Echnococcus granulosus & Wuchereria bancrofti

Lecturer: Omer Sardar

Medical Parasitology Ⅱ

Summer Semester

Lecture 7

10/09/2025

Echinococcus granulosus

Geographical distribution

The disease is prevalent in most parts of the world, though it is most extensive in the sheep and cattle-raising areas of Australia, Africa and South America. It is also common in Europe, China and the Middle East. It is a significant health problem in India. It is seen more often in temperate than in tropical regions.

Disease which causes:

Echinococcosis or hydatidosis (hydatid disease)

Habitat

The adult of *Echinococcus granulosus* live in the small intestine of carnivores (specially canids)

The larval stage hydatid cyst are found in various organ of mammalian intermediate host.

Morphology (adult)

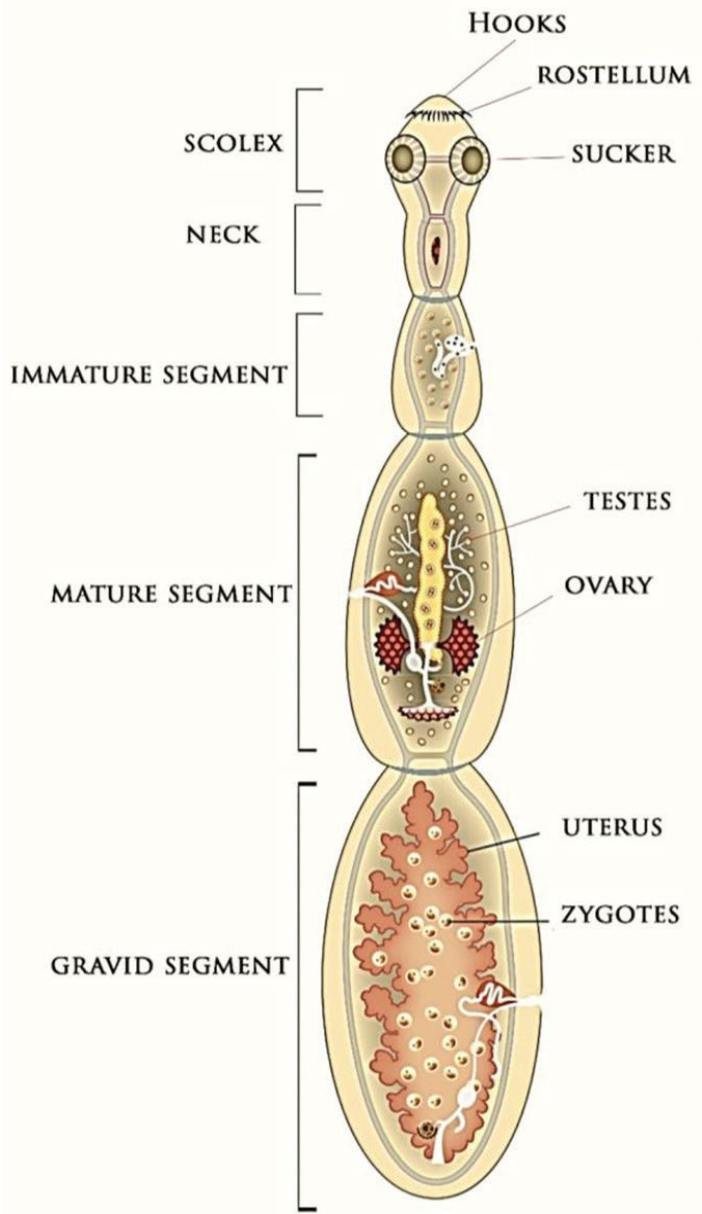
1- Adult worm is a small tape worm and measures 2-9mm in length.

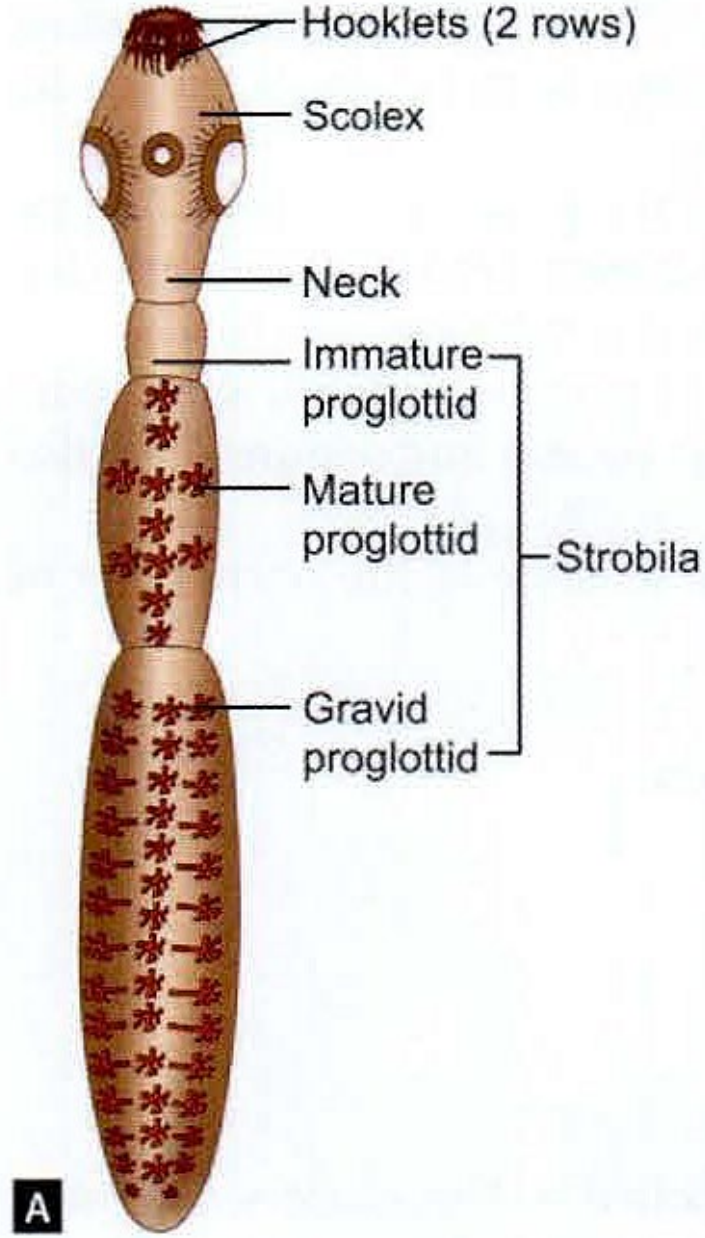
2- The scolex is pyriform provided with 4 suckers and a rostellum with double crown of large and small hooklets.

