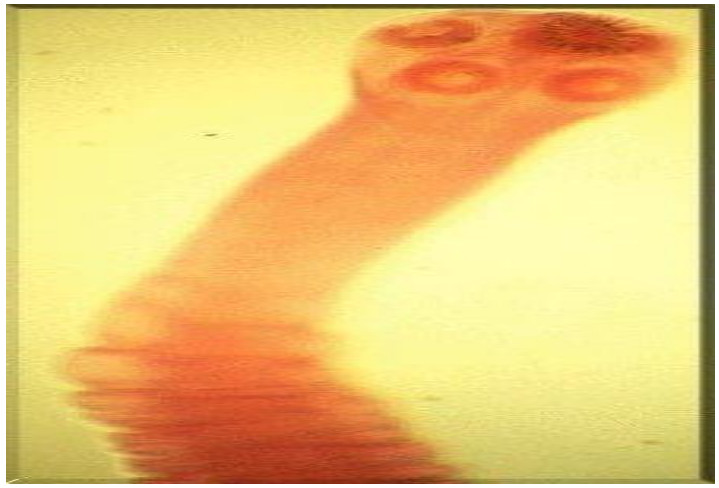
Hymenolepis nana
Hymenolepis diminuta

HYMENOLEPIS NANA

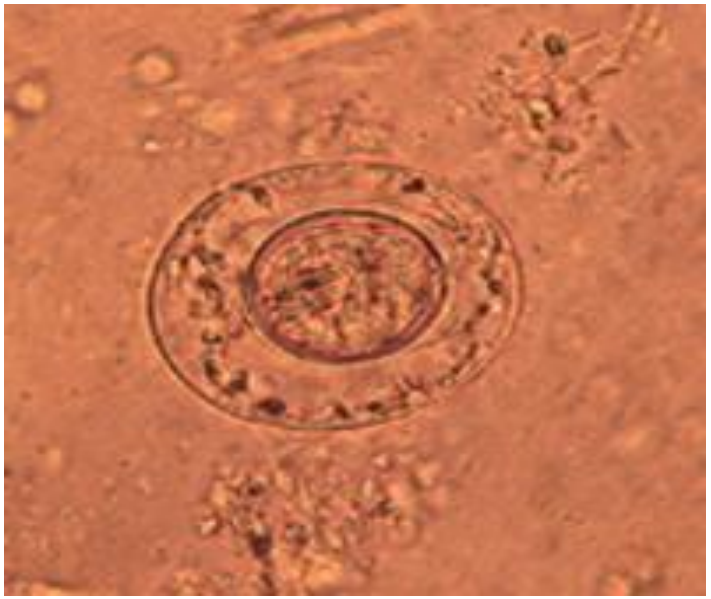
Commonly known as the *dwarf tapeworm, Hymenolepis nana is the smallest* tapeworm infecting man *and* The name Hymenolepis refers to the thin membrane covering the egg (Greek *hymen—membrane, lepis—rind or* covering) and nana to its small size (nanus—dwarf). It is cosmopolitan in distribution but is more common in the warm than in cold climates. Infection is most common in school children and institutional populations. The adult worm lives in the human intestine,It completes its life cycle in one host, the parasite being maintained by transmission between humans,and even in a single individual, who can act as both the definitive and intermediate host.

Morphology

Adult worm measures 1-4.5cm in length. It is made up of head (scolex), neck and segmented body. The head carries four suckers and a rostellum armed with one row of hooks. The segments of the body are divided into mature and gravid segments. In the mature segment, there are three testes in the middle.



The egg is roughly spherical or ovoid, 30 to 45 µm in size, with a thin colourless outer membrane and an inner embryophore enclosing the hexacanth oncosphere.
The space between the two membranes contains yolk granules and 4 to 8 polar filaments arising from two knobs on the embryophore. The eggs float in saturated salt solution



- Mode of transmission
- Direct

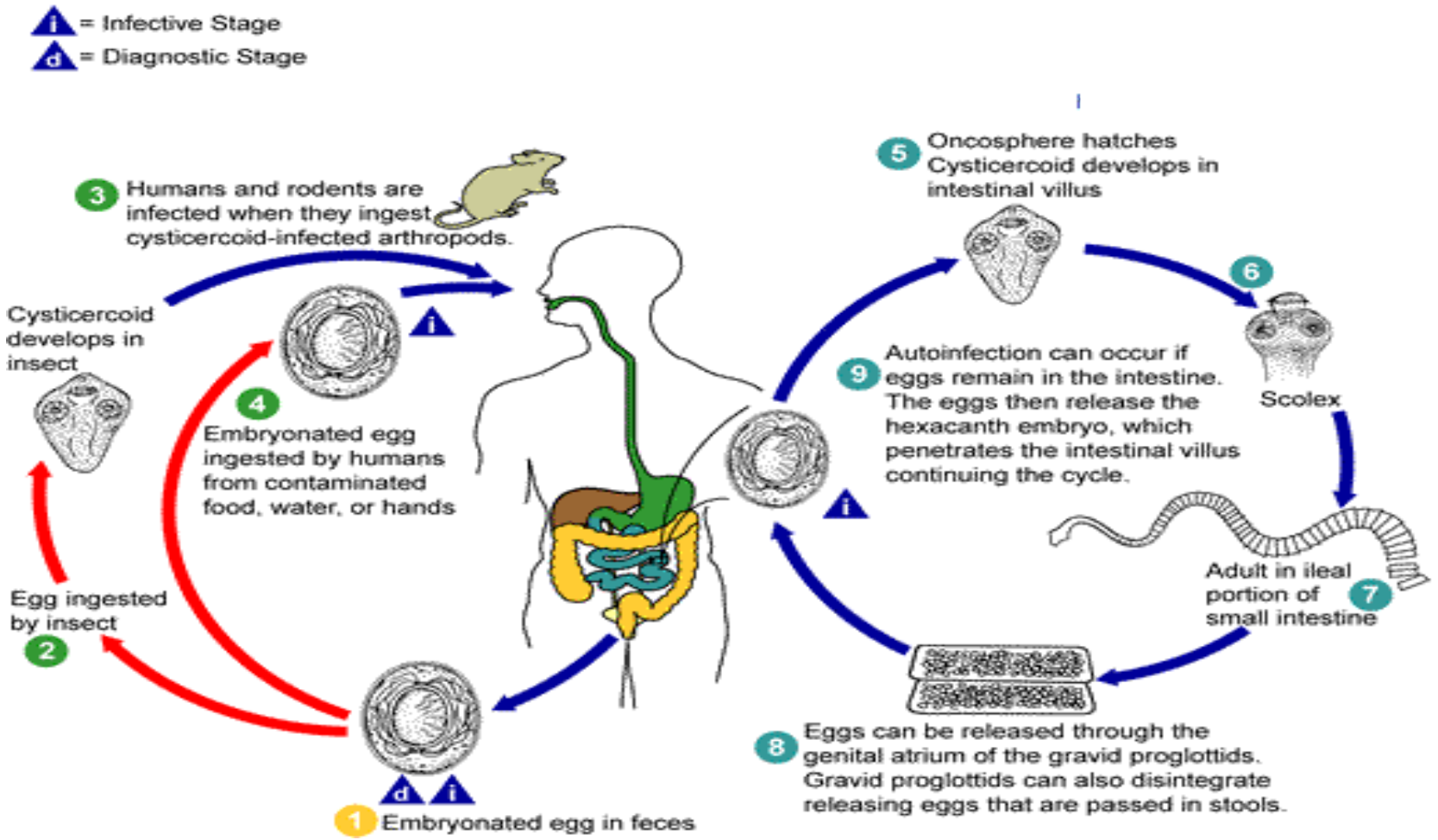
1.Ingestion of egg with contaminated raw vegetables.
2. Direct infection from a patient
3. Auto infection: the eggs of H. nana are infective as soon as they are passed with feces by the patient. If the hands of the patient are contaminated by these eggs, she/he infects herself/himself again and again.

