

Ascariasis

Compiled by Dr. Nidhi Garg



Adult worms of *A. lumbricoides*

Soil transmitted helminths

- Parasite nematodes
 - Infection from contact with eggs/ larvae in soil
 - Human to human direct transmission is impossible*
- Nematodes include
 - Roundworms, whipworms, and hookworms
 - Common to be infected with all three worms
- One of the world's most important causes of physical and intellectual growth retardation.

What is Ascariasis?

- Most common helminthic disease
 - Estimated worldwide prevalence of 25%
 - 0.8-1.22 billion people
- Usually asymptomatic
- Most prevalent in children
 - Highest prevalence = 2 to 10 year olds
 - Highest intensity = 5 to 15 year olds

INTRODUCTION

- *Ascaris lumbricoides* is the largest nematode (roundworm) parasitizing the human intestine.
- *Ascaris lumbricoides* is an intestinal worm found in the small intestine of man (mainly in the jejunum and upper part of the ileum).
- They are more common in children than in adults
- As many as 500 to 5000 adult worms may inhabit a single host.



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Geographical distribution

- Worldwide
- High prevalence in underdeveloped countries that have poor sanitation (parts of Asia, South America and Africa)
- Occurs during rainy months, tropical and subtropical countries
- Even occurs in rural areas in the United States

Climate is an important factor

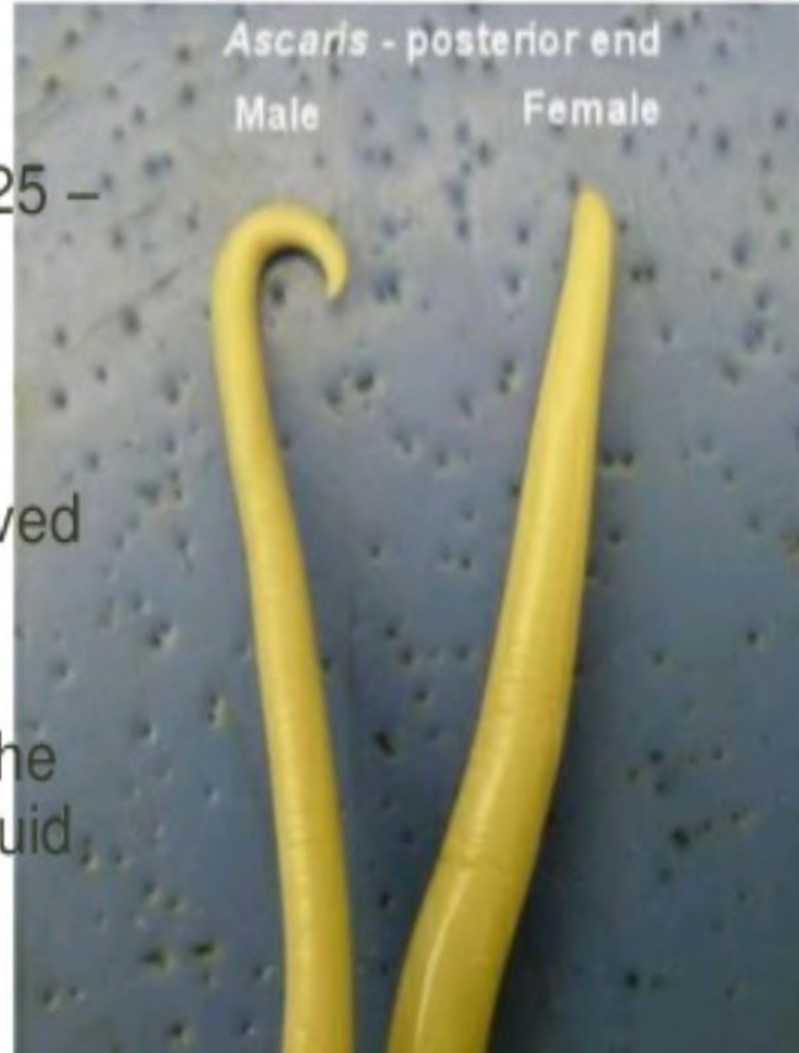
- Warm and moist climates
 - Latin America and Caribbean
 - Sub-Saharan Africa
 - Middle East and north Africa
 - India
 - South Asia
 - East Asia and Pacific Islands
 - China