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)

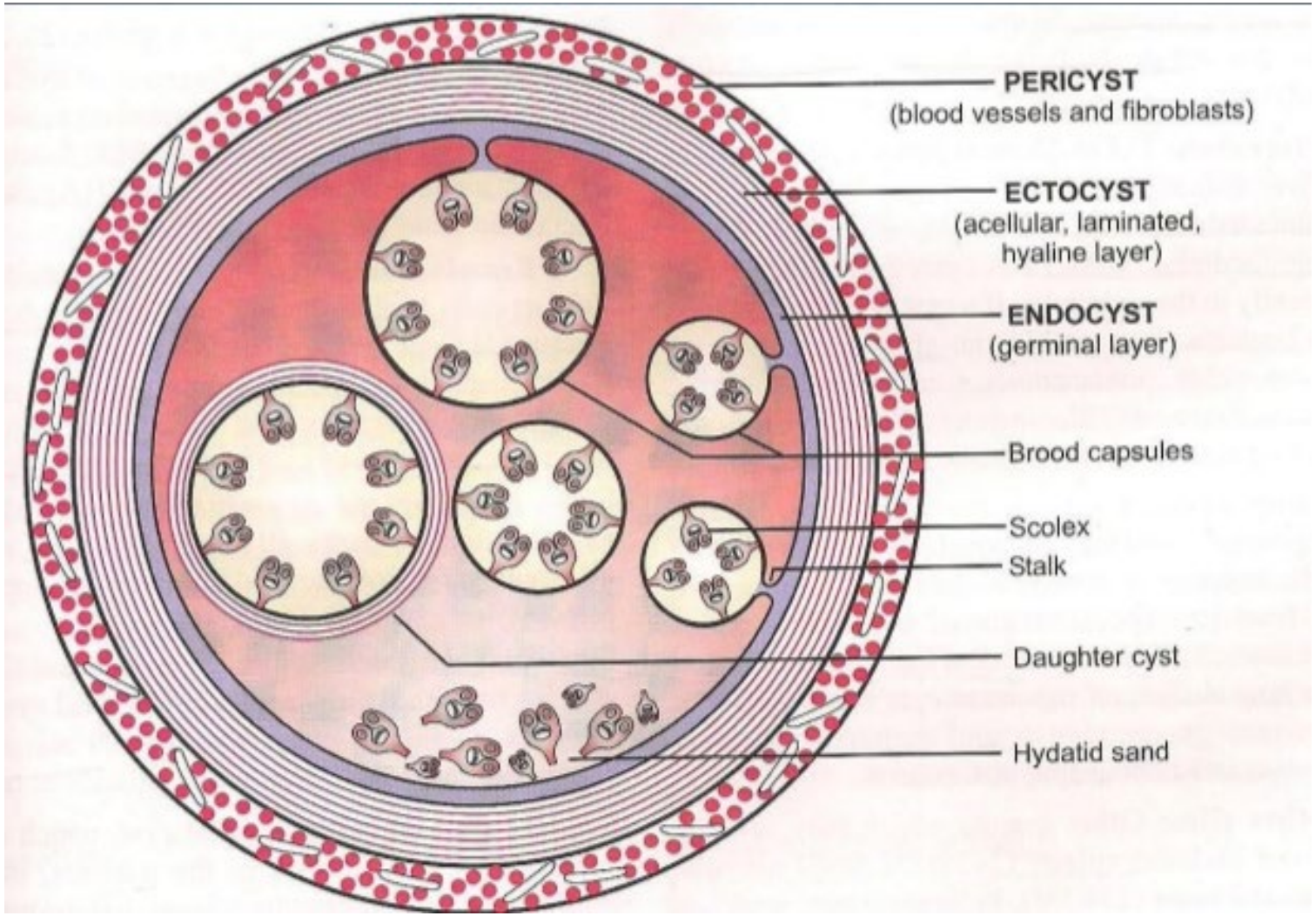



Hooklets (2 rows)
Scolex
Neck
Immature proglottid
Mature proglottid
Gravid proglottid
Strobila
A

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

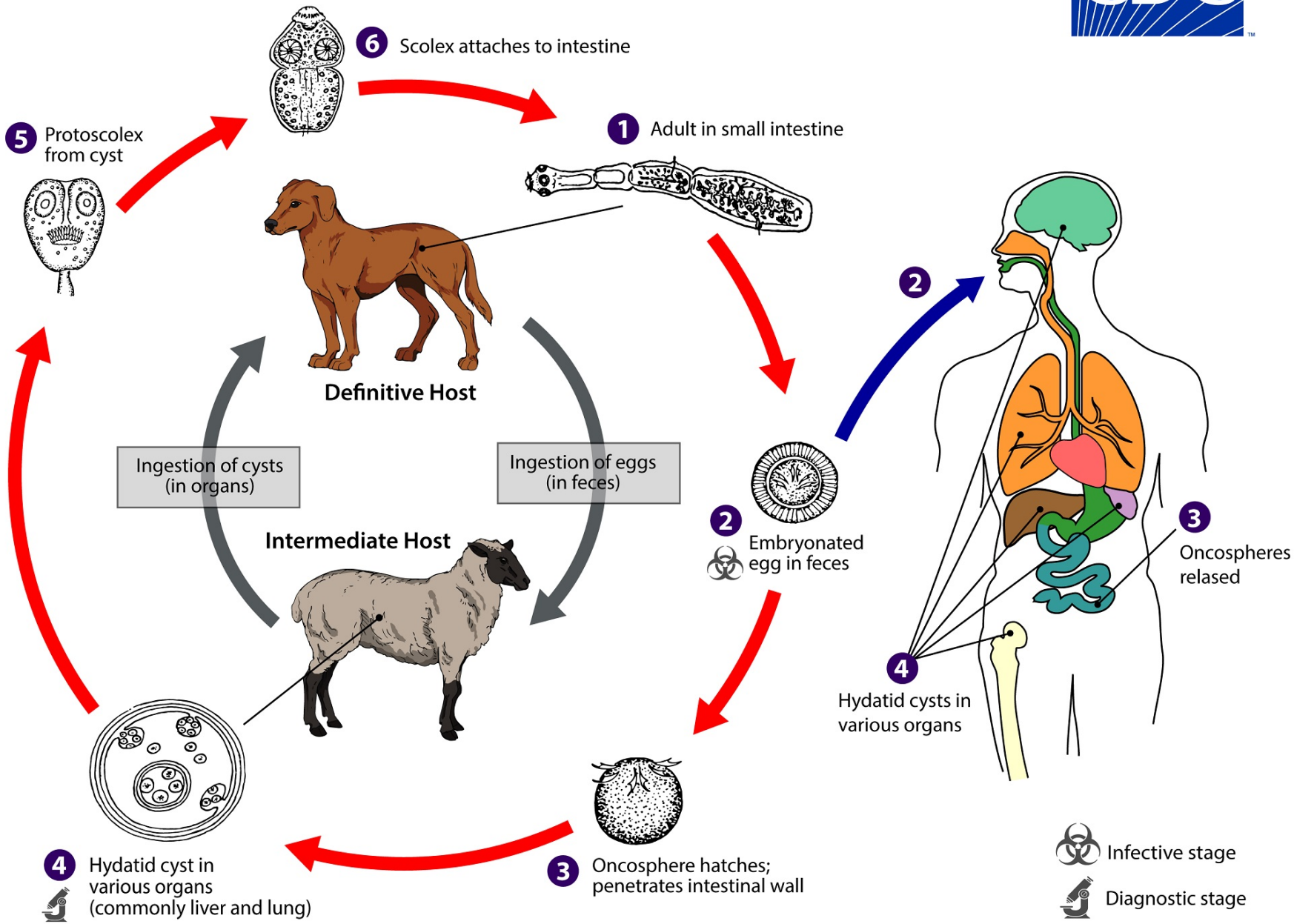


Life Cycle

- The adult worm lives in the small intestine of dogs and other canines (definitive hosts).
- Gravid proglottids release eggs that are passed in feces and contaminate soil, pasture, and food.
- Herbivores such as sheep, goats, or cattle ingest the eggs while grazing (intermediate hosts).In the intestine, eggs hatch into oncospheres, which then penetrate the gut wall and spread through the bloodstream.
- The larvae lodge mainly in the liver and lungs, developing into hydatid cysts containing protoscolices.
- When dogs consume raw infected offal with cysts, protoscolices evaginate, attach to the intestinal mucosa, and mature into adult worms, completing the cycle.
- Humans may accidentally ingest eggs; hydatid cysts form in organs (liver, lungs, brain), but humans are dead-end hosts.

