

General Microbiology Lab
Class Nematoda
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Nematodes of medical importance

Intestinal

Tissue & Blood

Small intestine

□ With tissue stage:

- *Ascaris lumbricoides*
- *Ancylostoma duodenale*
- *Necator americanus*
- *Strongyloides stercoralis*
- *Trichinella spiralis*

Large int.

• Without tissue stage:

- *Enterobius vermicularis*
- *Trichuris trichiura*

- *Wuchereria bancrofti*
- *Brugia malayi*
- *Loa loa*
- *Onchocerca volvulus*
- *Dracunculus medinensis*
- *Trichinella spiralis*

Nematodes of medical importance

Intestinal

Tissue & Blood

Small intestine

□ With tissue stage:

- Egg
- Larva (penetration)
- Larva (penetration)
- Larva (penetration)

• Without tissue stage:

- Egg
- Egg

Large int.

- Filariform Larav
- Filariform Larav
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- Filariform Larav
- Filariform Larav

Ascaris lumbricoides

- **Location of adult:** Small intestine of man
- **Infective stage:** Embryonated egg
- **Mode of transmission:** Ingestion of food (green vegetables) contaminated with embryonated egg
- **Diagnosis:** Eggs in stool
- **Disease:** Ascariasis

Laboratory Diagnosis-A. lumbricoides

Macroscopic

- Direct detection of worm/s in stool or vomit.
- Adults- males are 15 to 30 cm long, with strongly curved tails; females are 20 to 35 cm long, with straight tails.



Microscopic

- Direct examination of feces: bile stained eggs. (eggs may not be seen at least 40 days after infection).
- The egg has an outer shell membrane which is heavily mamillated.



Blood examination– eosinophilia.

Ascaris lumbricoides



Posterior end of male: curved with 2 spicules.



Egg: rounded with coarsely mammillated wall .

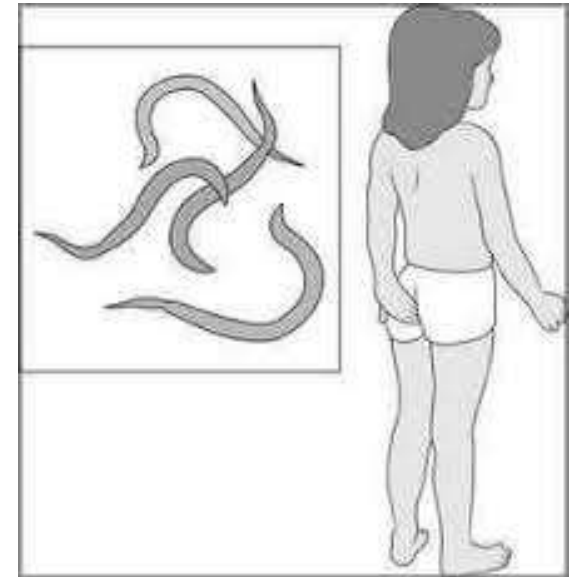
Other modes of diagnosis-A. lumbricoides

- **Imaging** – large collections of worms in abdomen
- **Serology (Ab detection)** – mainly reserved for epidemiological studies.



Enterobius vermicularis (pin worm)

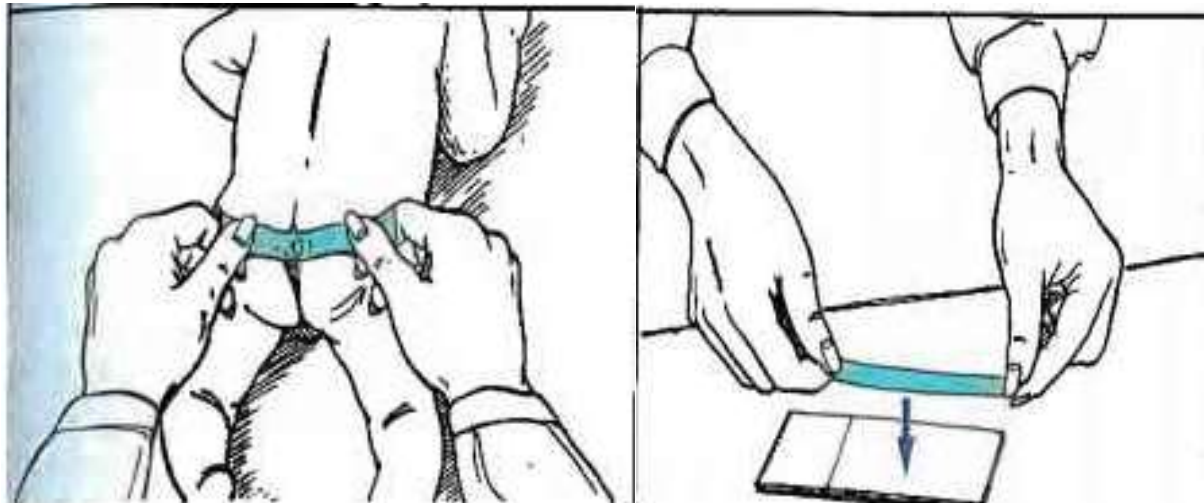
- **Location of adult:** Large intestine of man
- **Infective stage:** Embryonated egg
- **Mode of transmission:** Ingestion of food contaminated with embryonated egg or autoinfection via nails scratching the perianal region
- **Disease:** Enterobiasis



