

- *E. multilocularis*

- The cyst grows invasively by external budding, forming a diffuse growth through the infected organ, replacing that organs tissues. In contrast to *E. Granulosus* this growth is very rapid, infective prosocialises being present only 2 to 3 months.

Hydatid cysts



E. multilocularis



Echinococcus granulosus

Diagnosis

-Radiological diagnosis : by x-ray examination, C.T. scan and ultrasonography reveal the diagnosis in the most cases.

-Laboratory diagnosis: by

- **Direct method**, by finding the protoscolices, broad capsule in the hydatid fluid by aspiration but it is dangerous and not recommended because this will lead to rupture and consequent anaphylaxis.
- **Indirect methods**, such as Casoni's intradermal test, this is done by injection of two ml of sterile hydatid fluid intradermally in one arm and equal volume of saline in the other arm as control.

False positive result due to other parasitic infection, after surgical removal of the cyst and suppuration or calcification of the cyst.

- **Serological test:** such as (Complement fixation test), Indirect haemagglutination test, (Immunofluorescence antibody test) and (Enzyme-linked immunosorbent assay), (latex agglutination test).