

# Taeniasis

**Compiled by Dr Nidhi Garg**

# OUTLINE

- ❑ INTRODUCTION
- ❑ TAXONOMY
- ❑ HABITAT
- ❑ EPIDEMIOLOGY
- ❑ MORPHOLOGY
- ❑ LIFE CYCLE
- ❑ SIGNS AND SYMPTOMS
- ❑ HEALTH IMPLICATIONS
- ❑ DIAGNOSTIC TESTS
- ❑ TREATMENT
- ❑ PARASITE CONTROL MEASURES
- ❑ CONCLUSION
- ❑ RECOMMENDATIONS



# INTRODUCTION

- ❑ Taeniasis pose a public health hazard in man, hence, the growing need to understand the health implications of this endemic disease.
- ❑ Taeniasis is an intestinal infection of human with the adult stage of the tapeworm of the genus *Taenia*. The most important causative agents are *T. solium* and *T. saginata* and their respective larval stages *Cysticercus cellulosae* and *Cysticercus bovis*.

(Radostits *et al.*, 2007).



# TAXONOMY

- ❑ Kingdom - Animalia
- ❑ Phylum - Platyhelminthes
- ❑ Class - Cestoda
- ❑ Order - Cyclophyllidea
- ❑ Family - Taeniidae
- ❑ Genus - *Taenia*
- ❑ Species - *T. saginata* &  
*T. solium*

(Bowles *et al.*, 1994).

# HABITAT

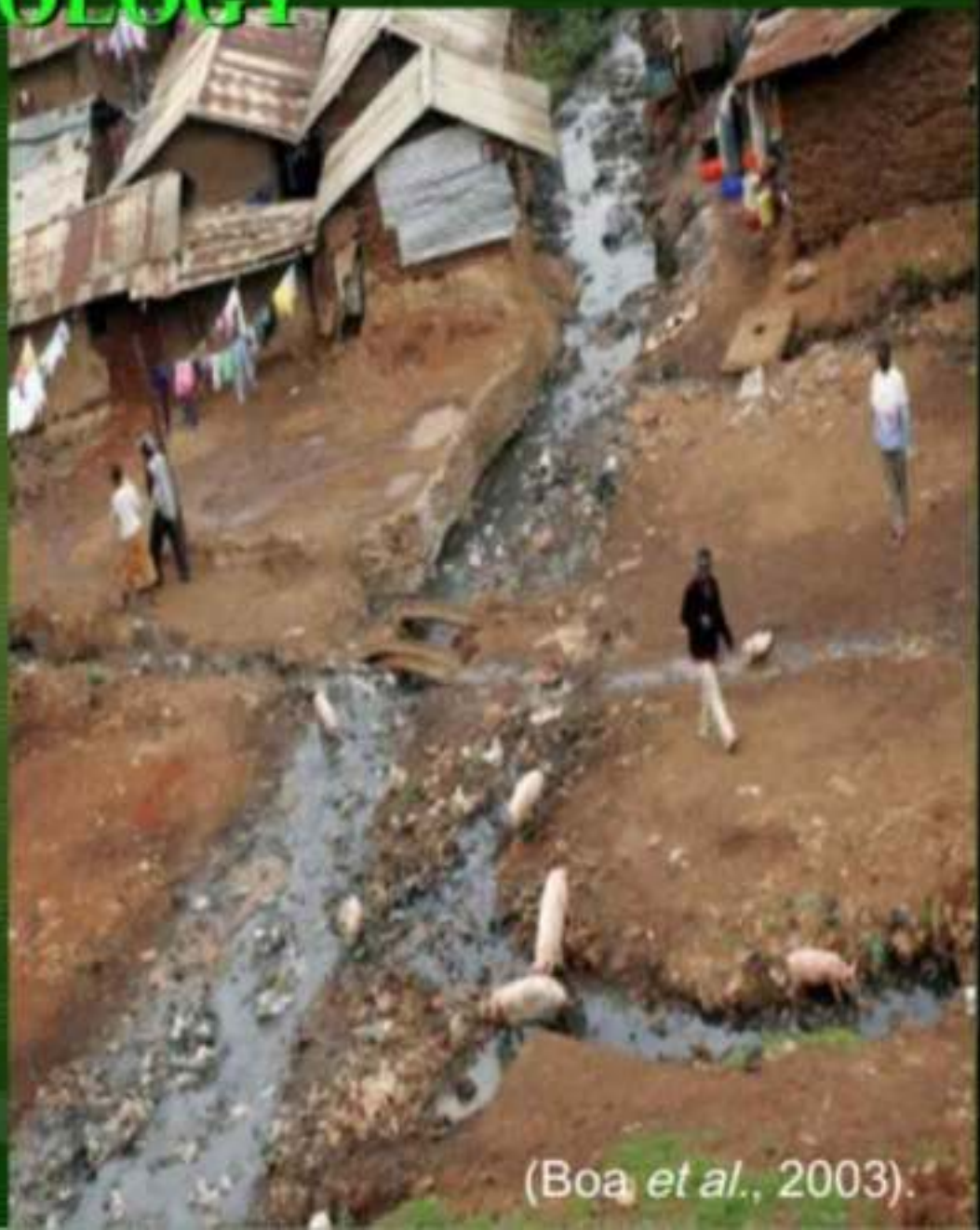
- ❑ Adult worms live in the small intestine of their definitive host
- ❑ Larval stage found in intermediate host tissue
- ❑ Eggs are diagnostic stage

(Newton *et al.*, 1949).



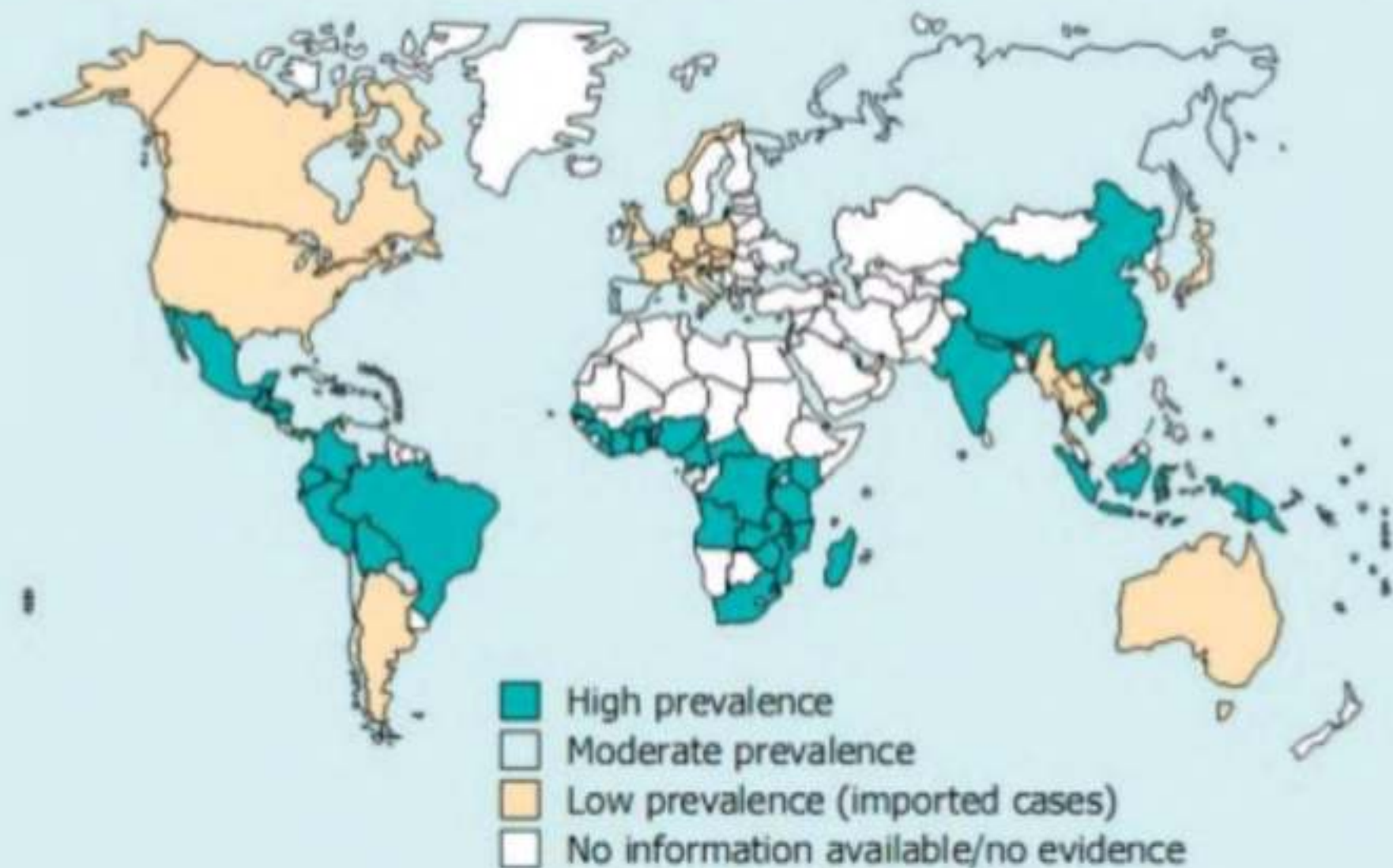
# EPIDEMIOLOGY

- ❑ Is found worldwide.  
About  
50 to 70 million people  
are affected
- ❑ Rural, developing  
countries with poor  
hygiene
- ❑ places where pigs are  
allowed to roam freely  
and eat human faeces  
allows the cycle to  
continue.



