Nematoda (Trichuris Trichiura & Trichinella spiralis)

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Medical Parasitology Ⅱ

Summer Semester

Lecture 3

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Trichuris trichiura

Trichuris trichiura

The name Trichuris means a “hair-like tail" (Greek trichos- hair, oura-tail). This name is not quite correct because it is the anterior end of the worm that is hair-like and not the tail. the name whipworm is more apt as the thick posterior part resembles the stock and the thin anterior end resembles the lash of a whip.

- The helminth causes Trichuris in humans, an intestinal infection caused by invasion of the colonic mucosa.

Epidemiology

Global distribution: It is worldwide in distribution, but is much more common in the tropics. The infection is widespread in tropical Africa, South America and Southeast Asia. Trichuris Infection is found throughout India.

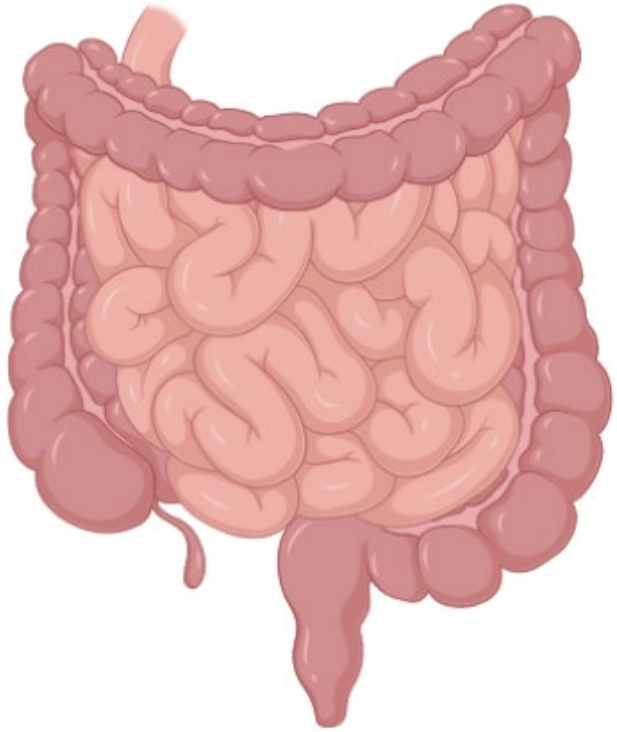
Prevalence: Some 800 million people are estimated to be infected with this worm.

• While whipworm infection is extremely frequent,

Whipworm disease is relatively rare

Habitat

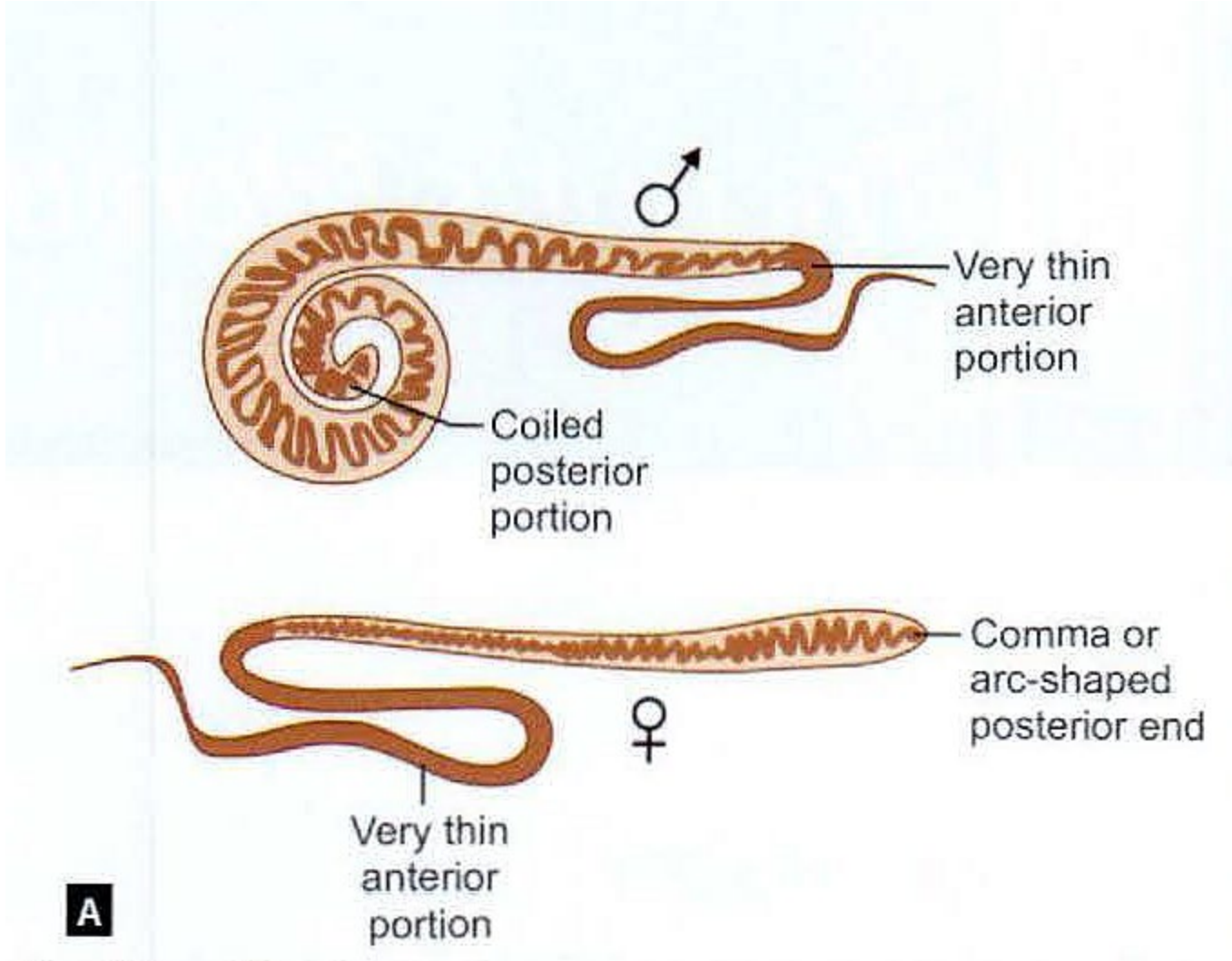
T. trichiura lives in the large intestine. The adult worms are found attached to the wall of the cecum and, less commonly to the vermiform appendix, colon.



