



# **Hookworms and *Enterobius vermicularis***

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Analysis  
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# Hookworm

- **Distribution**

Hookworm disease is prevalent throughout the **tropics** and **subtropics**. Two species of **human** hookworms are ***Ancylostoma duodenale*** and ***Necator americanus***.

- ***Ancylostoma duodenale***

- **Habitat**

The **adult worms** live in the lumen of the **small intestines** of infected persons.

# *Ancylostoma duodenale* morphology

- The posterior end of the **male** is expanded into a **copulatory bursa supported by flashy rays**. Two **copulatory spicules project** from the bursa.
- The **female** mouth has a prominent **buccal capsule**, with **4 hook-like teeth** ventrally and a median cleft dorsally.
- *Ancylostoma duodenale* **eggs** are **oval, colourless**.
- It has a **thin transparent shell**. When passed in faeces, the egg contains segmented ovum.
- There is a **clear space** between the segmented ovum and the eggshell.

# *Necator americanus* morphology

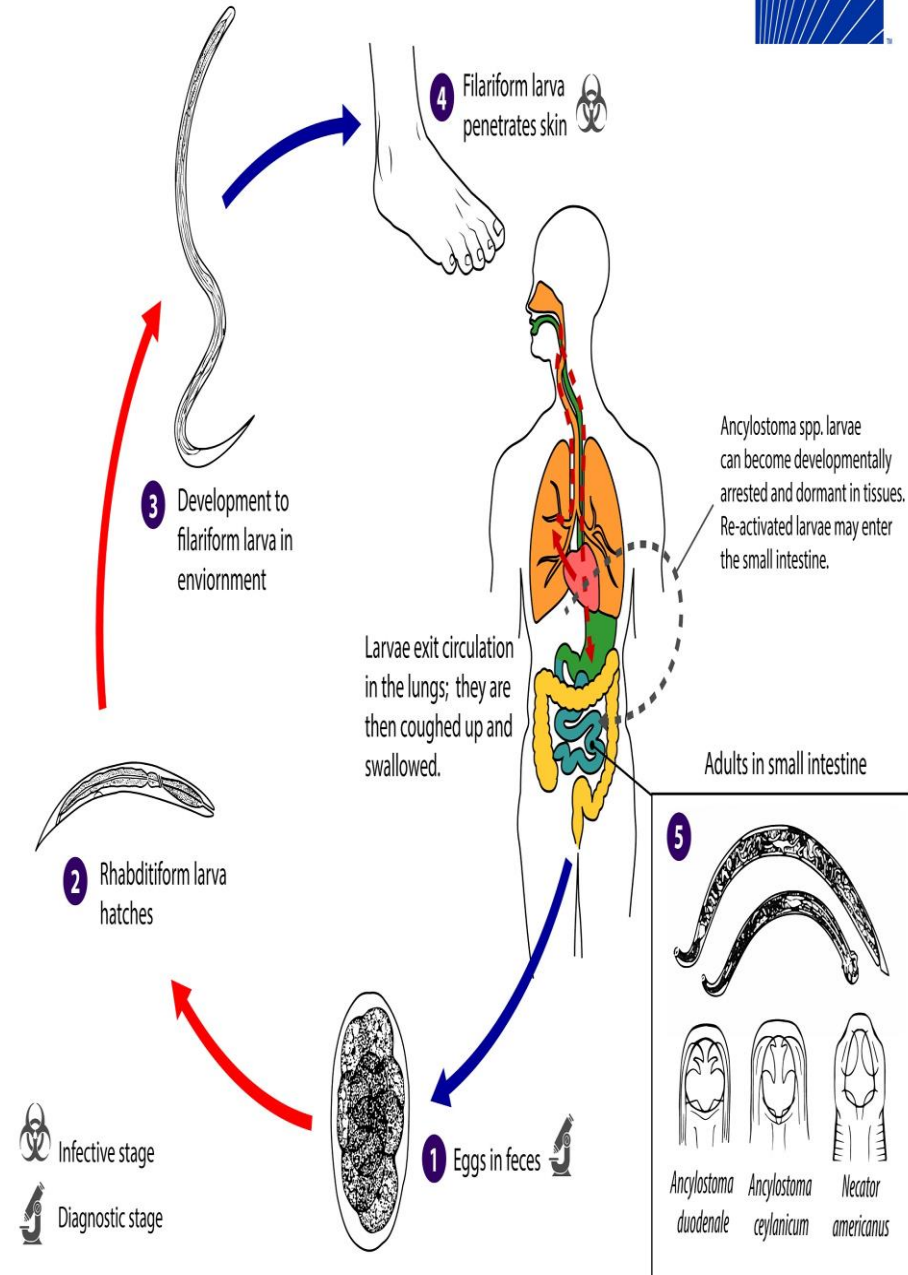
- The **adult** worms of *Necator americanus* are **slightly smaller** than *A. duodenale*.
- The **copulatory bursa** of the **male** is long and wide. The **copulatory spicules** are **fused at the ends** to form a barbed tip.
- The buccal capsule has **2 pairs** of semilunar **cutting plates**.
- The **anterior end** is bent in a direction **opposite** to the general curvature of the body, **while in** *Ancylostoma duodenale*, the bend is in the **same direction**.
- The **eggs** of *N. americanus* are **identical to** those of *Ancylostoma duodenale*.

