Lecture 6

Round, Hook and pinworms

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introduction

Medical helminthology is concerned with the study of helminthes or parasitic Worms

Helminthes are metazoa (multi-cellular organisms).

They cause different diseases in humans, but few helminthic infections cause life- threatening diseases.

The helminthes are classified into three major groups. These are:

1- Nematodes : are elongated, cylindrical worms with an unsegmented body

- Round worm Ex: *Ascaris lumbricoides*
- hook worm Ex : *Ancylostoma duodenale*
- Pin worm Ex : *Enterobius vermicularis*

2- Cestodes (Tape worms)

3- Trematodes (Flukes)

1-*Ascaris lumbricoides*

Adults

Table (1) : *A. lumbricoides* adults : Typical characteristics		
Characteristic	**Adult female**	**Adult male**
Size (length)	22 to 35 cm	Up to 30 cm
Color	Creamy – white pink tint	Creamy – white pink tint
Other features	Pencil – lead thickness	Prominent incurved tail

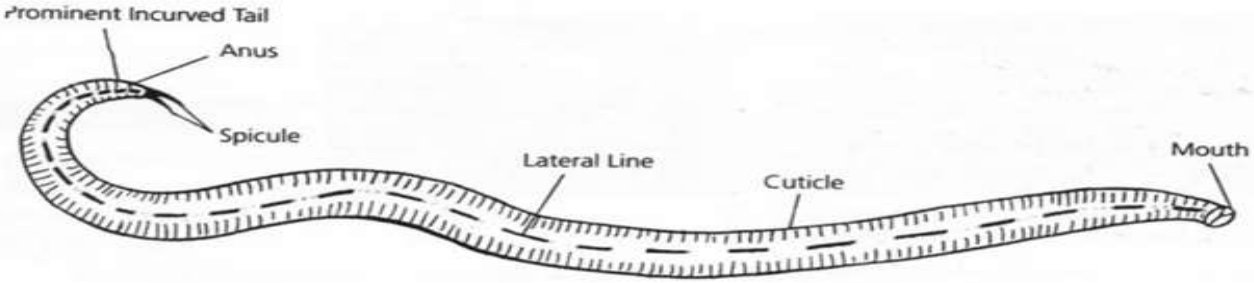
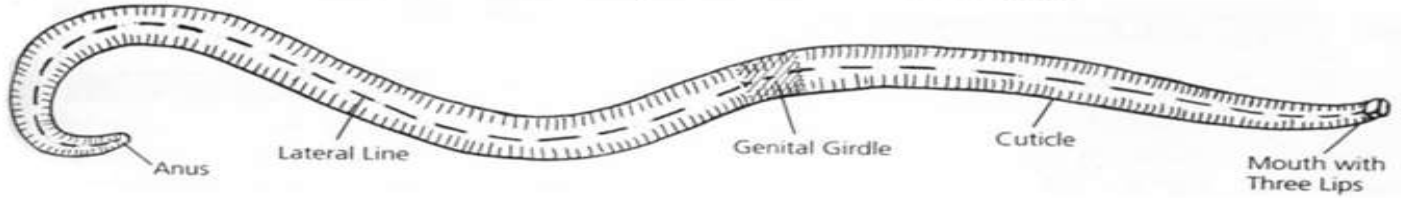


