



Strongyloides Stercoralis

Smallest Nematode known to cause human infection *Strongyloides stercoralis*.

Habitat

The adult worm is found in the small intestine (duodenum and jejunum) of man.

Morphology

Adult Worm

Female Worm

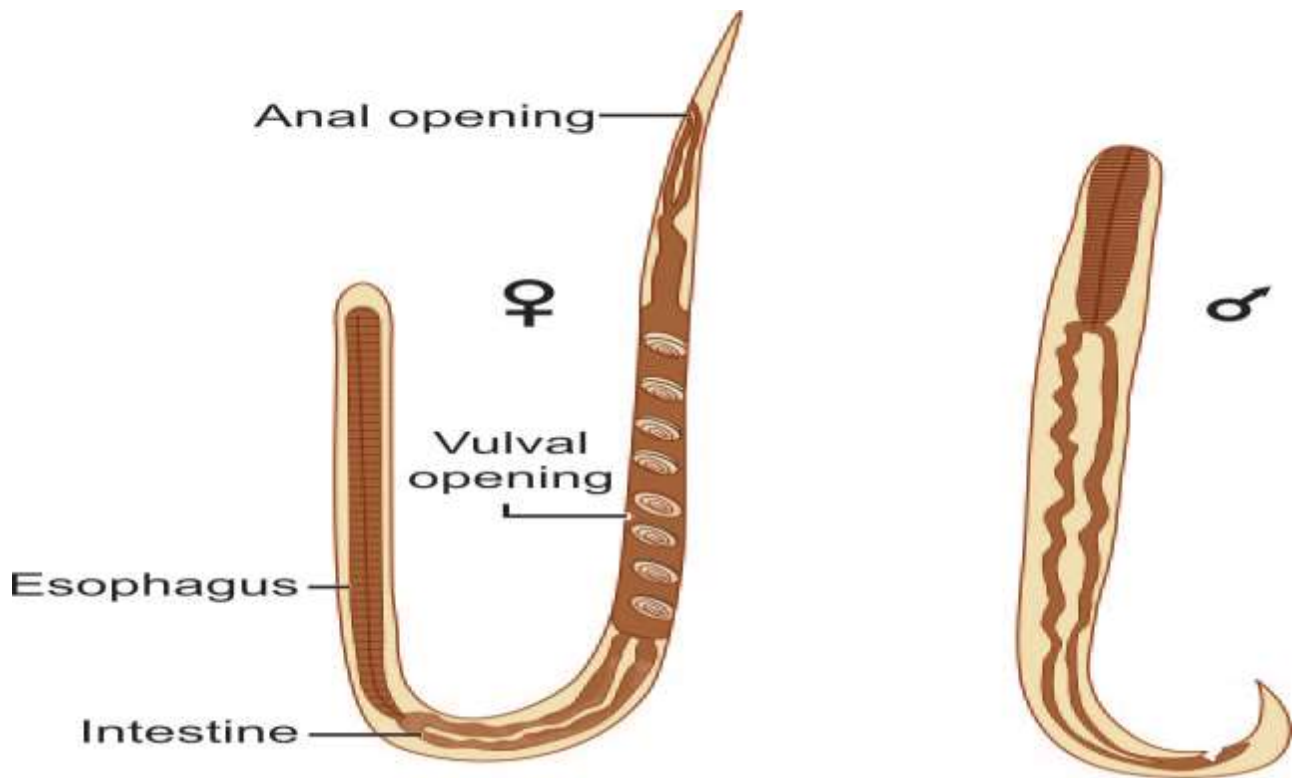
The female worm is **thin**, transparent, about 2.5 mm long and 0.05 mm wide

- It has a **cylindrical esophagus** occupying the anterior one third of the body and the intestines in the posterior two thirds, opening through the anus situated ventrally, a little in front of the pointed tail tip طرف الذيل المدبب.
- The reproductive system contains paired uteri, vagina, and vulva. The paired uteri lead to the vulva situated at the junction of the middle and posterior thirds of the body. In the gravid female, the uteri contain thin walled transparent ovoid eggs, 50 μm by 30 μm in size.
- The worm is ovoviviparous بيوضة ولودة .
- The individual worm has a lifespan of 3 or 4 months, but because it can cause autoinfection, the infection may persist for years.