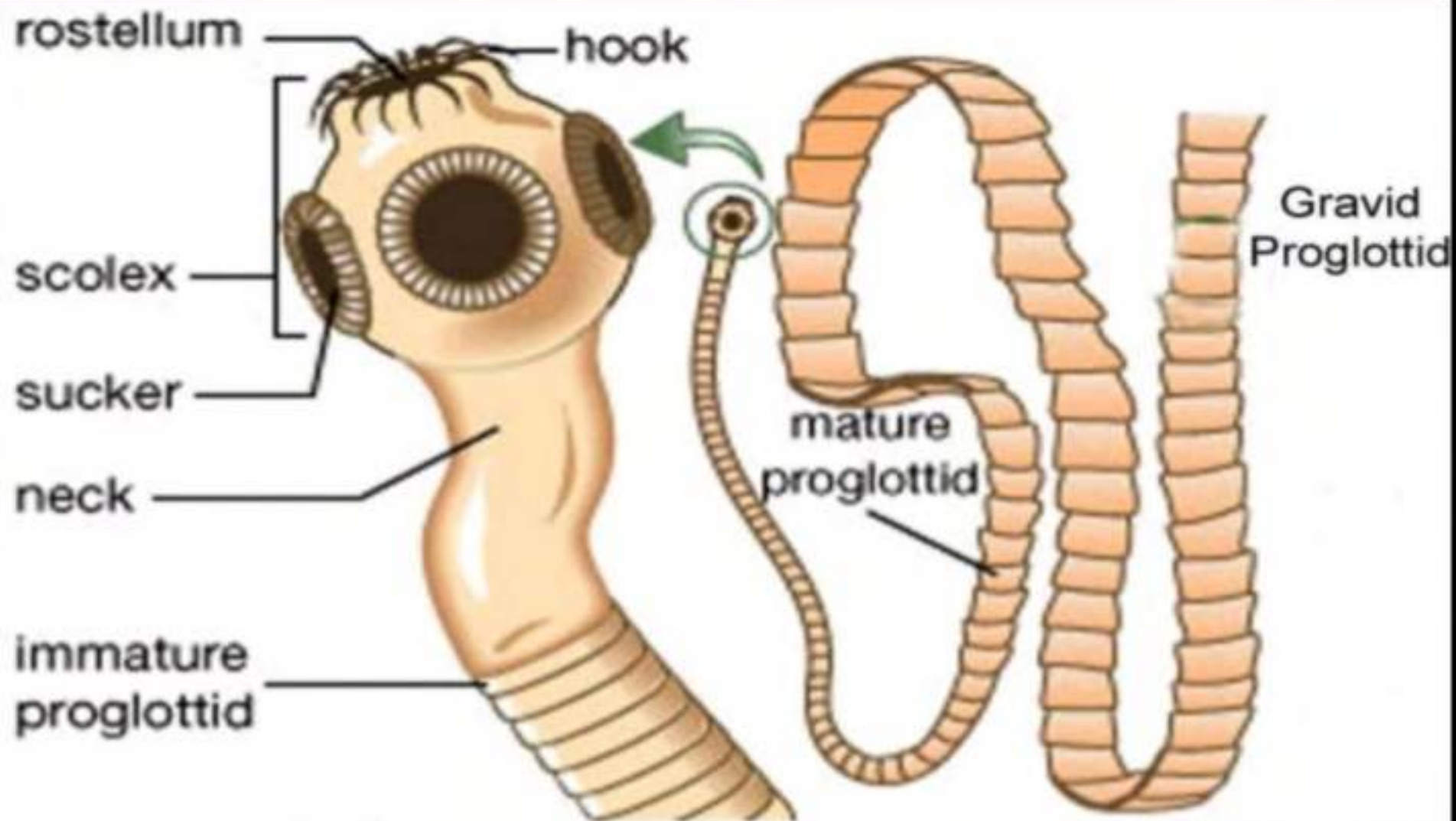
(Boa *et al.*, 2003).

## Global distribution of *Taenia solium* cysticercosis/taeniosis





# MORPHOLOGY



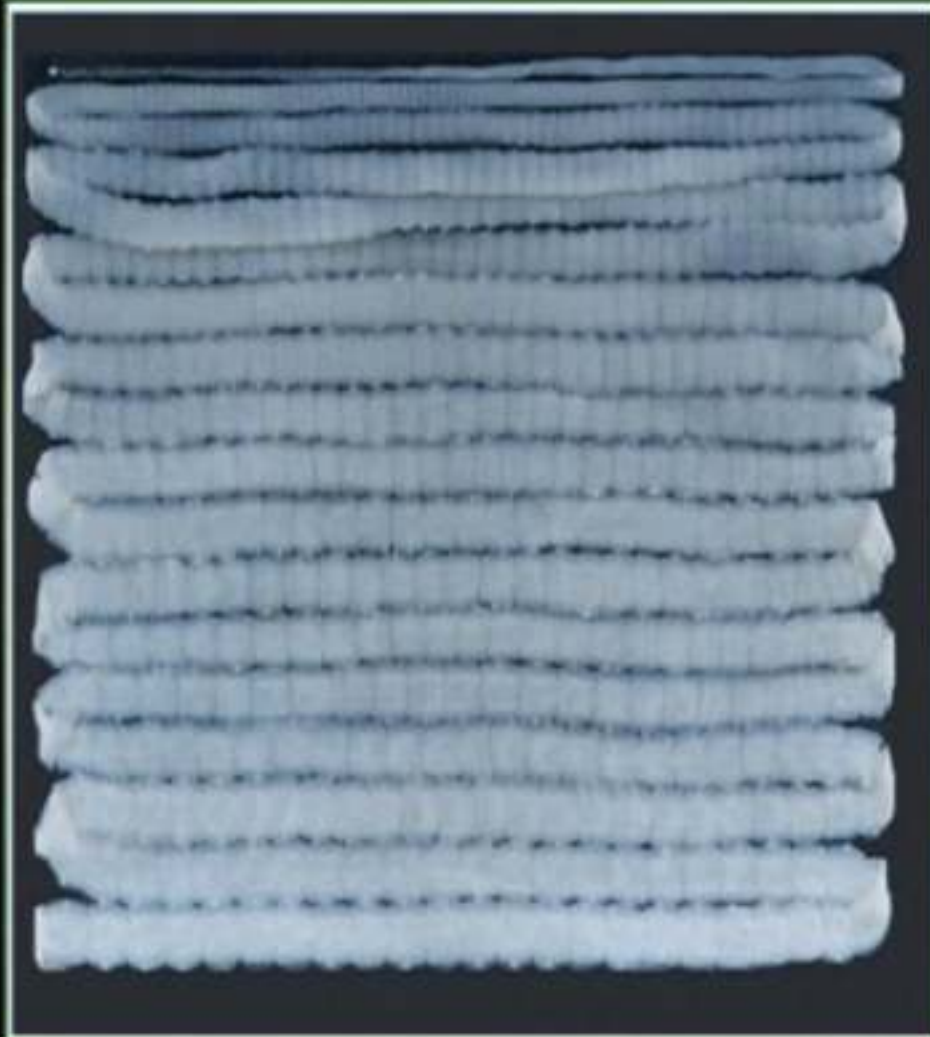
(Gracey, 1994).



# MORPHOLOGY cont'd.

	TAENIA SAGINATA	TAENIA SOLIUM
Length (meters)	3 to 10 (up to 25)	2 to 5 (upto 7)
Suckers	4	4
Rostellum & Hooklets	Absent	Present
Proglottids	1000 to 2000	1000
Eggs production /proglottid	100000	50000
		(Bowles <i>et al.</i> , 1994).

