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المرحلة الثالثة طفيليات تسلسل (١١) العدد (5)

16/4/2018

Medical Parasitology

TAENIA SOLIUM & TAENIA SAGINATA

3rd class

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TAXONOMY

- *Kingdom - Animalia,*
- *Phylum - Platyhelminthes,*
- *Class - Cestodes,*
- *Order - Cyclophyllidea,*
- *Family - Taeniidae,*
- *Genus - **Taenia**,*
- *Species - T. **saginata**, T. **solium***

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Taenia Solium & *Taenia Saginata*

- Taeniasis is a tapeworm (cestode) infection acquired by the ingestion of raw or undercooked meat of infected animals.
- Two species, *Taenia saginata* and *Taenia solium*, cause pathology in humans.
- *T. saginata* is associated with the ingestion of the worm's larval form found in infected beef, while *T. solium* is associated with that of infected pork.
- *T. saginata* is also commonly known as beef tapeworm. *T. solium* is similarly referred to as pork tapeworm.

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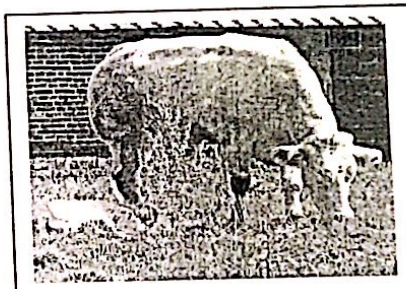

Taenia solium

(Pork Tapeworm)

Epidemiology & Geographical distribution

- These cestodes have a worldwide distribution but incidence is higher in developing countries.
- Approximately 100 million new infections of *Taenia* worms, develop annually throughout the world. Of which, approximately 50% of those infections are caused by each of the two worms equally.

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- Infection rate is as low as 1 per 1000 in most of North America and as high as 10% in the third world.
- *T. saginata* infection is common in areas of the world where beef is commonly eaten and human sanitation is poor. It is common in Muslims because of eating beef.
- *T. solium* is more prevalent in poorer communities where humans live in close contact with pigs and eat undercooked pork.
- It is very rare in Muslim because of religious restriction for eating pork.

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Related information

- Humans are the only definitive host.
- Intermediate hosts include Bovidae and Cervidae.
- Adults exist in the intestine of definitive hosts.
- Cysticerci exist in striated muscle of intermediate hosts. Possibly the most common tapeworm in humans.
- Little serious disease unless hosts are nutritionally deprived.
- Economic costs in cattle

- *T. saginata*: unlike other taeniids this species has **no rostellar** hooks.
- Humans are infected by eating a cystercus in raw/uncooked beef.
- Scolex evaginates in the small intestine, attaches, grows 3-4 months later proglottids appear in feces. Proglottids shed irregularly, may "crawl" out of the anus. Proglottids are weakly motile, most active in the evening
- Abdominal discomfort, diarrhea, frequent hunger pangs. Best diagnostic feature is presence of parasites.

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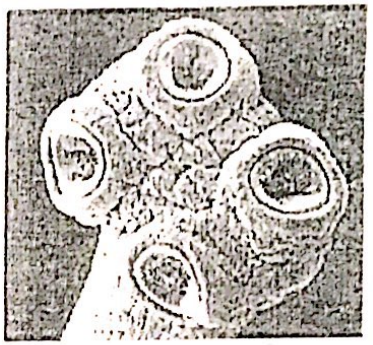

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Morphology

T. saginata

- *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), which reside in the small intestine, where they attach by their scolex. Each segment is about 18 x 6 mm with a branched uterus (15-30 branches).
- The egg is 35 x 45 mm, roundish and yellow-brown. It has peripheral radial striations and contains an embryo with 3 hooklets.

