



47

CESTODES

47.1 INTRODUCTION

Cestodes consist of flat tape like two dimensional worms which mostly reside in the intestines. They are hermaphrodite and are oviparous. They do not have a digestive system so the nutrients are taken up through the absorptive integument. These are segmented tape worms that vary in size from a few millimeters to several meters. They do not have a body cavity or alimentary canal.



OBJECTIVES

After reading this lesson, you will be able to:

- describe the general morphology of cestodes
- describe the pathology, life cycle & morphology of *T.solium* & *T. saginata*

2. The morphological features of the tape worms are:

- a) All cestodes have a scolex, a neck and strobila (segments)
- b) Body wall has three layers :
 - i. outer cuticle,
 - ii. middle muscle,
 - iii. radial tegumental cells
- c) They do not have a body cavity, only loose parenchymal tissue is present
- d) No digestive organs are present. The nutrients are absorbed by the body segments.



Notes

3. The Pathogenic species are:

- a) *Taenia solium*,
- b) *Taenia saginata*,
- c) *Echinococcus granulosus*,
- d) *Hymenolepis nana*
- e) *Diphyllobothrium latum*

47.2 T SOLIUM / T SAGINATA

1. Introduction

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

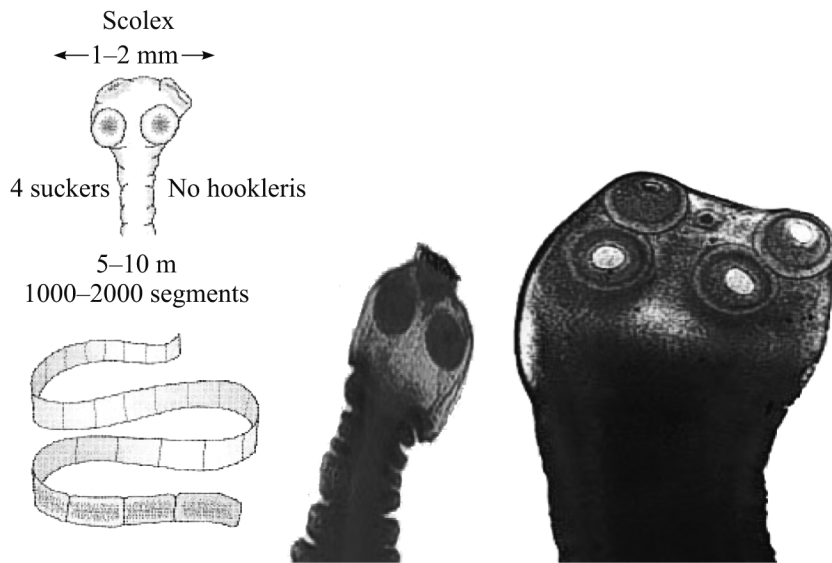
T. solium causes infection in pigs that are its definitive hosts while *T. saginata* infects cows. Man gets accidentally infected by eating pork meat or beef meat which is under cooked. Man can get the larval infection called cysticercosis by the ingestion of the eggs of *T. solium* tape worm.

2 Morphology

- a) **T. solium:** It is 3-4m long and is smaller than *T. saginata*. The scolex of *T. solium* has a rostellum armed with two rows of hooks in addition to the four suckers. Inside the gravid segments the number of uterine lateral branches are usually 7-13.
- b) **T. saginata:** It can grow as long as 10m. It has a scolex with four suckers but no rostellum is present. The proglottids at the posterior end of the chain are longer than its width. Each proglottid contains a branched treelike uterus consisting of more than 15 branches. The uterus contains 80,000 to 100,000 ova.
- c) **Ova:** the ova are released when a proglottid detaches from the tape worm in the intestinal lumen or when a proglottid disintegrates outside the host. The ova measure 30-40 μm and are round in shape. The outer shell forms a thick brownish radially striped embryophore which encloses an oncosphere with three pairs of hooklets. The ova are highly resistant and remain infective in a moist environment for weeks or months.

