

**General Microbiology Lab**  
**Class Nematoda**  
**2020-2021**

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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*

### • Without tissue stage:

- *Enterobius vermicularis*
- *Trichuris trichiura*

Large int.

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

### □ Larva migrans:

- *Ancylostoma spp.*
- *Toxocara spp.*

# Nematodes of medical importance

## Intestinal

## Tissue & Blood

Small intestine

### □ With tissue stage:

- Egg
- Larva (penetration)
- Larva (penetration)
- Larva (penetration)
- *Cyst*

### • Without tissue stage:

- Egg
- Egg

Large int.

- Filariform Larav
- Filariform Larav
- Filariform Larav
- Filariform Larav
- Filariform Larav
- *Trichinella spiralis*

### □ Larva migrans:

- *Ancylostoma spp.*
- *Toxocara spp.*

# *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*



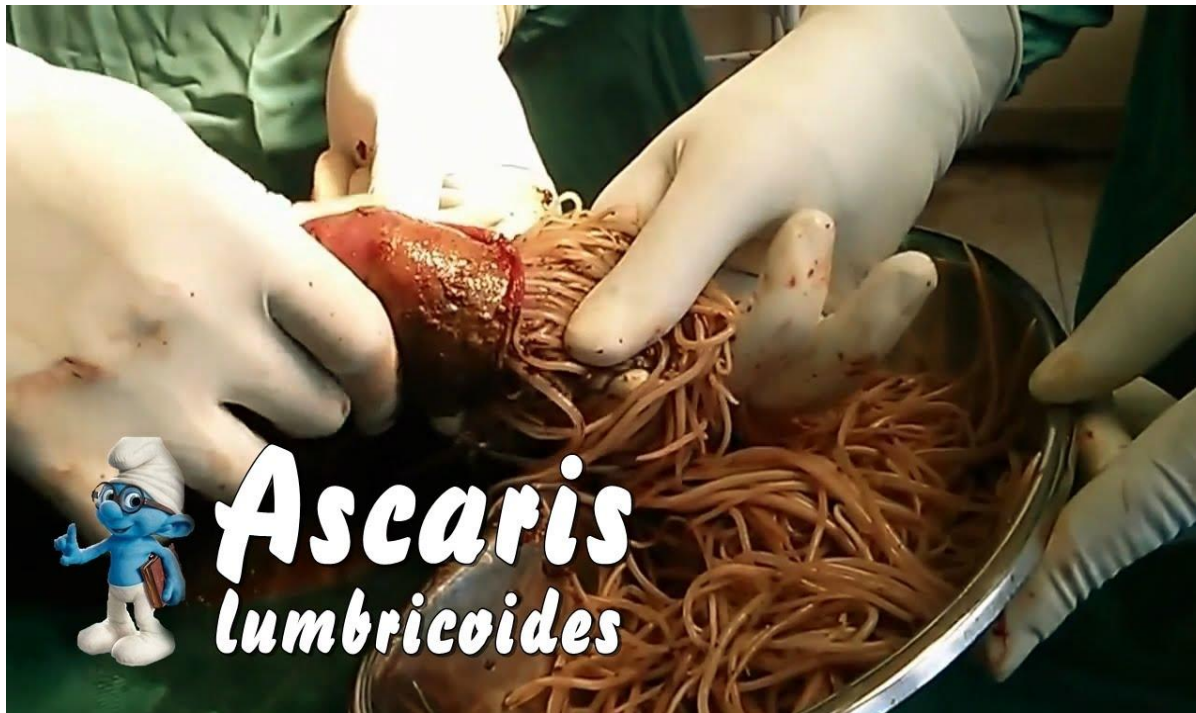
**Posterior end of male:** curved with 2 spicules.



