B-Order Cyclophyllidea

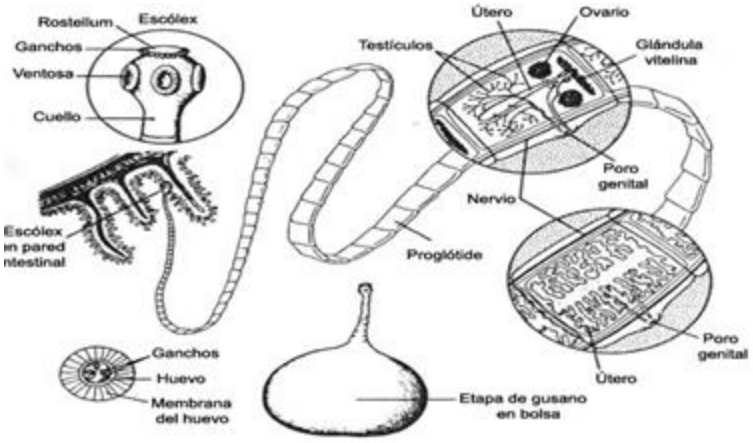
Possess scolices with 4 suckers
A rostellum that usually has hooks
Have a single compact, postovarian vitelline gland
Number of testes varies from one to several hundred
Most tapeworms of birds and mammals belong to this group

Family Taeniidae

Taenia solium ("human pork tapew[illegible]")

Scientific Classification

Kingdom	Animalia
Phylum	Platyhelminthese
Class	Cestoda
Order	Cyclophyllidea
Family	Taeniidae
Genus	Taenia
Species	T.Saginata



Humans are the only known natural definitive hosts
It is common in areas where raw or improperly cooked pork is a regular element of the diet
Its scolex is armed with 2 circles of 22 to 32 rostellar hooks
The hooks are of 2 sizes and alternate in the 2 circular rows

Life Cycle

The proglottids may rupture either in the host intestine or after it leaves the host
When eggs are ingested by pigs, the liberated oncospheres, using their hooks and penertration glands, penetrate the intestinal wall, gain access to the circulatory system, and are carried by the blood or lymph to muscles, viscera and other organs, where they develop into cysticerci
Each white, ovoid, fluid filled cysticercus, contains a single invaginated scolex
When infected, or measly pork is consumed by a human, the scolex evaginates and attaches to the intestinal wall

Epidemiology

The prevalence of pork tapeworm infection in humans varies by region
The very low incidence in the US can be attributed to the isolation of pigs from human feces
Religious dietary proscriptions forbidding pork consumption render human infection very rare in Moslem countries and in Israel

However, it is common in other parts of Africa, India, China, and several countries in SA and Central America

Symptamology and Diagnosis

Usually only a single adult tapeworm infects a human

The armed scolex may cause irritation of the mucosal lining, and there have been cases in which the scolex perforated the intestine, leading to peritonitis

However, the greatest hazard to human health associated with this parasite is infection with the cysticercus, causing a disease known as **human cysticercosis**

While common sites for infection of humans by cysticerci are the skeletal muscles and the brain, they can develop in practically any organ of the body, including the eyes and lungs, and heart

Cysts are well tolerated in muscles and subcutaneous tissues, although heavy infections can cause muscle spasms, weakness and general malaise

Developing cysts elicit a host inflammatory response often resulting in fibrous encapsulation

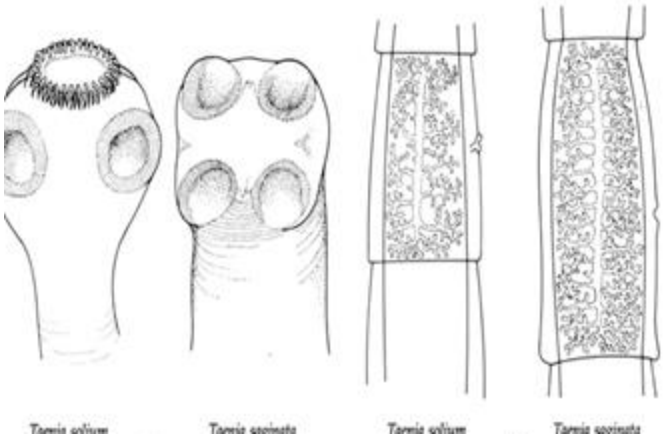
Calcification of the cyst may occur after 1 year, after which time the disease may become asymptomatic