- Indirect
    - Accidental ingestion of infected arthropod intermediate host like rice and flour beetles in which cysticercoid larve are released and develop into adult worms in the small intestine of the host.

Life Cycle

Eggs of *Hymenolepis nana* are immediately infective when passed with the stool and cannot survive more than 10 days in the external environment . When eggs are ingested by an arthropod intermediate host (various species of beetles and fleas may serve as intermediate hosts), they develop into cysticercoids, which can infect humans or rodents upon ingestion and develop into adults in the small intestine.) ,But in contaminated food or water or from hands contaminated with feces), the oncospheres contained in the eggs are released. The oncospheres (hexacanth larvae) penetrate the intestinal villus and develop into cysticercoid larvae.Upon rupture of the villus, the cysticercoids return to the intestinal lumen, evaginate their scoleces , attach to the intestinal mucosa and develop into adults that reside in the small intestine producing gravid proglottids . Eggs are passed in the stool when released from proglottids . An alternate mode of infection consists of internal autoinfection, where the eggs release their hexacanth embryo,The life span of adult worms is 4 to 6 weeks, but internal autoinfection allows the infection to persist for years .

Hymenolepis nana



- **Clinical Signs**
  - Symptoms are produced due to patient's immunological response to the parasite
  - Asymptomatic for light worm burden
  - Headache
  - Dizziness
  - Anorexia
  - Pruritus of the nose and anus
  - Abdominal pain
  - Pallor
  - Desquamation of intestinal epithelial cell or as serious as necrosis may occur

- **Diagnosis**
  - Demonstration of characteristic ova in the stool
  - Proglottids are not recovered because they undergo degeneration prior to passage
- **Treatment**

  Praziquantel

  – 25mg/kg single dose
  – Drug dosage is higher than that of taeniasis because of resistant cysticercoids in intestinal tissue
  – Niclosamide: 4 tablets chewed in a single dose daily for 5 days

Hymenolepis diminuta

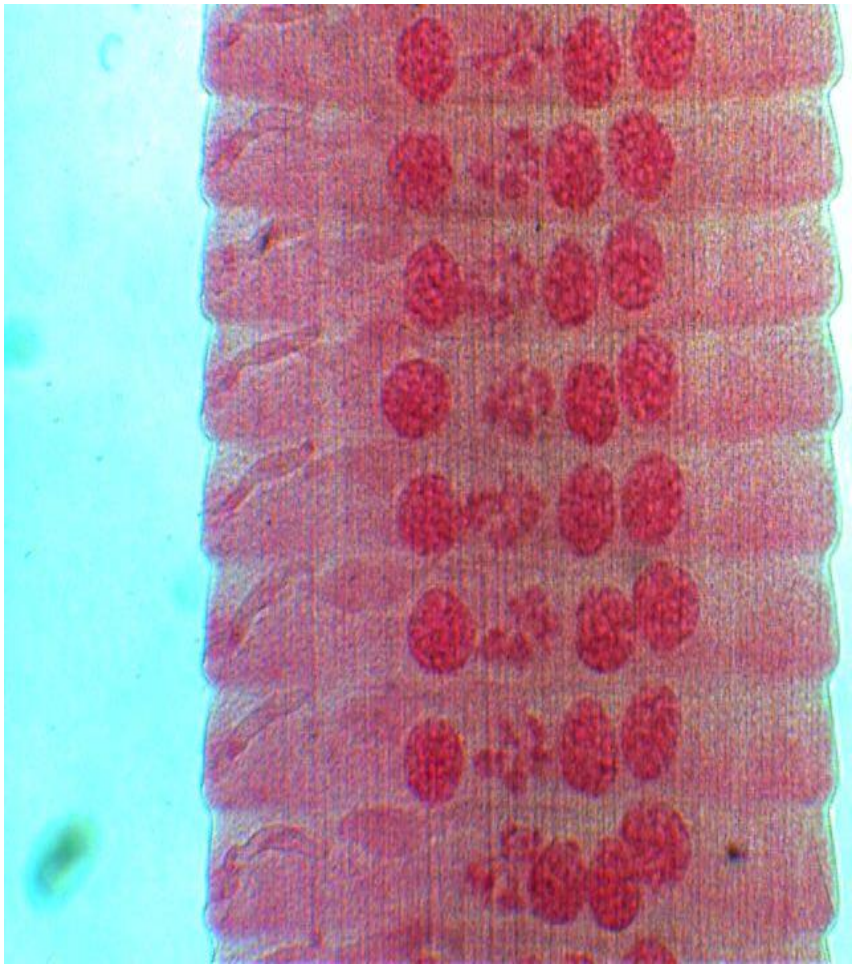
- Rat tape worm,common parasite of rats and mice
- Accidental human infections
- Differs from *Hymenolepis nana* in morphology and life cycle because it requires an intermediate host
- 2 Hosts
    - Larval stage: cysticercoid is passed in fleas
    - Adult stage: in rats and mice and accidentally in humans especially children who accidentally ingest infected fleas

H. diminuta differs from H. nana in that:

- ♦ The adult worm measures about 10-60 cm
- ♦ The rosetellum on the head has no hooks
- ♦ In the mature segment, there are two testes at one side and another testis on the other side.

