

## Intestinal Cestodes

### General Morphology

(1) **Adult worms** have a flat, ribbon-like white to yellowish body consisting of an anterior attachment organ (scolex) and a body (strobila) consisting of a chain of segments called proglottides.

(2) **Scolex** - the head. Characterized by the presence of sucking disks without or with hook which arrange in the Rostellum may be retractable (present on the top of scolex of "armed" tapeworms).

(3) **Neck and Strobila** – the body of the tapeworm consists of segments ( pro glottides ) Flattened, ribbon-shaped and segmented.

4- **Length** - varies in size (few mms to several meters).

5- **Covered** with protective cuticle .

6-**Hermaphrodite**, each segment contains male and female organs.

7- **No digestive system.**

### Intestinal cestodes: (TAPE WORMS)

*Tenia solium* (pork tapeworm),

*T. saginata* (beef tapeworm),

*Hymenolepis nana* (dwarf tapeworm)

*Diphyllobothrium lattu*m (fish or broad tapeworm)

### *Tenia solium* & *T. saginata* (Teniasis)

**Epidemiology:** Worldwide distribution, higher in developing countries: as low as 1/1000 in most North America and as high as 10% in the 3rd world. Pork tape worm incidence higher, in non Muslims peoples because they are feed on pork meat and beef tape worm incidence higher in Muslims peoples because they are feed on beef meat .

**Morphology:** *T. saginata*: 4-6 meters long and 12 mm broad; pear-shaped (head) scolex with four suckers but no hooks, neck, and long flat body with several hundred segments (proglottids), 18x6 mm each with branched uterus (15-30 branches). Roundish 35x45 µyellow-brown egg has peripheral radial striations and contains an embryo with hooklets

**T. solium:** Slightly smaller than *T. saginata*; globular scolex with four suckers and a circular row of hooks (rostellum) that gives it a solar appearance; neck, long flat body (0.1 meter); proglottids 5x10 mm with 7-12 branch uterus. Eggs are not distinguishable.

**Life cycle:** Tapeworm larval cyst (cysticercus) is ingested with poorly cooked infected meat, the larva escapes the cyst and passes to the small intestine where it attaches to the mucosa by the scolex suckers. The proglottids develop as the worm matures in 3-4 months. The adult may live in the small intestine as long as 25 years and pass gravid proglottids with feces. Eggs extruded from the proglottid contaminate and persist on vegetation for several days and are **consumed by cattle or pigs** in which they hatch and form cysticerci .

**Symptoms:** Light infections remain asymptomatic, but heavier infections may produce abdominal discomfort, epigastric pain, vomiting and diarrhea.

**Cysticercosis:** *T. solium* eggs (**but no *T. saginata*** ) can also infect humans and cause cysticercosis (larval cysts in lung, liver, eye and brain) resulting in blindness and neurological disorders.

The incidence of cerebral cysticercosis can be as high 1/1000 and may account for up to 20% of neurological case and muscular involvement is as high as 10% in non muslim countries .

**Pathology and Immunology:** Gastrointestinal symptoms are due to the presence of the tape worm. Cysticercosis symptoms are a result of inflammatory/immune responses. Antibodies are produced in cysticercosis and are useful epidemiological tools.