Enterobius vermicularis (pin worm)

Diagnosis

- Recovery and identification of eggs or adults from the perianal region utilizing the cellophane tape preparation.
- Specimens must be collected the first thing in the morning upon waking, especially before bathing or bowel movements.
- Eggs are rarely found in fecal samples because release is usually external to the intestines.



Laboratory Diagnosis- *Enterobius vermicularis* (Pin Worm)

Female
(10mm)
Posterior
end is
straight
with long
pointed
tail (4X)



Male
(5mm):
Posterior
end is
curved
with one
spicule



Egg:
Planoconvex or
D-shaped egg.
embryonated
(contain a larva).

Trichuris trichiura (whip worm)

Laboratory Diagnosis:-

- Finding the characteristic eggs in the faeces



Adult female: 5 cm long, larger than male. Posterior end is straight and blunt (resembles a whip) .



Adult male: 4 cm long. Posterior end is curved and provided with 2 spicules.



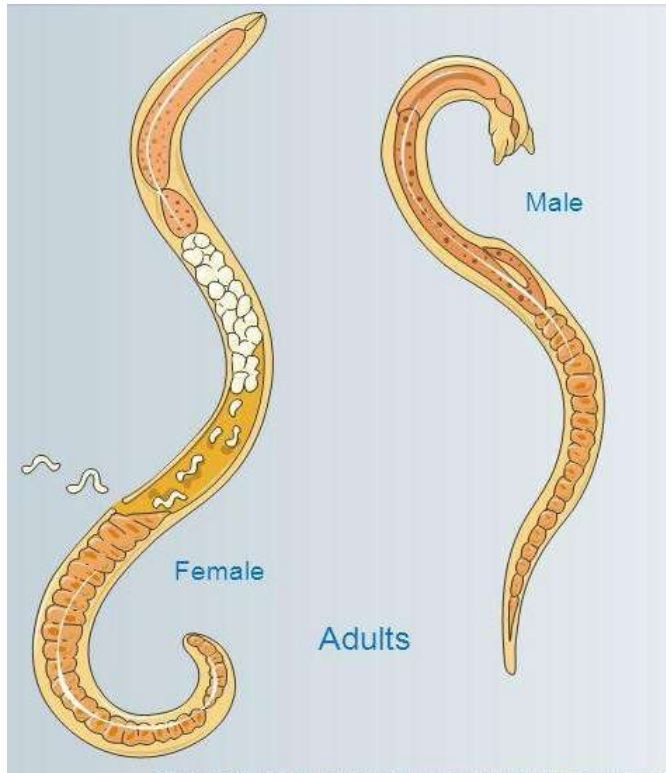
Egg: 60 μ m, bile stained . Barrel-shaped with Mucus plug at each pole