# *Taenia Adult worm*



*Taenia saginata*



*Taenia solium*

(Gray)

# Taenia solium

- Lives in jejunum
- 2-3 m long
- 4 large cup like suckers
- 20-50 hooks
- <1000 proglottids

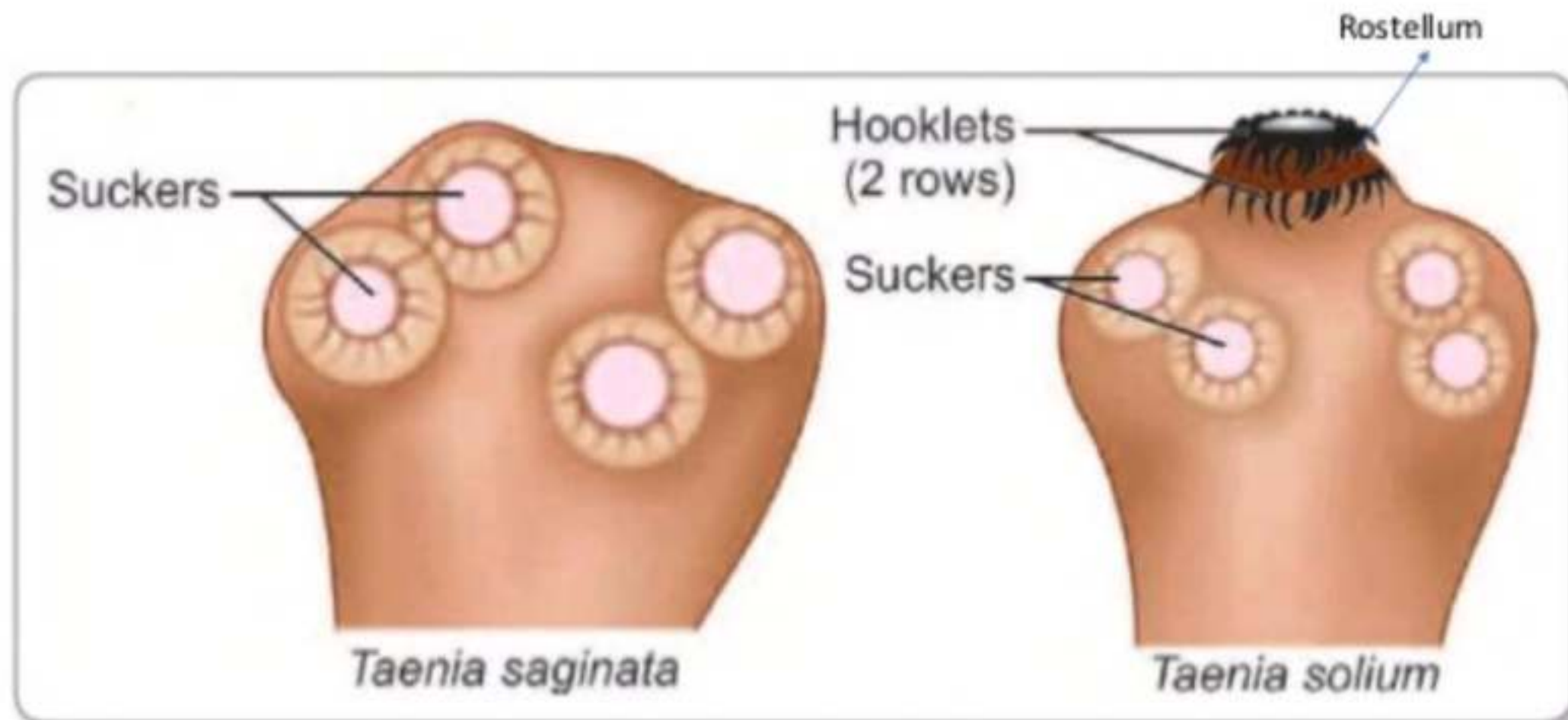




# Taenia saginata

- Live in small intestine
- 5-12 m long → up to 24m
- 4 suckers
- No rostellum or hooklets
- 1000-2000 proglottids are seen

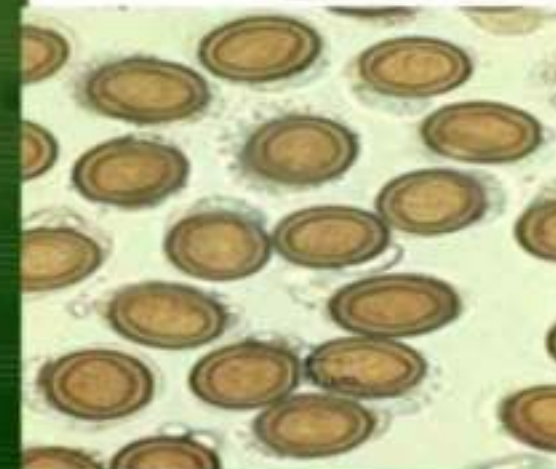




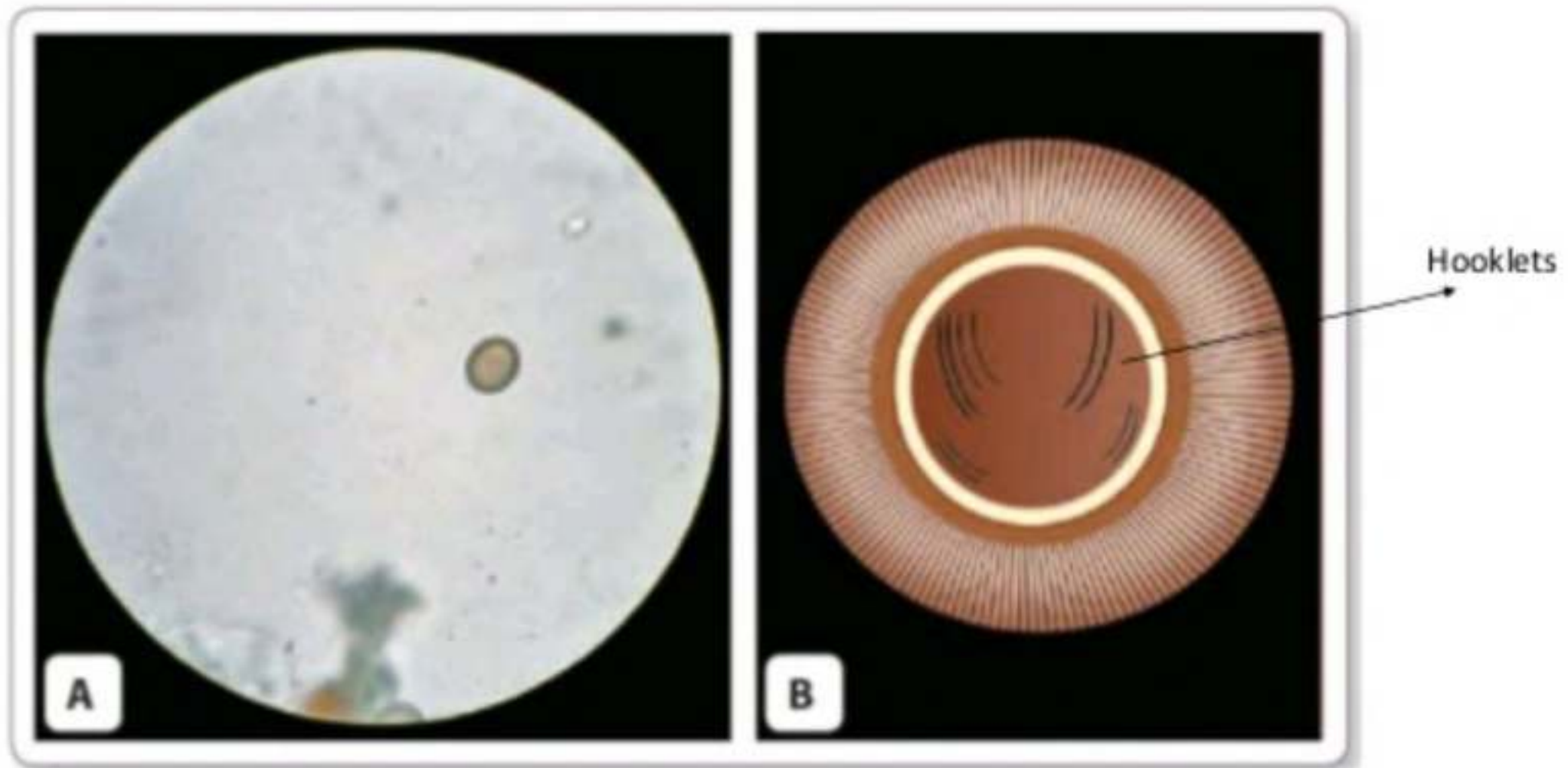
Scolex of *Taenia saginata* and *Taenia solium*

# EGG

- ❑ The eggs of *Taenia saginata* and *T. solium* are indistinguishable morphologically.
- ❑ The eggs are spherical, diameter 31 to 43  $\mu\text{m}$ , with a thick radially striated brown embryophore.
- ❑ Inside each is an oncosphere with 6 hooklets.