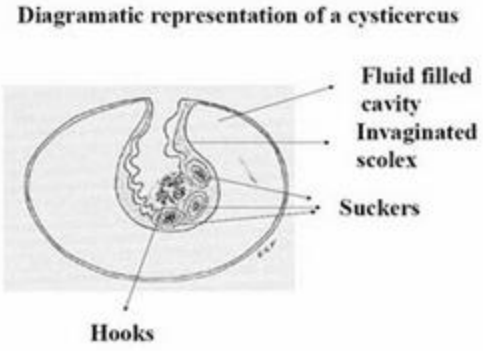
The most serious symptoms arise about 5-10 years after the infection as a result of dead and dying cysticerci

The degenerating parasite tissues and associated fluid also elicit a host inflammatory reaction that can be very severe, even fatal

Cysts developing in the CNS, sense organs, or heart can exert mechanical pressure and cause severe neurological symptoms

Violent headaches, convulsions, local paralysis, vomiting and optic disturbances are Common



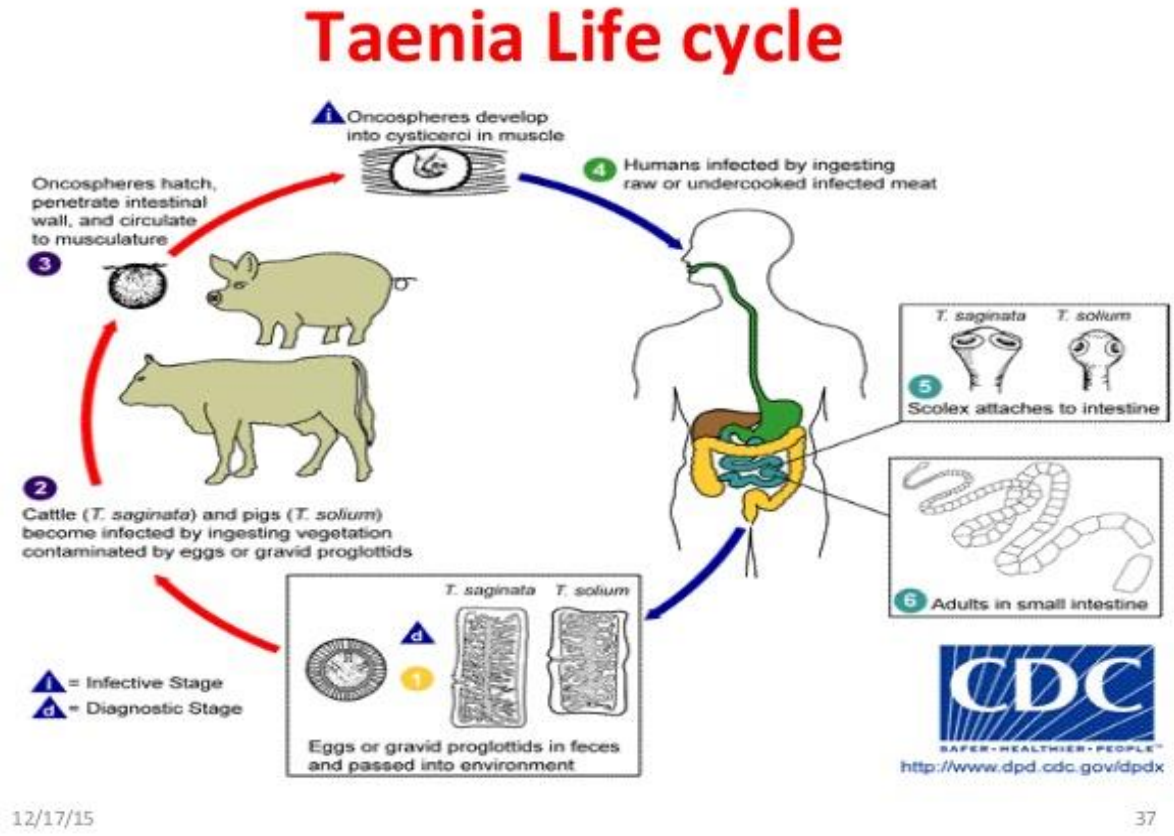


Taenia saginata (‘the beef tapeworm”)