Figure 7–8. ***Ascaris lumbricoides*** **adult male.**

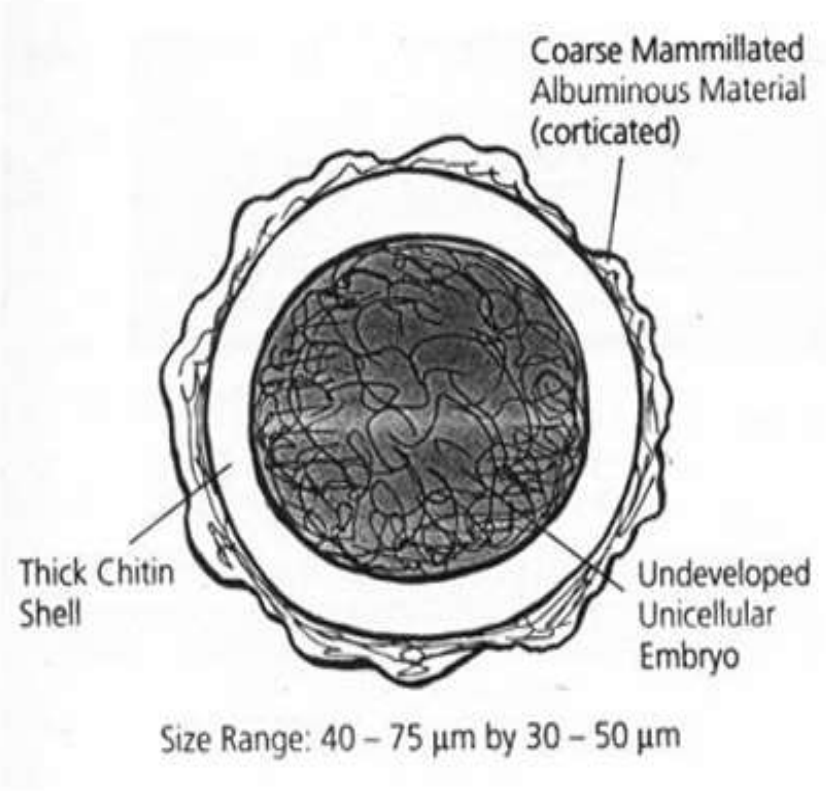
Figure 7–9. A) ***Ascaris lumbricoides*** adult female. **B)** ***Ascaris lumbricoides*** adult female.



Fertilized eggs

Table (2) : *A. lumbricoides* fertilized egg: Typical characteristics	
Size	40 to 75 µm by 30 to 50 µm
Shape	Rounder than nonfertilized version
Embryo	Undeveloped unicellular embryo
Shell	Thick , chitin
Other features	My be corticated or decorticated