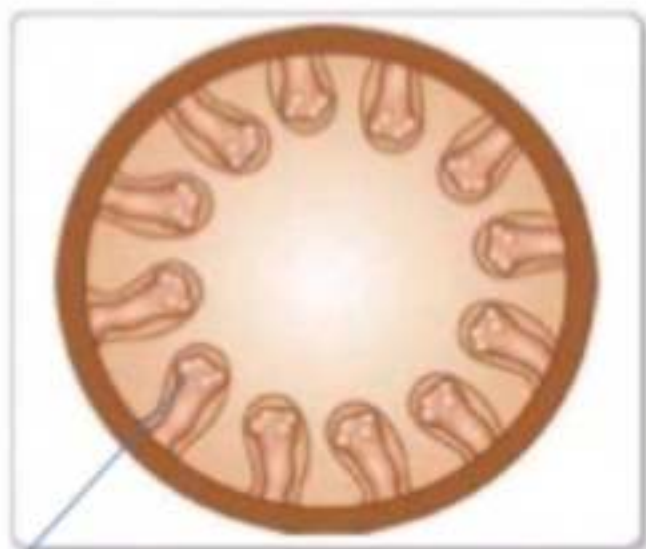






Egg of *Taenia*. **A.** As seen under microscope;  
**B.** Schematic diagram

Bile stained egg and doesn't float in salt solution

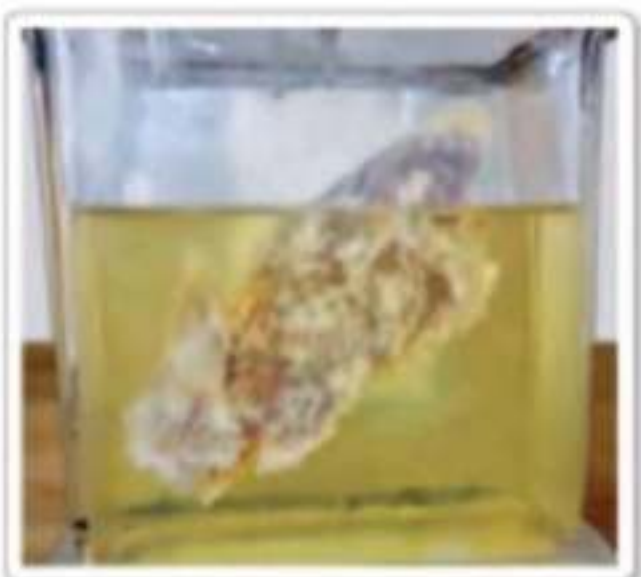


Schematic diagram showing cysticercus bovis in muscle

Scolex of larva invaginated in cyst



*Cysticercus cellulosae*



Cysticerci in muscles (measly pork)

	T.saginata	T.solium
Definite host:	Man	Man
Intermediate host:	<u>Cow</u>	<u>Pig</u>

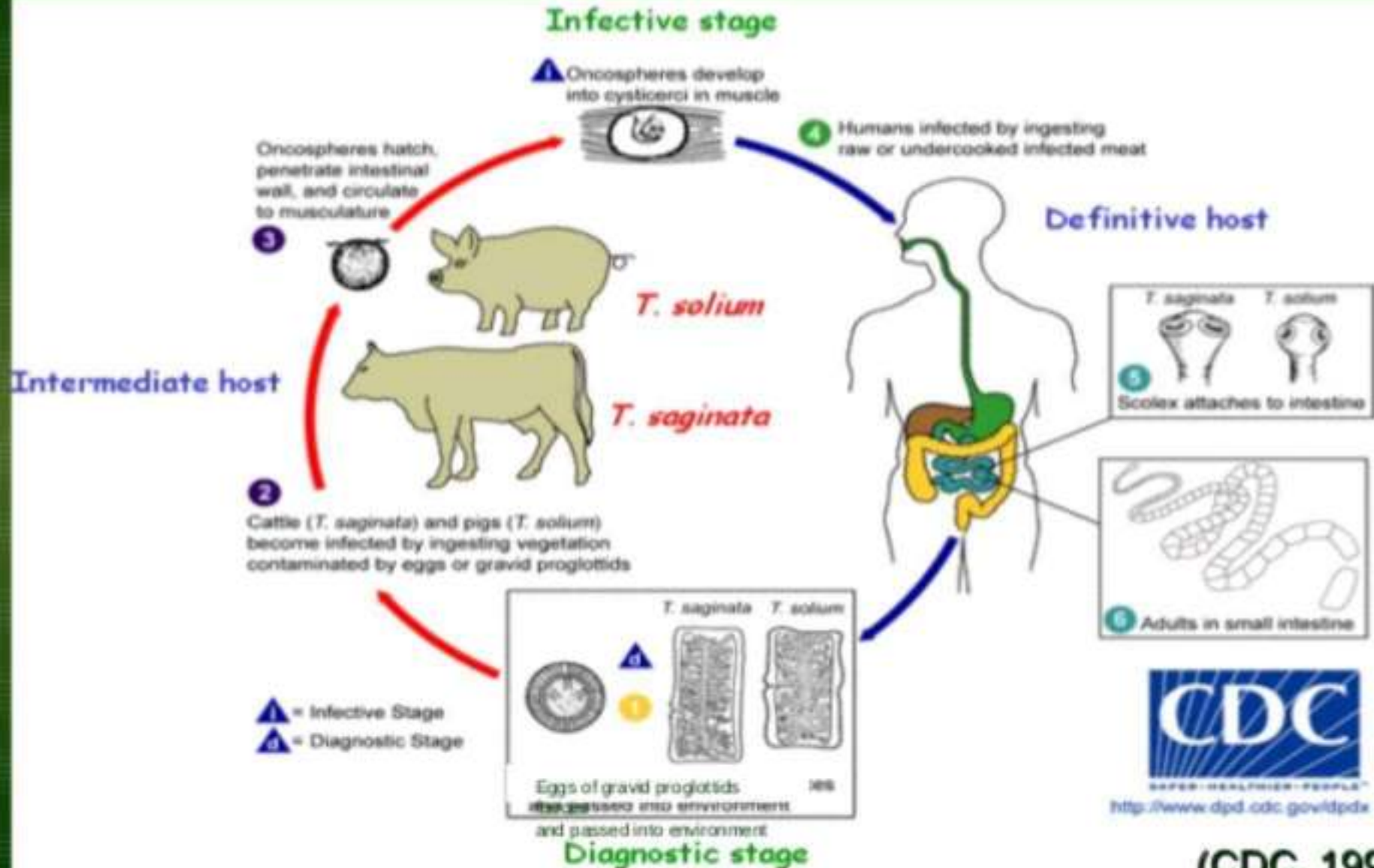


# Mode of infection

- Ingestion of infected Cysticerci in undercooked Beef / Pork.
- Ingestion of food, water or vegetables contaminated with eggs.
- Reinfection – transport of eggs from bowel to stomach.
- Incubation period → 8 to 14 weeks

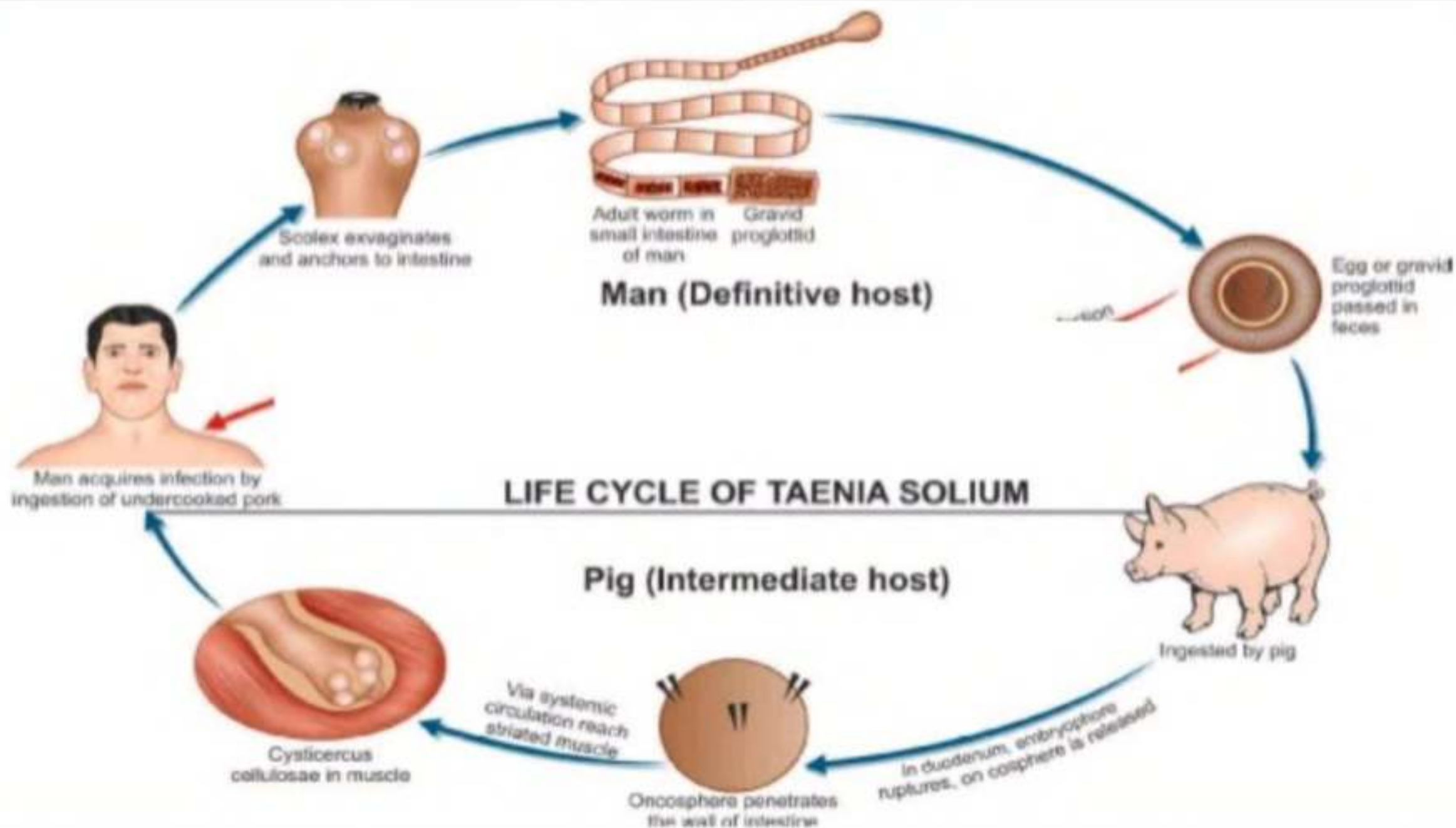
- Intestinal infection with *T. solium* occurs only in persons eating undercooked pork and usually in persons of low socio-economic condition with poor sanitation. It is uncommon in Jews and Mohammedans, who are not generally pork eaters. But cysticercosis may occur in any person residing in endemic areas, even in vegetarians because the mode of infection is contamination of food or drink with egg deposited in soil.
- Eggs of *T. solium* are infective to pigs as well as to man.