Cystic Echinococcosis

Echinococcus granulosus sensu lato



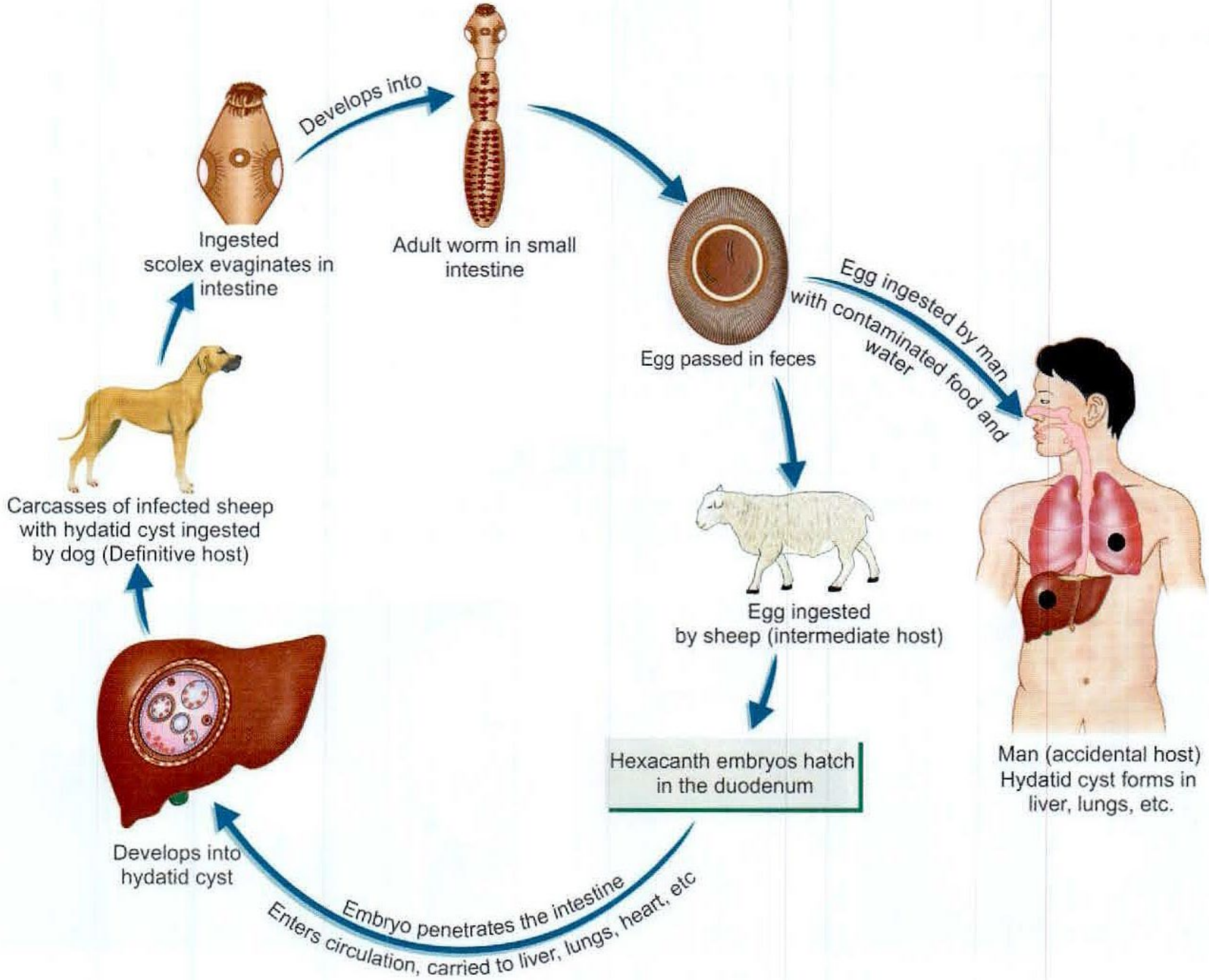


Fig. 17: Life cycle of *Echinococcus granulosus*

Definitive host

Intermediate hosts

Adult worm

Hydatid cyst
(larvae)

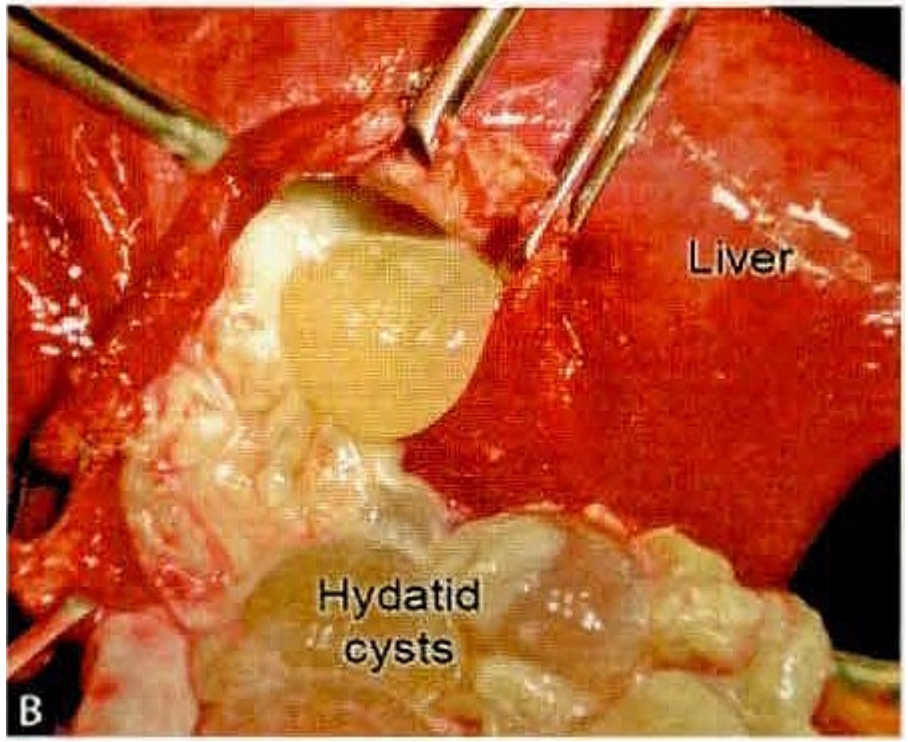
Pathogenesis

- Hydatid cysts form mainly in the liver (most common) and lungs; occasionally in the brain, bone, or other organs.
- Cysts enlarge slowly, compressing surrounding tissues and impairing organ function.
- Pressure effects lead to hepatomegaly, obstructive jaundice (liver), or respiratory difficulty (lungs).
- Rupture of cyst may release fluid, causing severe allergic reaction or even fatal anaphylaxis.
- Secondary echinococcosis can occur if cyst contents spread within the body.