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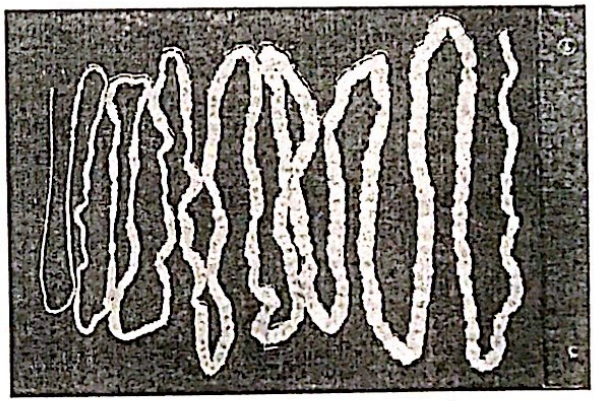

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- Each worm may have 1,000 to 2,000 proglottids, which detach from the tapeworm, and migrate to the anus or are passed in the stool (approximately 6 per day).
- The eggs in the gravid proglottids (80,000 to 100,000 eggs per proglottid) are released after the proglottid becomes free and are passed with the feces.

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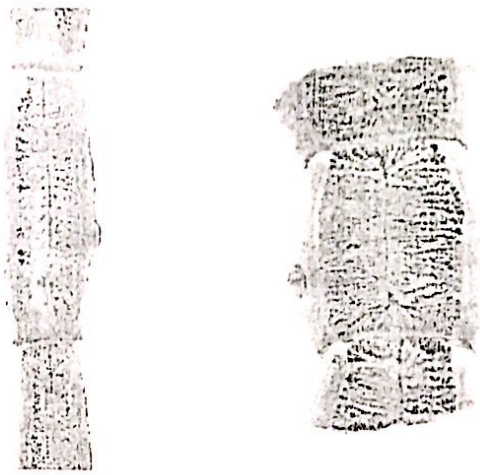

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- The eggs can survive for months to years in the environment. In the new host, the eggs release the oncosphere, which evaginates, invades the intestinal wall and migrates to the striated muscles, and develops into a cysticercus. The cysticercus can survive for several years in the animal.
- Humans become infected by ingesting raw or undercooked infected meat. In humans, the cysticercus develops over 2 months into an adult tapeworm, which can survive for more than 30 years

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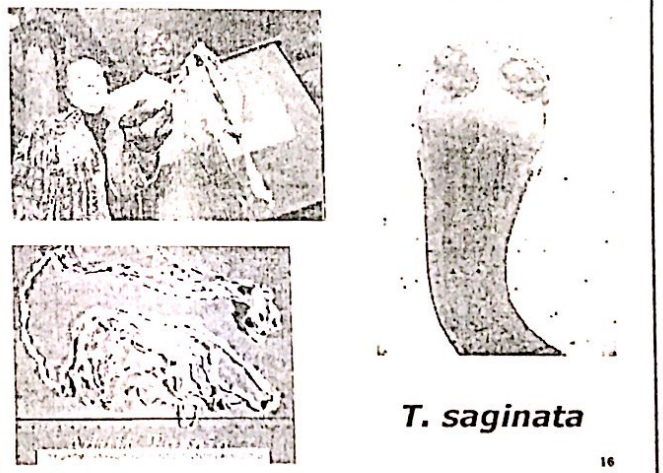

T. saginata

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The eggs of *Taenia saginata* and *T. solium* are indistinguishable morphologically (morphologic species identification will have to rely on the proglottids or scolices). The eggs are rounded or subspherical, diameter 31 - 43 µm, with a thick radially striated brown shell. Inside each shell is an embryonated oncosphere with 6 hooks. The egg in B still has the primary membrane that surrounds eggs in the proglottids

T. solium

- *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 ' 10 mm with a 7-12 branch uterus.
- The eggs of *T. solium* and *T. saginata* are indistinguishable

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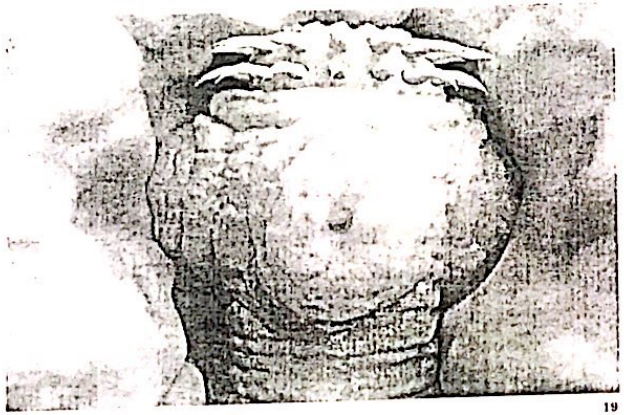