Morphology

Adult worm

- The male worm is 30- 45 mm long, while the female is slightly larger, about 40-50 mm.
- The worm is flesh -colored. In shape, it resembles a whip, with the anterior three-fifths (3/ 5) thin and thread-like and the posterior two-fifths (2/ 5) thick and fleshy, appearing like the handle of a whip.
- The anenuated anterior portion, which contains the capillary esophagus, is embedded in the mucosa.
- The posterior part contains the intestines and reproductive organs.
- The posterior end of the male is coiled ventrally, while the hind end of the female is straight, blunt, and rounded.
- The worm has a lifespan of 5-10 years.


♂
Very thin anterior portion
Coiled posterior portion
Comma or arc-shaped posterior end
♀
Very thin anterior portion
A

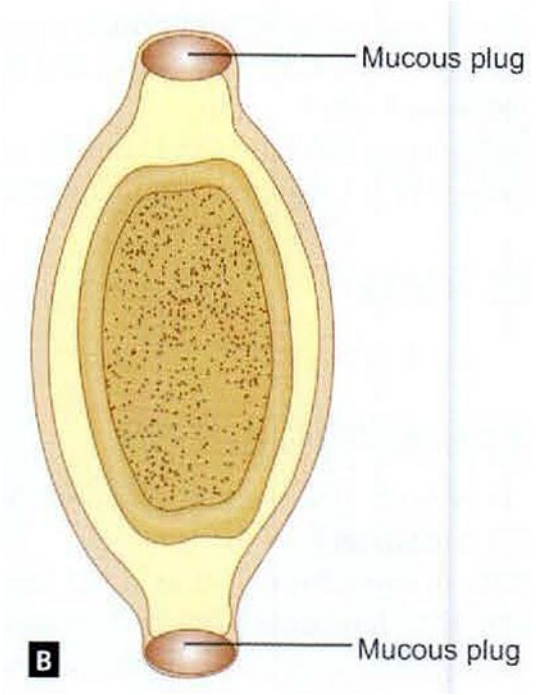

8

Morphology

Egg

The egg has a characteristic appearance.

