Intestinal nematodes

Part 2

Presented by

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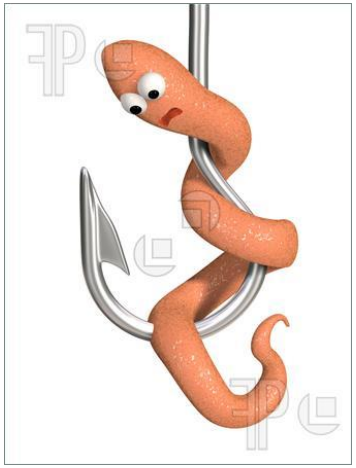


Hookworms

Human Hookworms

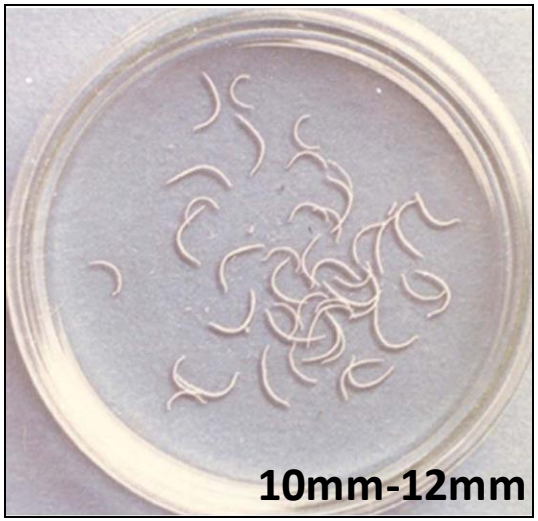
Old world hookworms

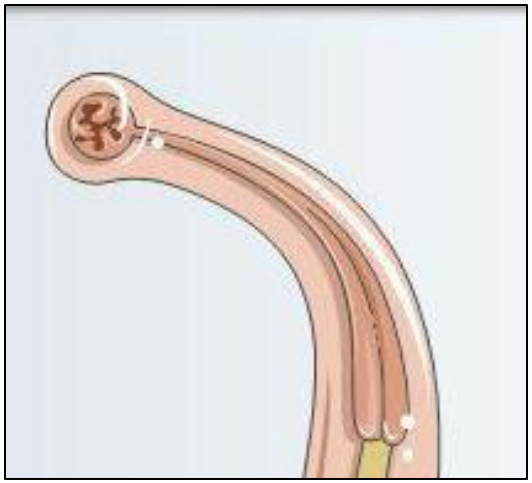
Ancylostoma duodenale

New world hookworms

Necator americanus

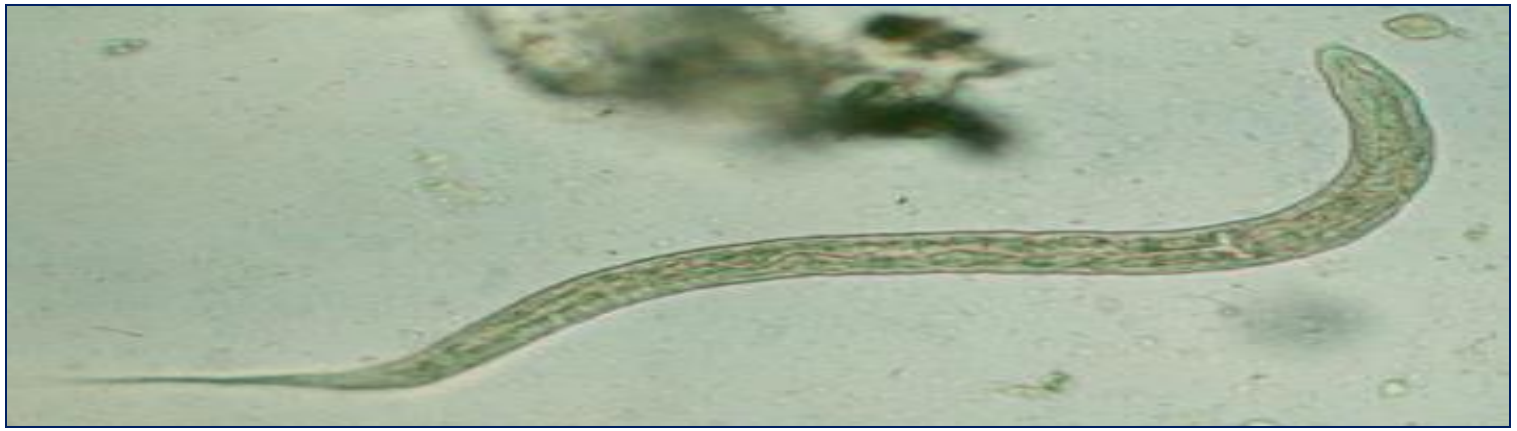
Ancylostoma duodenale





Size 60x40µ
Shape oval, blunt poles
Color translucent
Content immature (4 cell stage)

Rhabditiform larva



Pointed tail end

Filariform larva (I.S)

With pointed tail & Sheathed

Life Cycle of *Ancylostoma duodenale*

Adult in small intestine

L4 migrate up to the epiglottis

Alveoli (3rd molt → L4)

L4 swallowed to reach GIT undergo 4th molt (L5)

The lungs

The heart

Circulation

Man D.H.

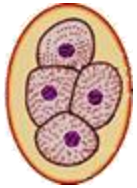
L5 mature to adults

L3 penetrate the skin or ingested and starts migration

Infective stage
Sheathed filariform larva

L3

Egg Maturation in the soil



Mature

Hatch

Release

L1

1st Molt

L2

2nd Molt

- **Habitat:** Upper part of the small intestine
- **D.H:** Man
- **D.S:** Egg
- **I.S:** Filariform larva
- **Mode of infection:** Penetration of the skin or mucus membrane

Pathogenesis and symptomatology

Disease: Ancylostomiasis

Skin penetration
Ground itch

