

# HELMINTHS

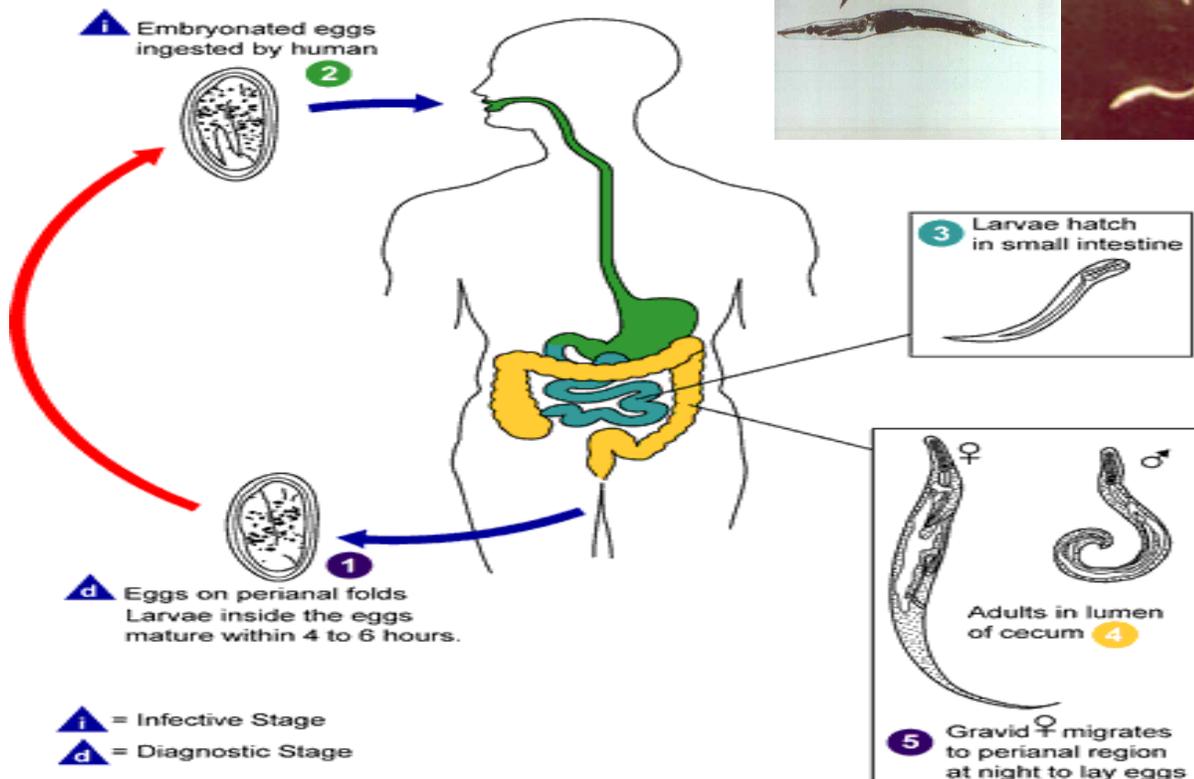
## Nematodes

### (Intestinal Nematodes)

► Common intestinal nematode infections:

1. *Enterobius (Oxyuris) vermicularis* : (Pinworm,seatworm,threadworm)
2. *Trichuris trichiura* : (whipworm)
3. *Ascaris lumbricoides* : (roundworm)
4. *Ancylostoma duodenale* & *Necator americanus* : (hookworm)
5. *Strongyloides stercoralis*

### 1. *Enterobius (Oxyuris) vermicularis* (Pinworm,seatworm,threadworm)



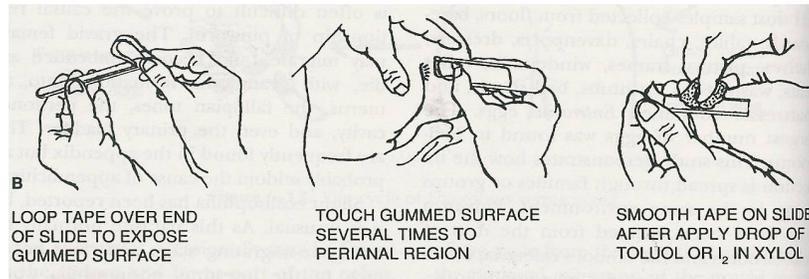
## Pathology & Clinical picture:

- Most infections **asymptomatic**.
- ✓ Intense anal pruritus  $\Rightarrow$  dermatitis & bacterial infection.
- ✓ Heavy reinfection  $\Rightarrow$  vulvovaginitis and appendicitis.

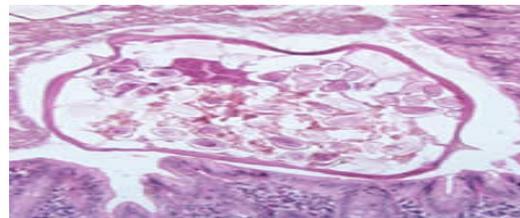
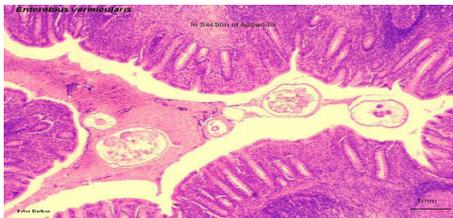
## Diagnosis:

- **scotch tape preparation** to collect eggs from perianal skin  $\Rightarrow$  microscopy