Hymenolepis diminuta

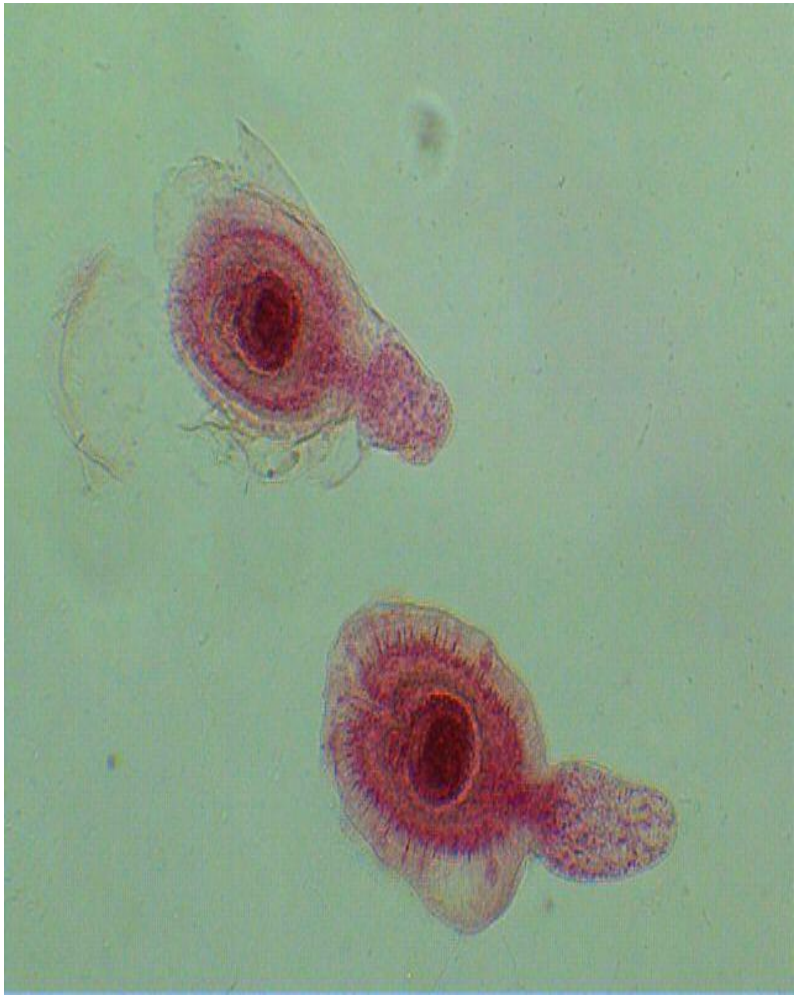
- Proglottid
  - 8,00 – 1,000
  - Mature proglottids of *Hymenolepis diminuta* from the laboratory rat.
  - The three spherical bodies are testes which surround the ovaries, ootype and vitelline glands. The genital pores are on the left margin



Hymenolepis diminuta

- Ova
  - Larger than *H. nana*
  - Outer shell is yellowish in color
  - Inner embryohore has 2 knob-like thickenings
  - No polar filaments

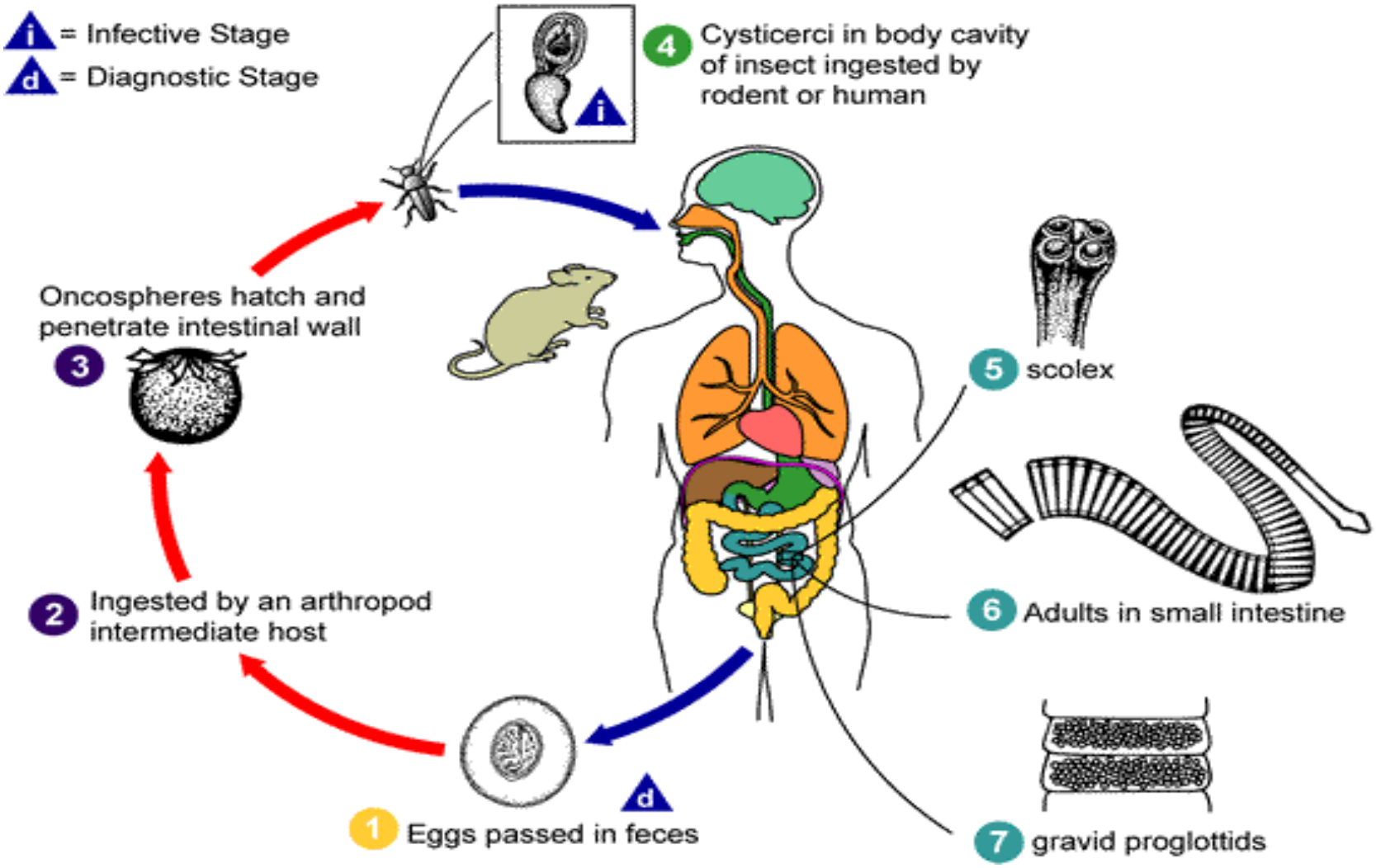
- cysticercoid of *Hymenolepis diminuta*.
- it is like a cysticercus but this larva has no bladder but instead has a tail.
- The dark body within the spherical portion is the scolex.
- The longer the tail.
- This stage is found inside an insect such as the mealworm,