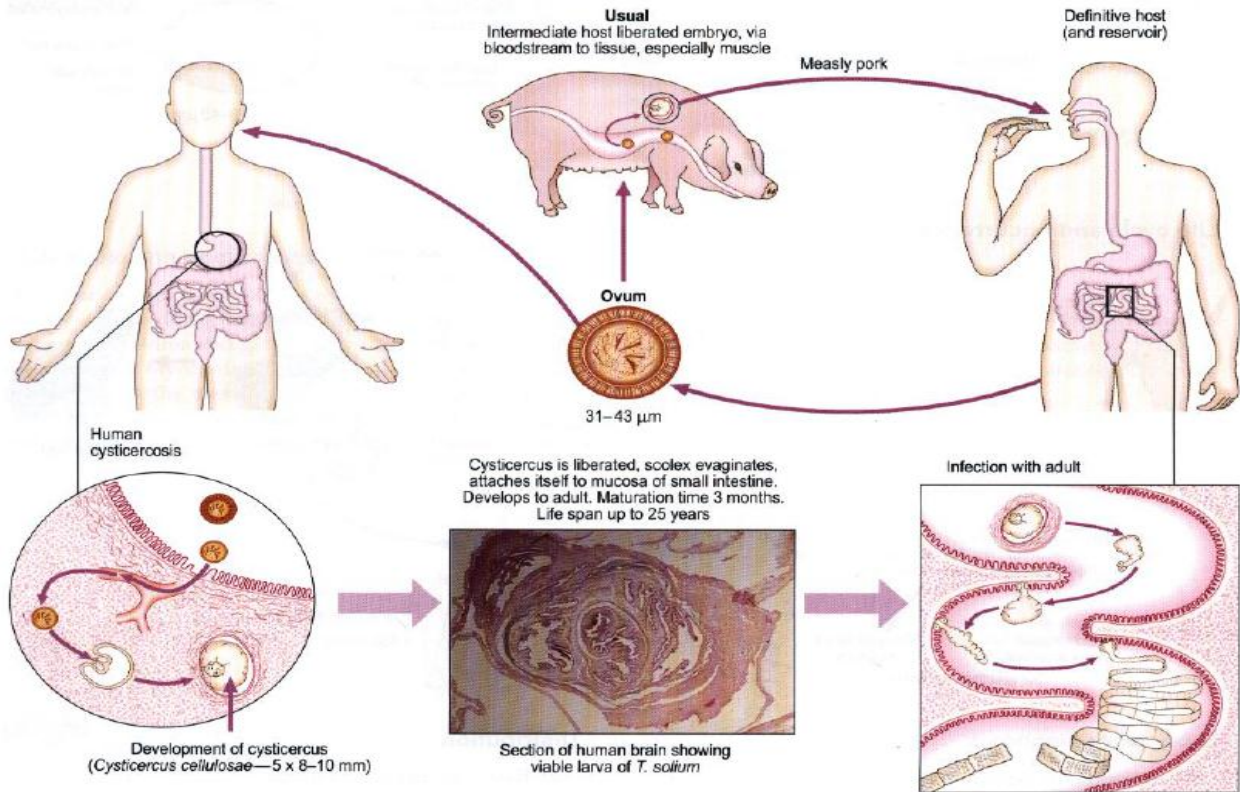
**Diagnosis:** Diagnosis is based on the recovery of eggs or proglottids in stool or from the perianal area. Cysticercosis is confirmed by the presence of antibodies.

**Treatment and control:** Praziquantel is the drug of choice. Expulsion of scolex must be assured to assume a satisfactory treatment. A thorough inspection of beef and pork, adequate cooking or freezing of meat are effective precautions, since cysticerci do not survive temperatures below -10° C and above 50° C.

## Cestode (tape) worms

### *Taenia solium* (pork tape worm)

#### Life cycle



#### Pathology and Clinical features

**Infection by larvae (cysticercosis).** Cysticerci, generally multiple, may occur in any site but are more frequent in the brain and muscle. They excite reaction in the area, especially when they die, which manifests as inflammation, fibrosis and later some calcification. This leads to focal CNS syndromes, especially epilepsy.

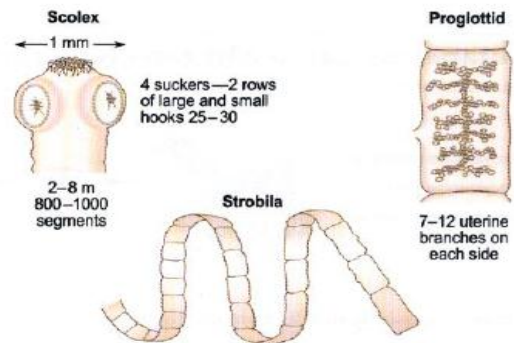
**Infection with adults.** Often there can be no pathology, but there might be mild irritation of intestinal mucosa.

#### Laboratory diagnosis

Eosinophilia.

**Larval infections.** There are several methods, including histological examination of biopsy material, serology (IFAT, ELISA, EITB) and radiology (CT or MRI scan of the brain, X-ray of the thigh muscles).

**Pure infection with the adult.** Gravid segments, ova and scolex can be found in faeces. The uterine branches of the mature segments can be demonstrated by injection of Indian ink through the uterine pore.

