



40

NEMATODES

40.1 INTRODUCTION

The nematodes are parasites which are cylindrical and have a bilateral symmetry. They cause intestinal and tissue infestation. The largest nematode is *Dracunculus medinensis* and can be 1.2 meter long and the smallest nematode is *Trichinella spiralis* which can be 4-5 mm long.



OBJECTIVES

After reading this lesson, you will be able to:

- describe the characteristics of nematodes
- describe the morphology of *ascariasis lumbricoides*
- explain the life cycle of *ascariasis lumbricoides*
- discuss the pathogenecity of *ascariasis lumbricoides*
- explain the laboratory diagnosis of *ascariasis lumbricoides*

40.2 CHARACTERISTICS OF NEMATODES

1. They have an elongated, cylindrical and unsegmented body.
2. They are bilaterally symmetrical
3. The body covering is lined from out to inside by:
 - (a) Epicuticle
 - (b) Exocuticle
 - (c) Mesocuticle
 - (d) Endocuticle



Notes

- (e) Basal lamina
- (f) Hypodermis
- 4. The body covering encloses a body cavity, which is a pseudocoel. The internal organs are suspended in the pseudocoel.
- 5. Musculature comprises of spindle shaped muscles which are divided into contractile and non- contractile part.
- 6. The size may vary from 5 mm to 1meter
- 7. They have male and female sex separately
- 8. The reproductive organs are as under
 - (a) Male : Vas deferans, seminal vesical, ejaculatory duct
 - (b) Female: Tubular ovary, oviduct, seminal receptacle, uterus, ovijector, vagina and vulva
- 9. The nervous system has sensory papillae on the cuticle.
- 10. Digestive system has a mouth, muscular oesophagus, intestine rectum and anus.

The nematodes are further divided based on their habitat in the host and are classified as

- (a) Intestinal nematodes
 - (i) *Ascaris lumbricoides* also called as round worm
 - (ii) *Ankylostoma duodenale* and *Necator americanus* also called as hook worm
 - (iii) *Trichuris trichura*
 - (iv) *Entrobilus vermicularis*
- (b) Tissue nematodes
 - (i) *Wucheraria bancrofti*
 - (ii) *Dracunculus medinensis*
 - (iii) *Trichinella spiralis*
 - (iv) *Oncocerca volvulus*
 - (v) *Strongyloides stercoralis*.

40.3 ASCARIASIS

Ascariasis is caused by *Ascaris lumbricoides*. It is also commonly called as round worm. The worm is found in the small intestines of infected individuals. Ascariasis is seen worldwide, but is more commonly seen in Asian and African nations.

40.4 MORPHOLOGY

The worm is oviparous and both adult form and ova are seen.

(a) Adult worm

The size of the adult worm is:

Female 200-400 mm × 3-6 mm

Male 150-300 mm × 2-4 mm

Anterior end: The anterior end has the mouth which has two ventral lips and one dorsal lip. The sensory papillae are present in the anterior end. Body cavity contains a fluid called ascaron.

Anterior end

Mouth 2 ventral lips

1 dorsal lip

Sensory papillae

Posterior end:

Male

Curved, conical tip

Genital pore opens into cloacae

Two curved copulatory spicules

Female

Anus is sub terminal

Vulva opens at junction of ant & middle 1/3 of body (vulval waist)

(b) Ova

The ova of ascaris lumbricoides are seen in two forms

(i) Fertilized

(ii) Unfertilized

(i) **Fertilized ova** are 75 µm × 50 µm in size and are ovoid in shape.

They are bile stained and hence appear brown in colour in saline mount preparation of stool specimen.

**Notes**



Notes

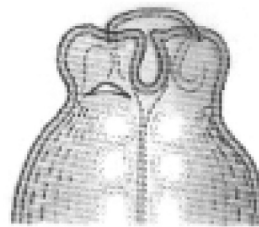
The outermost egg shell layer is a mammilated albuminous coat.

There is a thick egg shell made up of chitin.

The shell contains a single cell stage ovum

There is a clear space at the poles next to the single cell.

The fertilized ova may lose the outer mammilated albuminous coat and is then referred to as decorticated fertilized ova.



Head of adult to show arrangement of the three lips

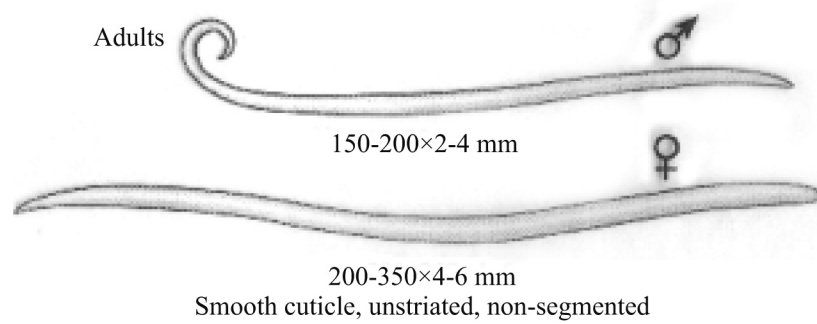
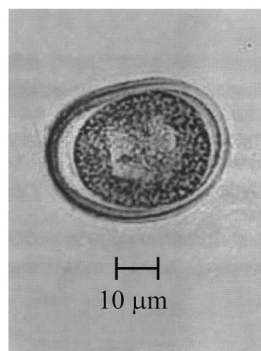
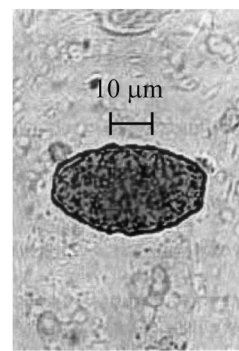


Fig. 40.1



Fertilized Ova



Unfertilized Ova

Fig. 40.2

(ii) **Unfertilized ova** are larger and measure $90\ \mu\text{m} \times 55\ \mu\text{m}$

It is ovoid in shape.