Scolex is unarmed; no rostellum or hooks

The morphology of the mature proglottids in this species is similar to that of *T. solium* except that *T. saginatus* has a bi-lobed ovary and about twice as many testes as *T. saginata*

Life Cycle



Adults reside in the intestine of humans and gravid proglottids detach singly from the strobila and pass to the outside with the feces

The eggs are then ingested by an appropriate intermediate host (e.g. cattle or some kind of ungulate)

The liberated oncosphere then penetrates the intestinal wall and is carried by the lymphatic or blood circulatory system to intramuscular connective tissue and develops into a cysticercus

Humans become infected by eating cysticerci in beef, particularly the muscles of the head and heart

Following evagination of the scolex and subsequent attachment to the intestinal wall the worm develops to maturity

Epidemiology

T. saginat is distributed throughout the world

Humans acquire infection by eating raw or improperly cooked beef infected with cysticerci

Cattle develop cysticerci by grazing in fields upon which human excrement has been deposited either through fertilization with “night soil” or from poor sanitation

Symptamology and Diagnosis

T. saginatus taeniasis in humans is often characterized by such symptoms as abdominal pain, greatly diminished appetite, and weight loss

These symptoms are especially common with patients already debilitated by malnutrition or some other illness

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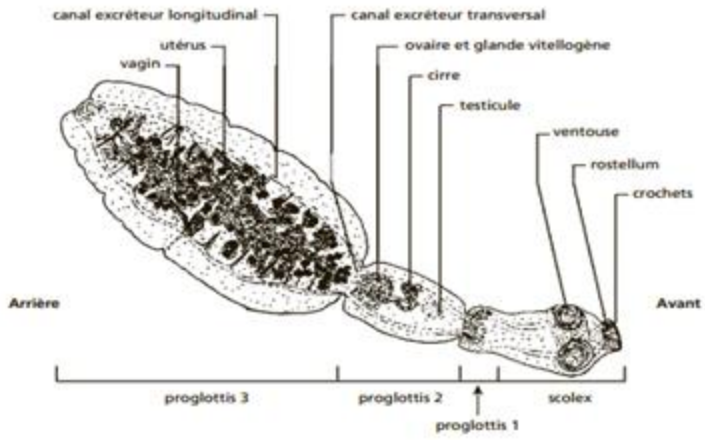
Echinococcus granulosus)

Kingdom:	Animalia
Phylum:	Platyhelminthes
Class:	Cestoda
Order:	Cyclophyllidea
Family:	Taeniidae
Genus:	*Echinococcus*



Adult worms inhabit the small intestine of a wide variety of canines and occasionally cats

The juvenile forms of these worms are huge and are capable of infecting humans, resulting in a series disease called **hydatidosis**

Eggs reach the exterior by elimination of gravid proglottids with the host's feces

The eggs are released when the proglottids disintegrate and each one contains a fully developed oncosphere

These get into the intermediate host by the intake of either water or forage contaminated with egg-containing feces

The usual intermediate host for *E. granulosus* is sheep, but cattle and other herbivores are sometimes utilized

Note:

Humans can be infected with the eggs as the result of intimate contact with dogs, particularly when dogs are allowed to lick faces after grooming themselves

Humans can also ingest eggs by putting contaminated fingers into the mouth or by eating raw plants contaminated with feces from infected foxes, cats or dogs

Once swallowed, eggs pass through the stomach and hatch in the small intestine

The freed oncospheres penetrate the intestinal wall, enter the mesenteric venules and become lodged in capillary beds of various visceral organs

