

lec. 1

Medical helminthology

Helminths: General Features

11

- **Medical helminthology:**

science concerned with the study of helminths or parasitic worms.

- General introduction:

1. The helminthic parasites are multicellular (metazoa) bilaterally symmetrical organism.
2. The term 'helminth' (Greek helmins-'worm') originally referred to intestinal worms, but now comprises many other worms, including tissue parasites as well as many free-living species.

❖ **Sources** of the parasites are different. Exposure of humans to the parasites may occur in one of the following ways:

1. Contaminated **soil** (Geo-helminths), **water** (cercariae of blood flukes) and food (*Taenia* in raw meat).
2. **Sucking insects** or **arthropods** (as in filarial worms).
3. Domestic or wild **animals** harboring the parasite (as in echinococcus in dogs).
4. **Person to person** (as in *Enterobius vermicularis*, *Hymenolopis nana*).
5. Oneself (**auto-infection**) as in *Enterobius vermicularis*.

• **Parasites enter the body through different routes including:**

Mouth, Skin and Respiratory tract by means of inhalation of airborne eggs.

Classification of helminths

- **Helminths, which occur as parasite in humans belong to 2 phyla:**
 1. Phylum **Platyhelminths** (flatworms) – It includes 2 classes:
 - A. Class – **Cestoda** (tapeworms)
 - B. Class – **Trematoda** (Flukes or digeneans)
 2. Phylum **Nemathelminths** – It includes class nematoda and 2 subclasses:
 - A. Subclass – **Adenophorea** (Aphasmidia)
 - B. Subclass – **Secernentea** (Phasmidia).
- **The differences between cestodes, trematodes, and nematodes have been summarized in Table 11.1.**

Table 11.1: Differences Between Cestodes, Trematodes, and Nematodes

	Cestodes	Trematodes	Nematodes
Shape	Tape-like, segmented	Leaf-like unsegmented	Elongated, cylindrical, unsegmented
Head end	Suckers present; some have attached hooks	Suckers are present but no hooks	Hooks and sucker absent. Well-developed buccal capsule with teeth or cutting plates seen in some species
Alimentary canal	Absent	Present but incomplete, no anus	Complete with anus
Body cavity	Absent, but inside is filled with spongy undifferentiated mesenchymatous cells, in the midst of which lie the viscera	Same as cestodes	Present and known as pseudocoel . Viscera remains suspended in the pseudocoel
Sex	Not separate: hermaphrodite (monecious)	Not separate: hermaphrodite except <i>Schistosoma</i>	Separate (diecious)
Life cycle	Requires 2 host except <i>Hymenolepis</i> (1 host) and <i>Diphyllobothrum</i> (3 host)	Requires 3 host except schistosomes (2 host)	Requires 1 host except filarial worms (2 host) and <i>Dracunculus</i> (2 host)

A. Class Cestoda

1. Cestodes have tape-like, dorso-ventrally flattened, **segmented** bodies.
2. They **do not possess an alimentary system**.
3. The head(**Scolex**) carries suckers and some also have hooks.
4. The body segmented in to three main parts:
 - A. Scolex
 - B. Neck
 - C. Proglottids (Strobila).
5. They are monoecious and body cavity is absent.
6. The class of Cestodes includes 2 orders:
 - A. **Pseudophyllidea** (scolex possesses a pair of longitudinal grooves called as bothria) e.g...*Diphylidium bothriolum*
 - B. **Cyclophyllidea** (scolex possesses 4 suckers (or acetabula) e.g..*Taenia solium*)













	<i>Taenia solium</i>	<i>Taenia saginata</i>	<i>Hymenolepis nana</i>	<i>Hymenolepis diminuta</i>	<i>Diphyllobothrium latum</i>	<i>Echinococcus granulosus</i>
Heads						
Proglottids	4 suckers 2 rows of hooks	4 suckers No hooks	4 suckers single row of 20-30 hooks	4 suckers No hooks	2 Suctorial grooves or bothria No suckers, No hooks	4 suckers 2 rows of hooks
						
	Longer than broad 7-12 uterine branches on each side	Longer than broad 15-30 uterine branches on each side	Broader than long	Broader than long	Broader than long Uterus coiled	Longer than broad

