Cestoda & Fecal fat test

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Medical Parasitology Ⅱ

Summer Semester

Lab 5

07/09/2025

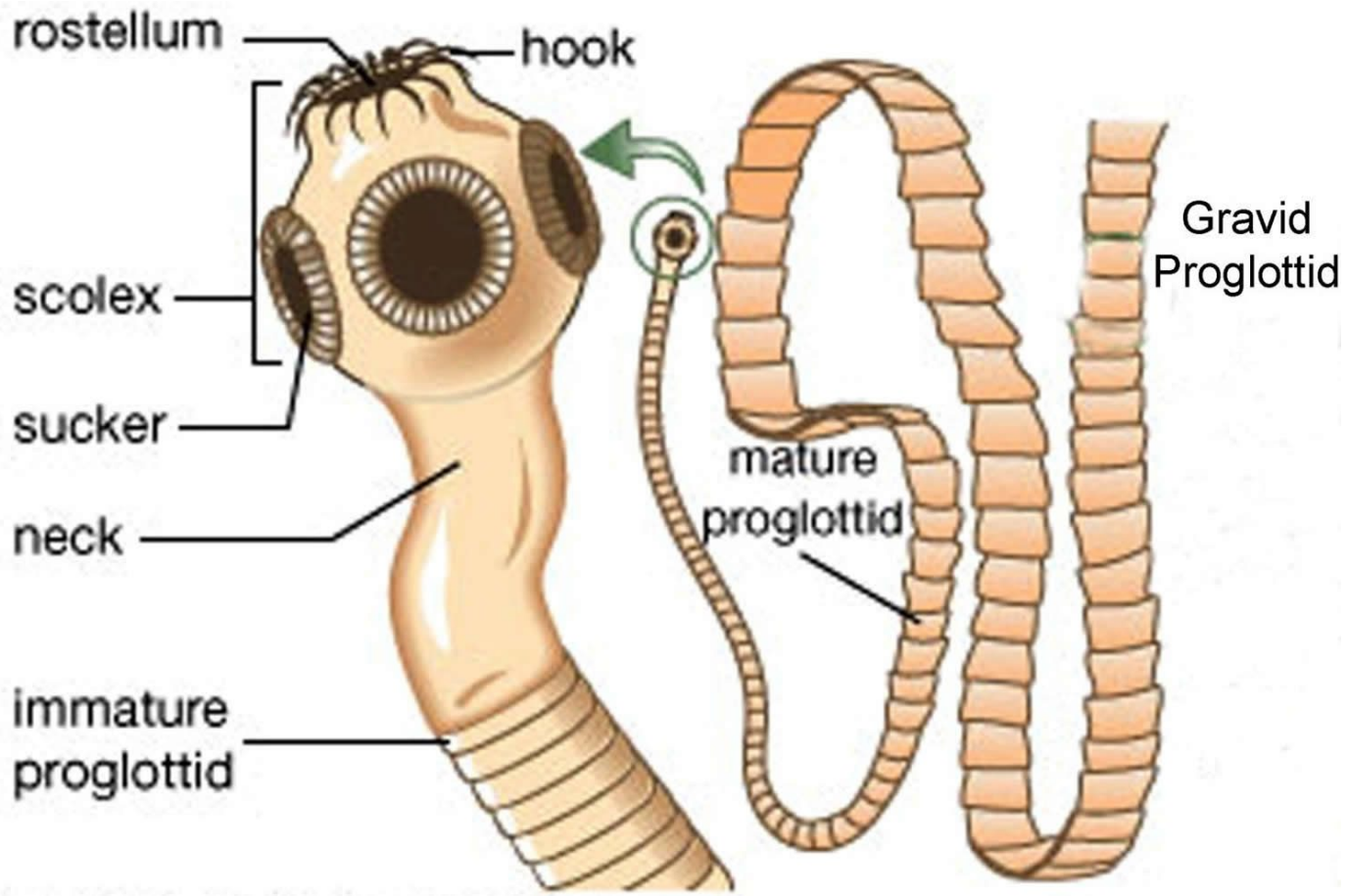
Cestoda

Cestodes are multisegmented, dorsoventrally flattened tape -like worms whose sizes vary from a few millimeters to several meters. The adult worms a re found in the small intestine of humans.

Tapeworms: General characteristics

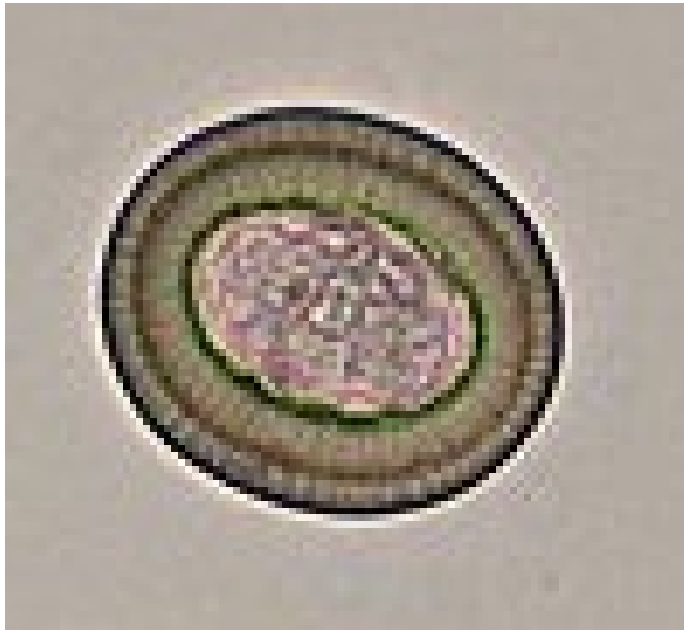
Adult worm consist of three parts:

- Scolex
- Neck
- Trunk(proglottids)

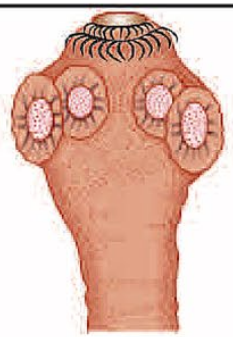
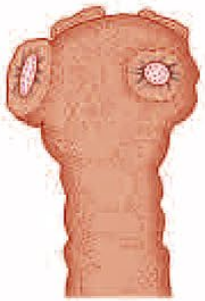
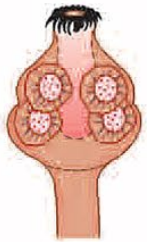
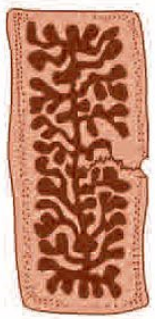
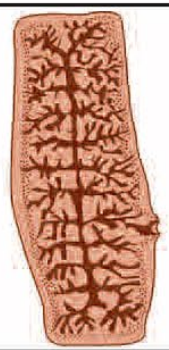


- Eggs
  - The eggs of Cyclophyllidea and Pseudophyllidea are different from each other
  - The embryo inside the egg is called the *oncosphere* (meaning *hooked ball)* because it is spherical and has hooklets. Oncospheres of human tapeworms typically have three pairs of hooklets and so, are called *hexacanth* (meaning *six-hooked)* embryos.

Cyclophyllidean egg	Pseudophyllidean egg
Covered by two layers: (1) egg shell and (2) embryophore	Covered by one layer: egg shell
Spherical	Ovoid in shape
Embryonated from the beginning	Freshly-passed eggs in feces are unembryonated
Eggs are not operculated and the embryo is not ciliated	Eggs are operculated and the embryo is ciliated



Examples of Tapeworms

	Taenia solium	*Taenia saginata*	*Hymenolepis nana*	*Hymenolepis diminuta*	*Diphyllobothrium latum*	*Echinococcus granulosus*
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

Taenia Saginata and Taenia Solium

Common Name

- *Taenia saginata:* Beef tapeworm
- *Taenia solium:* Pork tapeworm.

- The name *Taenia* is derived from the Greek word meaning *tape or band*. It was originally used to refer to most tapeworms but is now restricted to the members of the Genus *Taenia*.
- *Taenia saginata* is worldwide in distribution, but the infection is not found in vegetarians and those who do not eat beef.
- *Taenia solium* is also worldwide in distribution except in the countries and communities, which proscribe pork as taboo.

Morphology

	Taenia Saginata	***Taenia solium***
Length	5-10 meter	2- 3 meter
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)	20mmx 5mm	12mmx6mm

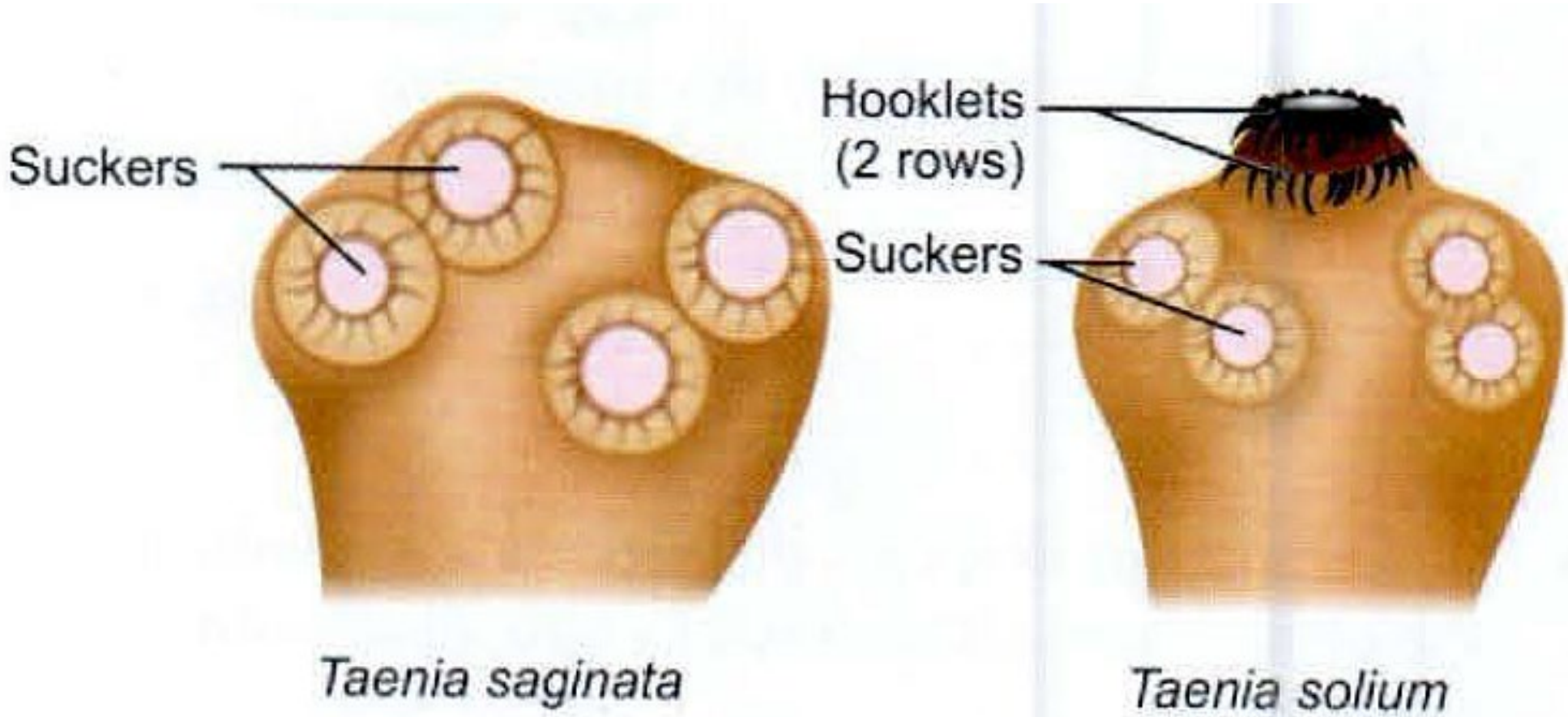


Fig. 8: Scolex of *Taenia saginata* and *Taenia solium*

	Taenia Saginata	***Taenia solium***
Expulsion	Expelled singly	Expelled passively in chains of 5 or 6
Larvae	Cysticercus bovis; present in cow not in man	Cysticercus cellulosae; present in pig and also 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

Cysticercus bovis:

- It is the larval form of *T. saginala*.
- The larva (cysticercus bovis) is the *infective stage* for humans.
- They can be seen on visual inspection as shiny white dots in the *infected beef* .