**Egg:** rounded with coarsely mammillated wall .

# Other modes of diagnosis-A. lumbricoides

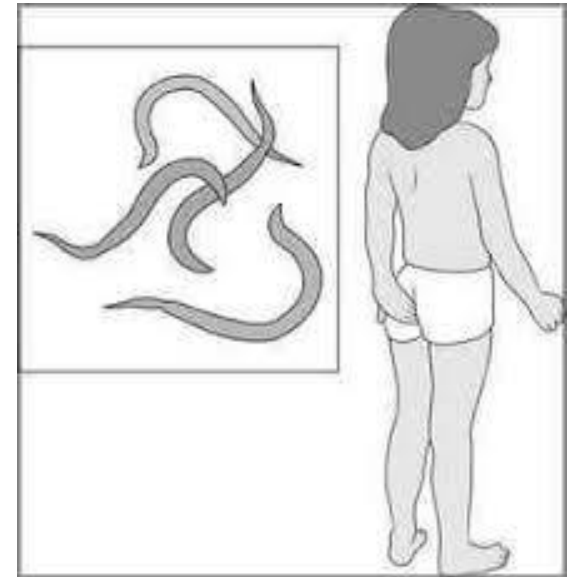
- **Imaging** – large collections of worms in abdomen
- **Serology (Ab detection)** – mainly reserved for epidemiological studies.





# *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

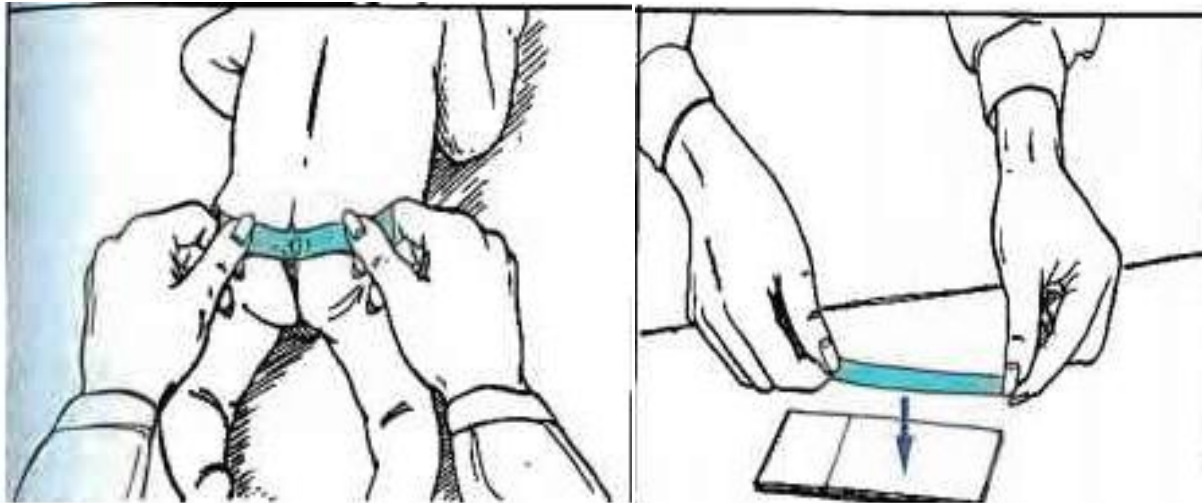




# *Enterobius vermicularis* (pin worm)

## 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  $\mu\text{m}$ , bile stained . Barrel-shaped with Mucus plug at each pole