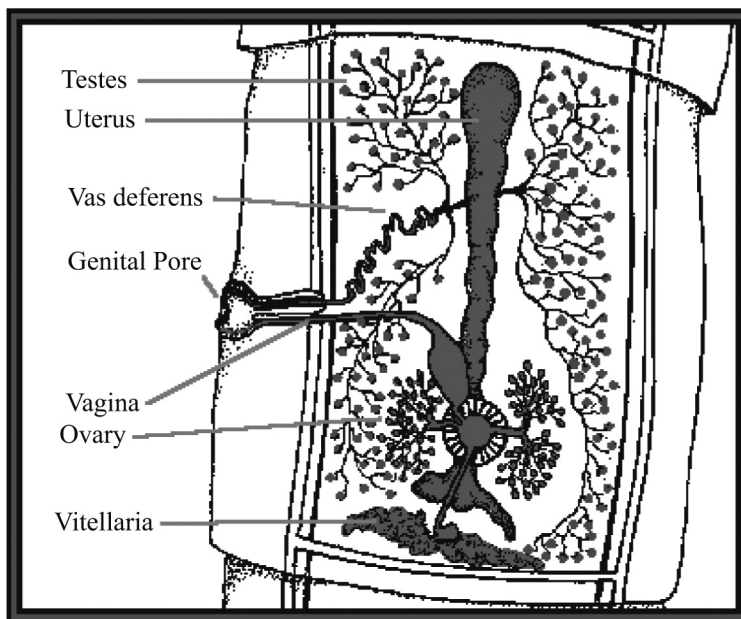


Notes



T. solium : Rostellum with hooklets

T. saginata: Four suckers, no rostellum



- Mature proglottid, shows trilobed ovary. Carmine stained.

Note : Less than 14 lateral uterine branches (one side).

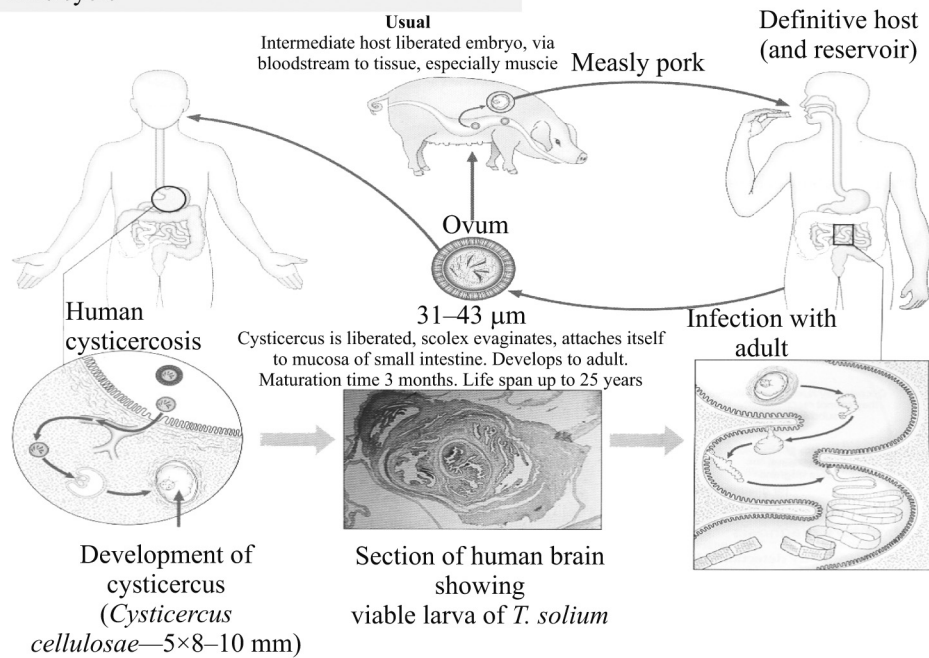


Notes

Cestode (tape) worms

Taenia solium (pork tape worm)

Life cycle



3. Life Cycle of *T solium*/ *T saginata*:

The adult worm is present in the intestines of host. The ova or the proglottid containing the ova are passed in the stools. The ova are then ingested by the intermediate host who could be pig (*T. solium*) or Cow (*T. saginata*). When a cow or buffalo feeds ingests the eggs the oncosphere hatches in the intestines. The larva hatches from the ova in the intestines of the intermediate host. The larva then penetrates the intestinal mucosa and reaches the muscles and develops into a cysticercus in three months time. Man gets infected when man eats the undercooked beef (*T saginata*) or pork (*T solium*) containing the cysticercii. In man the cysticercus develops into an adult tape worm. The cycle thus continues.