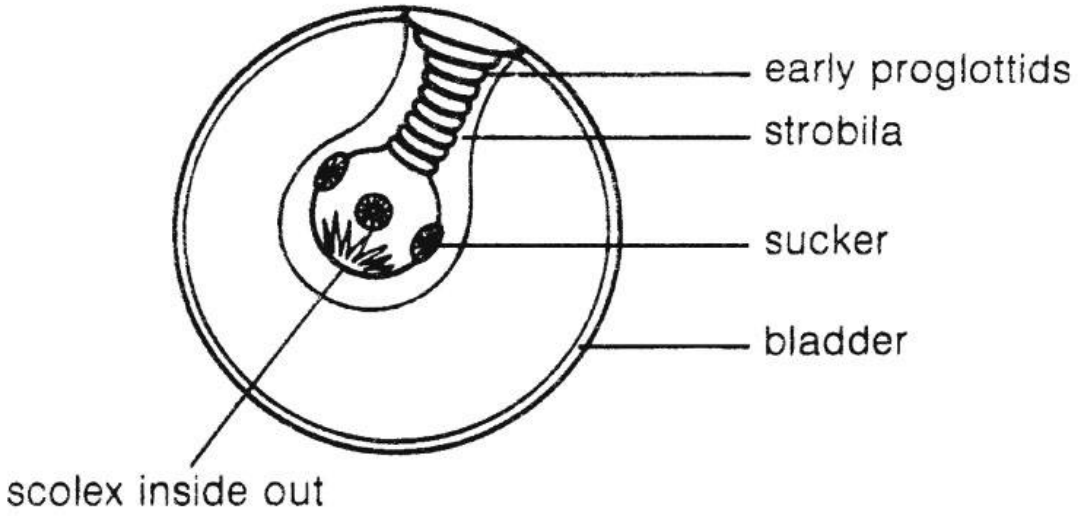


Fig. 126 **Cysticercus**. Generalized structure.

Cysticercus cellulosae:

- It is the larval form of *T. solium* and also the *infective form* of the parasite.
- It can develop in various organs of pig as well as in man.

Transmission

Taenia saginata:

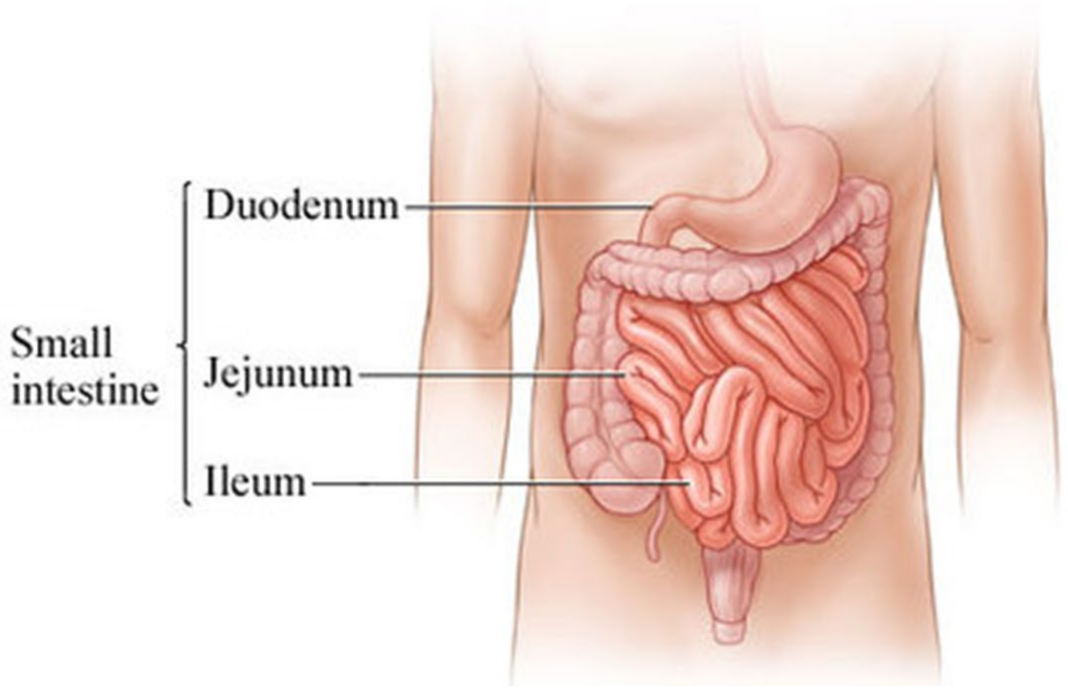
Ingesting undercooked (raw) Beef meat infected with cycticercus bovis that cause **(Taeniasis)**

Taenia solium:

- ingesting undercooked pork meat infected with cysticercus cellulosae **(Taeniasis)**
- Ingesting the egg of taenia solium that cause **(cysticercosis)**

Habitat

Both *Taenia saginata* and *Taenia solium* Adult worms live in the small intestine.



Life cycle

Taenia saginata passes its life cycle in two hosts**:**

1. ***Definitive host:*** Humans are the definitive hosts and harbor the adult worm.

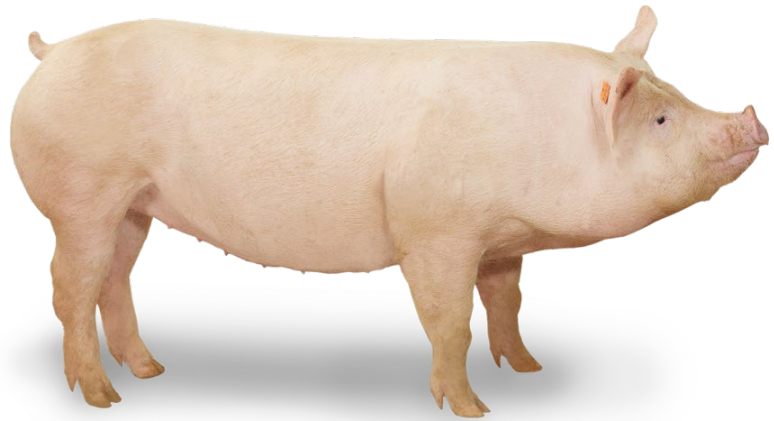
2. ***Intermediate host:*** Cattle (cow or buffalo) are the intermediate host and harbor the larval stage of the worm. *Infective stage:* Cysticercus bovis (larval stage)

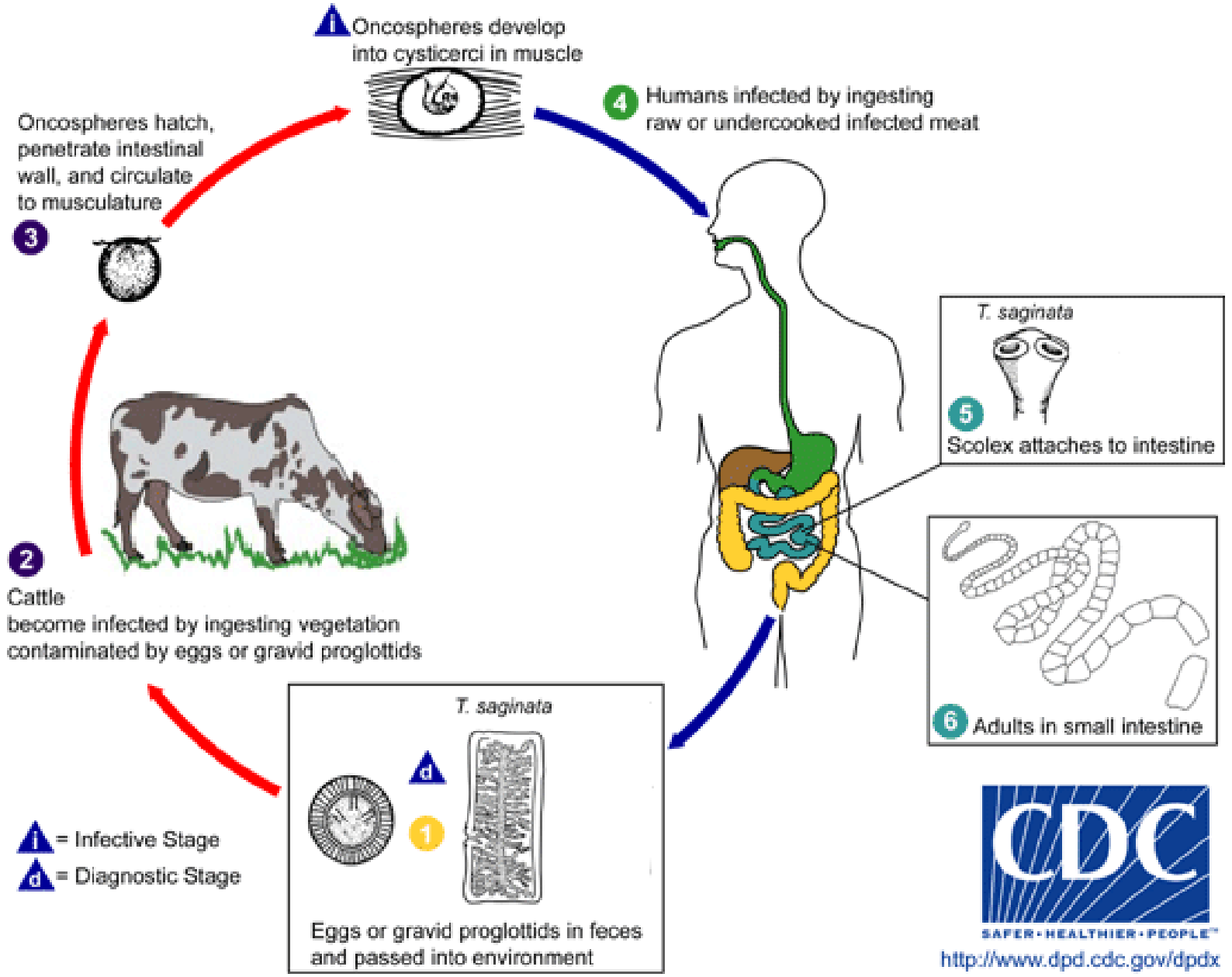
Life cycle

Taenia solium passes its life cycle in two hosts:

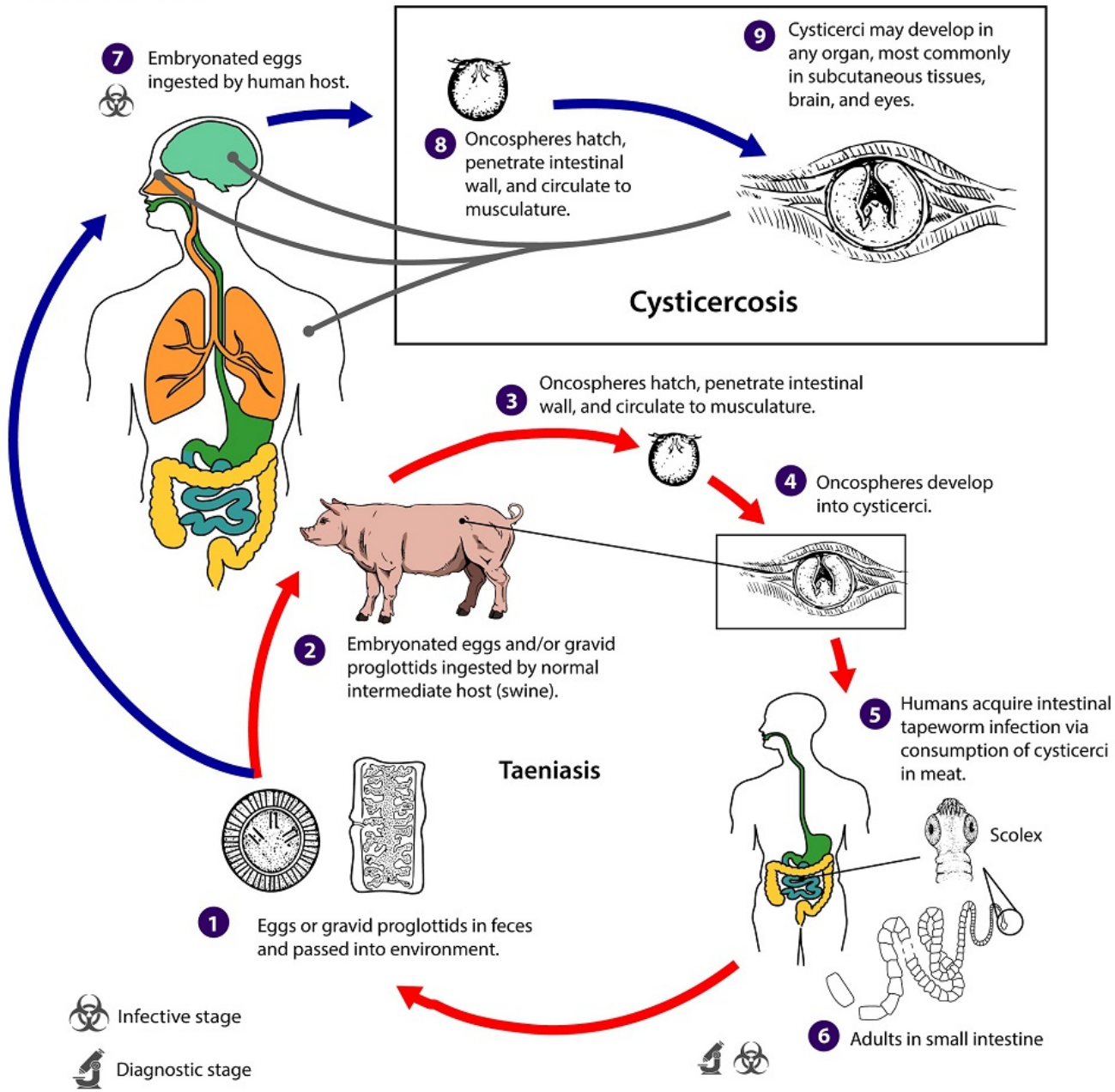
1. ***Definitive host:*** Humans are the definitive hosts and harbor the adult worm.