Life Cycle

Eggs of *Hymenolepis diminuta* are passed out in the feces of the infected definitive host (rodents, man) . The mature eggs are ingested by an intermediate host (various arthropod adults or larvae) , and oncospheres are released from the eggs and penetrate the intestinal wall of the host , which develop into cysticercoid larvae.The cysticercoid larvae persist through the arthropod's morphogenesis to adulthood.Humans can be accidentally infected through the ingestion of insects in precooked cereals, or other food items, and directly from the environment (e.g., oral exploration of the environment by children). After ingestion, the tissue of the infected arthropod is digested releasing the cysticercoid larvae in the stomach and small intestine.the parasite attaches to the small intestine wall. Maturation of the parasites occurs within 20 days and the adult worms can reach an average of 30 cm in length . Eggs are released in the small intestine from gravid proglottids that disintegrate after breaking off from the adult worms. The eggs are expelled to the environment in the mammalian host's feces.

Hymenolepis diminuta



Clinical Signs

Most people who are infected do not have any symptoms. Those who have symptoms may experience nausea, weakness, loss of appetite, diarrhea, and abdominal pain. Young children, especially those with a heavy infection, may develop a headache, itchy bottom, or have difficulty sleeping. Sometimes infection is misdiagnosed as a pinworm infection

Treatment

same as *Hymenolepis nana*

Diphyllobothrium latum
Dipylidium caninum

Diphyllobothrium latum and related species (fish or broad tapeworm), the largest tapeworms that can infect people, can grow up to 30 feet long. Several other *Diphyllobothrium* species infect humans, but less frequently.