Fig. 12.2: Differences between heads and proglottids of various Cestodes

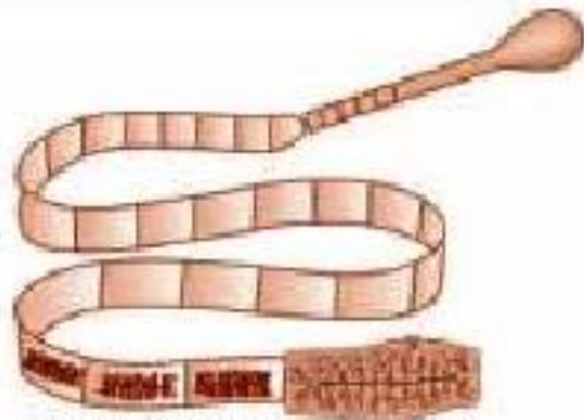
CYCLOPHYLLIDEAN TAPEWORMS

Taenia Saginata and Taenia Solium

Common name

Taenia saginata - Beef tapeworm

Taenia solium - Pork tapeworm



Adult worm in
small intestine
of man

Gravid
proglottid

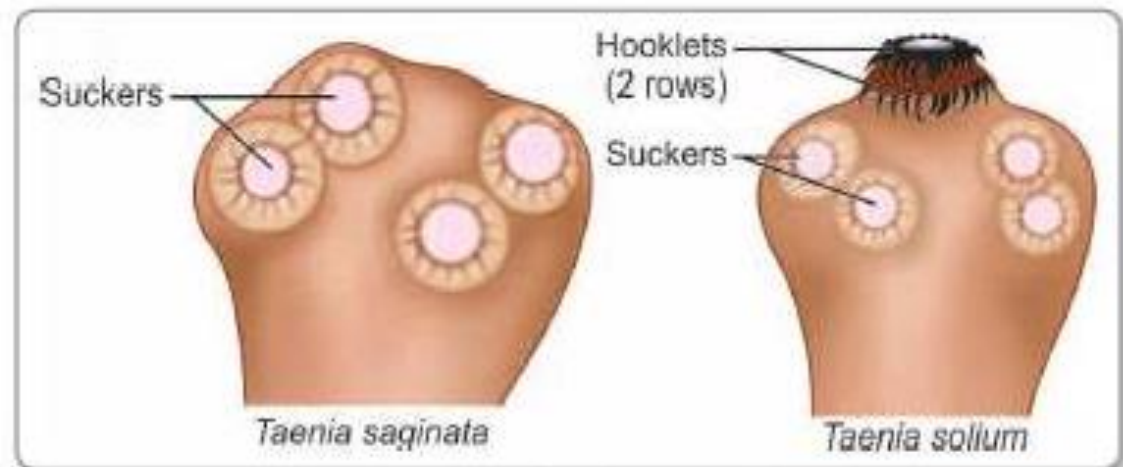


Fig. 12.7: Scolex of *Taenia saginata* and *Taenia solium*

Taenia solium

- **Common name** - (**Armed tape worm or Pork tapeworm**) - Morphology : table (12.4)
- **Final host** : small intestine of human
- **Intermediate host**: muscle of pig
- **Disease**: **Intestinal Taeniasis**, **Cysticercosis** e.g ocular C.
- **Infective stage**: larval stage of worm (Cysticercus cellulosae)
- **Mode of infection** :
 - A. Ingestion un cooked pork muscle – Intestinal taeniasis
 - B. **Autoinfection**: Gravid segment which rupture with in the definitive host, in the small intestine, hatching the eggs which contain hexacanth-embryo , produce Encosphere , which migrate to the host tissue via blood stream to form cysticercosis disease in human specially in eye ,brain, and muscular tissue.




Taenia solium W.M

- **Clinical Symptoms:**

1. Cause digestive problem , abdominal pain loss of appetite , weight loss, anemia , intestinal obstruction .

2. The most visible symptom of taeniasis is active passing of proglottids through the anus and in feces .

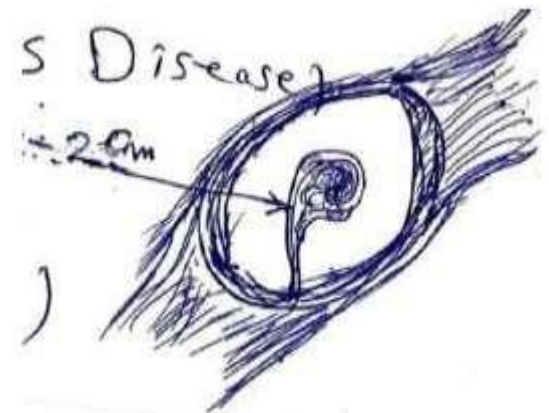
3. Infection with *Taenia-Solium* can result in human **cysticercosis disease** ,which can be **Cysticercus- cellulose**.