Male Worm

The male worm are shorter and broader than female measuring 0.6–1 mm in length and 40–50 μm in width.

- The copulatory spicules, which penetrate the female during copulation .
- They are not seen in human infection because they do not have penetrating power, therefore do not invade the intestinal wall.

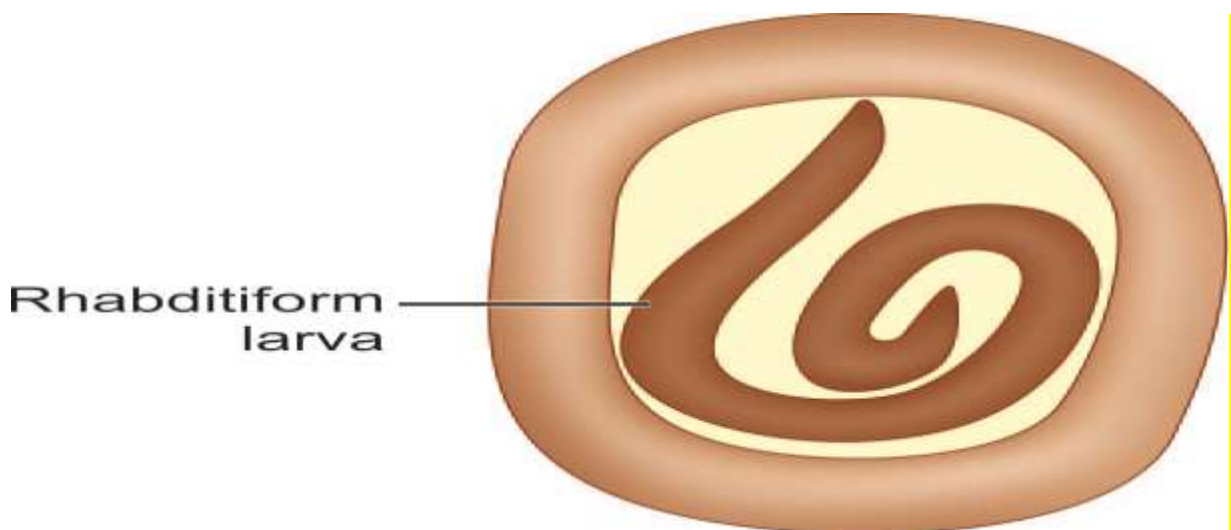


Adult worm (male and female)

Egg

Eggs are within the uterus of gravid female.

- Each uterus contains 8–10 eggs arranged anteroposteriorly in a single row.
- They are oval and measure 50–60 μm in length and 30–35 μm in breadth.
- As soon as the eggs are laid, they hatch out to rhabditiform larva (1st stage larva). Thus, it is the larva and not the egg, which is excreted in feces and detected on stool examination and not egg.



Egg of *S. stercoralis*

Larva

Rhabditiform Larva (L1 stage)