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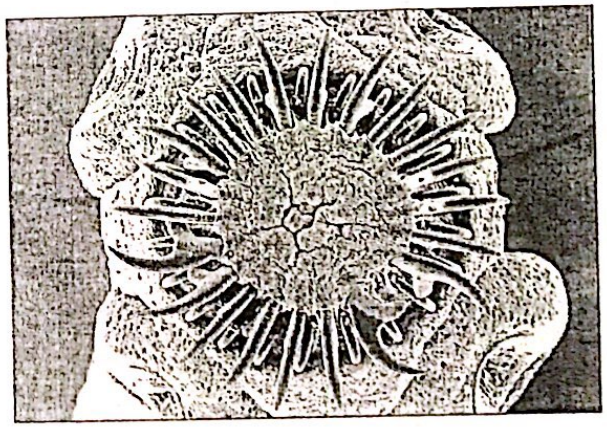

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T. solium

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Transmission

- In humans, it is the ingestion of under-cooked beef (*T. saginata)* or pork (*T. solium*) containing the larval cysts.
- Intermediate hosts, such as cows and pigs, are infected with the tapeworm when they come into contact with the worm's eggs located in the feces of infected humans.
- In addition to human, *T. saginata* also persists and has a developmental stages in the cow. *T. solium* persists and has developmental stages in pigs

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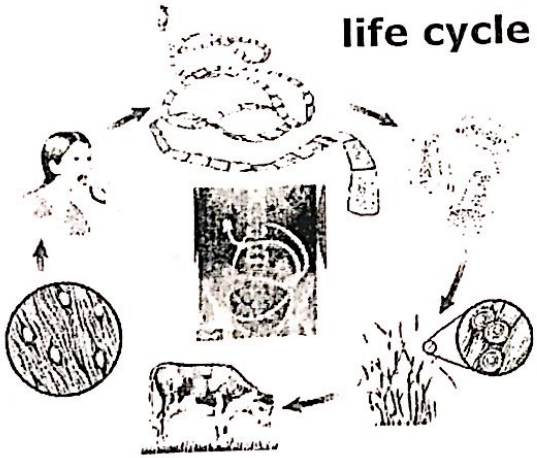
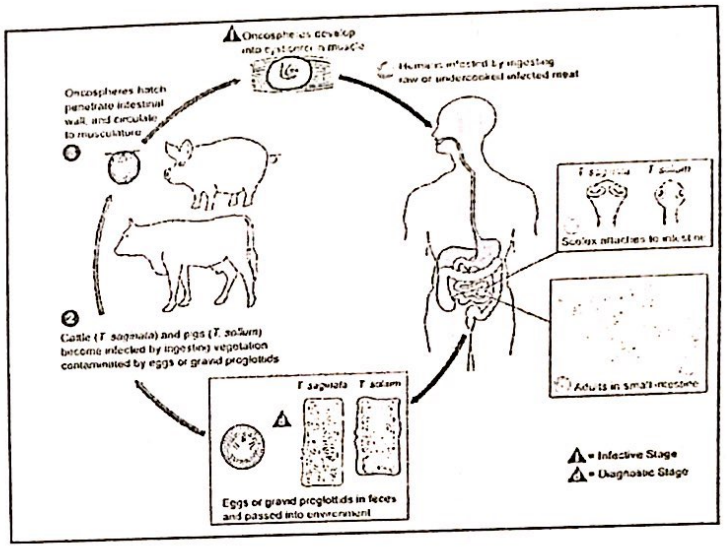
life cycle