- The larva Stage may be subcutaneous, muscular or in all organs of the body also in ,neurocysticercosis ,and ocular (loss of vision) and conjunctivitis

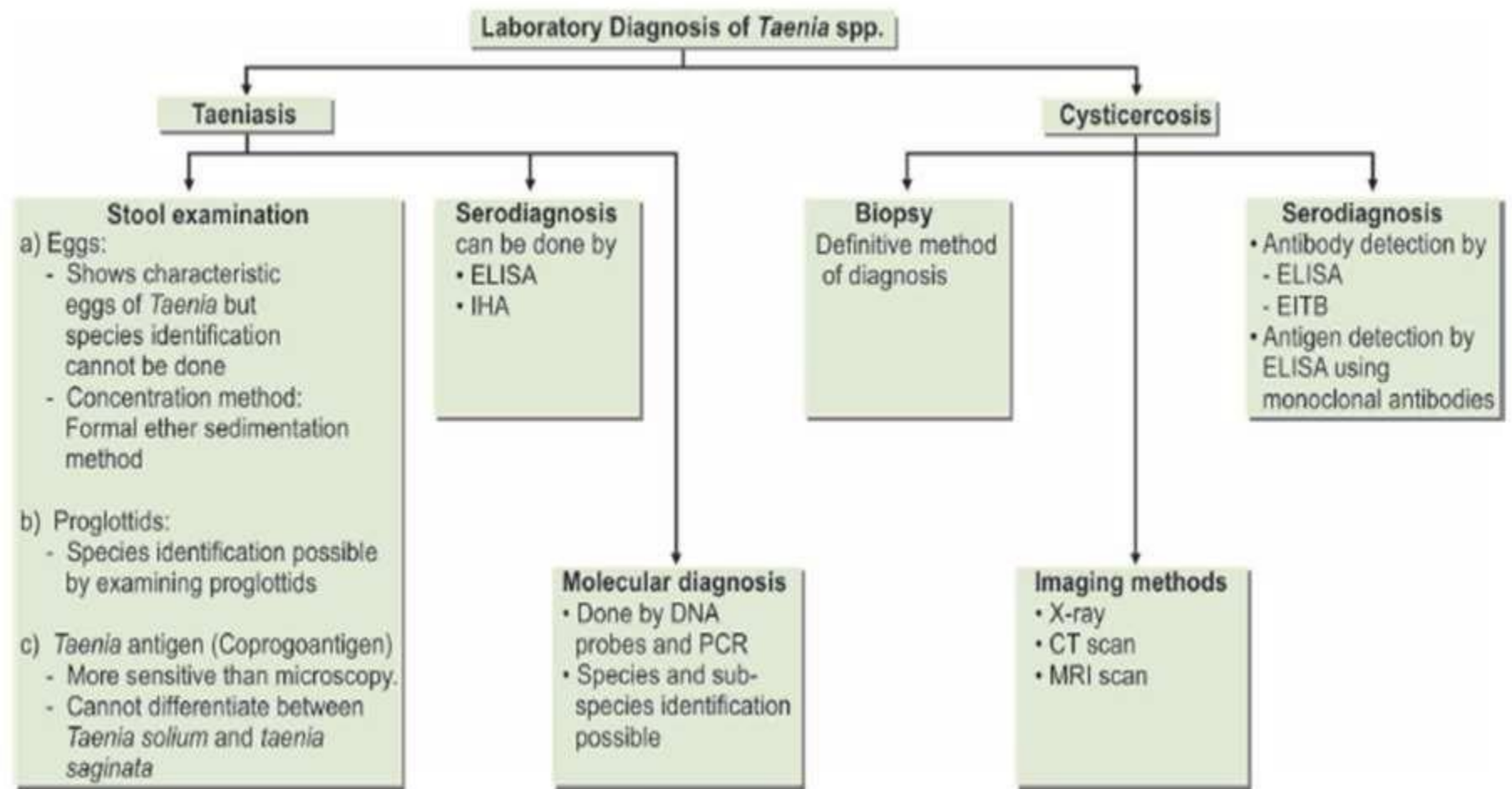
- **very serious disease infected the eye or brain damage**



Fig. 1: Rt eye showing smooth, horizontally oval subconjunctival swelling.

