

# Helminthes (Metazoa)



**Helminths \* Worms \* Metazoa \* Multicellular**

- Helminths are **multicellular (Metazoan)** worms or wormlike animals.
- They may be parasitic or free living.
- Helminths have **complete systems** like reproductive or digestive or excretory system.
- Since they are multicellular, most helminths may be easily seen by naked eyes.
- Helminths life cycle: **egg, larval (juvenile), and adult stages.**
- Helminths have either **direct life cycle** or **indirect life cycle** (intermediate host or vector).

# CLASSIFICATION OF HELMINTHS



**Helminths are found in two phyla of the subkingdom Metazoan (multicellular animals):**

**a. Phylum: Platyhelminthes (flatworms)**

**Class I: Cestoda (Tapeworms).**

**Class II: Trematoda (Flukes).**

**b. Phylum: Aschelminthes or Nemathelminthes**

**Class: Nematoda (roundworms, threadworms).**

# Genus : *Taenia*



**Have two medical important species**

**1-*Taenia saginata*: Beef tapeworm.**

**The cow is the intermediate host and human is final host.**

**2- *Taenia solium*: Pork tapeworm**

**The pigs and human are the intermediate host as well as human is the definitive host which carries the adult worm.**

# Cestoda



**A- All cestoda are hermaphrodites. Both male and female reproductive organs at the same mature segment)**

**B- All cestoda have stages: ovum, larva and adult. The length of an adult worm varies, according to the species, from 3-8 mm to 25 or 30 feet.**

**\*The Cestodes main structure is divided into**

- 1- The scolex, or head, which bears the organs of attachment. it has either suckers with or without rostellum and hooks.**
- 2- The neck that is the region of segment proliferation and production of segments.**
- 3- The chain of fragments called proglottids or segments (totally are called strobila) or The strobila is made up of segments called proglottids.**



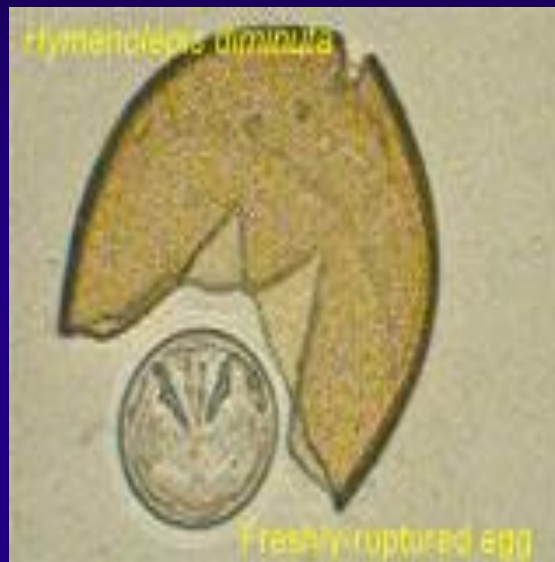
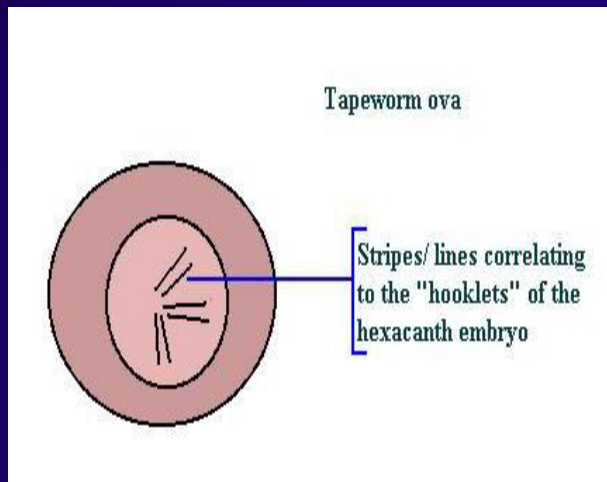
# Three types of segments

**A- Immature segments: the beginning of segments.**

**B- Mature segment: has both male and female reproductive organs.**

**C- Gravid segment: has uterus filled with ova (eggs).**

**Full developed and mature egg has internal embryo is called oncospheres (hexacanth embryos) which contain three pairs of hooks (Six hooks).**