4. Pathology and clinical features

Infection by larvae (cysticercosis). Cysticerci, generally are multiple, and may occur at any site in the body. They are however most frequently seen in the muscles and the brain. They excite an inflammatory reaction in the surrounding area especially when they die. In some infected individuals the certain morphological changes (villous formation, enterocyte proliferation, cellular mucosal infiltration) and functional disturbances are seen. The inflammation then is followed by fibrosis and calcification. In the brain this manifests as focal neurological syndromes especially epilepsy.

Infection with adults: This may often be an inapparent infection. In some cases there may be mild irritation of the intestinal mucosa.

Cysticercosis is sometimes seen in people who do not consume meat. In these people the infection is contracted by ingesting the ova along with raw or uncooked salad or leafy vegetables which have not been washed well and may contain the ova of tape worm.



Notes

5. Laboratory Diagnosis

Gravid segments and ova and scolex can be found in the stools of the infected person. The uterine branches of the mature segments can be demonstrated by injection of india ink through the uterine pore.

Larval infections are often discovered accidentally on histopathological examination of subcutaneous nodules or muscle biopsies. Imaging studies like CT scan or MRI are often helpful in diagnosing cysticercus as the cause of epilepsy. X ray of the thigh muscles detects the cysticercus in the muscles.

Serological tests based on detecting specific IgG/ IgM antibodies to *Taenia solium* are available. These tests are ELISA.



INTEXT QUESTION 47.1

1. Cestodes are segmented
2. Nutrients of cestodes are absorbed in the
3. *Taenia* in man causes infection
4. The intermediate host in *T. Solium* is

47.3 *HYMENOLEPUS NANA*

1. Introduction

The natural host of the dwarf tape worm is the mouse.

2. Morphology

The worm is 1-4 cm long and is 1 mm wide. The ova are elliptical and measure 40 X 50 μm and contain an oncosphere.



