Echinococcus granulosus

Geographical distribution

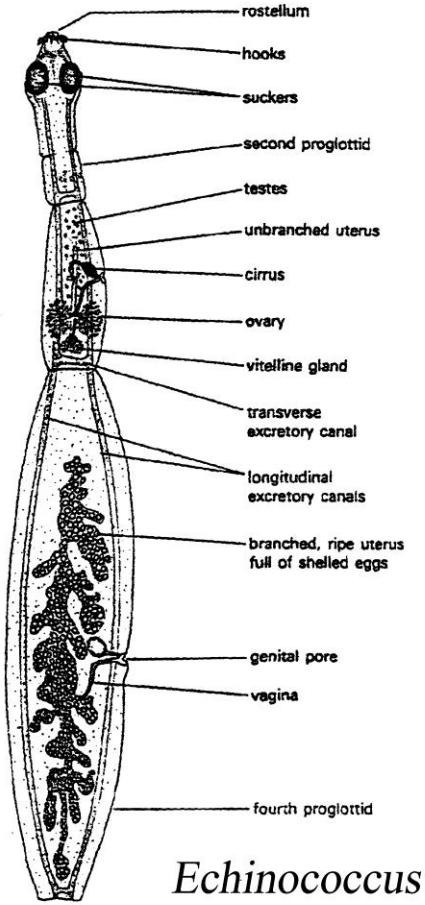
- World wide
- Disease more of temperate than tropical countries
- More commonly seen where sheep & cattle raising constitute an important industry
- Close association between man, dog & sheep

Habitat

- Man –
  - Intermediate host - harboring larval form – Hydatid cyst
- Optimum intermediate host - sheep
- Dog –
  - Definite host – adult worm lives in small intestine
- Other definite host – wild canine animals
  - Wolf, jackal, fox

Morphology of adult worm

- Small in size – 3 to 6 mm in length
- Consist of
  - Head or scolex
    - 4 suckers
    - Protrusible rostellum with 2 circular rows of hooklets
  - Neck
  - Strobila consisting of 3 Segments -
    - Immature
    - Mature
    - Gravid - biggest one - 2-3 mm L × 0.6 mm B



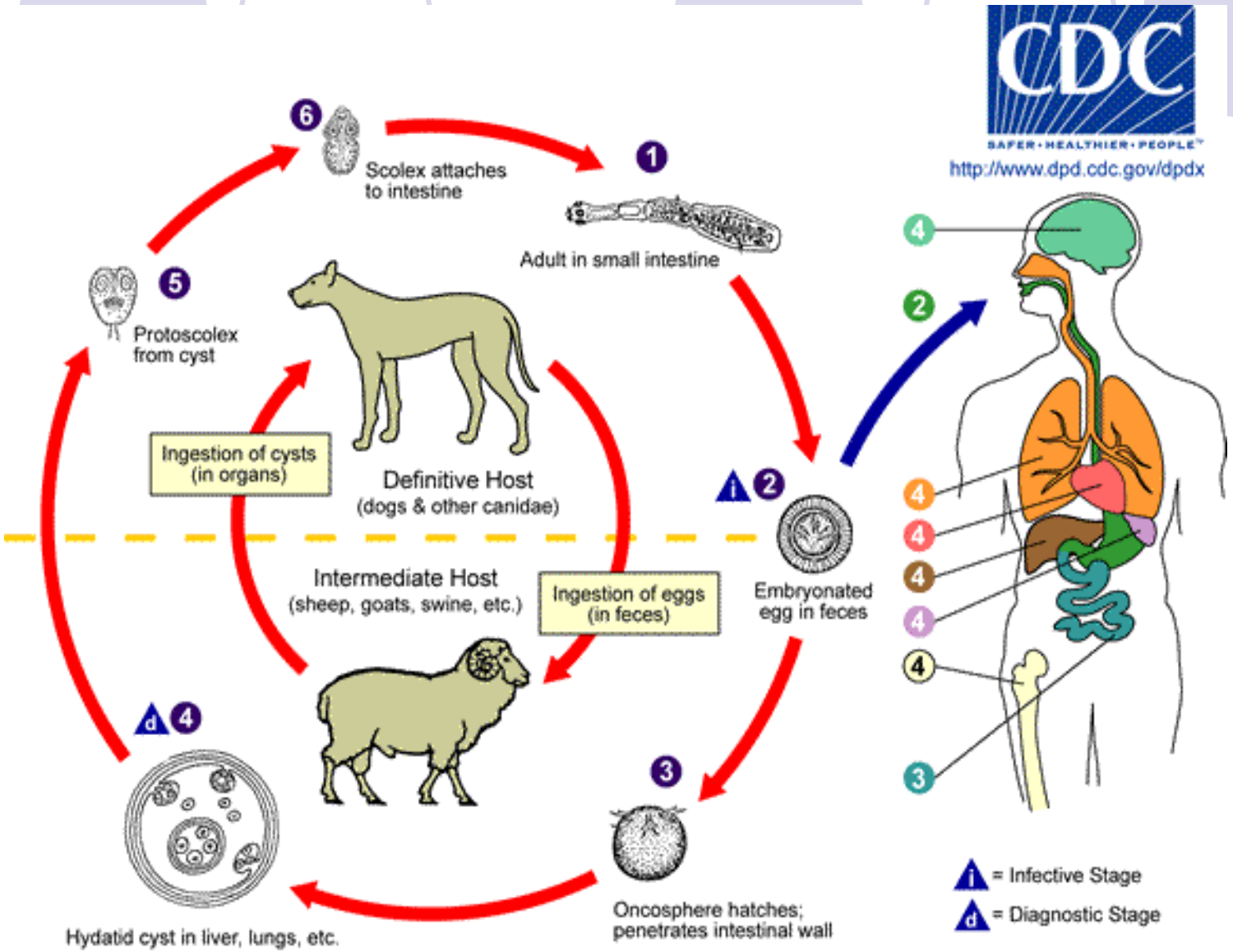
Echinococcus sp.