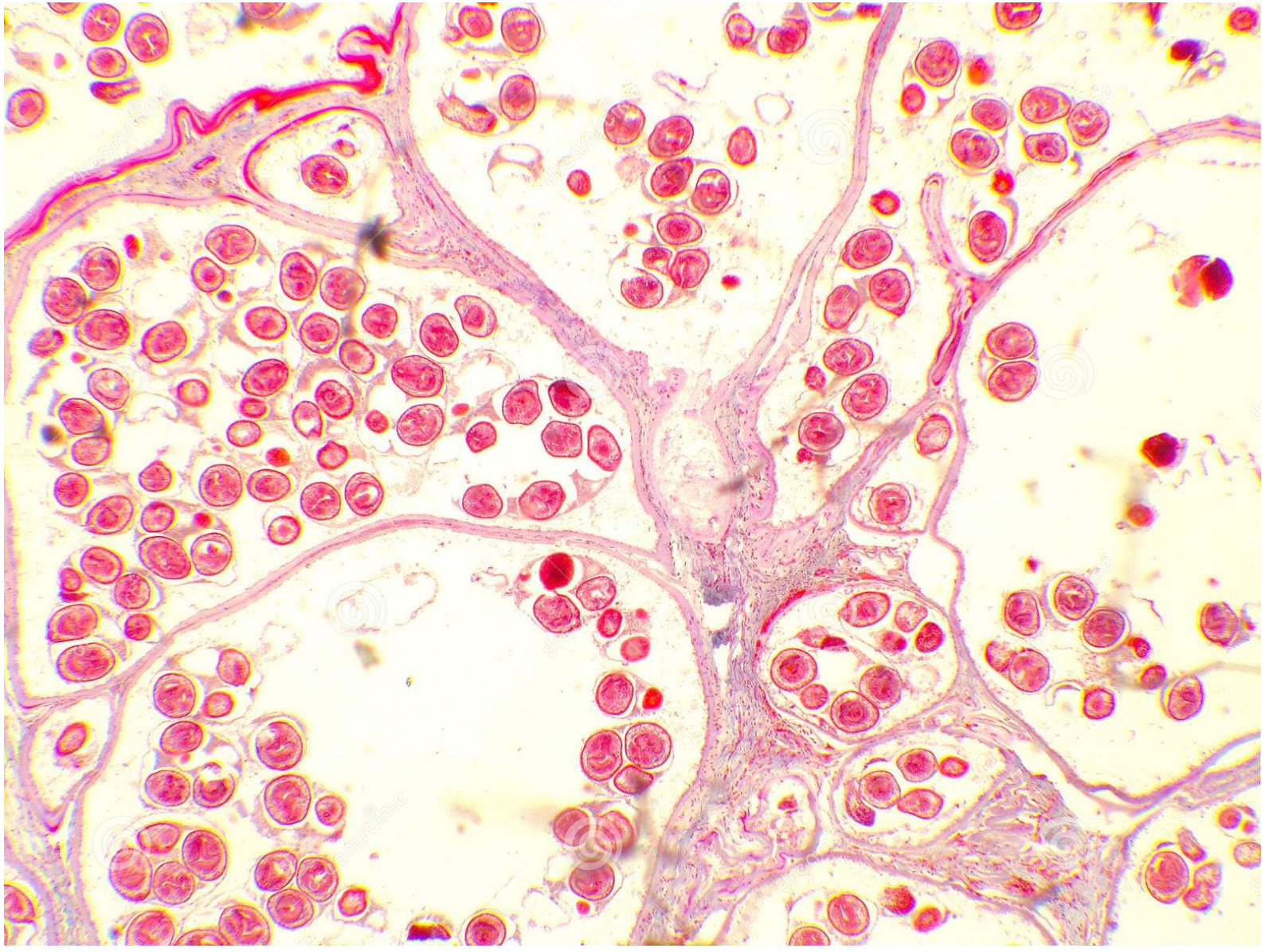
Clinical Manifestation

- **Liver involvement**: Abdominal pain, hepatomegaly, obstructive jaundice.
- **Lung involvement**: Cough, chest pain, hemoptysis, dyspnea.
- **Other organs**: Brain → seizures, neurological signs; Bone → pathological fractures.
- **Complications**: Cyst rupture → allergic manifestations, anaphylactic shock, secondary hydatidosis.
- Many cases remain asymptomatic for years due to slow cyst growth.