# Cestoda tape worm

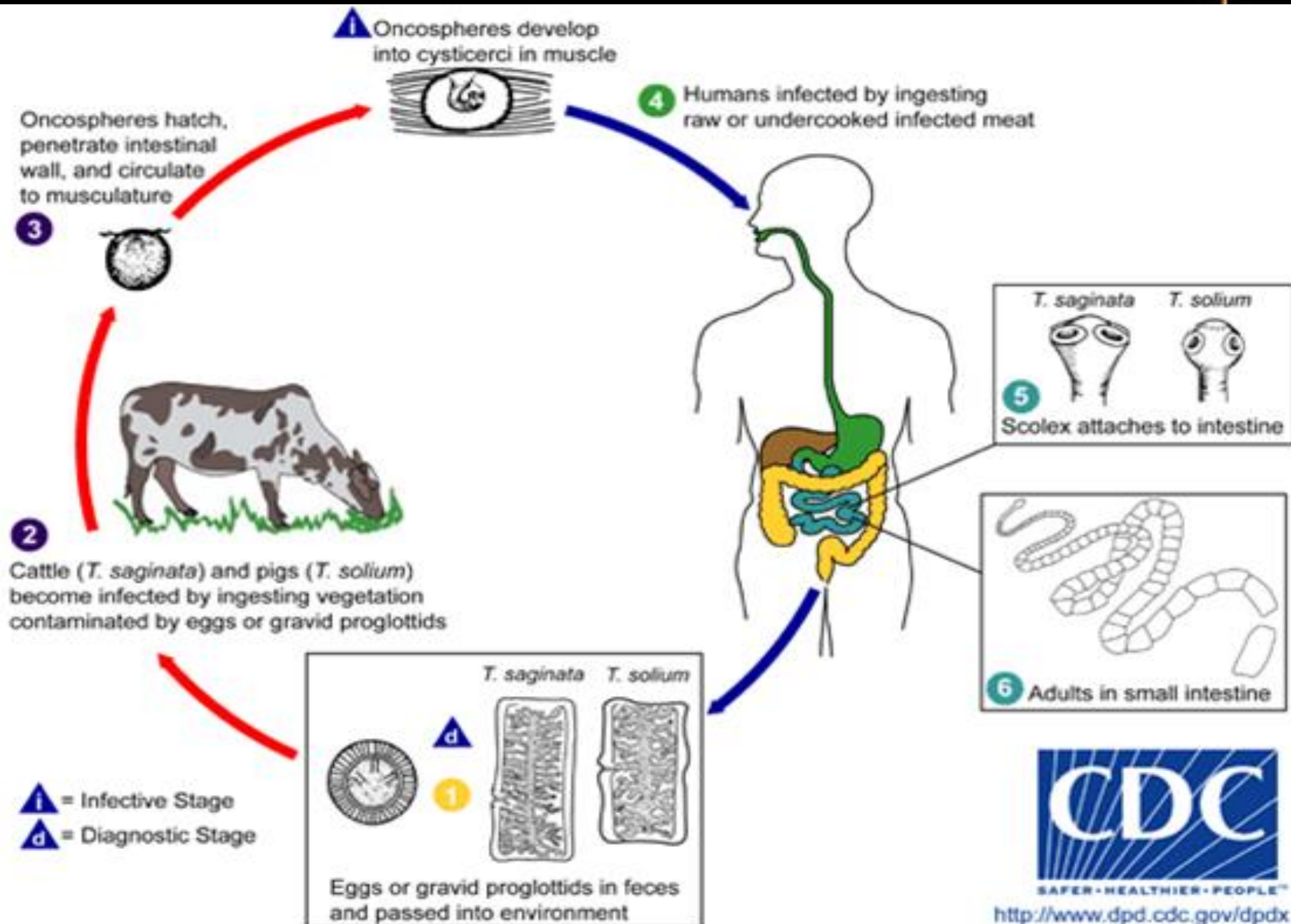


- ❖ *Taenia saginata* **called** Beef T.W.
- ❖ *Taenia solium* **called** Pork T.W.
- ❖ *Hymenoleps nana* **called** Dwarf T.W.
- ❖ *Echinococcus granulosus* **called** Dog T.W.

# 1-*Taenia saginata* (Beef tapeworm).

- **Common name:** called the beef tapeworm.
- **Disease:** beef tapeworm infection or beef taeniasis.
- **Infective stage to human is called :** *cysticercus bovis* is taken by inadequate cooked meat of cows.
- **Rout of infection:** mouth.
- **Habitat:** adult worm in the small intestine of human.
- *Cysticercus bovis* larvae in the muscle of different organs of COWS.





# Symptoms

Tapeworms are usually asymptomatic.

However heavy infection often results in weight loss, dizziness, abdominal pain, diarrhea, headaches, May be intestinal obstruction.