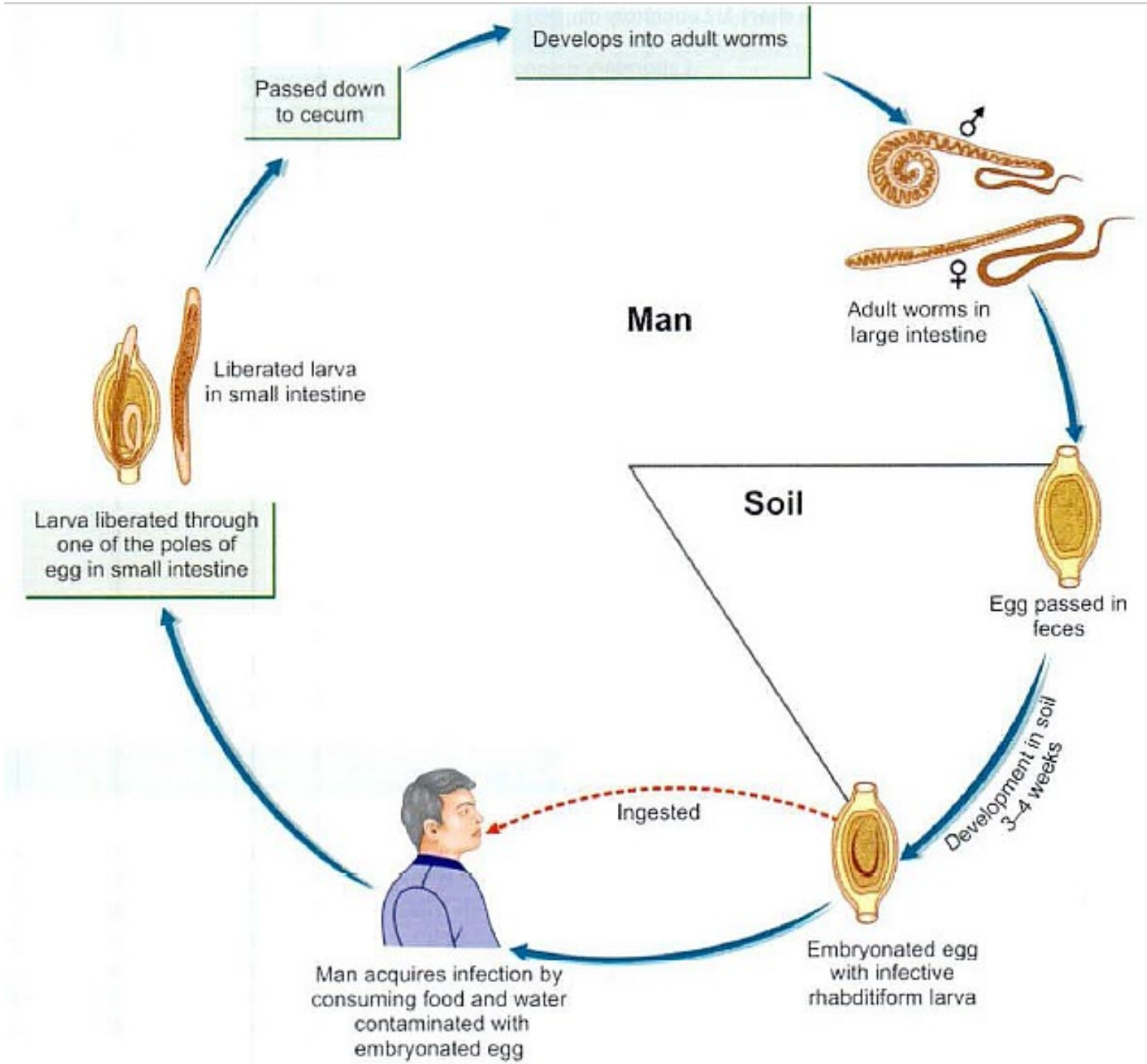
- It is brown in color, being bile-stained.
- It has a triple shell, the outermost layer of which is stained brown.
- It is barrel-shaped and about 50 µm long and 25 µm wide in the middle, with a projecting mucus plug at each pole containing an unsegmented ovum. The plugs are colorless.



Life cycle

- Infection: Humans ingest embryonated eggs from contaminated soil/food.
- Larvae: Eggs hatch in the small intestine, larvae move to the cecum/colon.
- Adults: Mature whipworms embed in the mucosa and produce eggs.
- Environment: Eggs passed in feces become infective in soil (2–3 weeks).
- Cycle repeats when infective eggs are ingested.

Life Cycle

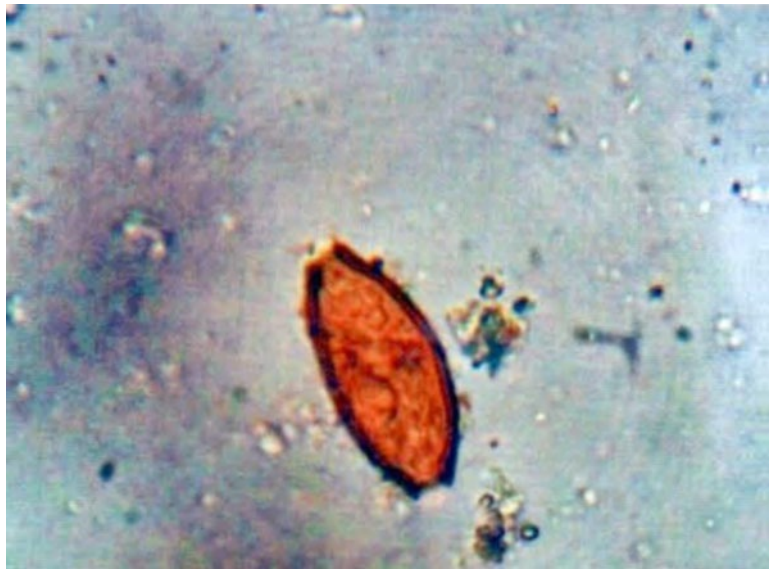

Develops into adult worms
Passed down to cecum
Man
Adult worms in large intestine
Liberated larva in small intestine
Larva liberated through one of the poles of egg in small intestine
Soil
Egg passed in feces
Development in soil 3–4 weeks
Ingested
Man acquires infection by consuming food and water contaminated with embryonated egg
Embryonated egg with infective rhabditiform larva

Sign and Symptoms

Infection with T. trichiura (trichuriasis, whipworm infection, or trichocephalosis) is asymptomatic, except when the worm load is heavy. Disease may result due to mechanical effects or allergic reaction, such as it can cause gastrointestinal problems (abdominal pain, diarrhea).