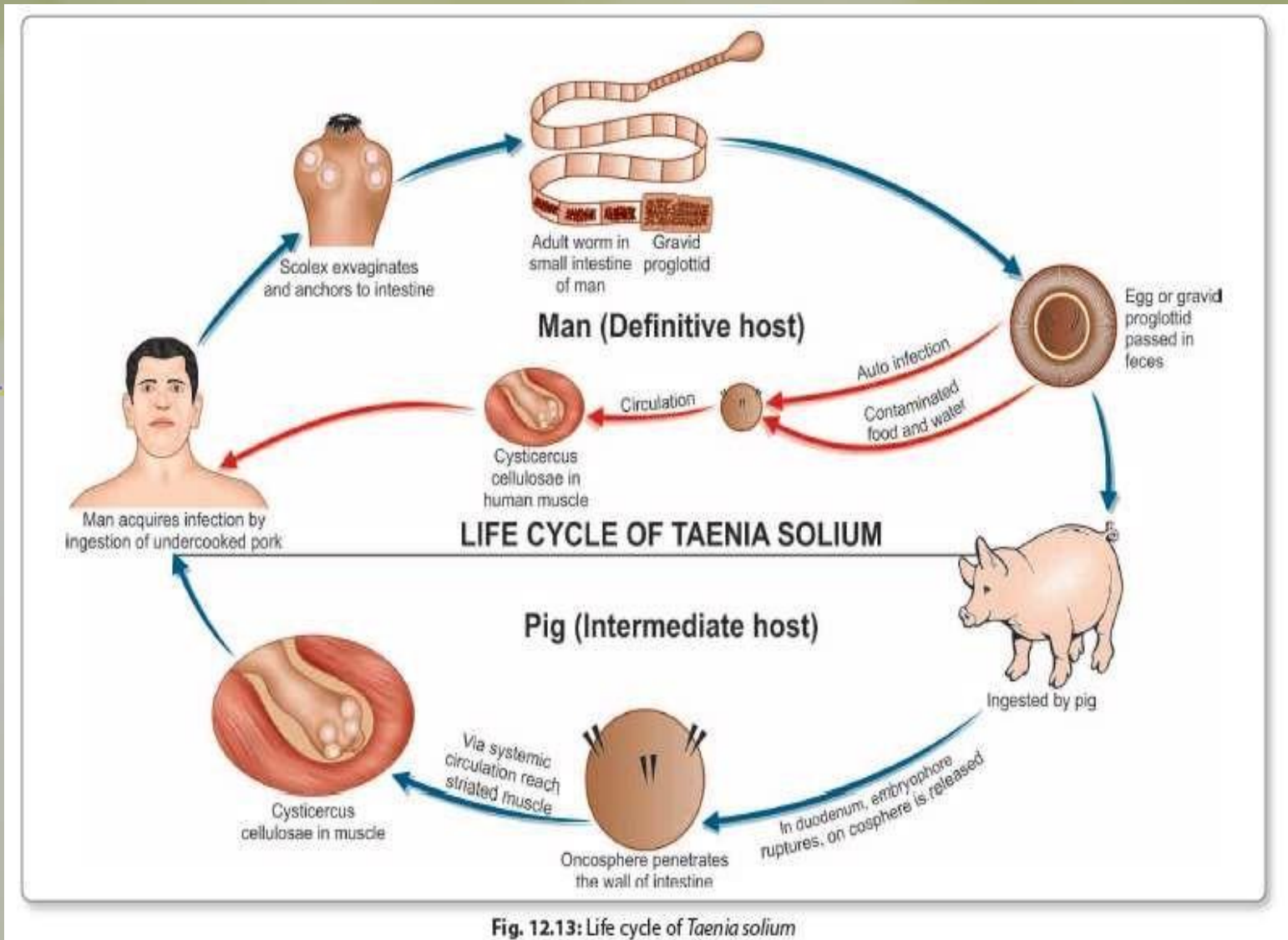


- **Diagnostic stage:** ova in stool + Mature And Gravid proglottid



Flowchart 12.1: Laboratory diagnosis of *Taenia* spp.