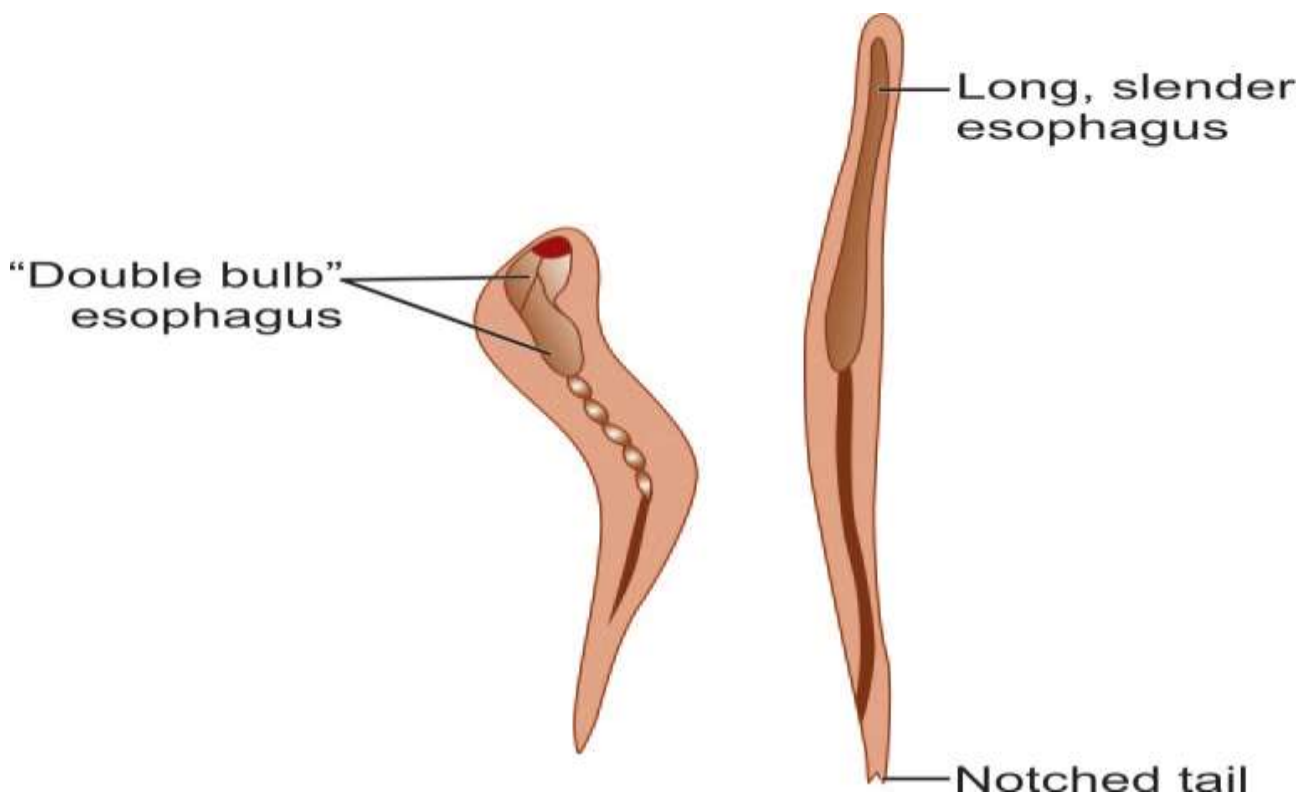
This is the first stage of larva. Eggs hatch out to form L1 larva in the small intestine.

- It is the most common form of the parasite found in the feces.
- It measures 0.25 mm in length, with a relatively short muscular double bulb esophagus.
- The L1 larva migrates into the lumen of the intestine and passes down the gut to be released in feces.

Filariform Larva (L3 stage)

This is the third stage of larva.

- L1 larva moults twice to become the L3 larva.
- It is long and slender and measures 0.55 mm in length with a long esophagus of uniform width and notched tail ذئيل مسنن.
- It is the infective stage of the parasite to man.



Larvae of *Strongyloides stercoralis*. A. Rhabditiform larva; B. Filariform larva

Life Cycle

The life cycle of *S. stercoralis* is complex because of the multiplicity of pathways through which it can develop. It is unique among human nematodes as it has a parasitic cycle and a free-living soil cycle, in which it can persist for long periods in soil by feeding on soil bacteria, passing through several generations.

Natural host: Man, although dogs and cats are found infected with morphologically indistinguishable strains..

Infective form: Filariform larva.