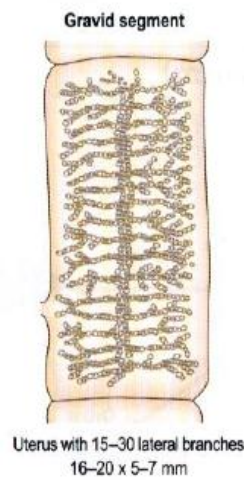
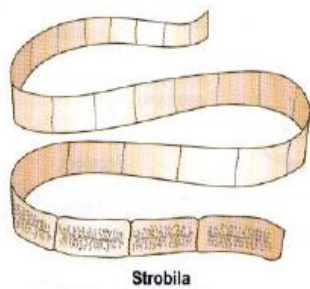
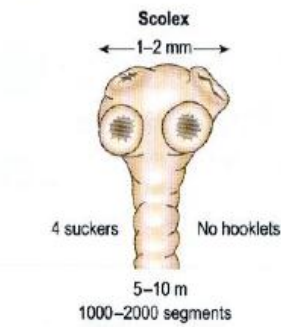
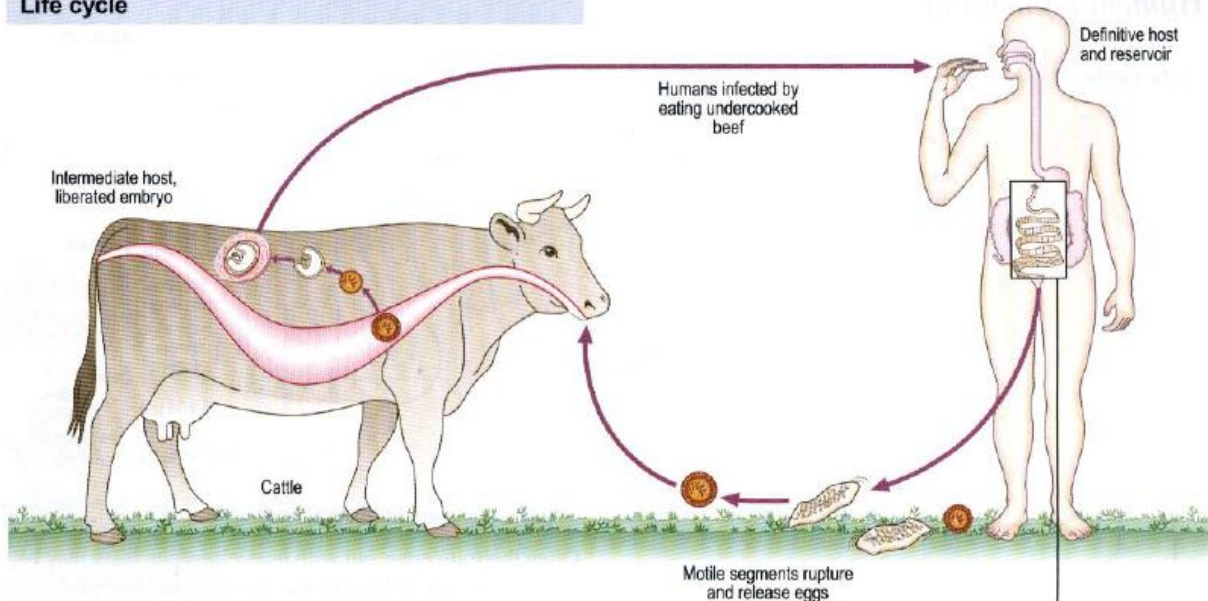


#### Distribution

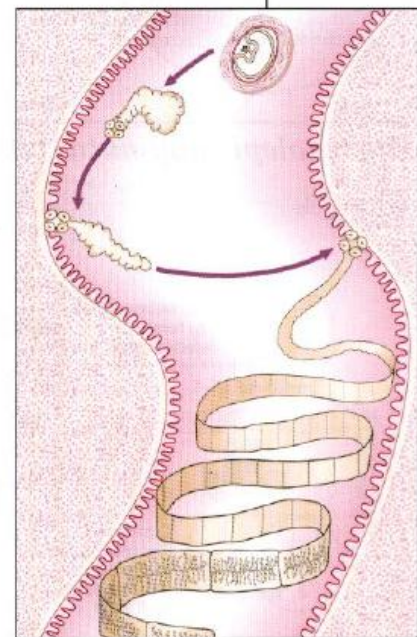
5 million people infected worldwide. *Taenia solium* is endemic in pig-rearing areas of the world where hygiene and animal husbandry are poor.