MODES OF TRANSMISSION

- Occurs mainly via ingestion of water or food (raw vegetables or fruits in particular) contaminated with *A. lumbricoides* eggs.
- Occasionally inhalation of contaminated dust
- Children playing in contaminated soil may acquire the parasite from their hands
- Enhanced by the fact that individuals can be asymptotically infected and continues to shed eggs for years

MORPHOLOGY

- It is a elongated, cylindrical and tapering at both ends.
- Sexes are separate
- The female is longer than male 25 – 40 cm long, 4-6 mm in diameter.
- Male is smaller being 15-30 cm long, 2-4 mm in diameter.
- The posterior end of male is curved ventrally in the form of a hook
- The digestive and respiratory organs of the worm float inside the body cavity possessing a toxic fluid known as ascaron



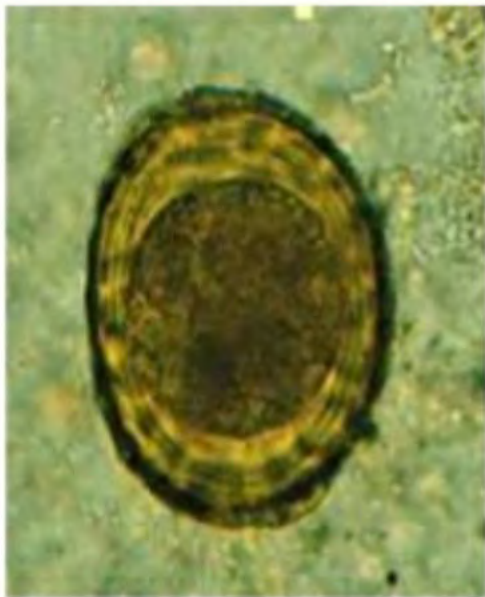
The Mouth Parts

- The mouth opens at the anterior end.
- It is surrounded by three finely toothed lips.
- The lips are one dorsal and two ventrolateral.
- These lips bear sensory structures called labial papillae



- A mature female *A. lumbricoides* lays enormous number of eggs
(nearly 2,00,000 eggs daily) which are passed in the faeces
- There are two kinds of the eggs. They are fertilized eggs, and unfertilized eggs
- We usually describe an egg in 5 aspects: size, color, shape, shell and content
- **Decorticated eggs:** Both fertilized and unfertilized eggs
sometimes may lack their outer albuminous coats and are colorless

Fertilized Egg



- Broad oval in shape, brown in color, an average size $60 \times 45 \mu\text{m}$.
- The shell is thicker and consists of chitinous layer, and mammillated albuminous coat stained brown by bile.
- The content is a fertilized ovum.
- There is a new-moon(crescent) shaped clear space at the each end inside the shell.