Trichinella spiralis

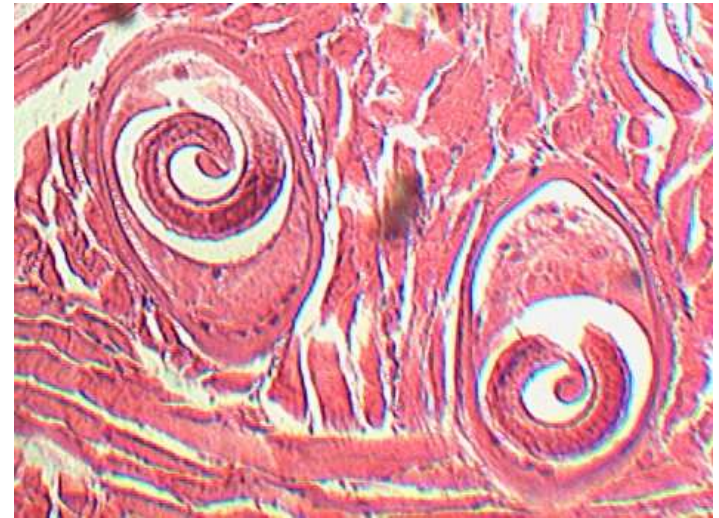
- **Location of adult:** Small intestine of man
- **Location of larvae:** Encysted in striated muscles
- **Infective stage:** Encysted larvae in striated muscles
- **Mode of transmission:** Ingestion of undercooked meat containing encysted larvae
- **Diagnosis:** Muscle biopsy to identify larvae in striated muscles
- **Disease:** Trichinosis

Laboratory Diagnosis-*Trichinella spiralis*

1. Muscle biopsy – encysted larva
2. Blood – eosinophilia between 2nd & 4th week
3. Serology – to detect specific Abs



- Male: up to 1.5mm
- Female: up to 4 mm, viviparous



Encysted larva in muscle:
lies along the muscle fibers
Shape: Usually seen coiled
inside a lemon shaped
cyst.

Strongyloides stercoralis (The dwarf thread worm)

Laboratory Diagnosis

- Eggs hatch in the intestine (not usually passed in stool specimens).
- Finding the larvae in faeces or in duodenal aspirates using direct or concentration method.
- In hyper-infection syndrome the larva may be found in sputum and in other specimens.

Strongyloides stercoralis (The dwarf thread worm)

Adult worms:

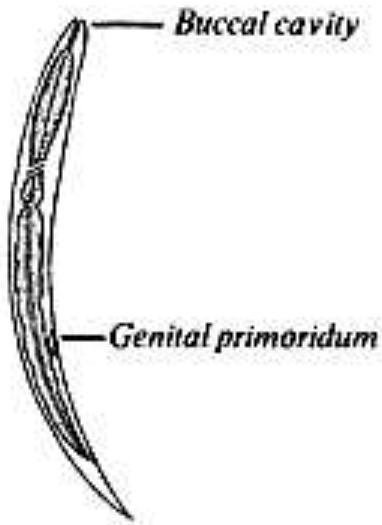
2 - 2.5mm, ovoviviparous, eggs laid in the tissues.

Egg:

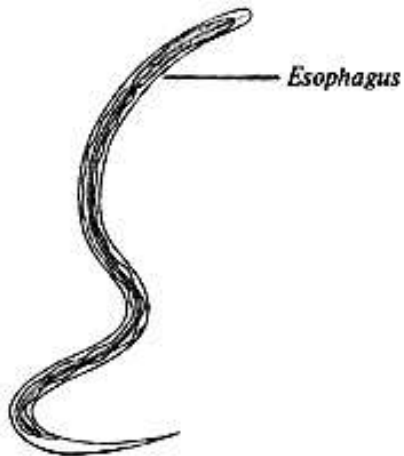
oval, clear, thin shelled similar to hookworms but smaller



Necator americanus - The New World hookworm
Ancylostoma duodenale - The Old World hookworm



Hookworm rhabditiform



Hookworm filariform larva

Morphology:

- **Rhabditiform larvae:** long buccal cavity.
- **Filariform larvae:** lose oral structures & have sharp pointed tails.
- **Adults** - males: 7 to 11 mm long, females: 8 to 15 mm long.