# Taenia saginata (beef tape worm)

## Life cycle



Scolex evaginates in small intestine and attaches itself to mucosa of jejunum



Maturation time 8-10 weeks.  
Life span up to 25 years

## Pathology and Clinical features

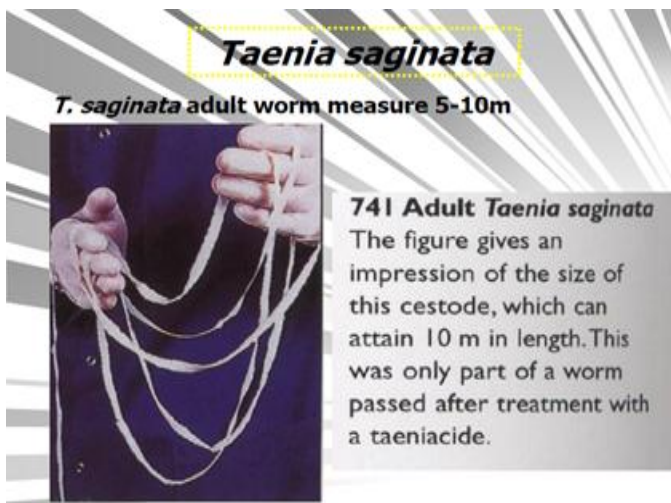
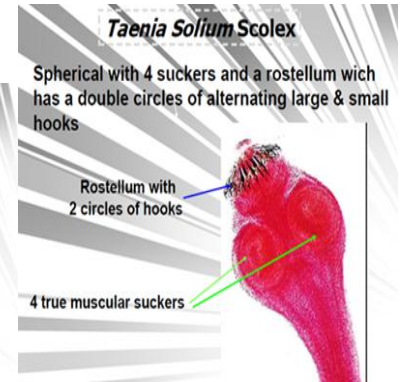
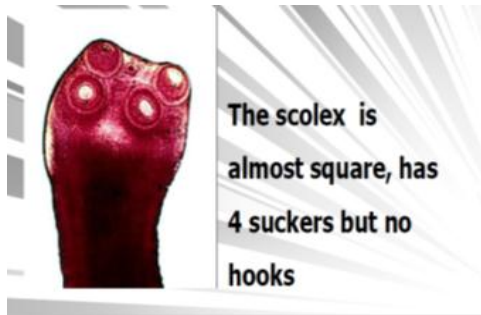
Usually there is no pathology as *Cysticercus bovis* is unknown in humans. Occasionally there is vague alimentary upset.

## Laboratory diagnosis

Gravid segments, ova and scolex can be found in faeces. Uterine branches of the mature segments may be seen in a crush preparation between two glass slides, or by Indian ink preparation, as in *T. solium*. Ova are also found on the perianal skin (on clear adhesive tape slides).

## Distribution

*Taenia saginata* is found in beef-eating areas, especially in the tropics.



## Hymenolepis nana

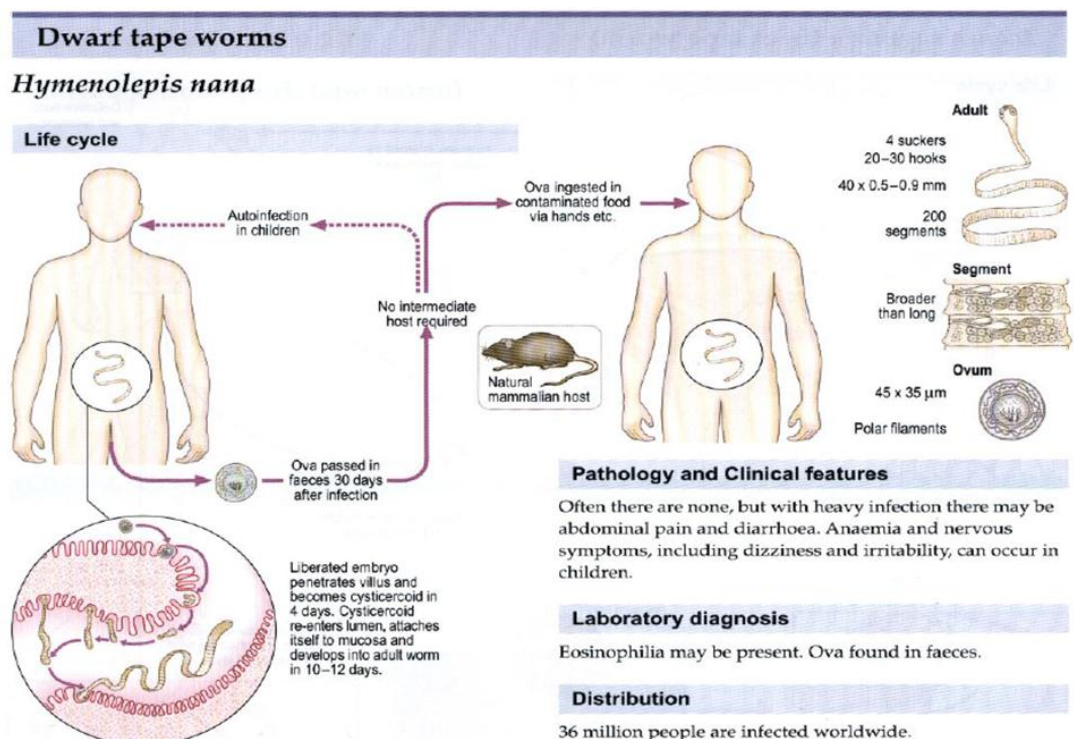
- (1) Frequency - most common of tapeworm infections in humans.
- (2) Requires no intermediate host - can use insects such as fleas or beetles, but these are not necessary.
- (3) Definitive hosts - human, rodents.
- (4) Autoinfection - infected humans ingest eggs from their own feces.
- (5) Morphology - adult is small, 2 to 4 cm in length.
  - (a) scolex - 4 sucking disks & short rostellum with hooks.
  - (b) proglottid – proglottids are broader than long; rarely seen in feces specimens (disintegrate in intestine).
  - (c) eggs - the egg is the most often seen stage in specimens. It measures 45 to 50 microns in diameter and exhibits polar filaments lying between the egg shell
- (6) Mode of Infection - Ingestion of eggs.