2. ***Intermediate host:*** Pigs are the intermediate host and harbor the larval stage of the worm.




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
T. saginata
5 Scolex attaches to intestine
2 Cattle become infected by ingesting vegetation contaminated by eggs or gravid proglottids
6 Adults in small intestine
T. saginata
d
1
Eggs or gravid proglottids in feces and passed into environment
i = Infective Stage
d = Diagnostic Stage
CDC
SAFER·HEALTHIER·PEOPLE™
http://www.dpd.cdc.gov/dpdx

Taenia solium



Laboratory Diagnosis

1- Taeniasis:

- **Microscopy:** Diagnosis of *Taenia* tapeworm infections is made by examination of stool samples; individuals should also be asked if they have passed tapeworm segments. Tapeworm eggs can be detected in the stool 2 to 3 months after the tapeworm infection is established.

- **Serodiagnosis:** Specific antibodies to adult stage antigen in serum can be demonstrated by ELISA,

2- Cysticercosis:

Muscle Biopsy

Neurocysticercosis usually requires imaging (MRI or CT brain scans)

Echinococcus granulosus

Geographical distribution

Cosmopolitan, the disease is common in east Africa

Disease which causes:

Echinococcosis or hydatidosis (hydatid disease)

Habitat

The adult of *Echinococcus granulosus* live in the small intestine of carnivores (specially canids) and the larval stage hydatid cyst are found in various organ of mammalian intermediate host.

Morphology (adult)

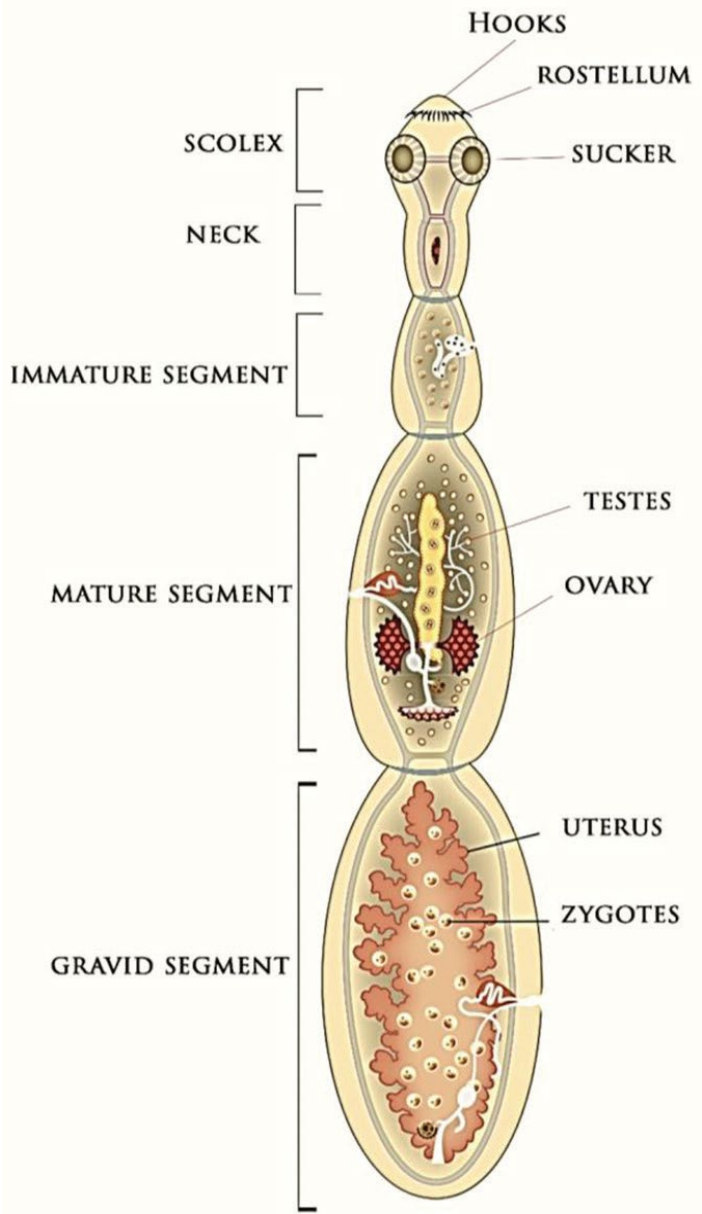
1- Adult worm is a small tape worm and measures 2-9mm in length.

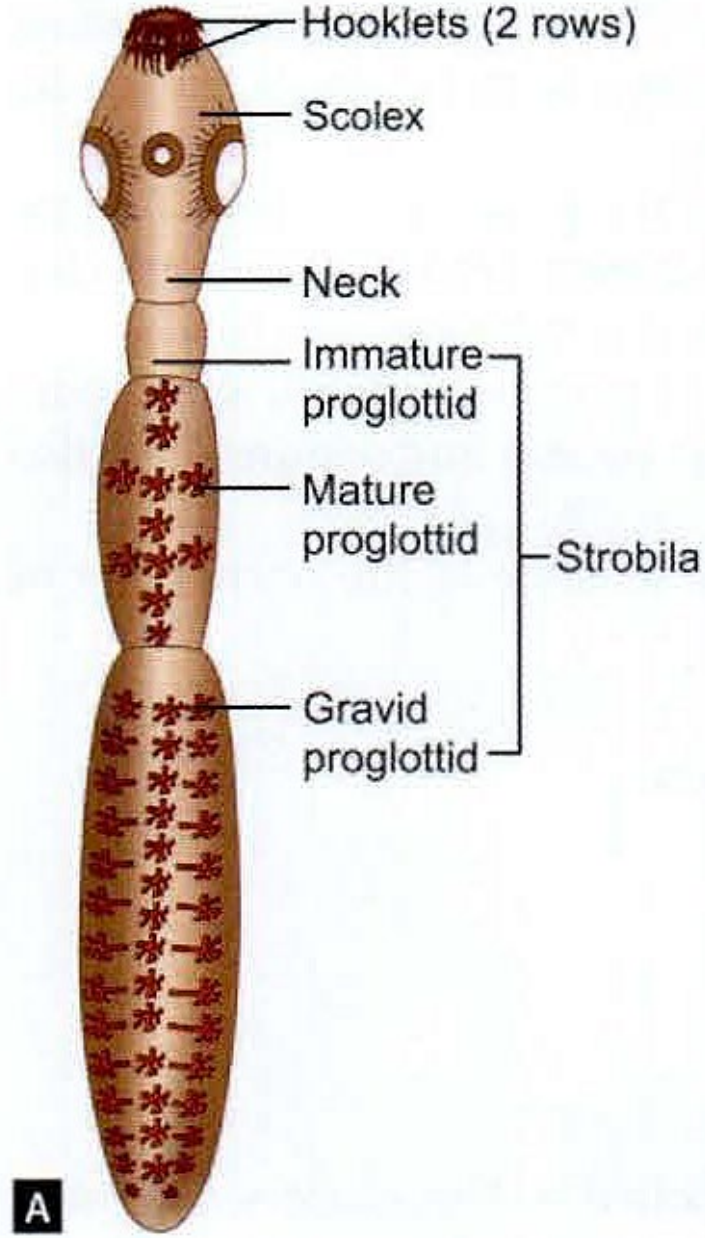
2- The scolex is pyriform provided with 4 suckers and a rostellum with double crown of large and small hooklets.

3- It has an attenuated neck; usually only one immature proglottid, one mature proglottid, and one gravid proglottid.

5- Larva is known as hydatid cyst

Echinococcus granulosus (adult)

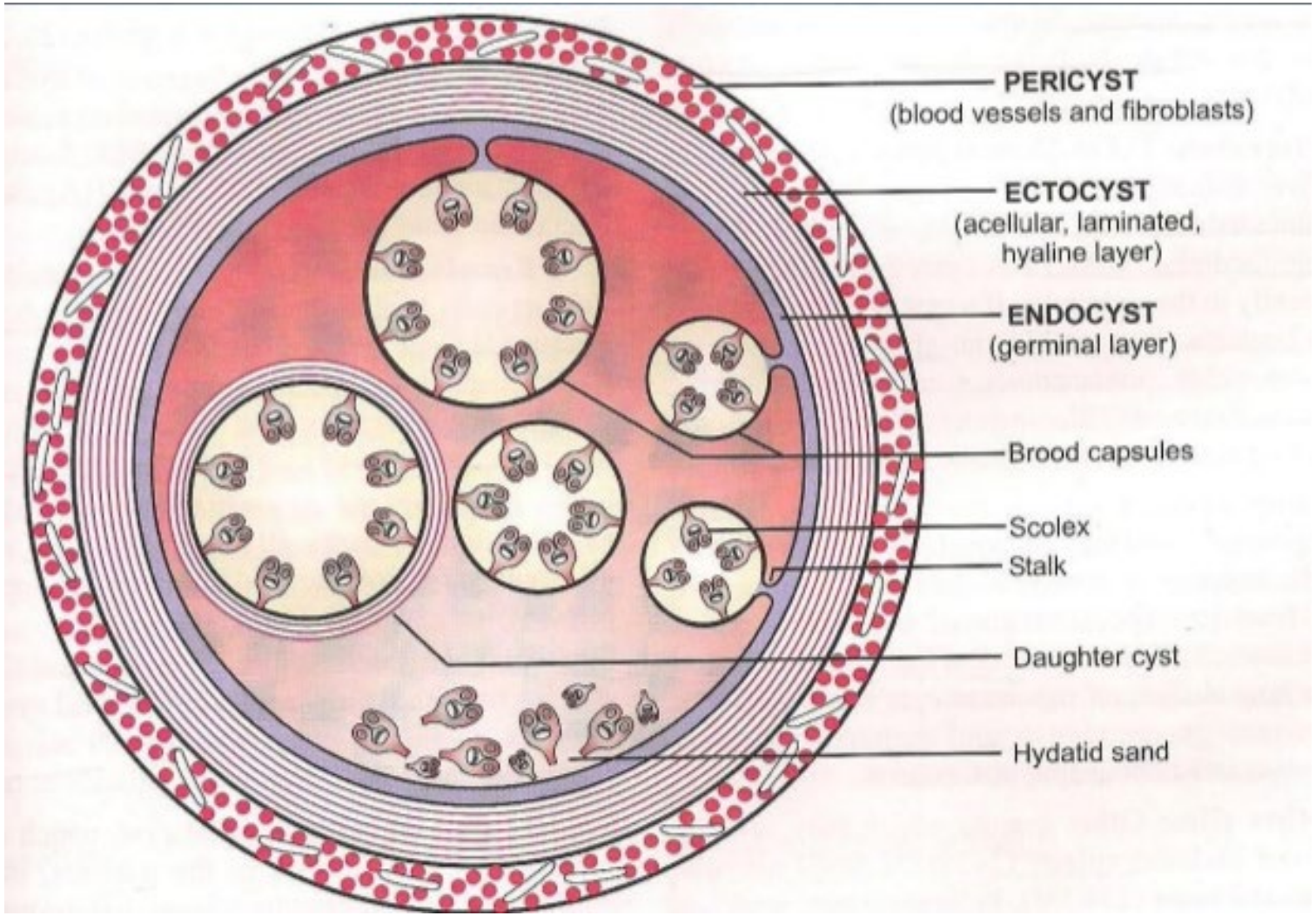



Hooklets (2 rows)
Scolex
Neck
Immature proglottid
Mature proglottid
Gravid proglottid
Strobila
A

