ASCARIS LUMBRICOIDES

Introduction :→ Ascaris is a member of class Nematoda. It is also known as round worm. It resides as an endoparasite in the small intestine of man. It is studied as the typical representative of the class as it is widely distributed and abundant in presence.

SYSTEMATIC POSITION :→

Phylum — Aschelminthes
Class — Nematoda
Order — Ascaroidea
Genus — Ascaris
Species — A. lumbricoides

HABIT AND HABITAT :—

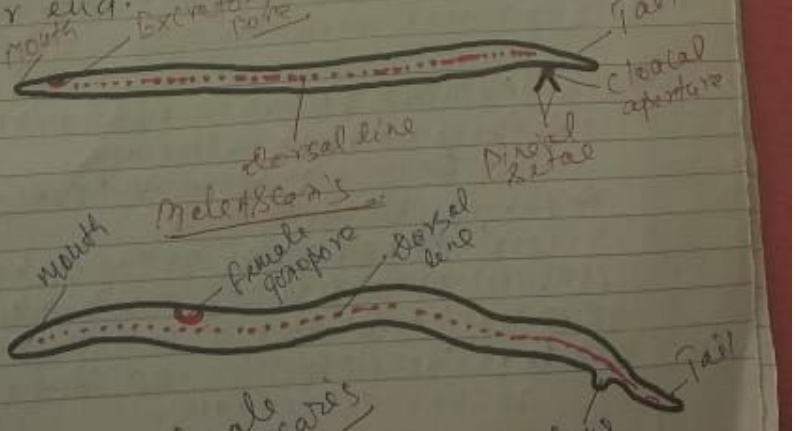
It is found in the small intestine of man more common in children. They produce an enzyme and have a resistant surrounding to counter the effects of digestive enzymes.

1000 to 5000 worms may be present in a single host. It is a monogenetic parasite and the life cycle is completed in a single host (man). It lives on the digested food of the intestine.

EXTERNAL STRUCTURE :→

(i) light yellow to light pink in colour in fresh or alive specimen.
(ii) Body elongated and cylindrical tapering at both ends.
(iii) females 20-40 cm in length and 4-6 mm in diameter while males 15-30 cm in length and 2-4 mm in diameter.
(iv) the posterior end of the male is recurved ventrally.

(v) Externally the body is covered with a cuticle which is transversely striated.
(vi) Running along the entire length of the body there are four longitudinal striations or lines - one mid-dorsal one mid-ventral and rest two are laterals.
(vii) The mouth is a triradiate aperture situated at the anterior most end. It is guarded by three lips, - one mid-dorsal and two ventro-lateral in position.
(viii) Anus is located as a transverse slit on ventral side a little in front of the curved posterior end of the body. In males it also serves as a reproductive aperture.
(ix) In males a pair of needle like chitinous structures project from the Anus known as penial setae.
(x) Excretory pore is located on the mid ventral side at a distance of 2 m.m from the anterior end.
(xi) The genital aperture of female is situated on the ventral surface at about one third distance of the body from the anterior end.



Body Wall :→

The body wall of Ascaris is made up of three layers —

(a) An outer cuticle
(b) A middle epidermis and
(c) inner layer of longitudinal muscles.

(a) Cuticle :→

It is the outermost layer which is thin transparent and transversely striated. It is secreted by the underlying epidermis. It is multilayered. Five layers have been distinguished —

(i) Lipoid layer (ii) Cortical or Cortex layer
(iii) Matrix layer (iv) Fibre layer and
(v) Basement membrane.

(b) Epidermis :→

The epidermis or hypodermis is syncytial in nature. The ectoderm is bulged at four places namely dorsal ventral and two lateral sides to give rise to the streaks on the body surface.

(c) Muscles :—

A longitudinal muscle layer lies beneath the epidermis. Due to epidermal bulging they are arranged in 4 blocks and are not continuous.

The muscle layer is composed of typical muscle cells and are of spindle shaped. About 150 cells are present in each block of muscle.

Body Cavity :→

The body cavity is not a Coelom in the true sense as it is not lined by cell layers derived from the mesoderm. The body cavity is lined externally

by fibrous process of longitudinal muscle cells and internally by cuticle encasing the intestine. It is filled with pseudo-coelomic fluid.

T.S of Ascaris through middle region

DIGESTIVE SYSTEM:→

(i) The mouth is anterior and terminal in position. It leads into a straight tube which runs along the entire length of the body. It is guarded by three lips.

(ii) Behind the mouth is oesophagus which leads into pharynx.

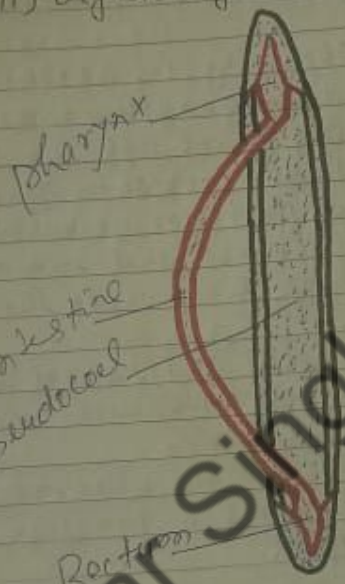
(iii) The pharynx is dilated and its wall is muscular. It draws food from the intestinal contents of the host.

(iv) Pharynx leads to the intestine.

(v) The posterior part of the intestine narrows down to form the Rectum which opens to the outside through Anus.