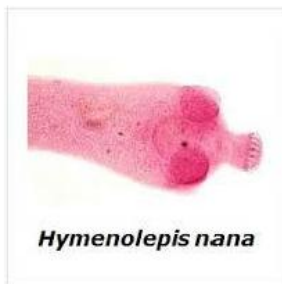
## Symptoms

Infections due to *H. nana* may cause no symptoms even with heavy worm infection. However, symptoms of restlessness, irritability, anorexia, abdominal pain and diarrhea have been reported. Heavy worm infection may be caused by auto-infection which can be a problem in the immune compromised patient .

## Laboratory Diagnosis

Diagnosis is based on recovery and identification of the characteristic ova in a formal-ether concentrate of feces. Adult worms and proglottids are rarely seen in stool samples.

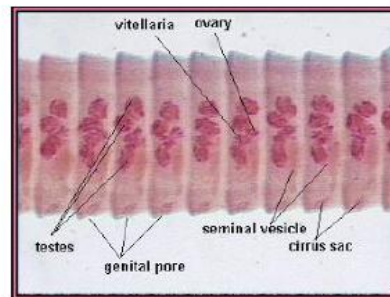




Scolex



egg



proglottids

## **Diphyllobothrium latum (fish or broad tapeworm)**

**Epidemiology:** The infection is distributed worldwide, in the subarctic and temperate regions; associated with eating of raw or improperly cooked fresh water fish.

**Morphology:** It is the longest tapeworm of man, ranging from 3-10 meters with more than 3000 proglottids. The scolex resembles two almond-shaped leaves and the proglottids are more broad than long, a morphology reflected by the tape's name. Eggs are 30x50 µ in size and contain an embryo with 3 pairs of hooklets (figure 4).

**Life cycle:** Man and other animals are infected by eating uncooked fish that contains plerocercoid larvae (15x2 mm) which attach to small intestinal wall and mature into adult worms in 3-5 weeks. Eggs discharged from gravid proglottids in the small intestine are passed in the feces. The egg hatches in fresh water to produce a ciliated coracidium which needs to be ingested by a water flea (Cyclops) where it develops into a proceroid larva. When infected Cyclops are ingested by the freshwater fish, the proceroid larva penetrates the intestinal wall and develops into plerocercoid larva, infectious to man (figure 5).