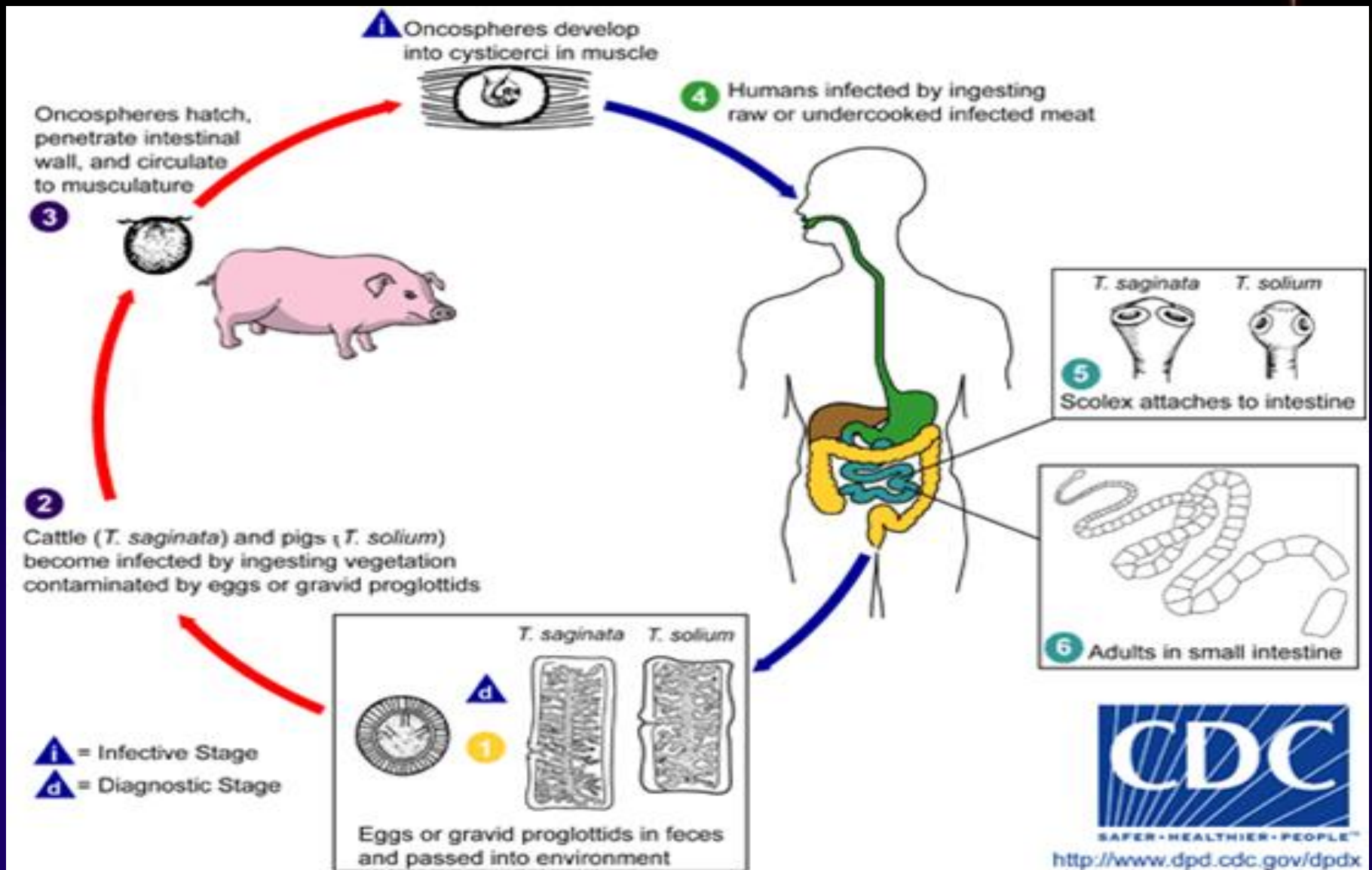
## Control

Avoid taken uncooked beef meat containing infective stage in the muscles.

Diagnosis find ova and gravid segment in stool.

Treatment: Praziquantel drug of choice

# 2-Taenia solium (Pork tapeworm).



## 2-Taenia solium (Pork tapeworm).

- **Common name:** called pork tapeworm.
- **Disease:** Pork tapeworm infection or pork taeniasis or Cysticercosis.
- **Infective stage:** to human is called Cysticercus cellulosae is taken by inadequate cooked meat of pigs or ova by contamination of food and water.
- **Intermediate host:** human (accidentally) and pigs.
- **Final host is:** human only.
- **Habitat:** adult worm in the small intestine of human.
- Cysticercus cellulosae larvae: in the muscle of different organs of pigs and human.
- Human may be as intermediate and final host.

*It is more dangerous because of human is the intermediate host as well final host. In human larvae can cause serious symptoms if they localize in the brain, resulting in Neurocysticercosis*

The severity of cysticercosis depends on **location**, **size** and **number of parasite larvae** in tissues, as well as the host immune response.

**Diagnosis:** to find out ova and gravid segment in stool.

in cysticercosis find out larvae in muscles and brain of human.

**Control:** Avoid to take undercooked meat of pork or keep away in contact with pigs.

**Treatment:**

- Praziquantel is drug of choice. Surgical intervention may be necessary to treat CNS lesions.

- Albendazol appears to be more effective and a safe drug for Neurocysticercoses.

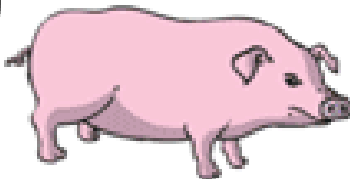
**i** Oncospheres develop into cysticerci in muscle



**4** Humans infected by ingesting raw or undercooked infected meat

Oncospheres hatch, penetrate intestinal wall, and circulate to musculature

**3**

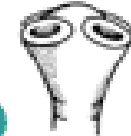


**2**

Cattle (*T. saginata*) and pigs (*T. solium*) become infected by ingesting vegetation contaminated by eggs or gravid proglottids

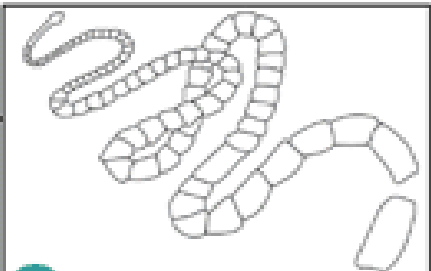
*T. saginata*

*T. solium*



**5**

Scolex attaches to intestine



**6**

Adults in small intestine

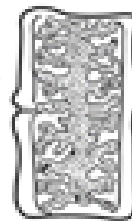
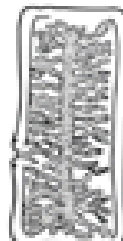
*T. saginata*