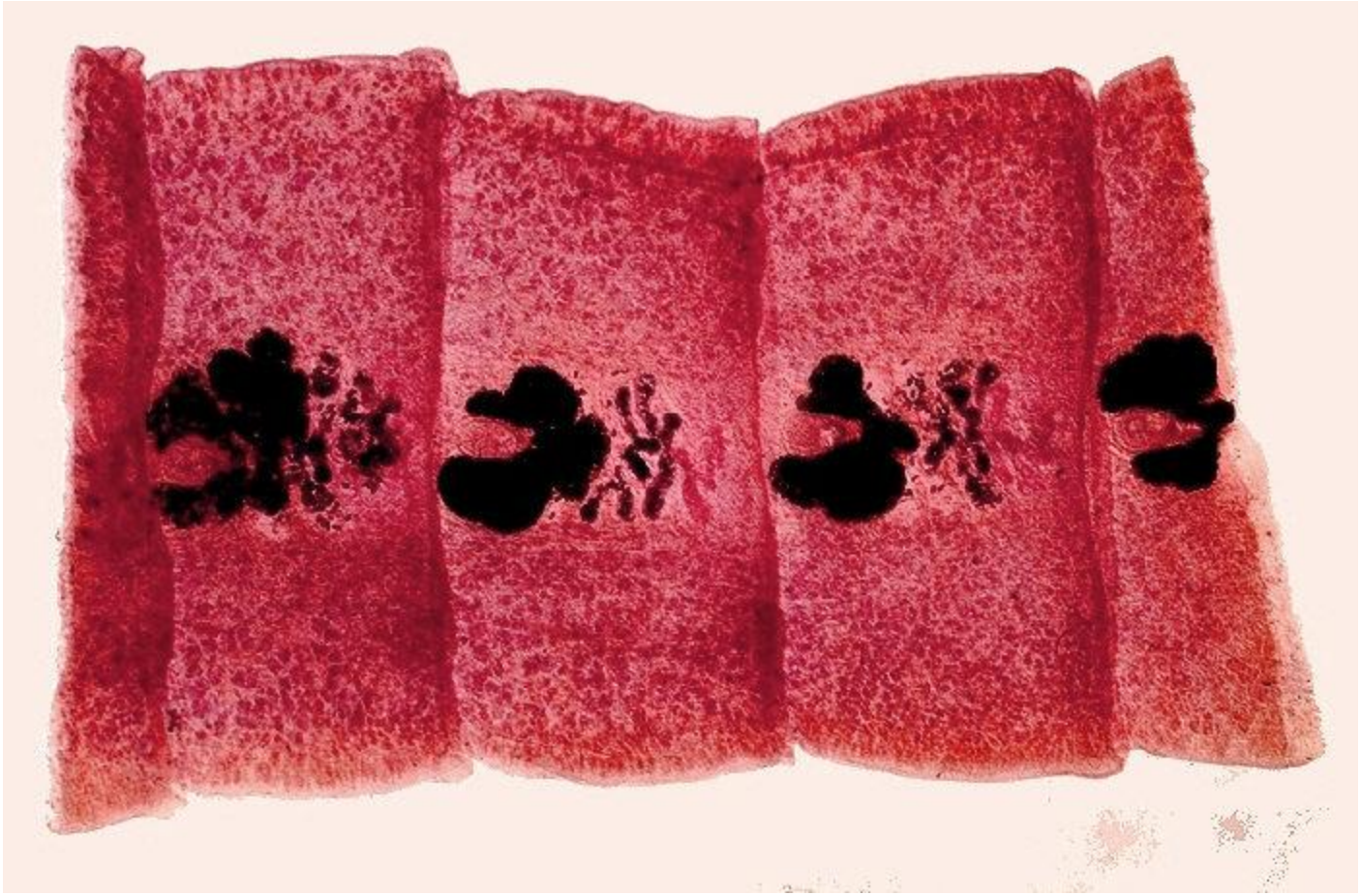
Diphyllobothrium latum

- Morphology
  - Adult worm is yellowish grey in color
  - Dark central markings in the strobila are due to the egg-filled uterus
  - Measures 3 to 10 meters in length
  - Life-span is for a period of 5 to 15 years

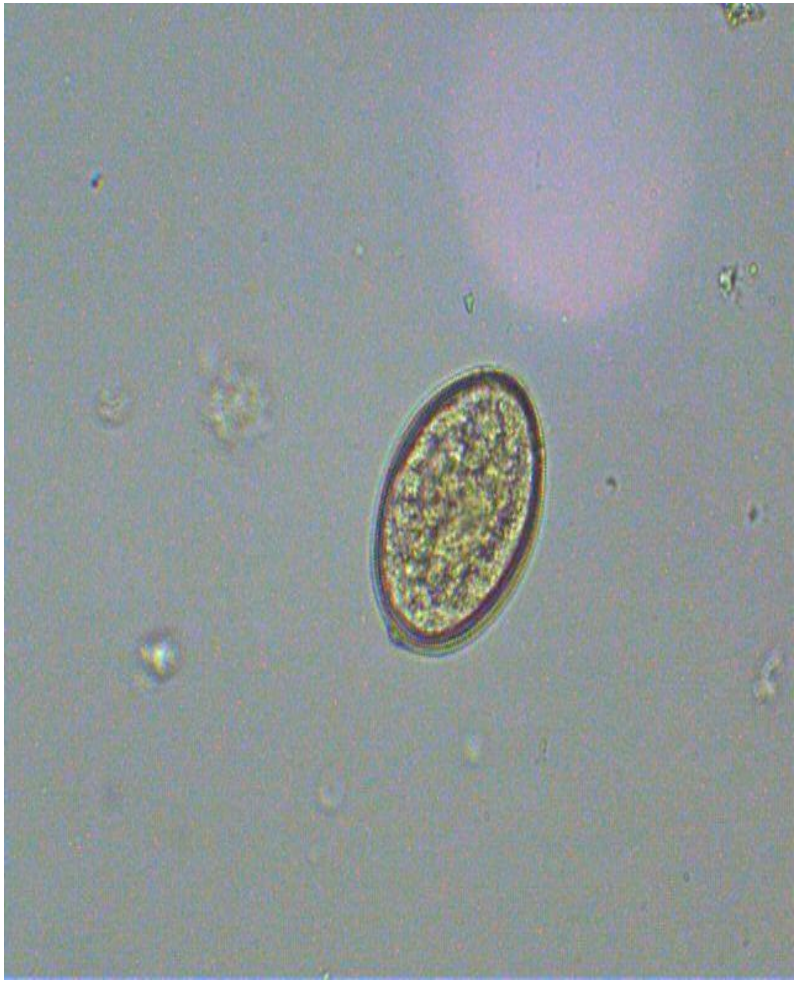
Scolex

- Scolex is spoon-shaped or spatulate
- Scolex bears 2 slit-like grooves called bothria (1 on the dorsal surface and 1 on the ventral surface)
- Scolex has no rostellum and no hooklets
- Neck is thin and unsegmented and is much longer than the head

Diphyllobothrium latum



- Ova
  - Passed out in the host's feces in large numbers
  - Oval
  - Bile stained
  - Contains abundant granules and unsegmented ovum
  - Inconspicuous operculum at one end and a small knob at the other end
  - Does not float in saturated solutions of common salt
  - A single egg gives rise to a single larva
  - Not infective to man