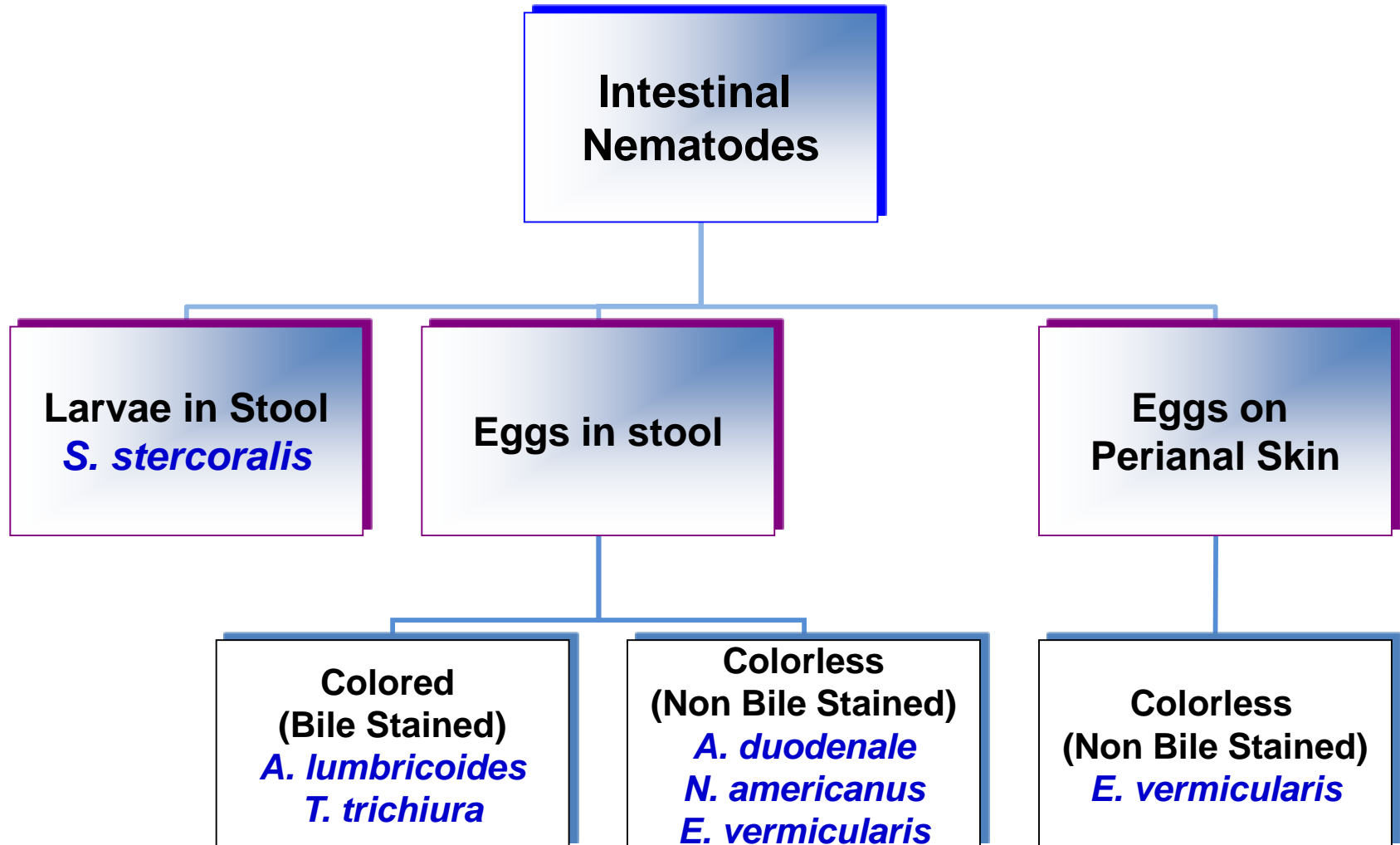
***Necator americanus* - The New World hookworm**
***Ancylostoma duodenale* - The Old World hookworm**

Egg:-

- **Size** : 65-40 μ m.
- **Shape**: oval.
- **Shell**: very thin and appears as black line.

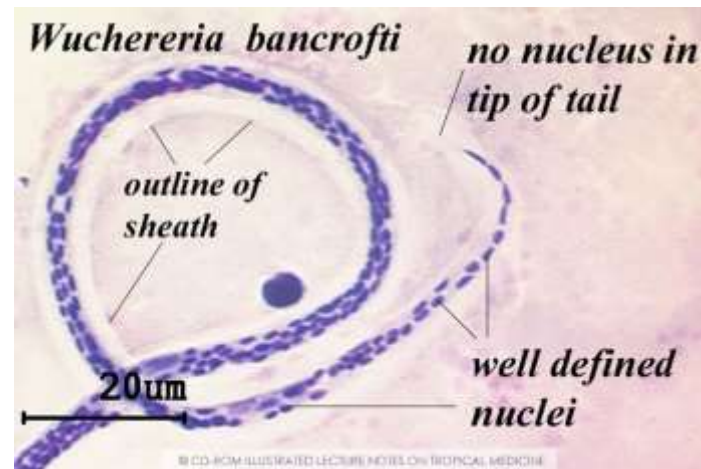


Key to the diagnosis of Intestinal Nematodes



The Filarial Worms-*Wuchereria bancrofti*

- **Diagnosis** - Detection and identification of microfilaria in stained blood smears. Exhibits a marked circadian migration, best seen at night after 10 P.M.
- **Morphology** - Microfilariae are sheathed, and the nuclear column does not extend to tip of tail.
- **Serological diagnosis.**