Eggs

- Oval
- 32-36 µ L × 25 -32 µ B
- 2 covering
- Hexacanth embryo
- Infective to man, cattle, sheep & other animals

Life cycle

- 2 host
- Definite host –dog, wolf, jackal or fox
  - Dog is optimum definite host
  - Adult worm lives in small intestine, discharges eggs along with faeces
- Intermediate host – sheep, pig, cattle, goat & man
  - Sheep is optimum intermediate host


CDC
SAFER·HEALTHIER·PEOPLE™
http://www.dpd.cdc.gov/dpdx
6
Scolex attaches to intestine
1
Adult in small intestine
5
Protoscolex from cyst
Ingestion of cysts (in organs)
Definitive Host
(dogs & other canidae)
i 2
Embryonated egg in feces
Intermediate Host
(sheep, goats, swine, etc.)
Ingestion of eggs (in feces)
d 4
Hydatid cyst in liver, lungs, etc.
3
Oncosphere hatches; penetrates intestinal wall
4
2
4
4
4
4
4
3
i = Infective Stage
d = Diagnostic Stage

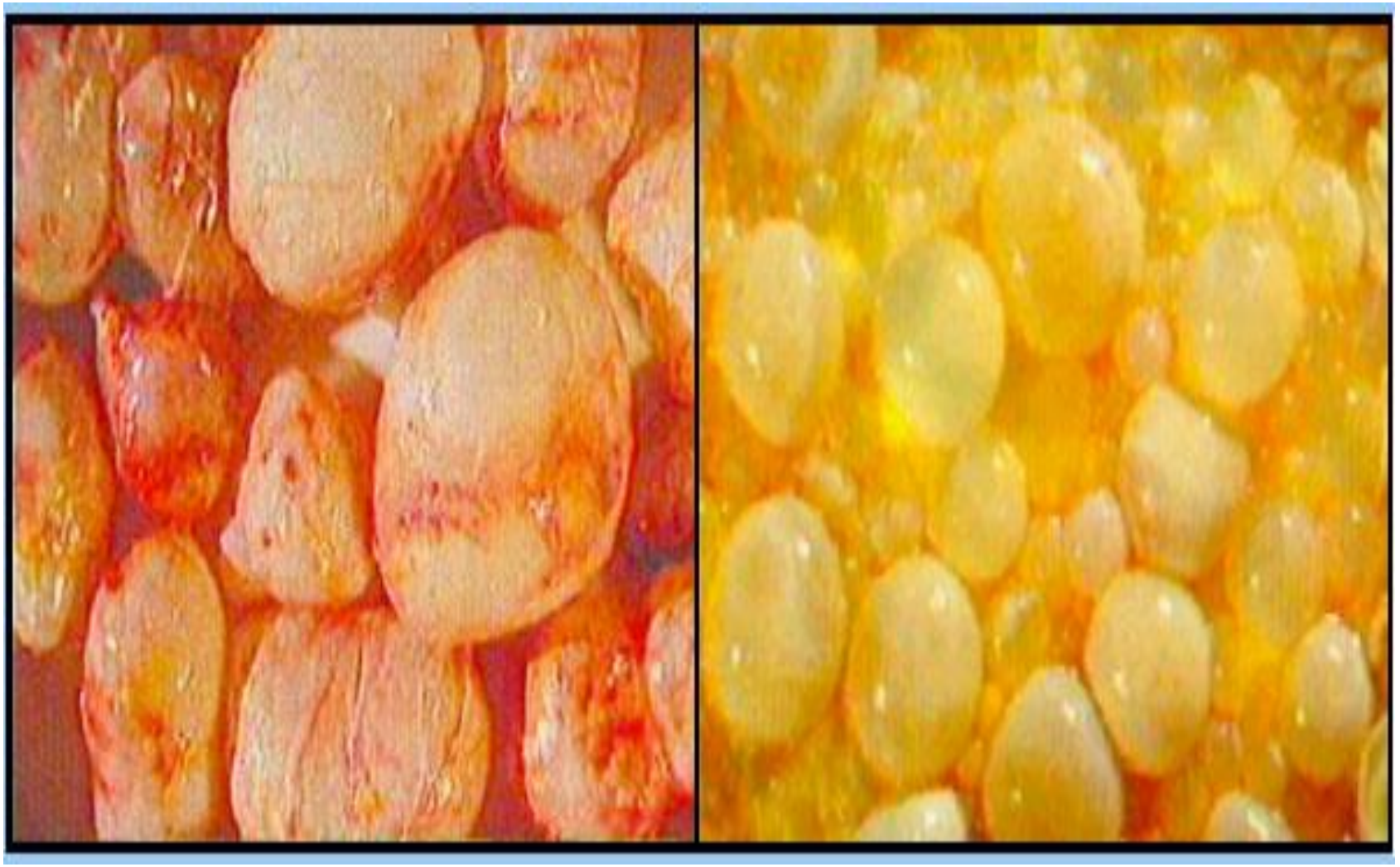
Reaction of host

- Wherever embryo settles, an active cellular reaction consisting of monocytes, giant cells and eosinophils take place around it
- Large number of parasites destroyed by phagocytosis
- Some escape destruction and develop into hydatid cyst
- Cellular reaction disappear followed by appearance of fibroblast, angiogenesis and forms a fibrous envelope- Capsule or pericyst
- In an old cyst, it sclerosed and calcified and parasite inside dies

