

NEMATODES (ROUND WORMS)

**Phylum Nemathelminthes
(Aschelminthes)
Class Nematoda.**

All the important human parasites of the Phylum Nematelminthes (Aschelminthes) belong to the Class Nematoda.

They are un-segmented, elongated and cylindrical.

They have separate sexes with separate appearances.

They have a tough protective covering or cuticle.

They have a complete digestive tract with both oral and anal openings.

The nematodes are free living (Majority) or parasites of humans, plants or animals.

The parasitic nematodes:

The nematodes are generally light cream-white colored. Their life cycle includes: egg, larvae and adult.

The parasitic nematodes are divided into:

1. Intestinal nematodes

1.1. Intestinal nematodes with tissue stage

A. *Ascaris lumbricoides*

B. Hookworms

C. *Strongyloides stercoralis*

1.2. Intestinal nematodes without tissue stage

A. *Enterobius vermicularis*

B. *Trichuris trichuira*.

2. Tissue and blood dwelling nematodes

2.1. Filarial worms

2.2. *Dracunculus medinensis*

2.3. *Trichinella*

2.4. *Larva migrans*.

INTESTINAL NEMATODES WITH TISSUE STAGE

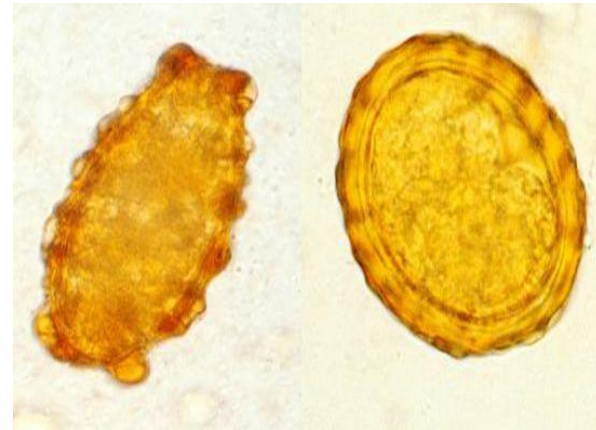
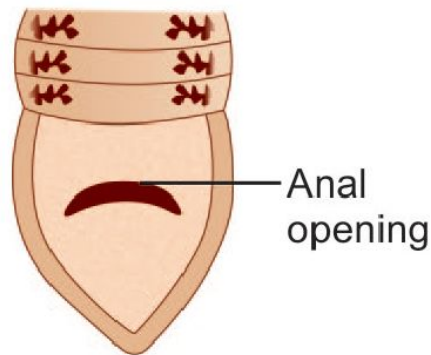
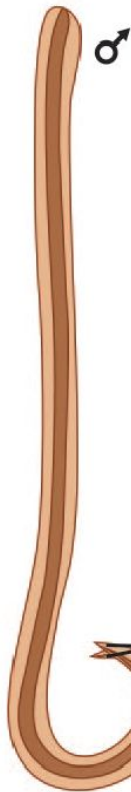
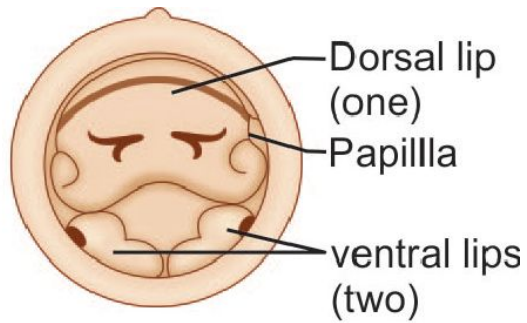
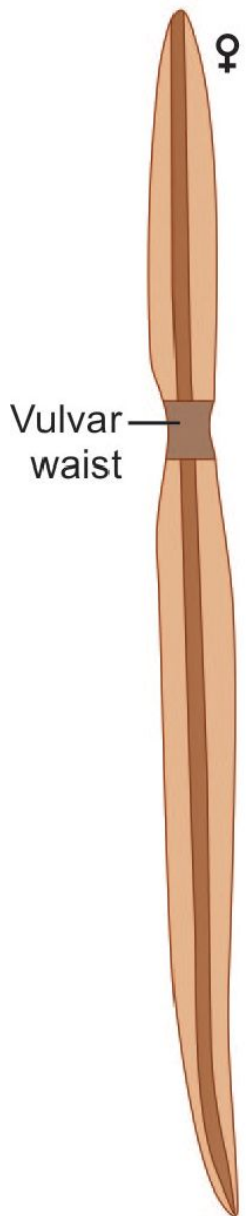
Ascaris lumbricoides

These are common roundworms infecting more than 700 million people worldwide.

Morphology

Male adult worm measures 15-20 cm in length. The posterior end is curved ventrally. The female worm measures 20-40 cm in length. Its posterior end is straight. *Male Worm:* The adult male worm is little **smaller** than female. Its posterior end is curved ventrally to form a **hook** and carries 2 **copulatory spicules**. *Female Worm:* The female is **larger** than male, measuring 20–40 cm in length and 3–6 mm in thickness. Its posterior extremity is **straight** and **conical**. The vulva is situated mid-ventrally, near the junction of the anterior and middle thirds of the body. A **distinct groove** is often seen surrounding the worm at the level of the vulvar opening. This is called the **vulvar waist** or **genital girdle** and is believed to facilitate mating. The vulva leads to a single vagina, which branches into a pair of genital tubules that lie convoluted through much of the posterior two-thirds of the body.

Egg: Two types of eggs are passed by the worms; fertilized and unfertilized. The fertilized eggs, laid by females, inseminated by mating with a male, are embryonated and develop into the infective eggs. The unfertilized eggs, are laid by uninseminated female. These are non-embryonated and cannot become infective.



Life cycle

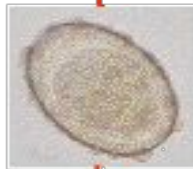
Life cycle of *Ascaris* involves only 1 host. **Natural host:** Man. There is no intermediate host. **Infective form:** Embryonated eggs. **Mode of transmission:** Infection occurs when the egg containing the **infective rhabditiform** larva is swallowed. A frequent mode of transmission is through fresh vegetables grown in fields manured with human feces ('night soil'). Infection may also be transmitted through contaminated drinking water.

Ingested eggs hatch in the duodenum. The larvae penetrate the intestinal wall and circulate in the blood. From the heart they migrate to the lungs, ascend to the trachea, descend to the esophagus and finally reach the small intestine to become adult. The female pass immature eggs which pass to the soil and mature in 2 weeks.

Adult males and females in the small intestine.



Females produce eggs that are passed in the host's feces. (A single female can produce 200,000 eggs per day!)



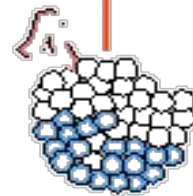
Juveniles in eggs mature to the infective (second) stage.



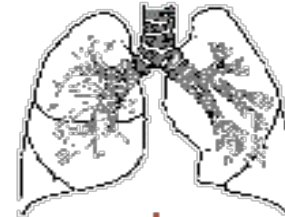
Eggs ingested by host and hatch in the small intestine. The juveniles penetrate the tissues of the intestine and enter the blood stream.



The juveniles are "coughed up" and swallowed. The juveniles complete their development in the small intestine.



The third stage juveniles migrate from the pulmonary capillaries into the alveoli (air sacs).



The juveniles migrate to the lungs and molt into third stage juveniles.

Symptoms

Fever, urticaria, angioneurotic edema, wheezing, and conjunctivitis.

Acute biliary obstruction or pancreatitis, obstructive appendicitis.

Spoliative action—protein and vitamin A deficiency.

Toxic action—urticaria and angioneurotic edema.

Mechanical action—intestinal obstruction, intussusception, volvulus, intestinal perforation.

In Lungs—Ascaris can cause pneumonia (Loeffler's syndrome).

Diagnosis

Laboratory Diagnosis of *Ascaris lumbricoides*

Detection of Parasite

Eggs

Larva

Adult worm

- Definitive diagnosis of ascariasis is made by demonstration of eggs in feces
- Rarely, when the infestation is light, eggs are demonstrable only by concentration methods

In the early stage of infection, when migrating larva cause Loeffler's syndrome, the diagnosis may be made by demonstrating the larvae in sputum, or in gastric washings

- Can occasionally be seen by naked eye in stool or sputum of patient
- X-ray, Barium meals and ultrasound imaging may help in diagnosis

Serodiagnosis

Ascaris antibodies can be detected by

- ELISA
- IHA
- IFA

Serodiagnosis is helpful in extra intestinal ascariasis like Loeffler's syndrome

Blood examination

Eosinophilia may be seen in early stages of infection

Treatment

pyrantel pamoate 11 mg/kg once; maximum 1 g,
albendazole 400 mg once,
mebendazole 100 mg twice daily for 3 days or 500 mg once,
ivermectin 150–200 mg/kg once.

Prophylaxis

Preventing fecal contamination of soil.

Treatment of vegetables and other garden crops with water containing iodine 200 ppm for 15 minutes kills the eggs and larvae of *Ascaris* and other helminths.

Avoid eating raw vegetables.

Improvement of personal hygiene. Treatment of infected persons.

HOOK WORMS

HOOK WORMS

There are two species of hookworm:

1. *Ancylostoma duodenale*

2. *Necator americanus*

The adults are found in the small intestines of man. Mixed infection is common. Both of the species are found in Ethiopia, but *N. americanus* is more common.

