

# Taenia Solium

Systematic position

Phylum - Platyhelminths

Class - Cestodea

S. class - Eucestoda

Order - Cyclophyllide

Genus - Taenia

Species - Solium

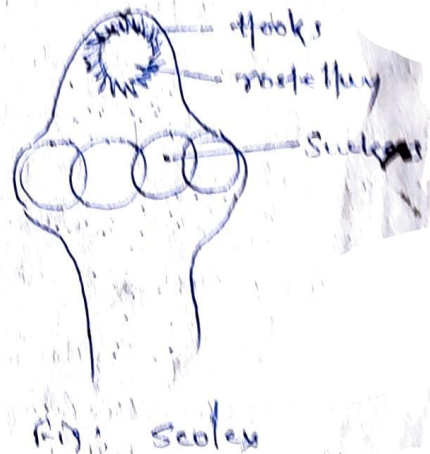
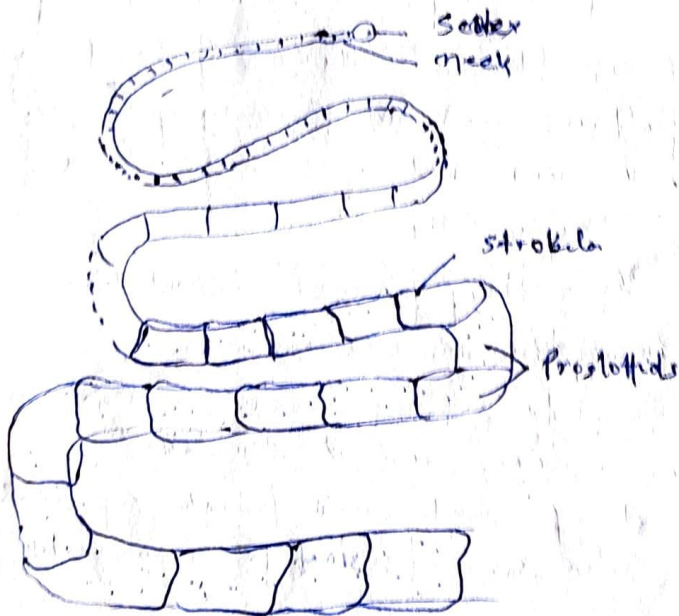
Common name - Pork Tapeworm of Man

② Geographical distribution - World wide in distribution (Cosmopolitan)  
Very common in Mexico, Latin American countries, North China, India  
Palaearctic countries man coming near of insufficiently cooked pork

③ Habitat - The adult tapeworm lives as a parasite in small intestine (upper jejunum) of man.

## Morphology

Tape or ribbon-shaped, segmented, dorso-ventrally flattened; 2-3 metres long body - divisible into scolices, neck and strobila



a) scolex - knob-like (1 mm in diameter) with a set of four muscular and circular suckers and an apical canal or rostellum bearing 28-30 hooks in two rows.

Scolex is used as an organ of attachment.

b) Neck - Short, narrow, unsegmented region behind the scolex  
Called as the building zone, growth zone, area of segmentation and also area of proliferation behind the scolex.  
strobila - forms the main body; very long ribbon-like part of 800-1000 segments or proglottids.

A strobilla has an anterior excretory (without sex organ), middle - mature and posterior grand set of proglottids (highly branched uterus)

Mature proglottids bear male and female reproductive organs while the young ones are distended with eggs.

Apolysis - A small no. of grand proglottids regularly break off from the posterior end and pass out - without the scolex (Apolysis). This phenomenon is the function of the scolex.

- It seems to transfer the developing embryos to outside.
- It keeps the size of the body within limit.

Body wall - The body wall consists of :-

- Cuticle - Outermost thick resistant layer, wrong to call it cuticle as recent scientists have to proved it to a naked cytoplasmic and physiologically active surfaces.
- Epicnemis - large cells embedded into underlying parenchyme.
- Layer of longitudinal muscle - beneath the epicnemis cells.
- Layer of circular muscle :- divides the parenchyme into an outer Cortical zone and inner Medullary zone enclosing the nervous, excretory and reproductive systems.

Nutrition - The digested food present in the intestine of the host is the main food. Different substances may be absorbed through the general body surface.

Respiration - Mainly anaerobic. The respiratory rate is highest in the anterior proglottid; no respiratory organ.

Excretory System - Consists of (i) flame cells (ii) Lateral longitudinal canals (iii) capillaries and (iv) secondary canals. The excretory canals branch and rebranch into fine canaliculi terminating flame cells.

The exact nature of the excretory products is not known.

Nervous system - Special receptors are absent.