- It is a **cutaneous** lesion produced as a result of penetration of human skin by filariform larva of *A. duodenale*.
- The most common sites are usually **between the toes**, **dorsal surface of the foot** and **inter digital spaces of hands.**
- Characterized by erythema, popular rash, vesicles and pustules with secondary bacterial infection

Migratory phase

- **Verminous pneumonia or Loeffler's syndrome** which is manifested by fever, cough, dyspnea, and hemoptysis with eosinophilia.
- **Eosinophilic granuloma** and abscess formation in different organs when larvae are distributed through the circulation to other organs.

Intestinal phase

- **Nausea, vomiting, diarrhea** and abdominal pain
- **Anaemia** (microcytic hypochromic) due to blood suction by worms and bleeding at the attachment sites (worm release anticoagulant) that may lead to anemic heart failure
- **Hypoproteinemia and nutritional deficiency** that leads to growth retardation

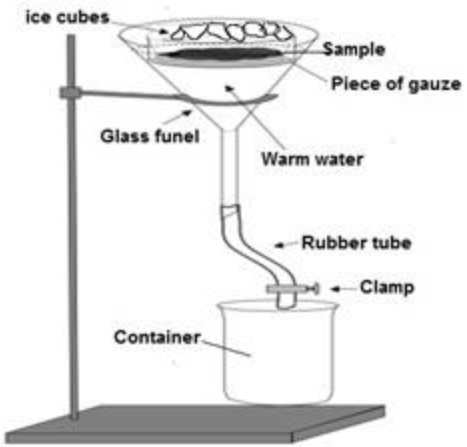
Ground itch

Laboratory diagnosis

Fresh stool examination for egg detection by different methods:

- **Direct smear.**
- **Concentration methods**
- **Stool culture**

Examination of stool for larvae by Baermann's technique



Blood examination for anaemia

Treatment

Albendazole

Supportive treatment:

-High protein diet.

-Vitamins & iron.