*T. solium*



**d**

**1**



Eggs or gravid proglottids in feces and passed into environment

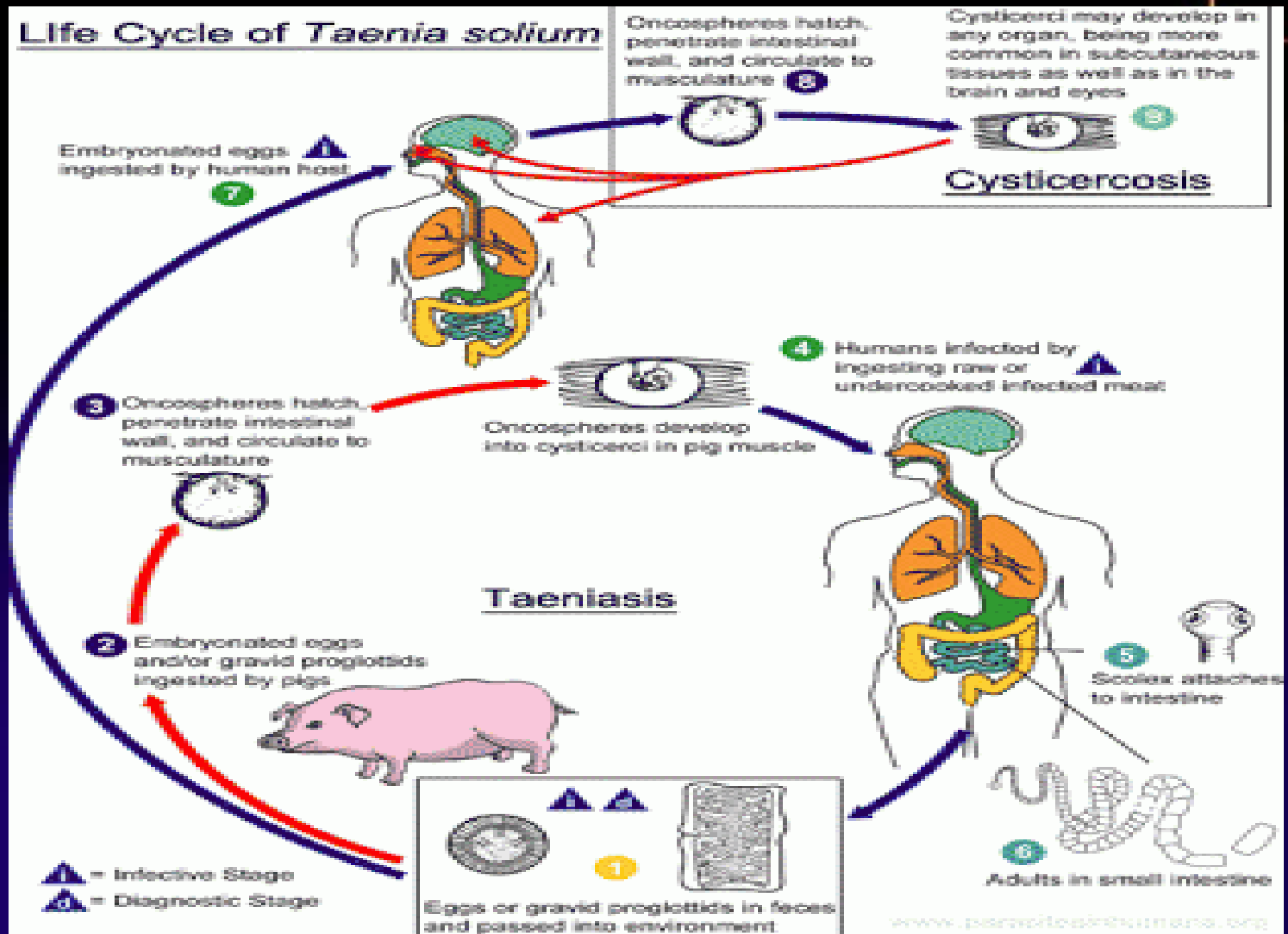
**i** = Infective Stage  
**d** = Diagnostic Stage



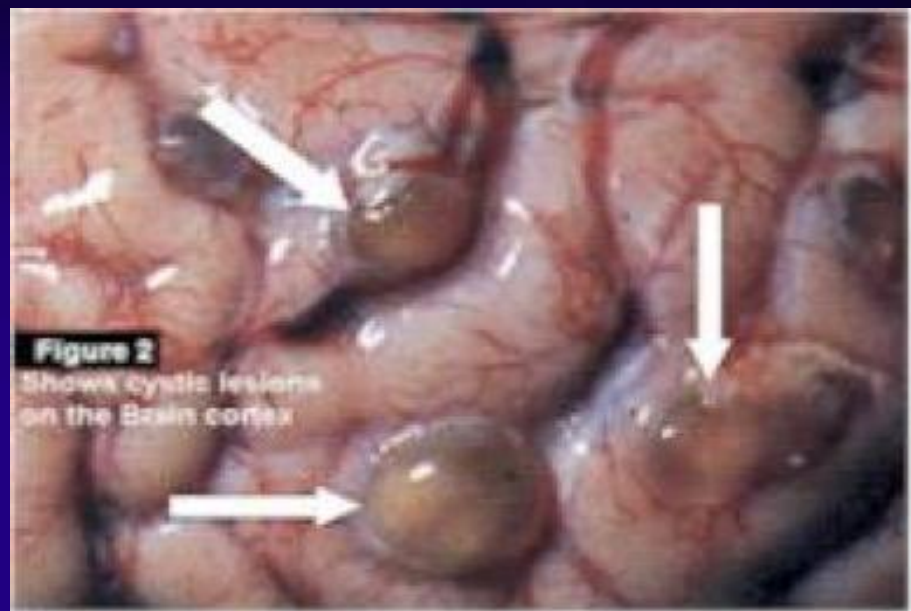
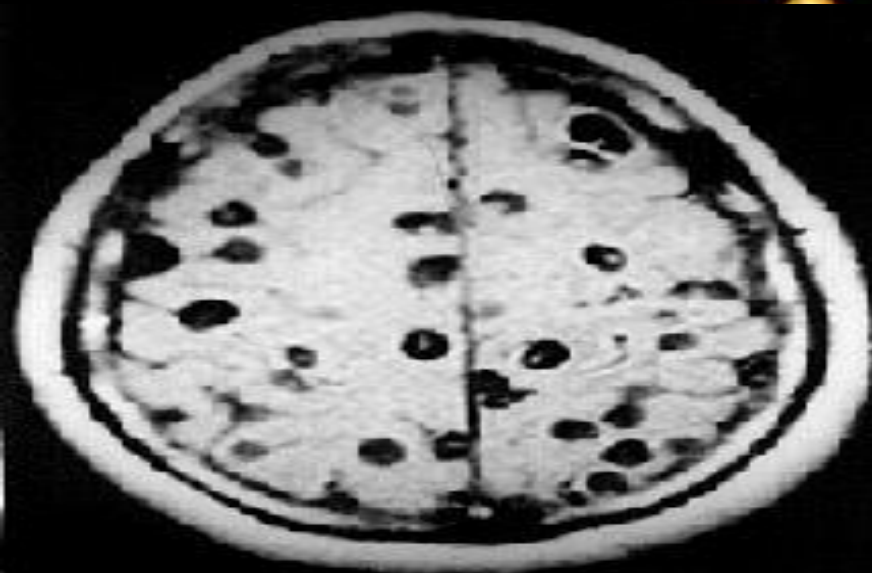
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# Life Cycle of *Taenia solium*







