

Nematode

General characters:

- 1- Unsegmented worms. They are elongate and cylindrical or filiform in appearance, both ends are pointed.
- 2- The sizes show a great variation.
- 3- The body is covered with a cuticle.
- 4- There is body cavity (pseudocoelomate) in which the various organs are located such as digestive, genital, excretory and nerve systems.
- 5- The alimentary canal is complete consisting of an oral cavity, mouth, oesophagus, intestine and anus. the oral cavity may have teeth or cutting plate.
- 6- All the nematodes of man are separate sexes.

Reproductive systems:

The male genital system: consist of a long tube which can be differentiated into testis, vas deferens, seminal vesicle and ejaculatory duct. The genital duct forms a common passage with intestine known as cloaca. Accessory copulatory organs such as spicule and gubernaculum, are also present.

The female genital system consist of a single or double tubes. Each part of the tube is differentiated into ovary, oviduct, seminal receptacle, uterus, vagina and vulva. The female genital pore opens either in the middle of the body or near the mouth.

Mode of infection of nematode parasite:

- 1- By ingestion of egg (embryonated or non embryonated) contaminating food or drink (*Enterobius vermicularis*)
- 2- By penetration of the skin *Ancylostoma deudendale*
- 3- By blood-sucking insects *Wuchereria bancrofti*
- 4- By inhalation of infected dust (*Enterobius vermicularis*)

Terms used in the nematodes

Cuticle: an outer hyaline, non-cellular layer forming the integument of nematodes

Cervical alae: wing-like expansion of the cuticula near mouth

Cervical papillae: protuberances of cuticula near oesophagus

Buccal capsule: when the oral **فتحة** aperture leads to a mouth cavity, it may contain teeth or cutting organs

Cloaca: a common passage in male nematodes where the rectum and the genital duct open

Filariform larva: the larva has long oesophagus and its posterior end not like **انتفاخ** bulb

Rhabditiform larva: the larva has short oesophagus and its posterior end like bulb

Gubernaculum: an elevation of the dorsal wall of coelca which guides the spicule during copulation

Spicule: represents the accessory copulatory organ it is rod عصا like

Copulatory bursa: an umbrella like expansion of cuticle surrounding the cloaca of the male nematode of some species. It is supported by fleshy rays comparable with the أشعة أو اضلاع ribs of umbrella.

Trichinella spiralis

Geographical distribution:

Common in Europe and united state, also reported from some parts of Africa, china and Syria. Natural human infection with this helminth has been reported in India.

Habitat:

The adult lives in the small intestine of human, pig, rats, bear, fox, dog, cat and white whale. The larval stages live in striated muscles of the above host.

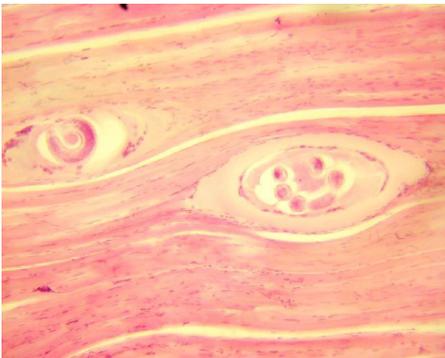
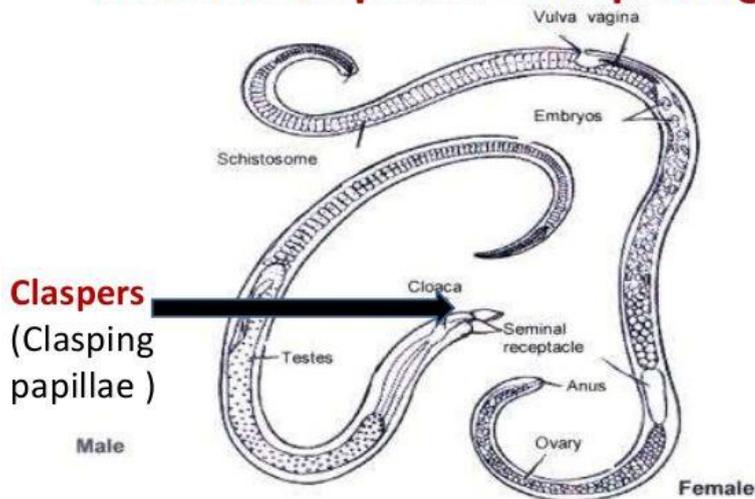
Morphology:

Adult worm it is one of the smallest nematodes infecting man. The male is shorter than female. The spicule and copulatory sheath are lacking, but at the tail end, there are two papillae on either side. The female is much longer than male . The female is discharge embryos instead of eggs.