Mode of infection

- Penetration of skin by the third stage filariform larva, when a person walks barefoot
- Autoinfection.
- The adult female worm is found in the human intestine embedded in the mucosa of the duodenum and upper jejunum.
- Since only the female worms are seen in the intestine, it was earlier believed that they are **parthenogenetic** عذرية التوالد and can produce offsprings ذرية without being fertilized by the male. But it has now been established that parasitic males do exist. They can be demonstrated in experimentally infected dogs. They are not seen in human infections because they do not invade the intestinal wall and so are eliminated from the bowel soon after the females begin to oviposit. However, the majority of females are probably parthenogenetic.
- The eggs laid in the mucosa hatch immediately, releasing rhabditiform larva.
- The rhabditiform larva migrates into the lumen of the intestine and passes down the gut to be released in feces.
- The rhabditiform larva may even metamorphose into filariform larva during passage through the bowel.
- These filariform larvae may penetrate colonic mucosa or perianal skin without leaving the host and going to the soil, thus providing a source of autoinfection.

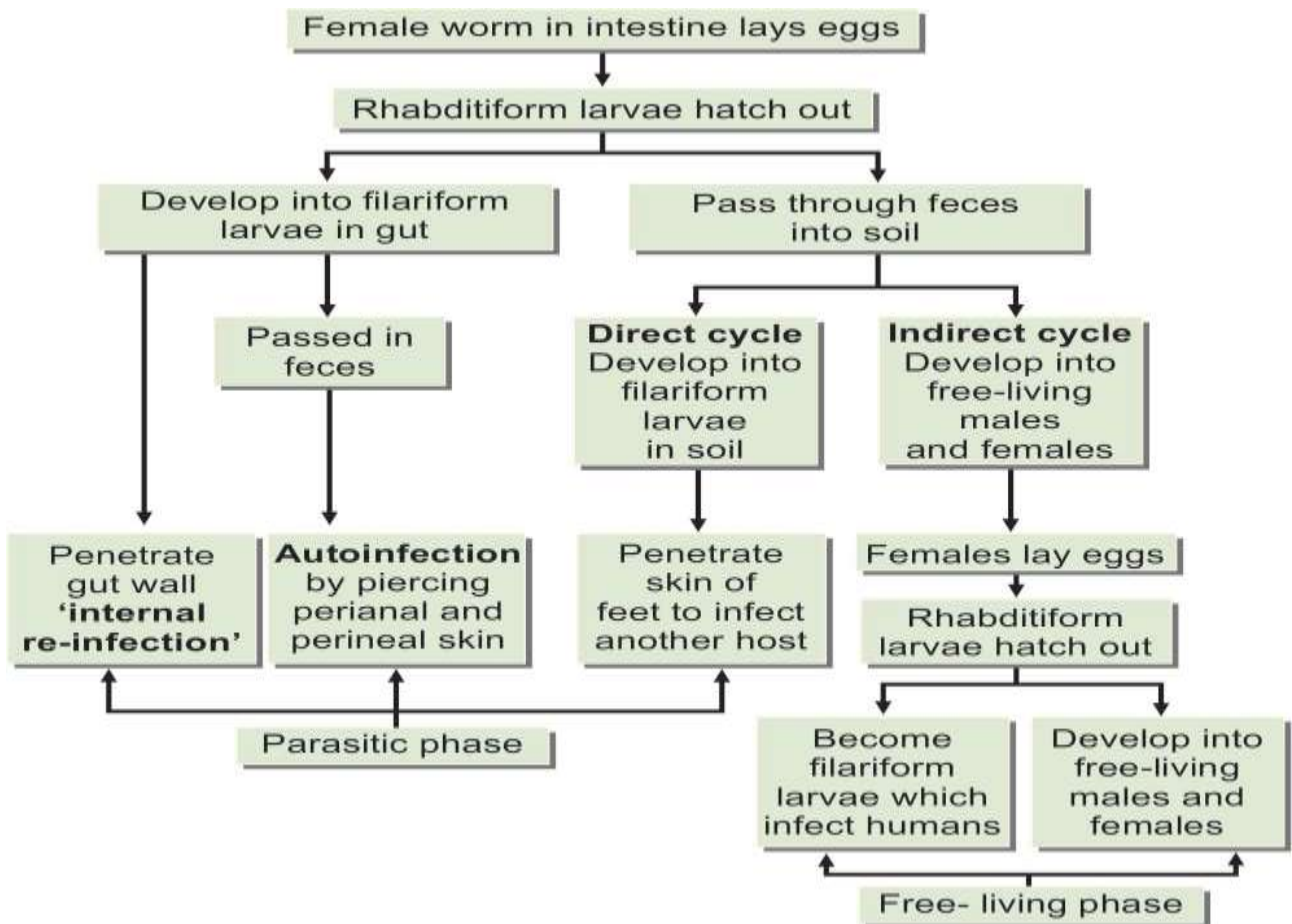
This ability to cause autoinfection explains the persistence of the infection in patients for long periods, even 30–40 years, after leaving the endemic areas.
المناطق الموبوءة.