Hydatid cyst – larval form

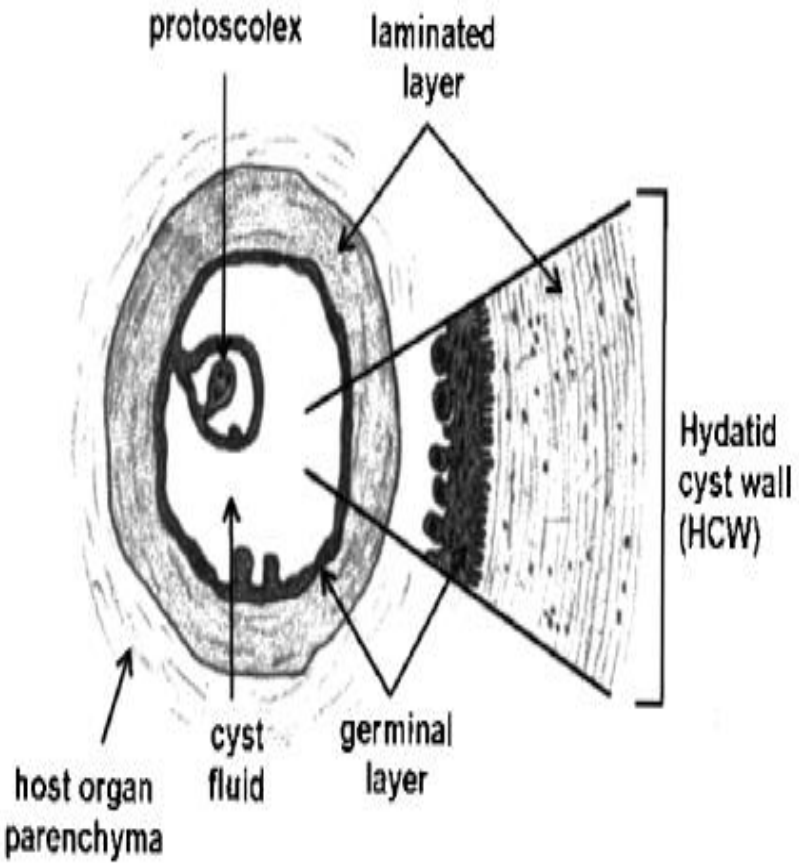
Mother cyst (left)

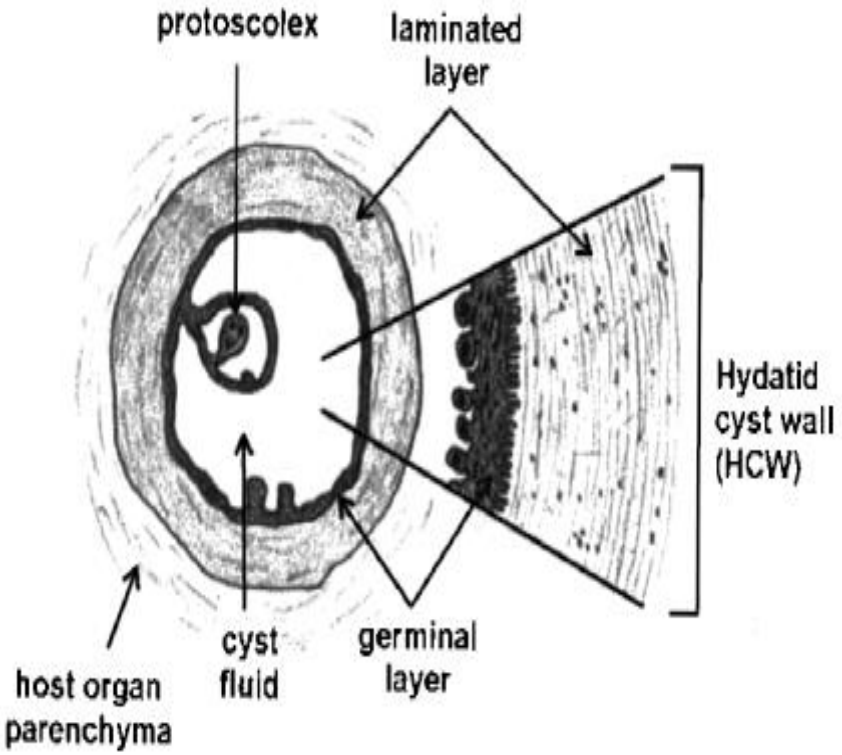
Daughter cyst (right)

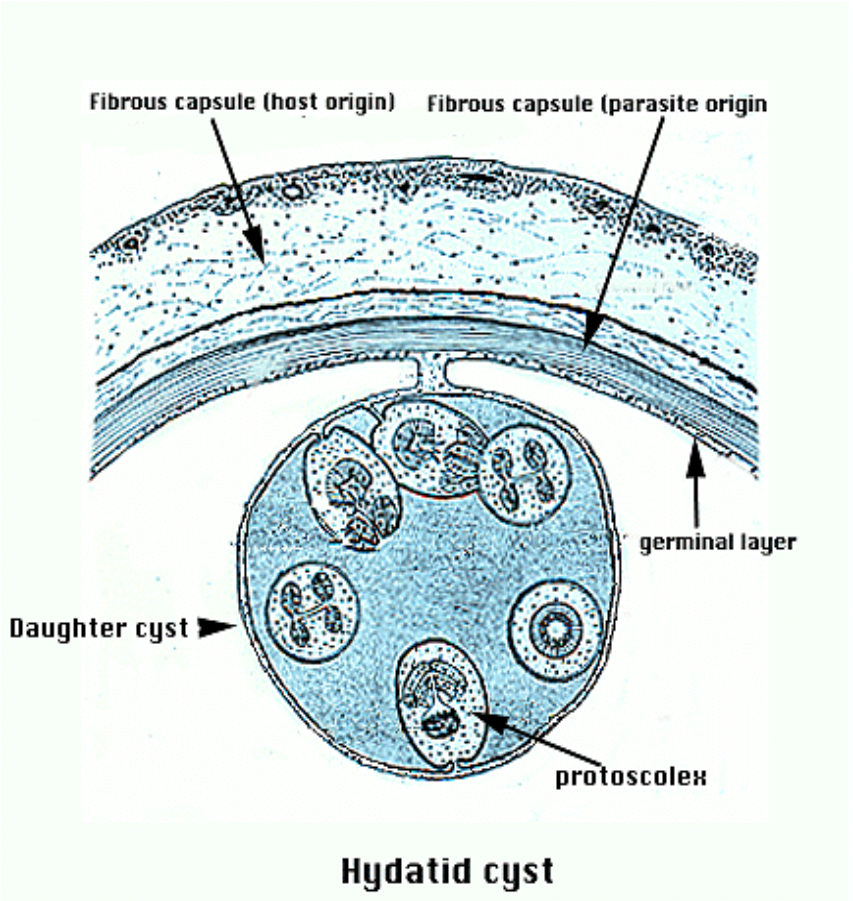


Larval form – Hydatid cyst

- Vesicular structure – bladder which form in intermediate host
- Multiples by budding & produce many daughter & grand-daughter cyst
- On wall of these emerges brood capsule containing scolex or future head of worm with hooklets