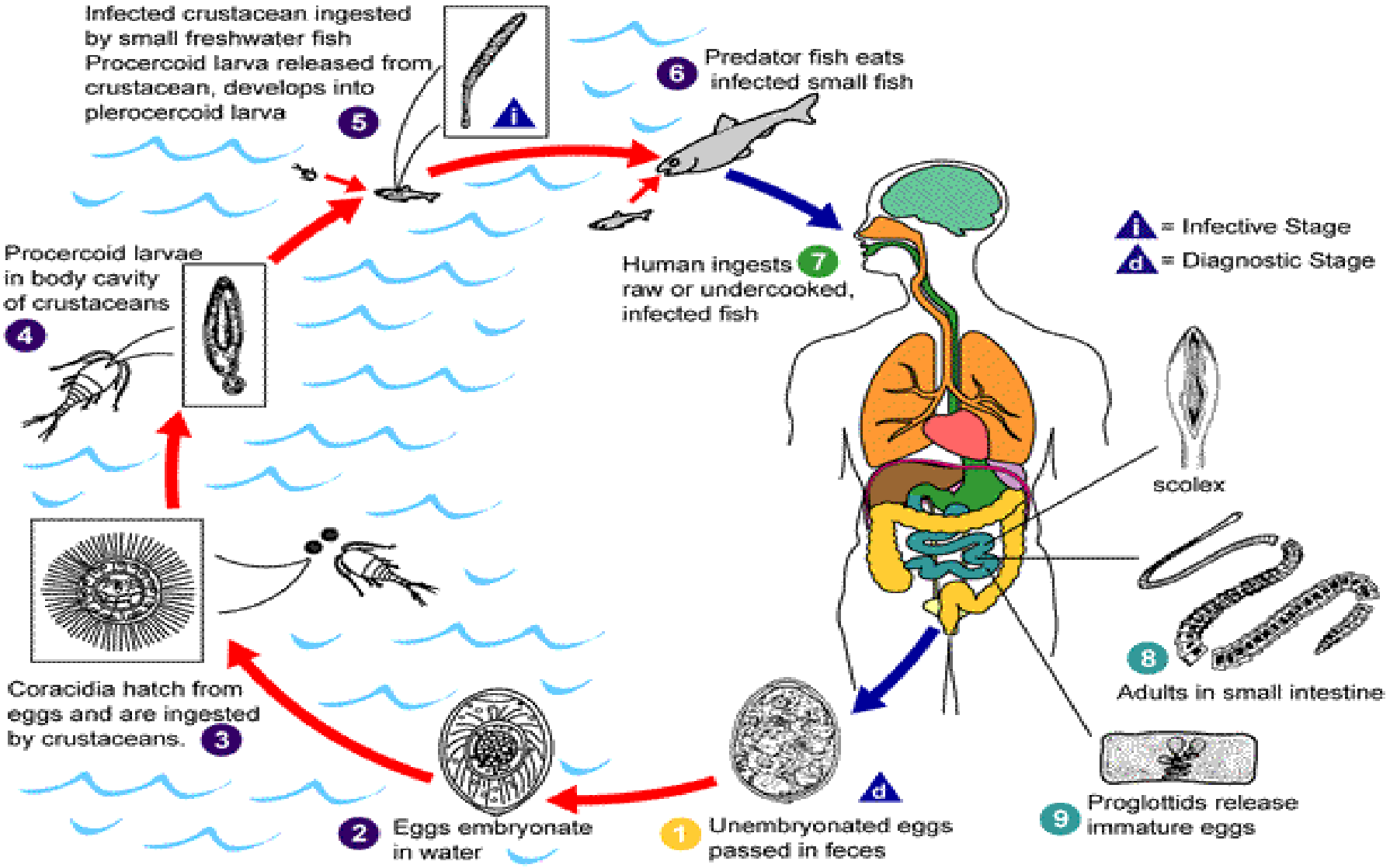


- larva
    - Passed first in water and then in the respective intermediate hosts
    - 3 stage
        - First stage larva
            - » Coracidium
            - » Ciliated oncosphere that develops from egg in water
        - Second stage larva
            - » Procercoid
            - » Spindle-like solid body with cephalic invagination
            - » Found inside the cyclops (the first intermediate host)
        - Third stage larva
            - » Plerocercoid
            - » Head is invaginated in the neck
            - » Found in the fresh water fish, the second intermediate host
- Final Host
    - Man, dog, cat
    - Small intestine
- 1st I.H.
    - Cyclops
- 2nd I.H.
    - Fresh water fish, pike, trout, salmon, perch
- Mode of Infection
    - Ingestion of imperfectly cooked infected fish or roe containing plerocercoid larvae

Life Cycle

Immature eggs are passed in feces. Under appropriate conditions, the eggs mature (approximately 18 to 20 days)and yield oncospheres which develop into a coracidia . After ingestion by a suitable freshwater crustacean the coracidia develop into procercoid larvae . Following ingestion of second intermediate host,small freshwater fish, the procercoid larvae are released from the crustacean and migrate into the fish flesh where they develop into a plerocercoid larvae. The plerocercoid larvae are the infective stage for humans. these small second intermediate hosts can be eaten by larger predator species, e.g., trout, perch, In this case, the sparganum can migrate to the musculature of the larger predator fish and humans can acquire the disease by eating these later intermediate infected host fish raw or undercooked . After ingestion of the infected fish, the plerocercoid develop into immature adults and then into mature adult tapeworms which will reside in the small intestine. The adults of *D. latum* attach to the intestinal mucosa by means of the two bilateral groves (bothria) of their scolex . The adults can reach more than 10 m in length, with more than 3,000 proglottids. Immature eggs are discharged from the proglottids (up to 1,000,000 eggs per day per worm) and are passed in the feces . Eggs appear in the feces 5 to 6 weeks after infection. In addition to humans, many other mammals can also serve as definitive hosts for *D. latum* .

Diphyllobothrium latum



- **Diagnosis**
  - Diagnosis is made by identification of eggs or segments of the tapeworm in a stool sample with a microscope. Eggs are usually numerous, but more than one stool sample may be needed to find them.

Treatment

- **Praziquantel***, adults, 5-10 mg/kg orally in a single-dose therapy; the dosage for children is the same.
- (Note: praziquantel should be taken with liquids during a meal.)
- **Alternative:**
- Adults, **niclosamide** 2 gm orally once; children, 50 mg/kg (max 2 gm) orally once.