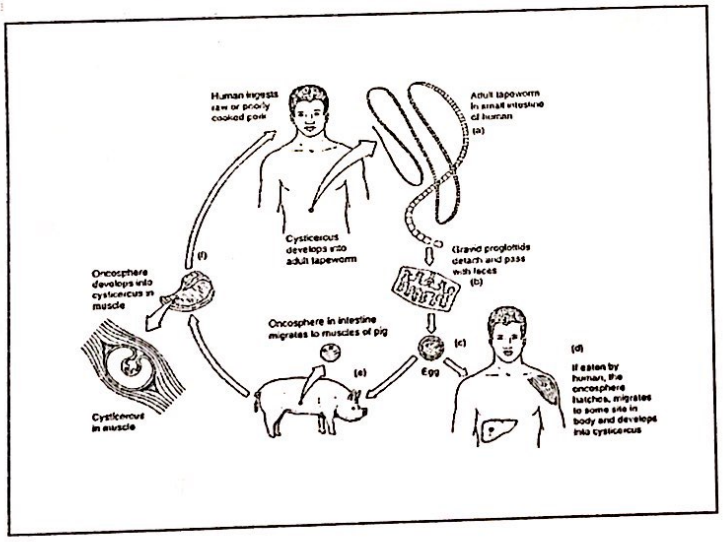


LIFE CYCLE

- Man is the only definitive host, but he can also be the intermediate host for *T.solium*. Pig is the important intermediate host for *T.solium*. Adult worm reside in the lumen of the upper part of small intestine.
- The infective stage to man are both egg/gravid proglottid and cysticercus for *T.solium*. A tapeworm larval cyst (cysticercus) is ingested with poorly cooked rice-like 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. When eggs consumed by pigs in which they hatch and form cysticerci.
- *T.solium* eggs can also infect humans and cause cysticercosis (larval cysts in lung, liver, eye, maxillofacial.





Clinical Features

- ✓ People infected with adult *taenia* often are asymptomatic.
- ✓ Infected people may become aware of infection by noticing proglottid segments of the tapeworm in their feces.
- ✓ Symptoms of infection, if any, are general: nausea, intestinal upset, vague abdominal symptoms such as hunger pains, diarrhea and/or constipation, or chronic indigestion.
- ✓ Increased eosinophils may be a sign of infection.

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- ✓ A more severe form of taeniasis, cystercercosis, can occur upon ingestion of *T. solium* eggs found in the feces of infected humans.
- ✓ These eggs hatch in the small intestine and migrate to various tissues of the body and form cysts. *T. saginata* rarely causes cystercercosis.
- ✓ *Taenia saginata* taeniasis produces only mild abdominal symptoms. The most striking feature consists of the passage (active and passive) of proglottids.

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- ➢ Occasionally appendicitis or cholangitis can result from migrating proglottidsy,.
- ➢ *Taenia solium* taeniasis is less frequently symptomatic than *Taenia saginata* taeniasis.
- ➢ The main symptom is often the passage (passive) of proglottids. The most important feature of *Taenia solium* taeniasis is the risk of development of 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.

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Cysticercosis

The pathology associated with cystercercosis depends on which organs are infected and the number of cysticerci. For instance, a cysticercus in the eye might lead to blindness, a cysticercus in the spinal cord could lead to paralysis, or a cysticercus in the brain (neurocysticercosis) could lead to traumatic neurological damage or epileptic seizures. For this reason, cysticerci gather more attention when they occur in the central nervous system or the eye rather than when they develop in voluntary muscles.

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Treatment

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 -10oC and above 50oC.

Treatment of cysticercosis is very difficult with varying success: praziquantel + corticosteroids + albendazole.

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Prevention

- ✓ Prevention is based on strict meat inspection, health education, cooking pork and beef well, hygiene and widespread sanitary installations.
- ✓ Best way to prevent taeniasis is to make sure that meat has been cooked properly and thoroughly by adequate boiling or heating.
- ✓ Freezing to -5°C for 4 days, -15°C for 3 days, or -24°C for 1 day kills the larvae as well.

- ✓ Good hygiene and hand washing after using the toilet will prevent self-infection in a person already infected with tapeworms in addition to contamination of foodstuffs by human feces.
- ✓ Proper disposal of feces, to avoid contamination of food, soil, and water, is important as well.

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