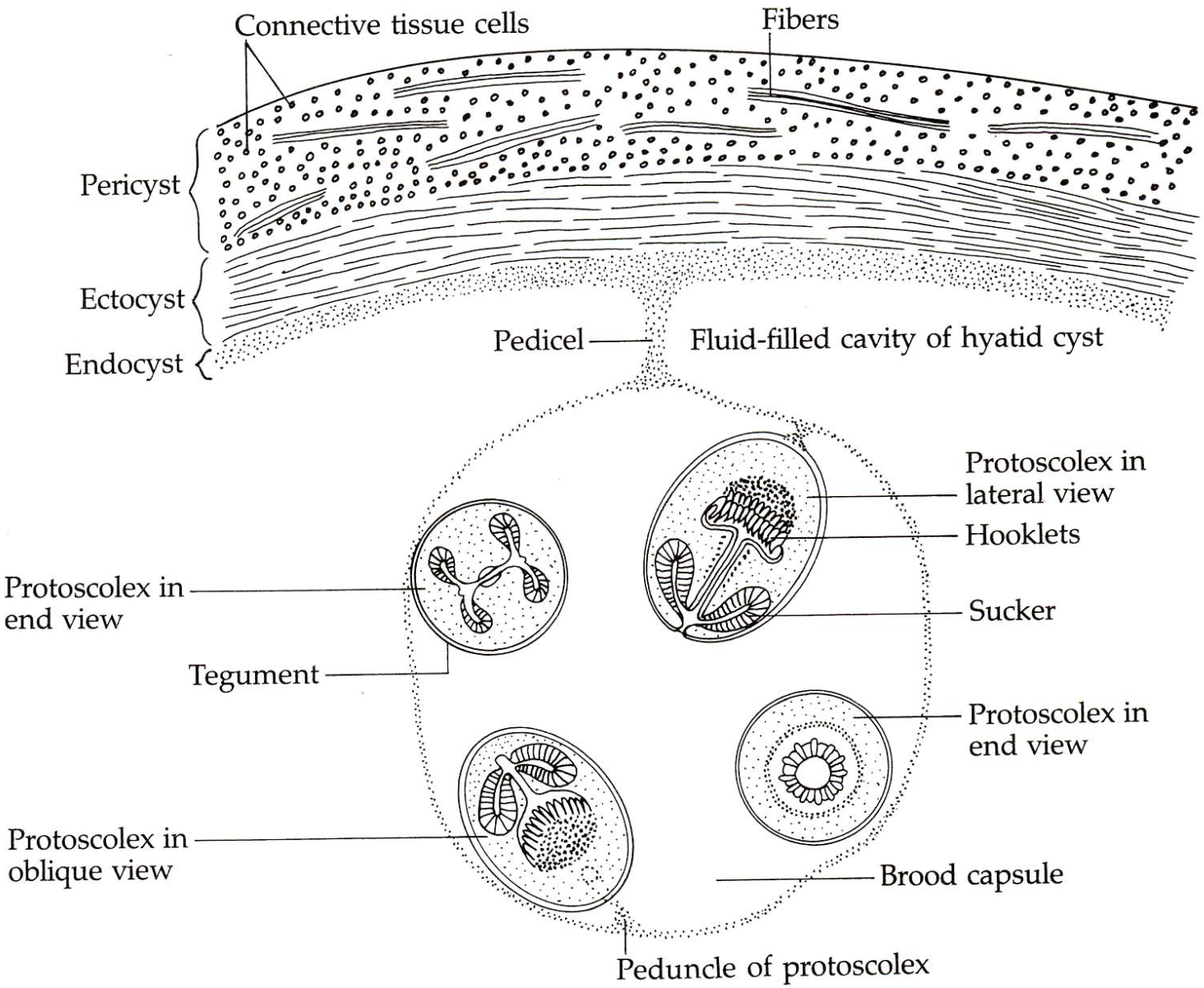




Hydatid cyst

Anatomy of Hydatid cyst

- Outer cuticular layer
  - Laminated hyaline membrane – thickness of 1 mm looks like a white of a hard-boiled egg
  - Elastic and when incised curls on itself exposing inner layer
- Inner germinal layer
  - Cellular and consists of number of nuclei embedded in a protoplasmic mass
  - Thin -22 to 25 µ
  - Vital layer gives rise to
    - Brood capsule with scolices
    - Secrets specific hydatid fluid
    - Forms outer layer


Connective tissue cells
Fibers
Pericyst
Ectocyst
Endocyst
Pedicel
Fluid-filled cavity of hyatid cyst
Protoscolex in lateral view
Hooklets
Protoscolex in end view
Sucker
Tegument
Protoscolex in end view
Protoscolex in oblique view
Brood capsule
Peduncle of protoscolex

Composition & character of hydatid fluid

- Clear colorless fluid
- Specific gravity - 1.005 to 1.010
- Reaction slightly acidic - pH 6.7
- Contains salts –
  - sodium chloride, sulphate, phosphate and sodium and calcium salt of succinic acid
- Antigenic
- Highly toxic –
  - when absorbed gives rise to anaphylactic reaction
- Hydatid sand –
  - granular deposit settled at bottom consisting of liberated brood capsule, free scolices and loose hooklets

Endogenous daughter cyst

- Result of growth over many years
- Mainly seen in man
- The daughter cyst developed inside mother cyst and may arise from detached fragment of germinal layer
- Also consists of 2 layers

Exogenous daughter cyst

- Found in bone hydatid where growth continue to be in outward fashion
- Due to high intracystic pressure there is herniation of both layers through some weekend part resulting in formation of these cysts

Development of brood capsule

- It spurts from germinal layer, at first spherical later on vacuolated and transform into a vesicle
- The scolices -5 to 20 or more develop within these brood capsules
  - represents future head of worm
- In a growing hydatid cyst all stages from undifferentiated cellular bud to fully developed stage with suckers & hooklets are seen
- A fully developed scolex indicates complete biological maturation of cyst
- Scolices may remain attached to wall or may remains free inside cavity of cyst as Hydatid sand

Sign of complete biological development

Pathogenicity

- Adult worm in dog does not produce any symptoms

- Mode of infection :
  - Handling & fondling with infected dog
  - By allowing dog to feed from same dish
  - By taking undercooked vegetables contaminated with infected canine faeces

Clinical Features

Echinococcus granulosus infections remain silent for years before the enlarging cysts cause symptoms in the affected organs .