**Figure 2**  
Shows cystic lesions  
on the Brain cortex

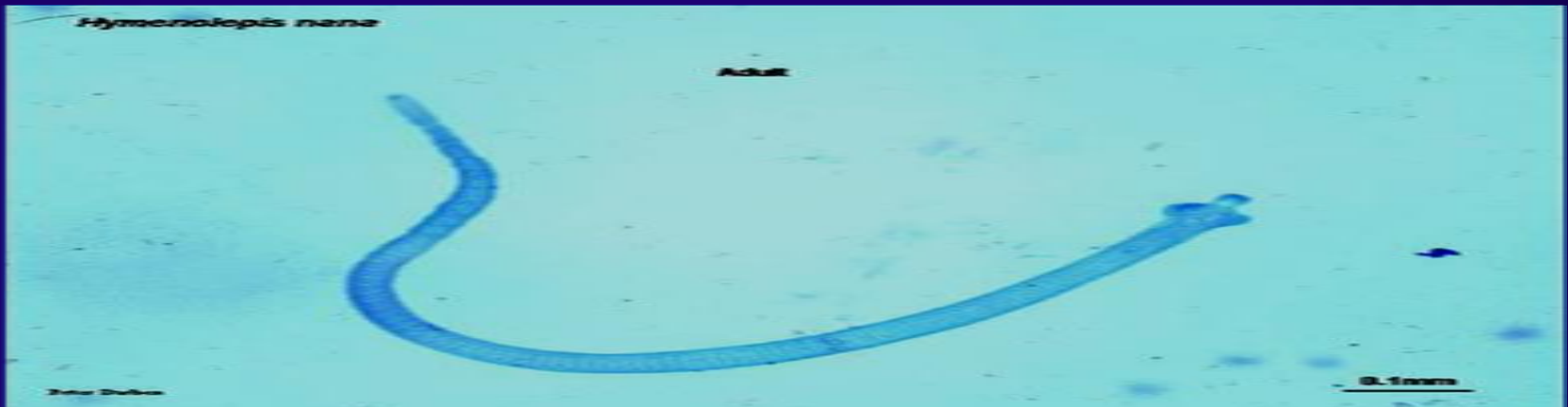
### 3-*Hymenolepis nana* → Dwarf Tapeworm.

- **Common name:** Dwarf tapeworm.
- Adult worm is only 10-45 mm long and 0.5-1 mm wide
- **Disease:** Dwarf tapeworm infection or **Hymenolepiasis** .
- Widely distribution in children and most common.
- **Infective stage to human** is called: **ova** by food and water.