Larvae; they remain encysted in striated muscle of the host. Inside the cyst the larva continues to develop up to the stage of sexes differentiated and when fully grown it becomes ten times its original size

Encapsulation of the larva begins about the 21st day and completed within 3 months. A غمد بيضوي بشكل حاد ليموني الشكل blunt ellipsoidal lemon shaped sheath develops as a result of host tissue reaction around the larva. the calcification occurs after 6 to 18 month.

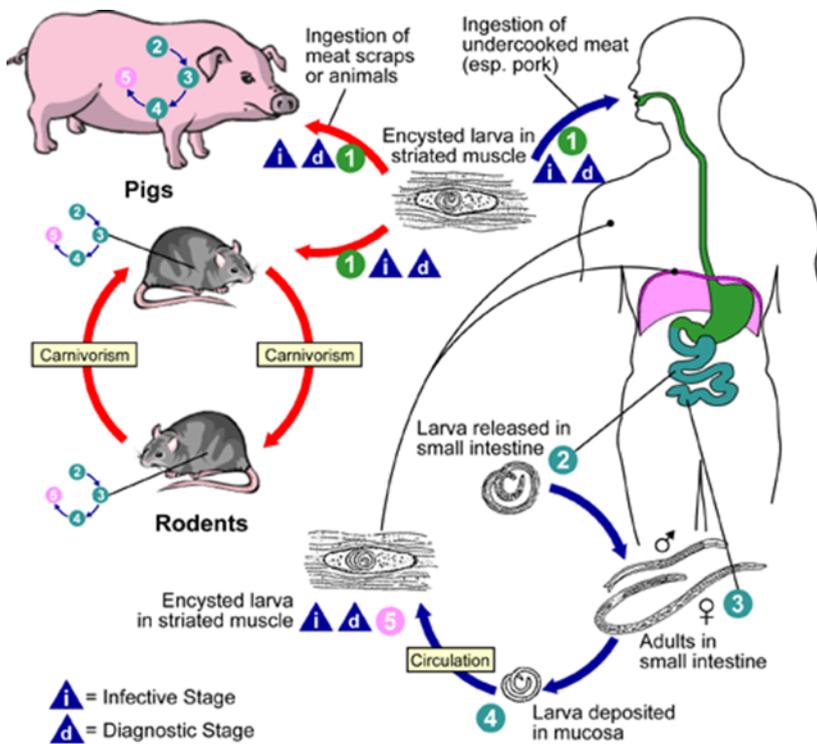
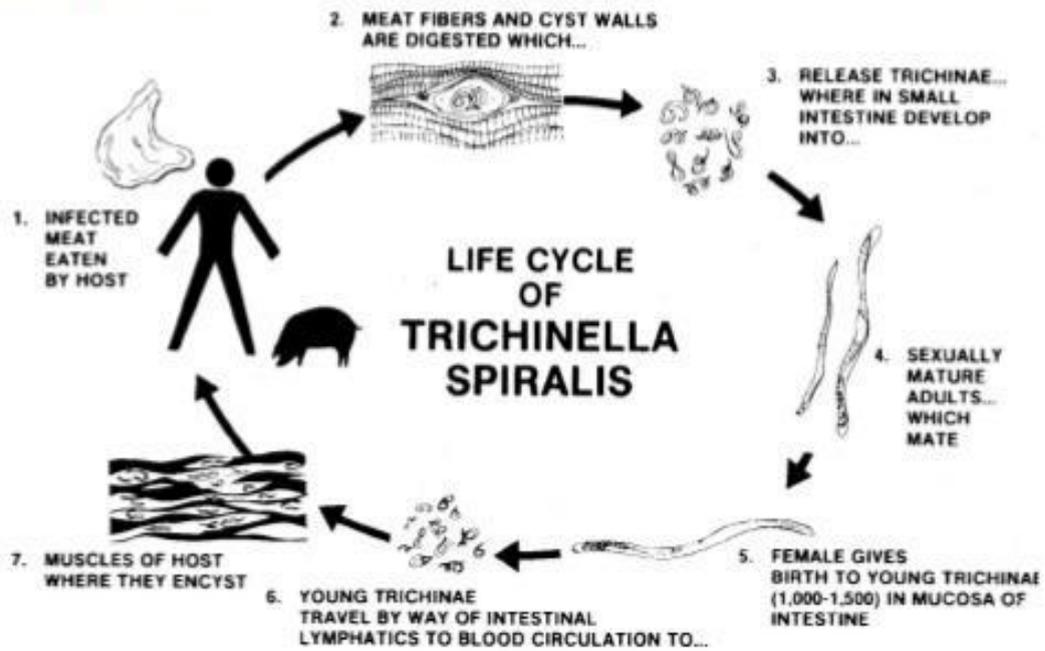
Trichinella spiralis- Morphology