Hydatid cyst in Liver

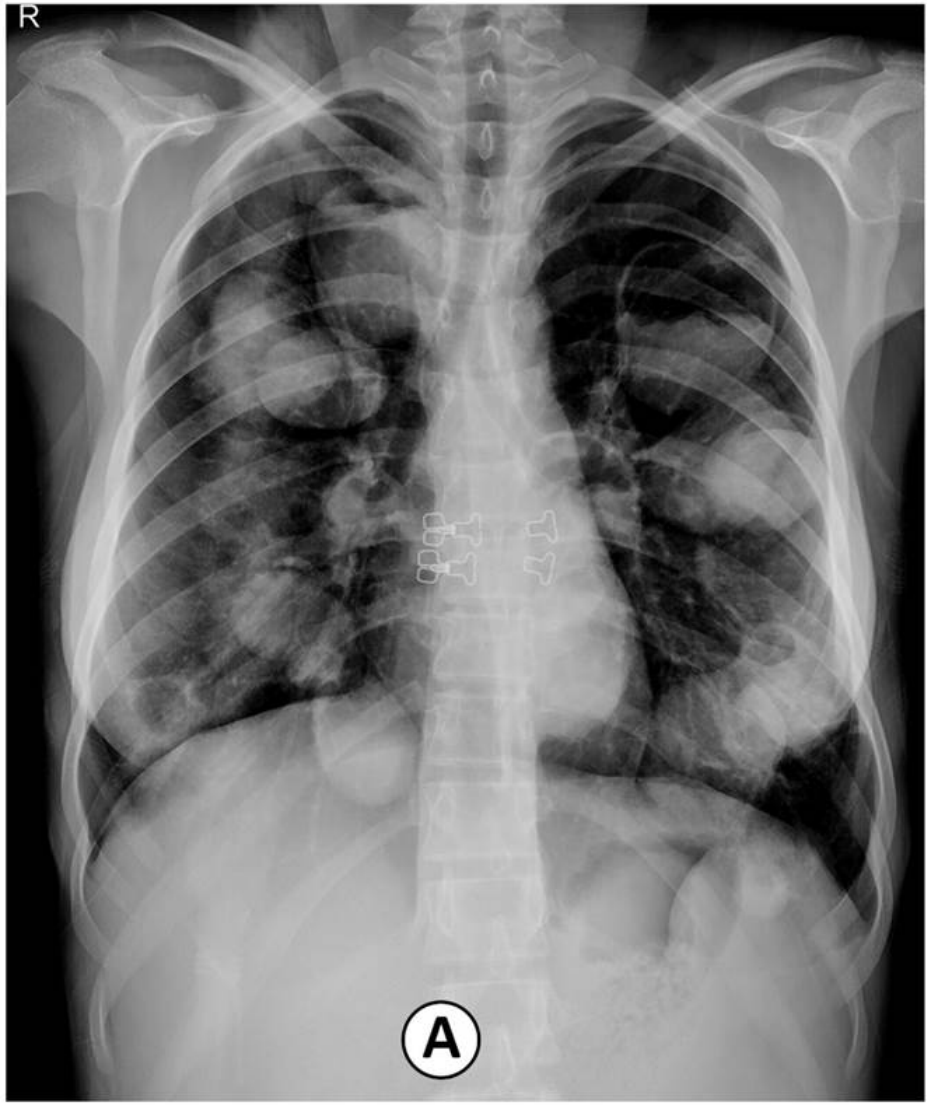


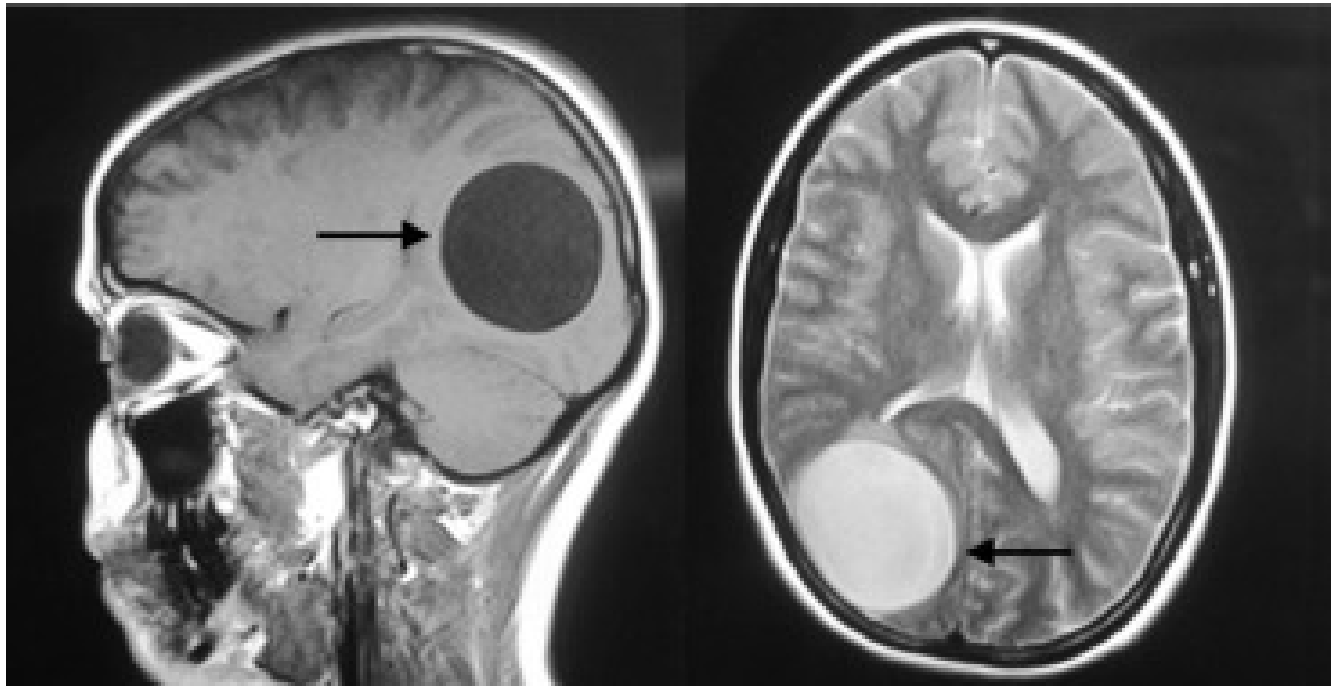
Hydatid cyst: *Ecchinococcus granulosus* larvae