Hydatid cyst (larvae)

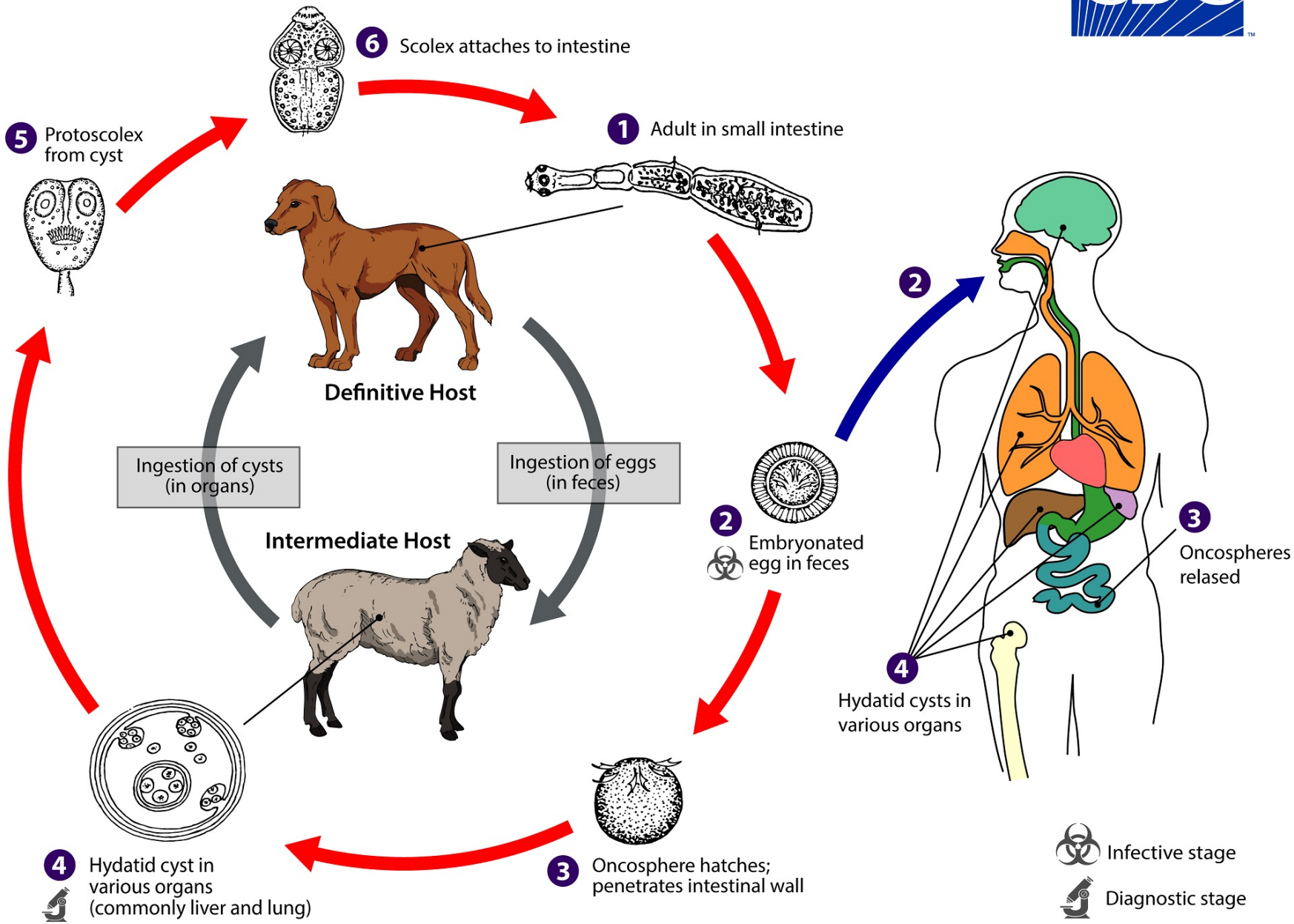
1. When egg swallowed by a suitable intermediate host, it will hatch in the duodenum, the oncosphere migrate through the intestinal wall, enters the mesenteric venules bed in various organs tissues. They begin to develop a cystic cavity and it becomes young hydatid cyst.
2. After 5 months the hydatid cyst has reached a diameter of 1cm and has differentiate to (outer layer and inner layer)