(vi) The entire alimentary canal is made

up of single epithelial layer covered internally and externally by cuticle derived from Ectoderm.
(iii) Digestive glands of any kind are absent.



Alimentary canal of Ascaris

EXCRETORY SYSTEM :→

(2) The excretory system consists of two longitudinal excretory canal through each lateral side.

(ii) The two excretory canal remain united with each other at the anterior end and form a 'H' shaped structure. The bridge is the transverse canal, from here arise terminal canals anteriorly opening outside by an excretory pore.

(iii) There is complete absence of flame cells. The canal is in contact with 4 to 6 big tube of cells which collect store and pass on the waste matters in dissolved state to the excretory canal.

NERVOUS SYSTEM :→

(i) The nervous system consists of a ring of nervous matter round the pharynx.

(ii) The ring is swollen on the ventral side and is ganglionic in nature.

(iii) The ring gives off six nerves to the anterior and six nerves to the posterior side.

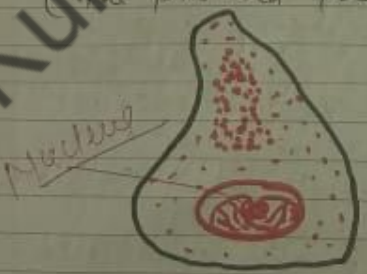
(iv) Of the posterior nerves two are of considerable thickness and run along the dorsal and ventral lines upto the posterior end of the body.

(v) The dorsal and ventral longitudinal nerves are connected with each other by transverse commissures.

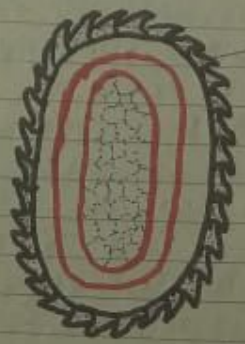
(vi) [illegible] of the ventral nerve cord swells and forms a ganglion just infront of the Anus.

SENSE ORGANS :→

The only sense organs are sensory papillae situated at the lips and tail the posterior part of the male (the pre and post anal papillae.)



Spermatozoa of Ascaris



Egg of Ascaris

REPRODUCTIVE SYSTEM:—

Sexual dimor-
- phism is present and Sexes are Separate.

MALE REPRODUCTIVE ORGAN:—

(i) A single thread like much Coiled Structure exist in the body cavity. It is differentiated at the anterior region as the testis middle portion as the Vas-diferens and the posterior region as the Seminal vesicle.

(ii) The Seminal vesicle continues as an ejaculatory duct and opens into the Anus.

(iii) At the end there is a pineal bc enclosing two pinsal setas.

(iv) The opening is often termed as cloaca.

(v) The sperms of Ascari's are typical in the sense that they show amoeboid movement in the body of the female.

STRUCTURE OF SPERMS:—

(i) A ripe sperm is cone shaped in appearance having a broad base and an apex.

(ii) The apex contains the Acrosome and the broad base contains nucleus and mitochondria.

(iii) The sperms remain non-motile in the male gonoduct.

FEMALE REPRODUCTIVE ORGAN:→

(i) These consist of a pair of much Coiled thread like Ovaries which pass into a uterus via oviduct.

(ii) The two uteri unite and form a muscular vagina.

(iii) The vagina opens to the outside by the female genital aperture.

LIFE CYCLE:→ It is completed in a single host. It involves the following processes:—

(A) FERTILIZATION:— Eggs are produced in large numbers (20,000 eggs a day) and are fertilized in the upper part of the uterus while the parasite is still in the intestine. After fertilization the eggs become enclosed in a hard shell. The characters of fertilized eggs are following:—

(i) Round and oval in shape
(ii) Brownish in colour
(iii) Surrounded by translucent shell.

(B) LIBERATION OF FERTILIZED Eggs:— Eggs are liberated and comes out of the body of host with the faecal matter. It is not infective to man.

(C) DEVELOPMENT IN SOIL:— In the soil and within the shell the development proceeds and a juvenile is formed in 10-14 days from the start of cleavage.

Juvenile is also known as Rhabditoid as it shows close resemblances with Rhabditis a nematode. After some time it moults within the egg shell and becomes the second stage Rhabditoid. It is infective.

INFECTION:→ Infection is direct. Human Consumption of contaminated food or drink may lead to the entry of eggs with rhabditiform larva in the stomach.

HATCHING AND TRANSITION TO ADULTHOOD

In the small intestine the shell is dissolved and the larva are set free.

The newly hatched larvae burrow in the mucous membrane of small intestine. From there they come to the liver via the portal system. After living there 4 to 8 days they pass through the right auricle to the lung. In lungs they moult twice and grow in size. The total migratory period is 10-15 days.

Taking various pathways i.e bronchi, trachea, larynx and finally to pharynx where it irritates causing coughing by which it re-enters the alimentary canal and becomes located in the upper region.

After reaching the intestine it moults fourth or last time. The young worm becomes adult, sexually mature within 6-10 weeks and begins its life cycle again.

Stomach ← Intestine (with moulting) ← male — sperm > zygote → outside with host faeces

Oesophagus ↑

Swallowed into gullet ↑ Pharynx ↑ Trachea ↑ Bronchus ↑ Alveoli ↑ Lung (2nd & 3rd moulting) ↑ Pulmonary artery ← Right auricle of heart ← Post veines ← Hepatic vein ← Liver

female — ova

↓ 1st moulting

↓ Larva (1st)

↓ Swalled by new host

↓ Intestine of new host larva hatches out

↓ Bores intestinal wall

↓ Hepatic portal vein

Life cycle of Ascaris