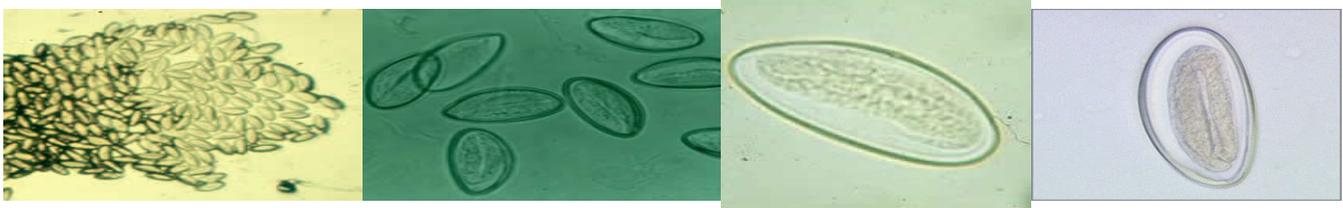
### scotch tape preparation



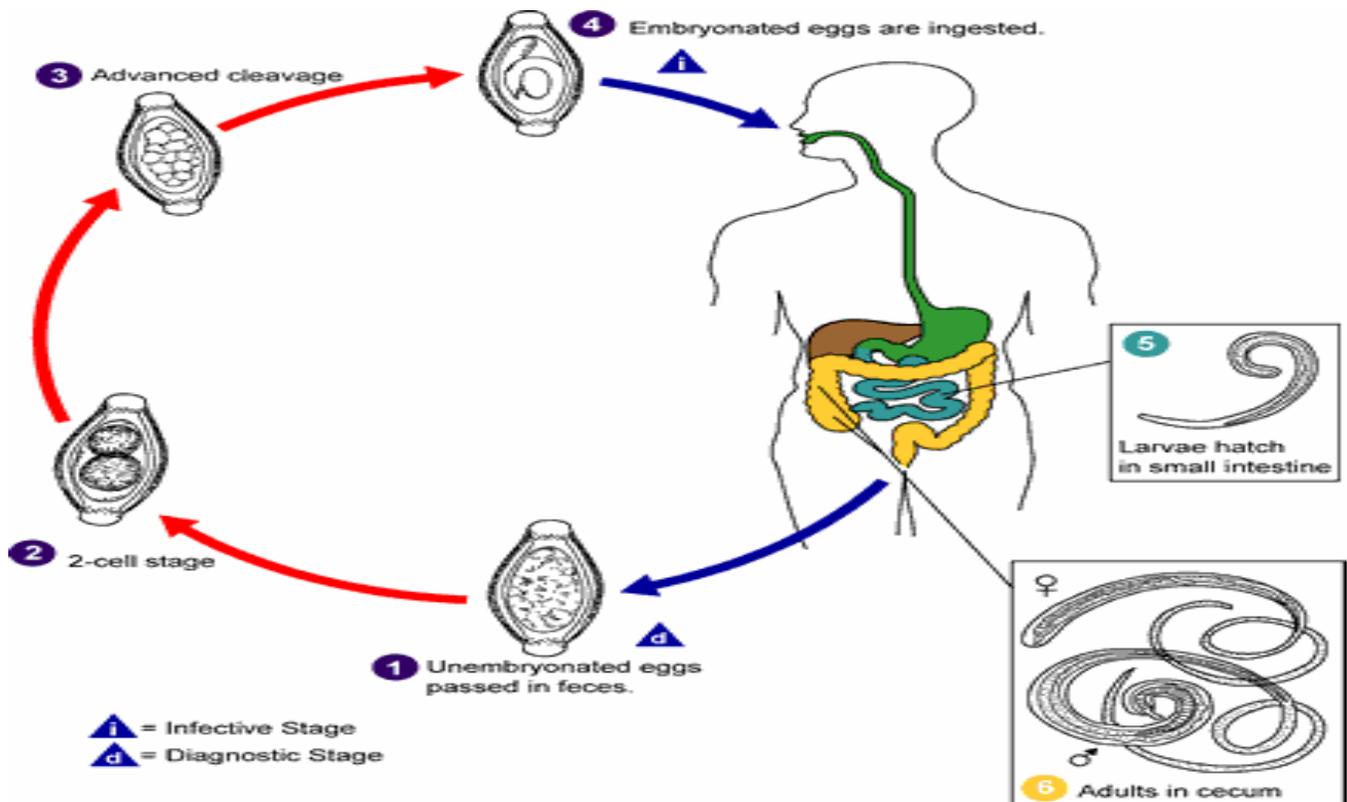
### Section of adult pinworm in appendix



### Enterobius eggs



## 2. *Trichuris trichiura* (whipworm)



Embryonated egg



Unembryonated egg

### Pathology & Clinical picture

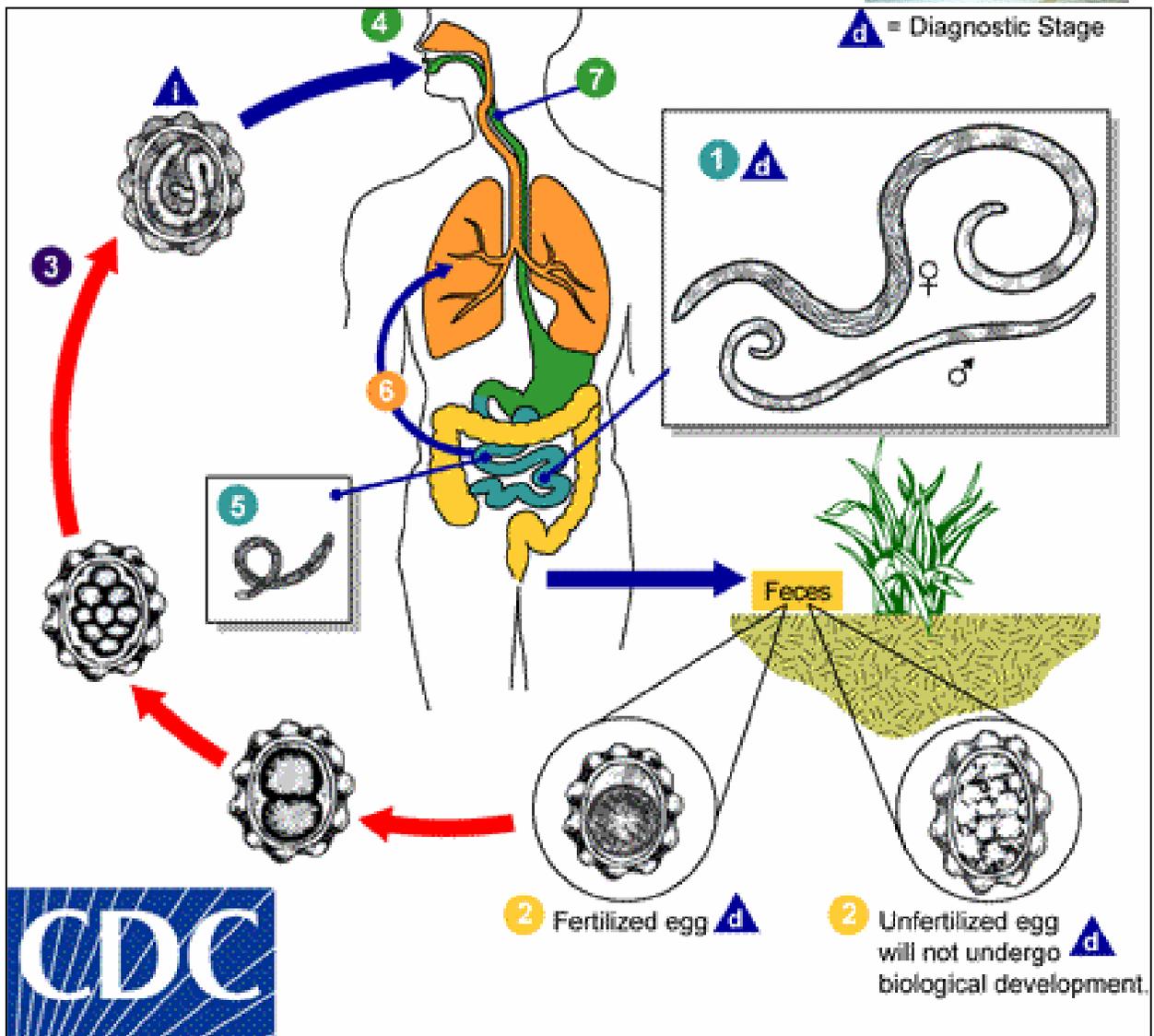
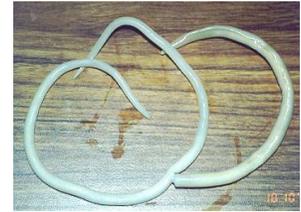
- Light infections: asymptomatic.
- Heavy infection: abdominal symptoms and diarrhea leading to *rectal prolapse* in children.