A. lumbricoides Fertilized eggs



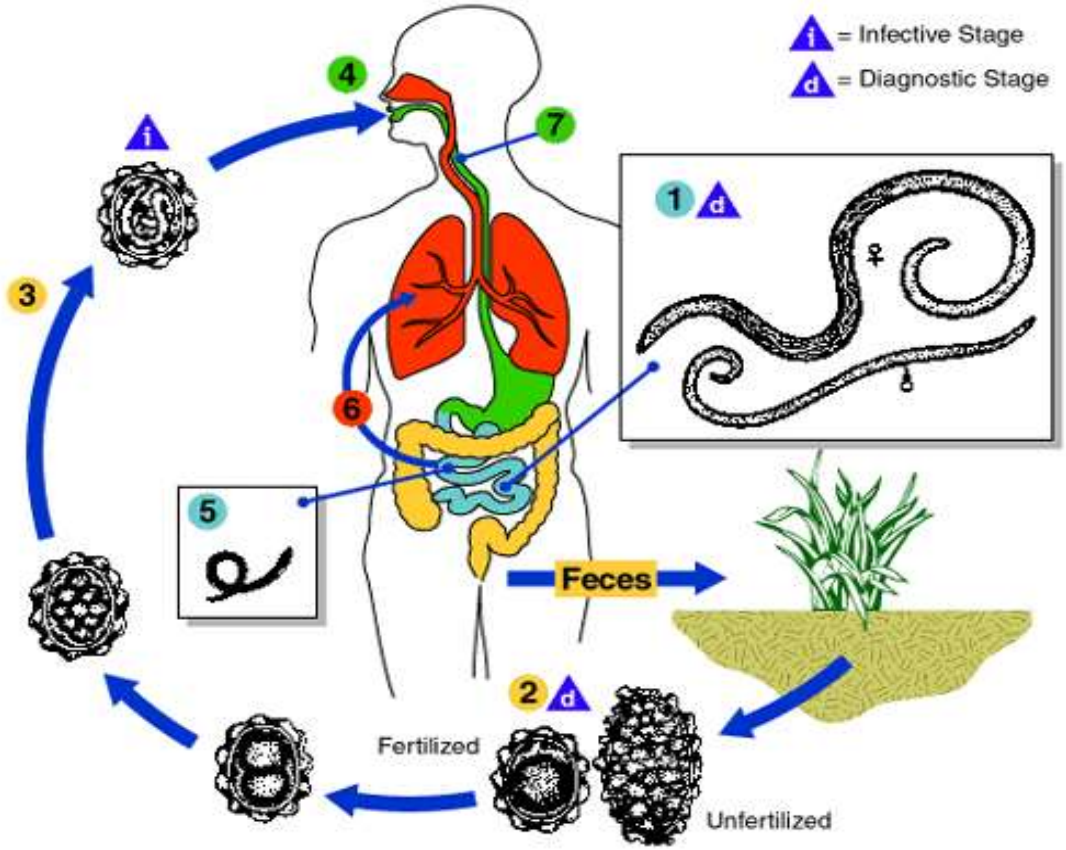
Unfertilized eggs

Table (3) : *A. lumbricoides* nonfertilized egg: Typical characteristics	
Size	85 to 95 µm by 38 to 45 µm size variations possible
Shape	Varies
Embryo	Unembryonated ; amorphous mass of protoplasm
Shell	Thin
Other features	Usually corticated

Life cycle

The life cycle of *A. lumbricoides* is relatively complex compared with the parasites presented thus far. Infection begins following the ingestion of infected eggs that contain viable larvae. Once inside the small intestine, the larvae emerge from the eggs. The larvae then complete a liver lung migration by first entering the blood via penetration through the intestinal wall. the first “stop” on this journey is the liver . From there, the larvae continue the trip via the blood stream to the second “stop” the lung . Once inside the lung, the larvae burrow their way through the capillaries into the alveoli . Migration into the bronchioles then follows. From here , the larvae are transferred through coughing into the pharynx, where they are then swallowed and returned to the intestine.

Maturation of the larvae occurs, resulting in adult worms, which take up residence in the small intestine. The adults multiply and a number of the resulting undeveloped eggs (up to 250,000 per day) are passed in the feces .


i = Infective Stage
d = Diagnostic Stage
1 d
2 d
3
4
5
6
7
Feces
Fertilized
Unfertilized

Clinical symptoms

Ascariasis / Roundworm Infection

Patients who develop symtomatic ascariasis may be infected with as few as a single worm . such a worm may produce tissue damage as it migrates through the host . a secondary bacterial infection may also occur following worm perforation out of the intestine.

Patients infected with many worms may exhibit vague abdominal pain, vomiting, fever, and distention . mature worms may entangle themselves into a mass that may ultimately obstruct the intestine, appendix, liver, or bile duct . such intestinal complications may result in death. In addition, discomfort from adult worms exiting the body through the anus, mouth, or nose may occur. Heavily infected children who do not practice good eating habits may develop protein malnutrition .

Laboratory diagnosis

The specimen of choice for the recovery of *A. lumbricoides* eggs is stool . adult worm may be recovered in several specimen types depending on the severity of infection , including the small intestine, gallbladder, liver and appendix. In addition, adult worms may be present in the stool, vomited up or removed from the external nares, where they may attempt to escape. An enzyme-linked immunosorbent assay (ELISA) is also available.

Ancylostoma duodenale (hook worm)

The adult worms live in the small intestines of infected persons, mostly in the jejunum, less often in the duodenum, and infrequently in the ileum

Life cycle of ancylostoma is completed in a single host

Morphology: The females are longer than males, ancylostoma duodenale buccal capsule reinforced with a hard chitin-like substance carries 6 teeth; 4 hook-like teeth ventrally, and 2 knob-like with a median cleft dorsally