# Hookworm life cycle

1. **Eggs** are passed out in faeces of infected human.
  2. The eggs hatch into **rhabditiform larvae**, L1, in the **soil**. L1 moults into L2.
  3. L2 moults into the **infective filariform larva**, L3.
  - 4-5. The L3 larvae **penetrate the skin** and enter the circulation, ending up in the **heart** and **lungs**.
- In the lungs, the larvae **rupture out** of the alveolar capillaries and **crawl up to the trachea** and pharynx.
  - They are then swallowed and develop into **adults in the lumen of the small intestine** in 1–2 months. The adult female deposits eggs which are excreted into the faeces.
  - **Both hookworms** have **similar life cycle**.



## Intestinal Hookworm



# Pathogenesis and Clinical Features of hookworms

- When the filariform larva penetrates the skin, it causes **severe local itching** called **ground itch**.
- Erythematous papular **rash** develops when a large number of larvae penetrate the skin.
- **Loeffler's syndrome** may occur in heavy larvae infection.
- Hookworm infection is usually asymptomatic. Adult worms **suck blood** aided by the **anticoagulant** that they secrete. The worms change feeding sites and the old biting sites will **continue to bleed**. Stool may become **black in colour** (malaena).
- Chronic infection can lead to **iron deficiency anaemia**.

# Diagnosis and treatment of hookworms

## Diagnosis

1. Microscopic examination
2. Stool culture

## Treatment

- Albendazole, mebendazole, and pyrantel pamoate.
- Iron supplement is given to correct anaemia.
- In severe cases, blood transfusion may be needed.

## Prevention and Control

1. Proper faecal disposal.
2. Use of **footwear** and **gloves** to prevent skin penetration by filariform larva.
3. Treatment of patients.

# ***Enterobius vermicularis***

Common name: **Pinworm**

- **Distribution:** it is **worldwide** in distribution and commonly affects children.
- **Habitat:** adult worms are found in the **caecum** and **appendix**.
- **Morphology**

The mouth is surrounded by 3 wing-like cuticular expansions (cervical alae). It has a bulb-shaped oesophagus.

The **female** posterior third is **pointed** (pin-like).

The **male** worm posterior end is **curved ventrally** and carries a copulatory spicule.