### Diagnosis:

- eggs in stools

### 3. *Ascaris lumbricoides* (roundworm)



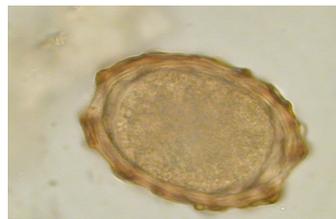
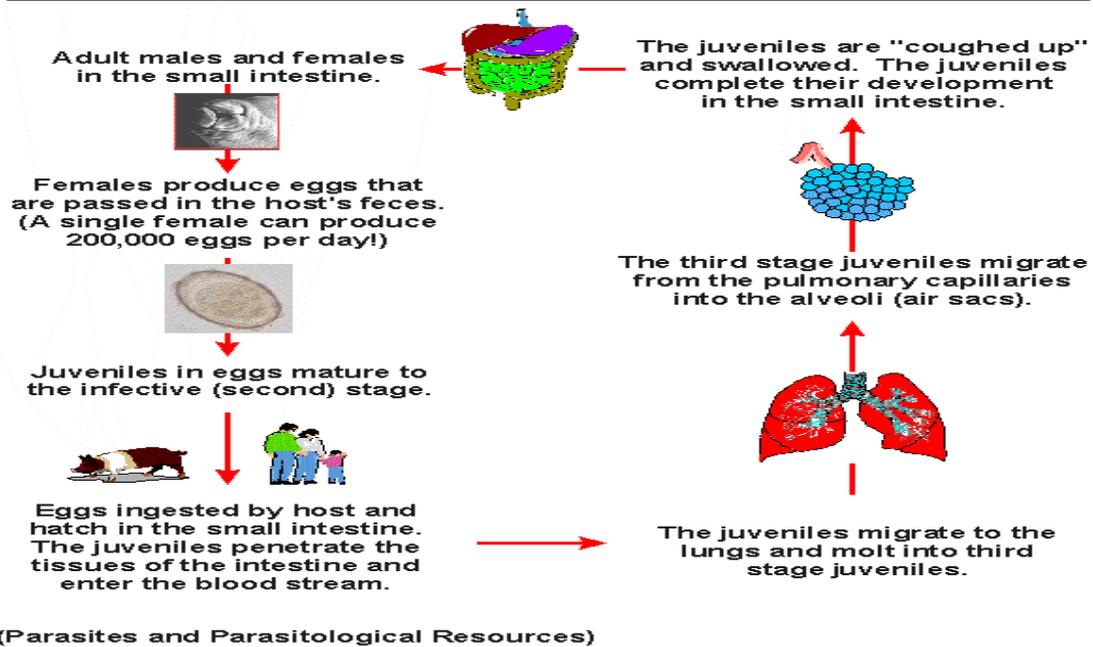
#### Pathology & Clinical picture:

- **Adult worm:** Light infections asymptomatic.
- ✓ Migrating adult worm may obstruct bile duct
- ✓ Heavy infections ⇒ intestinal obstruction.
- **Larvae:** Loeffler's syndrome