Ancylostoma duodenale

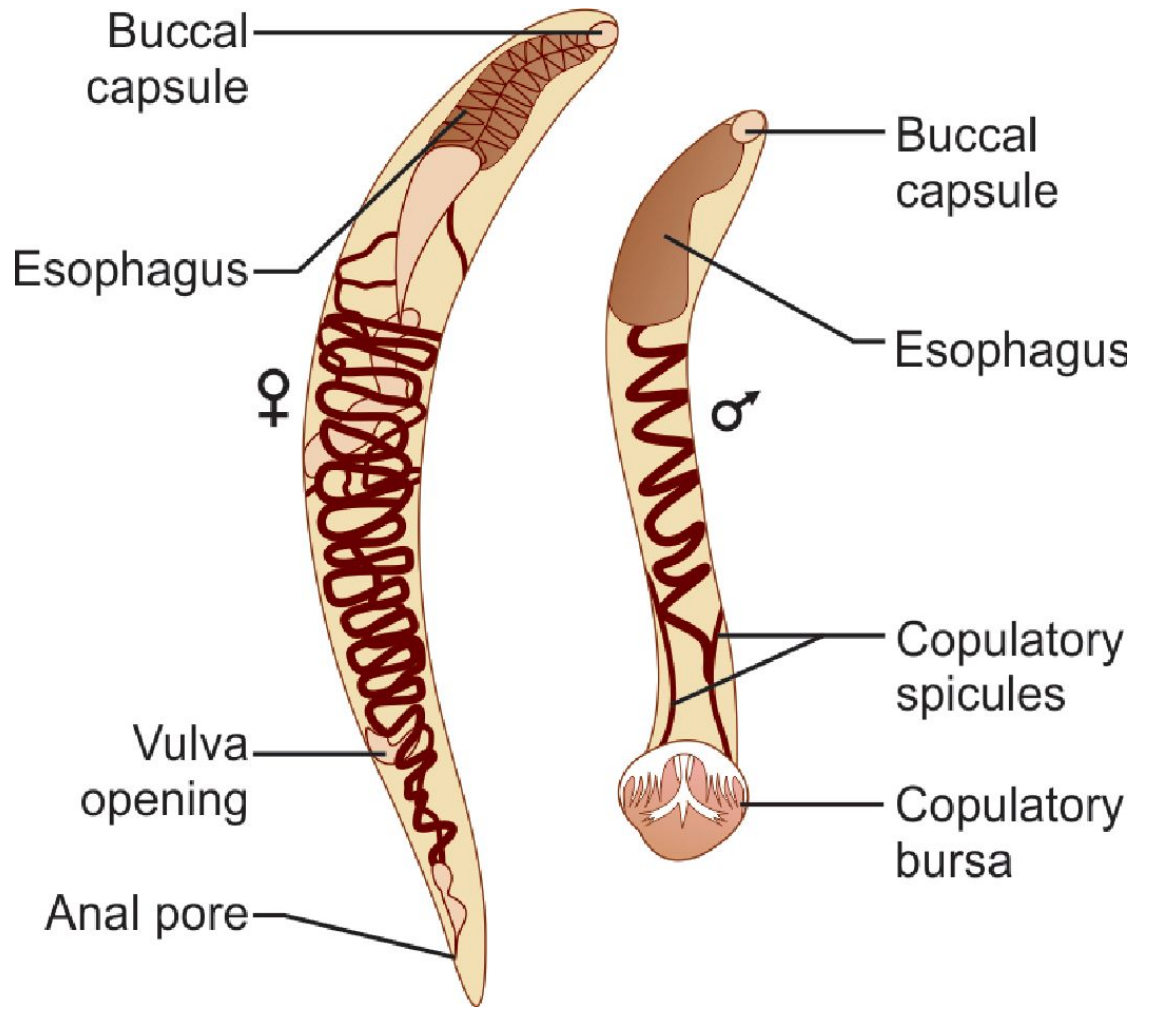
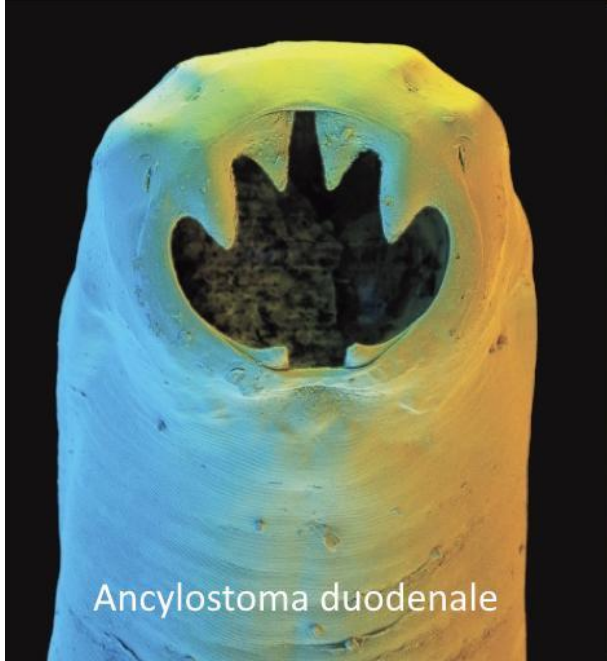
Grayish-white in color. The body is slightly ventrally curved. The anterior end follows the body curvature. The buccal cavity is provided ventrally with pairs of teeth and dorsally with a notched dental plate.

Distribution: This species is found in the northern part of the world including China, Japan, Europe, North Africa and Ethiopia.

Morphology

Male: The male measures 10 cm in length. The posterior end is broadened into a membranous copulatory bursa that is provided with two long spicules.

Female: The female measures 12 cm in length. The posterior end is straight.



Necator americanus

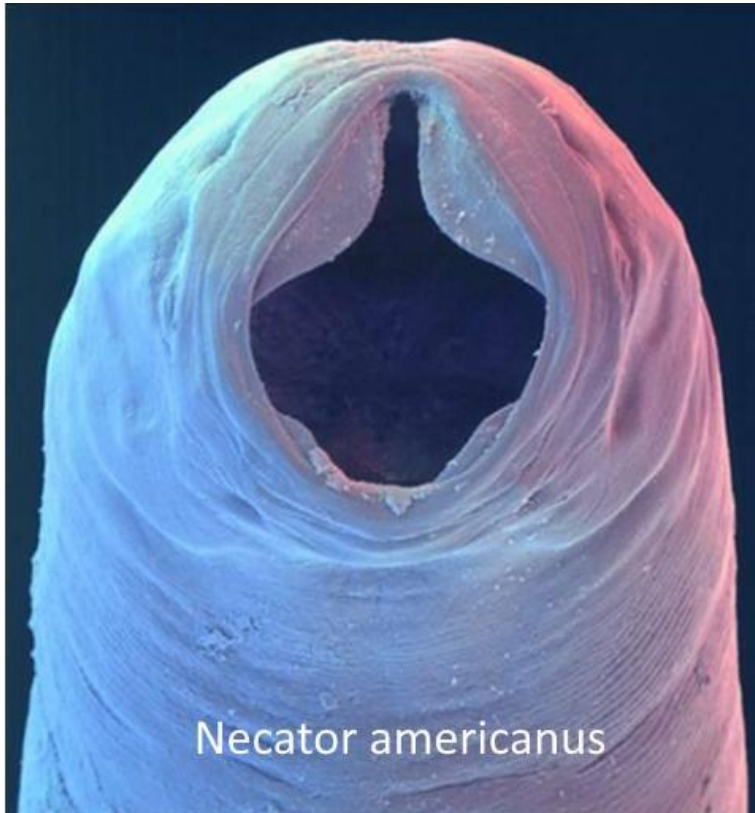
This species, so called American hookworm, is found in predominantly the tropics. The anterior end is hooked against the body curvature. The mouth is provided ventrally and dorsally with cutting plate.

Morphology

Male: The male measures 8 cm in length. The posterior end is broadened into a membranous copulatory bursa, which is provided with two long spicules fused distally.

Female: The female measures 10 cm in length. The posterior end is straight

Infective stage and methods of infection: The filariform larva infects by skin penetration.

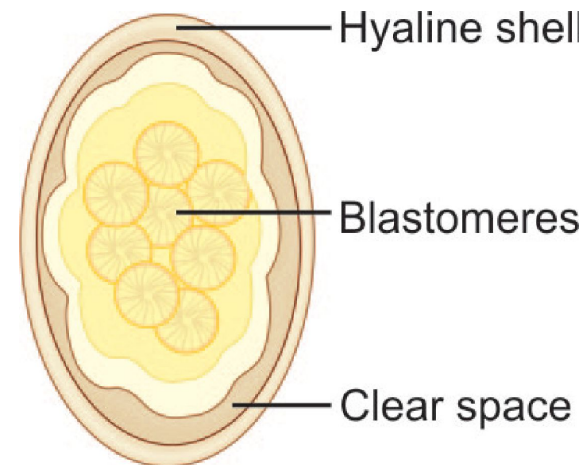


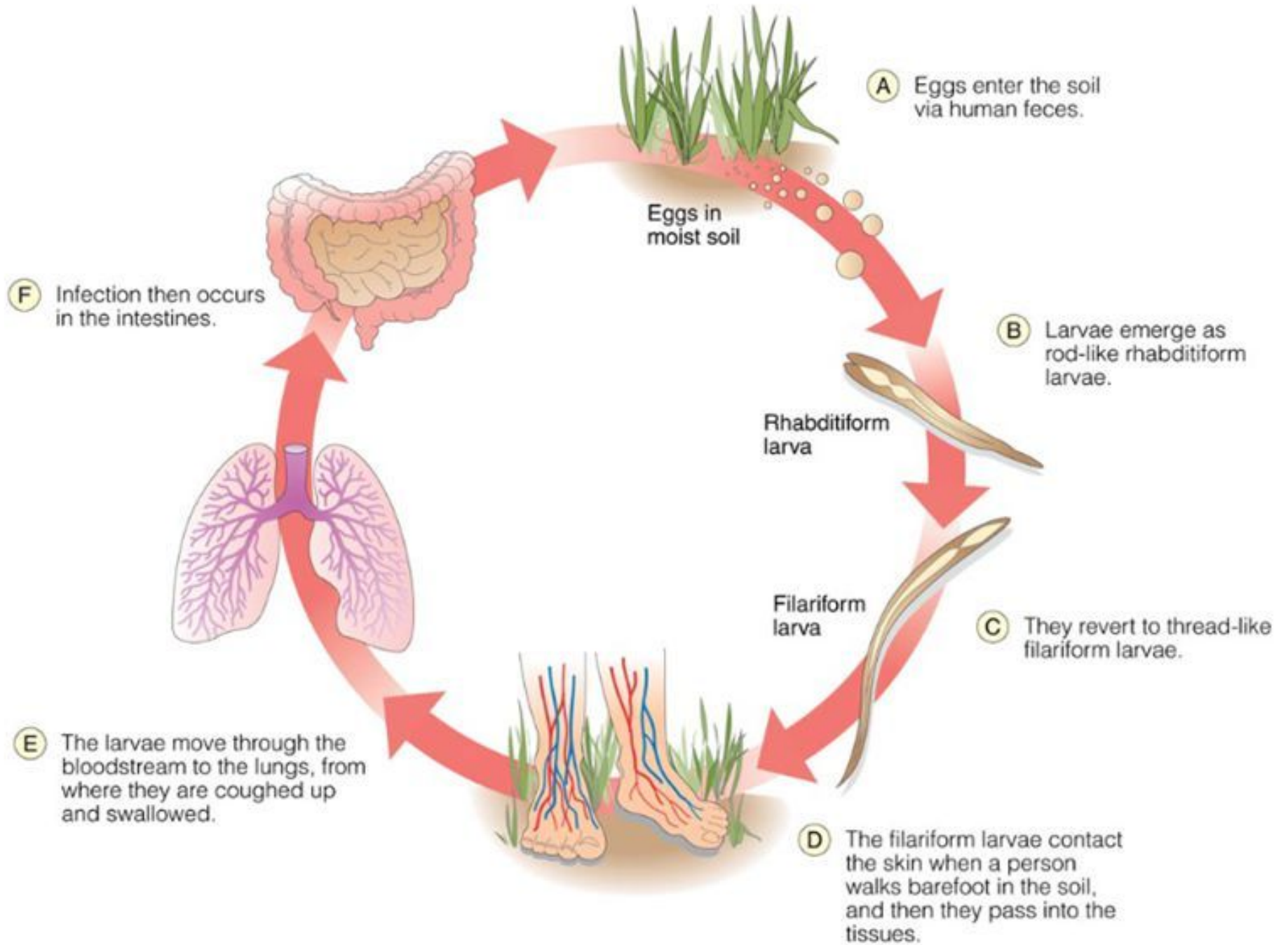
Life cycle

Adult male and female worms live in the small intestine. The female lays eggs (oval, 60x40 microns), which contain immature embryo in the 4 cell stage. When the eggs pass in the stool to the soil and under favorable conditions of temperature, moisture and oxygen, they hatch into larvae, which molt twice and become infective. When the filariform larvae penetrate the skin, they circulate in the blood, reach the lungs, ascend to the trachea, descend to esophagus to reach the small intestine and become adults.



Egg of hookworm





Symptoms

Adult worms in the intestine feed on blood causing iron deficiency anemia. The larvae may cause inflammation of the lungs.

Diagnosis

Examination of stool by direct saline smear to detect the eggs.

Treatment

Mebendazole: 1 tab 2x daily for 3 days.

LARVA MIGRANS

There are three types of larva migrans:

a. Cutaneous larva migrans (Creeping eruption)

Various animals harbor hookworms. Two species of dogs and cats are important.

1. *Ancylostoma braziliens*: infects both dogs and cats.

2. *Ancylostoma caninum*: infects only dogs.

Both of these are common in the tropics and subtropical regions where human hookworms can best complete their life cycles. If man comes in contact with infective larvae, penetration of the skin may take place; but the larvae are then unable to complete their migratory cycle. Trapped larvae may survive for weeks or even months, migrating through the subcutaneous tissues. They may evoke a fairly severe reaction - pruritus and dermatitis. The dermatitis leads to scratching and then bacterial superinfection.