# LIFE CYCLE OF TAENIA



(CDC, 1993)





Life cycle of *Taenia solium*

Cysticerci are ingested  
with raw or undercooked pork

Pig ingests embryonated eggs  
hatch, oncospheres migrate  
to tissues, develop to cysticerci

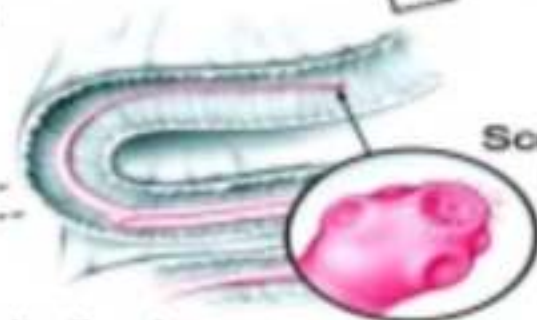


Cysticerci in  
muscle tissue

Cysticerci are released  
from muscle in stomach



Adults mature and  
live in small  
intestine



Scolex contains  
hooklets and  
four suckers

Adults live in  
small intestine

*T. solium*

Adults grow to  
~ 10 m in length

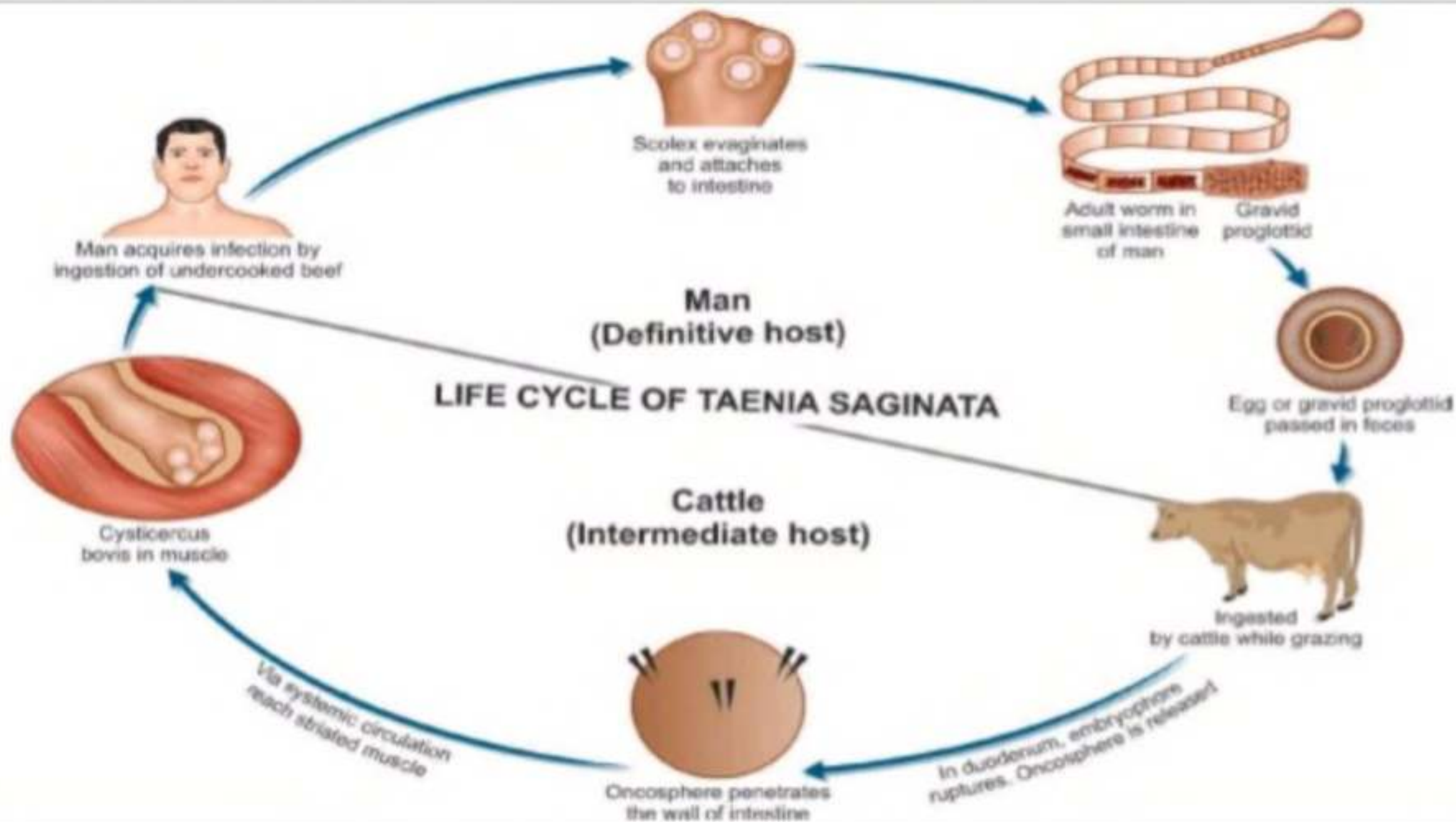


Gravid  
proglottid

Proglottids  
pass in feces

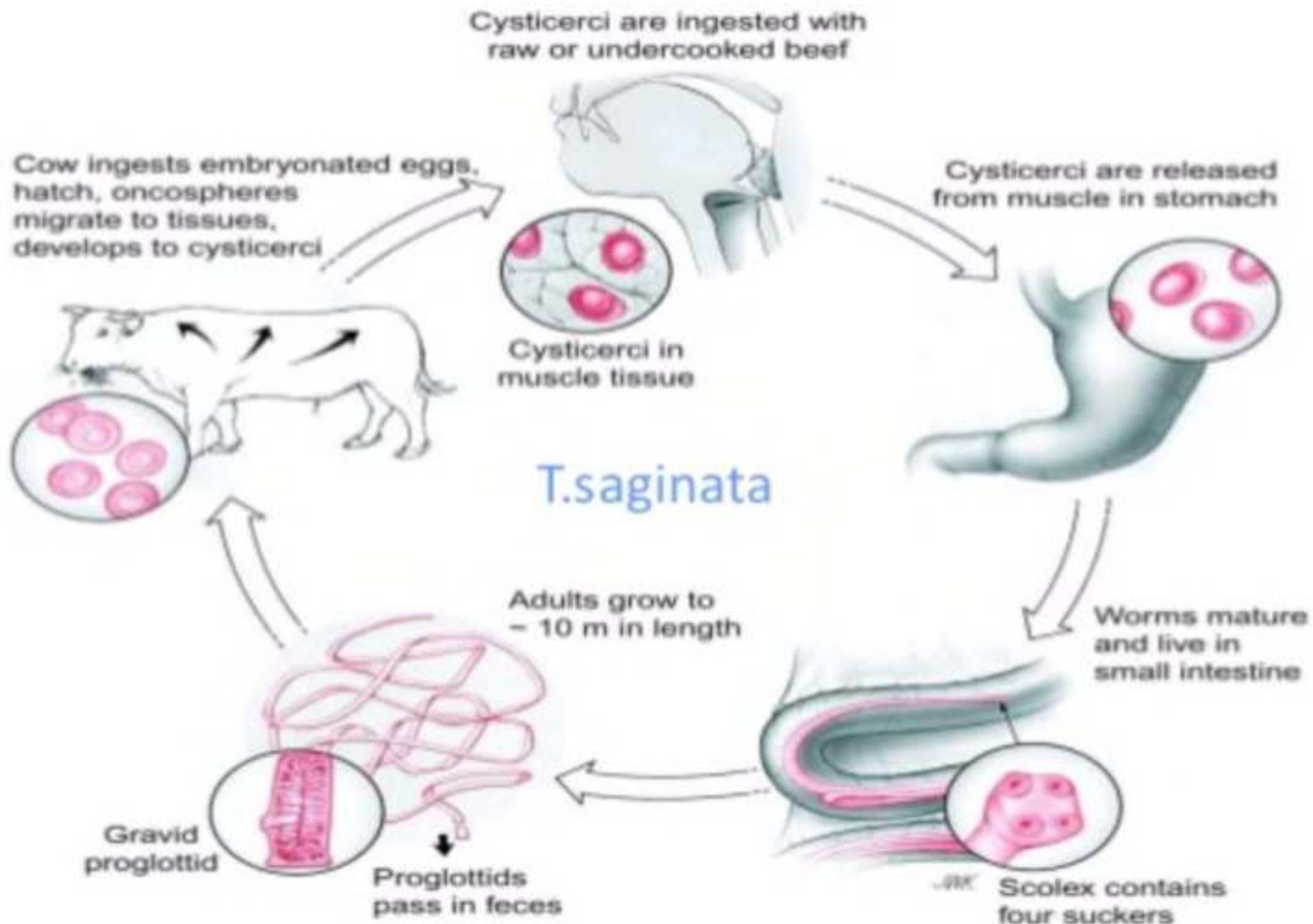


(see Cysticercosis)



Life cycle of *Taenia saginata*





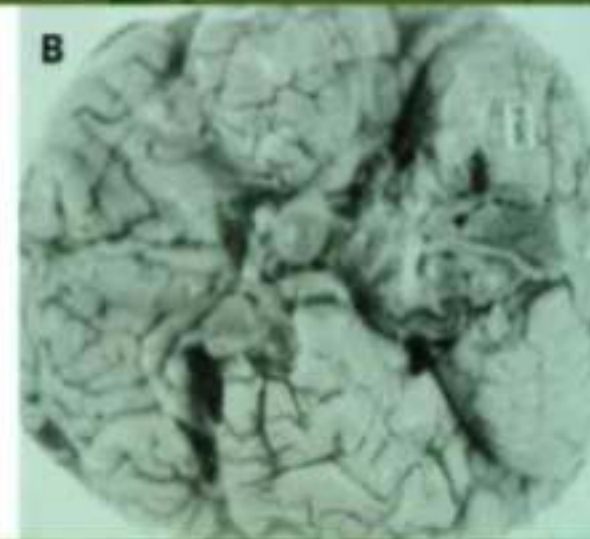
# SIGNS AND SYMPTOMS

- ❑ Most people are Asymptomatic or mild symptoms.
- ❑ Tapeworms can cause digestive problems including abdominal pain, loss of appetite, weight loss, diarrhoea and stomach upset.
- ❑ Most visible symptom - passing of proglottids
- ❑ RARE - tapeworm segments become lodged in the appendix (appendicitis), or the bile ducts (cholangitis)
- ❑ Infection with *T. solium* tapeworms can result in human cysticercosis, - cause seizures and muscle or eye damage.

(Arechavaleta *et al.*, 1998).

# HEALTH IMPLICATIONS

- ❑ PERNICIOUS ANAEMIA
- ❑ APPENDICITIS
- ❑ ABDOMINAL PAIN
- ❑ CONSTIPATION
- ❑ DIARRHOEA
- ❑ LOSS OF APPETITE
- ❑ CYSTICERCOSIS IN MUSCLE
- ❑ NEUROCYTOSIS
- ❑ OPHTHALMIC CYSTICERCOSIS
- ❑ INSOMNIA



(Medina *et al.*, 1990).



# Diagnosis

## □ Taeniasis

- ◆ Direct faecal smear
- ◆ Brine floatation technique
- ◆ Cellophane-tape technique

- Visualization of Taenia eggs-has poor sensitivity and difficult to differentiate from *T. saginata*

- Coproantigen detection ELISA-95% sensitivity and 99% specificity

