

## Summary

- A very common parasite, 15 to 40 cm long - jejunum (small intestine)
- Lung passage may cause transient asthma-like symptoms
- Generally atypical symptoms, or asymptomatic
- Sometimes obstruction of hollow organs (intestine, pancreas and biliary tract) causing severe complications

## Life cycle



Adult *Ascaris lumbricoides*. ©ITM

Cosmopolitan but much more common in the tropics. The eggs pass on to the ground via the faeces. Fertilized eggs require 10 to 40 days in the outside world to mature before they become infectious.

Direct self-infection is thus ruled out. Once they are mature the eggs are taken up once more (faecal-oral transmission) via contaminated food, drink (fluids), dirty fingernails or hands. In the intestine small larvae emerge from the eggs and these bore through the intestinal wall. In this way they reach the blood (portal vein system). They are carried with the blood, through the liver to the lungs. Lung passage occurs 3 to 14 days after ingestion. In the lungs the larvae make their way to the bronchial lumen and ascent via the respiratory branches into the throat. They are subsequently swallowed and in this way they again reach the intestine. They grow into adult worms in the jejunum. They do not damage the intestinal wall. Adult worms do not multiply in the human host; the number of adult worms in an infected individual depends on the degree of exposure to infectious eggs over time. Egg laying begins two months after infection when both female and male worms are present in the intestine. Each female worm produces approximately 200,000 fertilized eggs per day. The adult worm survives on average for 1 year. The creatures reach 15 to 40 cm, making them the largest nematode parasitizing humans. There is no animal reservoir. Occasionally infections with *Ascaris suum* occur (parasite of pigs); this worm resembles *Ascaris lumbricoides* very closely and some think the parasites are identical.

## Epidemiology

This is the most common worm infection in humans. It has a cosmopolitan distribution. Children are most often infected. The eggs are very resistant, which makes it possible in certain circumstances for them to survive for a long time in the outside world (years). The number of eggs which can be found in the soil is a measure of the hygiene standard and degree of sanitation of an area (faecal pollution of the ground).

## Clinical aspects

The vast majority are asymptomatic. Any illness caused by worms depends to an important extent on the number of parasites. The total worm load is only increased by repeated exposure (exceptions are *Strongyloides stercoralis* and *Capillaria filippinensis* which can multiply inside the human body). Some people have various forms of intestinal discomfort or allergic symptoms. Serious complications are rare. Nevertheless, in view of the large number of infected persons, the morbidity and mortality should not be disregarded.

## Lung passage symptoms

The larvae undergo lung passage. This produces rarely symptoms of mild to severe cough, dyspnoea, thoracic pain and sometimes fever. The clinical picture is similar to asthma or pneumonia. On chest X-ray migratory infiltrates are rarely observed. Eosinophilia is present. This whole phenomenon is called “Loeffler’s syndrome”. The sputum contains many eosinophils, Charcot-Leyden crystals and sometimes also larvae. The symptoms last for some days or max. 2 weeks. Most of the time this goes unrecognized.

## Obstruction of, or migration in, hollow organs

- When numerous adult worms are present they may form a tangle and cause mechanical intestinal obstruction manifested by a bloated abdomen, increased peristalsis with clangor, colicky pain, vomiting (bile, faecaloid) and dilated intestinal lumen on an abdominal X-ray.
- Migration into the biliary tract may lead to biliary obstruction (cholestasis) with possibly infection (e.g cholangitis, liver abscess, pancreatitis).
- Sometimes there is migration to the appendix with inflammation (appendicitis).
- Sometimes an adult *Ascaris* is present in vomitus.
- Occasionally an adult can penetrate the lacrimal duct.
- Recent surgical intestinal sutures can be breached by an invasive adult *Ascaris*, leading to bowel perforation and peritonitis. Pre-operative deworming is advised in endemic areas.
- Infection with *Ascaris lumbricoides* also plays a role in the development of pigbel (clostridial necrotizing enteritis, an often fatal type of food poisoning caused by a  $\beta$ -toxin of *Clostridium perfringens*; see chapter on diarrhoea).

## Malnutrition

*Ascaris* itself does not cause malnutrition. In borderline malnutrition the presence of numerous worms can have a negative effect, however. It is also important to know that many patients suffer from anorexia. On a population level the mass treatment (deworming) has a positive influence on the cognitive development in children.

## Diagnosis

Since an adult female lays up to 200,000 eggs per day, as a rule no concentration technique is necessary to detect eggs in the faeces. If infection is solely with one or more male worms then no eggs will be detected. Stool concentration methods for detection of *Ascaris* eggs (rarely needed in endemic areas) include Kato-Katz and FLOTAC techniques like for other intestinal worms. Charcot-Leyden crystals, which consist of lysophospholipase, an eosinophil-derived enzyme, may be seen by microscopic stool examination.

During lung passage there is significant eosinophilia. After lung passage there is no longer appreciable eosinophilia. Sputum analysis may demonstrate eosinophils and Charcot-Leyden crystals.

X-ray of the intestine with barium contrast may show one or more adult worms. The worm forms a long, thin dark area. Sometimes a central longitudinal radio-opaque line can be seen; this is the intestinal tract of the worm. Such a line is absent in tapeworms.

An ultrasound of the pancreas (Wirsung duct) or of the biliary tract and gallbladder may show an ectopic migrating adult *Ascaris*.

## Treatment

Mebendazole (Vermox®): 100 mg BD x 3 days, effective, broad spectrum (or 500 mg single dose)

Albendazole, 400 mg single dose effective, broad spectrum

Ivermectine: similar efficacy (single dose 200 µg/kg) as single dose albendazole

(Flubendazole (Fluvermal®): 100 mg BD x 3 days, effective, narrow spectrum;  
Piperazine (Adiver®): narrow spectrum; Pyrantel pamoate/ oxantel (Antiminth®,  
Combantrin®) can be used in pregnancy; Levamisole; Tribendimine; Nitazoxanide)

Pulmonary manifestations can be treated with bronchodilators or if severe with systemic corticosteroids if *Strongyloides stercoralis* infection is ruled out.

### Drug resistance

Benzimidazole drugs bind to nematode  $\beta$ -tubulin and inhibit parasite microtubule polymerisation. Drug resistance against front-line antihelmintics is widespread in nematodes of livestock due to frequent treatment of animals. Therefore, the effectiveness of drugs must be closely monitored in regions where mass antihelmintic chemotherapy is administered.