Treatment

Thiabendazole: Applied topically.

b. Visceral larva migrans

A syndrome caused by the migration of parasitic larvae in the viscera of a host for months or years. It may be caused by transient larval migration in the life cycles of several parasites such as hookworm, *Ascaris lumbricoides*, *T. spiralis*, *S. streccoralis* and other filarial worms.

Toxocariasis

This is a kind of visceral larva migrans caused by

◆ *Toxocara canis* (Dog ascarid) and

◆ *Toxocara cati* (Cat ascarid).

These cause persistent larval migration and thus the visceral larva migrans is called toxocariasis.

Morphology

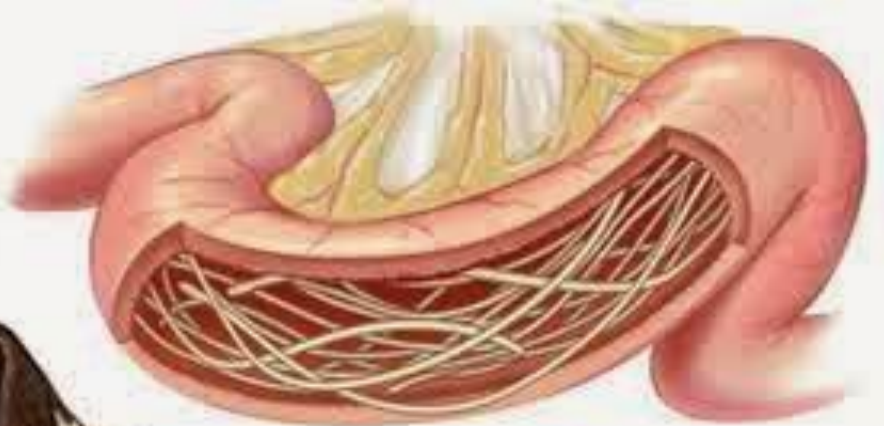
◆ The larvae of *Toxocara canis* and *Toxocara cati* measure about 400 μm in length.

◆ The life cycle of these parasites in their respective hosts is similar to that of *A.lumbricoides* in humans.



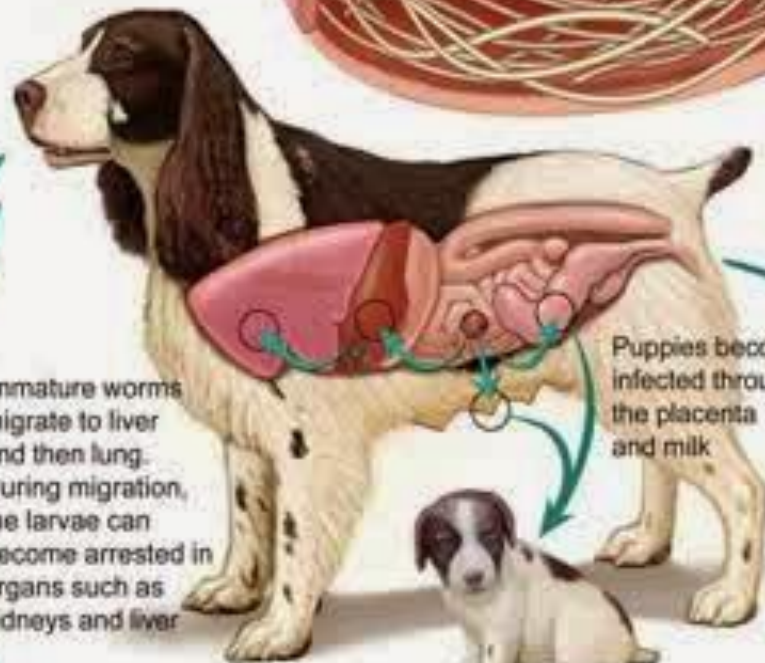
Roundworm (*Toxocara canis*)

Adults release eggs
in dog's small intestine



Humans can accidentally
consume roundworm eggs
and become infected.
Infections can appear in the
eye, brain and other organs

Secondary host is
consumed; eggs
and larvae hatch in
small intestine



Eggs passed in feces.
Eggs can appear in feces
2-4 weeks after infection

Puppies become
infected through
the placenta
and milk

Immature worms
migrate to liver
and then lung.
During migration,
the larvae can
become arrested in
organs such as
kidneys and liver



Secondary hosts,
such as
earthworms
or field mice,
come in contact with eggs and
become carriers



Egg develops in soil. Eggs become infective 2 weeks
after being passed in feces — remaining so for years



Epidemiology. Visceral larva migrans is cosmopolitan in distribution.

Transmission: Ingestion of eggs of *Toxocara* species in contaminated food or soil or direct contact with infected patients. Children are more at risk.

Symptoms

- ◆ Majority are asymptomatic.
- ◆ Eosinophilia
- ◆ Cerebral, myocardial and pulmonary involvement may cause death.

Diagnosis

Identification of larvae in tissue.

Treatment

Thiabendazole: 25 mg/kg twice daily for 5 days.

Strongyloides stercoralis

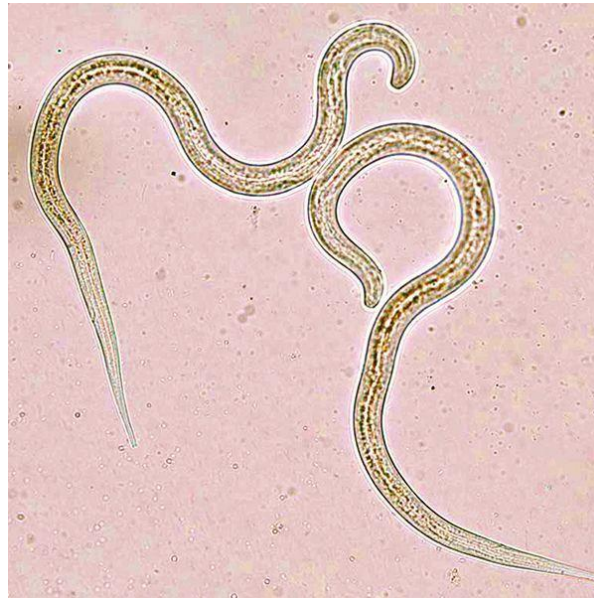
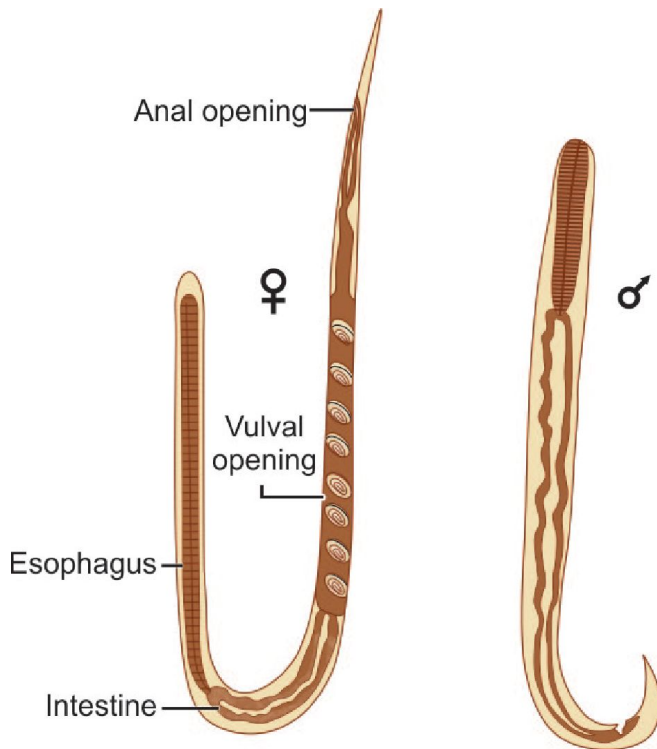
The worms may be present as parasitic in the host or free living in the soil.

Morphology

Male: The male measures 1 mm in length with curved posterior end and carries two spicules

Female: The female measures 2.5 mm in length with straight posterior end.

Infection: follows skin penetration by filariform larvae

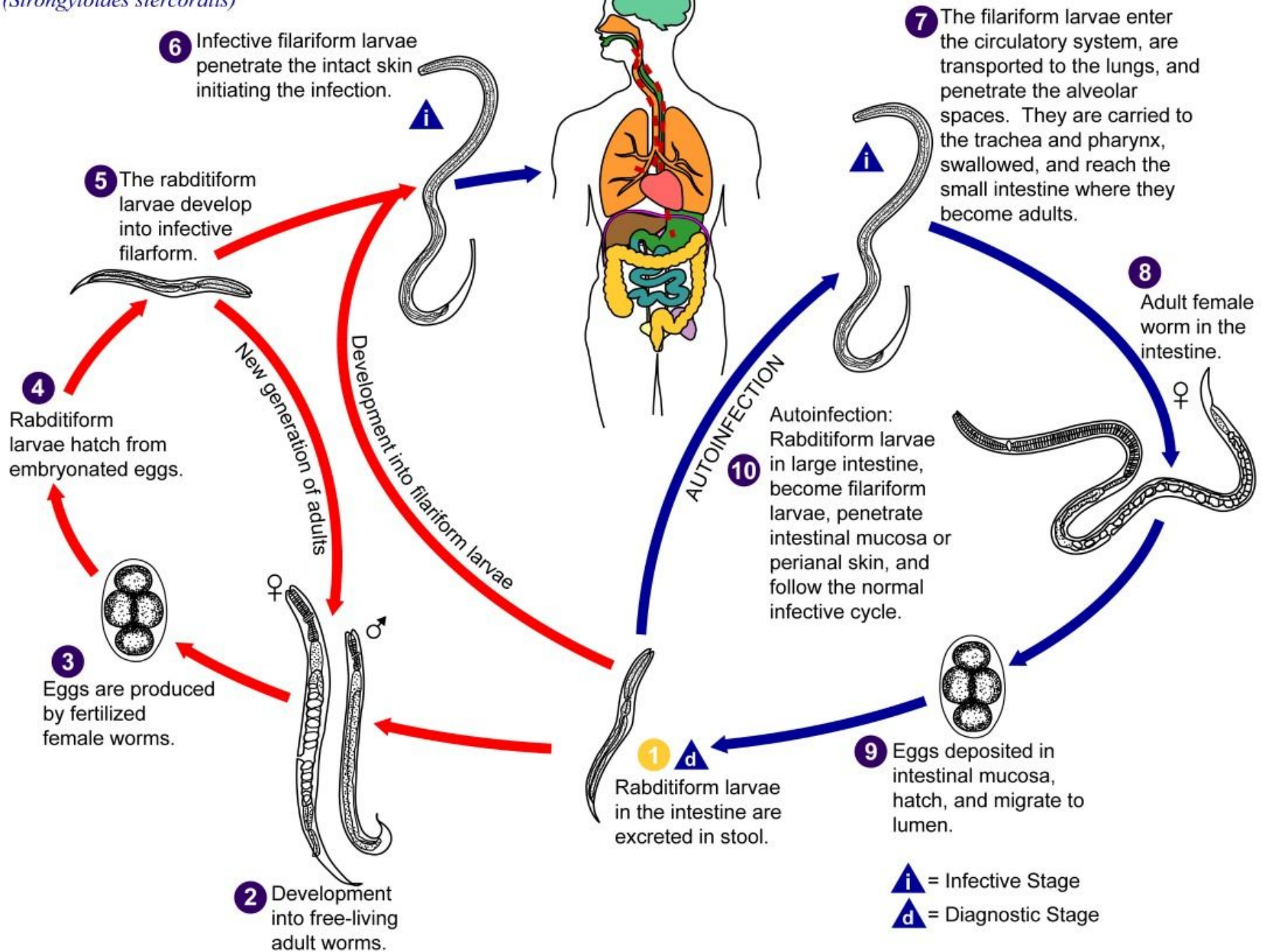


Life cycle

Adult male and female worms live in the small intestine. After fertilization, the female penetrates the mucosa of the small intestine and lay eggs in the submucosa. The eggs hatch and the larvae penetrate the mucosa back to the lumen. If the environmental conditions are favorable, the larvae will come out with the stool to the soil. They transform into adults, which lay eggs, and hatching larvae get transformed to adults and so on. If the environmental conditions are not favorable, the larvae in the stool will moult and transform into infective filariform larvae, which pierce the intestine (auto-infection). Larvae penetrating the skin from the soil or by autoinfection are carried by the blood to the lungs, ascend to the trachea, descend to the esophagus and mature in the small intestine.