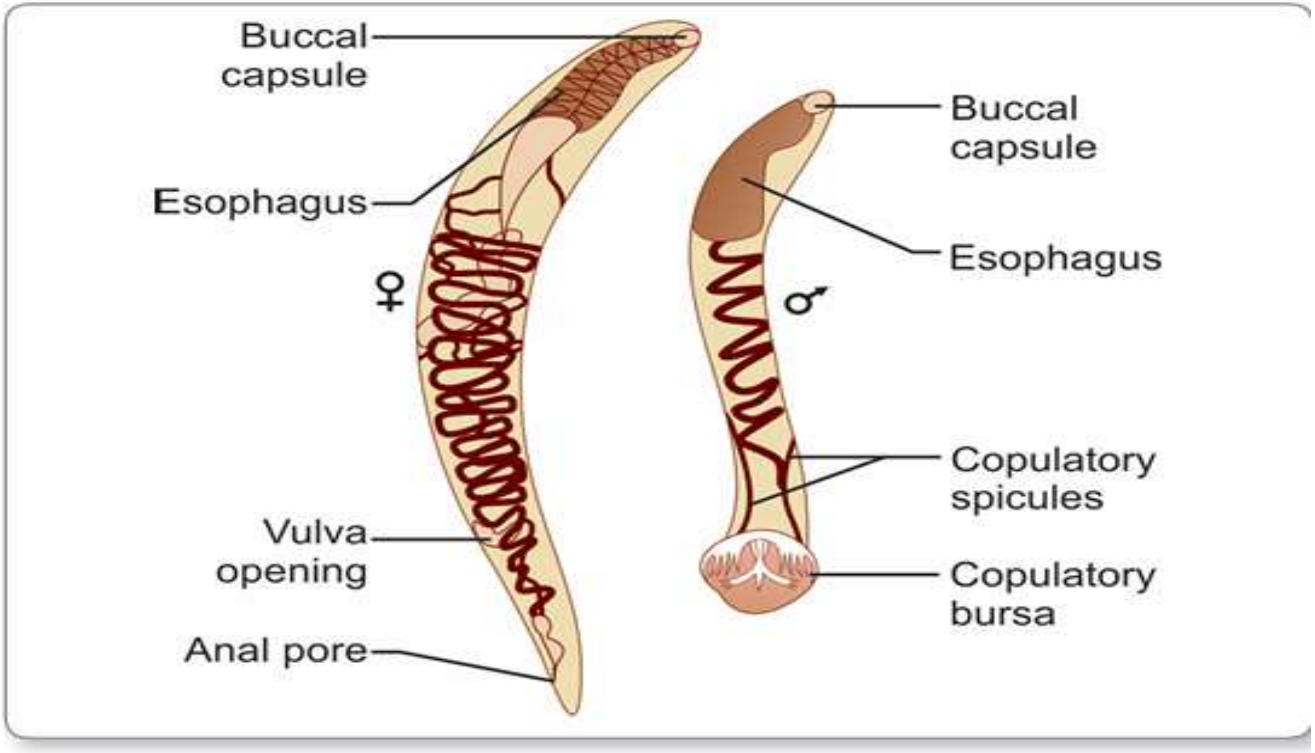
Infective stage: filariform larva

Diagnostic stage: egg

Definitive host: humans

Distinguishing Features of Male and Female worms of Ancylostoma duodenale

	Male	Female
Size	Smaller, about 8–11 mm in length	Larger, 10–13 mm in length
Copulatory bursa	Present	Absent
Genital opening	Opens in cloaca along with anus	Opens at the junction of the middle and posterior third of body


Buccal capsule
Esophagus
♀
Vulva opening
Anal pore
Buccal capsule
Esophagus
♂
Copulatory spicules
Copulatory bursa

Egg

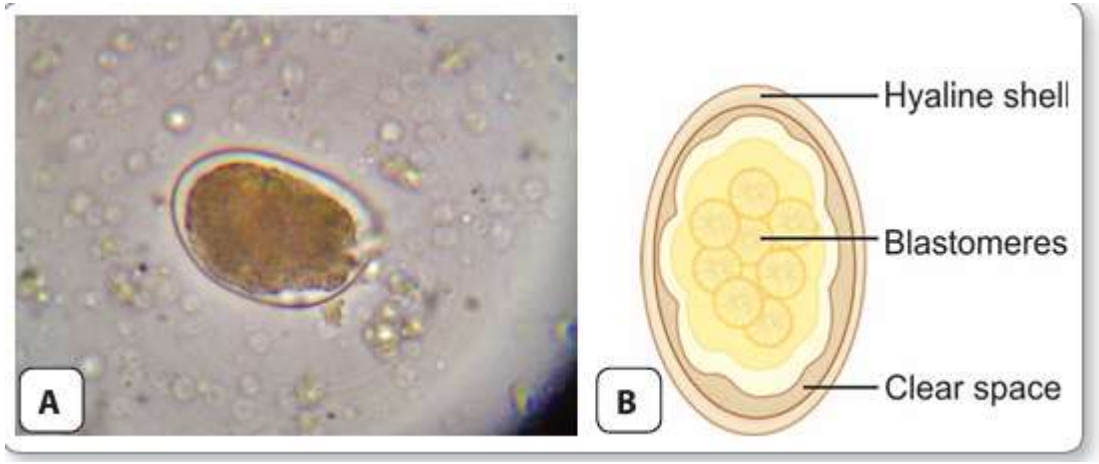
Shape : oval or elliptical with a clear space between the segmented ovum and the egg shell