Hepatic involvement can result in abdominal pain, a mass in the hepatic area, and biliary duct obstruction.

Pulmonary involvement can produce chest pain, cough, and hemoptysis .

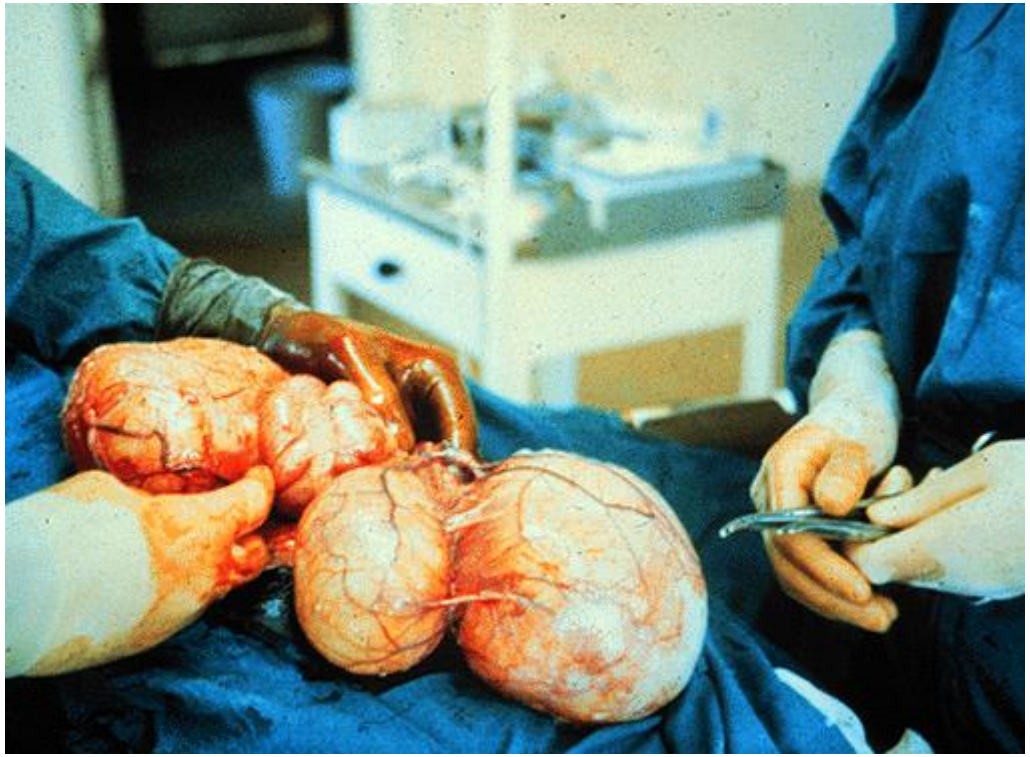
(The coughing or spitting up of blood from the respiratory tract)

Clinical Features

In addition to the liver and lungs, other organs (brain, bone, heart) can also be involved, with resulting symptoms of Space Occupying Lesion

Rupture of the cysts can produce fever, urticaria, eosinophilia, and anaphylactic shock as well as cyst dissemination (generalized secondary echinococcosis)

Hydatid cyst



Ruptured hydatid cyst of lung

Lab diagnosis

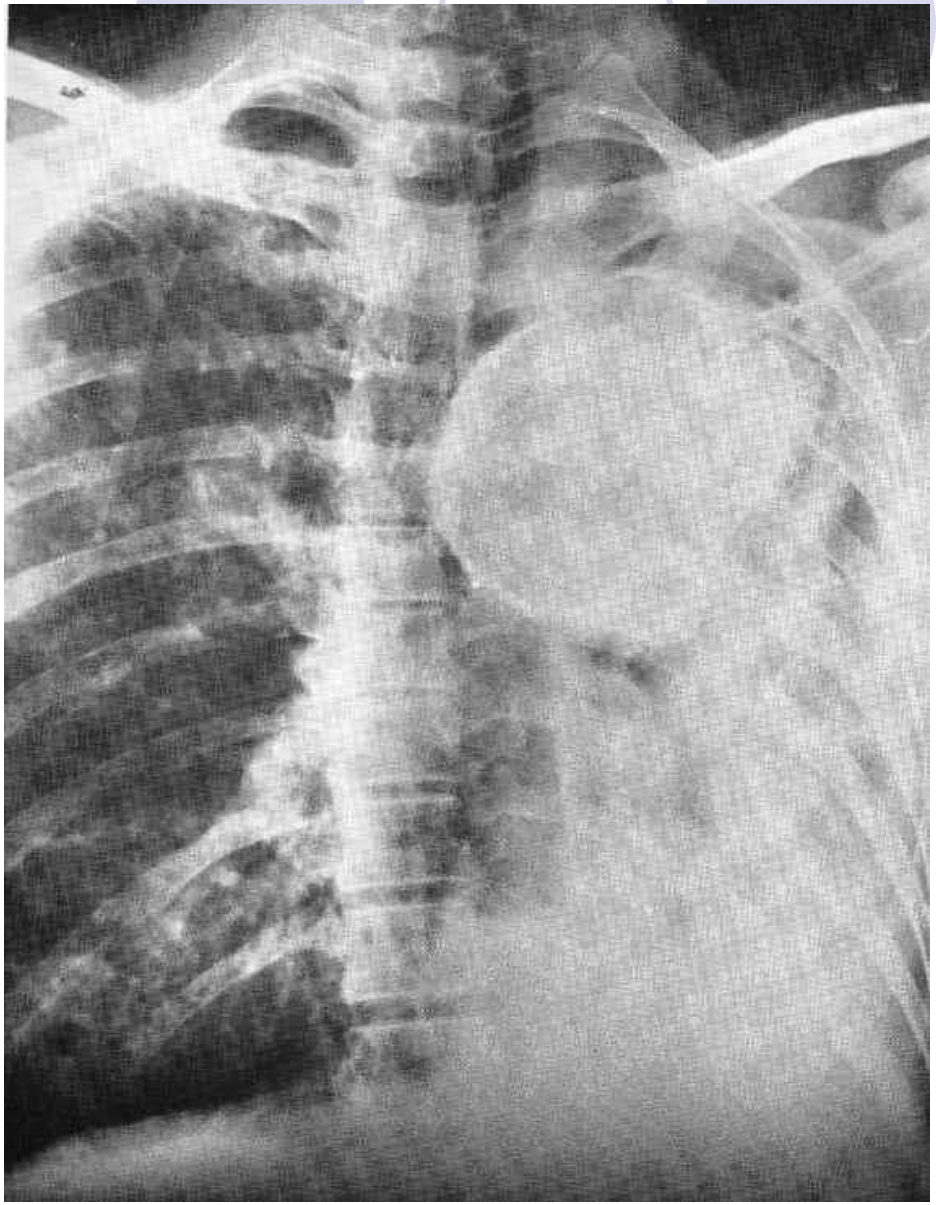
- Casoni's reaction
  - An immediate hypersensitivity reaction
  - Intradermal injection of 0.2 ml of hydatid antigen produces a wheal > 5 cm diameter in half an hour which fades in an hour
- Blood examinaiton
  - Eosinophilia – 20 to 25 %