Strongyloidiasis

(*Strongyloides stercoralis*)



Symptoms

The patient complains of mucoid diarrhea. Larvae in the lungs may cause pneumonia.

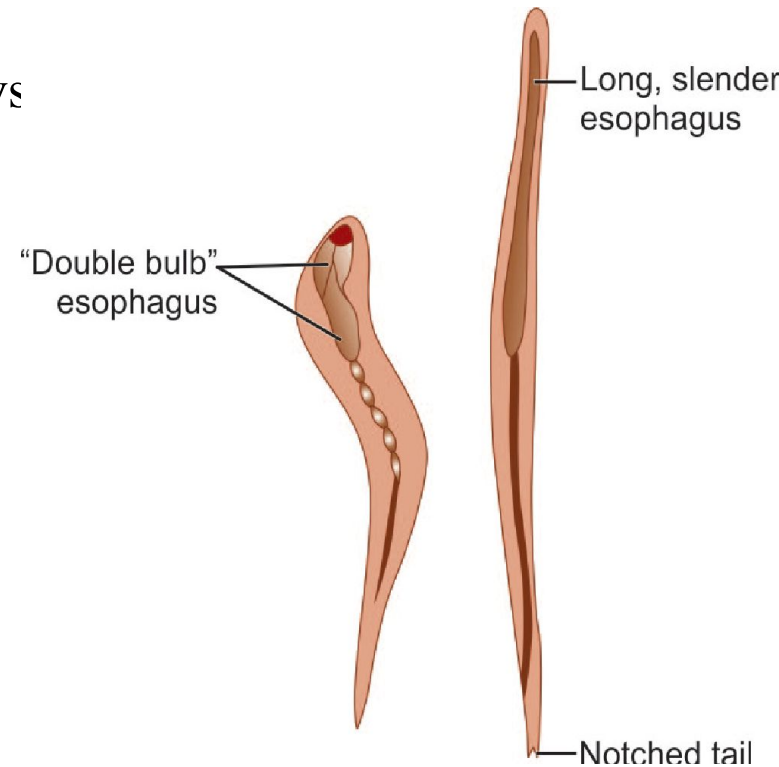
Disseminated strongyloidiasis. Multiplicity of symptoms are present due to the injury of other organs by the migrating larvae. Organs such as liver, heart adrenals, pancreas, kidneys, and CNS, etc. may be affected. This is usually seen in immunocompromized individuals.

Diagnosis

Detection of rhabditiform larvae of strongyloides in stool.

Treatment

Thiabendazole: 25 mg/kg twice daily for 3 days



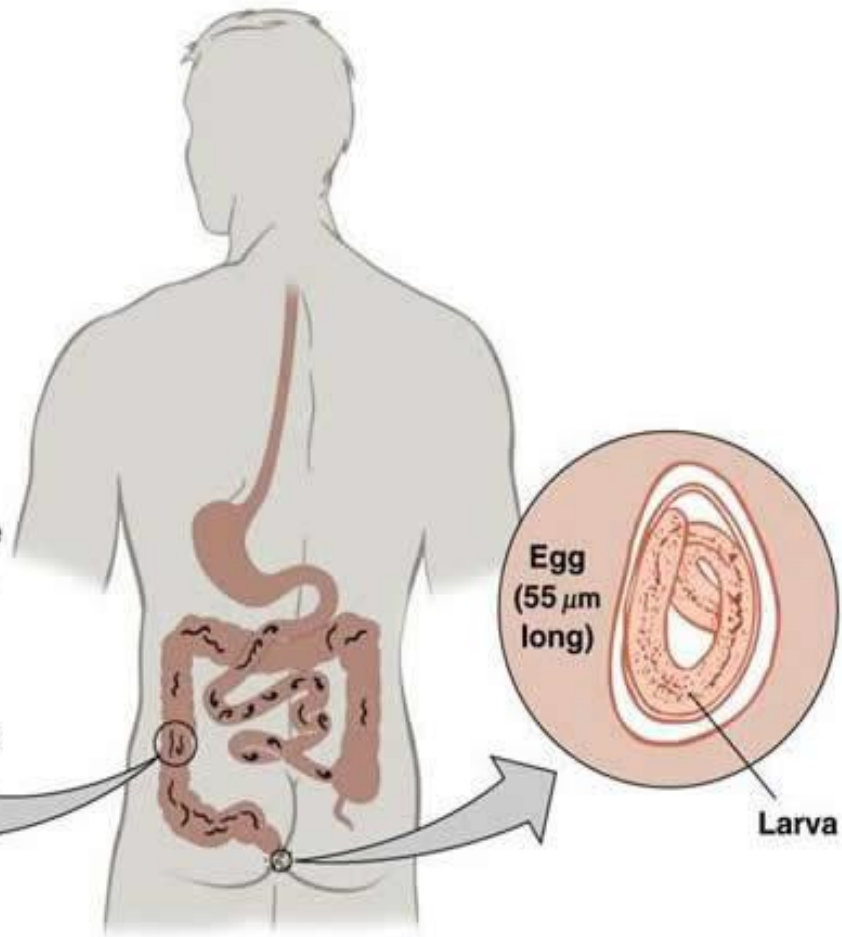
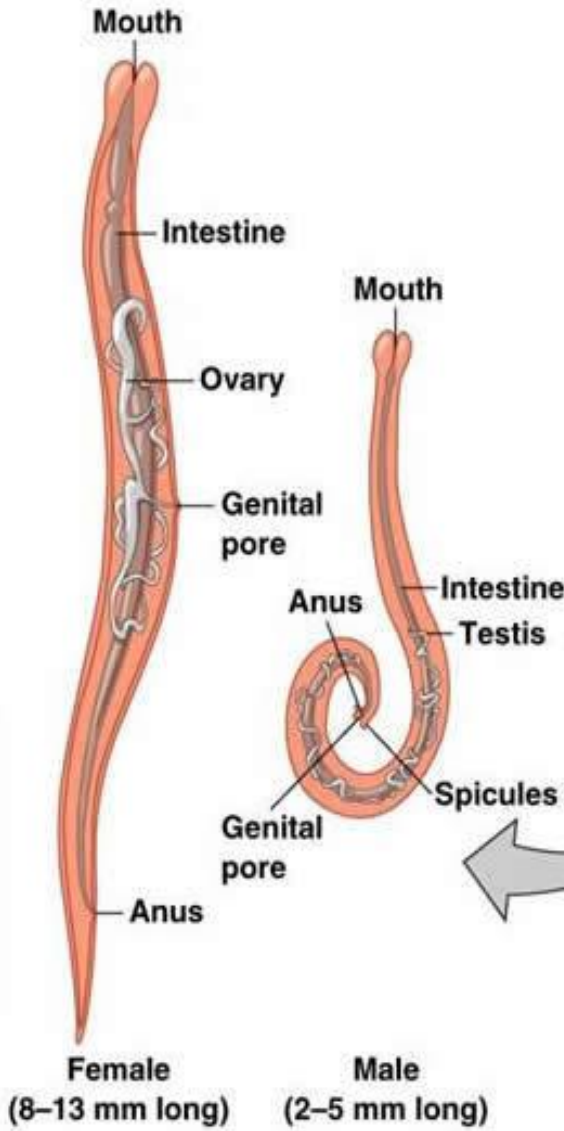
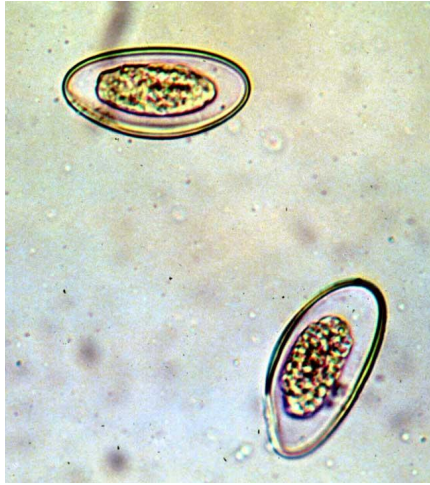
**INTESTINAL NEMATODES
WITHOUT TISSUE STAGE**

Enterobius vermicularis (*pin worm or thread worm*)

Enterobius vermicularis is a small white worm with thread-like appearance. The worm causes enterobiasis. Infection is common in children.

Morphology

Male: The male measures 5 mm in length. The posterior end is curved and carries a single copulatory spicule. **Female:** The female measures 13 mm in length. The posterior end is straight.



LM 3 mm

(a) Adult pinworm

(b) Pinworm egg

Life cycle

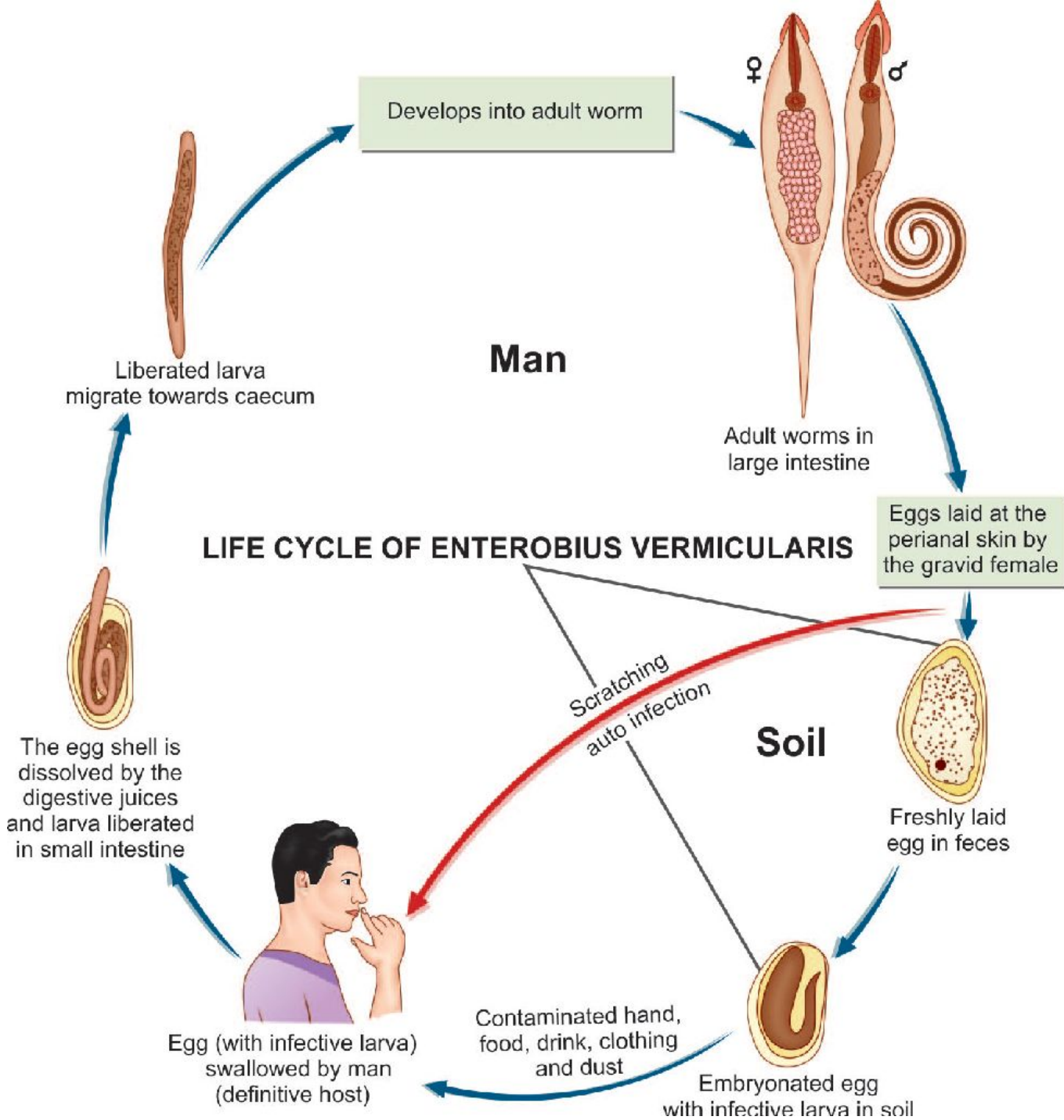
Natural host: Man

Infective form: Embryonated eggs, containing larvae with contaminated raw vegetables.