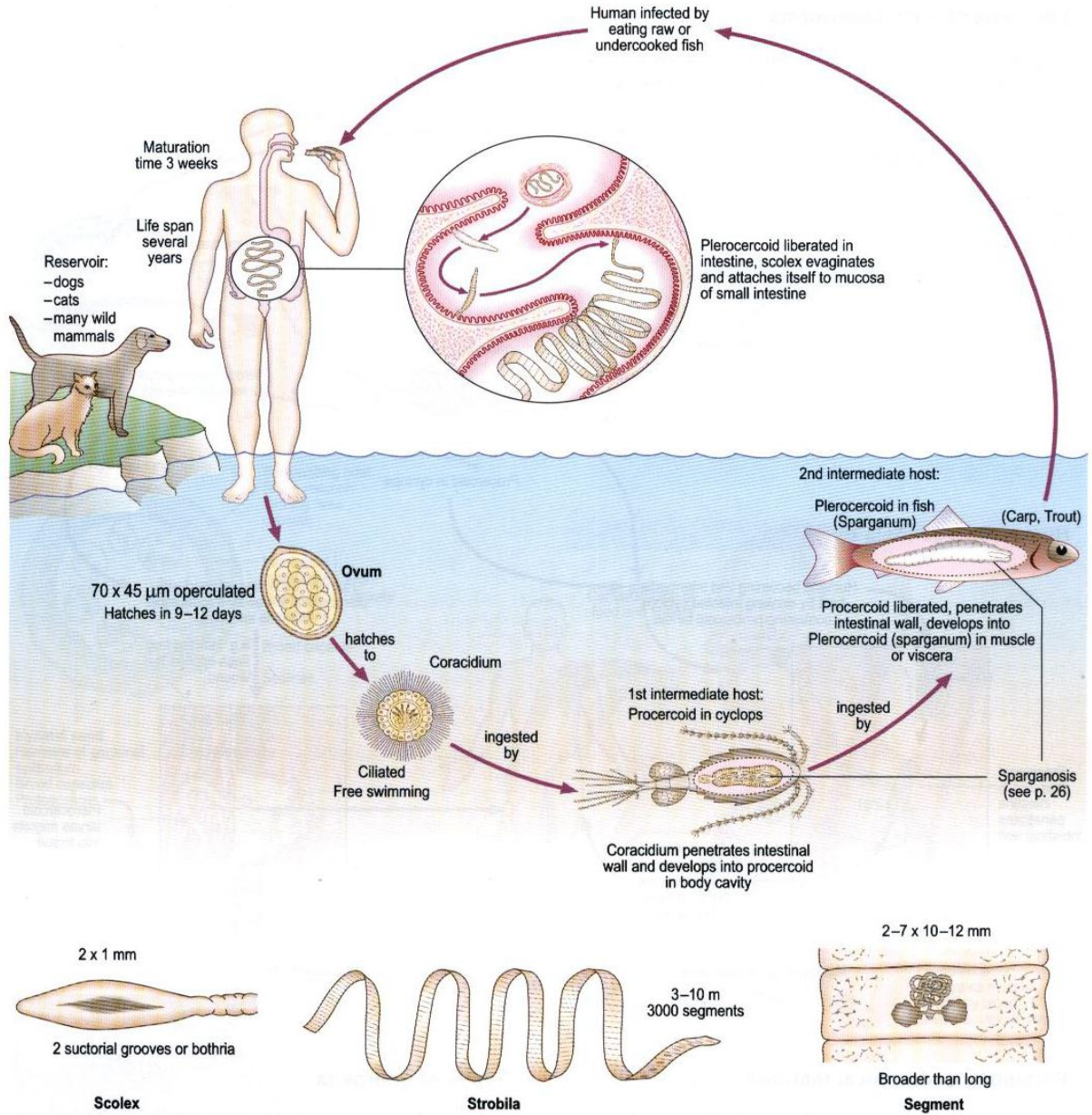
**Symptoms:** Clinical symptoms may be mild, depending on the number of worms. They include abdominal discomfort, loss of weight, loss of appetite and some malnutrition. Anemia and neurological problems associated with vitamin B12 deficiency are seen in heavily infected individuals.

**Diagnosis:** Diagnosis is based on finding many typical eggs and empty proglottids in feces (Figure 3). History of raw fish consumption and residence in endemic locality is helpful.

**Treatment and control:** Praziquantel is the drug of choice. Freezing for 24 hours, thorough cooking or pickling of fish kills the larvae. Fish reservoirs should be kept free of raw sewage.

# *Diphyllobothrium latum* (fish tape worm)

## Life cycle



### Pathology and Clinical features

Generally there is none, but occasionally there can be megaloblastic anaemia (through absorption of vitamin B<sub>12</sub> by the worm).

### Laboratory diagnosis

Eggs and gravid segments can appear in faeces. Megaloblastic anaemia (low serum B<sub>12</sub>).

### Distribution

16 million infected worldwide in eastern seaboard of Canada and America, Brazil, Baltic States, parts of West Africa, North Siberia and South East Asia.