- The rhabditiform larva voided with the feces may undergo two types of development in the soil

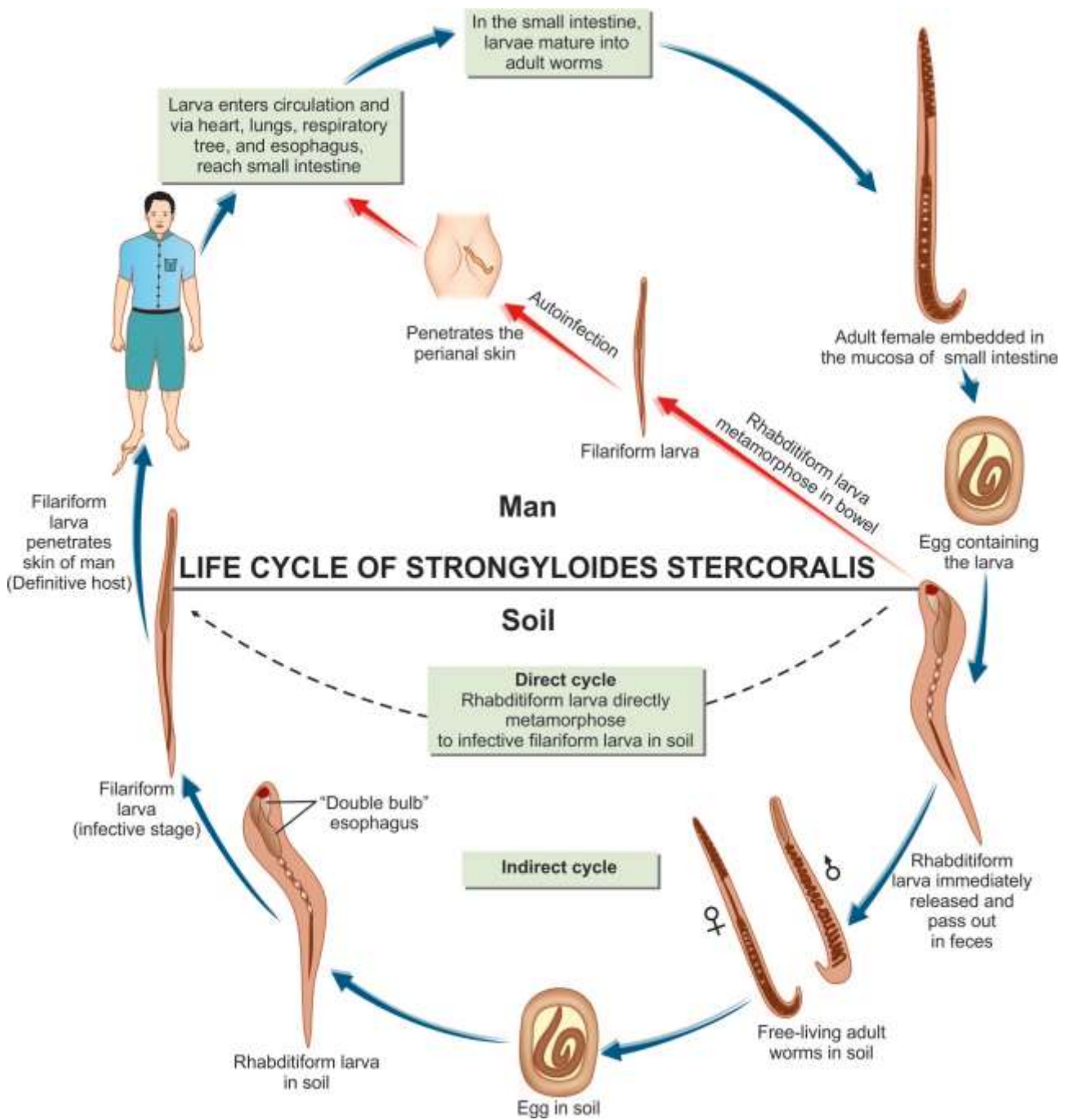
- ❖ Direct development

- ❖ Indirect development.

- Direct development: The rhabditiform larva on reaching the soil moults twice to become the infective filariform larva.
- Each rhabditiform larva gives rise to one filariform larva. When a person walks barefoot on soil containing the infective filariform larvae, penetrate the skin and enter the circulation.
- The larvae are carried along the venous circulation to the right side of the heart and to the lungs.
- Here, they escape from the pulmonary capillaries into the alveoli, migrate up the respiratory tract to the pharynx, and are swallowed, reaching their final destination المكان المقصود, small intestine.
- In the intestine, they mature into adult parasitic females and males in 15–20 days. Female worms then burrow into the mucosa of the intestine and lays eggs.
- The rhabditiform larvae hatch out immediately and enter into lumen of the bowel. They are excreted in the feces and thus, the life cycle is repeated.
- Free-living phase/indirect development: The rhabditiform larva passed in stools develop in moist soil into free-living males and females.
- They mate in soil.
- The fertilized female lays eggs, which hatch to release the next generation of rhabditiform larvae.