Hydatid cyst



Cystic Echinococcosis

Echinococcus granulosus sensu lato



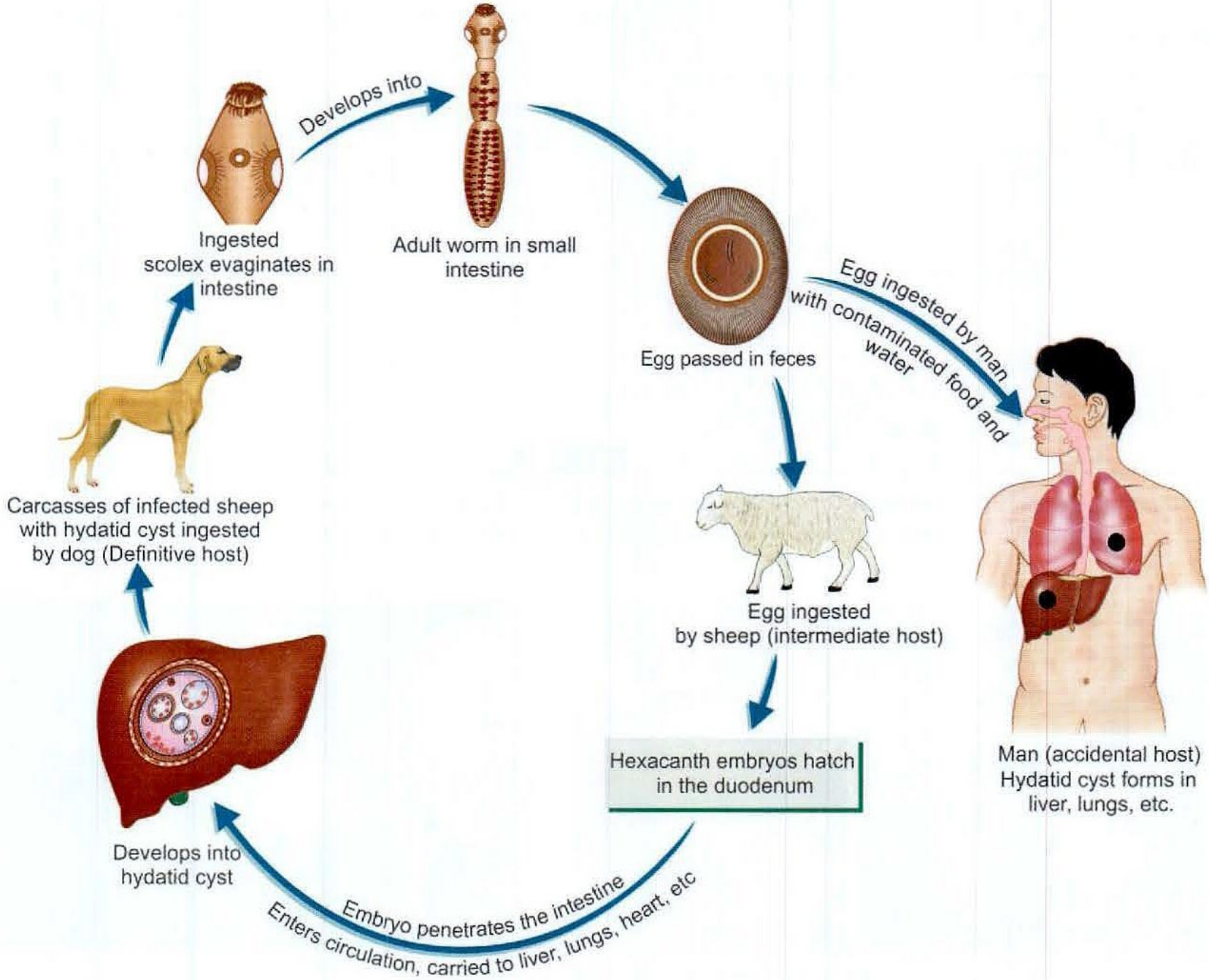


Fig. 17: Life cycle of *Echinococcus granulosus*

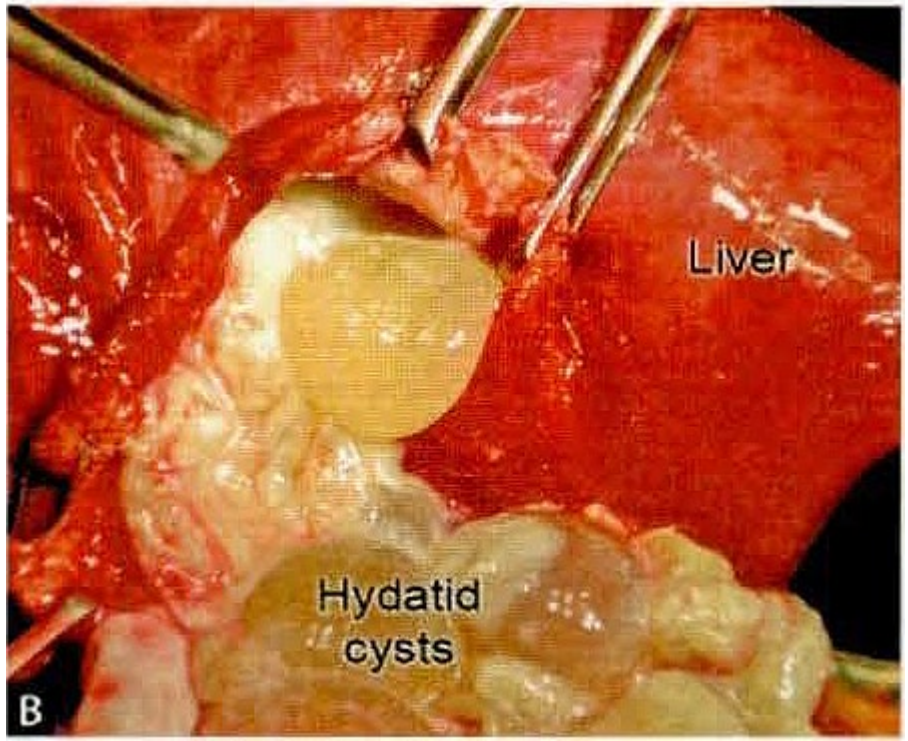
Definitive host

Intermediate hosts

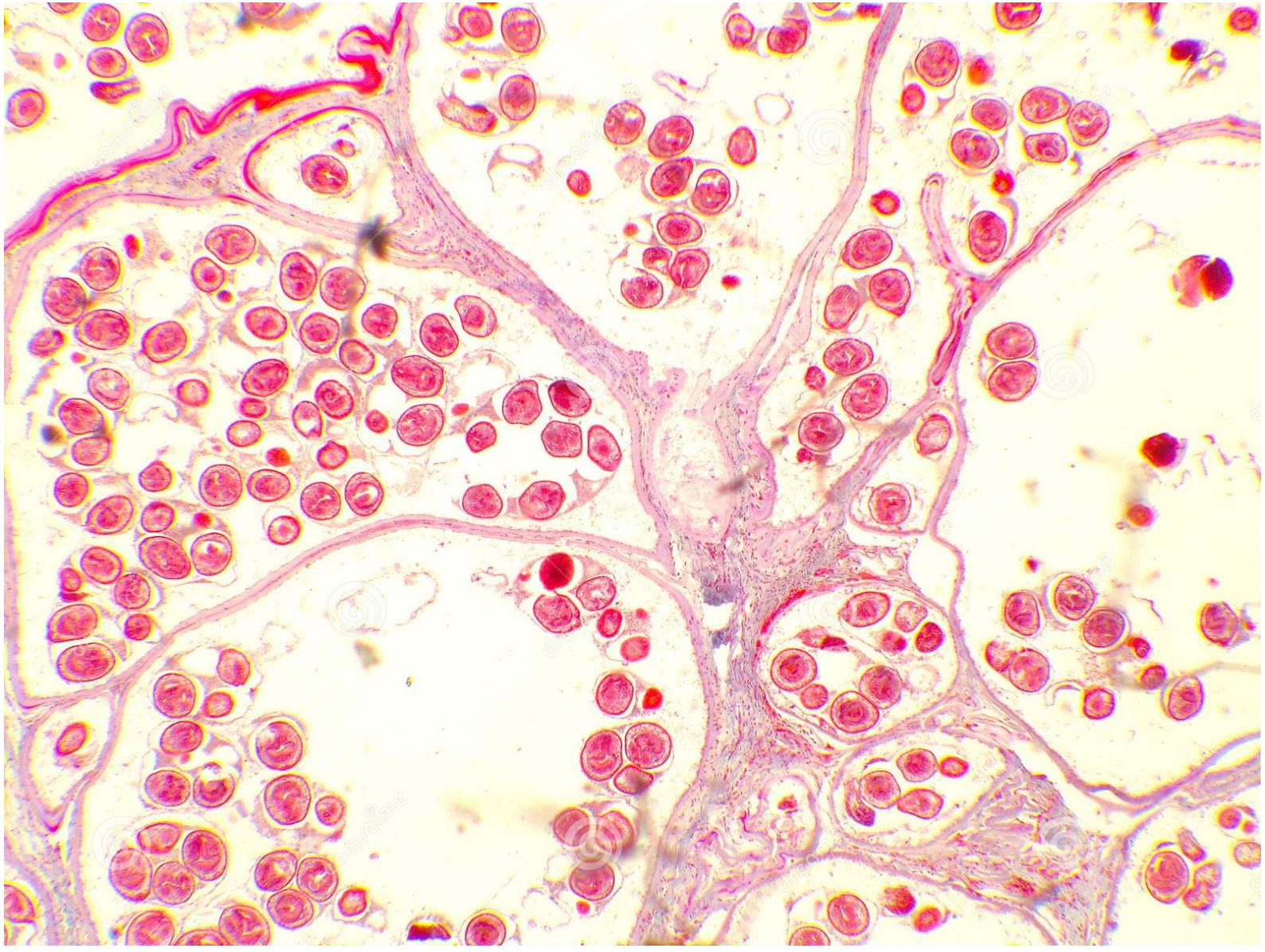
Adult worm

Hydatid cyst
(larvae)

Hydatid cyst in Liver

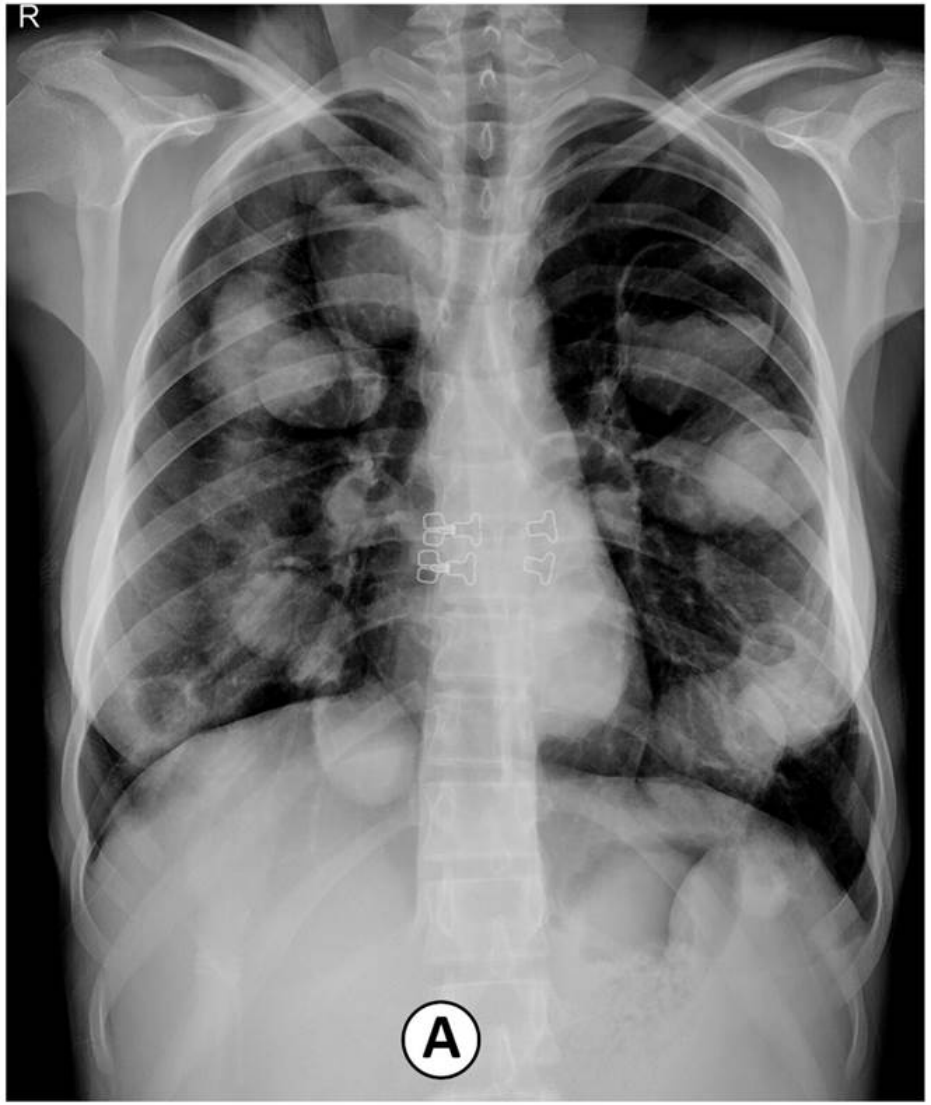


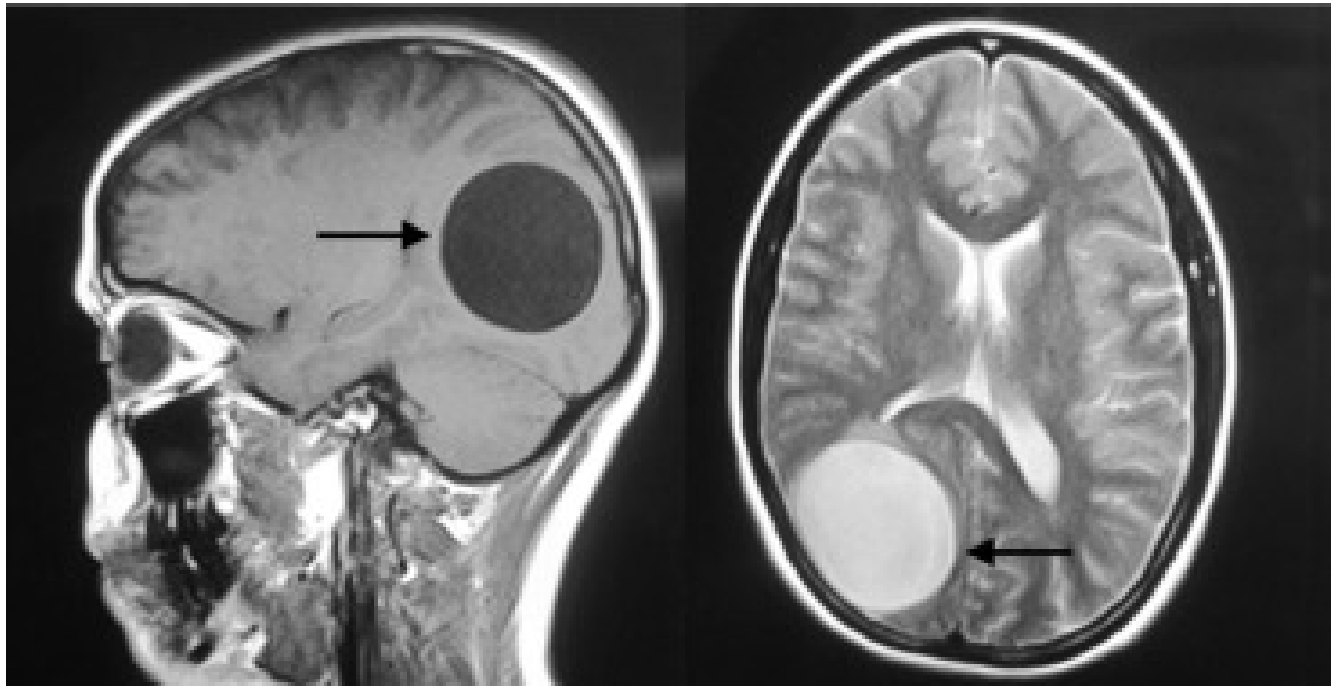
Hydatid cyst: *Ecchinococcus granulosus* larvae

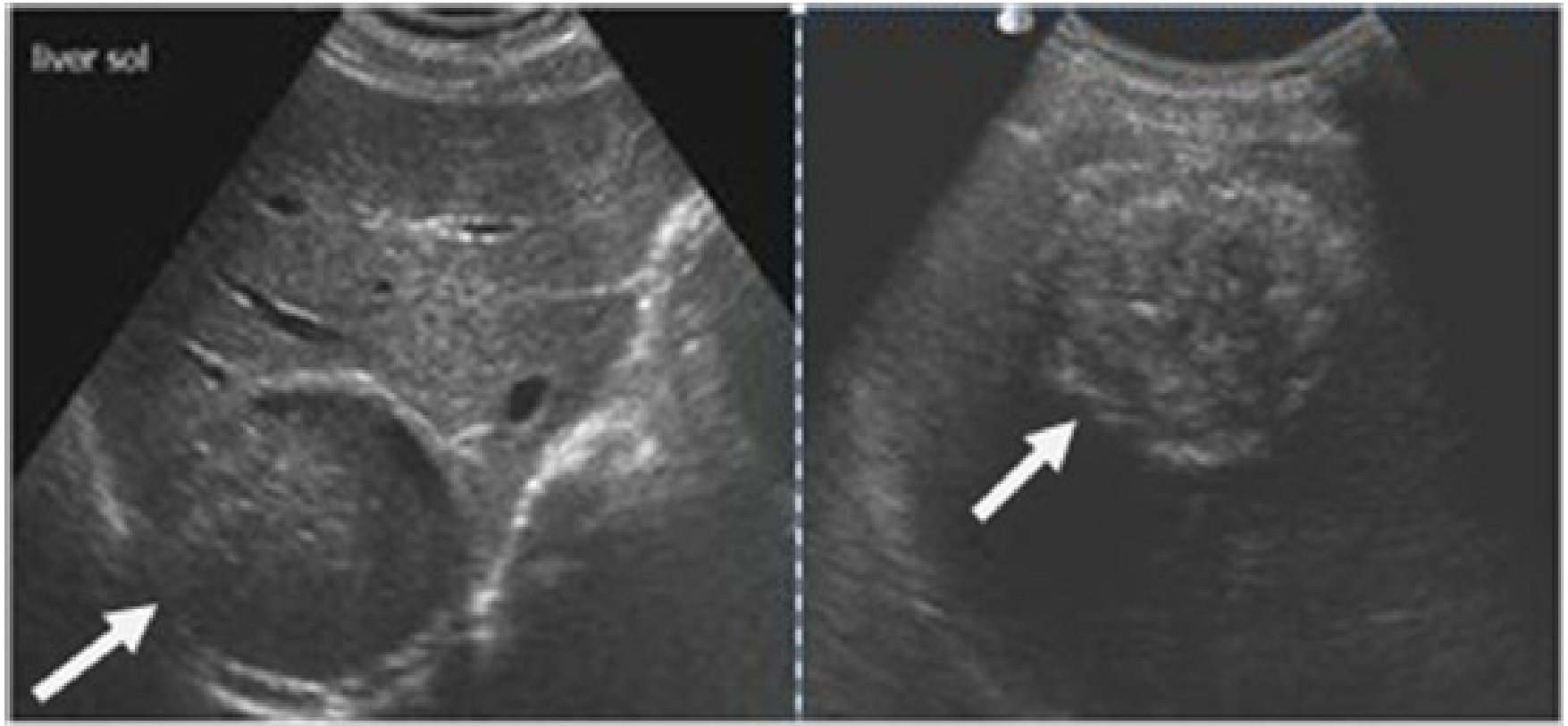


Diagnosis of hydatid disease

1. X-ray examination
2. ultrasound
3. CT scan
4. MRI scan
5. examination of blood, urine, sputum, faeces or other bodily fluids if a burst hydatid cyst is suspected
6. blood tests for antibodies to the cysts.