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Unfertilized egg

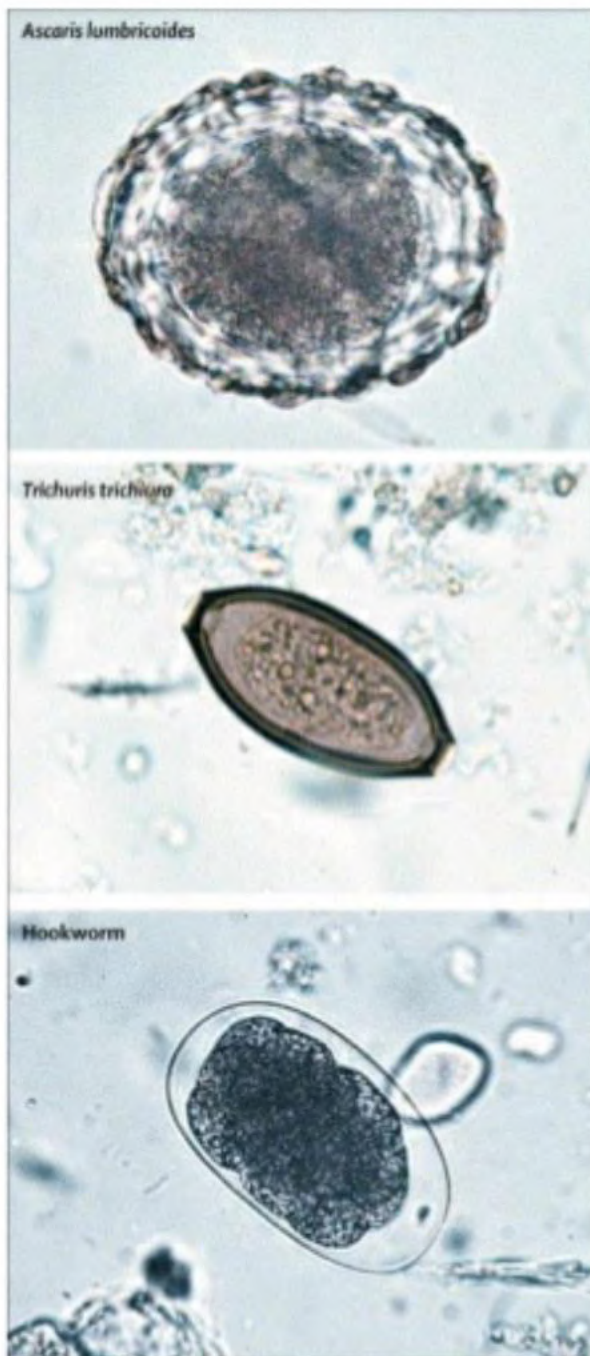


- Narrower and longer and measure 90 μm in length and 55 μm in breadth
- They are bile stained and brown in colour
- The chitinous layer and albuminous coat are thinner and irregular than those of the fertilized eggs
- The content is made of small atrophied ovum surrounded by many refractile granules of various size.
- Heaviest of all the helminthic eggs

DECORTICATED EGGS

Both fertilized and unfertilized eggs sometimes may lack their outer albuminous coats and are colorless.





Ascaris lumbricoides

Fertilized eggs

- Contain a zygote
- And a thick eggshell consisting of four layers

Extracted from **Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm**

Figure 2: Soil transmitted helminth eggs

Egg shed facts:

- Humans with ascariasis can shed in their faeces
 - Fertilized eggs only
 - 45% of infected persons
 - Unfertilized eggs only
 - 20% of infected persons
 - Or fertilized and unfertilized eggs
 - 40% of infected persons

LIFE CYCLE

- The life cycle of *A. lumbricoides* is passed in only one host, man
- No intermediate host is required
- Fertilised eggs containing unsegmented ovum are passed in the faeces
- They have to undergo a period of incubation in soil before acquiring infectivity
- A first stage rhabditiform larva develops from the unsegmented ovum within the egg
- This is followed by first moulting and a fully developed second stage rhabditiform larva within the egg

LIFE CYCLE

Egg hatch



3rd stage larvae



hepatic portal vessels to liver (3-4 days) -



via Hepatic vein



inferior venacava,



right heart



pulmonary artery

Lungs (2nd on 5th day and 3rd moulting on 10th day)