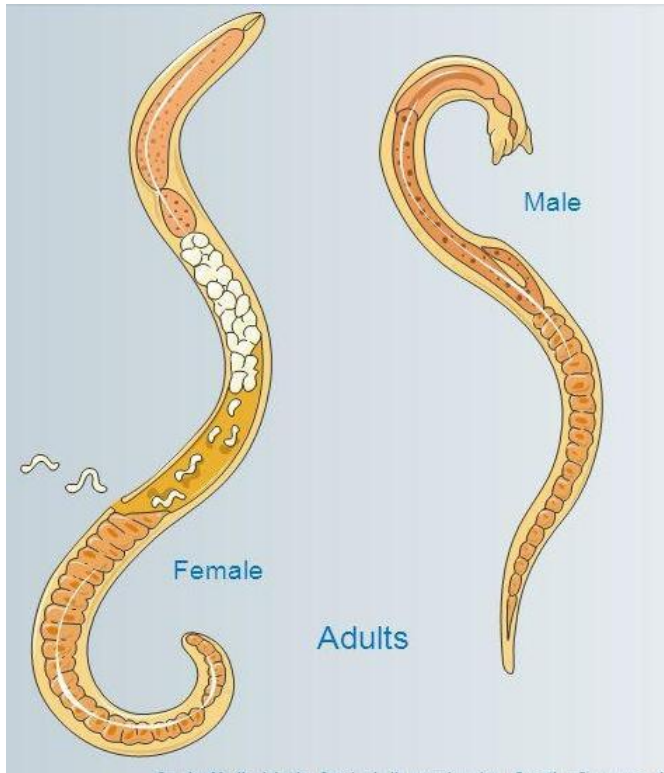
# *Trichinella spiralis*

- **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

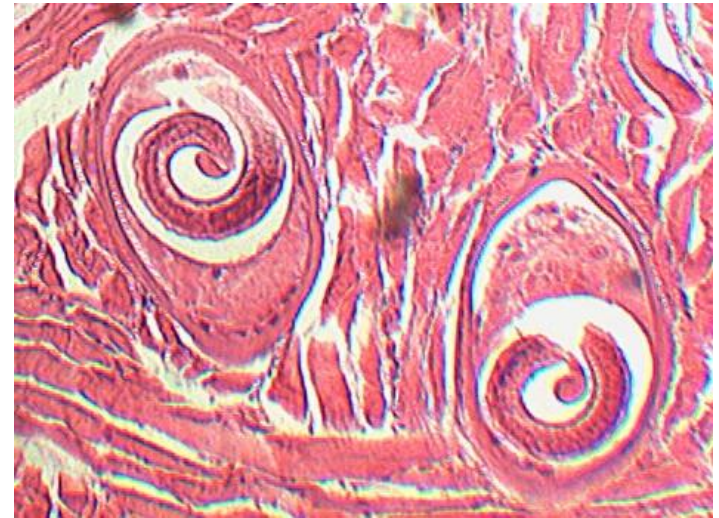


# Laboratory Diagnosis-*Trichinella spiralis*

1. Muscle biopsy – encysted larva
2. Blood – eosinophilia between 2<sup>nd</sup> & 4<sup>th</sup> 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.

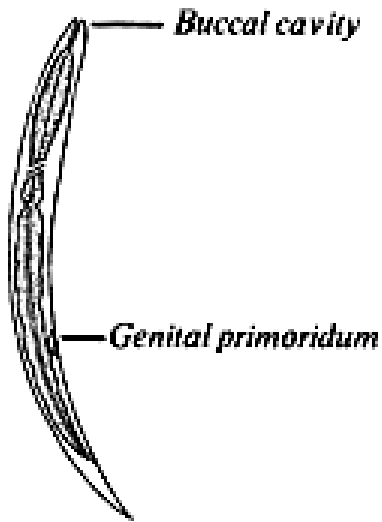
## Egg:

oval, clear, thin shelled similar to hookworms but smaller

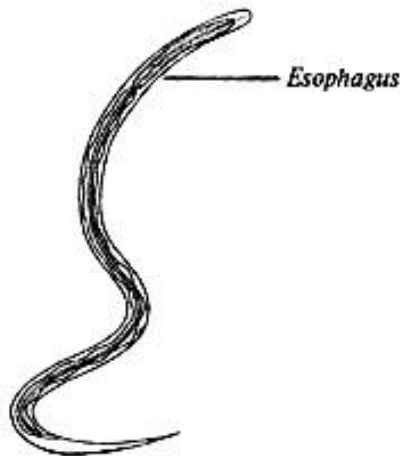




*Necator americanus* - The New World hookworm  
*Ancylostoma duodenale* - The Old World hookworm



*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.