R
A




liver sol

Fecal fat test

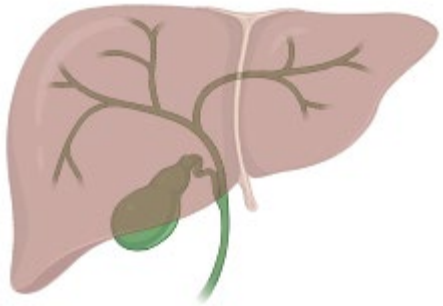
To understand the principle and clinical relevance of the fecal fat test, and to perform microscopic evaluation of stool for qualitative or quantitative detection of fat, particularly in malabsorption syndromes.

Background

The fecal fat test is used to detect excess fat in stool, indicating fat malabsorption or steatorrhea. It helps identify conditions affecting fat digestion and absorption, such as pancreatic insufficiency, bile duct obstruction, or intestinal damage from parasites like Giardia lamblia.

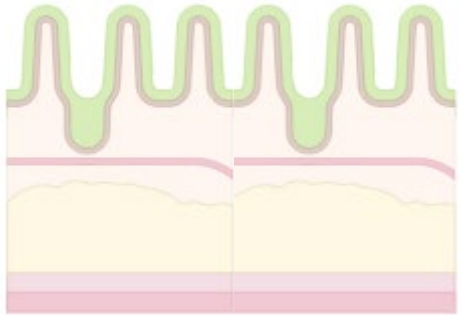
Normal digestion requirements:

Bile (from the Liver and Gallbladder)



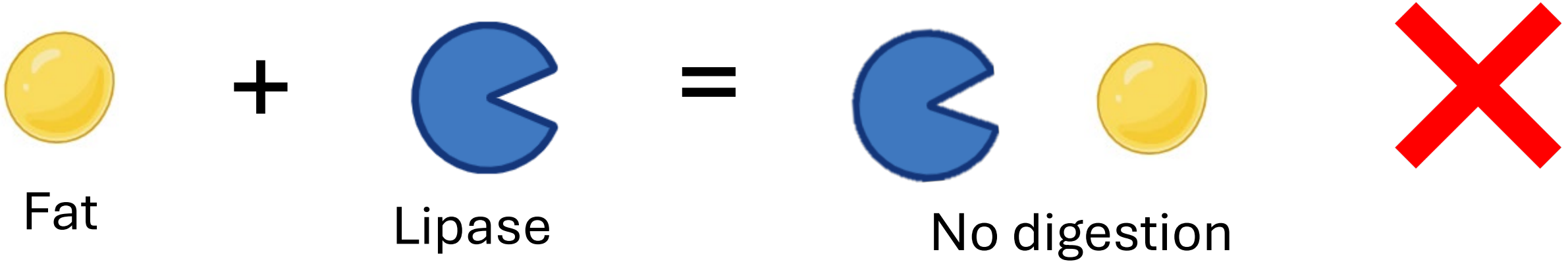
Pancreatic enzymes especially **lipase**

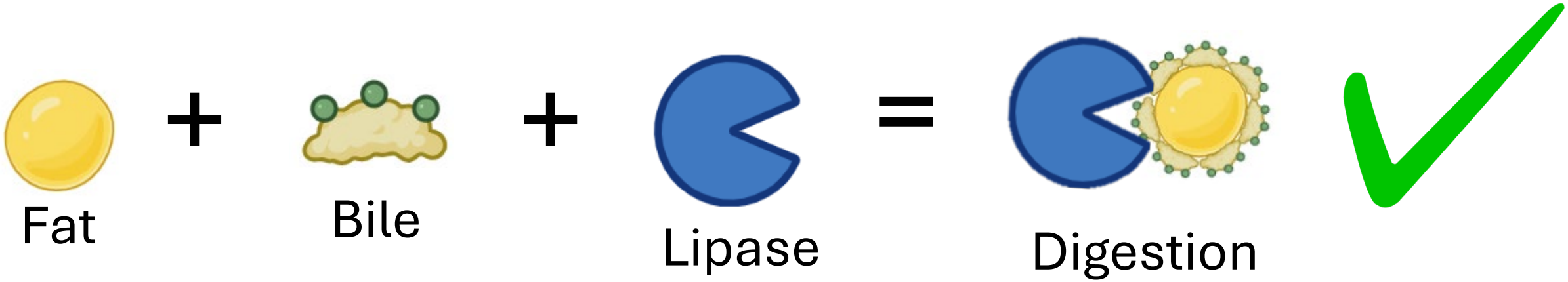
Intact intestinal mucosa



Disruption in any of these → steatorrhea

Digestion of Fat





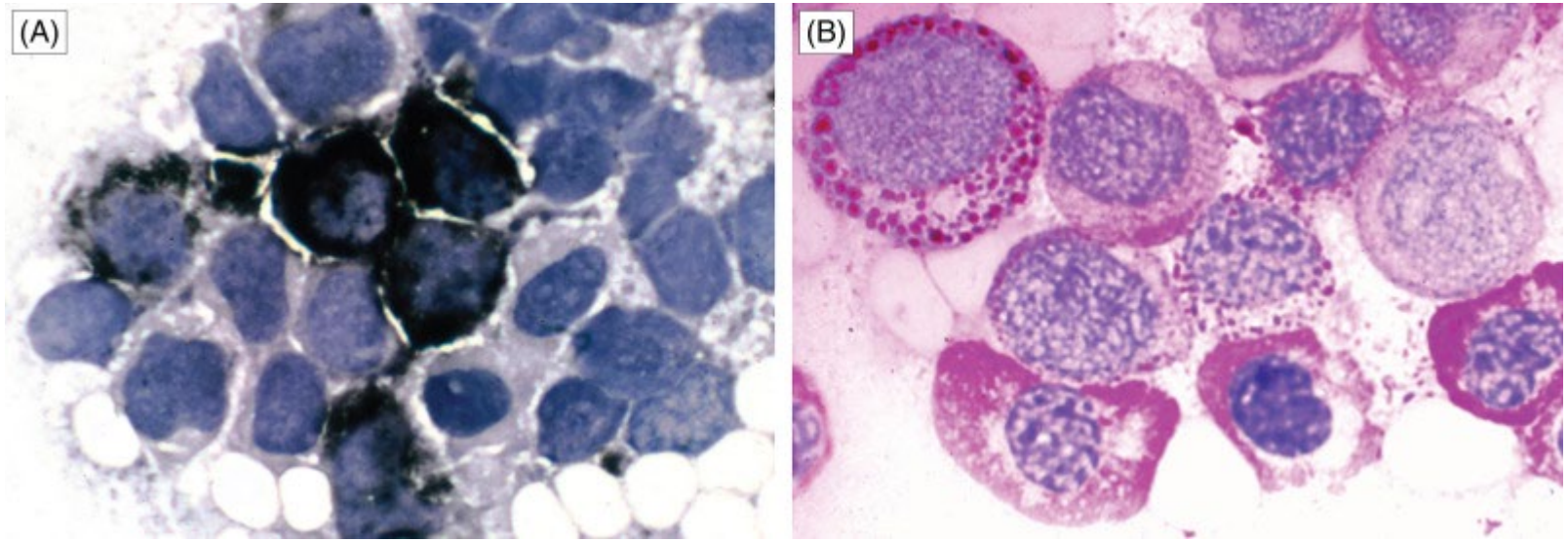
Clinical Significance

Elevated fecal fat is seen in:

1. Parasitic infections.
    - Giardia lamblia damages the small intestinal lining.
    - Strongyloides stercoralis (chronic cases may lead to malabsorption).
2. Pancreatic insufficiency (e.g., chronic pancreatitis, cystic fibrosis)
3. Bile obstruction (e.g., gallstones)
4. Celiac disease, Crohn’s disease

How to test Fecal fat

1. **Qualitative test:** by using Sudan Stain



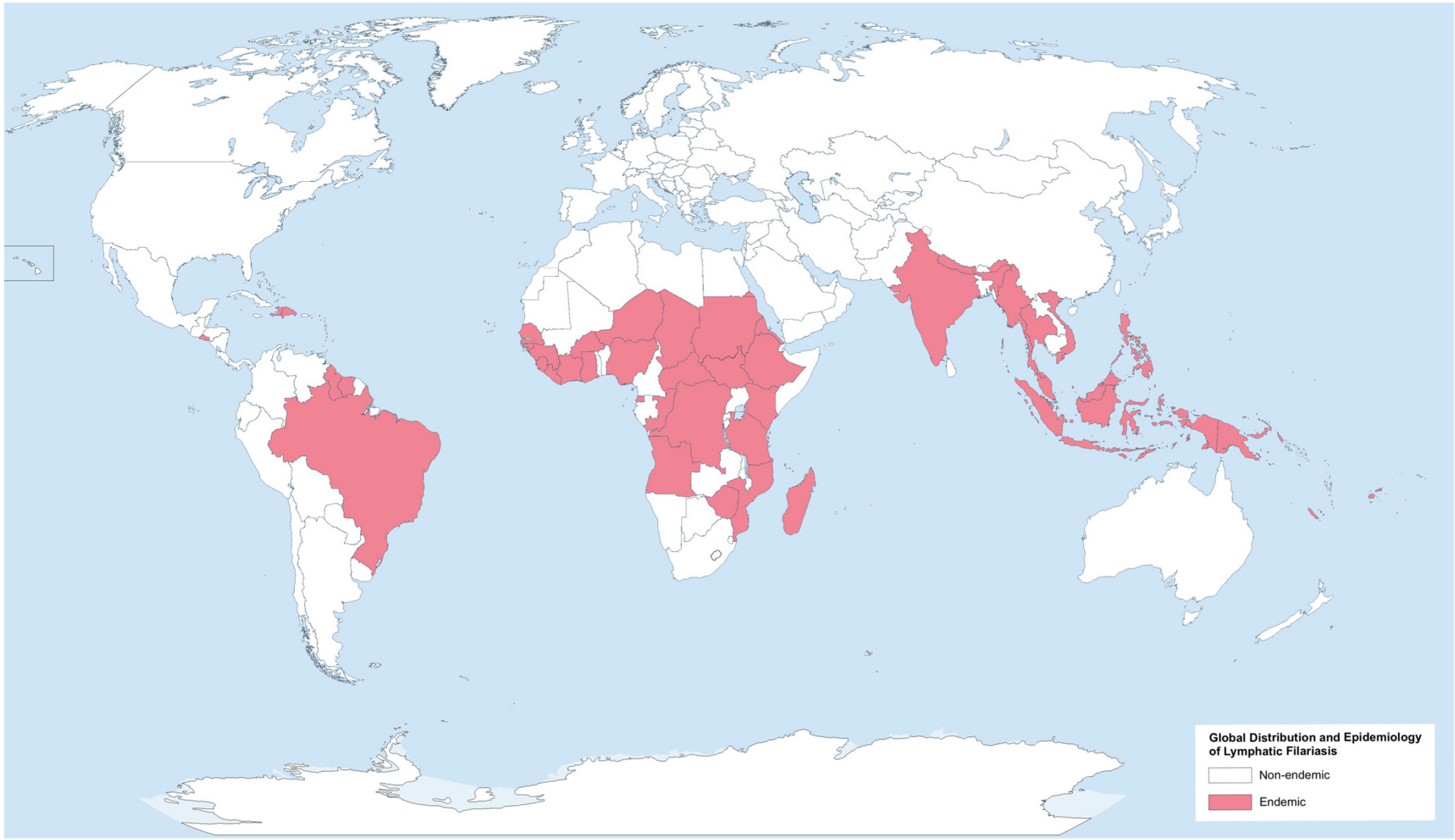
2. Near-infrared spectroscopy (NIRS): by using InfraAnalyzer 2000

Wuchereria bancrofti

Morphology

- ***Adult worm:*** The adults are whitish, translucent, thread-like worms with smooth cuticle and tapering ends.
- The female is larger (70-100 x 0.25 mm) than the male (25-40 X 0.1 mm).
- The posterior end of the female worm is straight, while that of the male is curved vertically and contains two spicules of unequal length.
- Males and females remain coiled together usually in the abdominal and inguinal lymphatics and in the testicular tissues.
- The female worm is ***viviparous*** and directly liberates sheathed microfilariae into lymph.
- The adult worms live for many years, probably 10-15 years or more.