#### Diagnosis:

- eggs in stools, larvae in sputum

## THE LIFE CYCLES OF *ASCARIS LUMBRICOIDES* AND *ASCARIS SUUM* (INTESTINAL ROUNDWORMS OF HUMANS AND PIGS)

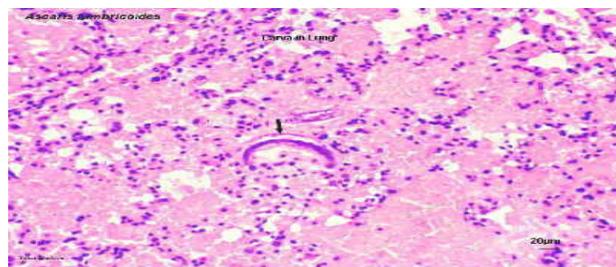


Embryonated egg

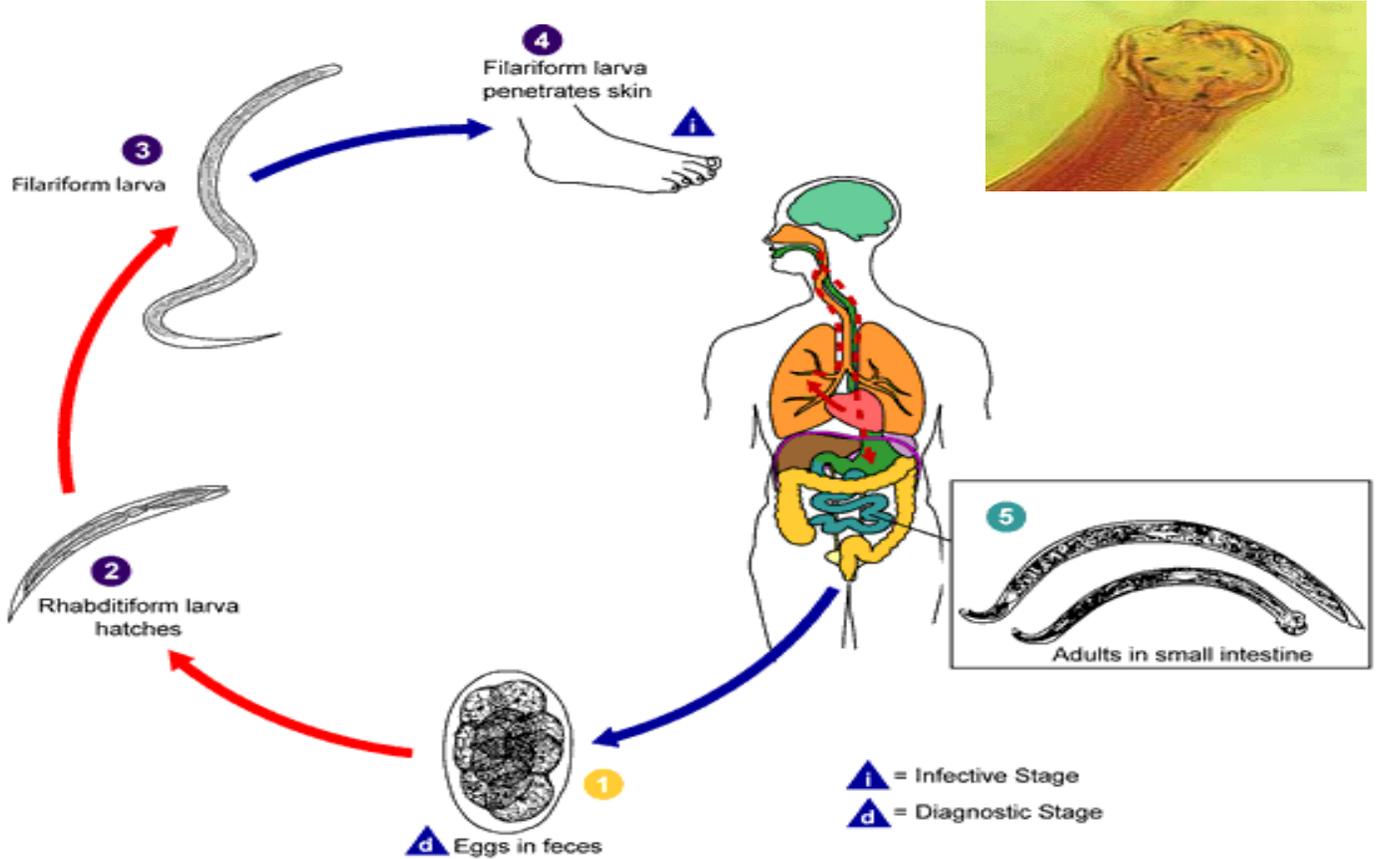


Unembryonated

Ascaris larva in lung



#### 4. *Ancylostoma duodenale* & *Necator americanus* : (hookworm)

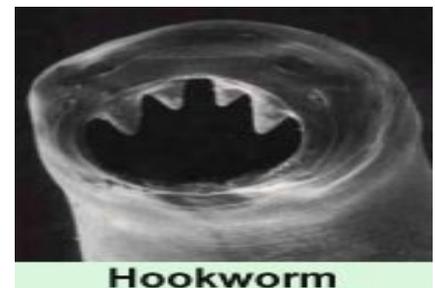


#### Pathology & Clinical picture

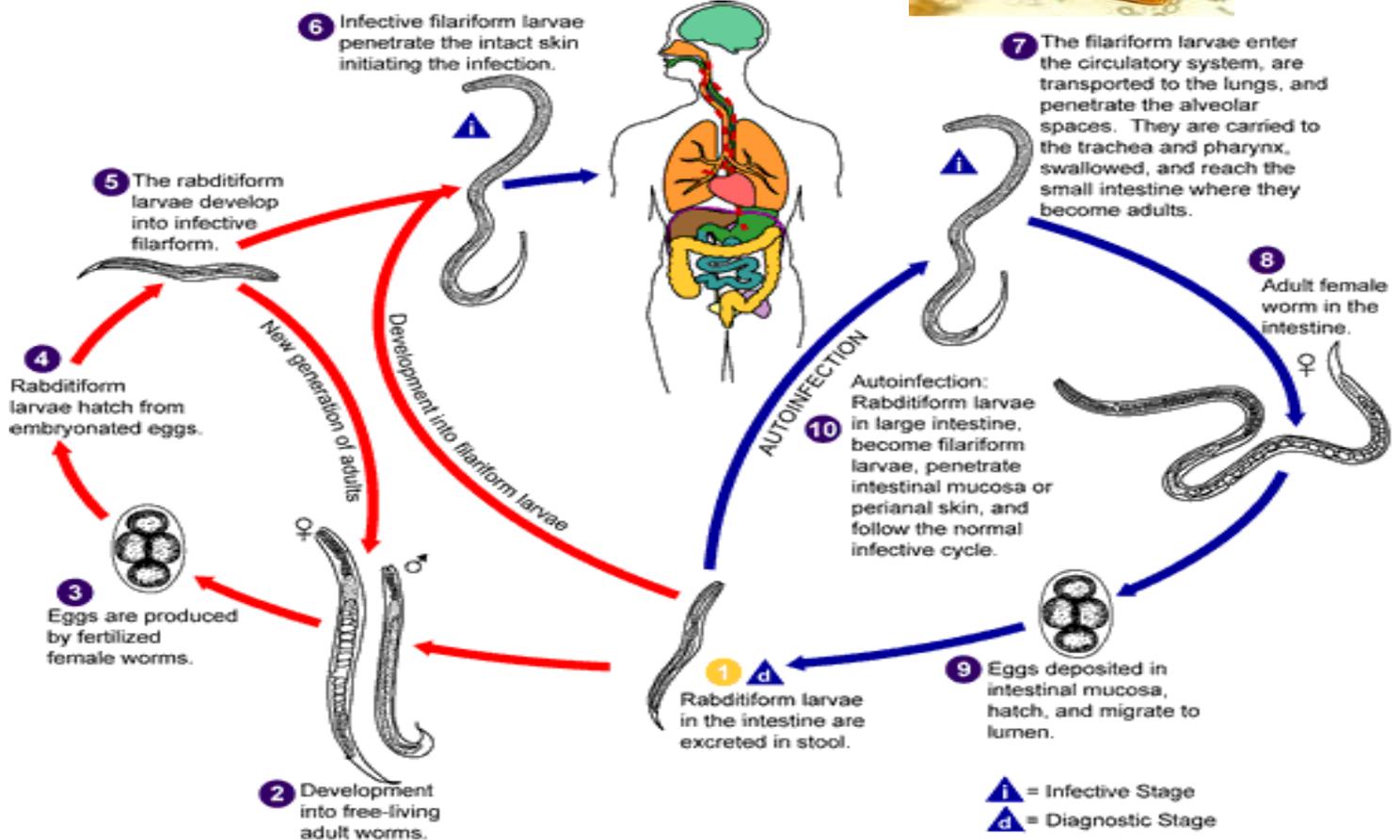
- ▶ **Low worm burden:** no symptoms.
- ▶ **Moderate to heavy burden:** epigastric pain vomiting, hemorrhagic enteritis, severe anemia, protein loss hypoproteinaemia and oedema.

#### Diagnosis:

- eggs in stools



## 5. *Strongyloides stercoralis*



### Pathology & Clinical picture

- ▶ **Cutaneous:** little or no reaction on penetration.
- ▶ **Intestinal:** inflammation of upper small intestine mucosa, diarrhea, upper abdominal pain.
- ▶ **Disseminated strongyloidiasis:** in patient with immunodeficiency-invasion of liver lungs and brain.

### Diagnosis:

- Identification of larvae in stools, duodenal aspirate or tissues.

