

# **Ascaris lumbricoides**

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

**Dr. Mirza Imteyaz Baig**

**Assistant Professor**

**Department of Zoology**

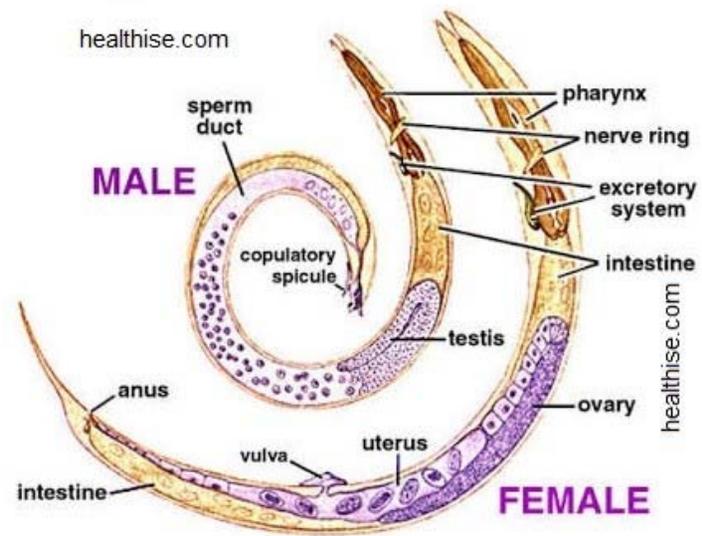
**Raja Singh College, Siwan.**

**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.



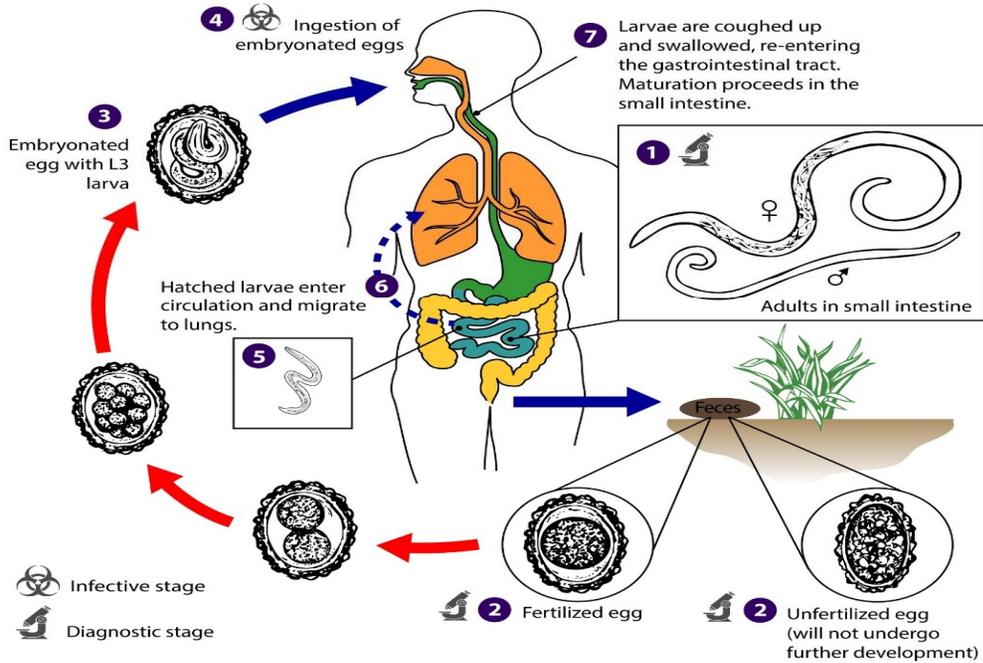
Female worms produce numerous eggs which are excreted with host faeces and must undergo embryonation before becoming infective.

- Fertilized eggs appear as round-oval tan-coloured stages (45-75 $\mu$ m long by 35-50 $\mu$ 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 $\mu$ 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).

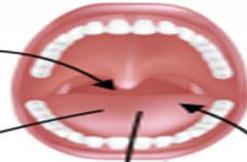
# Ascariasis



*Ascaris lumbricoides*

1

Ingestion of *Ascaris* eggs from feces

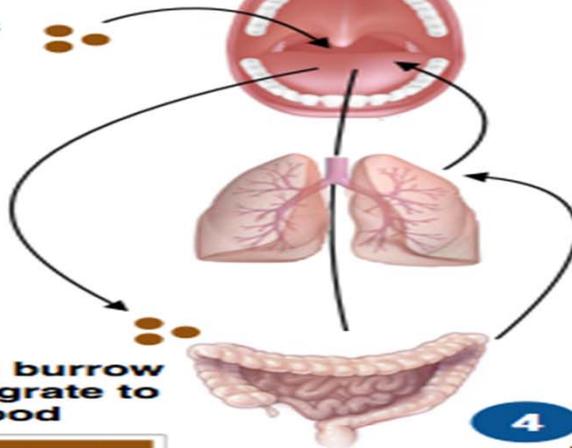


2

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

## Gastrointestinal Ascariasis

- Peritonitis
- Obstruction
- Pancreatitis
- Appendicitis



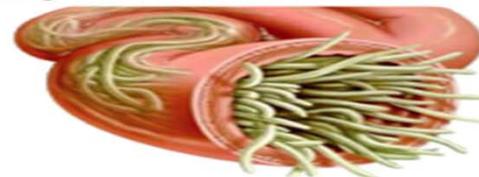
3

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

**Pulmonary Ascariasis**  
- 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).