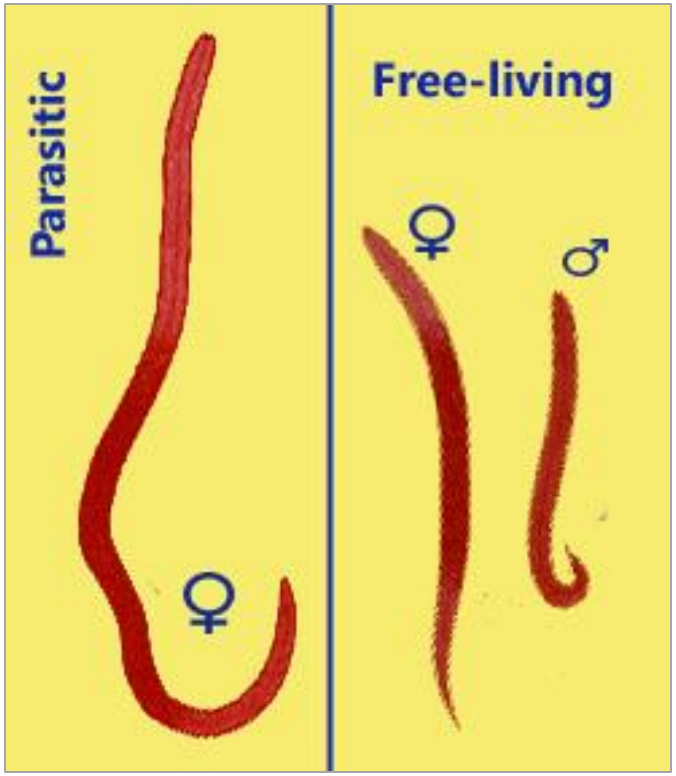
In severe anaemia, blood transfusion may be needed

Strongyloides stercoralis

Strongyloides stercoralis (Dwarf thread worm)

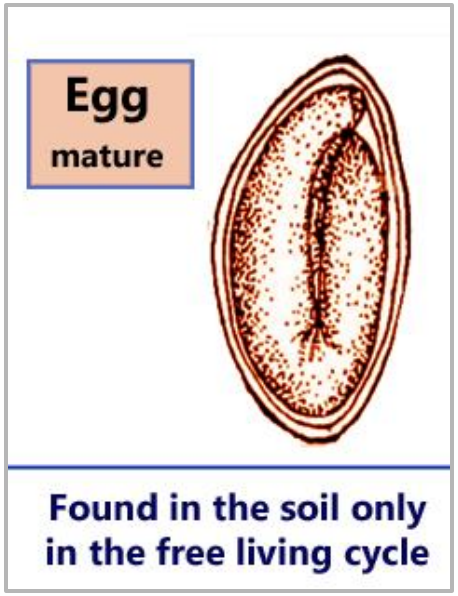
- It is a facultative parasite that can live as a parasite or free living.
- It is an opportunistic parasite that infects the immunosuppressed individuals