Wuchereria bancrofti microfilaria in blood smear

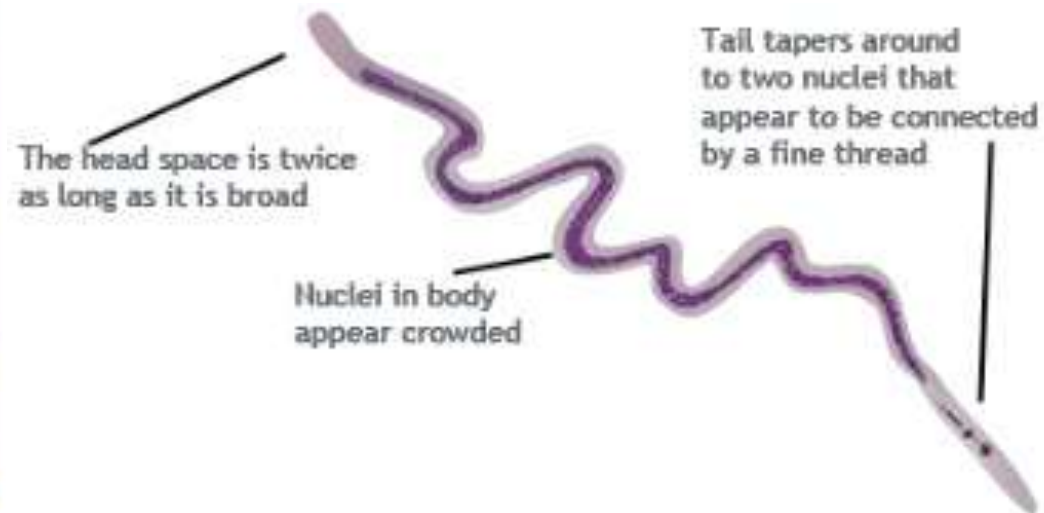
Tissue Nematodes

Brugia malayi

Morphology

- Adults :- Male: 13-23mm.
- Female: 43-55 mm.
- Microfilariae :- Size: 200-275 μ m by 5-6 μ m
 - Body nuclei are dense and stain darkly.
 - The tail is tapered, with a significant gap between the terminal and subterminal nuclei.

Diagnosis - Detection and identification of microfilaria in stained blood smears.



Tissue Nematodes

Loa Loa (Eye worm)

Morphology

- **Adults:-** Cylindrical and transparent
- **Male:** 30-34mm
- **Female:** 60mm
- **Microfilariae:**
 - Size: 250-300 μ m long and 8-10 μ m thick.
 - Body nuclei are not distinct and appear more dense than those of *W.bancrofti*
 - Nuclei extend to the end of the tail which is rounded.

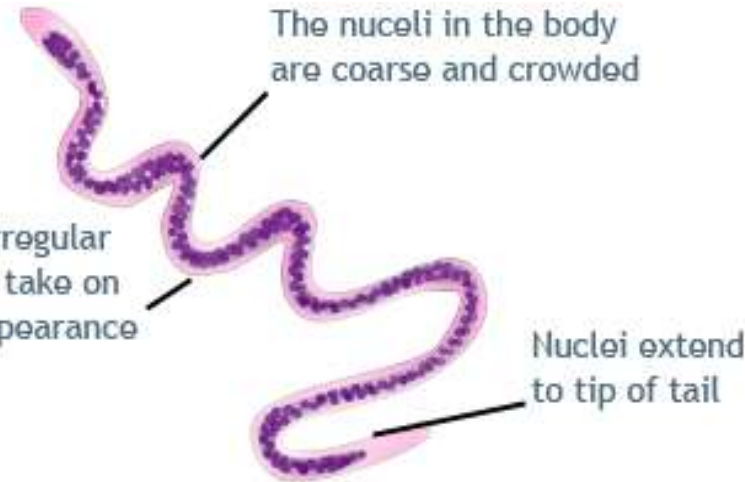


Sheath stains lightly or not at all

The body has irregular curves and can take on a corkscrew appearance

The nuclei in the body are coarse and crowded

Nuclei extend to tip of tail



Microfilariae of tissue nematodes

**Wucheria
bancrofti**



**Brugia
malayi**



Loa loa



Onchocerca volvulus

Morphology:

- **Adults:**
 - Male: 25-40mm, curved and bulbous tail.
 - Female; 33-55cm in length.
- **Microfilariae:-Size 240-360 μ m long and 5-9 μ m thick**
 - Has no sheath and head end is slightly enlarged.
 - Found only in skin, not in the blood stream.