Size: 60 x 40 μm

egg Shell: thin transparent hyaline shell membrane

Color: colorless and transparent

Content: 4-8 blastomeres.



Life cycle

Eggs shed in soil hatch within 48 hours, becoming rhabditiform larvae

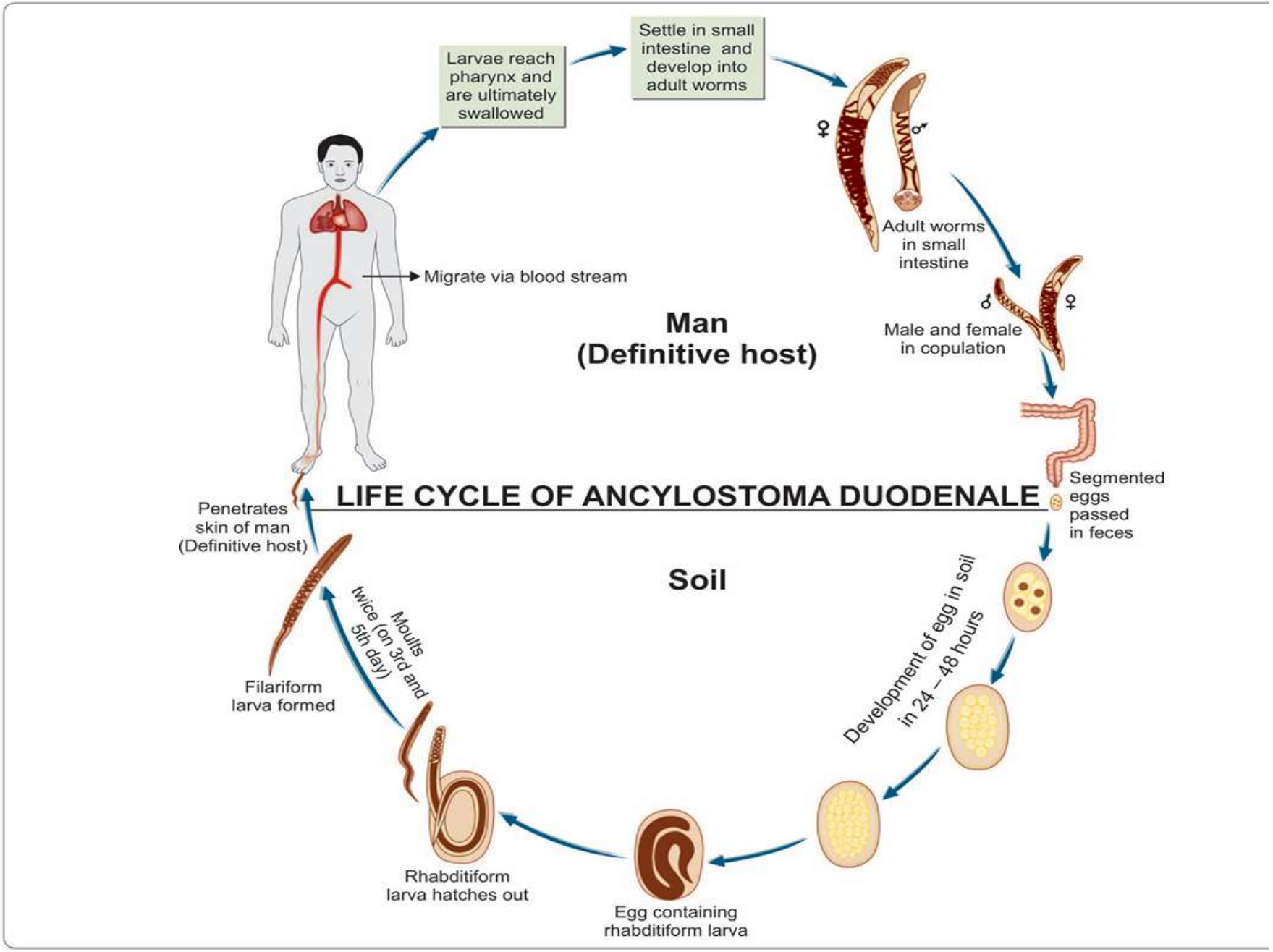
After 7 days, worms stop feeding and molt, transforming from the rhabditi form larvae to infective filariform larvae.