- Serological test
  - Precipitation test
  - Complement fixation test
  - Haemagglutination test
  - Flocculation test with bentonite or latex particles
- Exploratory cyst puncture
- Radiological diagnosis
  - Important for diagnosis of hydatid disease of lung, due to its saline content, it casts circular opaque shadow with a sharp outline

Hydatid cysts in liver

This patient had cyst in the right lobe.

Hydatid cyst in lung.
This patient had a single large cyst in the left lung.

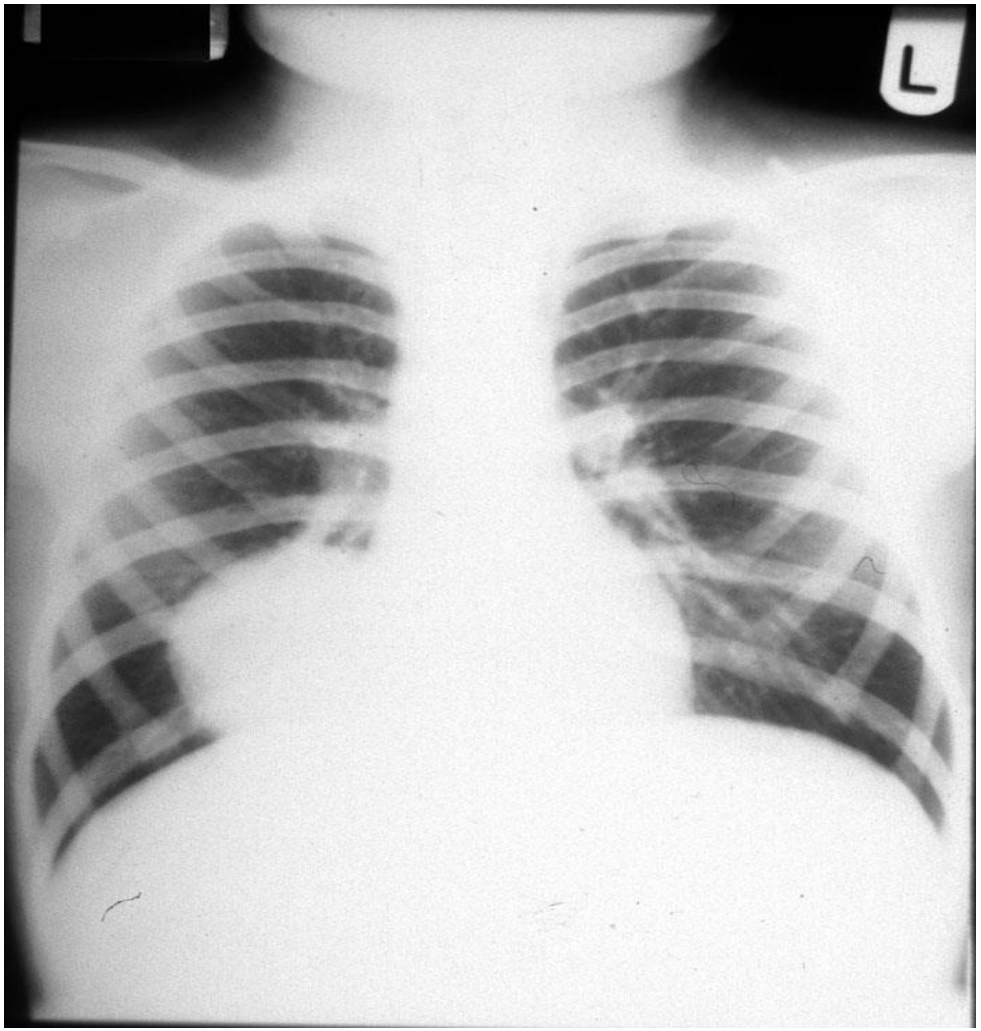


Hydatid disease

A hydatid cyst (*) in the skull of a child (the ruler at the top measures 15cm long, and the child's brain is below the hydatid cyst).

This infection resulted in the child's death.