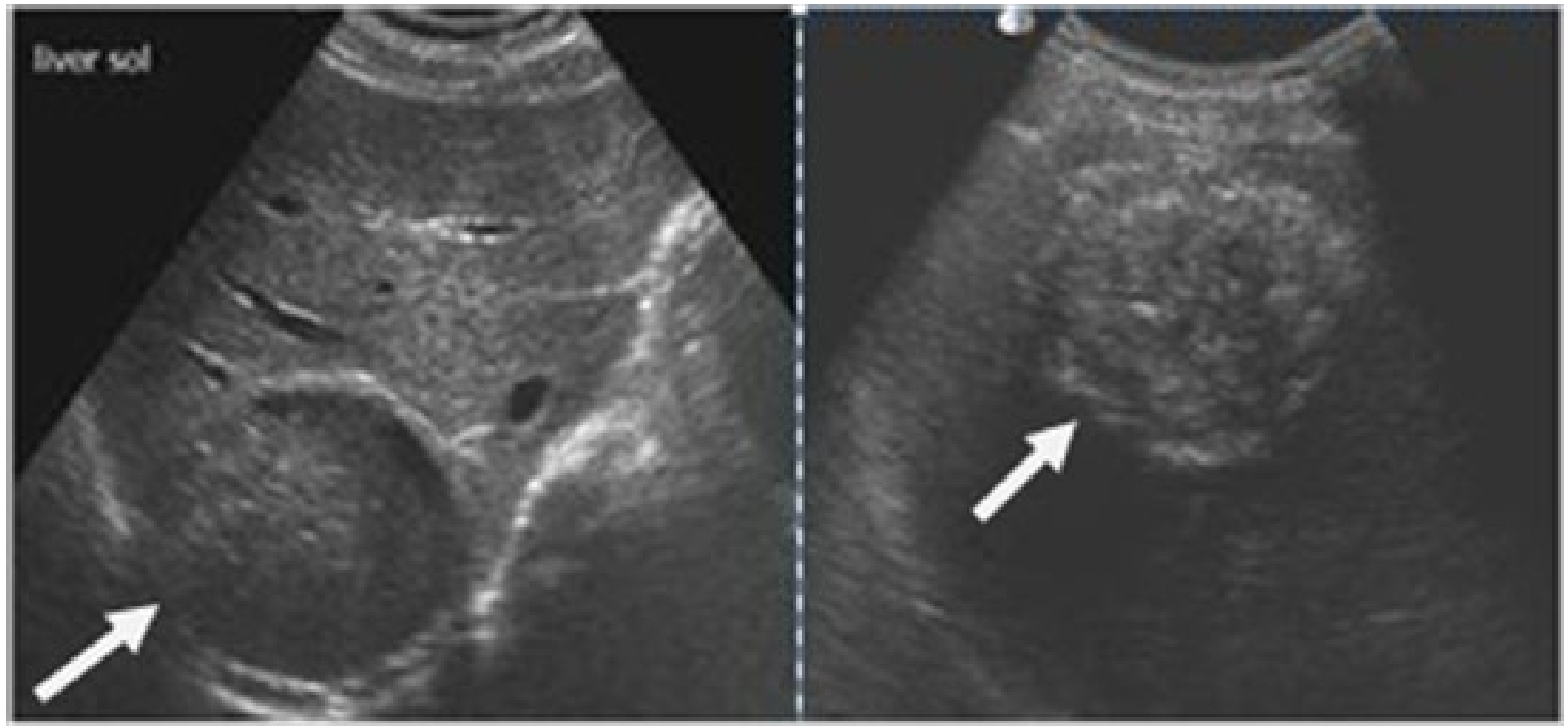


Diagnosis of hydatid disease

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

Treatment

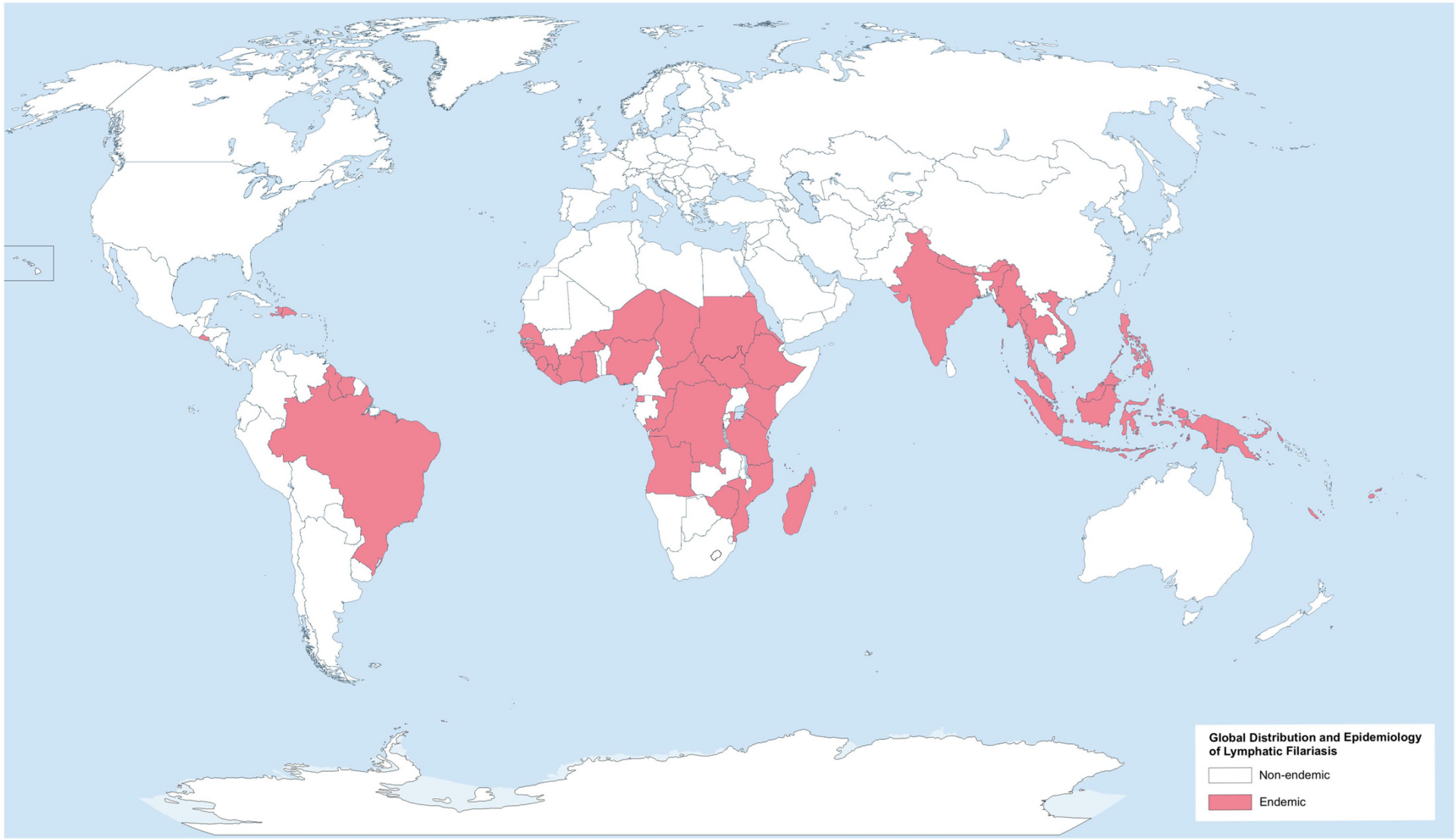
- **Surgery:** Traditional mainstay of treatment. Aims to remove the hydatid cyst without rupture.
- **PAIR technique (Puncture, Aspiration, Injection, Reaspiration).** Minimally invasive method guided by ultrasound.Cyst fluid aspirated, scolicidal agent (e.g., hypertonic saline, ethanol) injected, then re-aspirated.Useful for liver cysts; less invasive than surgery.
- **Medical therapy:** Albendazole (drug of choice) or mebendazole used to shrink cysts and reduce risk of recurrence.

Wuchereria bancrofti

Introduction

Wuchereria bancrofti is a parasitic filarial worm that causes lymphatic filariasis in humans, leading to chronic lymphatic obstruction and elephantiasis. It is transmitted by mosquitoes, with humans as the definitive host and mosquitoes as the intermediate host.

Geographical distribution



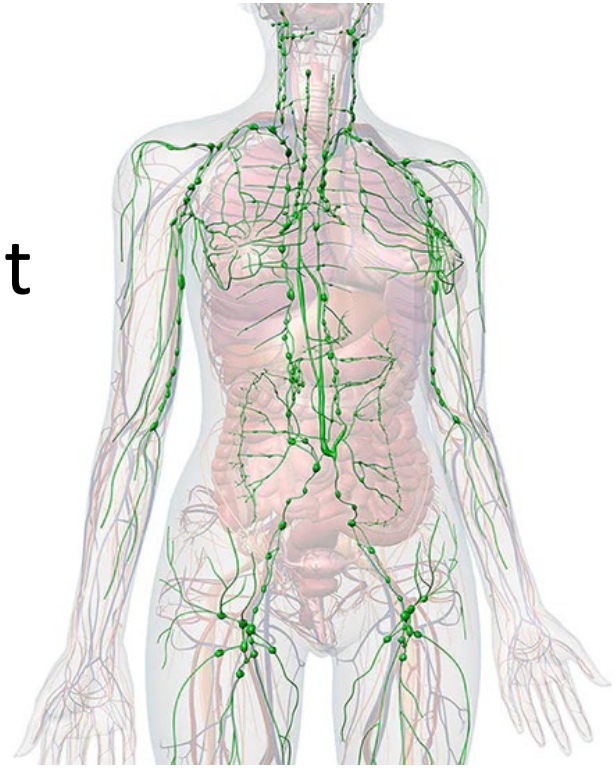
Morphology

- ***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.

Habitat

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

Adult



Microfilaria (Larvae)