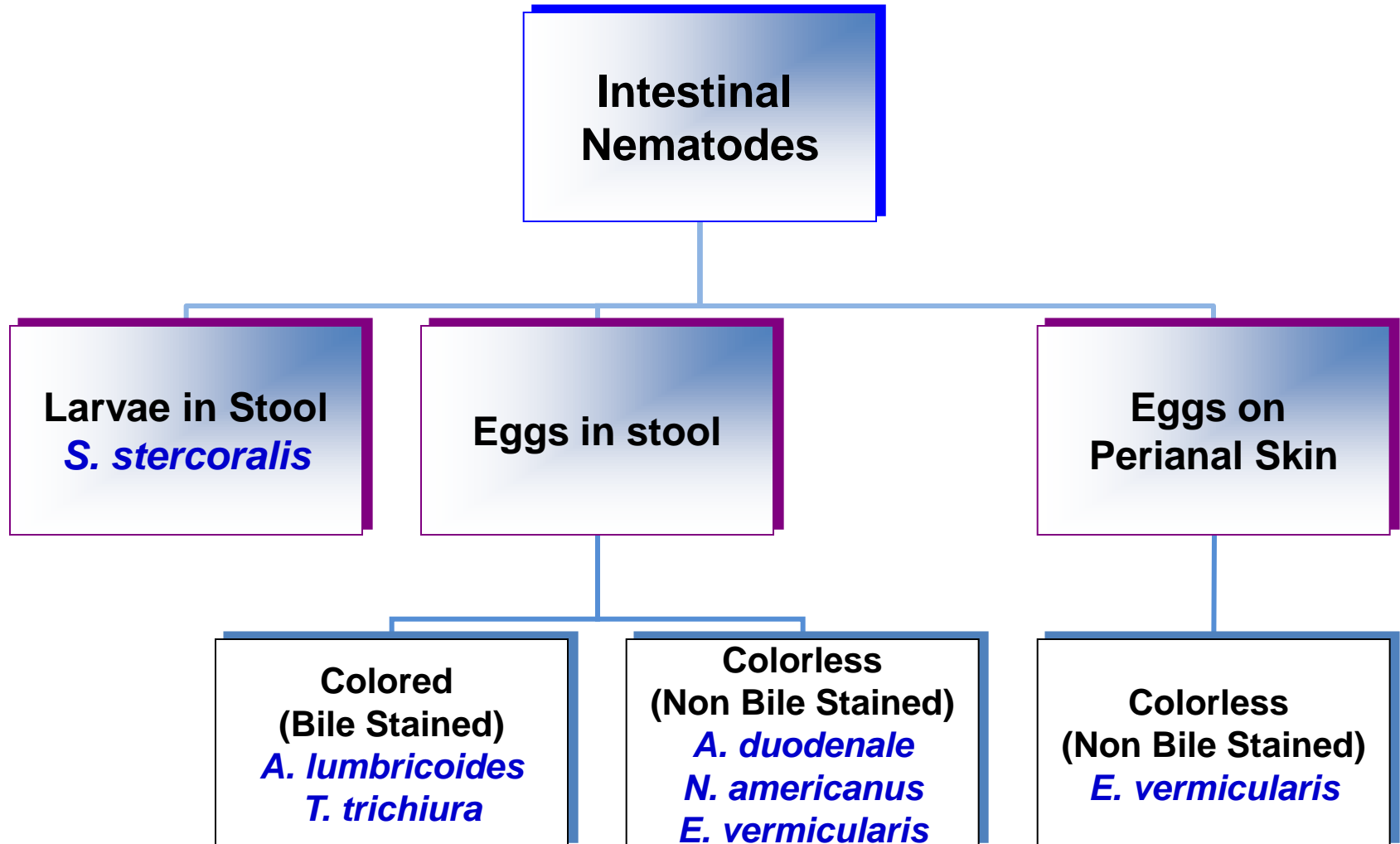
***Necator americanus* - The New World hookworm**  
***Ancylostoma duodenale* - The Old World hookworm**

**Egg:-**

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

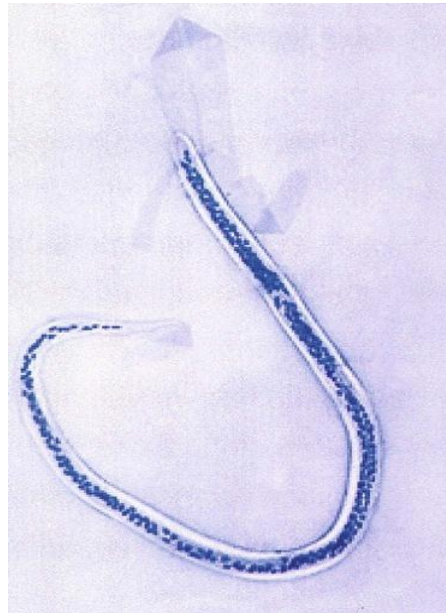
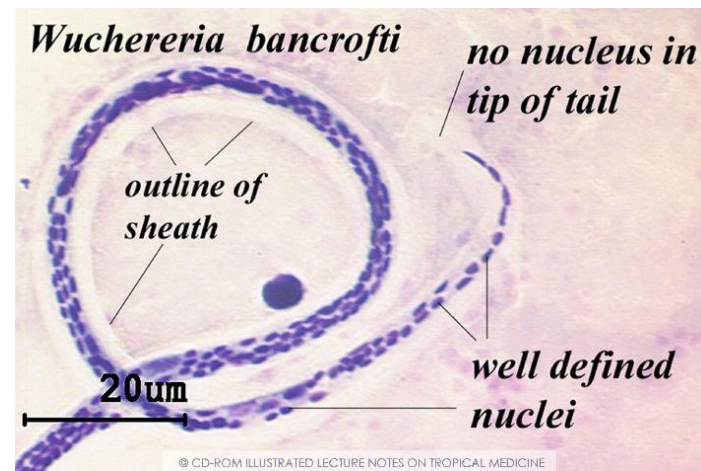