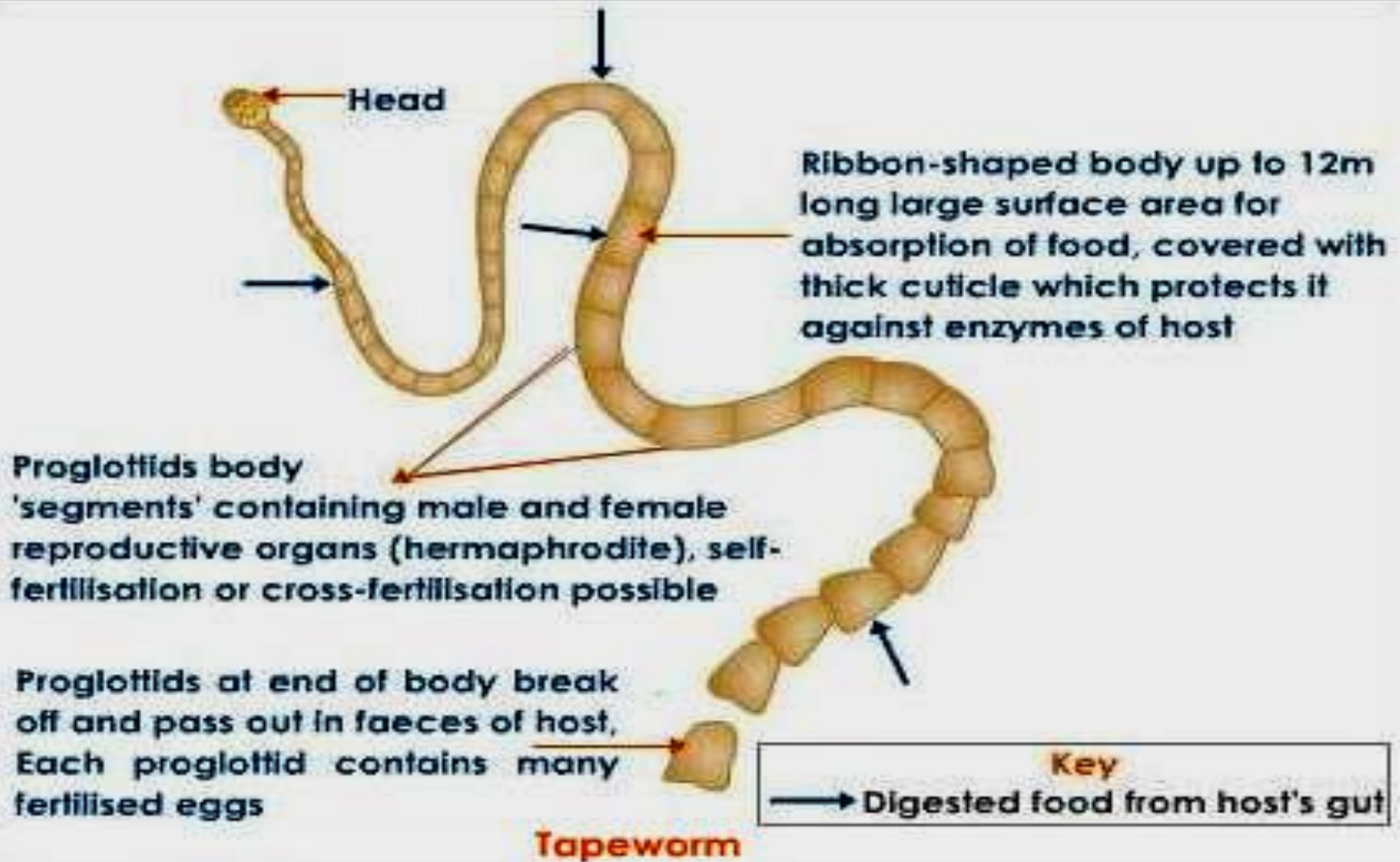
#### Mode of infection

1-contaminated food and water with ova or

2- Auto infection, ova remains and hatches in the intestine.