Mode of infection: Man acquires infection by ingesting embryonated eggs containing larva.

- By direct infection from a patient (Fecal-oral route).
- Autoinfection: the eggs are infective as soon as they are passed by the female worm. If the hands of the patient get contaminated with these eggs, he/she will infect him/herself again and again.
- Aerosol inhalation from contaminated sheets and dust.

Adult worm lives in the large intestine. After fertilization, the male dies and the female moves out through the anus to glue its eggs on the peri-anal skin. This takes place by night. The egg is 50x25 microns, plano-convex and contains larva. When the eggs are swallowed, they hatch in the small intestine and the larvae migrate to the large intestine to become adult.



Symptoms

Enterobiasis occurs mostly in children. It is more common in females than in males. About one-third of infections are asymptomatic. The worm produces intense irritation and pruritus of the perianal and perineal area (**pruritis ani**), when it crawls out of the anus to lay eggs. This leads to scratching and excoriation of the skin around the anus. As the worm migrates out at night, it disturbs sleep. **Nocturnal enuresis** is sometimes seen. The worm crawling into the vulva and vagina causes irritation and a mucoid discharge. It may migrate upto the uterus, fallopian tubes and into the peritoneum. This may cause symptoms of **chronic salpingitis**, cervicitis, peritonitis, and recurrent urinary tract infections. The worm is sometimes found in surgically removed appendix and has been claimed to be responsible for **appendicitis**.

Diagnosis

◆ Detection of eggs by NIH swab and cellophane scotch tape method. Detection of eggs under finger nail Detection of adult worm and eggs in stool.

Treatment

Pyrantel pamoate 11 mg/kg once, maximum 1 g,

Albendazole 400 mg once

Mebendazole 100 mg once

Prophylaxis

Maintainance of personal and community hygiene such as frequent hand washing, _ nger nail cleaning, and regular bathing.

Frequent washing of night clothes and bed linen.

Trichuris trichiura (whip worm)

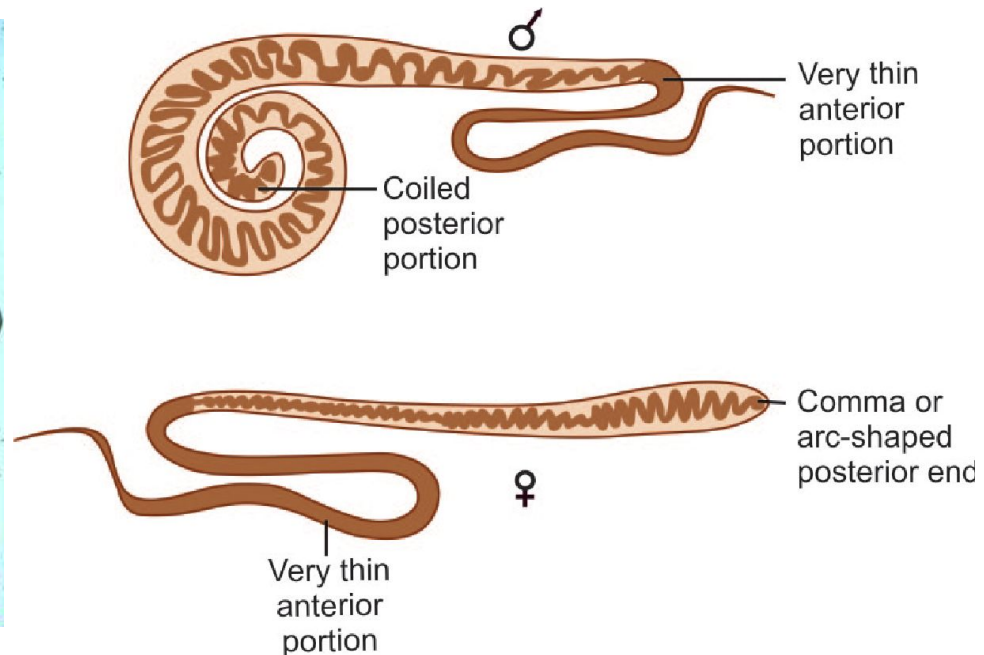
The worm is divided into a thin whip-like anterior part measuring $\frac{3}{5}$ of the worm and a thick fleshy posterior part of $\frac{2}{5}$ the length.

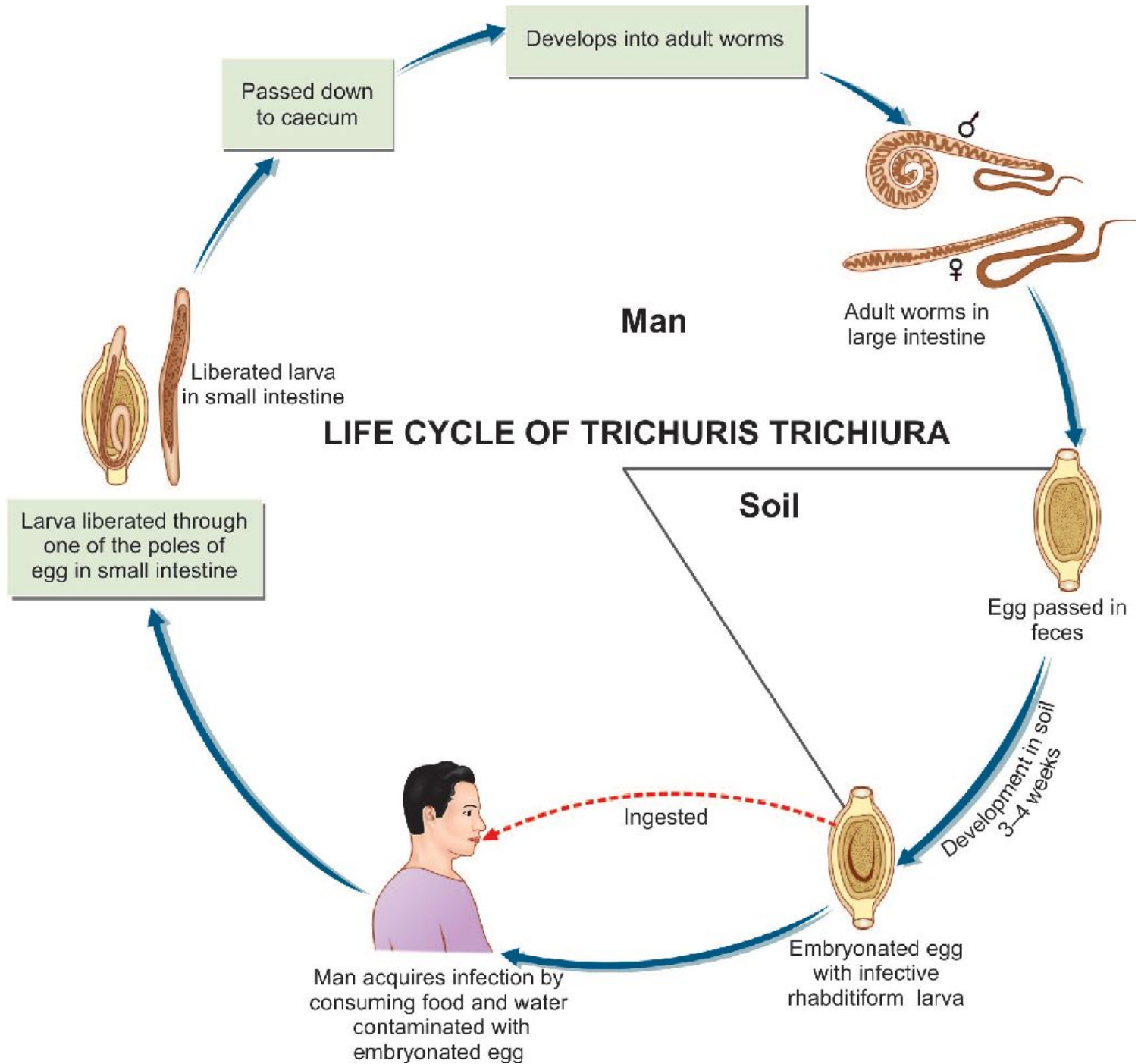
Male: The male measures 3-4.5 cm in length. Its posterior end is coiled and possesses a single cubicle.

Female: The female measures 4-5 cm in length. Its posterior end is straight

Infective stage and mode of infection

Infection is by ingestion of eggs containing larvae with contaminated raw vegetables.





Symptoms

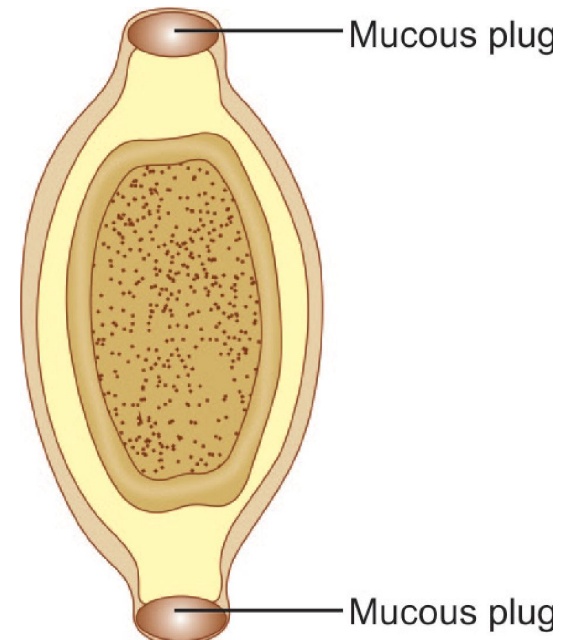
The patient complains of dysentery (blood and mucus in stool together with tenesmus). Rectal prolapse is also possible.

Diagnosis

Finding of characteristic eggs. The egg of trichuris is barrel-shaped, 50x25 microns. The shell is thick with a one mucoid plug at each pole.

Treatment

Mebendazole: 1 tablet twice daily for 2 days.