- Life cycle:



Taenia saginata

- **Common name (Unarmed tape worm or Beef tapeworm)** Morphology : table (12.4).
- **Final host** : small intestine of human
- **Intermediate host:** muscle of cattle which harbor the larval stage of the worm.
- **Disease:** Intestinal Taeniasis
- **Infective stage:** Larval stage of worm (**Cysticercus bovis**)
- **Mode of infection** : ingestion un cooked beef
- **Diagnostic stage:** ova in stool + Mature And Gravid proglottid
- **Treatment:** Single dose of praziquantel (10–20 mg/kg) is the drug of choice.

- Life cycle:

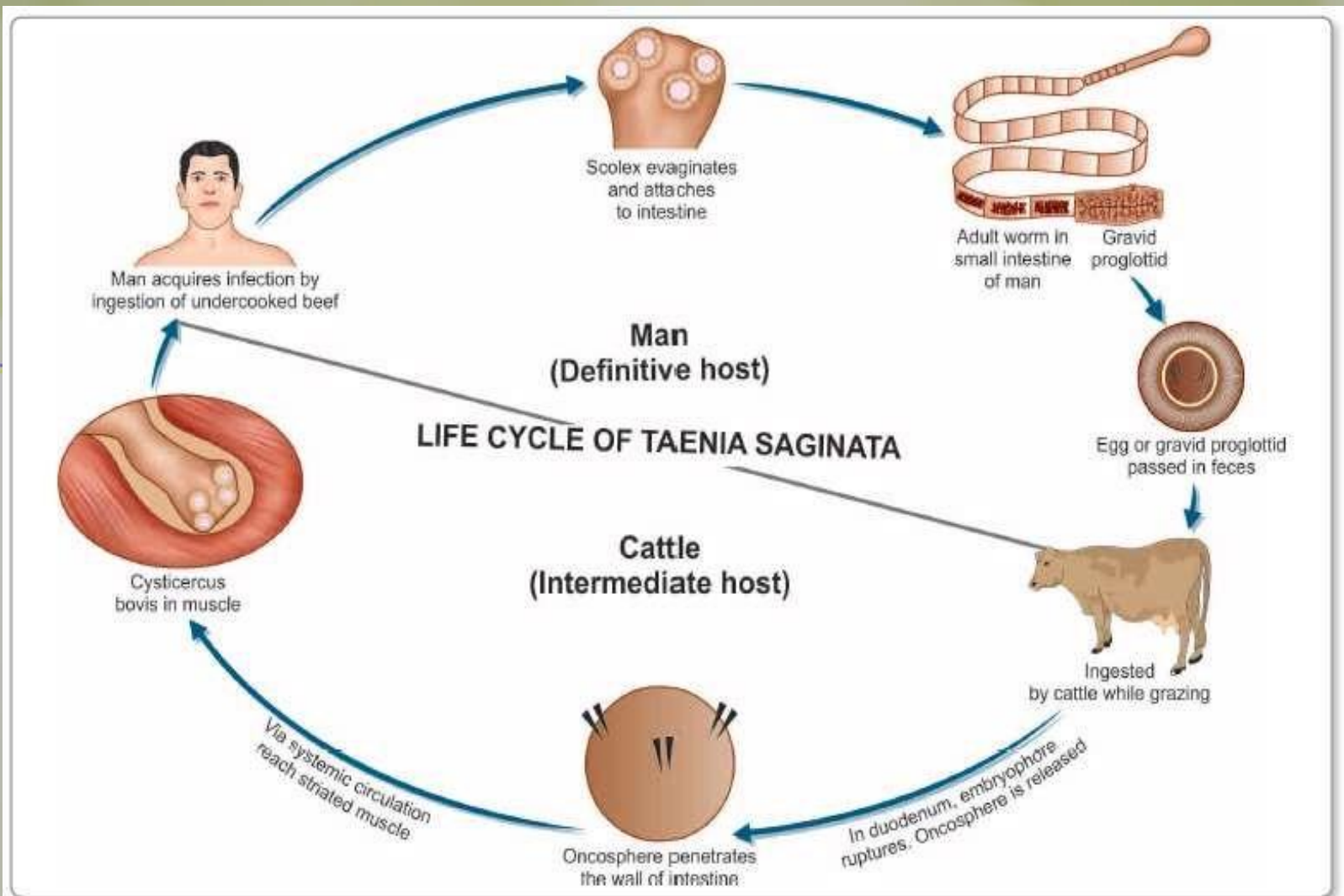


Fig. 12.12: Life cycle of *Taenia saginata*

Table 12.4: Difference between *Taenia saginata* and *Taenia solium*

	<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
Neck	Long	Short
Proglottids	1,000–2,000	Below 1,000
Measurement (gravid segment)	20 mm × 5 mm	12 mm × 6 mm
Expulsion	Expelled singly	Expelled passively in chains of 5 or 6