Cerebral hydatidosis


L

Hymenolepis nana

Dwarf tapeworm

Introduction

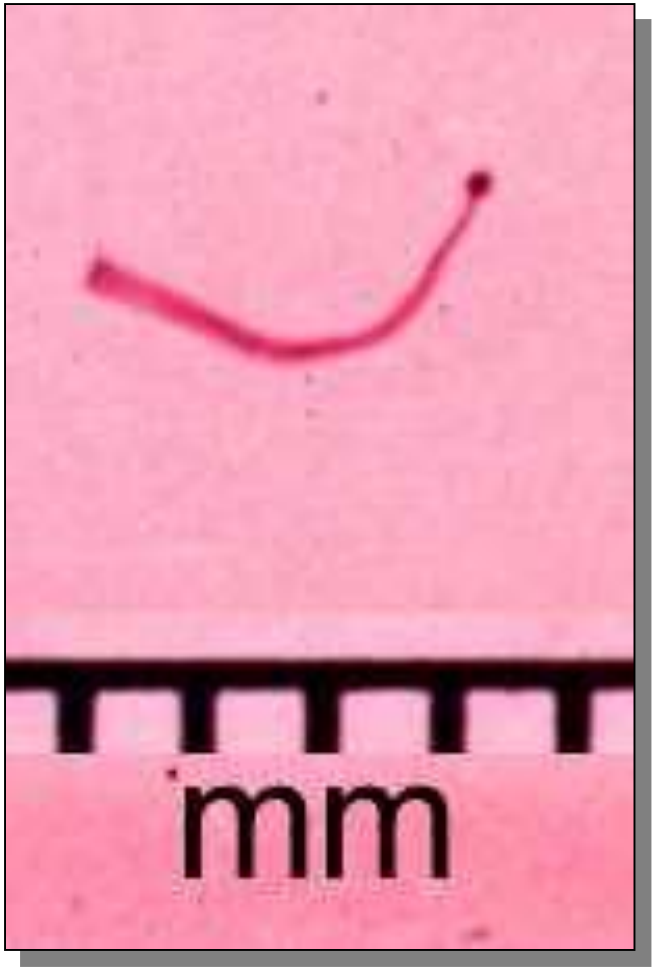
- Smallest and most common Cestode found in intestine
- Also called as “dwarf tapeworm”
- Hymen = membrane (thin outer covering of egg)
- Nanus = small
- Different than other worms in that it doesn’t require intermediate host

Habitat

- Small intestine – ileum
- Thousands of worms may be found in heavy infection

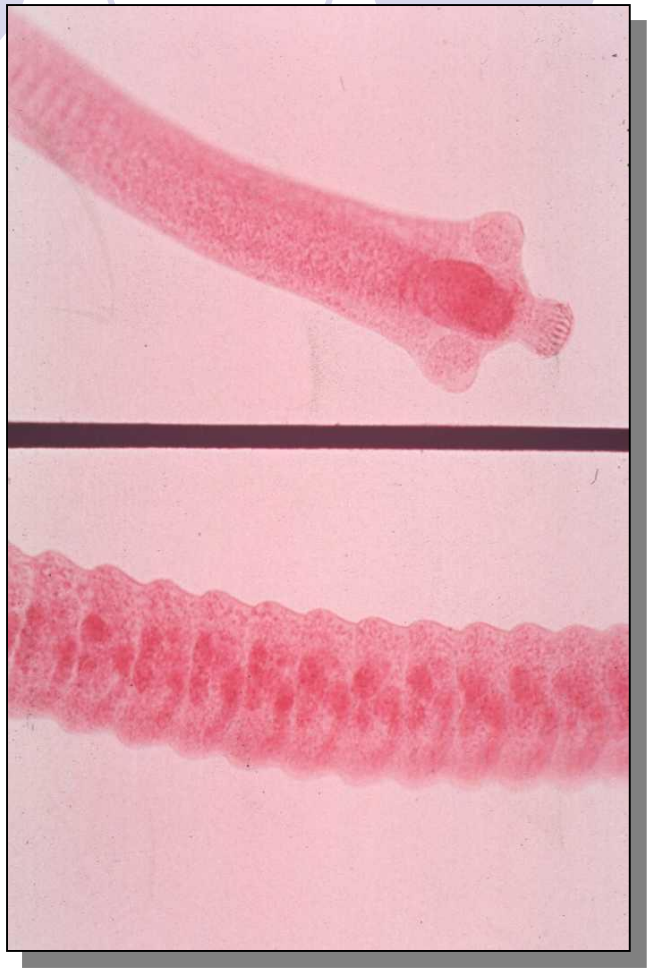
Morphology - adult worm

- Small & thread like
- 1 to 4 cm L X 0.1 cm B
- 1000 to 8000 worms may be present
- Life span – 2 weeks
- Has
  - Scolex
  - Neck
  - Strobila



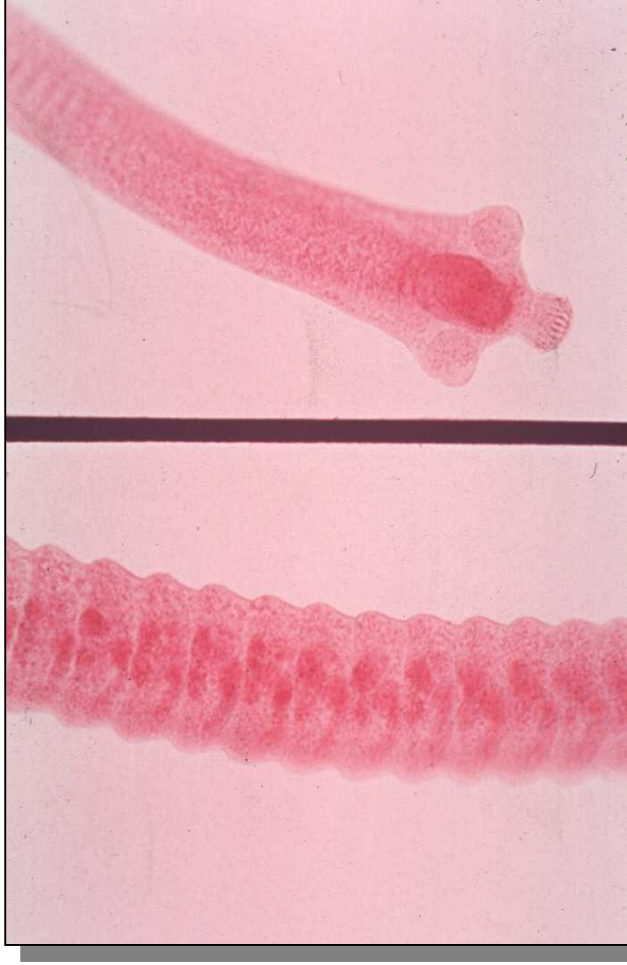
Scolex

- 0.3 mm wide
- Globular, has 4 suckers
- Retractable rostellum with single raw of hooklets
- Neck – short and fragile