## □ Cysticercosis

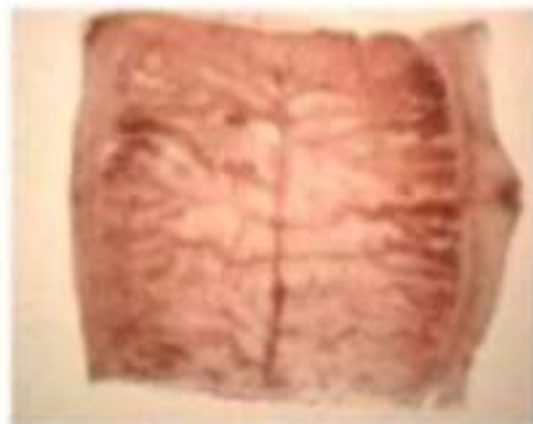
- ◆ Biopsy of subcutaneous nodules, X-ray, CT scan or MRI are used for the diagnosis of brain type and ophthalmoscope examination is used for ocular form
- ◆ Histopathological diagnosis (cysticercus in autopsy tissue).

- Differential leucocyte count (eosinophilia)

(Garcia *et al.*, 2003).

# Diagnosis

- Eggs and proglottids in stool
- Species identification based on proglattid morphology
- Scolex identification
- Stool PCR or ELISA



## Laboratory Diagnosis of *Taenia* spp.

### Taeniasis

#### Stool examination

- a) Eggs:
- Shows characteristic eggs of *Taenia* but species identification cannot be done
  - Concentration method: Formal ether sedimentation method
- b) Proglottids:
- Species identification possible by examining proglottids
- c) *Taenia* antigen (Coprogoantigen)
- More sensitive than microscopy.
  - Cannot differentiate between *Taenia solium* and *taenia saginata*

#### Serodiagnosis

- can be done by
- ELISA
  - IHA

#### Molecular diagnosis

- Done by DNA probes and PCR
- Species and sub-species identification possible

### Cysticercosis

#### Biopsy

Definitive method of diagnosis

#### Serodiagnosis

- Antibody detection by
  - ELISA
  - EITB
- Antigen detection by ELISA using monoclonal antibodies

#### Imaging methods

- X-ray
- CT scan
- MRI scan

Laboratory diagnosis of *Taenia* spp.



## Comparison of Gravid Proglottids



T.saginata

>12 branches per side



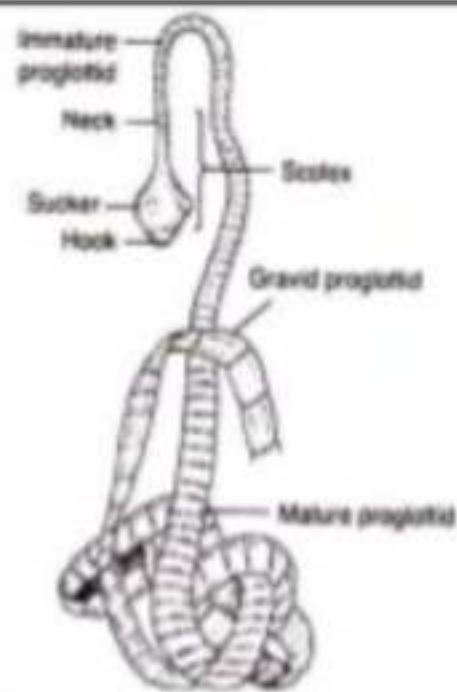
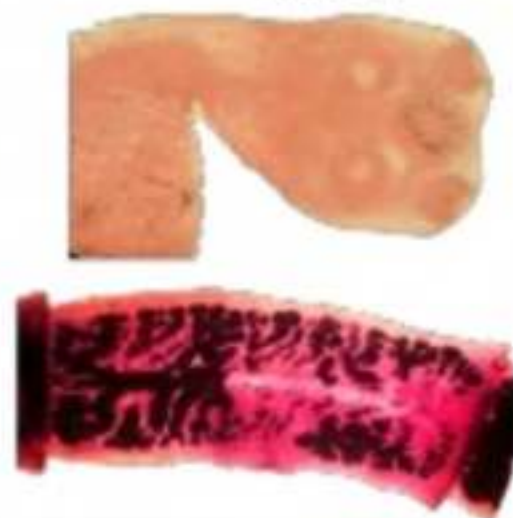
T.solium

10 branches



	<i>Taenia saginata</i>	<i>Taenia solium</i>
Length	5–10 m	2–3 m
Scolex	Large quadrate	Small and globular
	Rostellum and hooks are absent	Rostellum and hooks are present
	Suckers may be pigmented	Suckers not pigmented