Uterus	Lateral branches 15–30 on each side; thin and dichotomous	Lateral branches 5–10 on each side; thick and dendritic
Vagina	Present	Absent
Accessory lobe of ovary	Absent	Present
Testes	300–400 follicles	150–200 follicles
Larva	Cysticercus bovis; present in cow not in man	Cysticercus cellulosae; present in pig and also in man
Egg	Not infective to man	Infective to man
Definitive host	Man	Man
Intermediate host	Cow	Pig, occasionally man
Disease	Causes intestinal taeniasis	Causes intestinal taeniasis and cysticercosis

Scolex

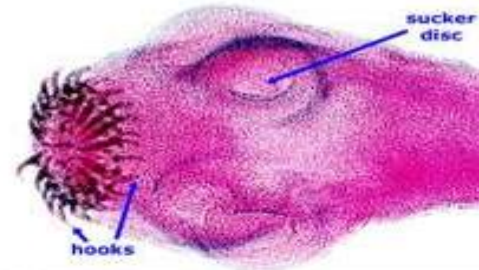
T. saginata

Large pyriform (quadrat) with 4 suckers without rostellum & hooks



T. solium

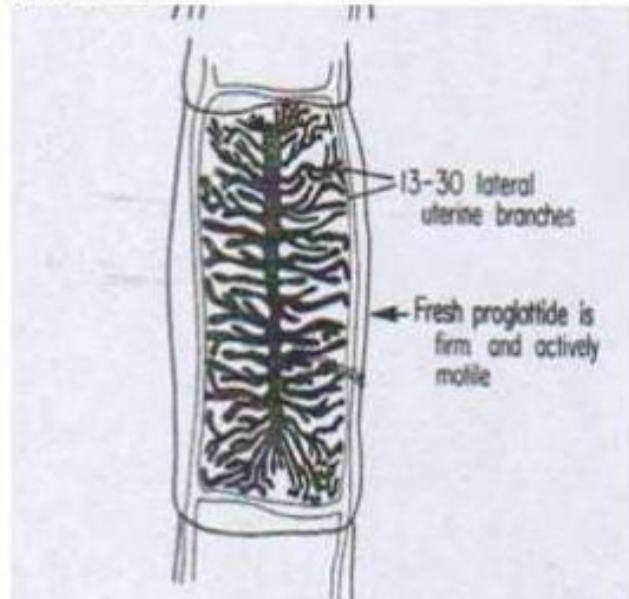
Small globular with 4 sucker and rostellum & hooks



Gravid segment

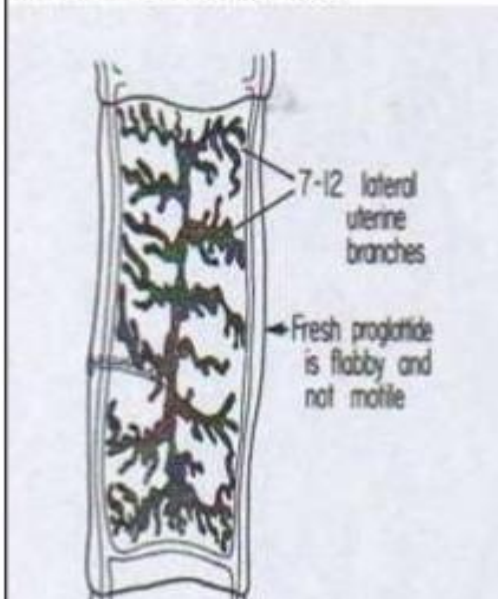
T. saginata

Lateral uterine branches 15-30 primary uterine branches, thin on each side.



T. solium

Lateral uterine branch 5-10 primary uterine branches, thick on each side.



Thank You

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