Reproductive system - A complete set of male and female reproductive organs occurs in each proglottid.

Maturing proglottid has a set of male and female reproductive organs. Genital pore in successive proglottids is regularly alternate and marginal.

Male reproductive organ - Consists of

- Testis - numerous in medullary parenchyme
- Vasa efferentia - One arising from each testis, they finally unite, almost in the middle of the proglottid and form the Common Vas deferens.
- Vas deferens - thick and convoluted tube, extending to the lateral margin of the body.
- Cirrus sac - a sac like structure at the distal end of vas deferens and enclosing a protrusible Cirrus (= copulatory organ).
- Male genital opening - the opening of cirrus sac (= cup shaped genital atrium)

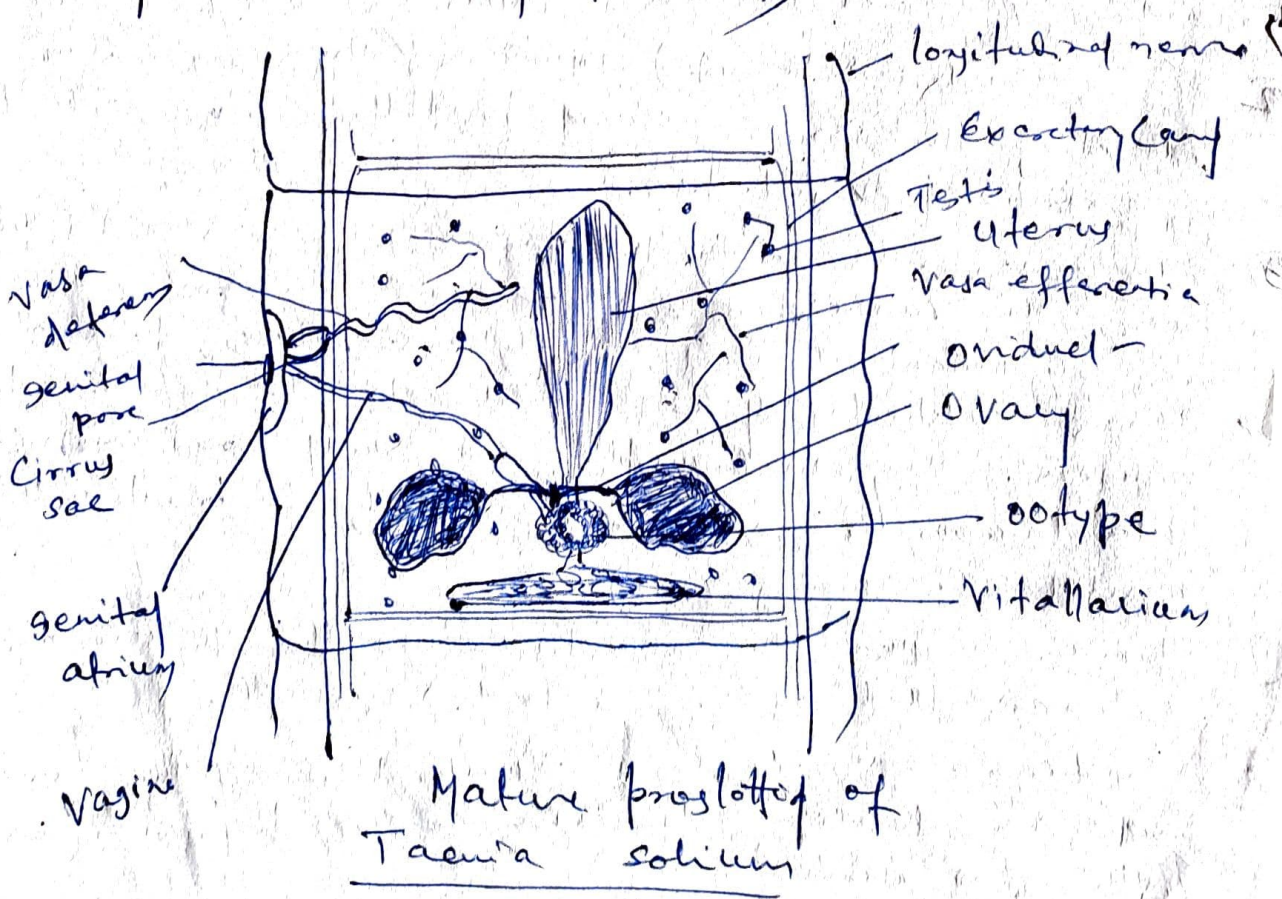
Genital papilla - There is another structure called Genital papilla which opens outside by the Common gonopore and into the Genital atrium.

male and female genital ducts open. The common gonopore of successive proglottids open on alternate sides i.e. once on right and then on left.