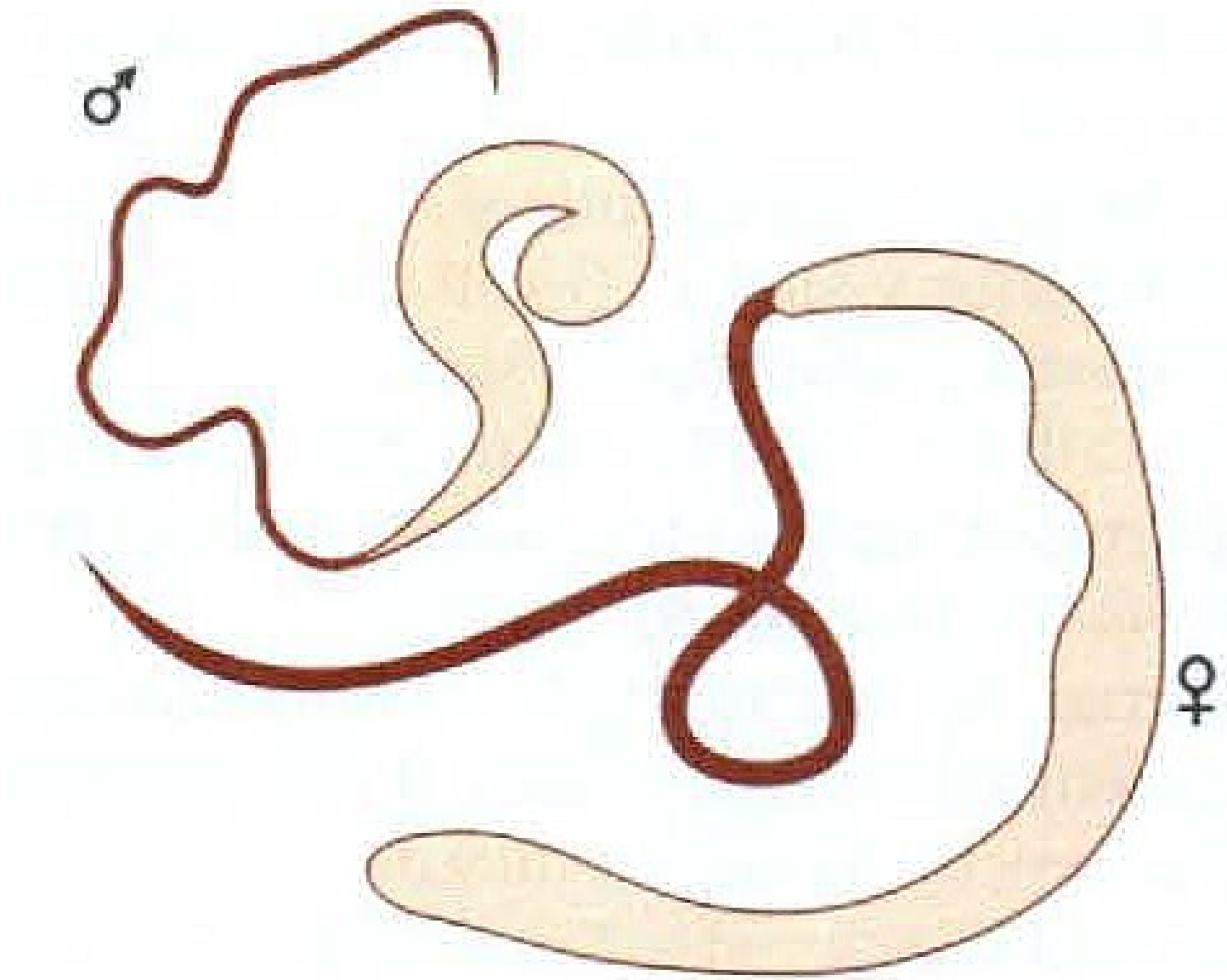


Fig. 2: Adult worm of *Wuchereria bancrofti*

Microfilariae:

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

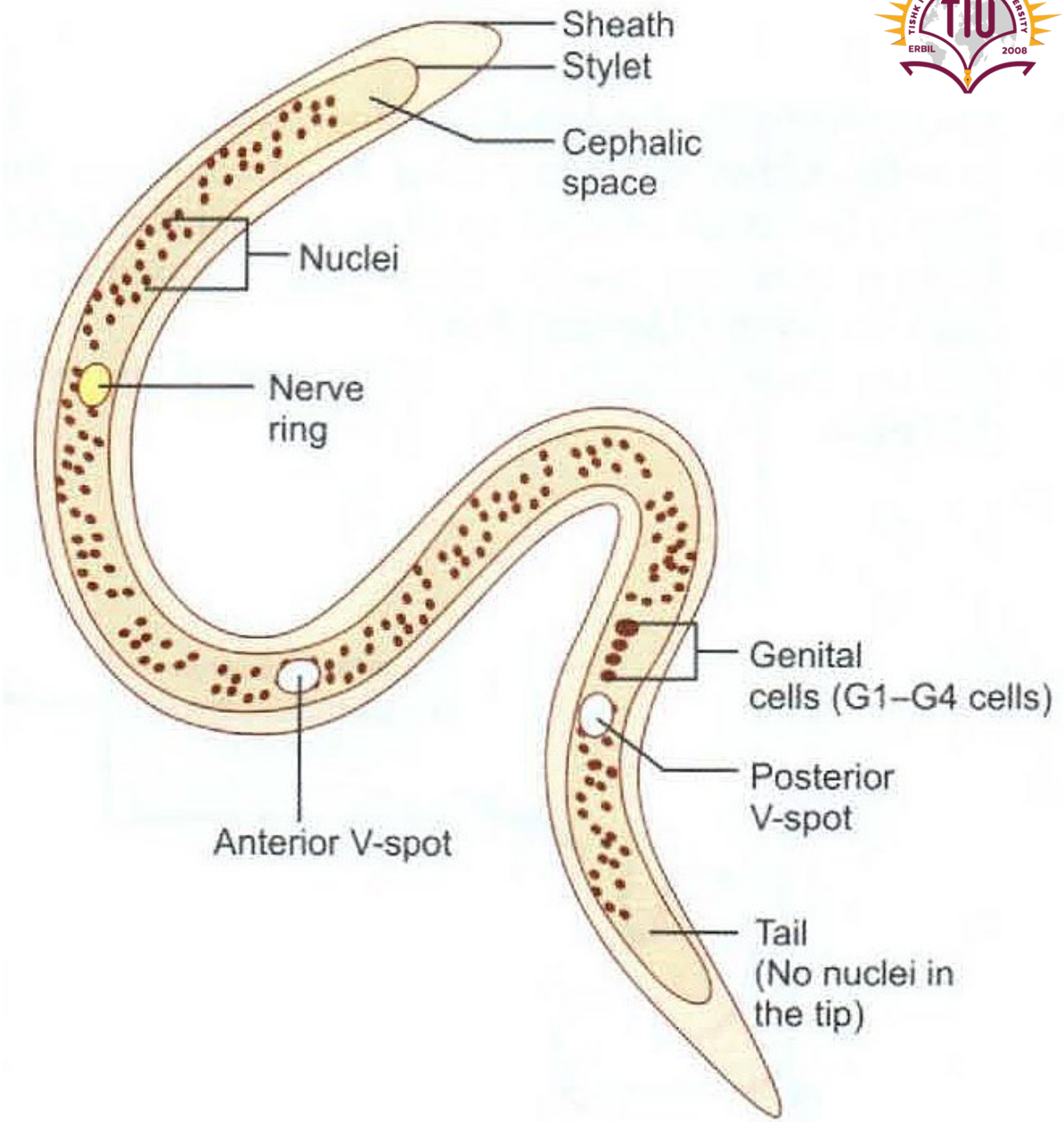
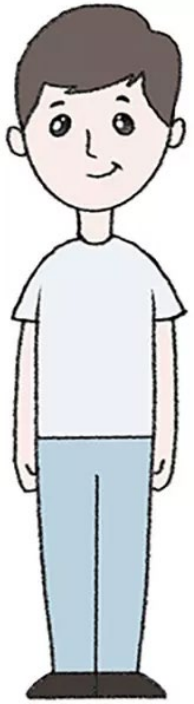


Fig. 3: Morphology of *Microfilaria bancrofti*

Life cycle

- **Definitive host:** Human



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

  Ex/*Culex* sp.

Life cycle

- Adult worms live in human lymphatic vessels (definitive host).
- Female worms release microfilariae into the bloodstream, mainly at night.
- Mosquitoes (Culex, Anopheles, Aedes) ingest microfilariae during a blood meal (intermediate host).In the mosquito, microfilariae develop into infective larvae over 10–14 days.
- Infective larvae are transmitted to humans when the mosquito bites again.
- Larvae migrate to lymphatic vessels and mature into adult worms, completing the cycle.