Lung alveoli



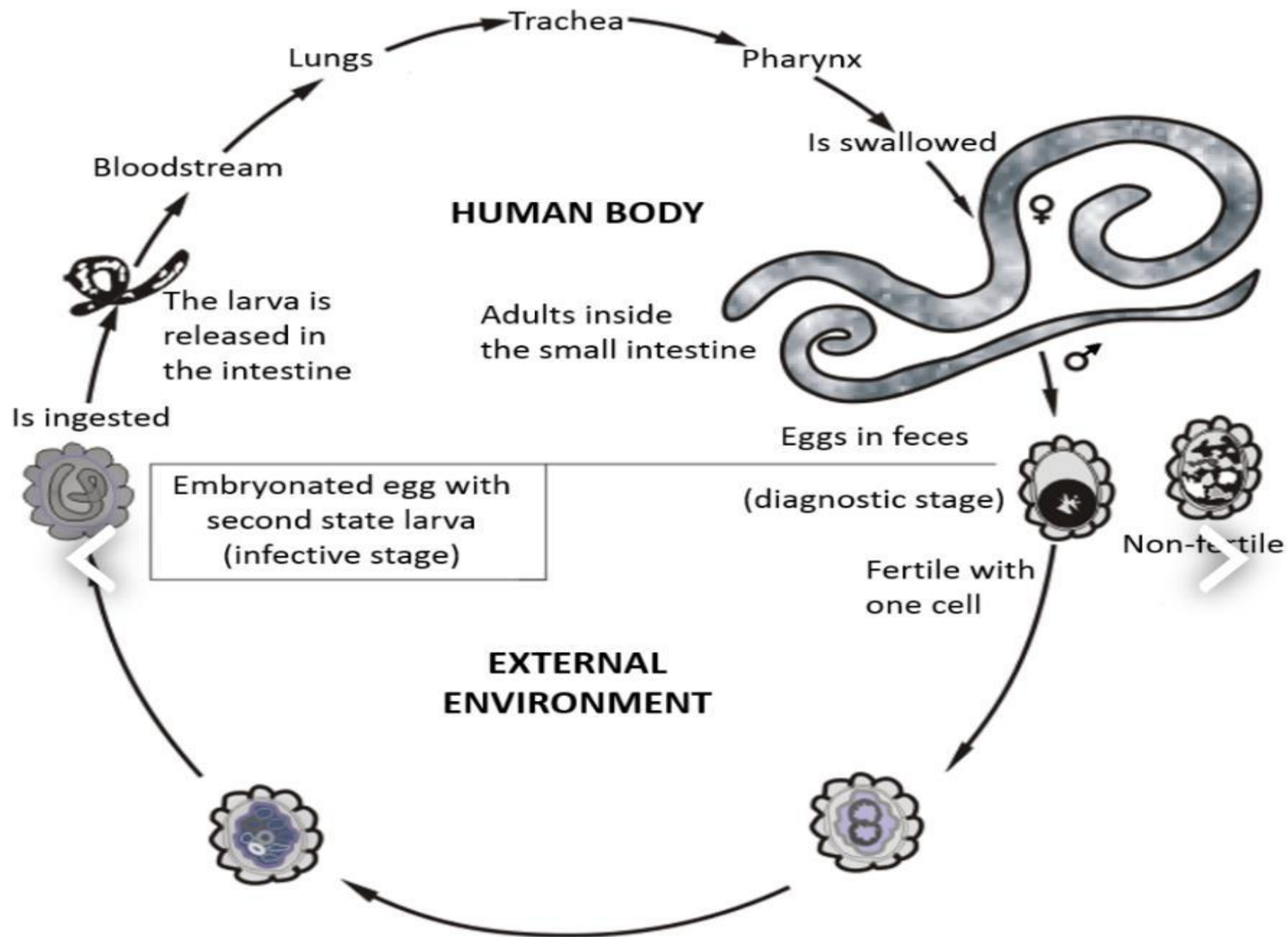
Larynx --



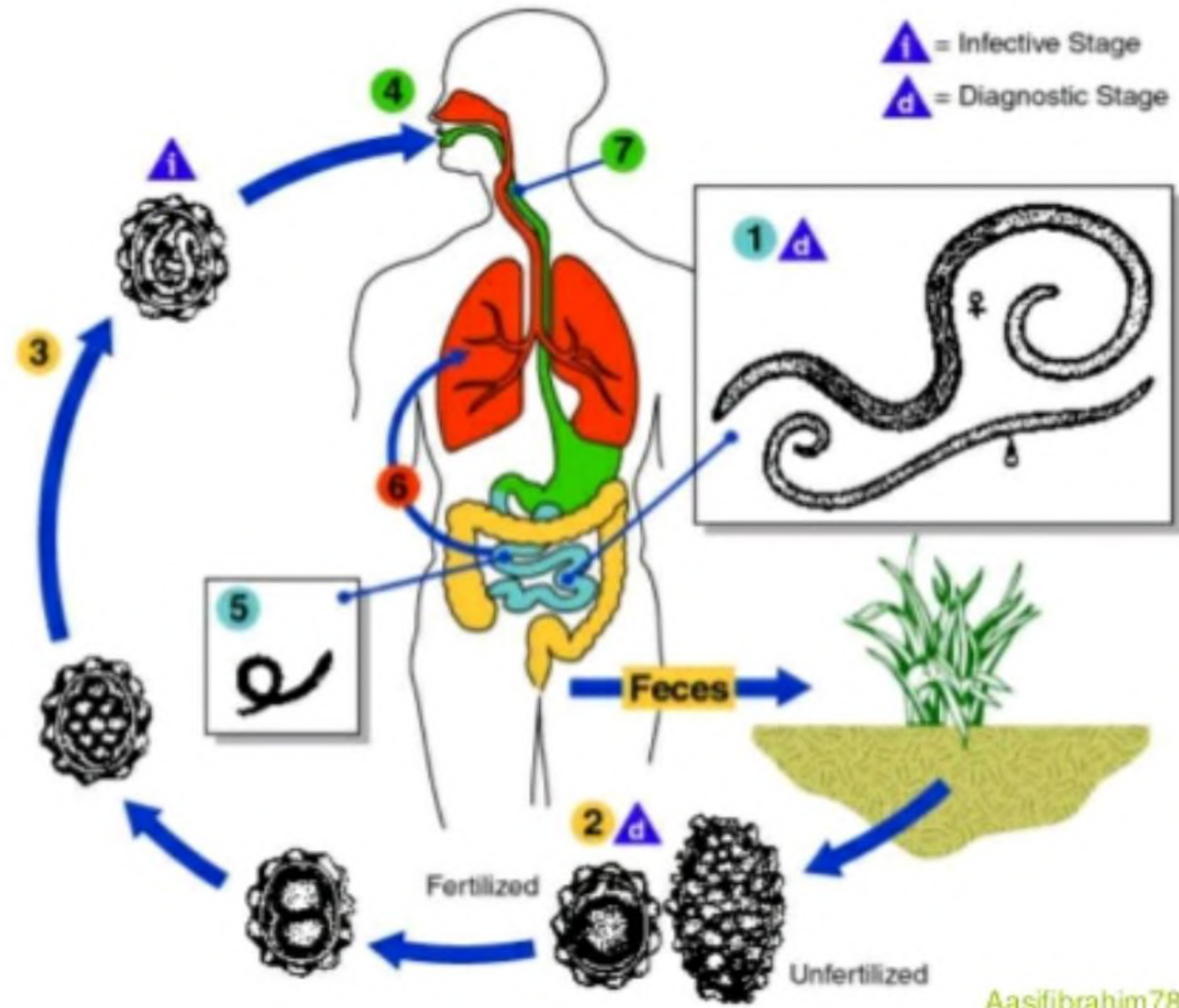
oesophagus



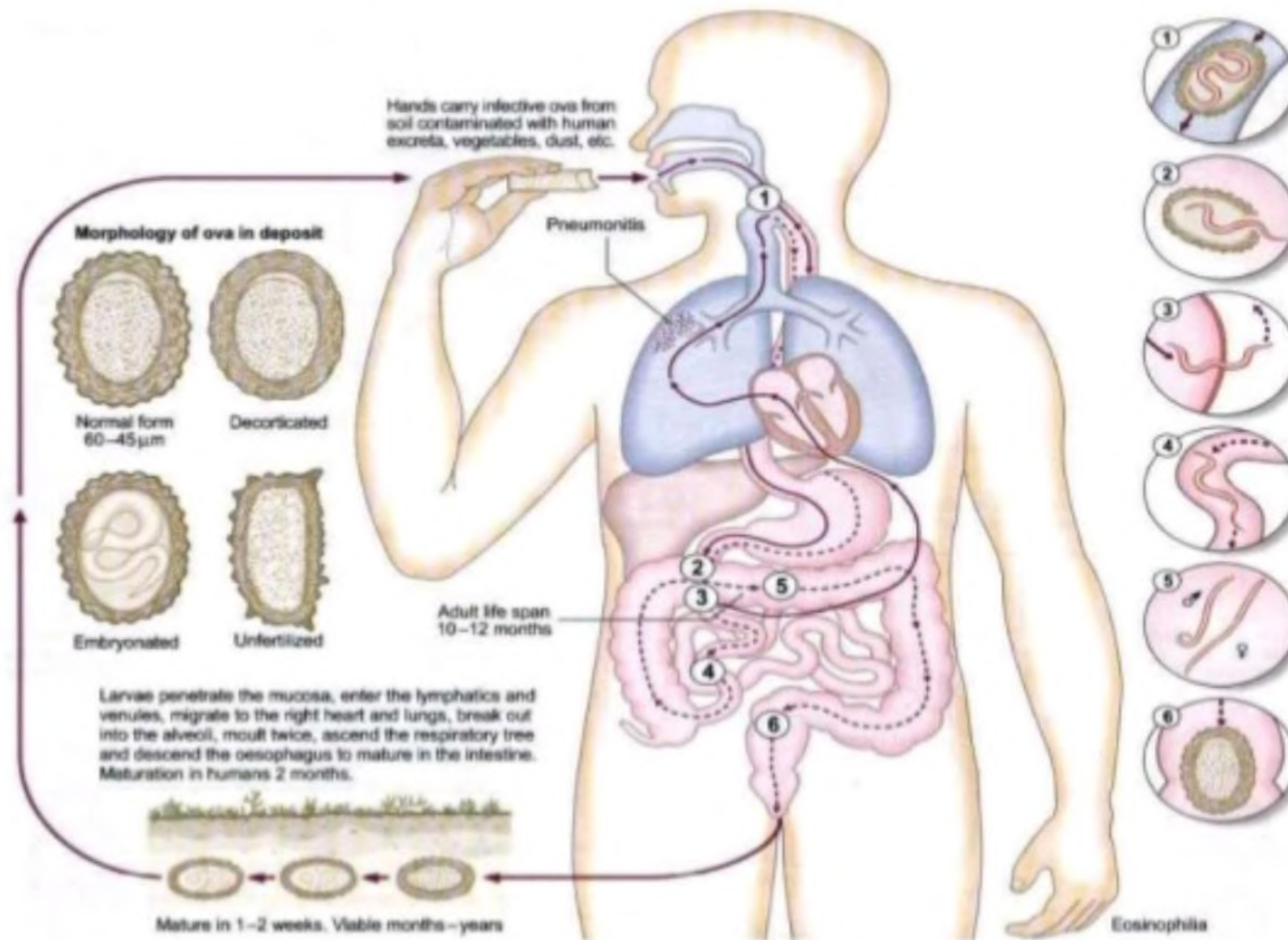
Stomach and localize in the upper part
of the small intestine
(4th moulting, on 25th to 29th day of infection)



Ascaris lumbricoides **Life Cycle**, Nematode (Roundworm)



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PATHOGENESIS

Disease produced by *A. lumbricoides* is known as ascariasis and is caused by both adult worms and migrating larvae

There are two phases in ascariasis:

1. The blood-lung migration phase of the larvae
2. The intestinal phase of the adults

THE BLOOD-LUNG MIGRATION PHASE OF THE LARVAE

1. The blood-lung migration phase of the larvae: During the migration through the lungs, the larvae may cause a pneumonia. The symptoms of the pneumonia are low fever, cough, blood-tinged sputum, asthma. Large numbers of worms may give rise to allergic symptoms. Eosinophilia is generally present. These clinical manifestation is also called Loeffler's syndrome.