Infections are acquired when the filariform larvae penetrates the skin of a human When a person walks barefooted on soil containing the filariform larva, they penetrate the skin and enter the subcutaneous tissue.

Inside the human body, the larvae are carried along the venous circulation to the right side of the heart and to the lungs. Here, they escape from the pulmonary capillaries into the alveoli, migrate up the respiratory tract to the pharynx, and are swallowed, reaching their final destination small intestine

in the small intestine feed ,grow in size and develop the buccal capsule, by which they attach themselves to the small intestine and develops into a single adult, male or female.

It takes usually about 6 weeks from the time of infection for the adult worms to become sexually mature and start laying eggs.


Settle in small intestine and develop into adult worms
Larvae reach pharynx and are ultimately swallowed
Adult worms in small intestine
Migrate via blood stream
Man
(Definitive host)
Male and female in copulation
Segmented eggs passed in feces
LIFE CYCLE OF ANCYLOSTOMA DUODENALE
Penetrates skin of man (Definitive host)
Soil
Moults twice (on 3rd and 5th day)
Development of egg in soil in 24 – 48 hours
Filariform larva formed
Rhabditiform larva hatches out
Egg containing rhabditiform larva

Clinical symptoms

When the filariform larvae enter the skin they cause severe local itching

Respiratory manifestations like bronchitis and bronchopneumonia

Hypochromic anemia

Epigastric pain , vomiting, diarrhea , the stool become raddish or black in colour

Laboratory diagnosis

1- demonstration of eggs in feces by direct microscope examination

2- demonstration of adult worm in feces or duodenal aspirate

3- blood examination

4 – stole culture

5 – chest x-ray

Enterobius vermicularis (Pinworm)

- Pinworm infections are one of the most common parasitic infections, especially in children.
- Prevalent worldwide, especially in temperate regions.
- Transmission occurs via the fecal-oral route, often through contaminated hands, clothing, bedding, or surfaces.