## Drug Treatment for intestinal nematodes

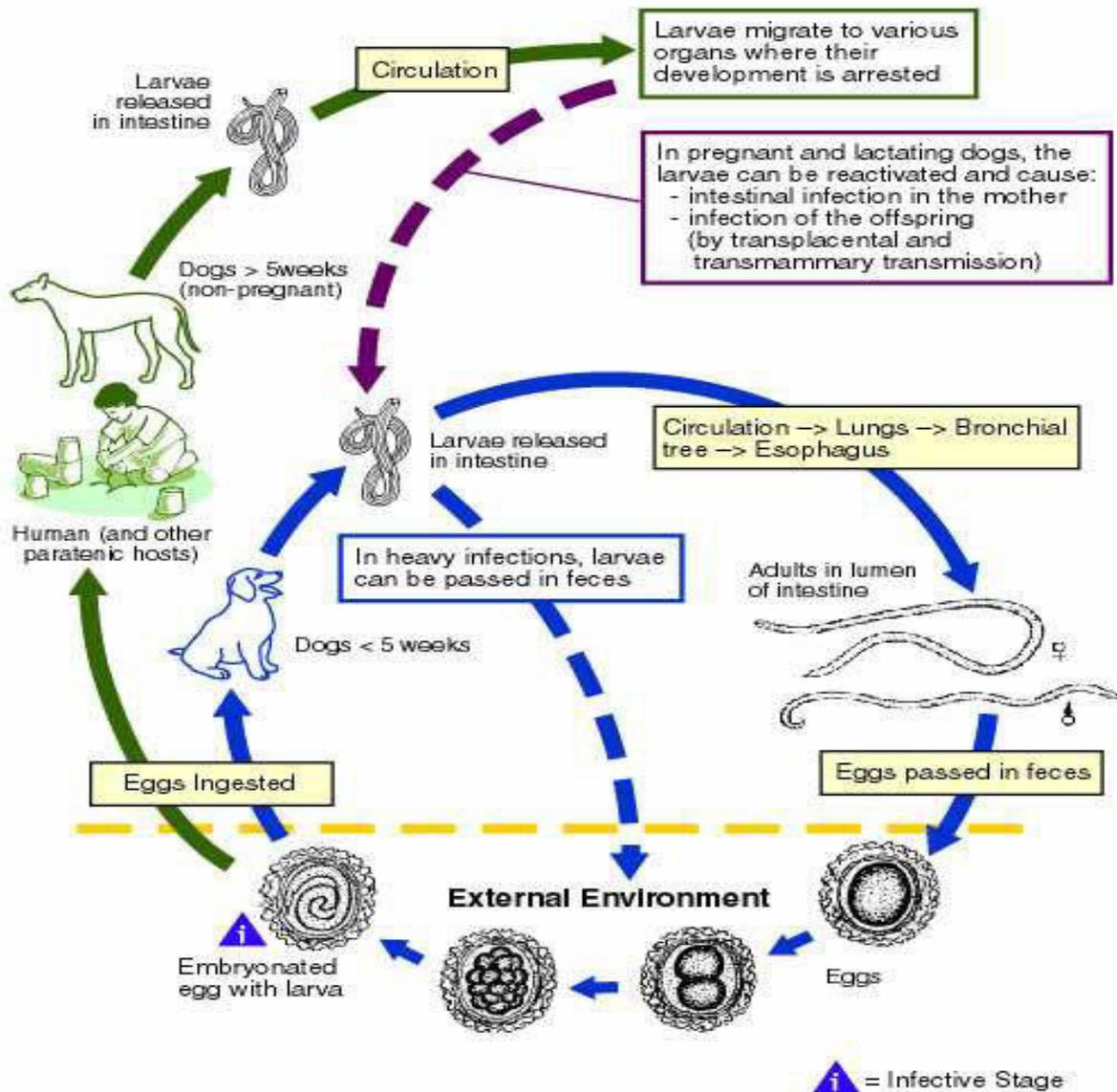
- ▶ The most commonly drugs used (antihelmintic) for intestinal nematodes are:
  - I. **Albendazole**
  - II. **Mebendazole**

### (Tissue Nematodes)

- ▶ Common tissue nematodes infections:

1. *Toxocara canis* (dog roundworm) larvae in organs (liver brain eyes), causing visceral larva migrans
2. *Trichinella spiralis* adults in small intestine ,larvae in tissues (mainly in muscles).
3. *Dracunculus medinensis* (guinea worm) adult female in subcutaneous tissues
4. *Filarial worms* (adult worm + microfilaria)
  - a. *Onchocerca volvulus*:
    - Adults : in subcutaneous swellings.
    - Microfilariae : mainly in skin, eyes causing River blindness.
  - b. *Wuchereria bancrofti*, *Brugia malay* & *B. timori*:
    - ✓ Lymphatic filariasis
      - Adults in lymphatics.
      - Microfilariae in blood.
  - c. *Loa loa*:
    - Adults : in subcutaneous and subconjunctival tissues, causing Calabar swellings.
    - Microfilariae : in blood.

## 1. *Toxocara canis* (dog roundworm):



### Visceral larva migrans:

- Mainly affects **children** who eat soil contaminated with embryonated (infective) eggs of *Toxocara canis*.
- Larvae **do not develop** in humans but migrate continuously in viscera and encapsulate, causing tissue damage.

