

Ascaris lumbricoides

B.Sc First year Zoology (Honours) Paper - 1

Dr. Mirza Imteyaz Baig

Assistant Professor

Department of Zoology

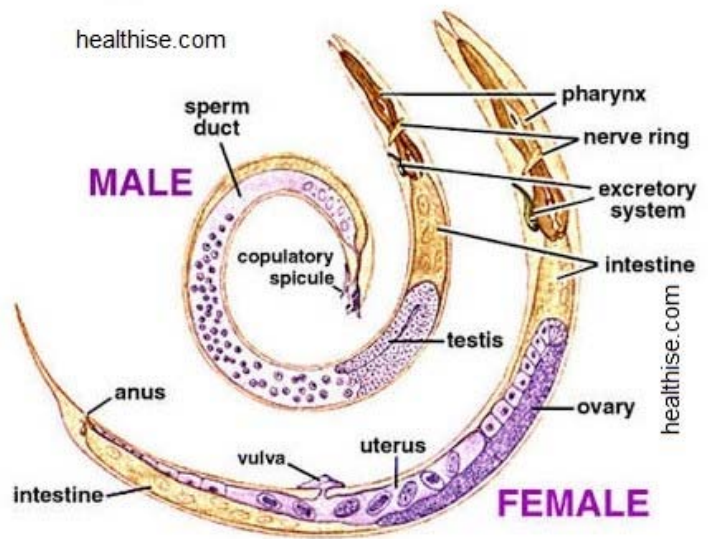
Raja Singh College, Siwan.

Mobile no: 09538245814

E- mail: bmirza7@gmail.com

- *A. lumbricoides* is common in many human populations around the world, particularly in tropical and subtropical countries with high rainfall, as well as in temperate regions with warm summers.
- Infections are particularly prevalent in countries where night soil (human faeces) is used to fertilize vegetable crops.
- It is estimated that almost one quarter of world population (1 billion people) may be infected.

- The ascaridoids are "round-worms" of the small intestine of many animals, including humans. They are characterized by their large size, three prominent anterior lips and the absence of a bursa.
- Round-worms have simple direct life-cycles involving faecal-oral transmission of infective eggs,
- Female worms measuring 20-50cm long by 3-6mm wide, while males are smaller, measuring 15-30cm long by 2-4mm wide with two simple spicules 2.0-3.5mm long.
- Adults have a striated cuticle and three small, but conspicuous, lips around the apical mouth.



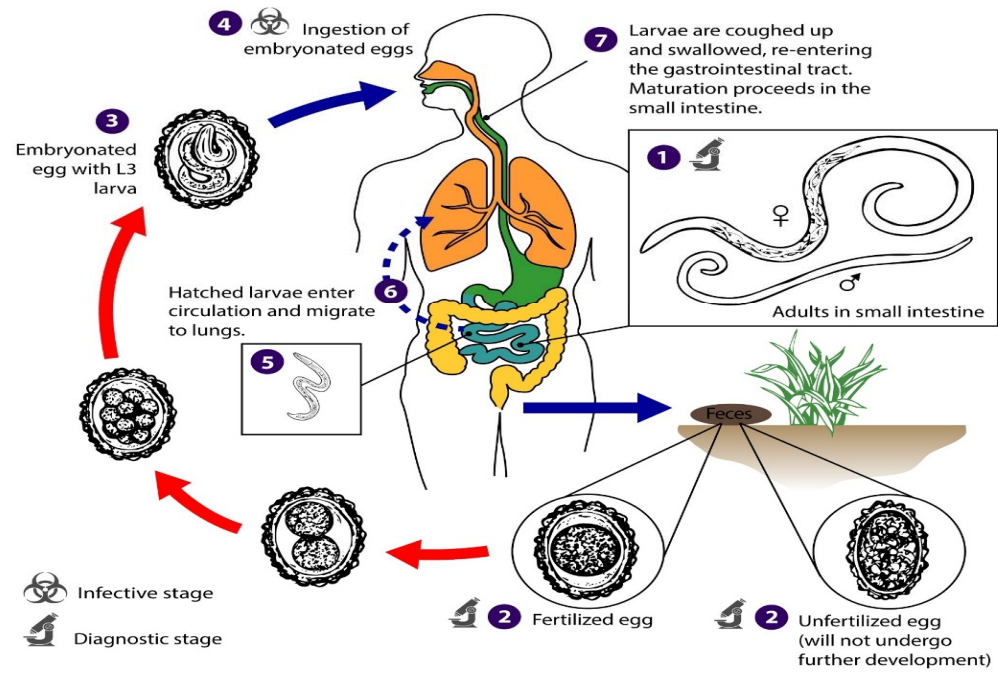
Female worms produce numerous eggs which are excreted with host faeces and must undergo embryonation before becoming infective.

- Fertilized eggs appear as round-oval tan-coloured stages (45-75 μ m long by 35-50 μ m wide) surrounded by a thick albuminous mamillated (lumpy) outer coat.
- Before insemination or in early stages of oviposition, female worms may also excrete unfertilized eggs which are more elongate (85-95 x 45 μ m).
- Fertilized eggs are excreted unembryonated, but then develop first-stage then second-stage infective larvae.