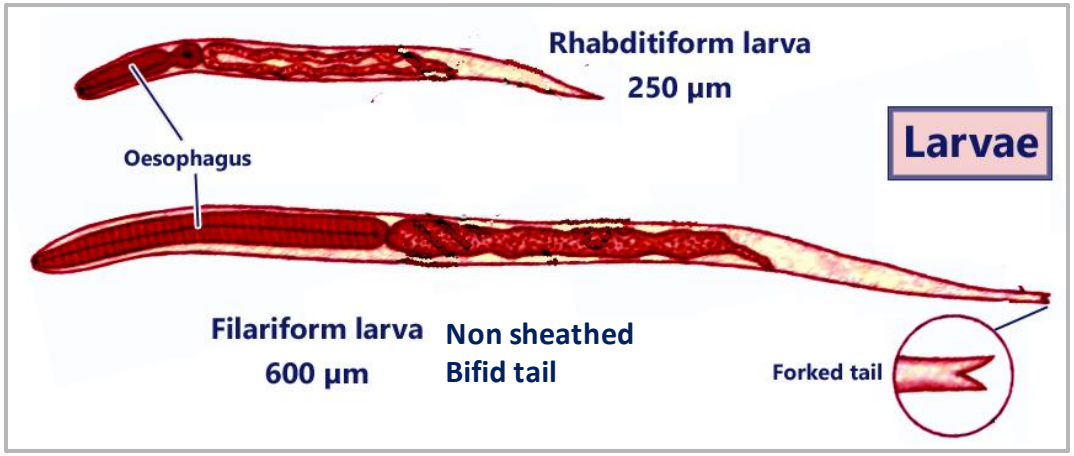
Strongyloides stercoralis



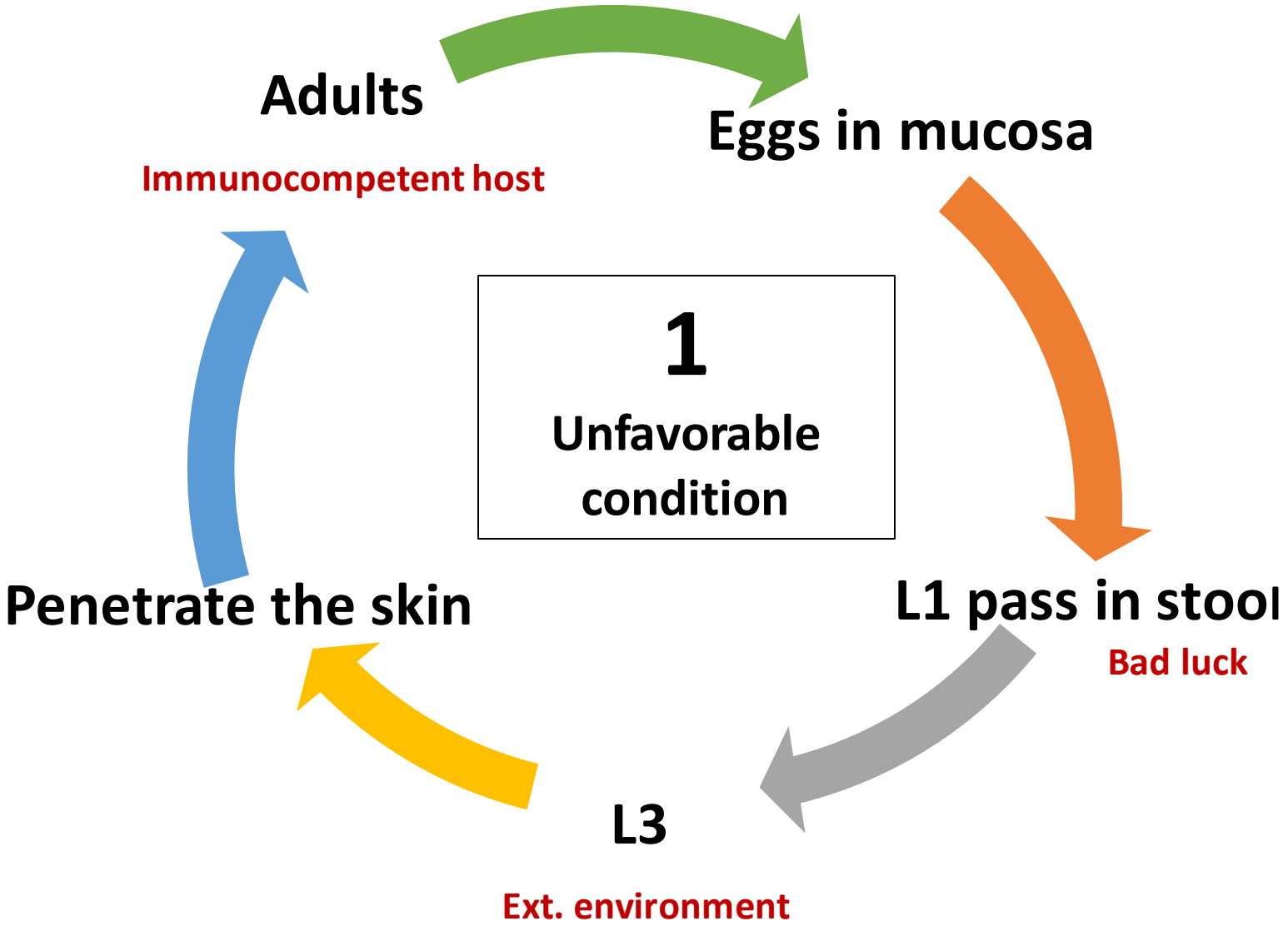
Adult:

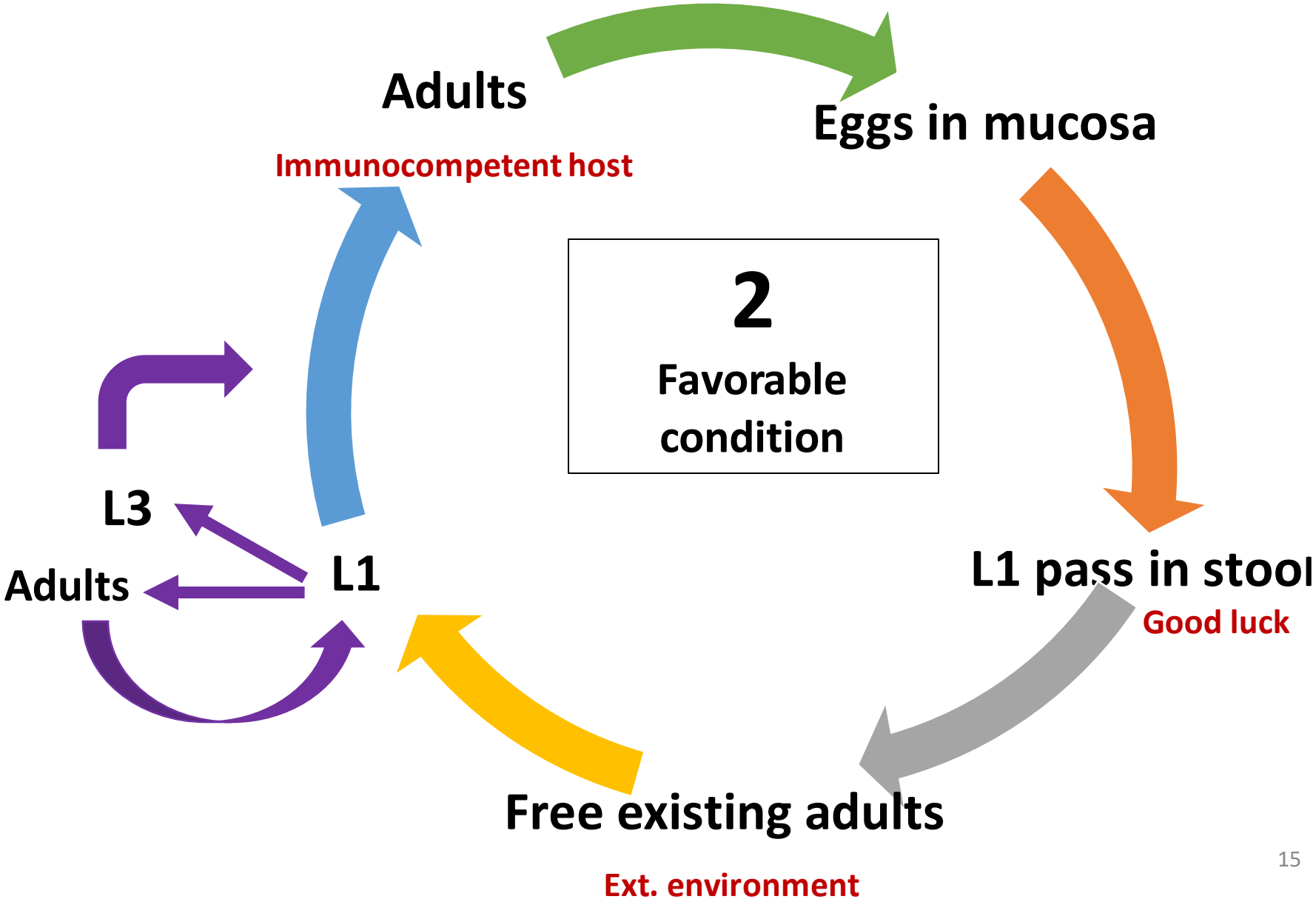
- **Male**: 0.7 mm in length. **free-living** in the soil.
- **Parasitic female:** 2-3 mm. Cylindrical oesophagus
- **Free-living female**: 1 mm. Rhabditiform oesophagus