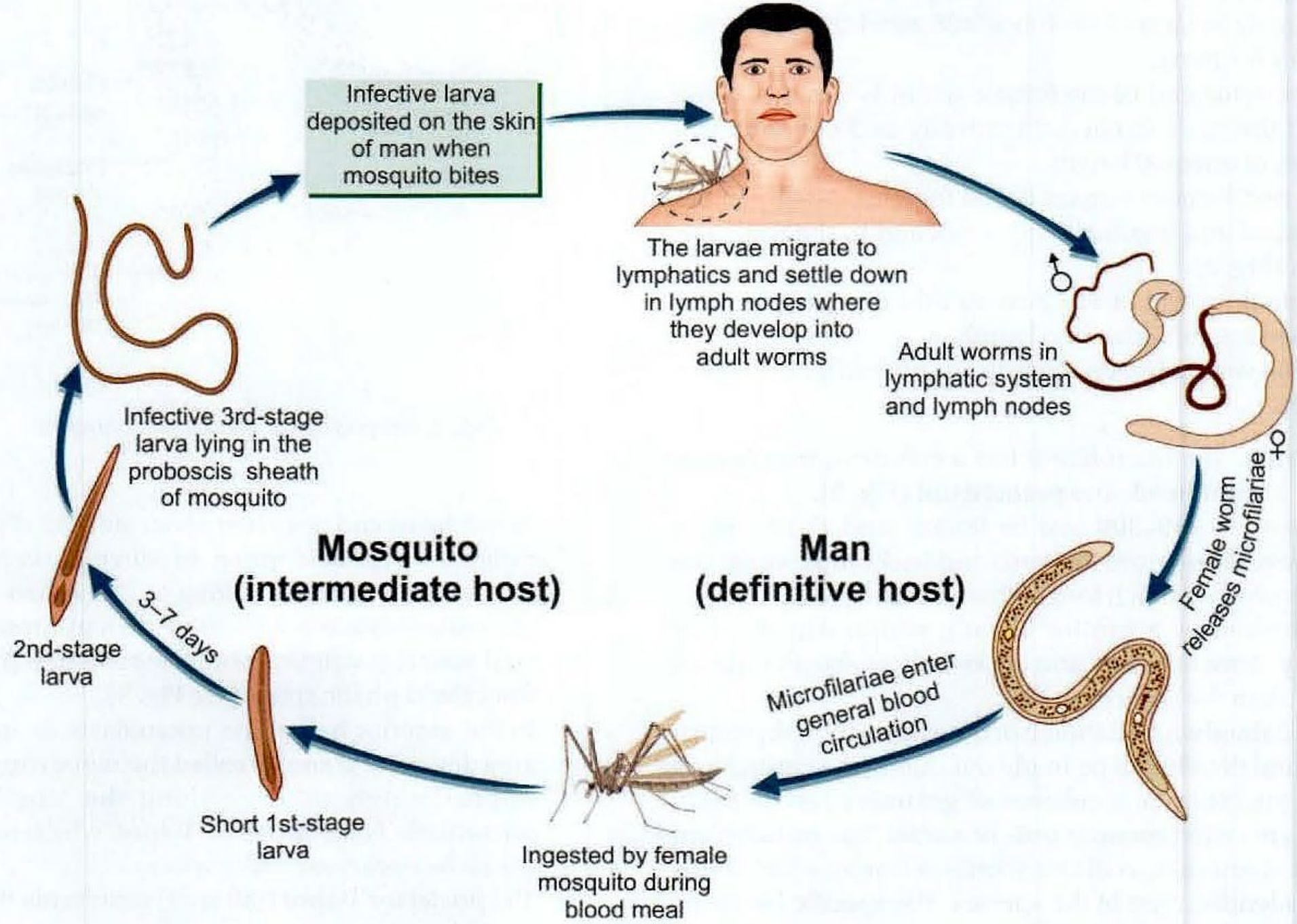


Fig. 4: Life cycle of *Wuchereria bancrofti*

Pathogenesis

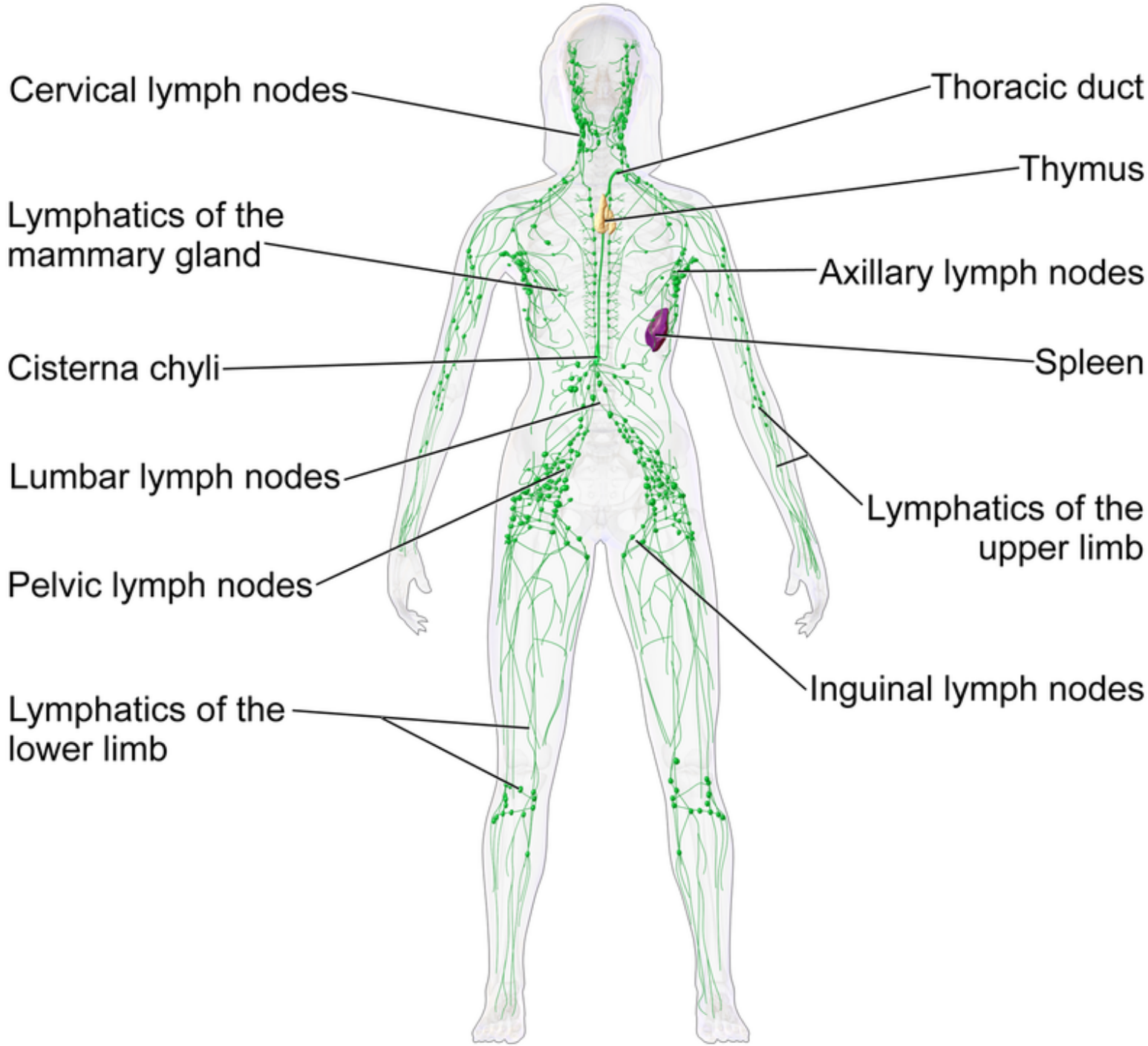
- Adult worms in lymphatic vessels cause obstruction and inflammation.
- Lymphatic blockage leads to lymphedema, fluid accumulation, and tissue swelling.
- Chronic infection can result in elephantiasis (gross enlargement of limbs or genitalia).
- Immune responses to dead or dying worms cause granuloma formation and fibrosis.

Clinical manifestation

- Many infections are asymptomatic in the early stages.
- Acute phase: Fever, lymphangitis, and tender lymphadenitis due to inflammatory reactions.
- Chronic phase: Progressive lymphedema of limbs, scrotum, or breasts.
- Elephantiasis: Severe, permanent swelling with skin thickening and fibrosis.
- Hydrocele: Fluid accumulation in the scrotum (common in males).

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

Treatment

Antifilarial drug

- Diethylcarbamazine (DEC) is the drug of choice; kills microfilariae and some adult worms.
- Albendazole is often combined with DEC to enhance efficacy.

Symptomatic and supportive care

- Elevation and Exercise: Elevating the affected limb and performing gentle exercises improves lymphatic drainage.
- Compression Therapy: Use of elastic bandages or stockings to reduce swelling.
- Skin Care: Moisturizing and care of cracked skin to prevent entry of bacteria.

References

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