Egg of *Trichuris trichiura*

Task 1. Intestinal nematodes

Latin name of parasite	<i>Ascaris lumbricoides</i>	<i>Ancylostoma duodenale</i>	<i>Strongiloides stercoralis</i>	<i>Enteobius vermicularis</i>	<i>Trichuris trichiura</i>
Forms of parasites					
Natural host					
Infective stage					
Transmission (Way of infection)					
Symptoms					
Diagnosis					
Treatment					
Prevention					

**TISSUE NEMATODES.
FILARIAL WORMS**

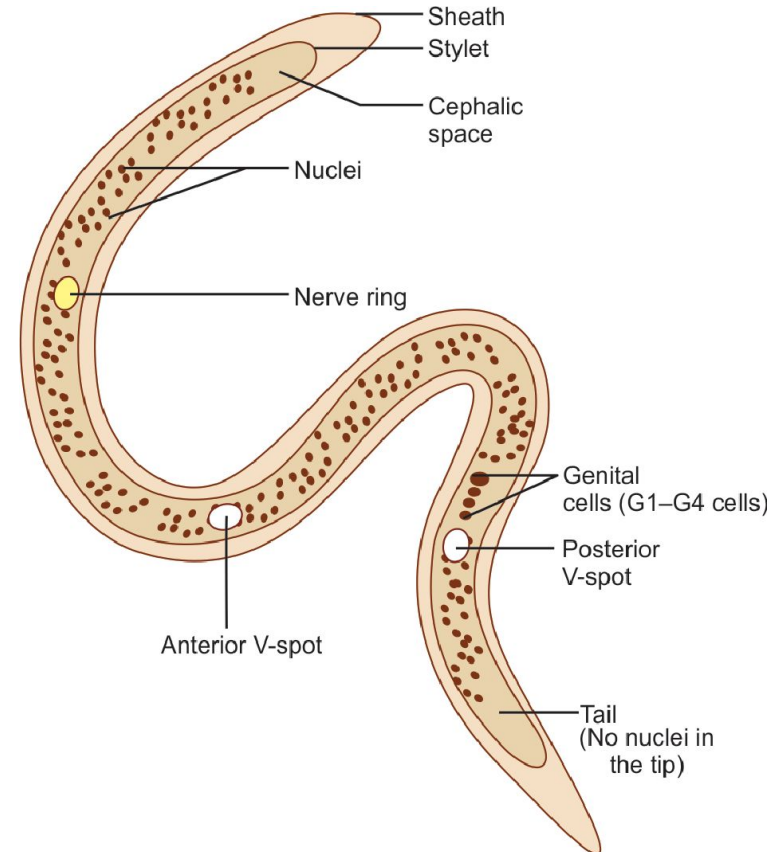
Filarial worms

This group includes the **filarial worms**, the guinea worm (*Dracuncululus medinensis*) and *Trichinella spiralis*.

The filarial worms have complex life cycles involving a developmental stage in an insect vector. They require an arthropod vector for their transmission. The worms inhabit either the lymphatic system or the subcutaneous tissues of man. The female worm gives rise to a young worm called microfilaria. The microfilariae, when taken by the arthropod intermediate host during biting, develop into filariform larvae, which are the infective stages. Humans get infected when bitten by the infected arthropod intermediate host.

Wuchereria bancrofti

This is a parasite of lymph nodes and lymphatic vessels- causing lymphatic filariasis. This filarial worm is transmitted by the bite of various species of mosquitoes. It is believed that over 100 million people are infected. The microfilariae are nocturnal – seen in greatest numbers in peripheral blood in the night between 10 PM-2 AM.

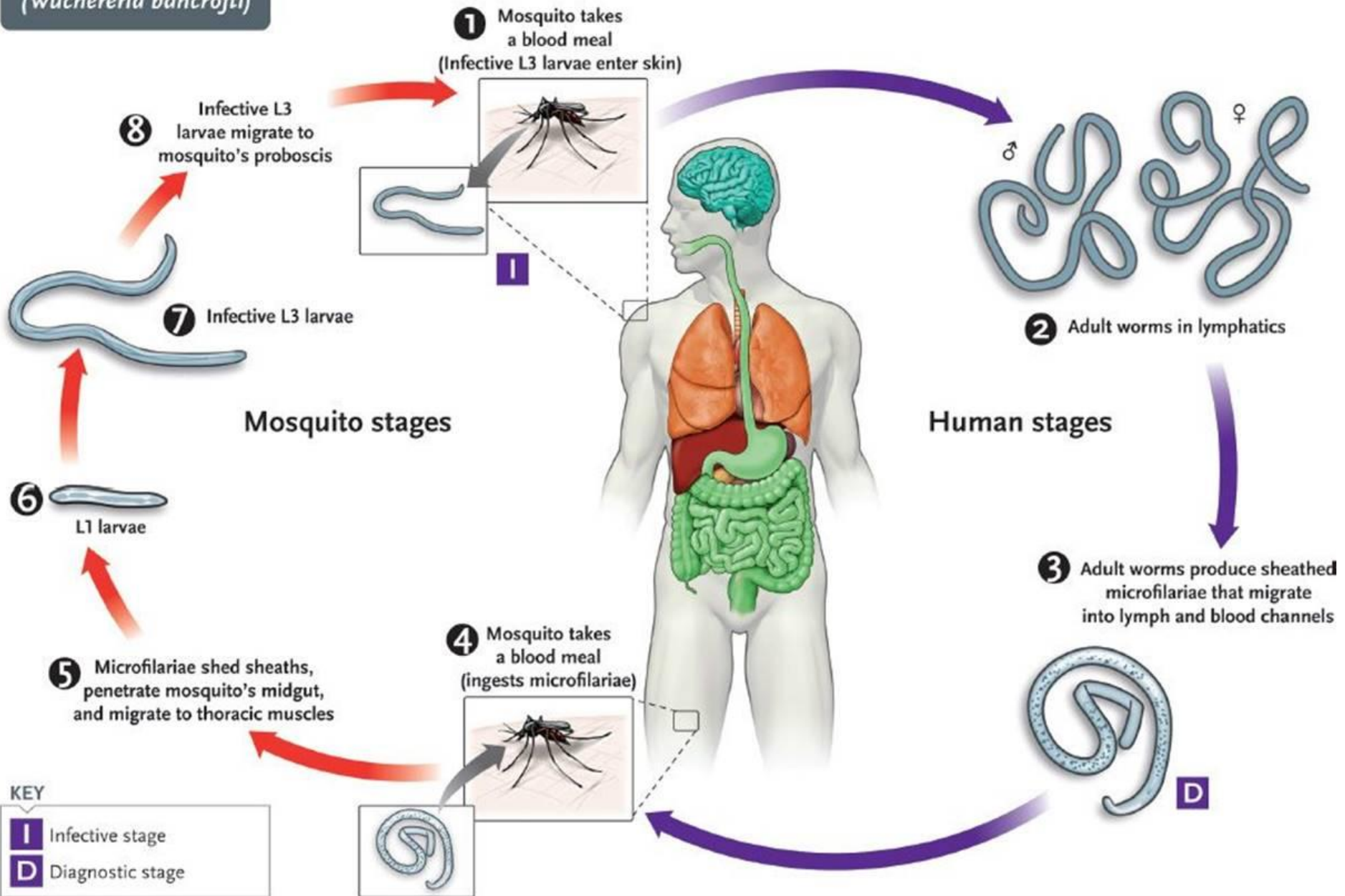


Mode of transmission and pathogenesis

The filariform larvae are introduced through the skin by the bite of the arthropod intermediate host. The larvae invade the lymphatics, usually the lower limb, where they develop into adult worms. The microfilariae are liberated into the blood stream. They remain in the pulmonary circulation during day, emerging into the peripheral circulation only during night, to coincide with the biting habit of the vector. Presence of the adult worms causes lymphatic blockage and gross lymphedema, which sometimes lead to elephantiasis.

Epidemiology: *W. bancrofti* infection is not reported in higher altitudes of Ethiopia, but limited to lowlands of Gambella. The epidemic area covers a long distance along the Baro River.

Filariasis (*Wuchereria bancrofti*)



Symptoms

- ◆ The adult worm obstructs the flow of lymph in the lymph nodes and the lymphatic vessels draining the lower limbs and the external genitalia.
- ◆ The lower limbs and external genitalia become swollen. The skin becomes thick and fissured. The disease is called bancroftian elephantiasis.
- ◆ The major symptoms and findings include: lymphangitis, lymphedema, fever, headache, myalgia, hydrocele and chyluria.

Diagnosis

- ◆ Blood film examination after staining by Giemsa or Leishman stain to detect microfilaria. The film should be taken by night.

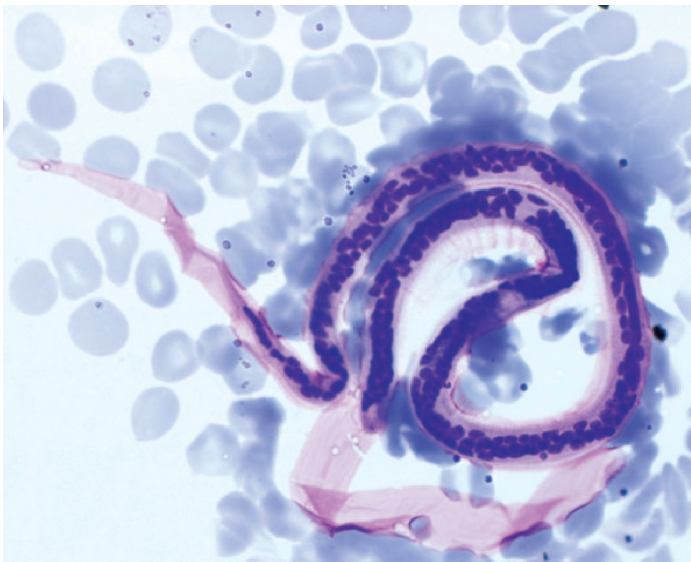


Figure. Microfilaria of *W. bancrofti* in blood smear

Treatment

Diethyl carbamazine (DEC): 2 mg/kg 3x daily for 2 weeks.

Endemic non-filarial elephantiasis (Podoconiosis)

Non-filarial elephantiasis of the lower limbs is common in Ethiopia. Silicon, aluminium and iron particles in the red clay soil are absorbed through skin abrasions in bare footed persons. The mineral particles cause obstruction of the lymphatics.



Microfilaria

Onchocerca volvulus

Infection by this filarial worm is common in Ethiopia. Endemic foci are found in Bebek, Gojeb valley, Dedessa valley, Agaro, Metekel, and in Northwestern Ethiopia around Gondar.

Morphology

Male: Similar to that of *Wuchereria bancrofti*.