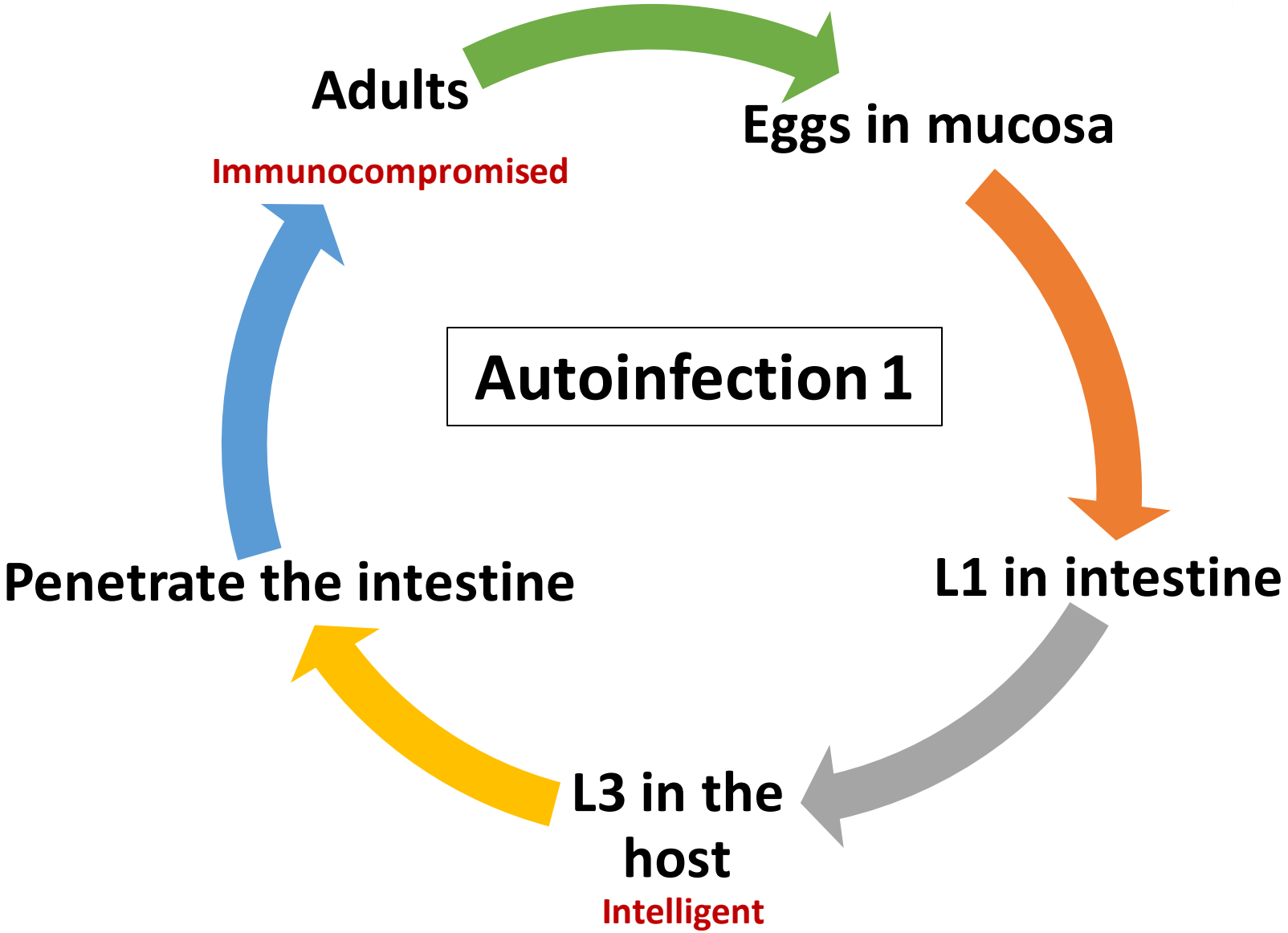


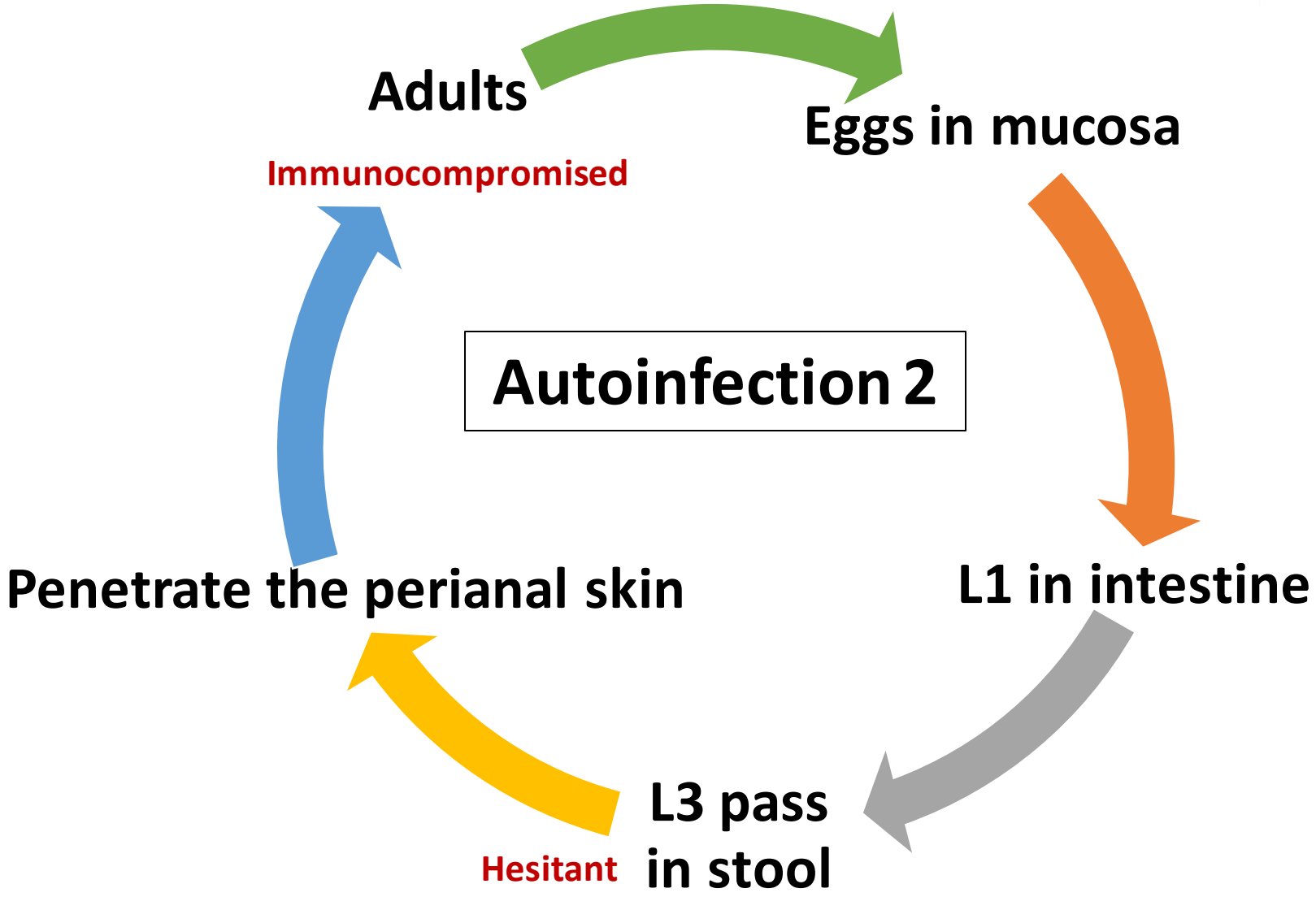


D.D with filariform larva of *Ancylostoma* ????