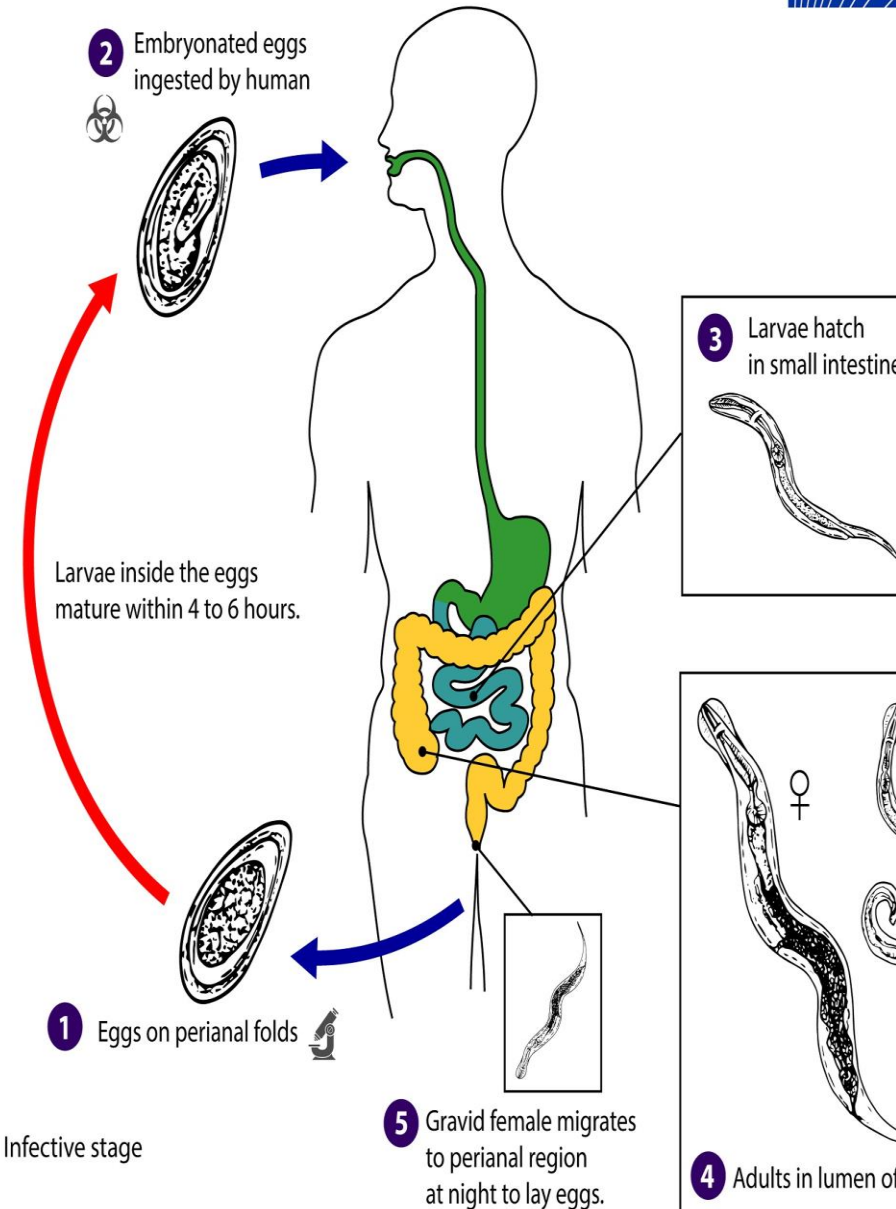
*Enterobius vermicularis* **egg** has a characteristic **D-shape**, flattened on one side and convex on the other. The shell is thick, and the egg contains a fully formed **coiled embryo**.



# Life Cycle

- (1) **Eggs** are laid by the gravid female worm in **perianal region**. Larvae inside the eggs mature within 4–6 h.
- (2) Embryonated eggs are **ingested** by human: (fingers to anus to mouth or via inhalation).
- (3) Eggs **hatch** in the **intestine**.
- (4) **Adults** develop in the lumen of the **large intestine** (caecum). Male worm dies after mating.
- (5) Gravid female **migrates** to perianal region at **night** to lay eggs.

**Retro infection** occurs when the egg hatches and the larva migrates up the rectum.



# Pathogenesis and Clinical Features of Enterobiasis

- Enterobiasis occurs mostly in **children**.
- Its main symptom is **intense irritation** and **pruritus** of the perianal (pruritus ani) and perineal area, which coincides with laying of eggs by the gravid female worm **at night**.
- The **eggs** are **sticky** and stick to the perianal skin. Pruritus ani **causes scratching** and excoriation of the skin around the anus.
- **In female patients**, the worms may cause **ectopic migration** when they crawl into the vagina causing **irritation**. It may also cause inflammation of the fallopian tubes (**Salpingitis**).

# Enterobiasis

- **Diagnosis**

Microscopic examination, gross examination, and histological examination.

- **Treatment**

Pyrantel pamoate, albendazole, or mebendazole can be used.

- **Prevention and Control**

1. Hand washing and keeping **fingernails short**
2. Washing of **bed linen**
3. Treatment of infected persons and household members