Laboratory diagnosis

Microscopic identification of whipworm eggs in feces is evidence of infection.



Treatment

Oral albendazole or oral mebendazole

Trichinella spiralis

Introduction

- Trichinella spiralis, tissue nematode, is the causative agent of trichinosis.
- The name Trichinella is derived from the minute size of
- the adult (Greek trichos-hair, ella suffix for diminutive, spiralis refers to the spirally coiled appearance of larvae in muscles).

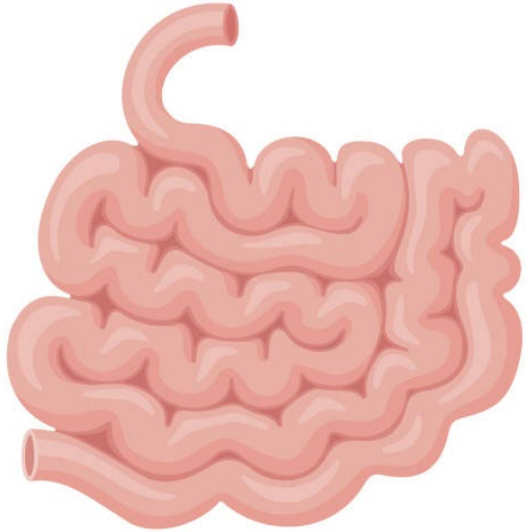
Distribution

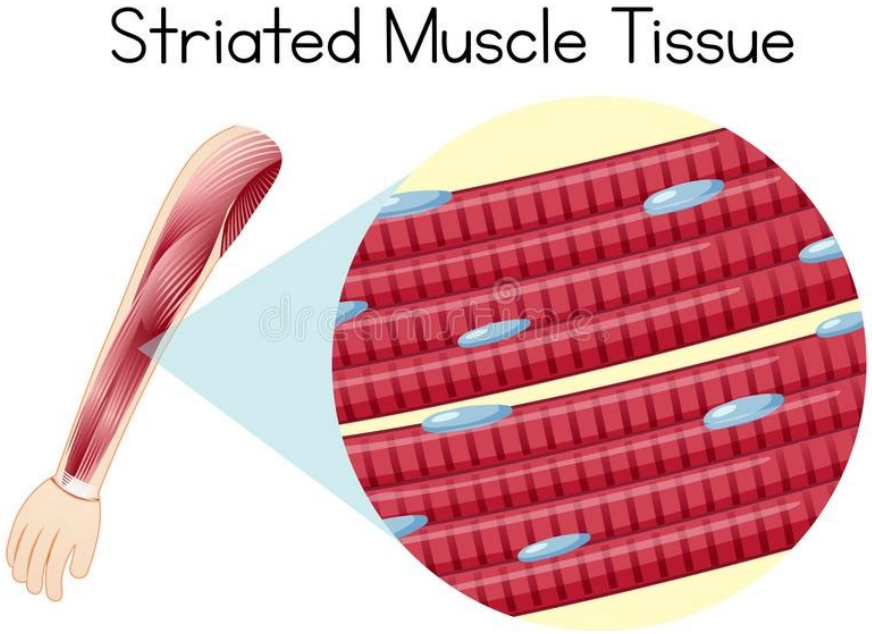
The major source of human infection was shown to be the consumption of inadequately cooked pork.

Trichinosis is recognized as an important public health problem in Europe and America, but is much less common in the tropics and oriental countries.

Habitat

- Adult worms live deeply buried in the *mucosa of small intestine (duodenum or jejunum)* of pig, bear, rat, or man.
- The encysted larvae are present in the ***striated muscles*** of these hosts. There are no free-living stages.