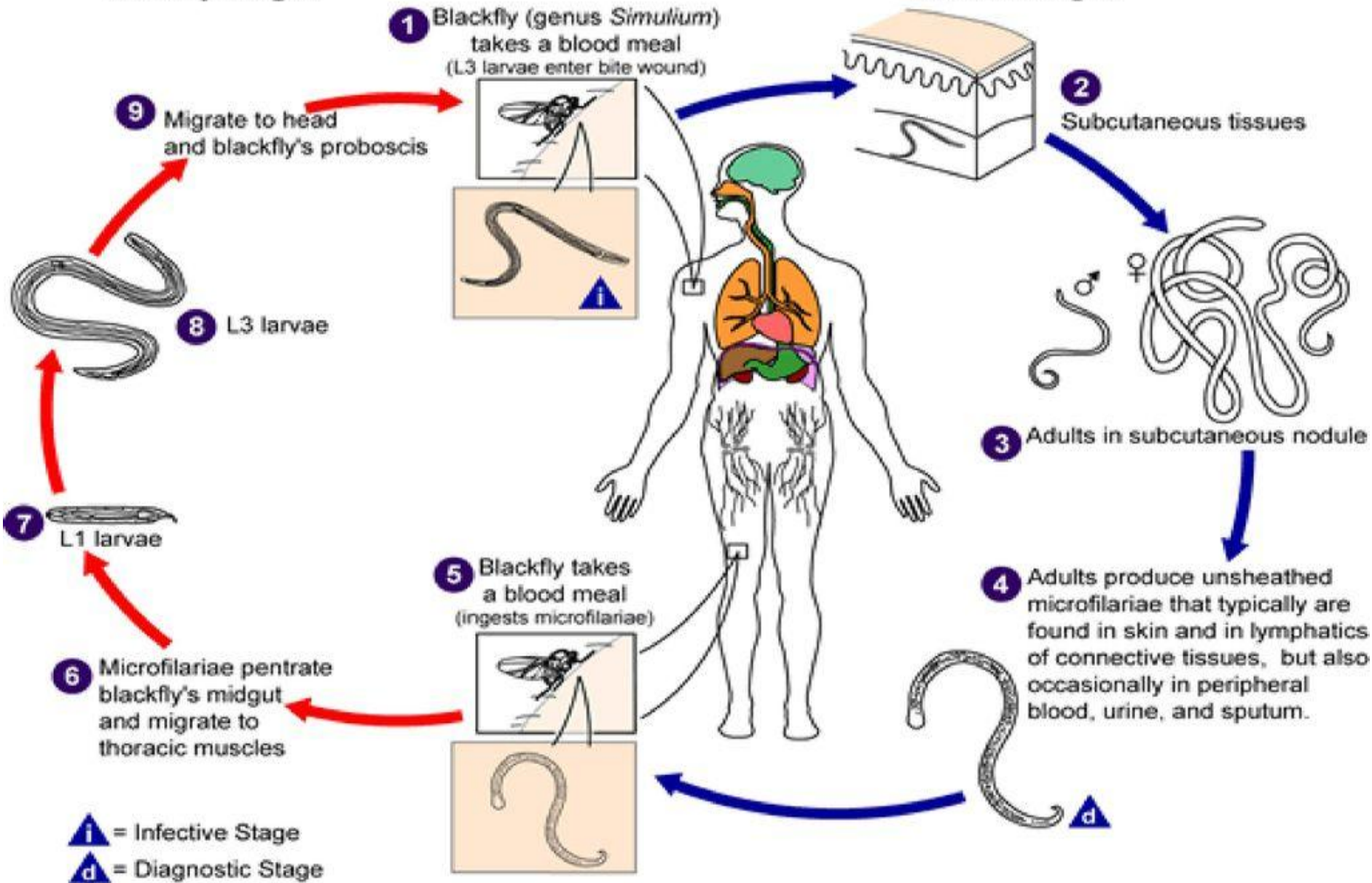
Female: The female measures 30-50 cm in length. It is present inside of a fibrous nodule (onchocercomata or onchocerca tumor).

Intermediate Host and vector: Female Simulium, (*Simulium damnosum*), Black fly, found around plantations following rivers or river basins.

Microfilaria. Measures 300 microns in length. It is non-sheathed microfilaria. It is present in the subcutaneous tissue fluids and not in blood.

Blackfly Stages

Human Stages



Infective stage and mode of infection: microfilaria.

Symptoms

The disease, onchocerciasis or river blindness includes:

- Skin fibrous nodules (onchocercomata) enclosing female worms. The nodules are common in neck, iliac crest and the coccyx.
- Skin hypo- or hyper- pigmentation. Dermatitis is present. In advanced cases, the skin becomes thickened and wrinkled, showing lizard or leopard skin appearance.
- Elephantiasis of the external genitalia and corneal opacity and optic atrophy may finally cause blindness.

Diagnosis

Superficial biopsy (skin snip) is taken from the skin using sharp razor blade. The specimen is allowed to stand for 30 minutes in saline before it is examined microscopically for microfilariae.

Treatment

Ivermectin: 50 mg/kg bodyweight, given every 6 or 12 months. Because it kills microfilariae but not adult worms, retreatment is necessary over a period of years.

Prevention

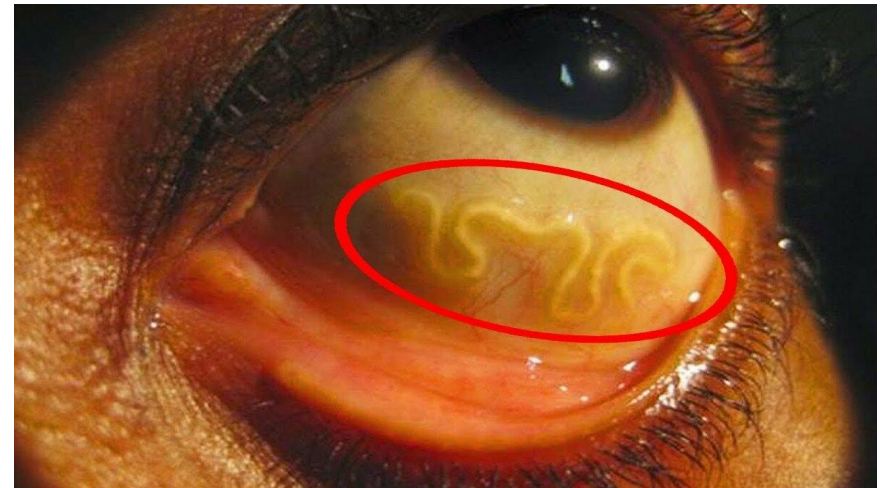
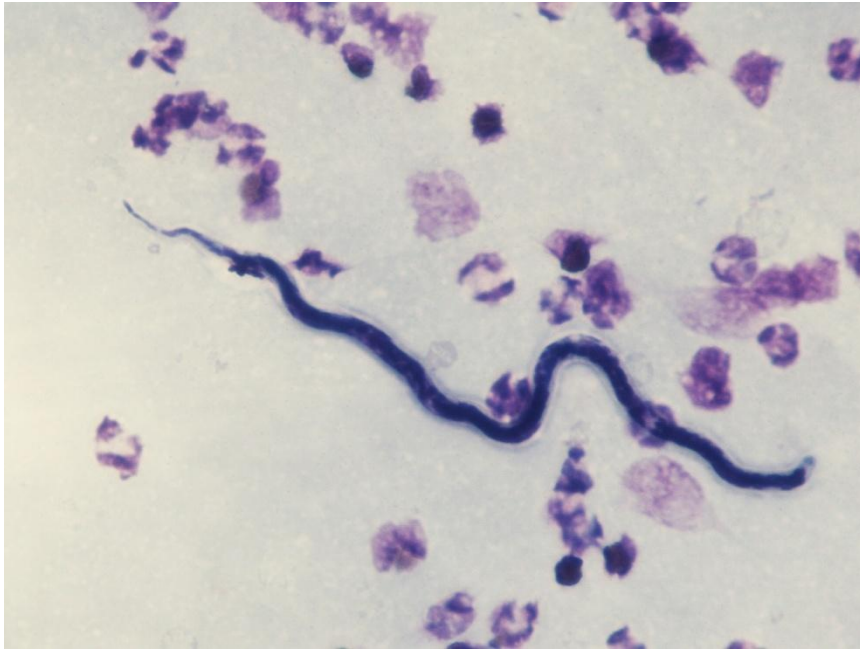
- Vector control
- Mass treatment
- Establishment of villages away from Simulium breeding places.
- Use of repellents
- Protective clothing

Loa loa

The eye worm, *Loa loa*, causes Loiasis. The insect vectors include mango flies of Chrysops - *Chrysops silacea*, *Chrysops dimidiata*. Loiasis is endemic in Central and West Equatorial Africa. The abundant rubber plantations provide a favorable environment for the vector to transmit the disease.

Morphology

Adult male worms: 30-34 mm in length. Adult female worms: 40-70 mm in length.



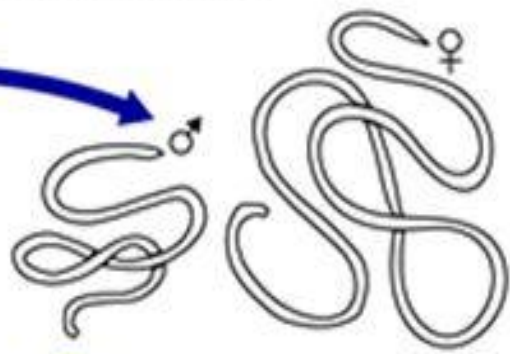
Fly Stages

1 Fly (genus *Chrysops*) takes a blood meal (L3 larvae enter bite wound)



Human Stages

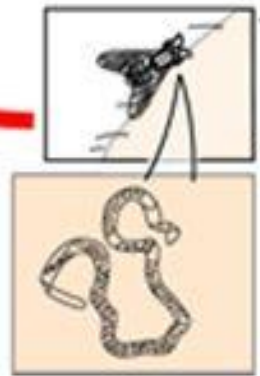
2 Adults in subcutaneous tissue



3 Adults produce sheathed microfilariae that are found in spinal fluid, urine, sputum, peripheral blood and in the lungs



4 Fly takes a blood meal (ingests microfilariae)



8 Migrate to head and fly's proboscis



7 L3 larvae

6 L1 larvae

5 Microfilariae shed sheaths, penetrate fly's midgut, and migrate to thoracic muscles

i = Infective Stage
d = Diagnostic Stage

Symptoms

The microfilaria have a sheath. Their diurnal periodicity corresponds to the feeding pattern of the insect vector, which bites humans from 10:00 AM to 4:00 PM. Incubation period is about one year. It causes calabar swelling beneath the skin due to parasites. There is fever, pain, pruritus, urticaria, allergic reactions, retinopathy, glomerulonephritis, meningo-encephalitis etc.

Diagnosis

- Detection of microfilaria in peripheral blood, urine, sputum, CSF - stained with Giemsa or unstained
- Eosinophilia

Treatment

DEC, 6 to 10 mg per kilogram per day for 2 to 3 weeks: but has side effects - allergic reactions

Dracunculus medinensis

(Guinea worm or Medina worm)

Dracunculus medinensis causes dracunculiasis. The infection is endemic to Asia and Africa: India, Nile Valley, central, western and equatorial Africa, lowlands of Ethiopia and Eritrea.

Morphology

Gravid female worms measure 70-120 cm in length. Their body cavity is almost fully occupied by a uterus greatly distended with rhabditiform larvae (250-750 μm in length). A digestive tube and cuticular annulations distinguish the larvae from microfilariae.



