

Phylum /Platyhelminths

Class :- 1- Trematodes

2- Cestodes (Tape worms الشريطية)

Cestodes (Tapeworms)

These are long segmented worms in which each segment is independent of the other except for neurological intercommunication. The adult stage always reside in the gut of the definitive host. All except for one have an intermediate host. Humans may serve as definite host, as intermediate host, or as both, depending on the species of tapeworm.

Common characters of Class Cestoda

1. Adult worm is flattened ribbon-like, without body cavity.
- 2- The body is composed of a head, neck and segmented strobilus .
- 3- Proglottids (segment): body of adult worm is subdivided into segments;(Immature , Mature and gravid segment).
- 4- The head has suckers, rostellum and hooklets or sucking grooves. The neck is the budding zone from which segments are formed. The segments or strobilla consists of immature, mature and pregnant proglottides.
- 5-The Mature segments contain both males and females reproductive organs .
- 6- They are hermaphroditic. There is a set of female and male reproductive organs in every mature proglottid.
- 7- Digestive tract is absent. Nutrition is absorbed by villi of body surface (There is no intestine; nutrients are absorbed through the integument) .
- 8- They are biohelminths. Intermediate hosts are indispensable.
- 9- Mature, gravid proglottids detach from the strobila.
- 10- All adult worms parasitize digestive tracts of mammals.
- 11 -The developing stages in intermediate hosts are called metacestode , such as cysticercus , hydatid cyst , cysticercoid , proceroid , plerocercoid.
- 12- Tapeworms are classified into two orders:
 - A- 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* .

B- 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 *Spirometra mansoni* and *Diphyllobothrium latum*.

Note :- Clinically important cestodes pathogenic to man are

- 1- *Tenia solium* (pork tapeworm),
- 2- *T. saginata* (beef tapeworm),
- 3- *Diphyllobothrium latum* (fish or broad tapeworm),
- 4- *Hymenolepis nana* (dwarf tapeworm)
- 5- *Echinococcus granulosus* and *E. multilocularis* (hydatid).

Cestode diagnosis

- Stool examination for eggs of adult forms
- Ultrasound/CT scan/MRI for tissue larval forms
- Serology

Treatment: praziquantel, albendazole, surgery

TENIASIS

1- TENIA SOLIUM

2- T. SAGINATA

Epidemiology

These cestodes have a worldwide distribution but incidence is higher in developing countries. Infection rate is as low as 1 per 1000 in most of North America and as high as 10% in the third world. Pork tapeworm shows a higher incidence but this is dependent on dietary habits.

T. saginata

Definitive (final host) :- Human

Site of infection : small intestine

Intermediate host :- cattle

Larval stage :- cysticercus bovis)

Common name :- Beef tape worms (hookless tape worm)

Morphology

T. saginata can be up to 4 to 6 meters long and 12 mm broad; it has a pear-shaped head (scolex) with four suckers but no hooks or neck. It has a long flat body with several hundred segments (proglottids). Each segment is about 18 x 6 mm with a branched uterus (15-30 branches). The egg is 35 x 45 micrometers, roundish and yellow-brown. It has peripheral radial striations and contains an embryo with 3 hooklets .

Epidemiology:

Most common tapeworm found world wide. Acquired from eating uncooked beef. Humans are definitive hosts. Very common in Lebanon and Ethiopia. Occasionally found in Canadian dairy cattle herds.

Biology (Life cycle)

A tapeworm larval cyst (cysticercus) is ingested by human 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 to 4 months. The adult may live in the small intestine as long as 25 years and pass gravid proglottids with the feces. Eggs extruded from the proglottid contaminate and persist on vegetation for several days and are consumed by cattle in which they hatch and form cysticerci .

Symptoms or Clinical signs :

Light infections remain asymptomatic ; , but heavier infections may produce abdominal discomfort, epigastric pain, vomiting and diarrhea. non-specific intermittent pains or indigestion. Tapeworm segments (proglotids) or segment chains are seen in the stools.

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: Stool examination for eggs or segments. Segments differentiated from pork tapeworm by having large number of uterine branches when viewed with a trans-illuminating light source.

Treatment

Praziquantel is the drug of choice. Expulsion of scolex must be assured to assume a satisfactory treatment. A thorough inspection of beef meat.,

Prevention (control):

- 1- Sewage treatment.
- 2- cook or freeze beef (adequate cooking or freezing of meat are effective precautions, since cysticerci do not survive temperatures below -10° C and above 50° C

Taenia solium

Definitive (final host) :- Human

Site of infection : small intestine

Intermediate host :- human and swine (pigs)

Larval stage :- cysticercus cellulosae)

Common name :- pork tape worms (Hook tape worm)

Note :- Human may be final and intermediate host in sametime in this tape worm.

Morphology

T. solium is slightly smaller than *T. saginata*. It has a globular scolex with four suckers and a circular row of hooks (rostellum) that gives it a solar appearance. There is a neck and it has a long flat body (0.1 meter in length). The proglottids are 5 x 10 mm with a 7-12 branch uterus. The eggs of *T. solium* and *T. saginata* are indistinguishable.

Epidemiology:

Not as widely disseminated as *T. saginata*. As with beef tapeworm humans are definitive hosts and pig the intermediate host.. Acquired by eating uncooked pork.

Life cycle

same as for the beef tapeworm (*T. saginata*) except for the intermediate host (pig). However humans can be infected with the larval cysts like in the pig (may be act as intermediate host)

Clinical: The same as beef tapeworm (above)

Treatment: Praziquantel

Prevention: Sewage disposal; cook or freeze pork

***Taenia solium* (cysticercosis)**

Cysticercosis

T. solium eggs 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 per 1000 population and may account for up to 20% of neurological case in some countries (e.g., Mexico); cysticercosis ocular involvement occurs in about 2.5% of patients and muscular involvement is as high as 10% (India).

Epidemiology:

The larval form of *T. solium* infects humans who ingest the eggs of this tapeworm passed in human stool. This occurs most frequently where human stool is used as fertilizer for soil **يصاب الانسان بالطور اليرقي عندما يستعمل البراز في تسميد التربة**. This occurs most frequently in developing countries where pigs are bred.

Life cycle of (cysticercosis)

T. solium eggs, on ingestion, hatch into larvae which penetrate small intestine mucosa and are carried throughout the body where they are deposited and grow in many different tissues (muscle, subcutaneous, brain, eye, heart). They form small (1-3 cm cysts with an invaginated scolex) and live for ~7 years.

Clinical:

Pathology is produced by the cysts as space occupying lesions (especially brain) and as foci of host inflammatory response when the cyst eventually dies or is killed with anti-helminthics. Frequent Presentations are seizures or hydrocephalus.