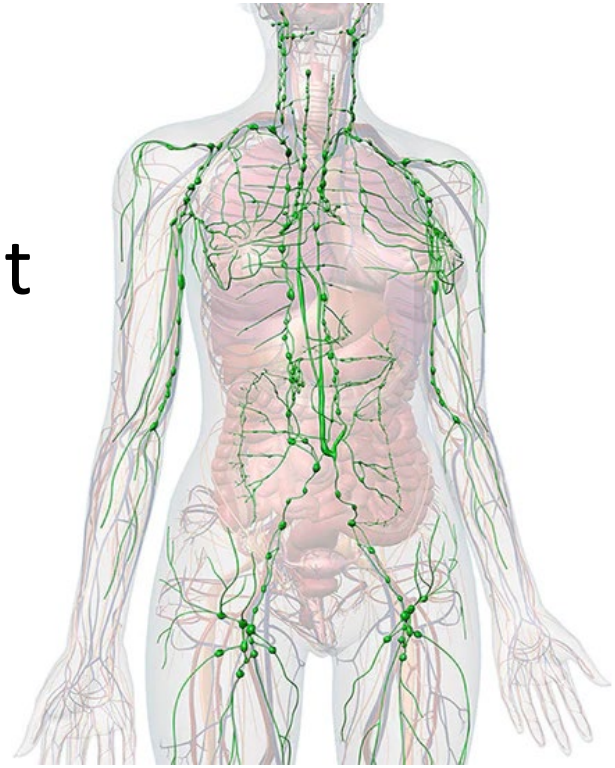
Geographical distribution



Habitat

The adult worms reside in the lymphatic system of man. The microfilariae are found in blood.

Adult



Microfilaria (Larvae)

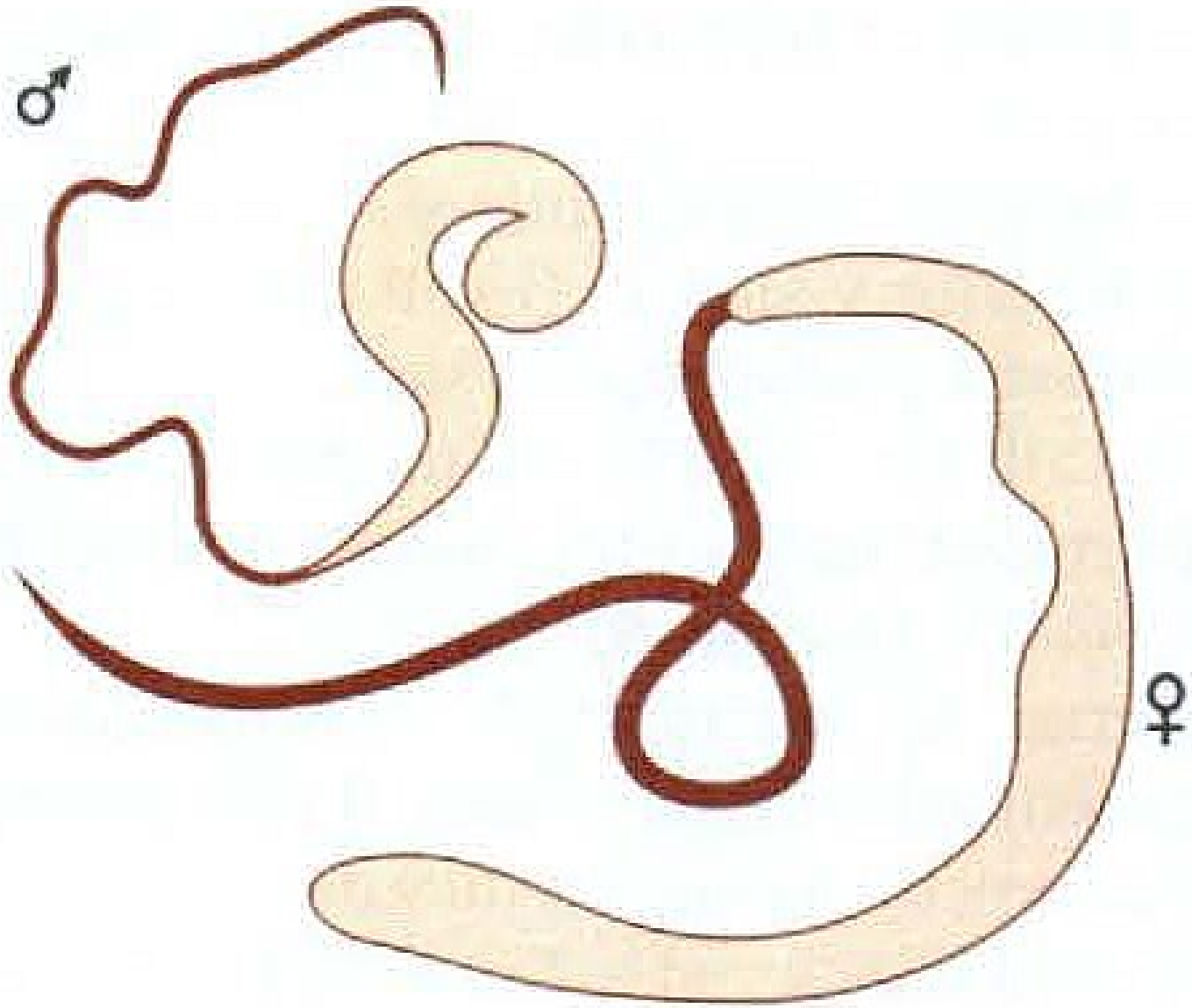


Fig. 2: Adult worm of *Wuchereria bancrofti*

Microfilariae:

The microfilaria has a colorless, translucent body with a **blunt head,** and **pointed tail**

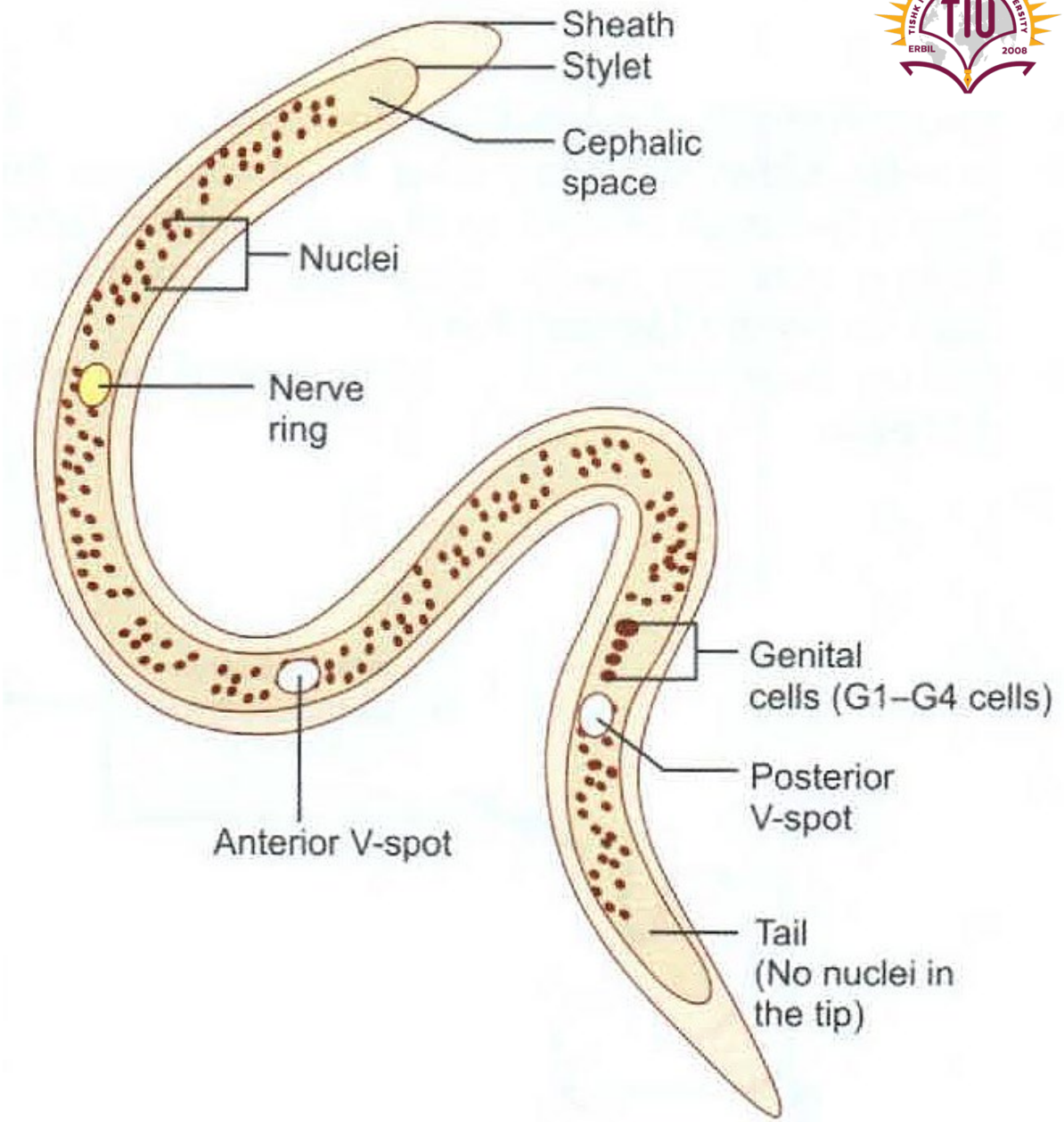
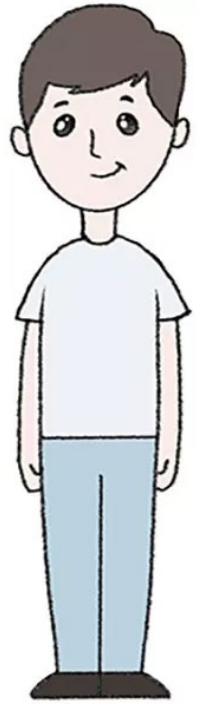


Fig. 3: Morphology of *Microfilaria bancrofti*

Life cycle

- **Definitive host:** Human



- **Intermediate host:** Female mosquitoes of different species act as vectors in different geographic areas.

  Ex/*Culex* sp.