**Pathology:** Eosinophilia, hepatomegaly, retinitis.

**Diagnosis:** serology, biopsy.

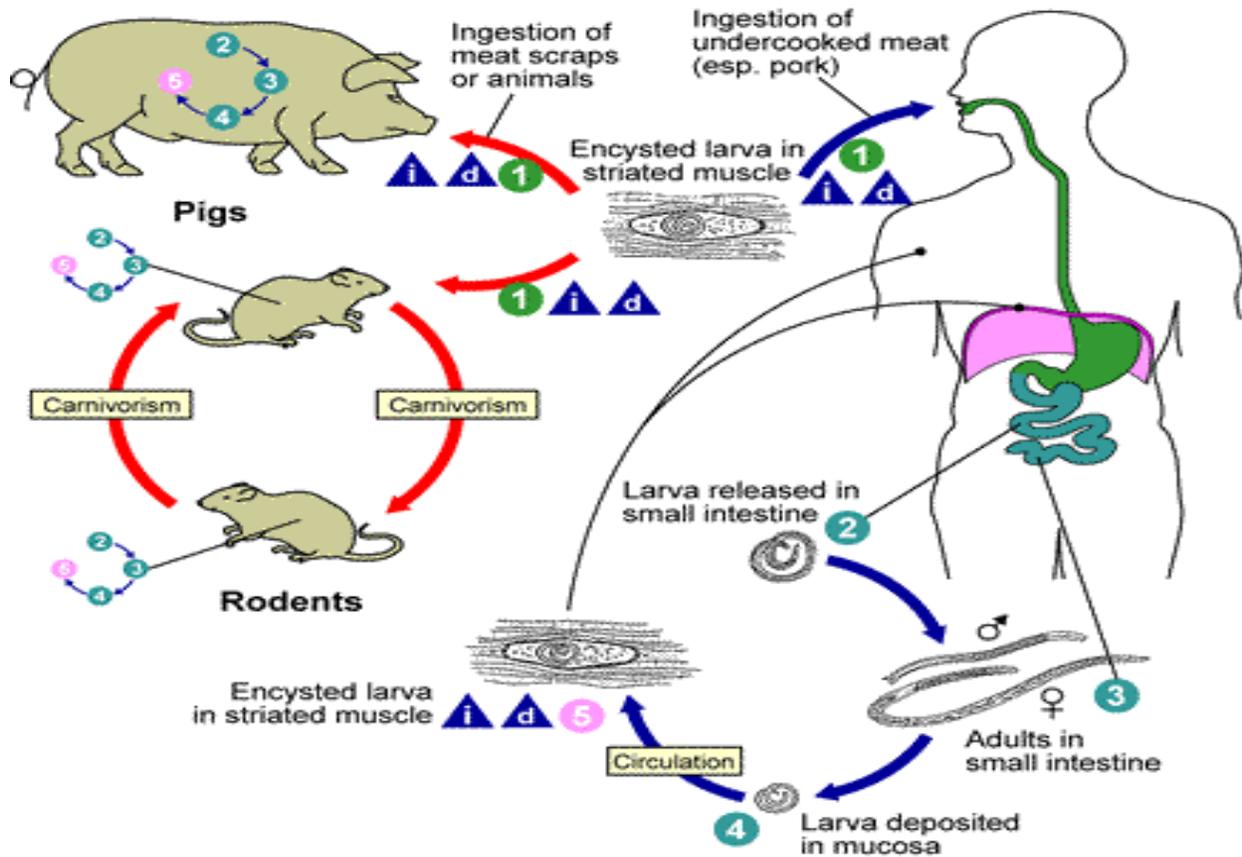
**Treatment:** Albendazole

## 2. *Trichinella spiralis*

▲<sub>i</sub> = Infective Stage  
 ▲<sub>d</sub> = Diagnostic Stage



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



## Trichinosis:

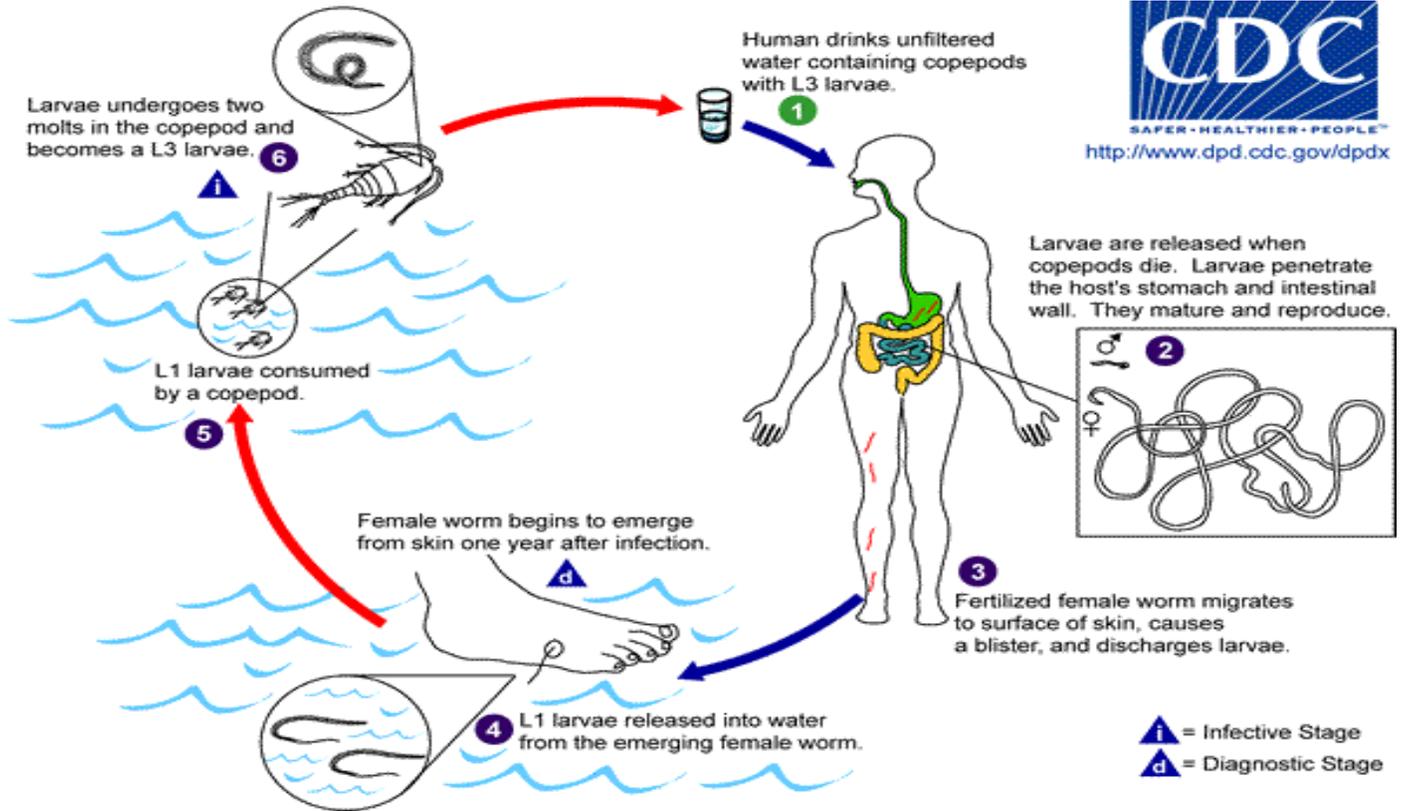
### Pathology:

- Adults cause mild gastroenteritis.
- Larvae cause fever, myositis and multi-system involvement which may lead to death.

Diagnosis: serology, muscle biopsy.

Treatment: Albendazole or Mebendazole + corticosteroids

### 3. *Dracunculus medinensis* (guinea worm)



## Dracunculiasis

- Adult female lives in subcutaneous tissues, causing a skin ulcer through which it protrudes its anterior end.