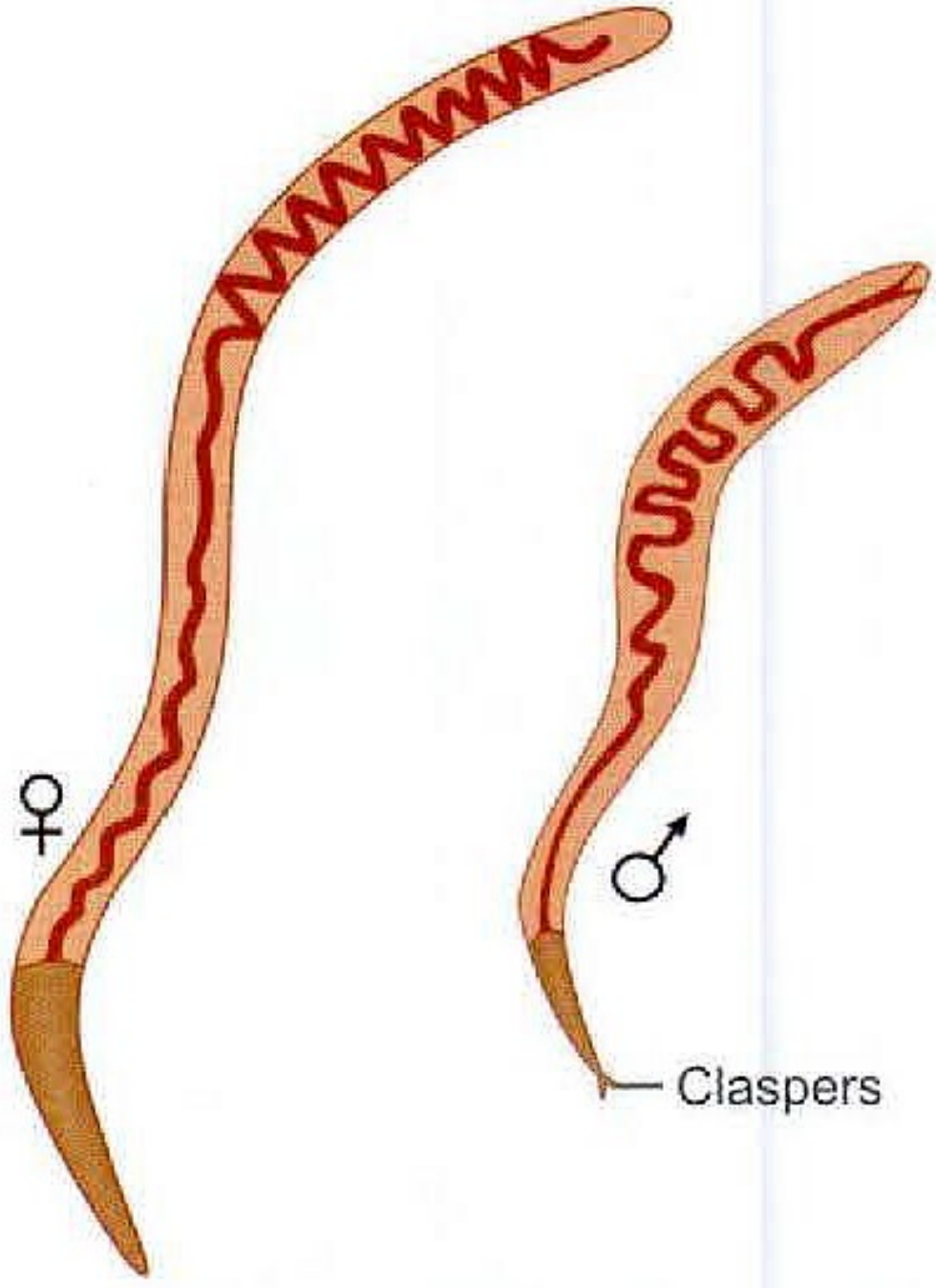




Morphology

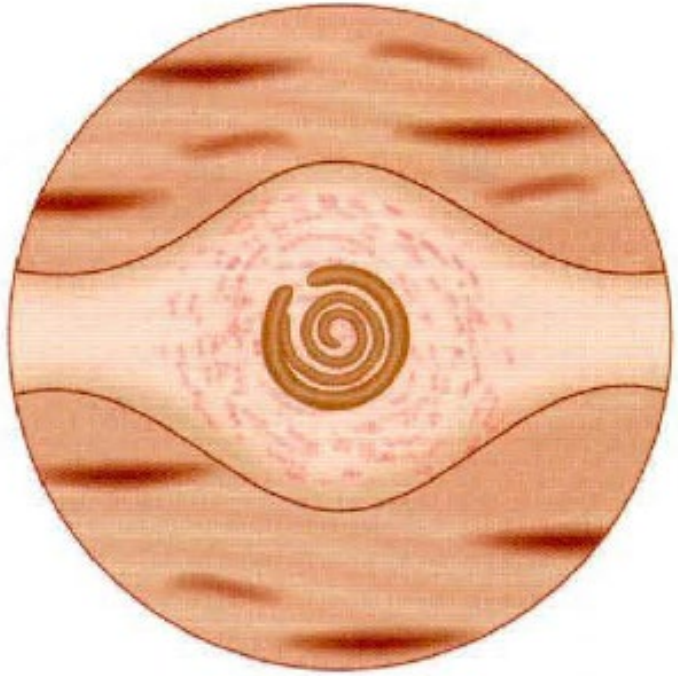
Adult Worm

- The adult T. spiralis, a small white worm just visible to the naked eye, is one of the smallest nematodes infecting humans.
- The male measures about 1.5 mm by 0.04 mm and the
- female about 3 mm by 0.06 mm (twice the length of male).
- The anterior half of the body is thin and pointed, well adapted for burrowing into the mucosal epithelium.
- The female worm is viviparous and discharges larva instead of eggs.