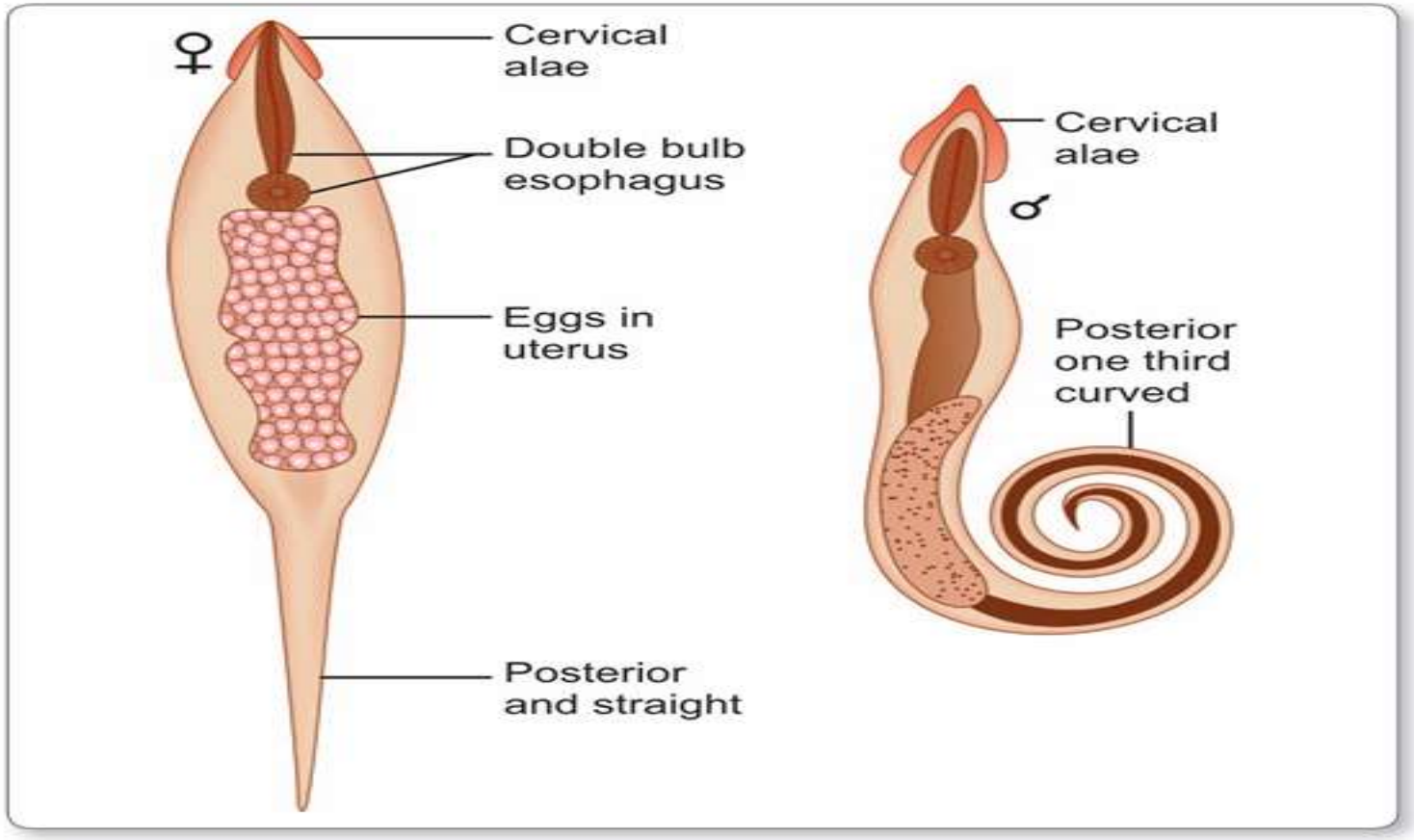
Adult worms:

Female: Measures about 8-13 mm in length, with a long, pointed tail.

Male: Smaller, about 2-5 mm in length, with a curved posterior end.

The body is white or transparent, making them visible to the naked eye

The egg is colorless and not bile-stained. It floats in saturated salt solution. It has a characteristic shape, being elongated ovoid, flattened on one side, and convex on the other (planoconvex) , measuring 50–60 µm by 20–30 µm, The egg shell is thick double layered The egg contains a tadpole-shaped coiled embryo .


♀
Cervical alae
Double bulb esophagus
Eggs in uterus
Posterior and straight
Cervical alae
♂
Posterior one third curved