In humans, the developing **hydatid cyst** (=a fluid filled vesicle containing secondary cysts or **brood capsules** that in turn contain a series of invaginated scolices) favors the

liver, although other tissues (lungs, spleen, heart, muscles, brain, etc.) may be invaded
Within the fully formed cyst, minute larvae with inverted scolices develop
Since these immature, 4 suckered scolices lack individual bladders they are called **protoscolices -** not bladder worms or cysticerci which contain a single scolex
In humans and some domestic animals, the formation of hydatid cysts represents a dead end for the parasite
However, many wild animals, such as infected rabbits and moose are potential intermediate hosts since the cysts are ingested when predators feed on these kinds of animals
Upon reaching the small intestine of the definitive host (the predator), each protoscolex develops into an adult worm
Adults live about 5 months
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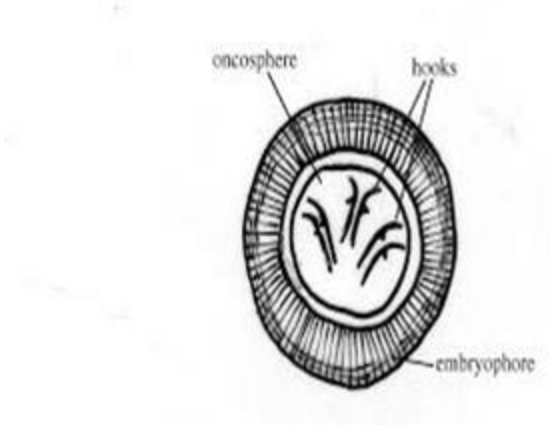
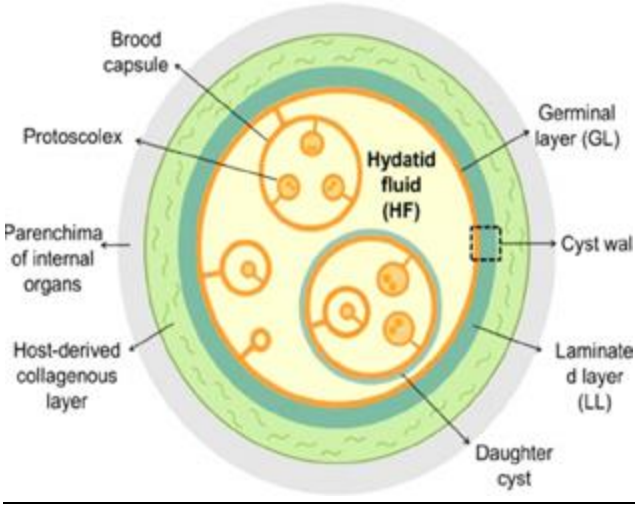
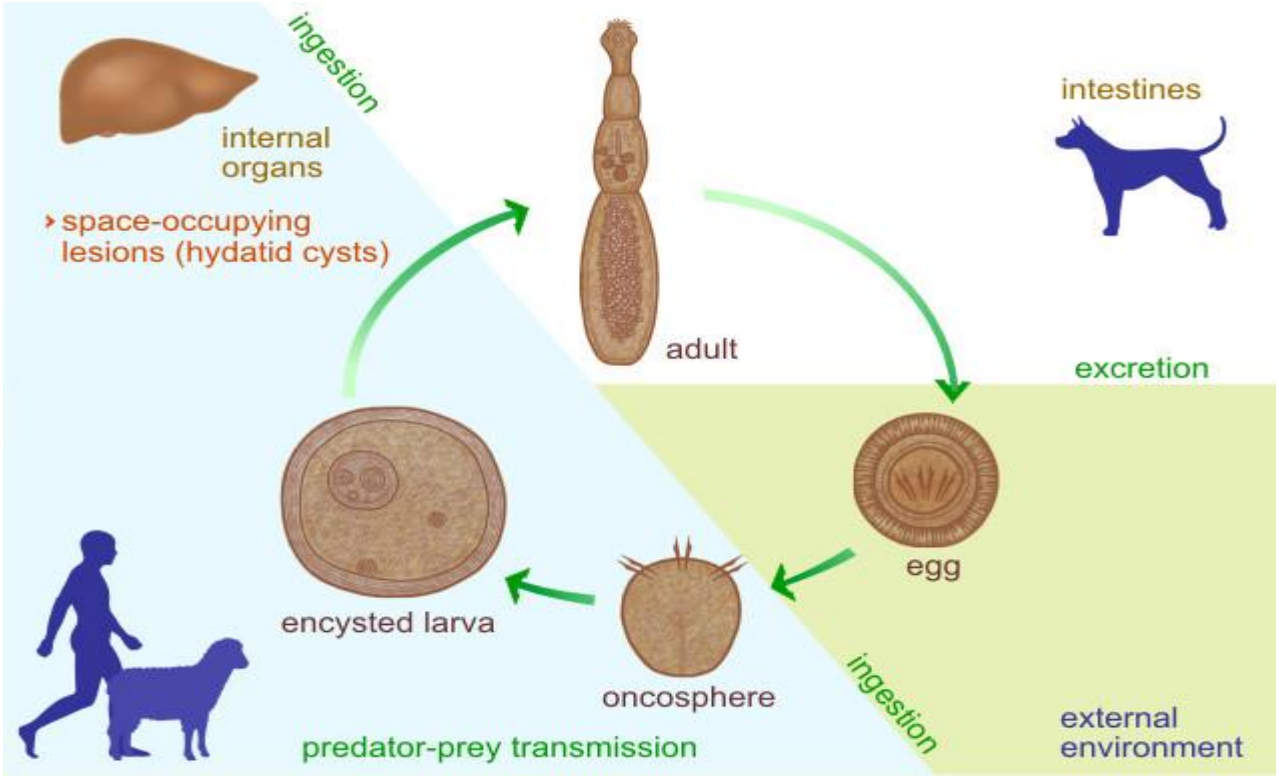
Hydatid Cyst