♀
♂
Claspers

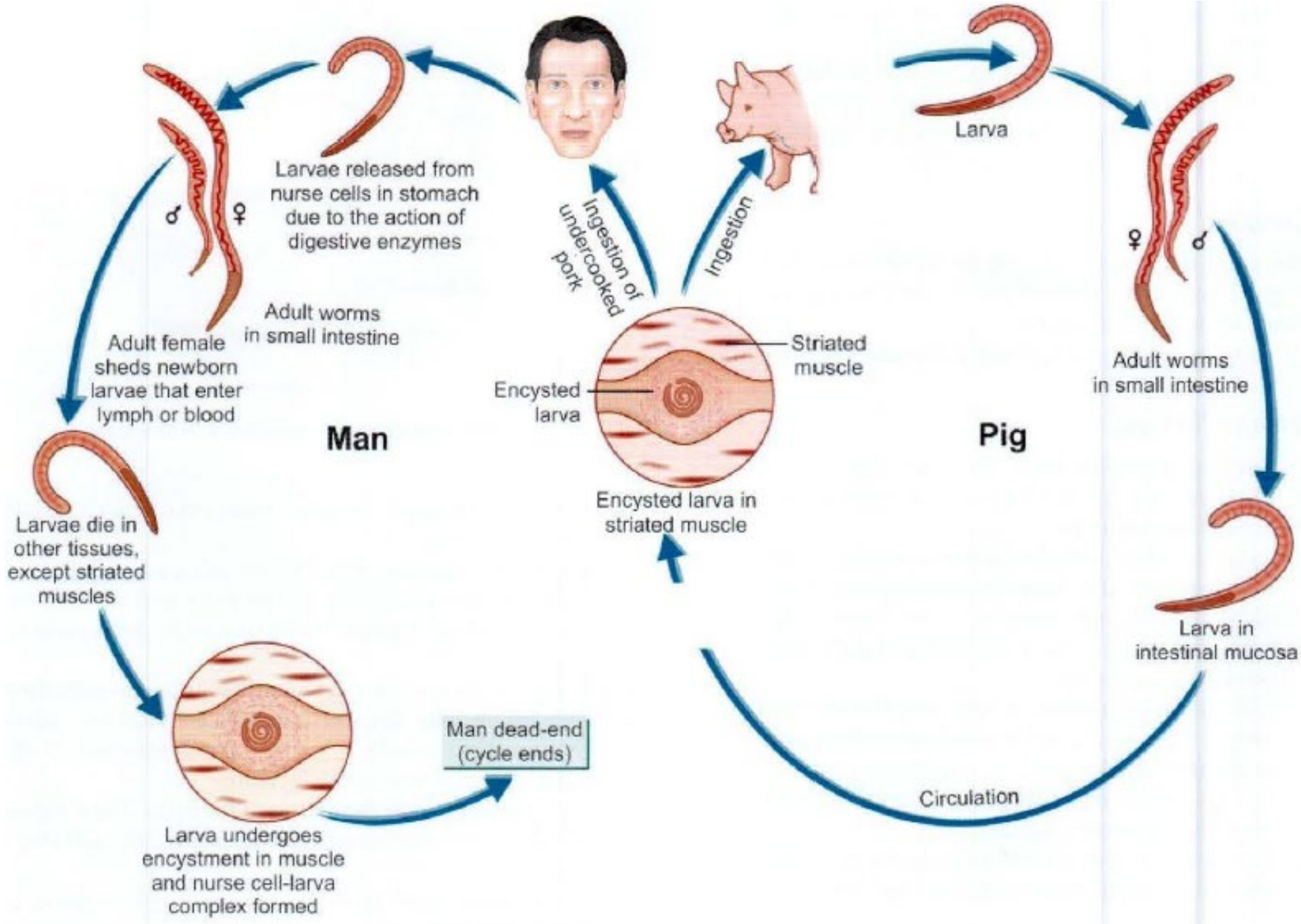
Morphology

- The larva becomes encysted in the striated muscle fiber and at the time of encystment measures 1 mm in length by 36 µm in diameter.
- The larva in the cyst is coiled and hence, the name spiralis.



Life cycle

- Infection: Humans acquire infection by eating undercooked meat (commonly pork) containing encysted larvae.
- Larval release: In the small intestine, cysts are digested, and larvae are released.
- Adults: Larvae mature into adults in the intestinal mucosa, where females produce new larvae.
  Migration: Newly born larvae enter the bloodstream and spread to striated muscles.
- Encystment: They coil inside muscle fibers, forming cysts that can remain infective for years.
- Cycle continues when another host eats the infected meat.