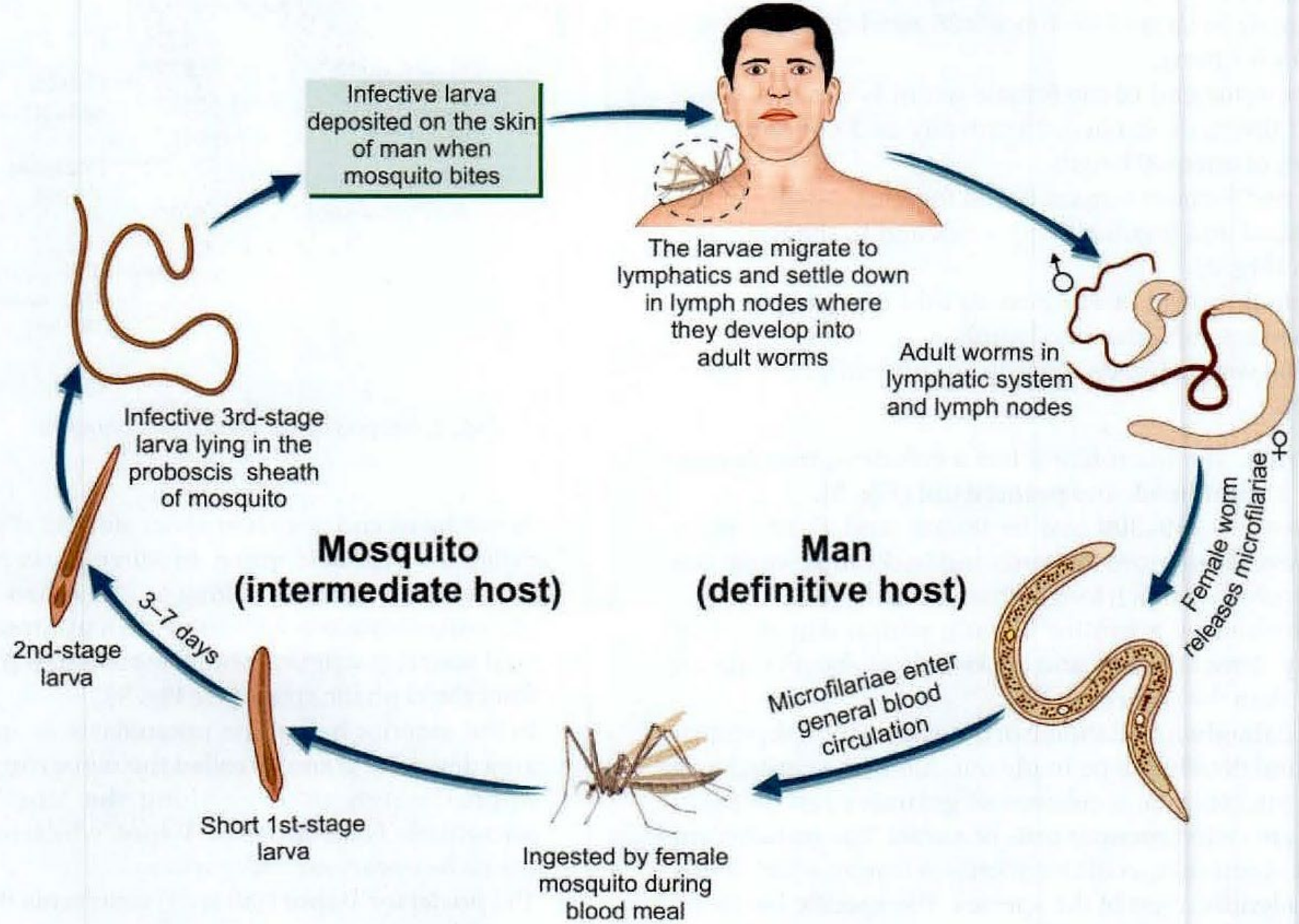
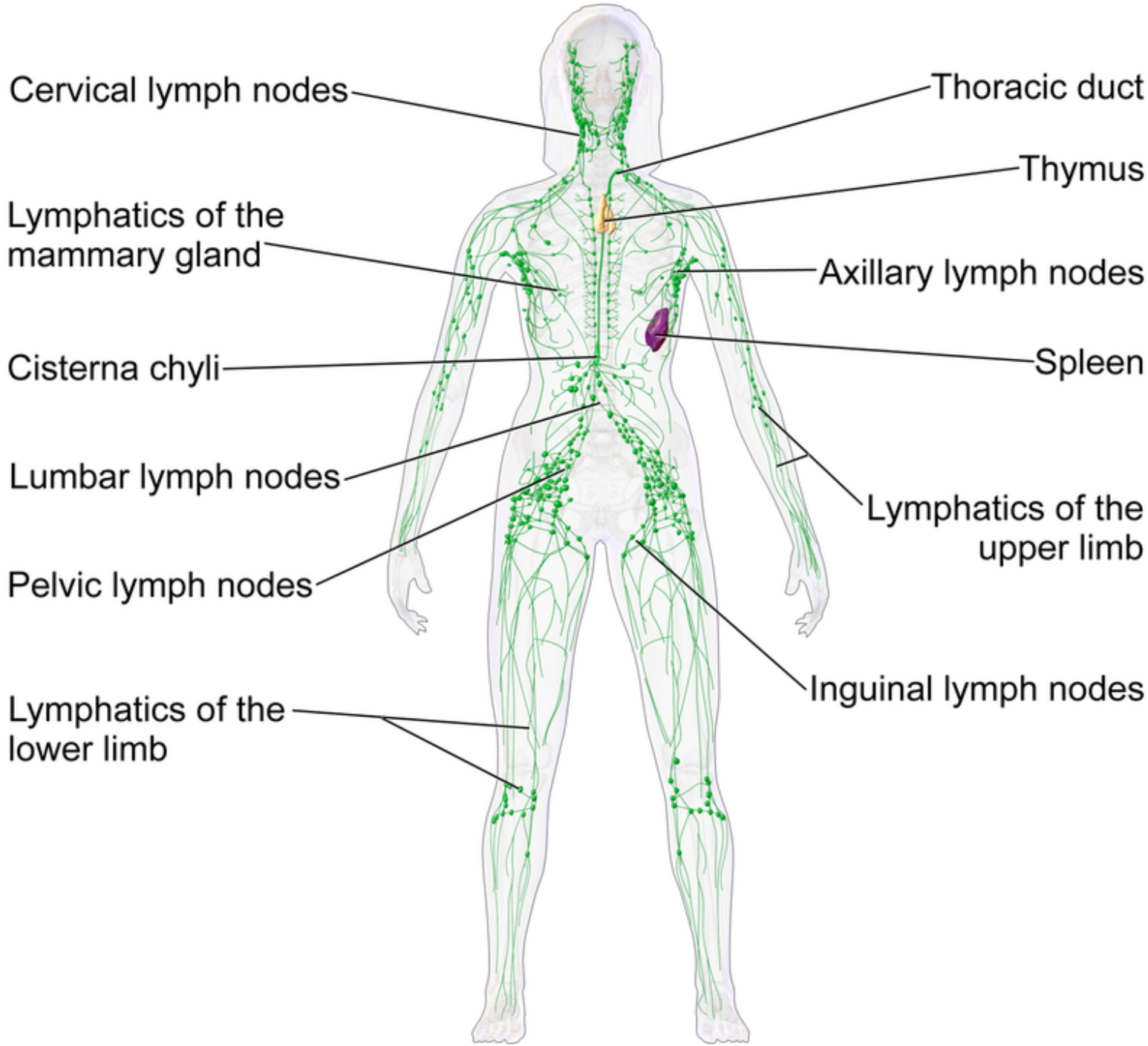


Fig. 4: Life cycle of *Wuchereria bancrofti*

Elephantiasis

Chyluria


Cervical lymph nodes
Thoracic duct
Thymus
Lymphatics of the mammary gland
Axillary lymph nodes
Cisterna chyli
Spleen
Lumbar lymph nodes
Lymphatics of the upper limb
Pelvic lymph nodes
Inguinal lymph nodes
Lymphatics of the lower limb

Diagnosis

Direct Method

1- **Detection of Microfilariae**

- By examination of a thick and thin blood smear, stained with Giemsa stain
- By examination of unstained mount of blood under microscope

2- Detection of adult worm

- Lymph node biopsy
- On X-ray (if worms are calcified)
- High frequency ultrasound and Doppler within the scrotum

Indirect Methods

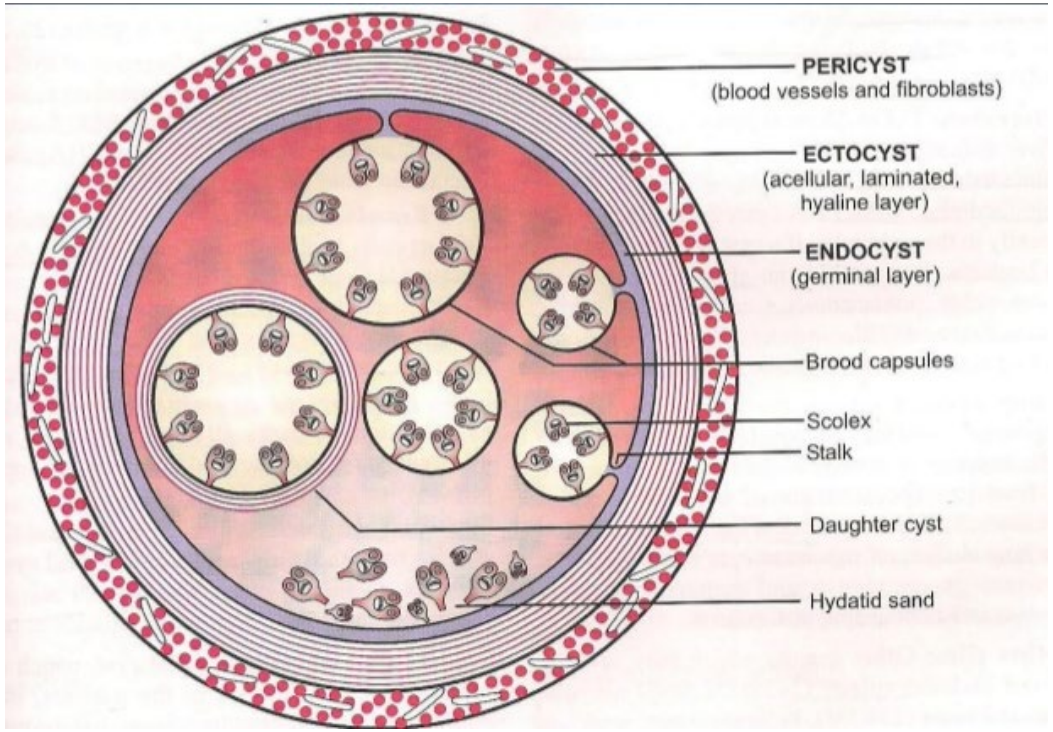
Immunodiagnosis

- ELISA

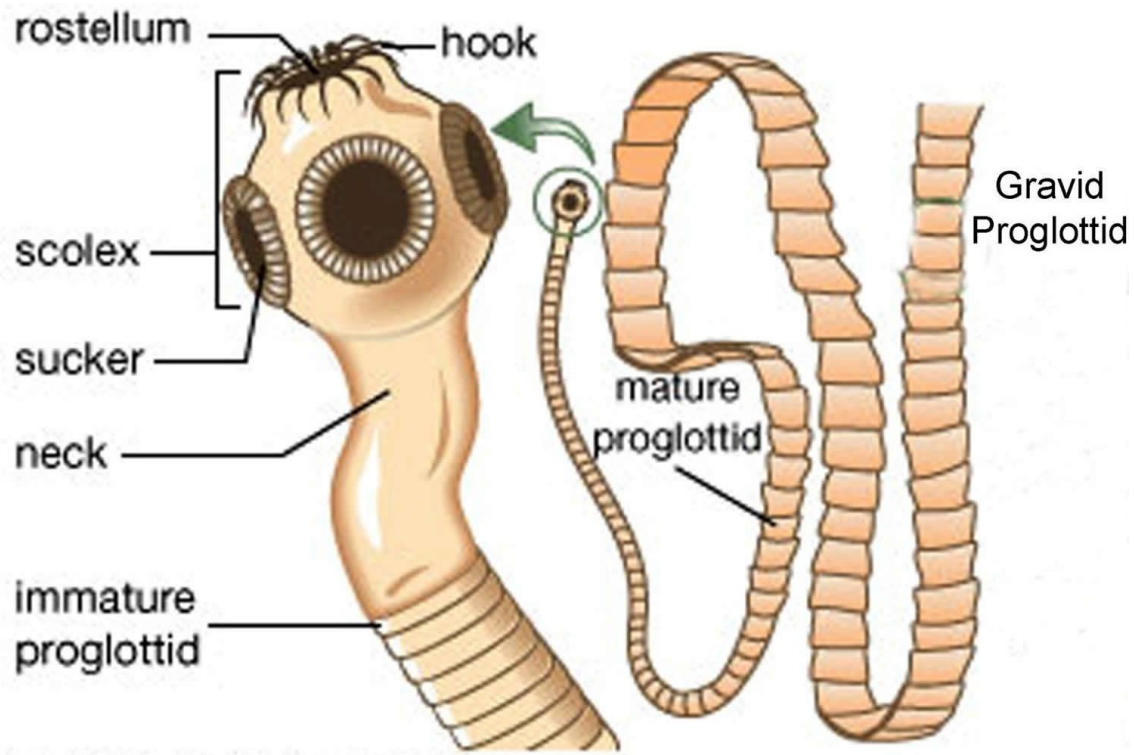
Molecular diagnosis

- PCR

Hydatid Cyst



Taenia sp.



References

- Paniker, C. K. J. & Ghosh, S. 2021. *Paniker's textbook of medical parasitology,* New Delhi, Jaypee Brothers Medical Publishers.