Diagnosis

- microfilariae are found in skin scrapings from around nodules.

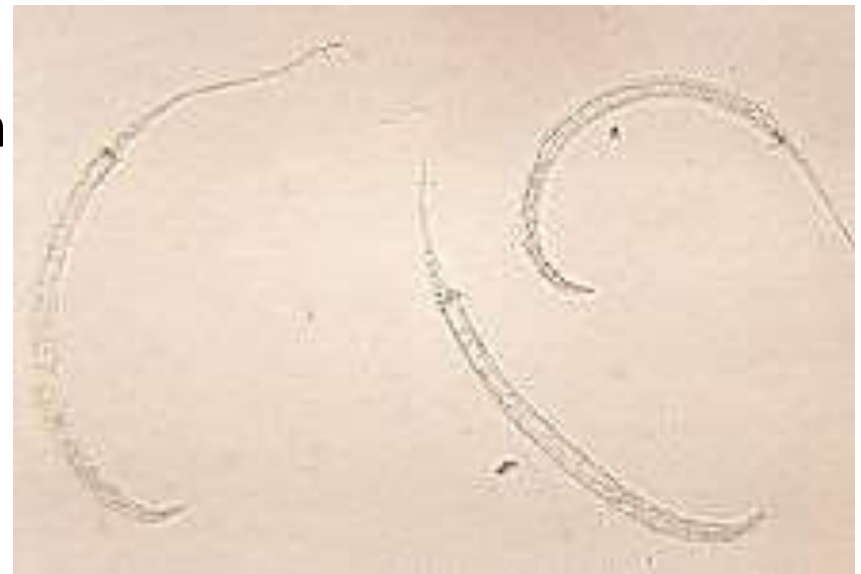
Dracunculus Medinensis (Guinea or Medina worm)

Morphology

- **Adults:** White with smooth surface
- **Male:** 12-29mm , coiled posterior end.
- **Female :**
 - 70-120 cm (average 100 cm)
 - The longest nematode of man
 - Viviparous

Larva: Size:500-700 μm

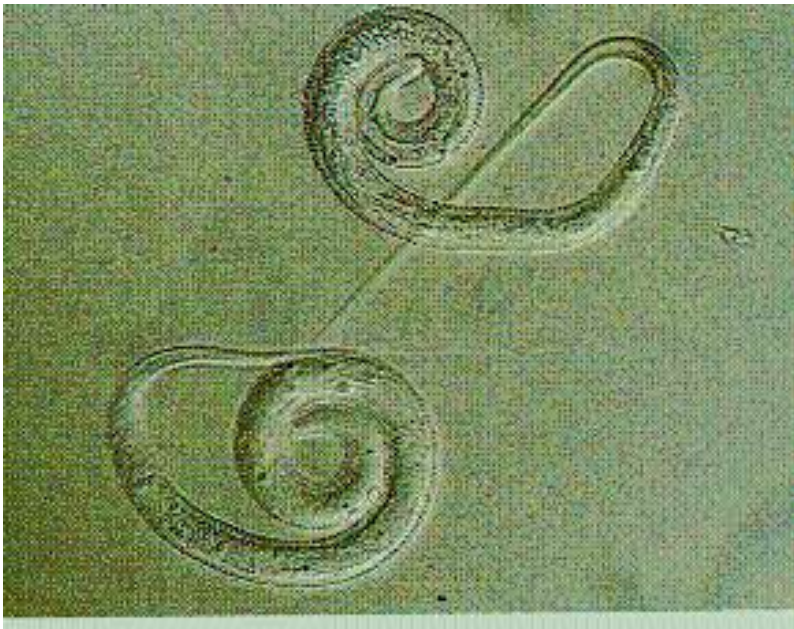
- Rounded anterior end
- Long and pointed tail
- Has Rhabditiform Oesophagus



Dracunculus Medinensis (Guinea or Medina worm)

Diagnosis -

- Visual observation of skin blister. The worm's serpentine presence beneath skin can be seen.
- Induce release of larvae from the skin ulcer by applying cold water.



Nematodes



Ascaris



Hookworms



Trichuris



Enterobius



Strongyloides



Trichinella spiralis