# Key to the diagnosis of Intestinal Nematodes



# 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

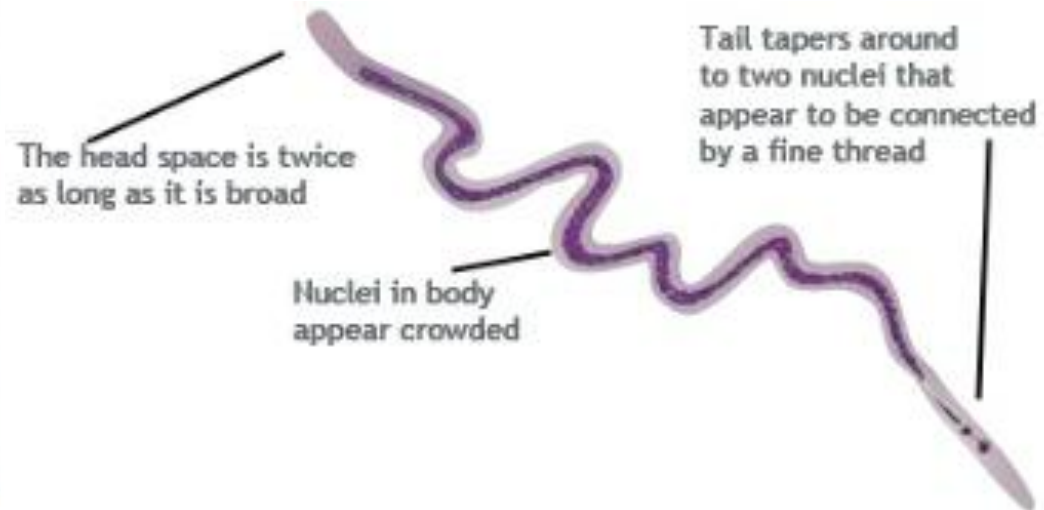
# Tissue Nematodes

## Brugia malayi

### Morphology

- Adults :- Male: 13-23mm.
- Female: 43-55 mm.
- Microfilariae :- Size: 200-275 $\mu$ m by 5-6 $\mu$ 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 $\mu$ m long and 8-10 $\mu$ 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.

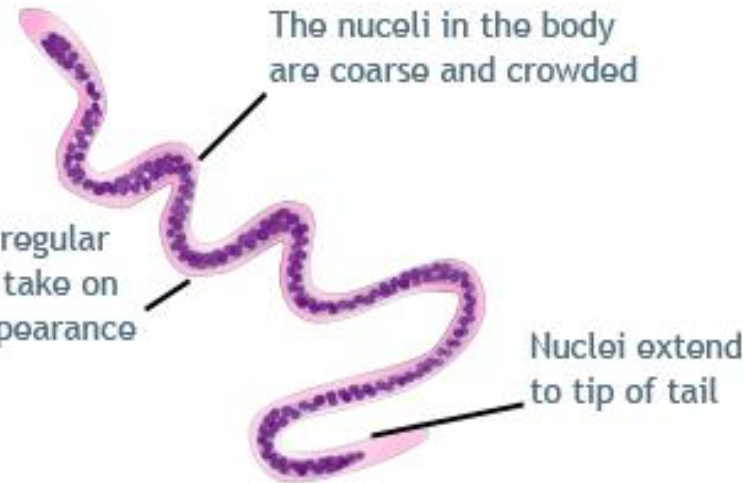


Sheath stains lightly or not at all

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 $\mu$ m long and 5-9 $\mu$ 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 $\mu\text{m}$