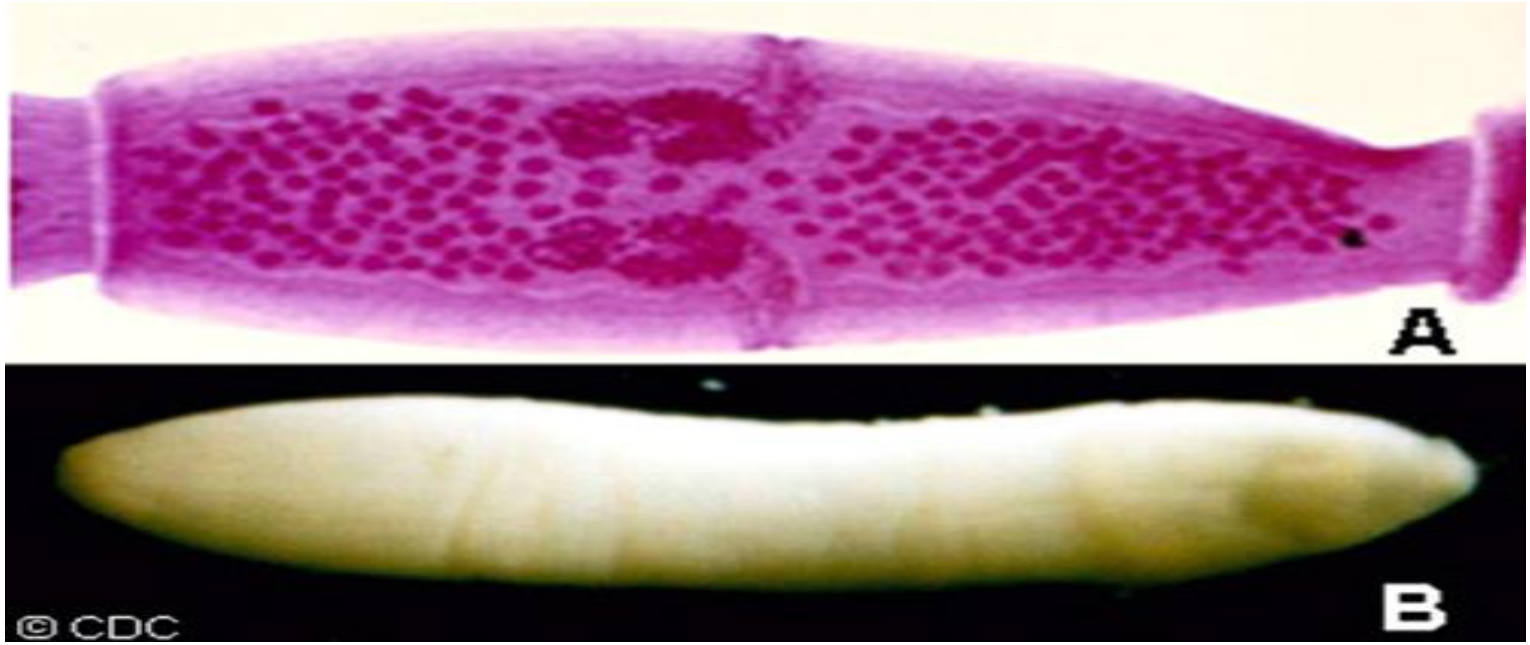
Symptoms

Most infections are asymptomatic. However symptoms can include abdominal discomfort, diarrhea, vomiting, and weight loss. Vitamin B12 deficiency leading to pernicious anemia may occur.

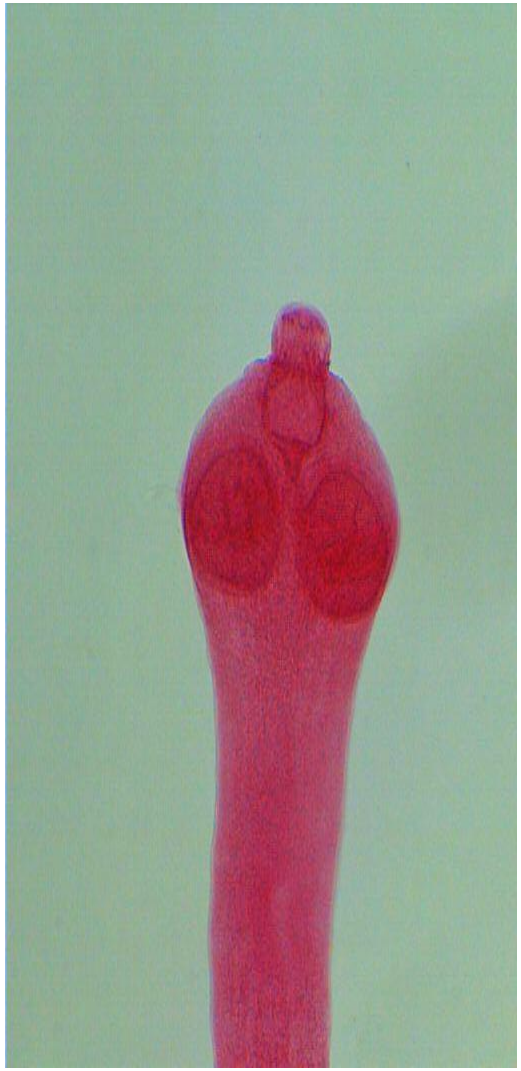
Dipylidium caninum

(the double-pored dog tapeworm) mainly infects dogs and cats, but is occasionally found in humans.

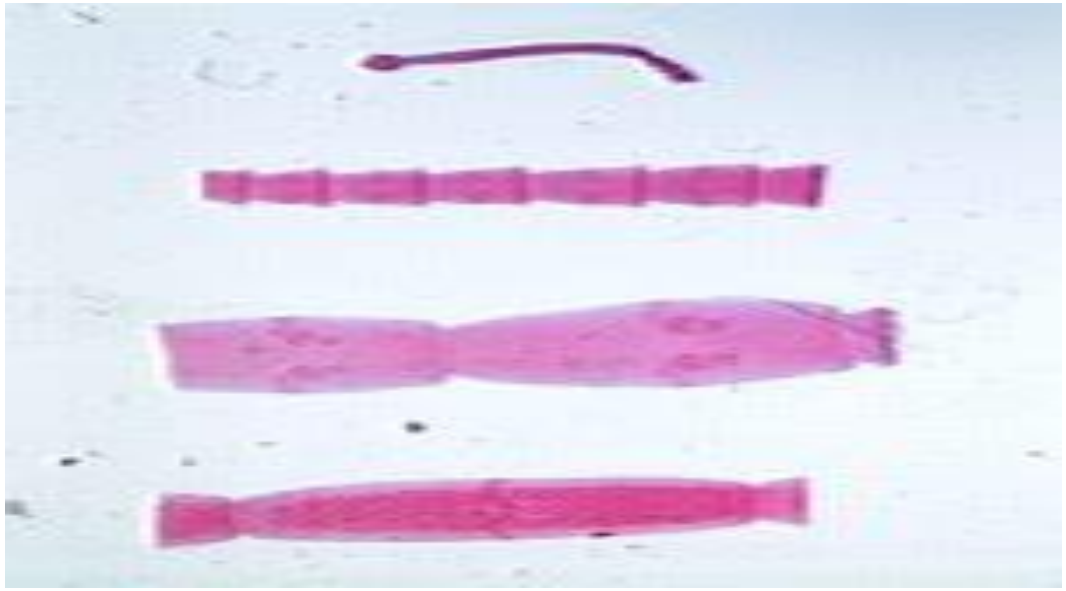
Dipylidium caninum proglottids (average mature size 12 mm x 3 mm) have two genital pores, one in the middle of each lateral margin. Proglottids may be passed singly or in chains, They are pumpkin seed-shaped when passed and often resemble rice grains when dried