Female reproductive organ - Consists of :-

- ① Ovary - bilobed; near the posterior border of proglottid.
- ② Oviduct - short, joins another wide tube - Vagina. The latter together form a swollen Ootype.
- ③ Vitellarium - A yolk gland near the posterior border of proglottid.
- ④ Yolk duct - arising from vitellarium and opening into ootype.
- ⑤ Mehlis gland - unicellular gland around ootype.
- ⑥ Vagina - a narrow duct arising from ootype and opening by female gonopore into genital atrium.
- ⑦ Seminal receptacle - a swelling near the proximal position of vagina for sperm storage.
- ⑧ Uterus - blind tube arising from ootype and extends upto the anterior end of the proglottid.

(Characteristic part of the reproductive system of Tape worm is the branched uterus & the only reproductive structure persisting in a gravid proglottid)



## LIFE CYCLE

The life cycle of the pork tapeworm is completed in two hosts

(1) Man - the definitive host - harbouring the sexually mature tapeworm

(2) Pig - the vertebrate intermediate host - harbouring the infective larvae of cysticerci.

Camel, dog, monkey and even Man may serve as intermediate host.

The gravid proglottids, distended with eggs are apolytic, i.e. they break away from the parent body and are passed out with the human faeces. The eggs do not become free even before gravid proglottid breaks off.

(3) Each egg contains a rounded hexacanth (6-hooked) embryo enclosed within two membranes.

In egg or gravid proglottid form, *T. Solium* is able to remain viable anywhere from days to months.

Note Autoinfection can also occur via faecal oral contamination. In this case, egg or gravid proglottids re-enter the body through the mouth as often travel to the central nervous system (CNS), the muscles or the eye, where they develop into cysticerci (leads to tapeworms of cysticercosis)

(4) Pigs (intermediate host) acquire infection by eating and digesting the egg or gravid proglottids along with the parasitized vegetation.

(5) The eggs migrate to the pig's intestine and within 24-72 hours, the onchophores or hexacanth embryos hatch out <sup>in the</sup> and by means of hooks and lytic secretions, penetrate <sup>the wall</sup> ~~the~~ muscle. They metamorphose into small round cysts called bladderworms or cysticerci (ability to persist in the muscle for many years)

(6) Humans acquire the infection by eating the undercooked or raw flesh of an infected animal.

(7) Cysticerci migrate to the small intestine of the human host and develop into ~~small~~ adult tapeworms (normally within two months).

- Parasitic adaptation of Taenia - Tapeworm shows several adaptations
- 1. Its internal parasitic life in comparison with a free living animal.
  - 2. External body covering (= tegument) is freely permeable to water and nutrients but protects against digestion by host's alkaline digestive juice.
  - 3. Lacking like and other organs of locomotion (not required)
  - 4. Scolex and suckers and spines serve for <sup>firm</sup> attachment.
  - 5. No alimentary canal as parasite absorbs readily available food.
  - 6. Microvilli increase the absorptive surface area.
  - 7. No need of circulatory, respiratory or sensory organs (absent)
  - 8. Production of large no. of eggs (nearly 40,000) per gravid segment ensures the survival of the species.
  - 9. Hermaphroditism and parthenogenesis ensuring self fertilization or cross fertilization with another proglottid. (same proglottid)

Symptoms  
 Infection with T. solium adults is usually asymptomatic. Scolex may cause some inflammation of the intestinal wall and may cause peritonitis.

The most important health problem is Cysticercosis. A Taeniarhynchosis - Pain in the abdomen, nausea, anaemia, decreased appetite, indigestion, or nervous disorders.

Cysticercosis - The most common sites of infection are the skeletal muscle and brain.

Treatment - Can be tackled by several anti-helminthic drugs such as Camoquin, Carbon tetrachloride, dichlorophenol etc. Removal of Cysticerci especially from delicate organs like brain, eye and liver is extremely difficult.

Prevention 1. Consumption of undercooked food should be avoided.  
 2. Faeces of infected persons should be properly disposed of and destroyed. Preventing pigs having access to them and digesting herbage embryos.

Human Infection

Cysticerci

Cysticercus  
larvated scolex

Invaginated scolex  
attached to intestinal wall



Adult

Man  
Primary Host

PIG  
SECONDARY  
HOST



ground  
proglottids  
with eggs  
hung out to feed



branched uterus  
containing eggs  
ingested by pig



encysted  
hexacanth  
(Pis infection)



oncosphere  
(in blood circulation)

Taenia Solium Life cycle



measly  
pork  
eaten by  
man

PIG Infection