THE INTESTINAL PHASE OF THE ADULTS

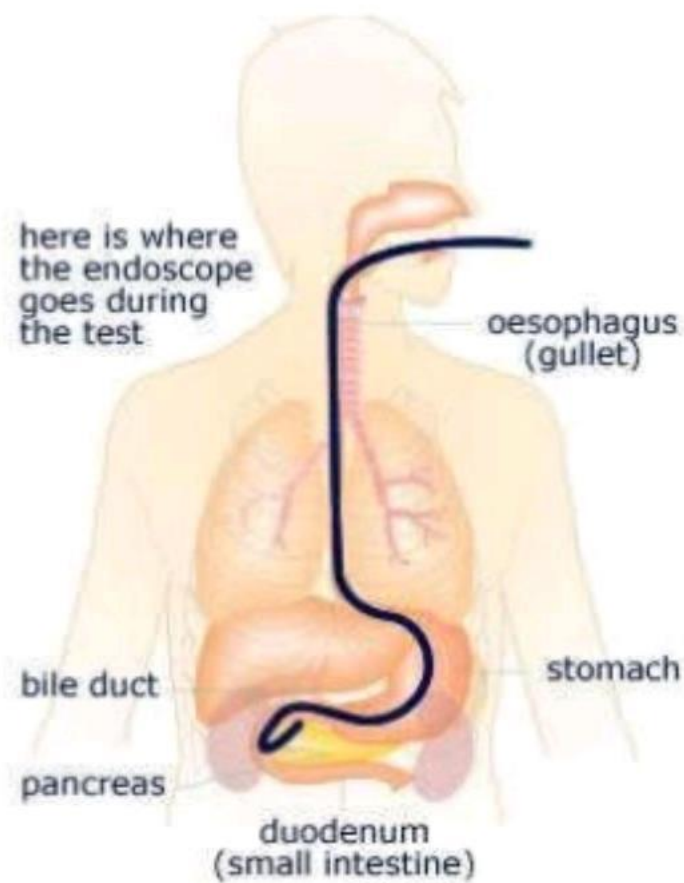
2. The intestinal phase of the adults. The presence of a few adult worms in the lumen of the small intestine usually produces no symptoms, but may give rise to vague abdominal pains or intermittent colic, especially in children. A heavy worm burden can result in malnutrition. More serious manifestations have been observed. Wandering adults may block the appendical lumen or the common bile duct and even perforate the intestinal wall. Thus complications of ascariasis, such as intestinal obstruction, appendicitis, biliary ascariasis, perforation of the intestine, cholecystitis, pancreatitis and peritonitis, etc., may occur, in which **biliary ascariasis is the most common complication.**

Symptomatic Ascariasis

- May manifest into
 - Growth retardation
 - Pneumonitis/ verminous pneumonia
 - Intestinal obstruction
 - Hepatobiliary and pancreatic injury
 - Eosinophilia*

Diagnosis

- Stool examination
 - Kato-Katz fecal smear
 - McMaster method
- Ultrasonography and endoscopy
 - ECRP



Laboratory diagnosis

Done by following methods

1. Parasitic diagnosis
 - a) Demonstration of adult worm
 - b) Demonstration of eggs
 - c) Demonstration of larvae
2. Serodiagnosis
3. Eosinophilia

Demonstration of adult worms

- Worm may be passed through anus, mouth, nose and rarely through ear
- Barium meal may occasionally reveal the presence of adult worms in the small intestine

Demonstration of eggs

- Eggs may be detected in stool or duodenal bile aspirate by direct microscopy or after concentration of faeces
- Eggs may not be seen if only male worms are present