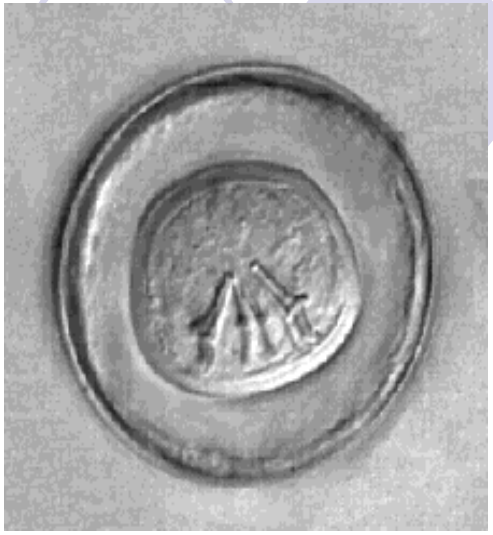


Strobila

- 200 proglottids
- Broader than length
- 0.9 mm B X 0.3 mm L
- Genital pore – lateral at one side of worm
- Gravid uterus forms a sac like structure having 100-200 eggs
- Testes – 3 in number
- Ovaries – bilobed



Eggs

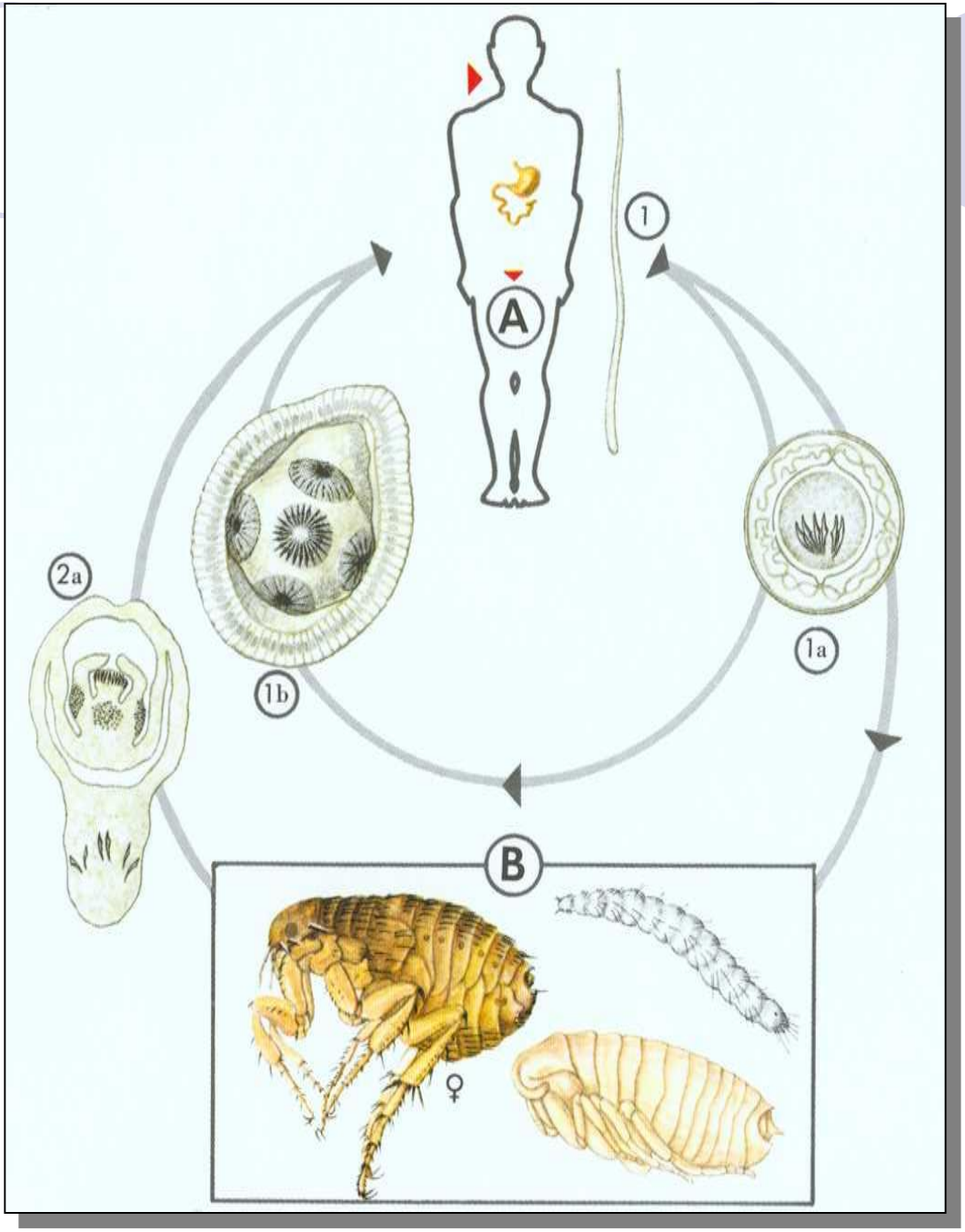


- Oval 45 µ × 35 µ
- Colorless = not bile stained
- Has got 2 covering
  - Thin colorless outer membrane
  - Inner thicker embryophore
- Space between two contains yolk granules & 4-8 thread like polar filaments
- Oncosphere contains hexacanth embryo
- Floats in saturated salt solution

Epidemiology

- Worldwide in distribution
- More common in children
- Man – only host, acts as definite as well as intermediate host
- Transmission occurs by ingesting of eggs along with food or water
- Natural parasite of mice, man is an accidental host

Life cycle



Clinical syndrome

- Most of infections- having low worm load – asymptomatic
- Heavy infection – abdominal discomfort, diarrhea, anorexia
- Hyper infection syndrome

Diagnosis

- Demonstration of eggs in stool


Thank you