- **Scolex**
  - Small and globular
  - 4 deeply cupped elliptical suckers
  - Protrusible/retractile rostellum
  - Rostellum has 1-7 rows of rose thorn shaped hooklets



- **Adult**
  - 10-70 cm in length
  - Pale reddish
- **Strobila**
  - 200 proglottids
  - Narrow



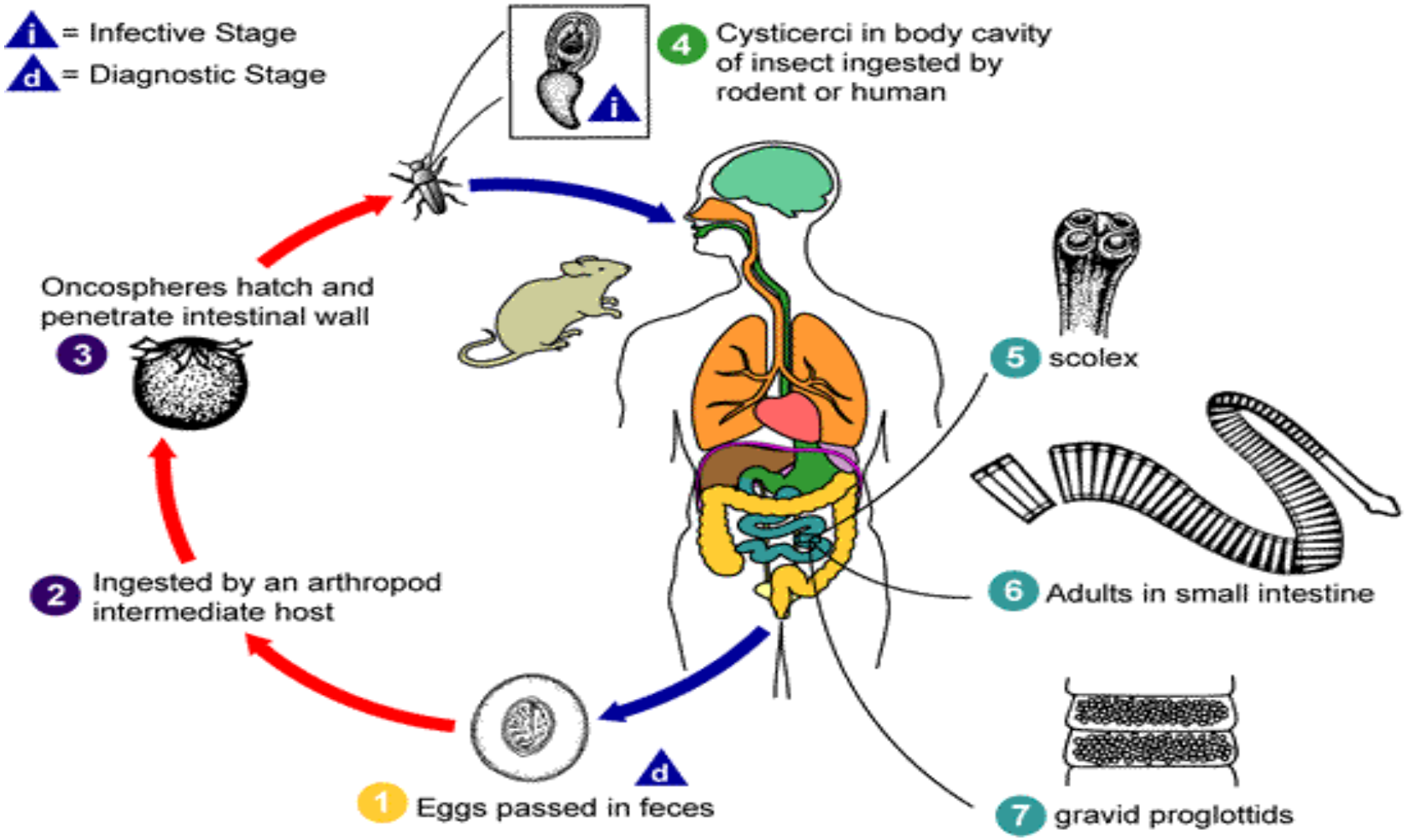
- **Mature proglottids**
  - 2 sets of male and female reproductive organs
  - Bilatera genital pores
- **Gravid proglottids**
  - Have size and shape of pumpkin seeds
  - Filled with capsules or packets of 8-15 eggs enclosed n an embryonic membrane

- Ova
  - Passed out in the feces along with the proglottids
  - Released by contraction of proglottids or disintegration outside the host
  - Spherical
  - Thin shelled
  - With a hexacanth embryo

Life Cycle

Gravid proglottids are passed out in the feces or emerge from the perianal region of the host.they release typical egg packets . Following ingestion of an egg by the intermediate host (larval stages of the dog or cat fleas ,(.an oncosphere is released into the flea's intestine. The oncosphere penetrates the intestinal wall, invades the insect's body cavity, and develops into a cysticercoid larva .The vertebrate host becomes infected by ingesting the adult flea containing the cysticercoid . The dog is the principal definitive host for *Dipylidium caninum*. Other potential hosts include cats, foxes, and humans (mostly children) , . Humans acquire infection by ingesting the cysticercoid contaminated flea. This can be occur by close contact between children and their infected pets. In the small intestine of the vertebrate host the cysticercoid develops into the adult tapeworm which reaches maturity about 1 month after infection . The adult tapeworms reside in the small intestine of the host, where they each attach by their scolex. They produce proglottids mature or segments. The proglottids mature, become gravid, detach from the tapeworm, and migrate to the anus or are passed in the stool.

Dipylidium caninum



Clinical Presentation

Most infections with *Dipylidium caninum* are asymptomatic. Pets may exhibit behavior to relieve anal pruritis (such as scraping anal region across grass or carpeting). Mild gastrointestinal disturbances may occur. The most striking feature in animals and children consists of the passage of proglottids. These can be found in the perianal region, in the feces, on diapers, and occasionally on floor covering and furniture .

Diagnosis

The diagnosis is made by demonstrating the typical proglottids or egg packets in the stool.

Treatment

Same as of *D. latum*