DEMONSTRATION OF LARVAE

- Ascaris larvae may be detected in the sputum during the stage of migration

2. Serodiagnosis

- Ascaris antibody can be detected by indirect haemagglutination (IHA) And immunofluorescence antibody (IFA) test
- These tests are useful for the diagnosis of extraintestinal – ascariasis like Loeffler's syndrome

3. Eosinophilia

- It is seen in larval invasion stage

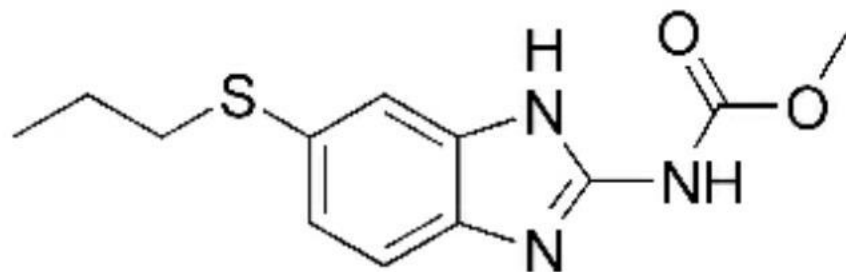
TREATMENT

- 1.Treatment to ascariasis:
- **Mebendazole, Albendazole** and Levamizole are effective.
- 2.Sanitary disposal of feces.
- 3.Hygienic habits such as cleaning of hands before meals.
- 4.Health education.

Treatment

- Drug therapy
 - Adult worms only!
- Benzimidazole anthelmintic drugs
 - Albendazole = DOC
 - Mebendazole
- During pregnancy
 - Pyrantel pamoate

Albendazole

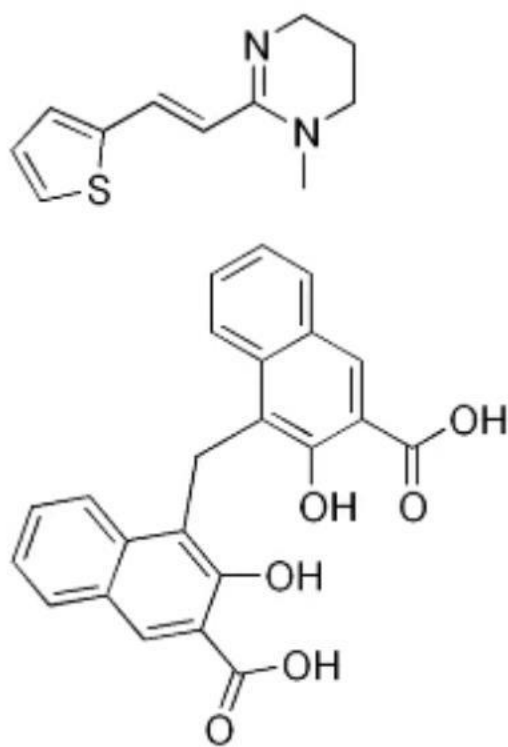


http://commons.wikimedia.org/wiki/File:Albendazole_structure.png

Treatment

- Paralyzing vermifuges
 - pyrantel pamoate
 - Piperazine
 - ivermectine
- Nitazoxanide
 - Primarily for protozoal infection
- Vitamin A supplements

Pyrantel pamoate



http://commons.wikimedia.org/wiki/File:Pyrantel_pamoate.png

Surgery

- Deworming
 - Should be done first
- Intestinal or Bilial surgery
 - ECRP
 - Cholecystectomy



Photo extracted from http://www.medscape.com/viewarticle/451597_3

PROPHYLAXIS

Ascariasis can be prevented by

- Proper disposal of human faeces
- Avoidance of eating raw vegetables and salads
- Periodic treatment with an effective anthelmintic, in communities that lack sanitary facilities

Prevention

- Community control
 - Difficult to achieve
- Health education
 - Along with sanitation programs
- Mass treatments
 - They do not seem to decrease transmission rates
- Vaccine in progress
 - Nasally administered 16-kd secretory protein