- These may repeat the free-living cycle or may develop into the filariform larvae, which infect humans and initiate the parasitic phase.



Life cycle of *S. stercoralis* (Mode of infection)



Pathogenicity and Clinical Features

Strongyloidosis داء الاسطوانيات (infection caused by *S. stercoralis*) is generally benign and asymptomatic. Blood eosinophilia and larvae in stool being the only indications of infection.

- ❖ Sometimes it may cause clinical manifestations, which may be severe and even fatal, particularly in those with defective immune response.
- ❖ The clinical disease may have cutaneous, pulmonary, and intestinal manifestations.

Cutaneous Manifestations

There may be dermatitis, with erythema and itching at the site of penetration of the filariform larva, particularly when large numbers of larvae enter the skin.

- In those sensitized by prior infection, there may be an allergic response.
- Pruritis الحكة and urticarial الشرى, particularly around the perianal skin and buttocks الارداف, are symptoms of chronic strongyloidiasis.
- The term larva currens تيارات اليرقات (meaning 'racing larvae' سباق اليرقات) has been applied to the rapidly progressing linear or serpigenous urticarial tracks المسارات الشروية الزاحفة caused by migrating filariform larvae. These often follow autoinfection and start perianally.

Pulmonary Manifestations

When the larva escape from the pulmonary capillaries into the alveoli, small hemorrhages may occur in the alveoli and bronchioles.