- Eggs in soil/water may be transferred to the mouth by contaminated hands or ingested with foods (uncooked vegetables, washed salads and fruits) or soil (pica = dirt-eating, especially by young children).
- Once ingested, the eggs hatch releasing infective larvae which invade the gut and migrate via the blood/lymph to the lungs over 8-10 days.
- They break into the airspaces (alveoli) of the lungs and move up the bronchi and trachea to the pharynx where they are swallowed.
- They moult in the small intestines and mature to adult worms.
- Females begin egg production 60-65 days after infection and produce huge numbers of eggs (up to 200,000 per day). The adult worms may live for 6 months to 2 years, so the entire parasite life-cycle can range from 2 months up to 5-10 years.

- The parasite forms several different developmental stages: eggs, larvae [moult from first-stage (L1) through to fourth-stage (L4)], and adults (male and female).
- When hatched in the host, these small larvae (1.2-1.8mm long) invade host tissues and undertake pulmonary migration.
- Large adult worms develop in the gut.
- Larvae hatch from ingested eggs and undergo pulmonary migration before developing into adult worms in the small intestines.
- Adult worms generally eat the food of their hosts, but heavy infections cause tangles of worms which can obstruct the gut.
- Clinical infections are typically found in young individuals, although older individuals may serve as sources of infection.

Ascaris lumbricoides



Site of infection

- Adult worms live in the lumen of the small intestine, where the females lay numerous eggs which are shed in host faeces.
- Prior to the development of adult worms, the infective larvae undertake a curious circuitous migration through the lungs, ending up in the gut from where they started.
- The larvae migrate through the gut wall into blood/lymph and are carried to the lungs where they penetrate into air spaces and move up the respiratory tree to the epiglottis where they are swallowed.

Mode of Transmission

- Infections are passed between hosts by the faecal-oral transmission of eggs containing infective larvae.
- Freshly-excreted eggs require 9-40 days for embryonation before they become infective. Embryonation occurs faster in warm moist soil (especially clay) and water (~10 days at 30°C).
- The eggs are very resistant to external environmental conditions and can survive high temperatures (up to 45°C) and dry conditions (down to 6% humidity). They are also dispersed in the environment by wind, water, earthworms and insects (cockroaches).

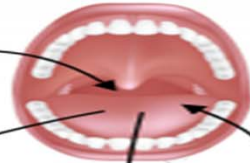
Ascariasis



Ascaris lumbricoides

1

Ingestion of *Ascaris* eggs from feces



2

Eggs hatch in intestines, burrow through gut wall, and migrate to the lungs via the blood

Gastrointestinal Ascariasis

- Peritonitis
- Obstruction
- Pancreatitis
- Appendicitis

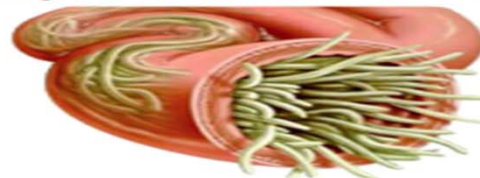
3

Larvae break into the alveoli and travel up trachea where they are coughed up and swallowed

- Loeffler's syndrome
- Pulmonary infiltrates

4

Larvae pass through the stomach into the intestines for a second time where they become adult worms



Pathogenesis

Infections by small numbers of worms may remain asymptomatic, although some individuals may develop allergic reactions (urticaria, eosinophilia).

- Adult worms developing in the gut feed on luminal content, they steal liquid nourishment from the host contributing to protein energy malnutrition and impaired carbohydrate absorption.
- Moderate-heavy infections may cause a variety of digestive disorders, poor growth and development in small children, abdominal pains, restlessness, insomnia and allergic responses (rashes, asthma).
- worms may also occasionally wander upstream (obstructing biliary or pancreatic ducts, sometimes even being regurgitated) or downstream (infecting the appendix, or being passed in faeces).

Diagnosis

Established infections are diagnosed by the microscopic detection of eggs in faecal material, often using sedimentation and/or flotation concentration techniques. Imaging techniques have been used to examine gut obstructions and masses of worms appear as filling defects in X-rays.

Treatment

- Various anthelmintic drugs have proven effective for the treatment of infections. Mebendazole appears to be the drug of choice, although it sometimes may cause some worms to wander.
- Suitable alternatives include pyrantel and levamisole, while albendazole has also been used.
- Once diagnosed, infections can be successfully treated.

Control

- Environmental decontamination is difficult because the eggs are very resistant to chemicals; they can embryonate in dilute formalin, potassium dichromate, acid solutions and many commercial disinfectants.
- Because infections accumulate in their hosts (worms do not multiply in hosts), control measures involve avoiding behaviours conducive to the uptake of eggs; such as improving personal hygiene, maintaining sanitary conditions, and proper disposal of excreta.
- Fresh faecal material should not be used to fertilize edible crops, but it can be processed by microbial biocomposting before use (high temperature processing destroys egg viability).