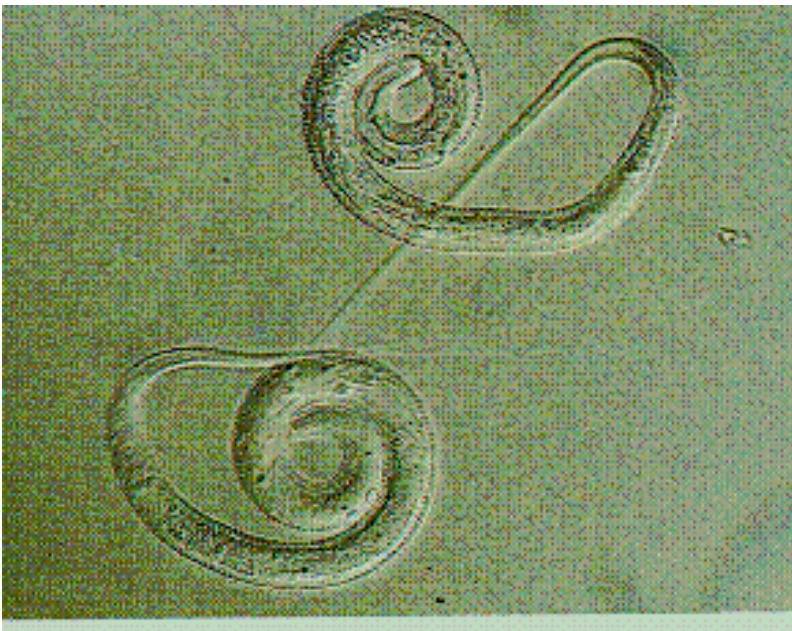
- Rounded anterior end
- Long and pointed tail
- Has Rhabditiform Oesophagus



# Dracunculus Medinensis (Guinea or Medina worm)

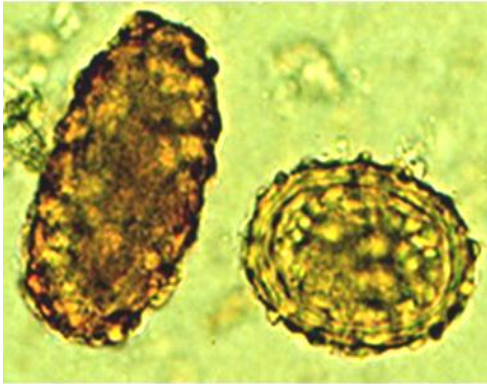
## Diagnosis -

- 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

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*Ascaris*



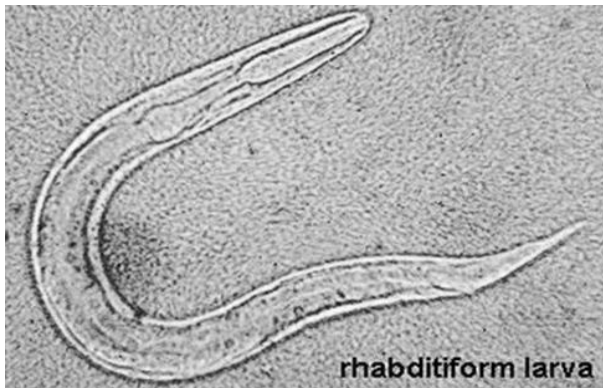
Hookworms



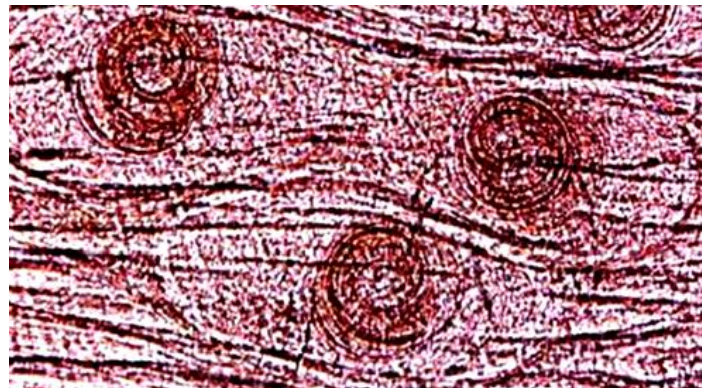
*Trichuris*



*Enterobius*



*Strongyloides*



*Trichinella spiralis*