At maturity, the cyst wall contains 2 layers: a thick, laminated, noncellular outer tegument called the **ectocyst,** and an inner, germinal epithelium that produces the protoscolices called the **endocyst**
Brood capsules attached to the germinal epthilium by the stalk, the **pedicel,** extend into the fluid filled cavity of the cyst
In large cysts, these capsules may rupture, and the freed protoscolices, which sink to the bottom of the bladder, are commonly known as hydatid sand
Each brood capsule contains 10-30 protoscolices
If a cyst ruptures within a host, each liberated protoscolex can produce a daughter cyst





Life cycle :



Symptamology and Diagnosis

The presence of unilocular cysts elicits a host inflammatory reaction that results in encapsulation of the cyst

The primary pathology of the cyst is impairment of the organs from mechanical pressure

Increased pressure resulting from cyst growth may cause the surrounding tissues to atrophy

Thus, the symptoms are not unlike those caused by a slow growing tumor

The brain, kidneys, spleen and vertebral column may also be invaded, producing symptoms ranging from seizures to kidney dysfunction

Protoscolices, freed by the rupture of cysts, enter the circulatory system and are transported to tissues throughout the body where they produce secondary echinococcosis

The rupture of cysts also releases hydatid fluid which sometimes causes severe allergic reactions

If a significant amount of fluid enters the bloodstream it can cause anaphylactic shock

Treatment

Surgery remains the preferred treatment for unilocular hydatidosis

Following drainage of the cyst fluid, replacement with 2% formalin for 5 min kills the protscolices and the germinal epithelium

In any surgical procedure for cyst removal, care should be taken to avoid rupturing the cyst