Plano-convex egg of Enterobius vermicularis containing tadpole shaped embryo

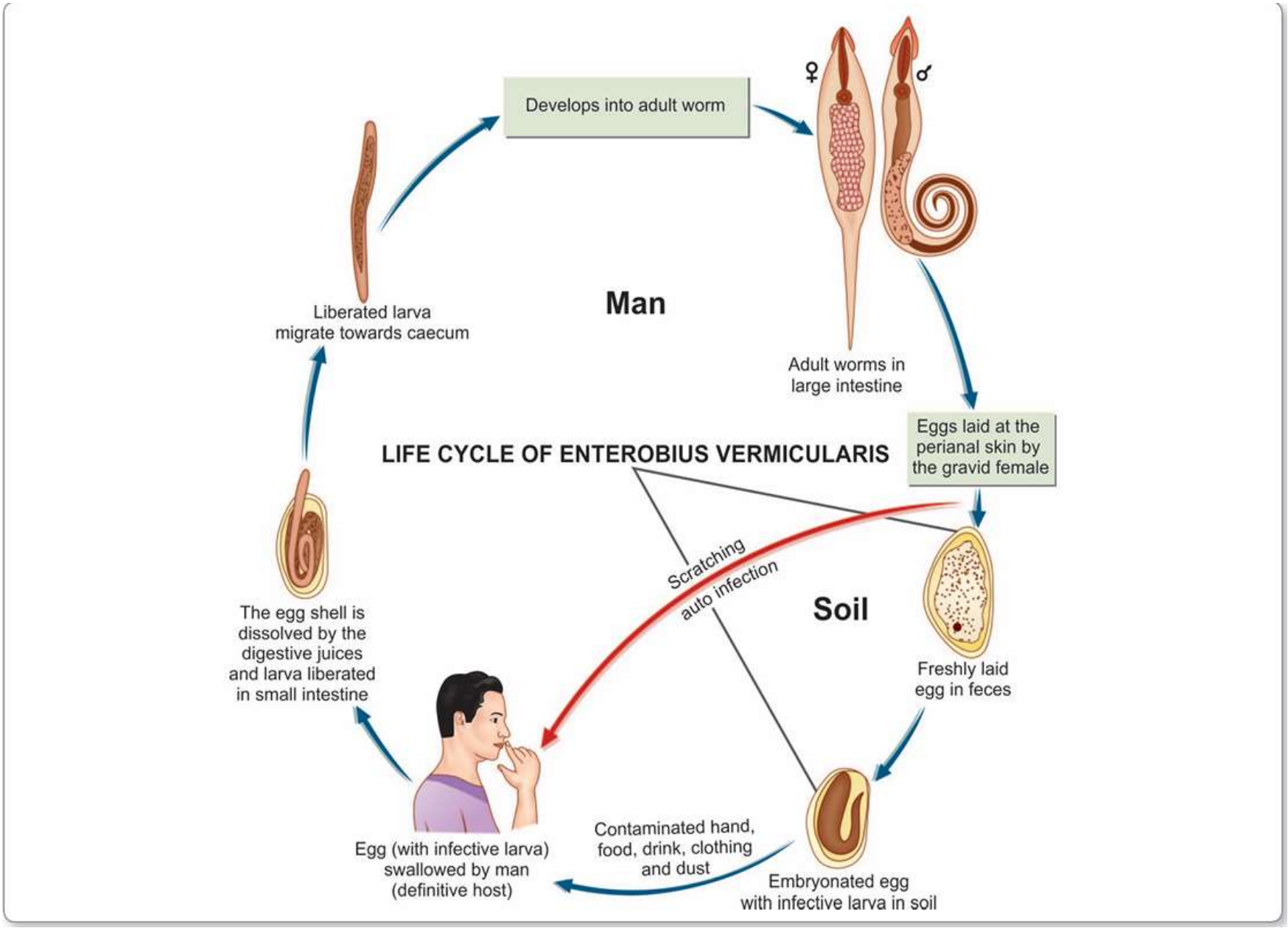
Life cycle

Humans ingest embryonated eggs containing larva through contaminated hands, food, or surfaces

The eggs hatch in the small intestine.

Larvae migrate to the large intestine, They moult in the ileum and enter the caecum, where they mature into adults within 2-6 weeks.

Gravid female worms migrates down the colon to the rectum. At night, when the host is in bed, the worm comes out through the anus and crawls about on the perianal and perineal skin to lay its sticky eggs.


LIFE CYCLE OF ENTEROBIUS VERMICULARIS
Man
Soil
Develops into adult worm
♀
♂
Adult worms in large intestine
Eggs laid at the perianal skin by the gravid female
Freshly laid egg in feces
Embryonated egg with infective larva in soil
Contaminated hand, food, drink, clothing and dust
Egg (with infective larva) swallowed by man (definitive host)
The egg shell is dissolved by the digestive juices and larva liberated in small intestine
Liberated larva migrate towards caecum
Scratching
auto infection

Clinical 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
- As the worm migrates out at night, it disturbs sleep. Nocturnal enuresis is sometimes seen
- worms may migrate to ectopic locations like the genital tract, causing urinary tract infections

Laboratory diagnosis

1- detection of egg

under finger nails , "Scotch tape" test: Clear adhesive tape is pressed on the perianal region early in the morning, and the tape is examined by a microscope for the presence of eggs

2- detection of adult worm by stool examination.


Thank You