microfilariae



Life cycle

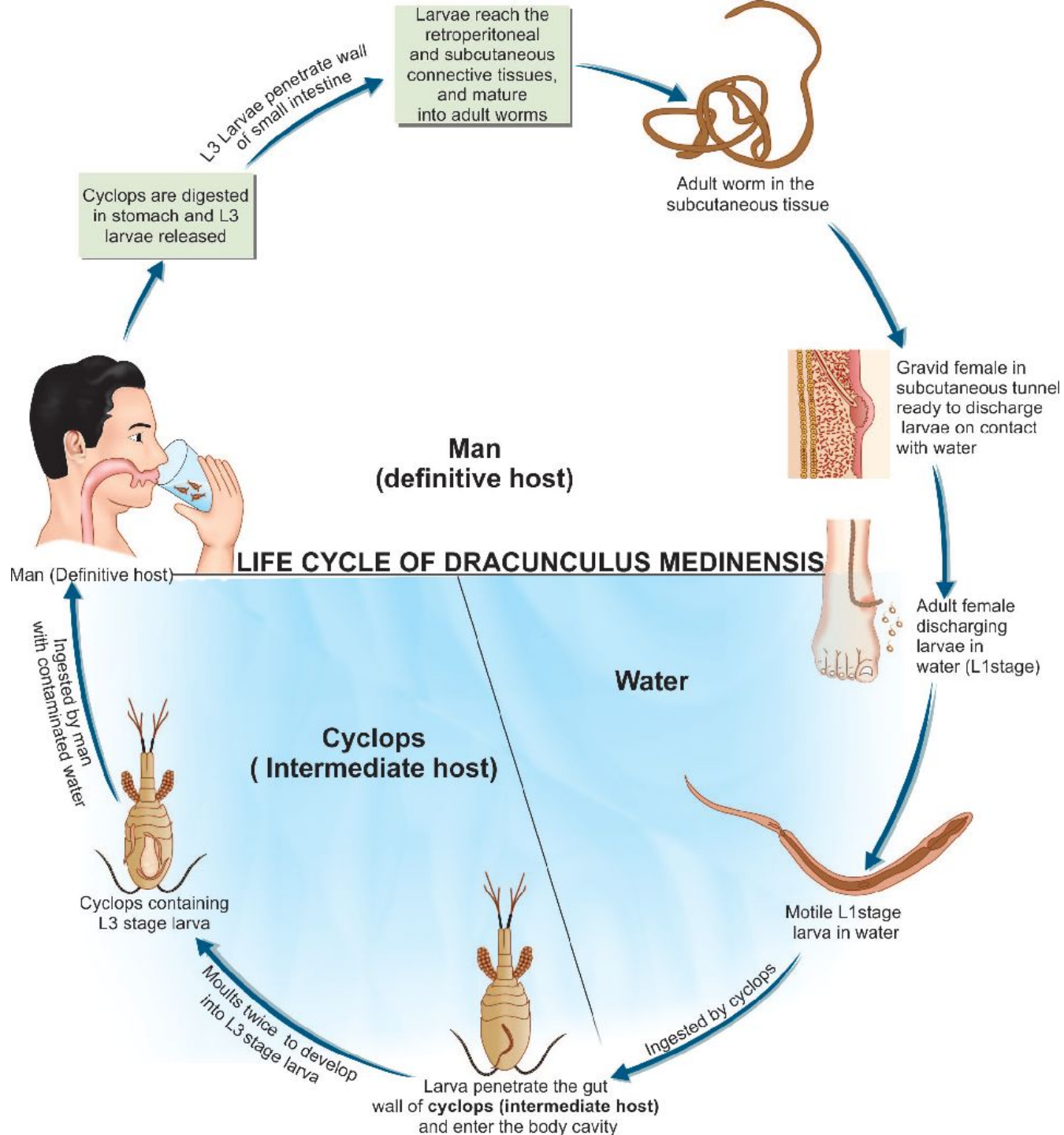
Definitive host: Man. No animal host or reservoir is known for *W. bancrofti*.

Intermediate host: Female mosquito, of different species acts as vectors in different geographic areas. The major vector in India and most other parts of Asia is *Culex quinquefasciatus* (*C. fatigans*).

Infective form: Actively motile third-stage filariform larva is infective to man.

Mode of transmission: Humans get infection by bite of mosquito carrying filariform larva.

Infection is acquired by drinking unfiltered or not boiled water that contains Cyclops species. The larvae are released in the stomach, penetrate the intestinal wall and find their way to the subcutaneous tissue. Mating takes place in the axillary or inguinal regions 3 months after infection. The male worms then die in the tissue and the female worms move down to the limbs within 10 months. In about 1 year, female worms in the subcutaneous tissue provoke the formation of a burning blister in the skin of the legs. When in water, the blister bursts, and about 5 cm of the worm is extruded from the resulting ulcer - thus releasing many thousands of first stage larvae. The larvae swim in water and are ingested by the intermediate host - Cyclops species- within about 4 days. Inside the Cyclops, the larvae molt twice and become infective in 2 weeks.



Symptoms

The female parasites in the subcutaneous tissue release toxic byproducts of histamine-like nature, which cause systemic allergic reactions, like erythema, urticaria, pruritus, fainting, asthma, dyspnea, etc. This is followed by the appearance of a blister on the legs, which ruptures on contact with water releasing larvae into the water by the female worm. The wound may ulcerate. The worms migrate into other tissues and may cause arthritis, pericarditis, abscesses etc. It occasionally penetrates the eyeball and causes loss of the eye.

Early stage—fever, malaise, urticaria, fugitive swelling, lymphangitis. Chronic stage—lymphadenitis,

lymphangiovarix, chyluria, hydrocele, and elephantiasis. Tropical pulmonary eosinophilia occurs due to hypersensitivity reaction to filarial antigen.

Diagnosis

Examination of blood (eosinophilia)

Microscopy of peripheral blood (microfilaria)

Demonstration of adult worm in biopsy

X-ray.

Serological tests.

PCR

Treatment

Surgical excision when the worm is in the leg

Niridazole (Ambilhar) or DEC

Prophylaxis

Eradication of the vector mosquito

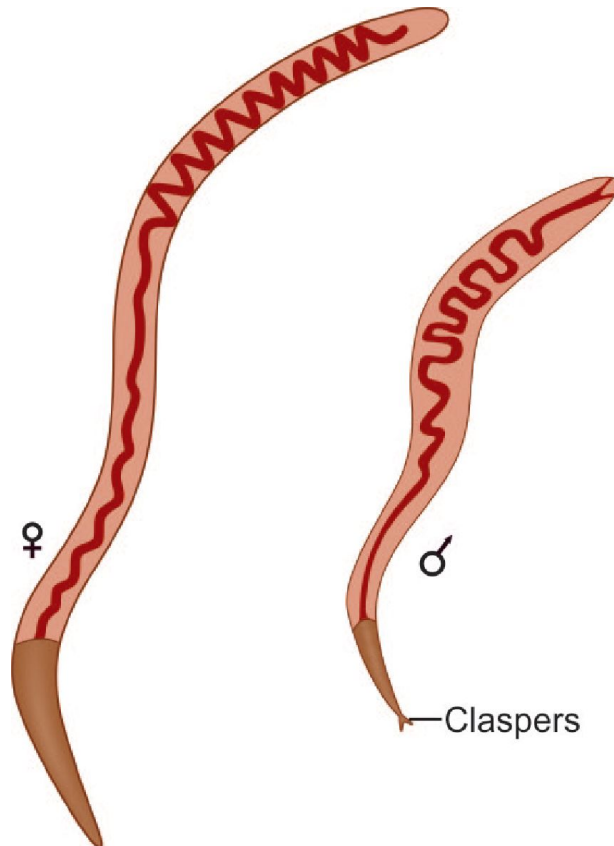
Detection and treatment of carriers.

Trichinella spiralis

This is the only important species in this group. It causes trichinosis – a cosmopolitan infection. More than 100 different animal species can be infected with *Trichinella* species, but the major reservoir host for human infections is swine.

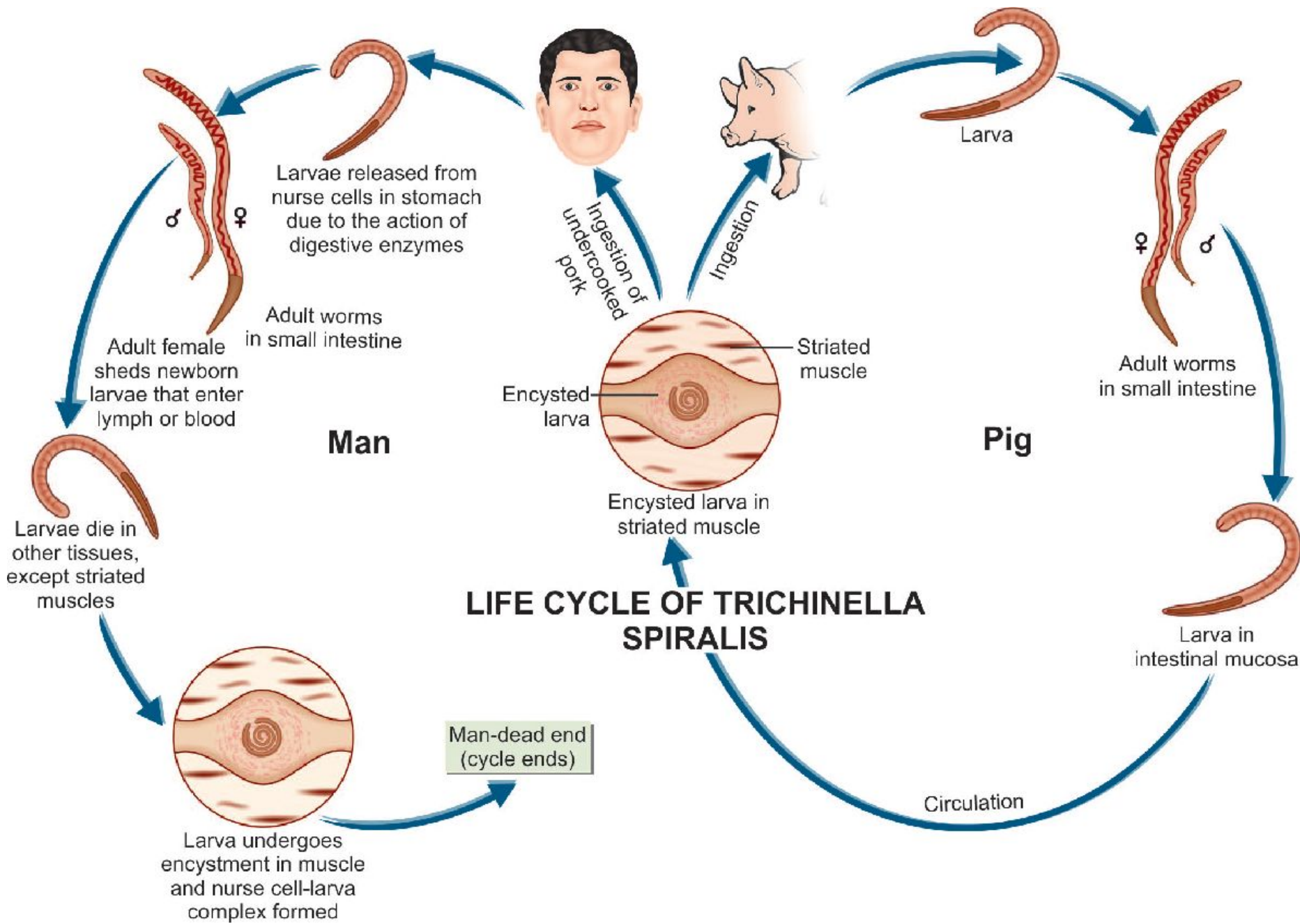
Morphology

Adult female worm measures 3-4 mm in length and the adult male worm measures 1.4-2.6 mm in length. The encysted larvae measure 800-1300 μm in length.



Life cycle

After ingesting infected meat, the capsule of the encysted larvae is digested by gastric juice, and the larvae are released in the duodenum or jejunum where they molt four times to become adult worm. After mating, the male worm dies and the female worm begins to deliver the embryos 4-7 days after the infection. The larvae penetrate the intestinal wall and migrate through the lymphatic vessels to the blood stream, which carries them to various organs. Skeletal muscles and diaphragm are most frequently parasitized. Others include the tongue, masseter and ocular muscles.



Symptoms

There are two clinical phases.

1. The intestinal phase: lasting 1-7 days - asymptomatic; sometimes cause nausea, vomiting, diarrhea, constipation, pain, etc.
2. The muscle phase: which causes myalgia, palpabral edema, eosinophilia, fever, myocarditis, meningitis, bronchopneumonia etc.

Diagnosis

- ◆ Muscle Biopsy
- ◆ Detection of larvae in blood or CSF
- ◆ Detection of larvae and adult worms in stool (rare).
- ◆ ELISA

Treatment

Thiabendazol

Prevention

- ◆ Cooking of all meat before consumption
- ◆ Inspection of pigs
- ◆ Pork must be stored at -15°C for 20 days.

Task 2. Tissue nematodes. Filarial worms

Latin name of parasite	<i>Wuchereria bancrofti</i>	<i>Onchocerca volvulus</i>	<i>Loa loa</i>	<i>Dracunculus medinensis</i>	<i>Trichinella spiralis</i>
Forms of parasites					
Definitive host					
Intermediate host					
Infective stage					
Transmission (Way of infection)					
Symptoms					
Diagnosis					
Treatment					
Prevention					