Life cycle: the life cycle is passed in one animal (pig, rat or man) but transference of the host is required for the preservation of the species from extinction. The animal (big) serves both as definitive and intermediate host, two hosts are required to complete the life cycle. The parasite entrance into man is unable to complete its life cycle.

The adult worm lives for not more than 2-3 month and the males die after copulation. The female enters to mucosa and submucosa of intestine and released larva which penetrates the intestine and migrate with lymph and blood to the most part of the body especially the striated muscle which supplied with an abundance of blood. The larva immediately develops and roll up to form spiral shape larva and become infective. The blunt ellipsoidal lemon shaped sheath develops as a result of host tissue reaction around the larva. The infection occurs when the host eats uncooked meat contain this larva. (when this infection occurs in man it is unable to complete, but when it occurs in pig or rat it able to complete by eat the scrap بقايا of animals or uncooked meat).

Life Cycle



Pathogenicity:

The symptoms are include:

- 1- Stage of intestine invasion (incubation): this is the period (5-7 days) during the larva grow to adult. The symptoms include: abdominal pain, nausea, vomiting, fever)
- 2- Stage of larval migration: the invasion of muscle occurs from 7th to 10th day after infection. the symptoms include: oedema of the eyelids and face ((تورم العين والوجه نتيجة تجمع السوائل) and fever>
- 3- Stage of encystment: this occurs only in striated muscles swelling of the face and abdomen. The death may happen in the second or third stages according to myocarditis.

Diagnosis can only be done by demonstrating the larva in the muscle by biopsy or autopsy, serological test and x-ray may be used.

Trichuris trichiura: called whip worm

Geographical distribution:

Worldwide. Common in warm and moist regions.

Habitat : in large intestine of man particularly in *الاعور* caecum

Morphology:

Adult: the general appearance of the worm is like a whip, the anterior end three-fifths is very thin and hair-like and the posterior end two-fifths is thick like the handle of the whip. The whole anterior end consists of a long oesophagus and is embedded in the mucous membrane of the large intestine. The thick posterior end consists of the intestine and sex organs. Male its caudal extremity is coiled ventrally. Female the caudal end is shaped like a comma.

Eggs:

Brown (bile stained) has a double shell the outer layer is bile stained, barrel-shaped with a mucous plug at each end, the not embryonated when first seen.

Life cycle: no intermediate host is required. The eggs come out of human host with the faeces and the development proceeds slowly in water or damp earth depending on the environmental conditions. In tropical climate a rhabditiform larva develops within the egg in the course of 3 to 4 weeks. In temperate climate the larva takes a long time (6 to 12 months) to complete its development. The embryonated eggs are infective to man. The man is infected when the embryonated eggs are swallowed with food or water. The egg shell is dissolved by the digestive juices and the larva emerges through one of the poles of the eggs. The liberated larvae pass down into the caecum, their site of localization. They grow directly into adult worms and embed their anterior part in the mucosa of the intestine. The worms become sexually mature within a month from the time of ingestion of the eggs and the gravid female begins to lay eggs. The cycle is then repeated.

Trichuris trichiura (whip worm)



Adult female 5 cm long, larger than male. Posterior end is straight and blunt. (magnifier)



Adult male 4 cm long. Posterior end is curved and provided with 1 spicule (magnifier)



Egg: barrel shaped with 2 transparent mucoid plugs (H.P)

Pathogenicity: infection with *T. trichiura* is known as tricuriasis. Usually the worms do not produce a pathogenic effect. The worms inhabiting the vermiform appendix may give rise to symptoms of acute appendicitis. In heavy infections the patient often complains of abdominal pain, mucous diarrhoea often with blood streaked stool and loss of weight.

Laboratory diagnosis; this is done by finding eggs by direct microscopic examination in stool. The adult may be present in stool. Proctoscopy examination shows worm on the rectal mucosa.

Proper disposal of the night soil and prevention of eating the unwashed vegetables.

Life Cycle of *Trichuris trichiura*