**Main pathology:** due to secondary bacterial infection and allergic reactions.

**Diagnosis:** clinical picture.

**Treatment:** surgical removal.

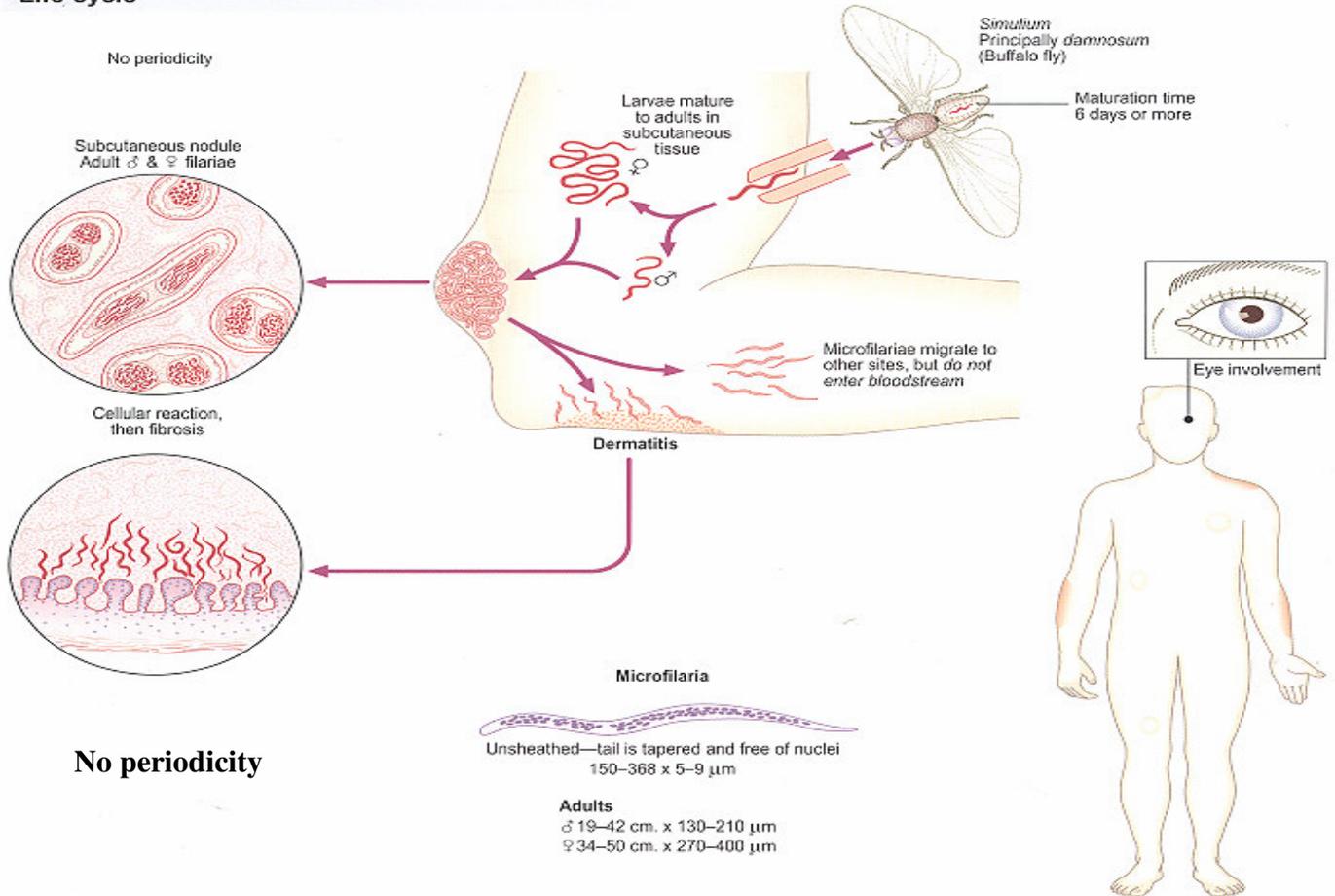


## Filarial worms

### a. *Onchocerca volvulus*:

#### *Onchocerca volvulus* (blinding worm)

##### Life cycle



## Onchocerciasis (river blindness)

### Pathology:

- Adults worms live in subcutaneous nodules.
- Main pathology caused by microfilariae in:
  - ✓ Skin: dermatitis
  - ✓ Lymph nodes: lymphadenopathy
  - ✓ Eyes: blindness



\*\* Reaction to worms and microfilariae causes dermatitis with loss of skin elasticity and the formation of fibrotic subcutaneous nodules. Living and dead microfilariae in the eye cause trauma and reactions that can result in blindness.

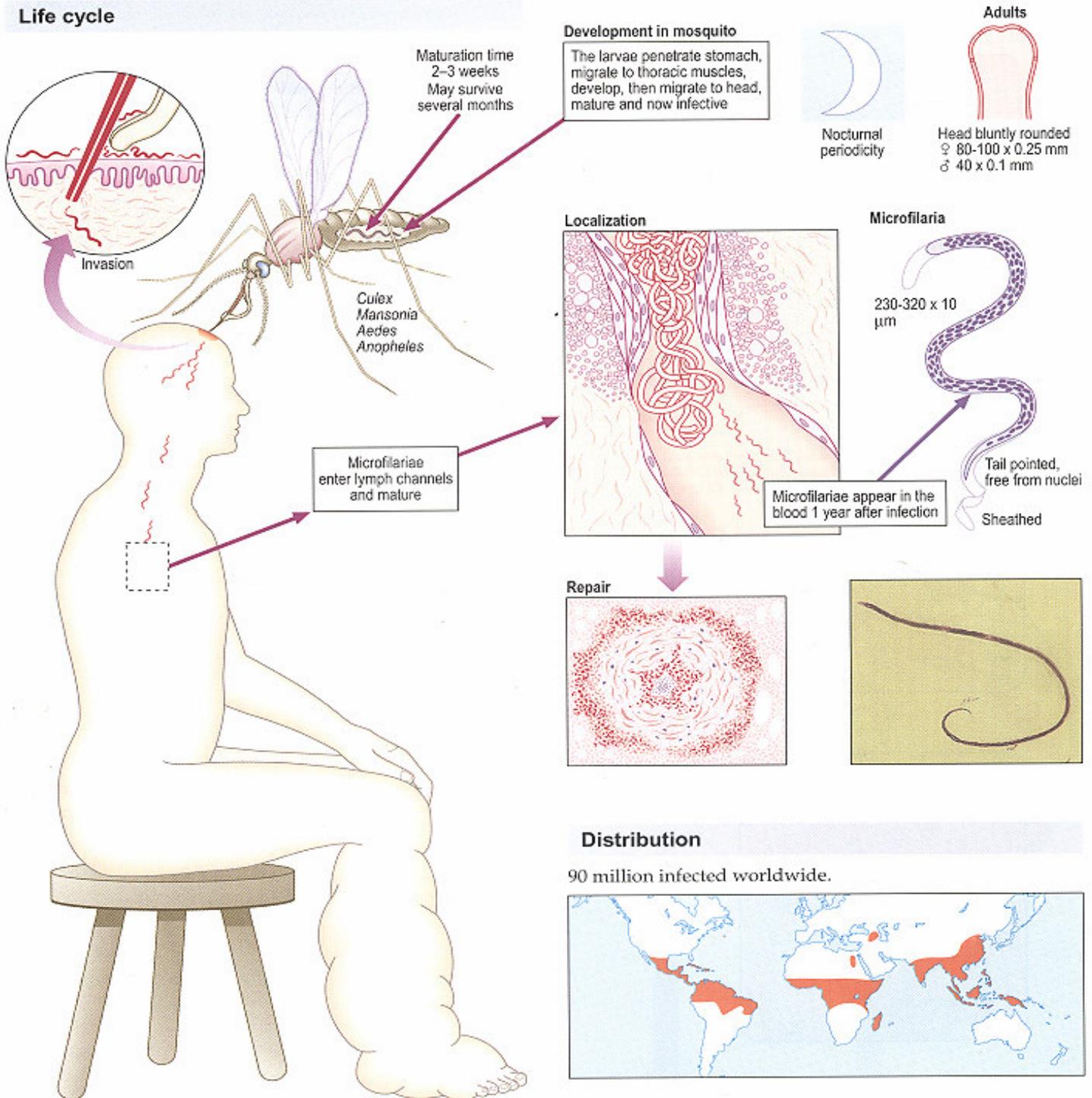
Diagnosis: skin snip to identify microfilariae.

Treatment: Ivermectin

**b. *Wuchereria bancrofti*, *Brugia malay* & *B. timori*:**  
Disease :filariasis, elephantiasis

***Wuchereria bancrofti* (filariasis)**

**Life cycle**



## LYMPHATIC FILARIASIS

- Mainly caused by *W. bancrofti* due to adult worm obstructing lymphatics.
  - ✓ **Acute:** lymphadenitis lymphatic varices
  - ✓ **Chronic:** lymphedema, hydrocele, chyluria.

### Pathogenesis:

- Disease manifestations are due to lymphatic dysfunction resulting from the presence of living and dead worms, inflammation, and immune reactions to worms and worm products.