Notes

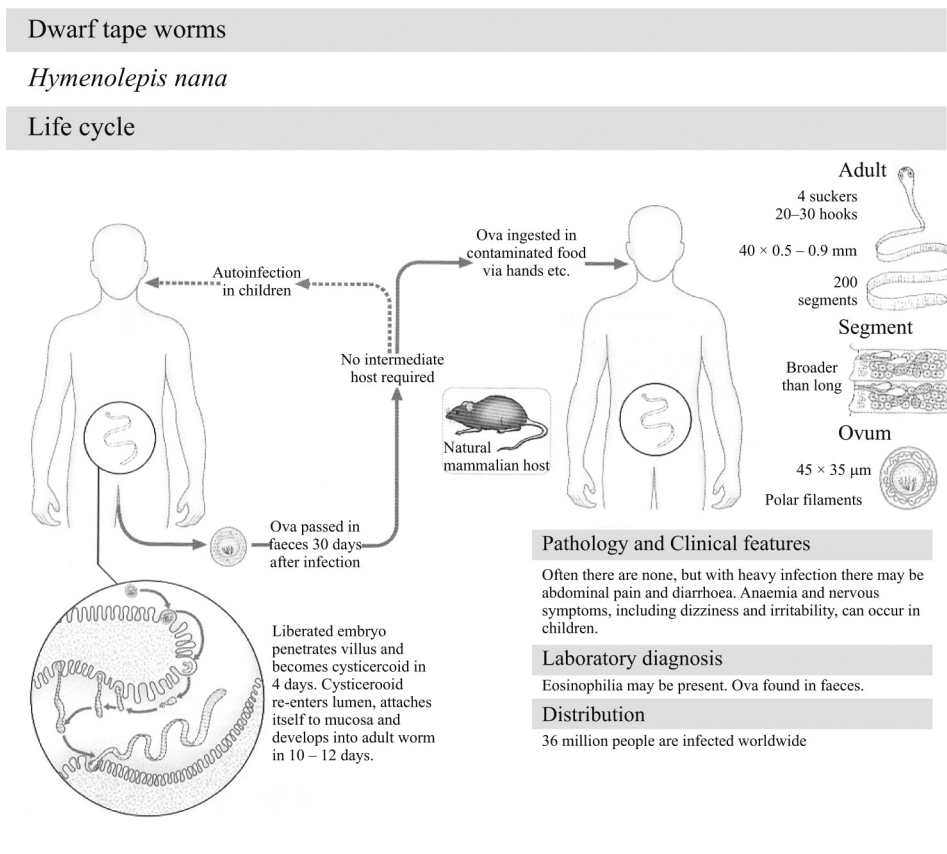


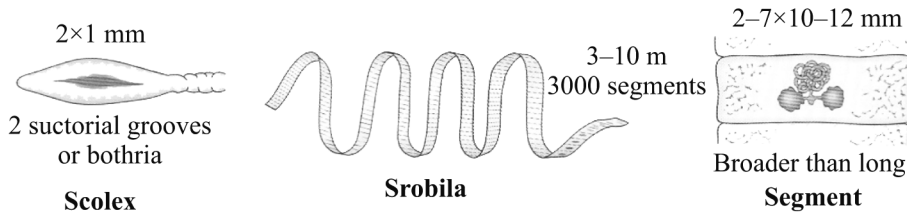
- *Hymenolepis nana* Egg
- 37-41 micrometer, faecal smear, wet mount.
- Note : Bipolar thickenings with filaments.

- *Hymenolepis nana*
- Adult dwarf tapeworm
- Scolex , Rostellum with hooklets

3. Lifecycle and pathogenesis

Man gets accidentally infected by accidental ingestion of the ova which are passed in the stools of the rodents like mouse. The rodents are its definitive



**Pathology and Clinical features**

Generally there is none, but occasionally there can be megaloblastic anaemia (through absorption of vitamin B₁₂ by the worm).

Laboratory diagnosis

Eggs and gravid segments can appear in faeces. Megaloblastic anaemia (low serum B₁₂).

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.



hosts. The oncosphere in the ova hatch in the intestine and penetrates into the intestinal villi and develop into a larva (cysticercoids). The larva then returns to the intestine and develops into an adult tape worm. Alternatively *H. nana* may also develop in an intermediate host like fleas, grain beetles. Infections are often latent and in apparent. It may cause gastrointestinal disturbances.

**WHAT HAVE YOU LEARNT**

- Cestodes are segmented tape worms. All cestodes have scolex, neck and strobila
- Pathogenic species are *Taenia solium*, *Taenia saginata*, *Echinococcus granulosus*, *Hymenolepis nana*
- *T. solium* causes infection in pigs and man gets infected by eating pork meat or beef meat which is under cooked.
- Man can get the larval infection called cysticercosis by the ingestion of the eggs of tape worm
- Gravid segments and ova and scolex can be found in the stools of the infected person.
- Serological tests based on detecting specific IgG/IgM antibodies are available
- The natural host of the dwarf tapeworm is mouse
- Man gets infected by accidental ingestion of ova which are passed in the stools of the mouse
- Eggs and gravid segments can appear in faeces and megaloblastic anaemia is also seen.

**Notes****TERMINAL QUESTIONS**

1. What are cestodes? Enumerate the different cestodes.
2. Describe the morphological characteristics of cestodes
3. Describe the life cycle of *T. saginata*/ *T. solium*.
4. Discuss the difference in the pathogenicity of *T. solium* and *T. saginata*.

**ANSWERS TO INTEXT QUESTIONS****47.1**

1. Tapeworm
2. Body segments
3. Cysticercosis
4. Pig