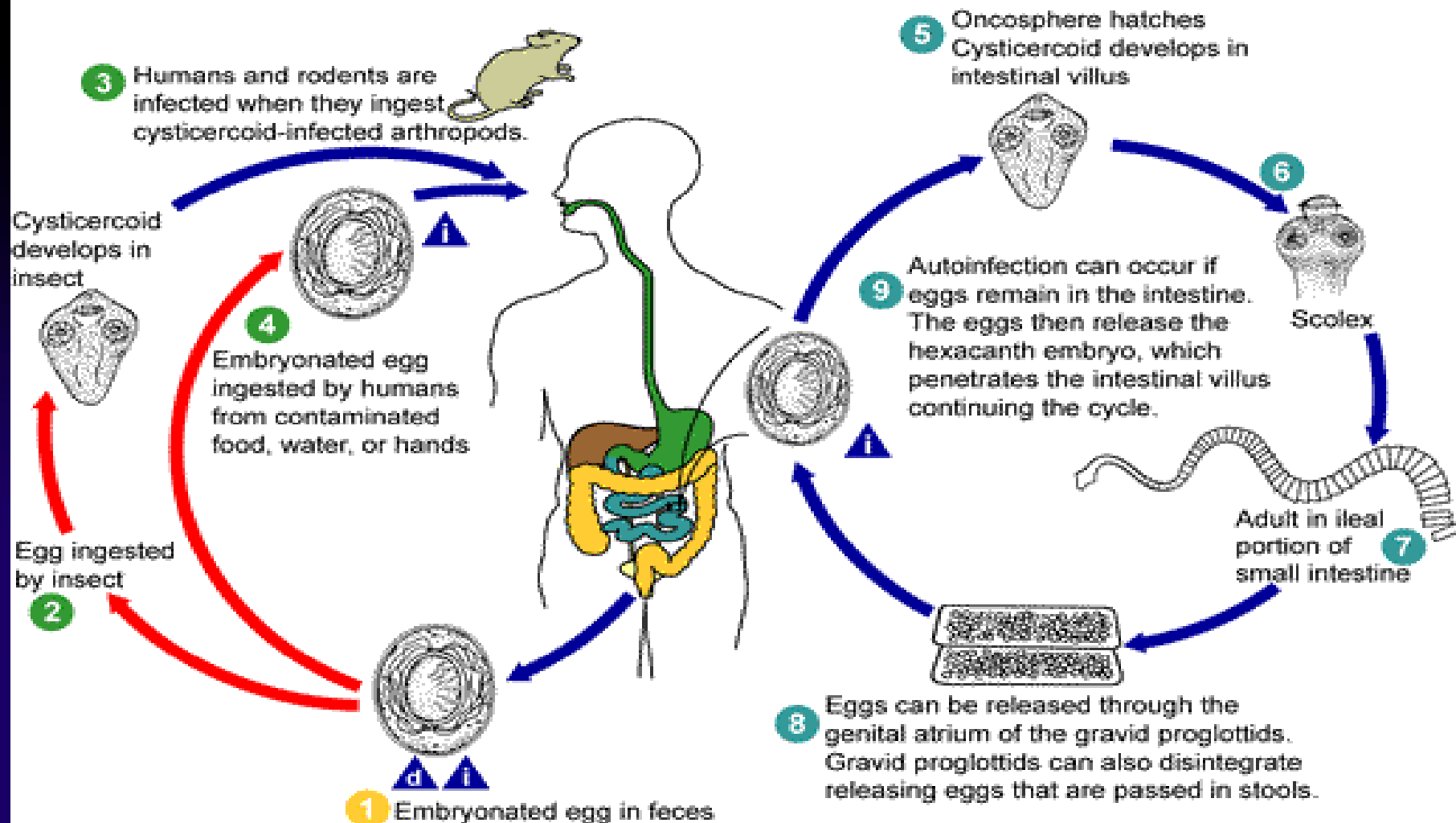
# MORPHOLOGY of *H. nana*



**i** = Infective Stage  
**d** = Diagnostic Stage



<http://www.dpd.cdc.gov/dpdx>





- **Route of infection:** Mouth.
- **Habitat:** Adult worm in the small intestine of human.
- **Life cycle** is direct no intermediate host.

## Symptoms

- Rare symptoms include anorexia, vomiting, nausea and behavioral disturbances.

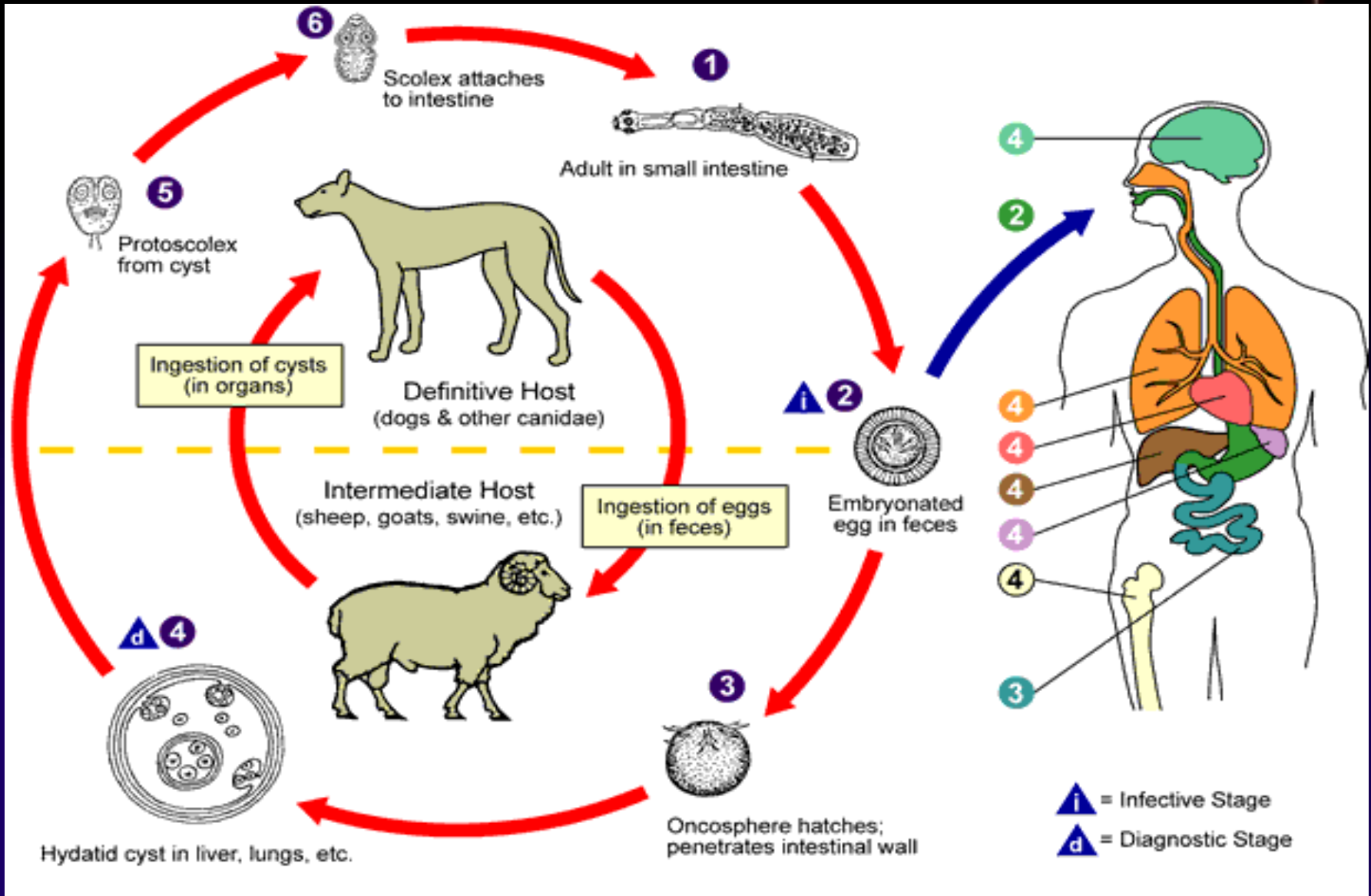
## Control

Avoid taken contaminated food and water.