Adults
Immunocompetent host
Eggs in mucosa
1
Unfavorable condition
L1 pass in stool
Bad luck
L3
Ext. environment
Penetrate the skin


Adults
Immunocompetent host
Eggs in mucosa
2
Favorable condition
L1 pass in stool
Good luck
Free existing adults
Ext. environment
L1
L3
Adults


Adults
Immunocompromised
Eggs in mucosa
Autoinfection 1
L1 in intestine
L3 in the host
Intelligent
Penetrate the intestine


Adults
Immunocompromised
Eggs in mucosa
Autoinfection 2
L1 in intestine
L3 pass
in stool
Hesitant
Penetrate the perianal skin

Life Cycle of *Strongyloides stercoralis*

Female in small intestine

L4 migrate up to the epiglottis

The alveoli (3rd molt → L4)

L4 swallowed to reach GIT undergo 4th molt (L5)

L5 mature to adults

The lungs

The heart

Adult lays eggs in the mucosa

L1 hatch and

L1 may molt twice in the intestine → L3

Circulation

Endo-autoinfection

1) L3 penetrate the mucosa

Exo-autoinfection

L3 starts migration

2) L3 penetrate perianal skin

L1 & L3 Larvae pass in the stool to Soil

3) L3 penetrate the skin starts migration

External infection

In less favorable environmental conditions : L1 molts → L3

Female lays eggs in soil that hatch → Rh larvae

L1 repeat the free-living generation

Or

L1 becomes infective L3

Under favorable environmental conditions : L1 grow → Free living male & female

In the lung, the filariform larvae may develop into free living adult worms (good media due to the presence of oxygen) invade the bronchial epithelium ➲ lays eggs ➲ rhabditiform larvae that may develop again to filariform larvae and repeat the cycle.

Rhabditiform larvae, filariform larvae and adult worm can be detected in the sputum.

- **Habitat:** Upper part of the small intestine
- **D.H:** Man
- **R.H:** Dogs and monkeys
- **D.S:** Rhabditiform, filariform larvae and adults
- **Mode of infection:** Skin penetration-autoinfection

Mode of infection

- Penetration of the skin or mucous membrane of mouth by infective filariform larvae.

Autoinfection (common in immunocompromised persons)

Internal

Where rhabditiform larvae may develop to filariform larvae (I.S) into the lumen of the small intestine, then penetrate the intestinal mucosa to reach the circulation.

External

Filariform larvae (I.S) come out the anus and penetrate the perianal skin to reach the circulation and complete the cycle

Pathogenesis and symptomatology

Disease: Strongyloidiasis

Skin penetration

- **Ground itch**
- **Larva currens** It occurs when the filariform larva penetrates the perianal region with external autoinfection causing linear or tortuous urticarial lesions over the trunk, thigh and buttocks.

Migratory phase
As *Ancylostoma*

Intestinal phase

- Nausea, vomiting and profuse watery diarrhea
- Epigastric pain and ulceration in the mucosa
- Malabsorption

Disseminated strongyloidiasis

??????
??????

Disseminated stronyloidiasis (Hyper infection syndrome)

In immunocompromised patients the parasite produces massive number of rhabditiform larvae that develop into filariform larvae in the intestinal lumen (autoinfection) ➲ penetrate the intestinal wall ➲ reach the circulation ➲ different organs as brain, lung, liver and kidney.

This condition is fatal and death occurs due to:

❶Massive increase of intestinal worm burden ➲ intestinal perforation, peritonitis and paralytic ileus.

❷Invasion of CNS ➲ meningitis& brain abscess.

❸Respiratory failure.

❹Septicaemia due to larval migration from the intestine.

Laboratory diagnosis

Direct methods

- Stool examination for rhabditiform larvae by direct smear and concentration methods.
- Stool culture .
- Duodenal aspiration reveals rhabditiform larvae.
- Sputum examination or culture: during disseminated disease, all stages may be present in lung (rhabditiform larvae, filariform larvae, adults).

Indirect methods

- Eosinophilia (10-40%)
- Serological testes (CFT, IHT, ELISA)

Treatment

- **Ivermectin (drug of choice).**
- **Mebendazale.**
- **Antihistaminic and antibiotics for cutaneous lesions.**


?
Quiz
Time

Define

- Ground itch
- Disseminated strongyloidiasis

Mention

- Complications of ancylostomiasis