

Hookworm infections

The hookworm is a parasitic nematode worm that lives in the small intestine of its host – eg, dog, cat or human. Two species of hookworms commonly infect humans, *Ancylostoma duodenale* and *Necator americanus*. Other hookworms that mainly infect animals can also be parasites of humans (*Ancylostoma ceylanicum*) or can cause cutaneous larva migrans (*Ancylostoma braziliense*, *Ancylostoma braziliense caninum*, *Uncinaria stenocephala*). *A. caninum* larvae can occasionally migrate to the human intestine, causing eosinophilic enteritis. *A. caninum* larvae have also been implicated as a cause of diffuse unilateral subacute neuroretinitis. This article covers intestinal hookworm infection. See the separate [Cutaneous Larva Migrans](#) article.

Life cycle^[1]

- Eggs are passed in the stool and (with favourable conditions of moisture, warmth and shade) larvae hatch in one to two days.
- The released larvae grow in the faeces and/or the soil, and after five to ten days they become filariform (third-stage) larvae that are infective and can survive for three to four weeks in favourable environmental conditions.
- On contact with the human host, the larvae penetrate the skin and are carried through the blood vessels to the heart and then to the lungs. They penetrate into the pulmonary alveoli, ascend the bronchial tree to the pharynx, and are then swallowed.
- The larvae reach the small intestine where they mature into adults. Adult worms live in the lumen of the small intestine, where they attach to the intestinal wall, causing intestinal blood loss. Most adult worms are eliminated within one to two years.

- Some *A. duodenale* larvae, following penetration of the host skin, can become dormant in the intestine or muscle. Infection by *A. duodenale* can probably also occur by the oral route, but *N. americanus* requires a transpulmonary migration phase.

How common are hookworm infections? (Epidemiology)^[2]

- Hookworm is the second most common human helminthic infection (after ascariasis). Hookworm infections are thought to affect approximately 470 million of the world's population.
- Distribution is worldwide but mostly in areas with a moist, warm climate. Both *N. americanus* and *A. duodenale* are found in Africa, Asia and the Americas.
- *N. americanus* predominates in the Americas and Australia.
- *A. duodenale* predominates in the Middle East, North Africa and Southern Europe.
- Infection is usually acquired by walking on, handling, or lying in contaminated soil.^[3]

Risk factors^[4]

- Low socioeconomic groups
- Exposure to infected soil
- Barefoot walking
- Poor sanitation and personal hygiene
- Children and pregnant women are at most risk

Hookworm infection symptoms (presentation) ^[5]

- Most individuals with hookworm infection are asymptomatic.
- Symptoms are due to inflammation in the bowel (eg, nausea, abdominal pain and intermittent diarrhoea) and the clinical manifestations of iron-deficiency anaemia.

- Local skin manifestations ('ground itch') can occur during penetration by the filariform larvae, and respiratory symptoms may occur during pulmonary migration of the larvae.
- The blood loss in the stools is occult and not visibly apparent.
- Chronic protein loss can result in hypoproteinaemia and anasarca (widespread swelling of the skin due to effusion of fluid into the extracellular space).
- Although the most common manifestation of hookworm infection is cutaneous larva migrans, larvae may also occasionally migrate to the bowel lumen and cause an eosinophilic enteritis.

Investigations^[6]

- FBC: eosinophilia (the appearance of eosinophilia coincides with the development of adult hookworms in the intestine); microcytic (iron-deficiency) anaemia.
 - Diagnosis depends on finding characteristic worm eggs on microscopic examination of the stools, although this is not possible in early infection.
 - CXR may show diffuse alveolar infiltrates during the migration of the worms through the lung in severe infection.^[7]
 - There are no serological tests for hookworm infections.
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Hookworm infection treatment and management

- In countries where hookworm is common and re-infection is likely, mild infections are often not treated.
- Hookworm can be treated with local cryotherapy when it is still in the skin.
- Albendazole is the most effective medication.^[6] Albendazole or mebendazole are effective both in the intestinal stage and during the stage the parasite is still migrating under the skin.
- In case of anaemia, iron supplementation (folic acid or vitamin B12 may also be required as red blood cells are replenished).

- Treatment for more severe infections may also include surgical removal of the parasites.

Complications^[2]

- Rapid hookworm re-infection is common in endemic areas.^[3]
- Hookworm is a leading cause of maternal and child morbidity in developing countries.
- Hookworm infections contribute to [anaemia](#), [malnutrition](#), developmental delay and [poor growth](#) in children and adolescents in the developing world.^[8]
- Hookworms also cause [intrauterine growth restriction](#), [prematurity](#), and low birth weight in newborns born to infected mothers.
- Hookworm infection is rarely fatal, but anaemia can be significant if there is heavy infection.

Prevention of hookworm infections

Community control is difficult unless socio-economic conditions, sanitation, education, and the availability of proper footwear significantly improve. Current World Health Organization (WHO) recommendations for hookworm infection include periodic mass therapy with albendazole to lower the overall worm burden.^[9] Hookworm vaccines are being developed but are not yet available.^[10] Advice for individuals includes:

- Prevent skin/soil contact: do not walk barefoot.
- Do not defecate outside latrines, toilets, etc.
- Do not use human excrement or raw sewage as manure or fertiliser in agriculture.

Further reading

- [Aziz MH, Ramphul K](#); Ancylostoma.
- [Al Amin ASM, Wadhwa R](#); Helminthiasis.
- [Maxfield L, Crane JS](#); Cutaneous Larva Migrans. StatPearls, Oct 2022.

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