*Taenia solium*



Cross structure of *Taenia solium*

*Taenia saginata*

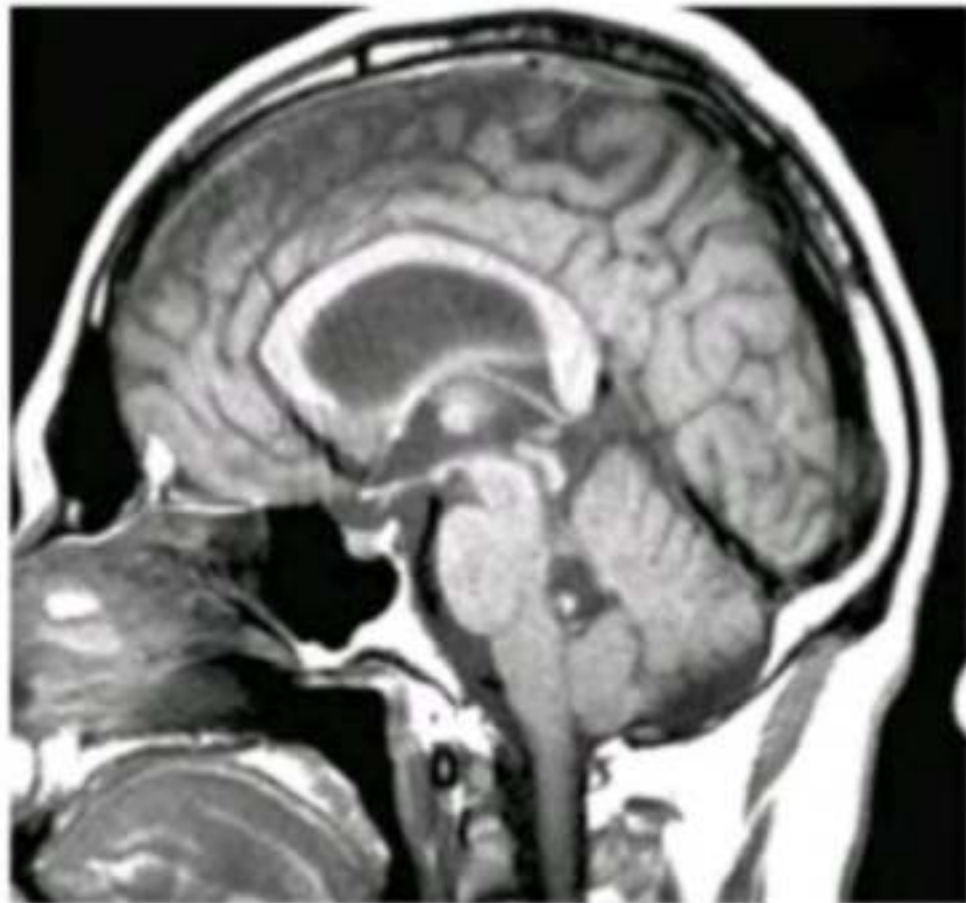


# Clinical disease



Ocular Cysticercosis

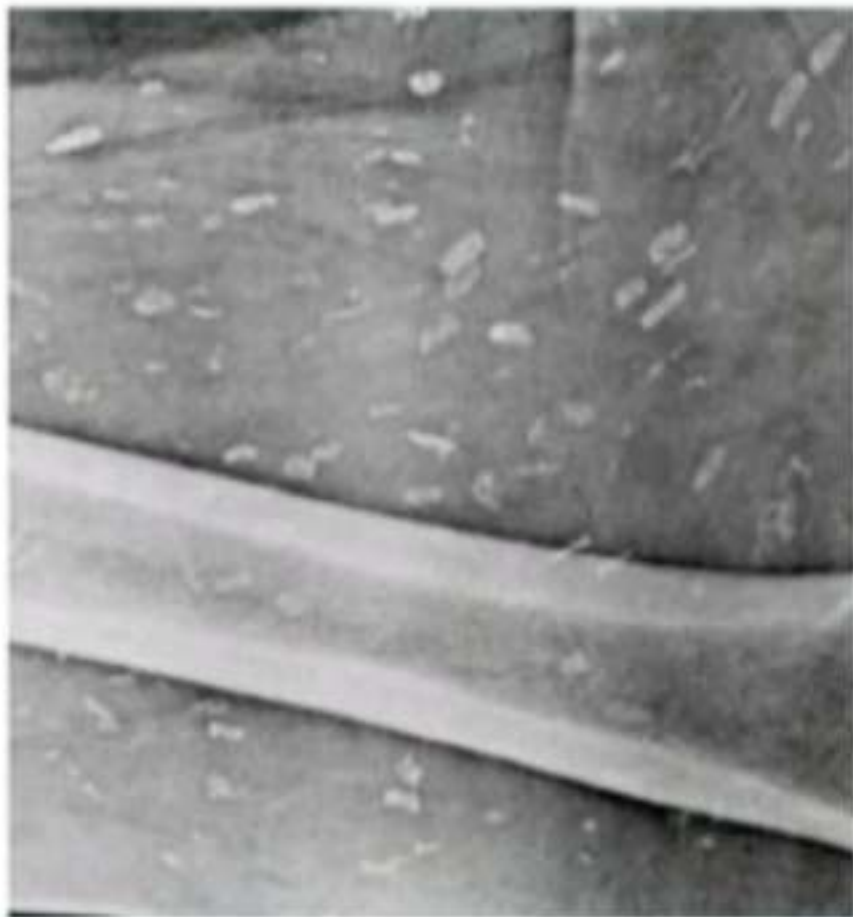
Hydrocephalus / Coma / Death



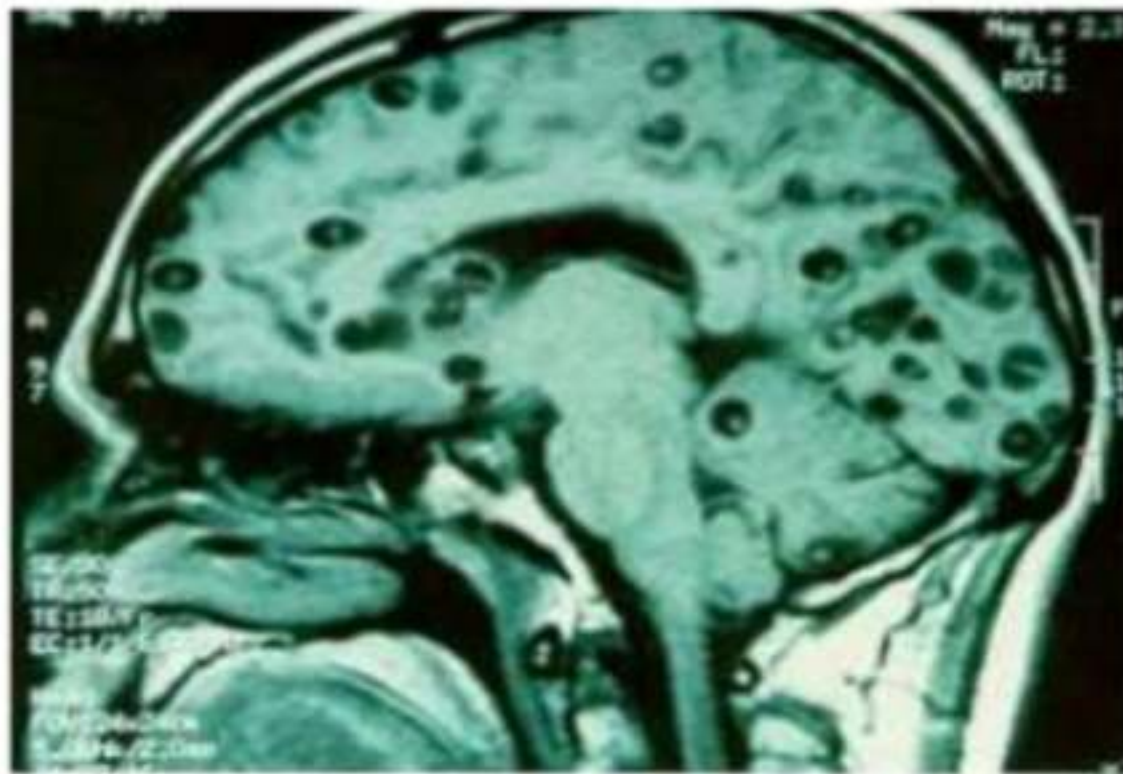
**Hydrocephalus**

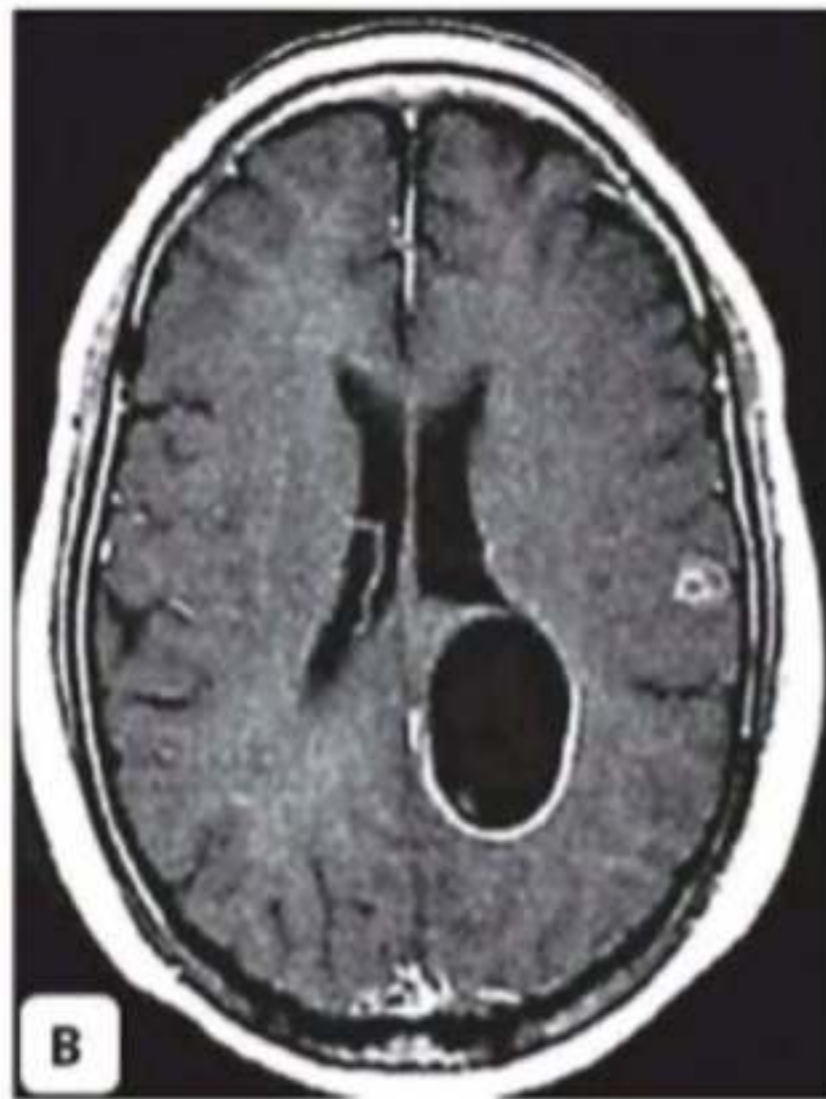


# Muscular Cysticercosis



# MRI





**A.** CT Scan shows multiple calcified cysts of *Cysticercus cellulosae* in the brain parenchyma; **B.** CT Scan of brain shows clear cyst wall in a cysticercal lesion



# TREATMENT

- ❑ Taeniasis is easily treated with praziquantel (5-10 mg/kg single dose)
- ❑ Niclosamide (adults and children over 6 year, 2g single dose)
- ❑ Albendazole is also highly effective for treatment of cattle and the pig infection
- ❑ Surgical removal is required for ocular and superficial cysticercosis



(Botero *et al.*, 1993)

# Treatment

- Surgical removal of cysticerci.
- Steroids during time of neurological symptoms.
- Praziquantal 50mg/kg/day 3 divided doses for 15 days.
- Albendazole 400mg/BD with fatty meal for 14 days.

3months→subarachnoid and ventricular cysts

- Anticonvulsants (e.g.Dilantin).

# Preventive measures

- Treatment of infected persons
- Meat inspection
- Health education



# Meat inspection

- Beef and pork is adequately cooked.
- Freezing meat below  $-5^{\circ}\text{C}$  for more than 4 days will kill cysticerci.
- Meat should be routinely inspected for evidence of Taeniasis at slaughter.
- Proper housing and feeding of pigs and cattle.