- **Diagnosis:** By finding ova and gravid segment in stool.
- **Treatment:** praziquantel is the drug of choice.



# *Echinococcus granulosus* L.C



# Egg is the infected stage comes from

I. Ingested of water or vegetable polluted by infected dog feces.

II. handling or caressing infected dog where the hairs usually contaminated with eggs

- The ova hatch in duodenum or small intestine into embryos oncosphere, which penetrate wall enter portal veins migrate via portal blood supply to organs: lungs, liver, brain etc...., thus causing extra intestinal infections.
- In these organs, larvae develop into hydatid cysts.
- The cyst may be large , filled with clear fluid and contain characteristic protoscolices (immature forms of the head of the parasite).
- These mature in to developed scolices, which are infected fore dogs.

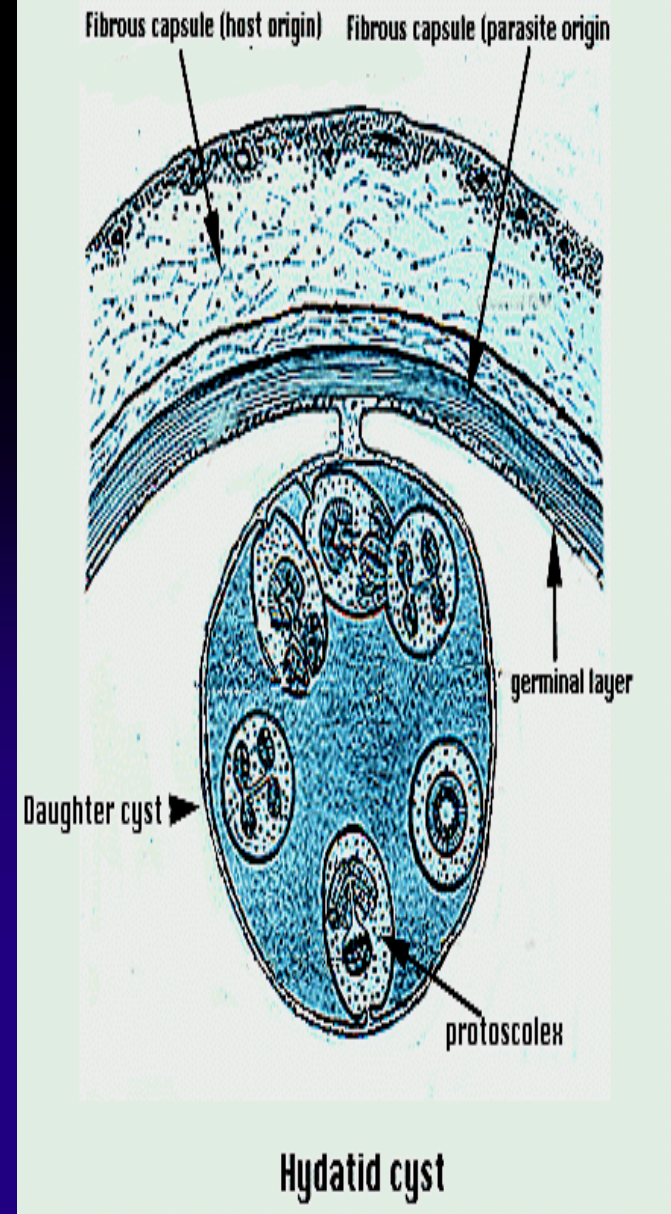


## 4-Echinococcus granulosus: Dog Tapeworm

- Common name: is called the dog tapeworm.
- **Disease:** Dog tapeworm infection in **dogs** and **Hydatidosis in (I.host)**.
- It is world wide specially in dogs regions.
- Infective stage to human and cattle is called: ova by food and water.
- **Mode of infection:** contaminated food and water with ova.
- **Rout of infection:** mouth.
- **Intermediate host:** human, sheep cattle, camels all carry hydatid cyst.
- **Larval stage:** is hydatid cyst in intermediate host.
- **Habitat:** adult worm in the small intestine of dogs.
- **Final host:** is only the dogs .

# Hydatid cyst structure

- 1- **Laminated layer:** non cellular for support the cyst
- 2- **Germinal layer:** cellular for support the cyst
- 3- **Broad capsule** for protoscolices formation
- 4- **Daughter cyst:** originated from G.L. or form protoscolx.
- 5- **Hydatid fluid:** consist from different compounds for the activity and viability and pathogenicity of the cyst.



# Symptoms

- Rare symptoms because the cyst grow slowly unless it rupture causing *Anaphylactic shock* due to release of protoscolices and toxins of hydatid cyst.
- \* **Control:** Avoid taken contaminated food and water.  
keep the dogs away with human contact.
- \* **Diagnosis:** Mostly X ray, CT scan or ultrasound to find the cyst.
- \* **Treatment:** surgical intervention most common(90%)  
**ALBENDAZOLE DRUG OF CHOICE.**

## Adult tapeworm

***Echinococcus* sp.**

Gravid  
proglottid

Mature  
proglottid

Immature  
proglottid

"Armed"  
scolices