Symptoms of allergic reaction, respond best with antihistamines

Benzimidazoles has been used to successfully reduce the size of unilocular cysts

E. MULTILOCULARIS

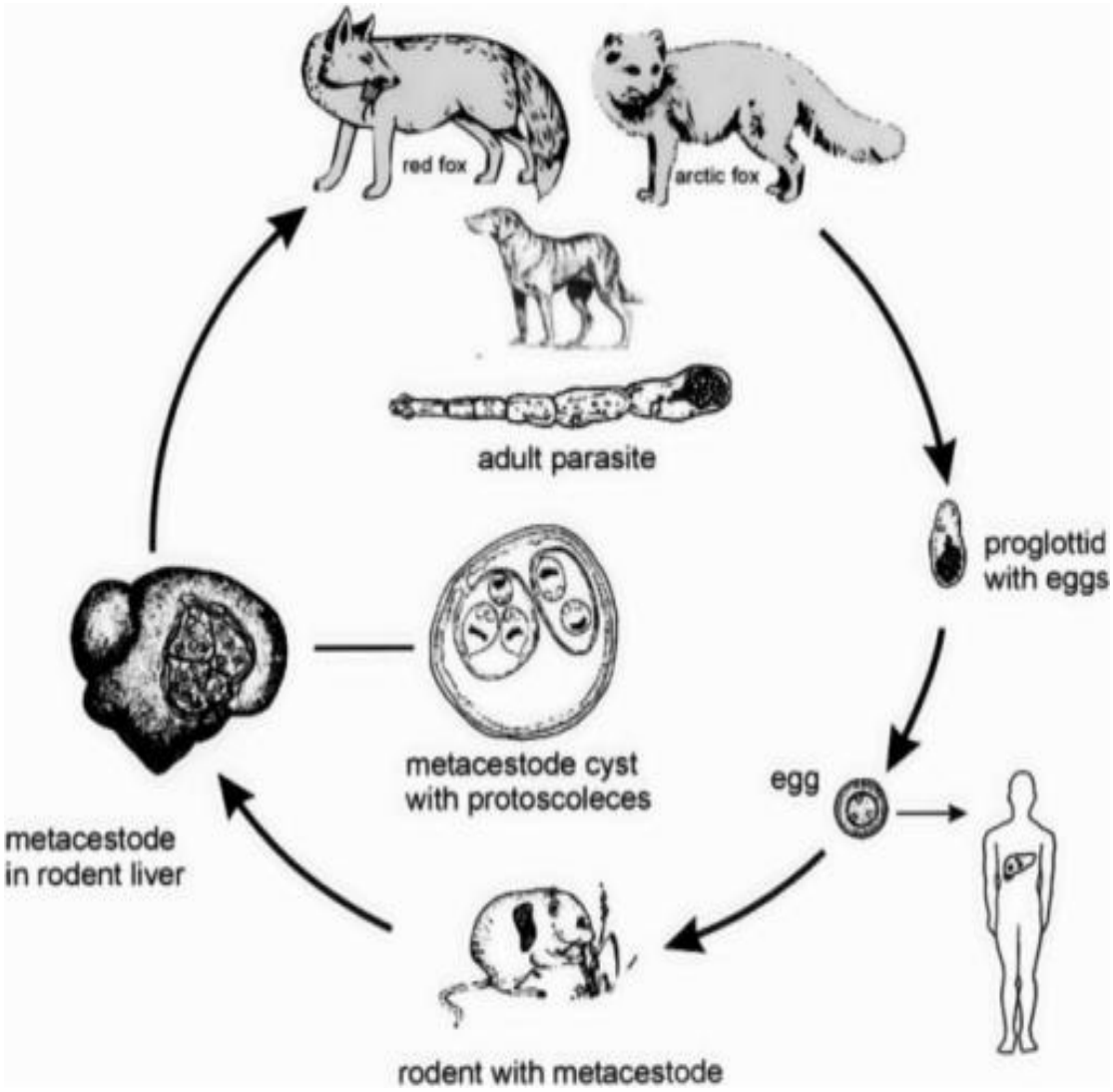
This is a tapeworm, **similar to *E. granulosus***, that also causes hydatid in northern parts of Asia and North America.

It has a very similar morphology and life cycle except that **rodents are its Intermediate host**.and the final host is terrestrial mammals, including wolves, foxes, jackals, coyotes, domestic dogs

Humans, when infected with this worm, also develop hydatid cysts which produce symptoms similar to those caused by *E. granulosus*. However, the cysts are **multilocular (many chambers).** The organism is resistant to praziquantel; high doses of Albendazole has some anti-parasitic effect. Surgery is the means of removing the cyst. Rodent control is the means of prevention.

Summary of the life cycle:

1. adult worm present in intestine of definitive host
2. eggs passed in feces, ingested by humans or intermediate host
3. onchosphere penetrates intestinal wall, carried via blood vessels to lodge in organs
4. hydatid cysts develop in liver, lungs, brain, heart
5. protoscolices (hydatid sand) ingested by definitive host
6. ingested protoscolices attach to small intestine and develop in to adult


red fox
arctic fox
adult parasite
proglottid
with eggs
egg
metacestode cyst
with protoscoleces
metacestode
in rodent liver
rodent with metacestode