# Health education

- Washing hands before eating and after defecation.
- Avoid usage of raw sewage for irrigation of pasture soil.
- Prevent the pollution of soil, water and food with human faeces.

# PARASITE CONTROL MEASURES

- ❑ Through proper cooking of meat at a temp not less than 60°C, Heat treatment-sterilize by heat or boiling at 95-100°C for 30 minutes or heat 72°C for 2hrs
- ❑ Freeze at -15°C for at least 30 days
- ❑ Avoid feeding swill or garbage to pigs
- ❑ Drying is ineffective, but salting and smoking can be effective

(Boa *et al.*, 2003).

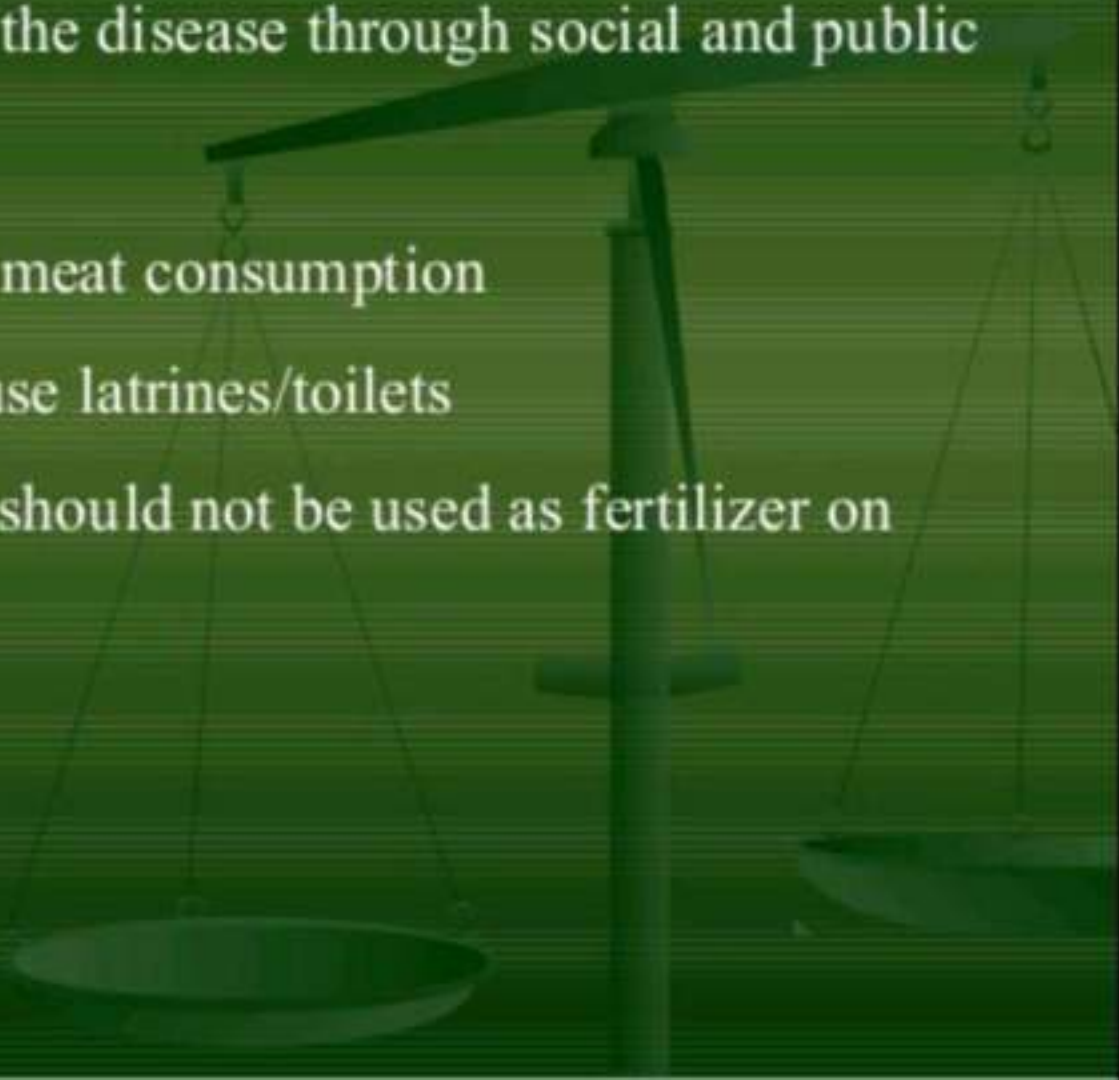


## CONCLUSION

- Taeniasis is an important zoonotic disease that affects both humans and animal healths, it occurs as a result of eating raw/under cooked meat, backyard slaughtering especially in holyday, and lack of sanitation gives a great favour for continual existence of parasite/disease within human and animal population.

# RECOMMENDATIONS

- ❑ There should be public awareness campaigns about health and economic importance of the disease through social and public media
- ❑ Avoid raw/undercooked meat consumption
- ❑ The community should use latrines/toilets
- ❑ Untreated human faeces should not be used as fertilizer on pasture.



# Human Cysticercosis

- Agent : Embryonated **eggs**
- Host : Man
- Environmental : Unhygienic conditions

# Mode of infection

- Hetero infection → ingestion of eggs of *T.solium* in contaminated water or food.
- Auto infection → regurgitated eggs into small intestine.