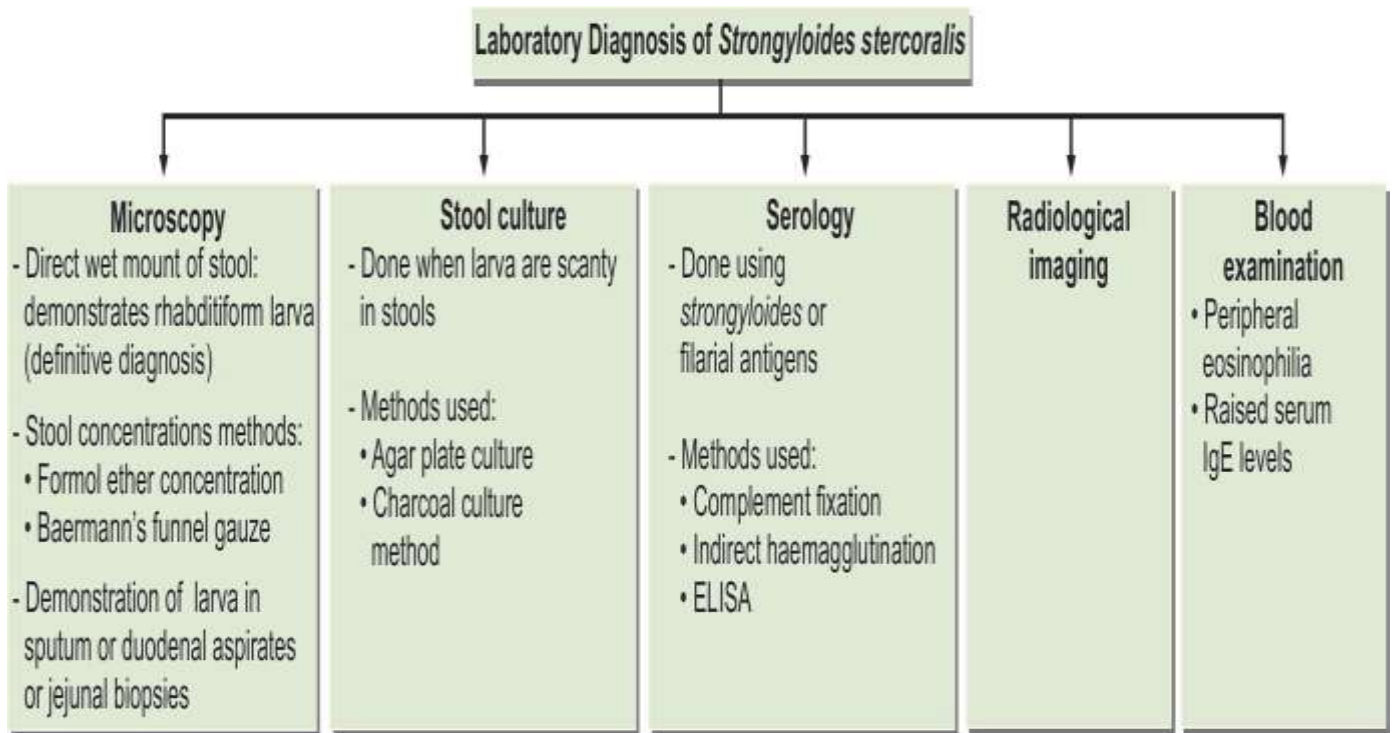
- ✓ Bronchopneumonia التهاب قصبي رئوي may be present, which may progress to chronic bronchitis التهاب الشعب الهوائية المزمن and asthmatic symptoms in some patients.
- ✓ Larva of Strongyloides may be found in the sputum of these patients.

Intestinal Manifestations

The symptoms may resemble those of peptic ulcer القرحة الهضمية or of malabsorption syndrome متلازمة عدم الامتصاص.

- ✓ Mucus diarrhea is often present. In heavy infection, the mucosa may be honey-combed قرص العسل with the worm and there may be extensive sloughing قرحة, causing dysenteric stools.
- ✓ Other manifestations are protein-losing enteropathy اعتلال الأمعاء الناقص البروتين.

Laboratory Diagnosis



Laboratory diagnosis of *S. stercoralis*

Stool Culture

When larvae are scanty in stools, diagnosis may be facilitated by stool culture.

Culture techniques used

Agar plate culture

Charcoal culture method

- The larvae develop into free-living forms and multiply in charcoal cultures set up with stools. Large number of free-living larvae and adult worms can be seen after 7–10 days.
- Serial examinations الفحوصات التسلسلية and the use of agar plate detection method improves the sensitivity of stool diagnosis.