Larvae released from nurse cells in stomach due to the action of digestive enzymes
♂
♀
Adult worms in small intestine
Adult female sheds newborn larvae that enter lymph or blood
Ingestion of undercooked pork
Ingestion
Striated muscle
Encysted larva
Encysted larva in striated muscle
Man
Pig
Larva
Adult worms in small intestine
Larvae die in other tissues, except striated muscles
Larva undergoes encystment in muscle and nurse cell-larva complex formed
Man dead-end (cycle ends)
Larva in intestinal mucosa
Circulation

Signs and symptoms

- **Intestinal phase:** diarrhea, abdominal pain, fever.
- **Muscle phase:** muscle pain, swelling around the eyes, headache, and fever.
- **Severe cases:** breathing/swallowing difficulty, heart or nervous system problems.

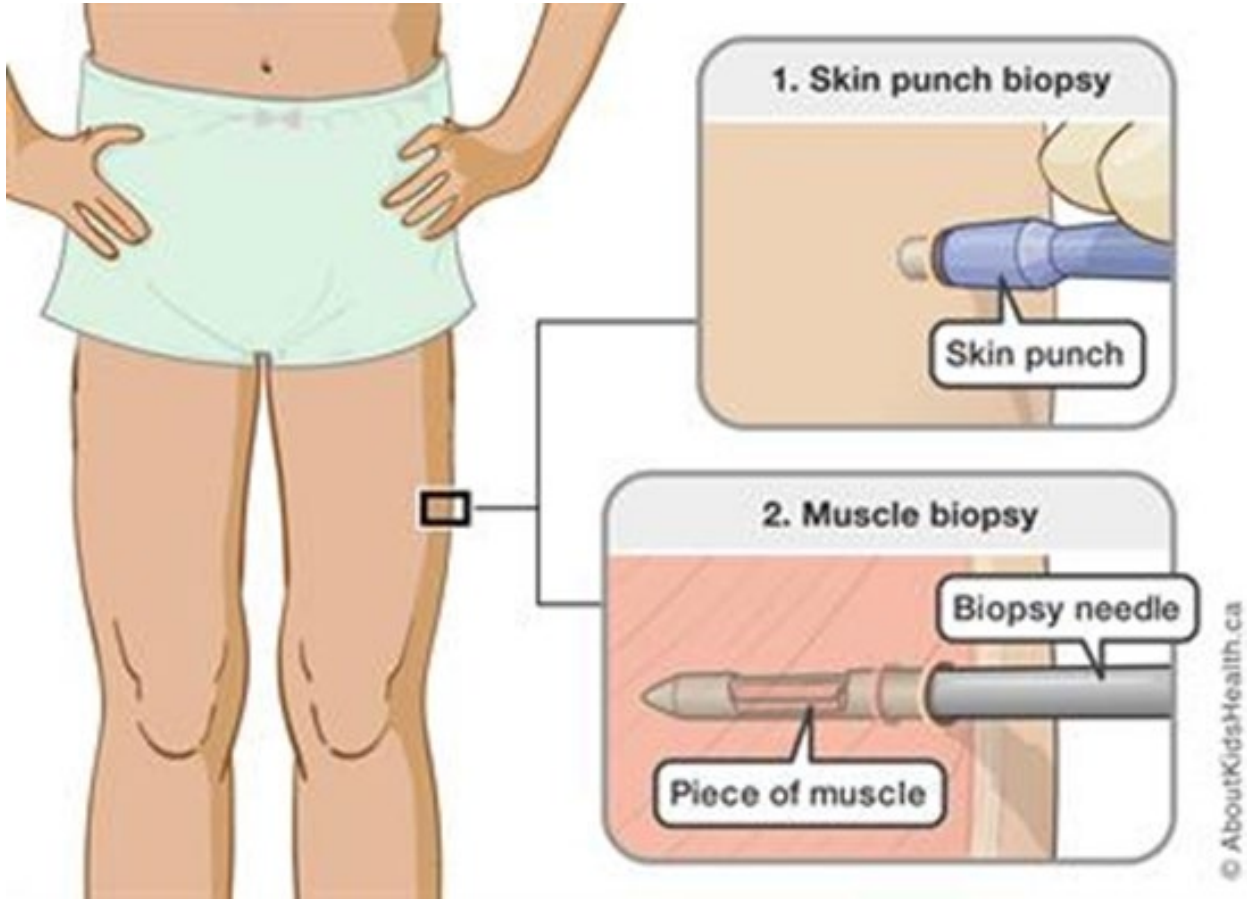
Diagnosis

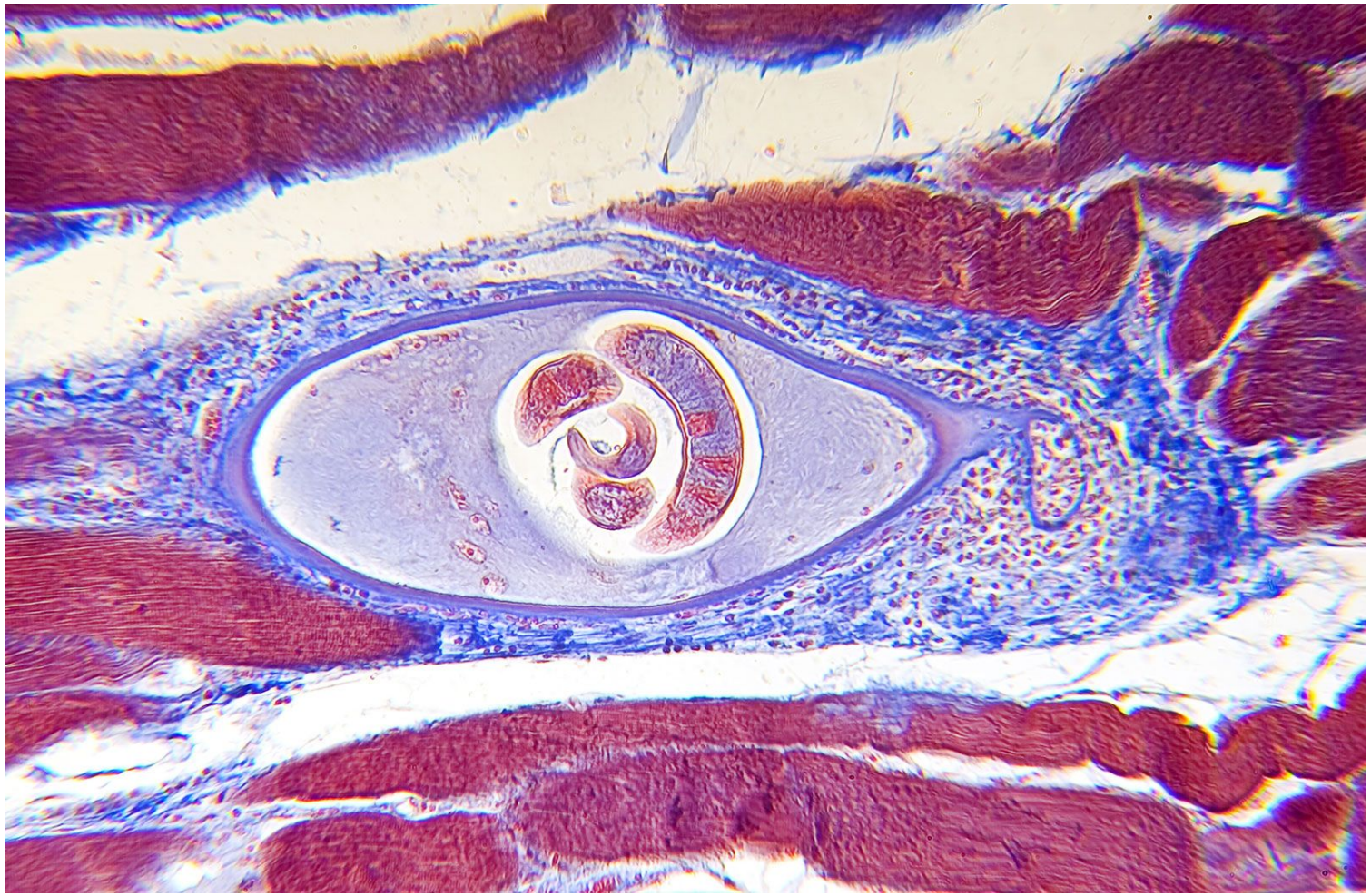
Direct methods

- Detection of spiral larvae in muscle tissue by performing **muscle biopsy.** Deltoid, biceps, gastrocnemius, or pectoralis muscles are usually selected for biopsy**.**
- Detection of adult worms and larvae in the stool during the diarrheic stage.
- **Xenodiagnosis:** For xenodiagnosis, biopsy bits are fed to laboratory rats, which are killed in a month or so, later. The larvae can be demonstrated more easily in the muscles of such infected rats.

Indirect Methods

- **Blood examination:** It shows eosinophilia (20-95%).
- **Serology:** Elevated serum immunoglobulin E (IgE). *T. spiralis* antibody can be detected by enzyme-linked immunosorbent assay (ELISA) test using TSL-1 secreting antigens obtained from the infective stage Larvae


1. Skin punch biopsy
Skin punch
2. Muscle biopsy
Biopsy needle
Piece of muscle
© AboutKidsHealth.ca



Treatment

- **Mild cases:** Supportive treatment consisting of bedrest, analgesics, and antipyretics.
- **Moderate cases:** Albendazole 400 mg BID for 8 days or mebendazole 200-400 mg TID for 3 days, then 400 mg TID for 8 days.
- **Severe cases:** Add glucocorticoids like prednisolone to albendazole or mebendazole

References

- Paniker, C. K. J. & Ghosh, S. 2021. *Paniker's textbook of medical parasitology,* New Delhi, Jaypee Brothers Medical Publishers.
- https://www.cdc.gov/pinworm/hcp/clinical-overview/index.html