### Host Defenses:

- Inflammatory reactions result in cellular infiltration and fibrosis of lymphatics. Damage to vessel walls result in endothelial cell proliferation.  
  
\*\* Lymphatic vessels are often partially or completely blocked by lymph thrombi, by masses of dead worms, or by endothelial proliferation, fibrin deposition, and granulomatous reactions .

### Diagnosis:

- detection of microfilariae in blood in early stages of the disease: Blood film, Knott's method (concentration of 1 ml of blood)
  - ✓ best 10 pm to 2 am (nocturnal periodicity).

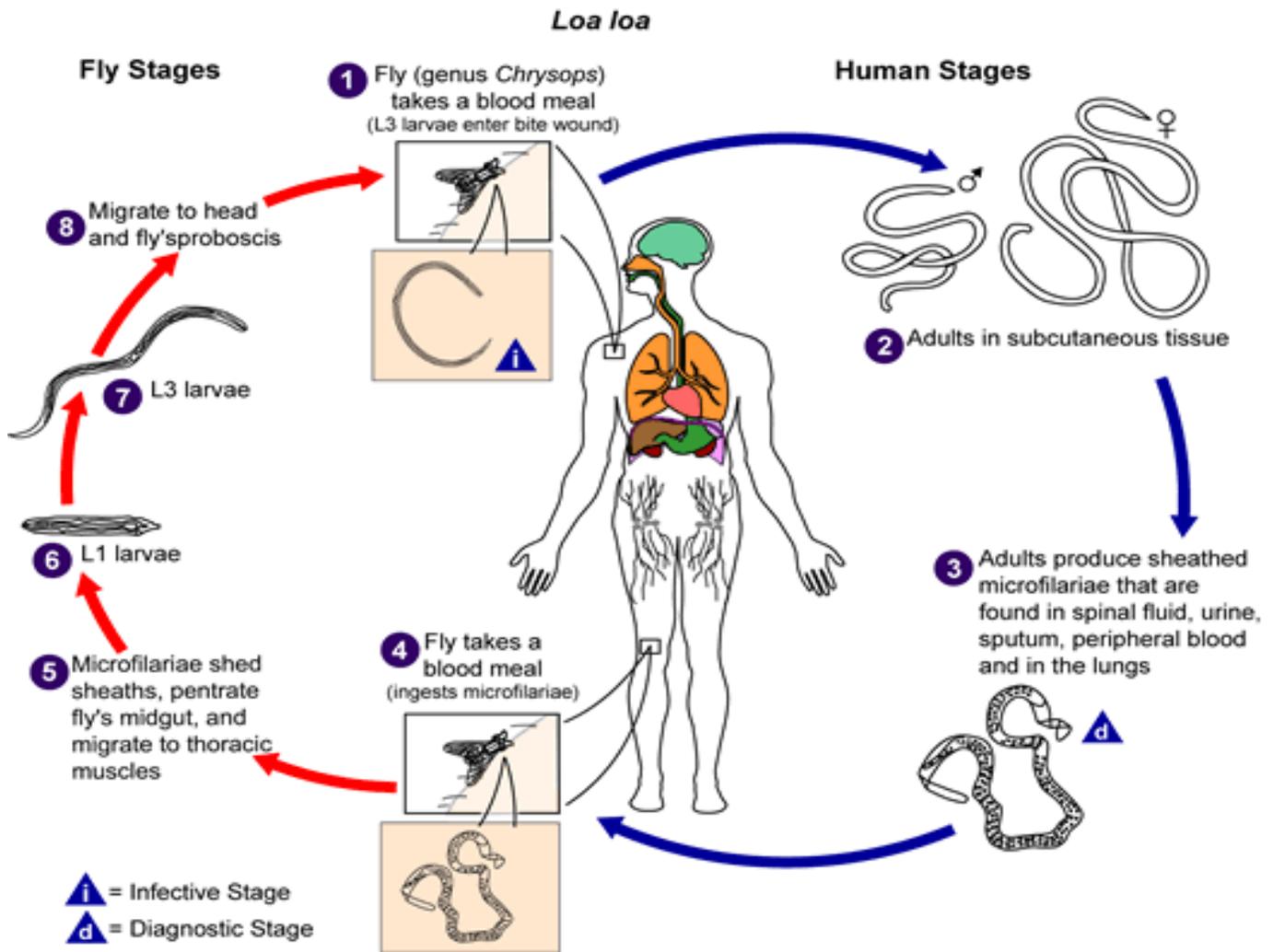
### Treatment:

- diethylcarbamazine (DEC) or ivermectin



filariasis, elephantiasis

c. *Loa loa*:



Intermediate host is Deer fly (*Chrysops*)

**Pathology:**

- Adult worm continuously migration in subcutaneous and subconjunctival tissues, causing Calabar swellings (allergic reactions) and conjunctivitis.

**Diagnosis:**

- detection of microfilariae in blood film during day time.

**Treatment:**

- diethylcarbamazine (DEC) or ivermectin, surgical removal.

NON-FILARIAL TISSUE NEMATODE INFECTIONS

| Nematode species              | Disease                             | Mode of transmission                   | Location in human                   | Diagnosis               | Treatment           |
|-------------------------------|-------------------------------------|----------------------------------------|-------------------------------------|-------------------------|---------------------|
| <i>Dracunculus medinensis</i> | Dracunculiasis, Guinea worm disease | Ingestion of infected cyclops in water | Subcutaneous, mainly in lower limbs | clinical                | Surgical extraction |
| <i>Trichinella spiralis</i>   | Trichinellosis (trichinosis)        | ingestion larvae in under-cooked pork  | Muscles, lungs, brain               | Serology, muscle biopsy | Albendazole         |
| <i>Toxocara canis</i>         | Visceral larva migrans              | Ingestion of infective eggs in soil    | Abdominal organs and brain          | Serology, ELISA         | Albendazole         |

MAJOR FILARIAL INFECTIONS OF HUMANS

| species                     | Disease                          | Geographic distribution                  | Location of adult in humans    | Location of microfilaria      | vector                    | Lab. Diagnosis |
|-----------------------------|----------------------------------|------------------------------------------|--------------------------------|-------------------------------|---------------------------|----------------|
| <i>Wuchereria bancrofti</i> | Elephantiasis                    | Tropical and subtropical areas           | Lymphatic vessels              | Blood (nocturnal periodicity) | mosquitoes                | Blood film     |
| <i>Brugia malayi</i>        | Elephantiasis                    | Asia                                     | Lymphatic vessels              | Blood (nocturnal periodicity) | mosquitoes                | Blood film     |
| <i>Onchocerca volvulus</i>  | Onchocerciasis (river blindness) | Africa, Central and South America, Yemen | Subcutaneous nodules           | Skin, eyes, no periodicity    | Simulium spp. (black fly) | Skin snip      |
| <i>Loa loa</i>              | Loiasis                          | Central Africa                           | Moving in subcutaneous tissues | Blood (diurnal periodicity)   | Chrysops spp. (deer fly)  | Blood film     |