The egg shell is thinner.

It contains a mass of disorganized highly refractile granules of various sizes.



Notes



INTEXT QUESTIONS 40.1

1. Ascariasis is caused by
2. Round worm is also called as
3. Body cavity of hook worm contains a fluid called
4. Fertilized ovum without the albuminous coat is referred as

40.5 LIFE CYCLE

The adult worms are present in the small intestines and after sexual reproduction the gravid female *Ascaris* worm lays eggs, these are passed in faeces and mature

Life cycle

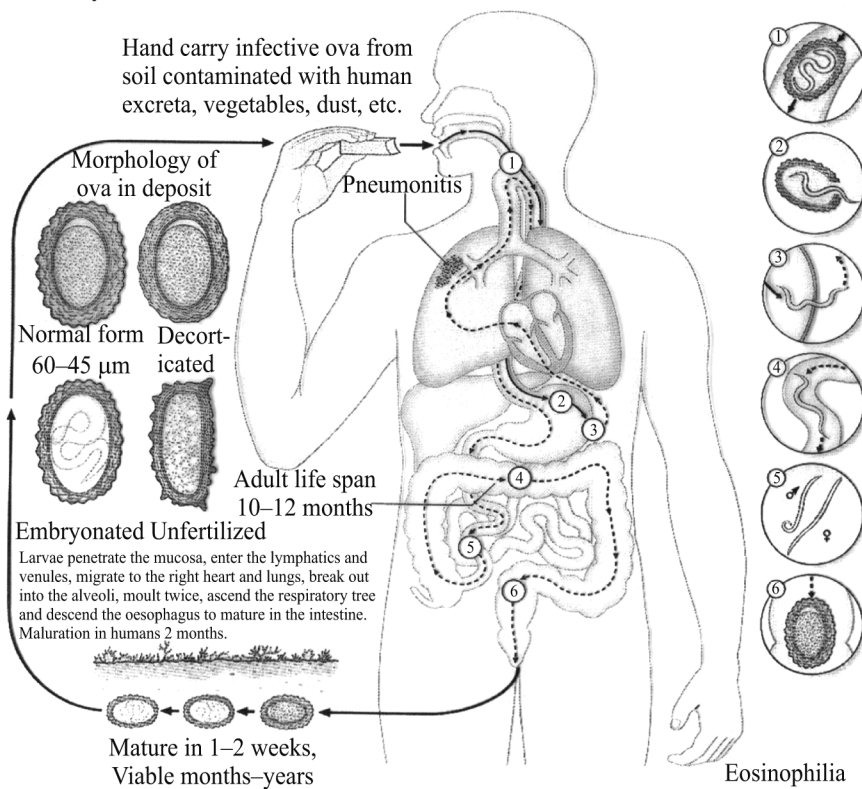


Fig. 40.3: *Ascaris lumbricoides* (round worm)



Notes

within 1-2 weeks in the soil. Ova remains viable in the soil for months to a year. The infective ova are ingested by the hands carrying the ova from soil contaminated with excreta, vegetables or dust etc.

The ova reach the stomach where the larva comes out from the egg shell. The larva penetrates the stomach wall and enters the lymphatics and venules. Through the venules and blood circulation it reaches the heart and eventually reaches the lungs.

In the lungs the larva undergoes development from first stage to second stage and then the third stage larva. The larva increases in length and reaches a length of 1500 μm . The larva then moves up on the airway passage from the alveoli to bronchioles. It passes through the bronchi and trachea to reach the pharynx and from there it goes to the esophagus. From the esophagus it travels to the stomach and duodenum to finally reach the large intestines. In the intestines the larva develops into the adult stage. The life cycle continues after sexual reproduction and formation of ova. The life span of an adult worm is about one year.

40.6 PATHOGENECITY

The Ascaris infestation can cause nutritional deficiency especially in children. Numerous worms can get entangled and cause intestinal obstruction. The worm can obstruct small lumen organs like the bile duct, appendix. They may cause appendicitis, pancreatitis, and peritonitis.

Children may vomit out a bolus worms. The presence of larva in the lungs may cause an allergic pneumonia called Loeffler's pneumonia. Granulomatous lesion may form at an ectopic site once the worm dies.

40.7 LABORATORY DIAGNOSIS

The demonstration of ova in the stools or detection of adult worm establishes the laboratory diagnosis. The ova are seen both in saline stool preparation as well as in the iodine preparation.



WHAT HAVE YOU LEARNT

- Ascariasis is caused by *Ascaris Lumbricoides*. It is also commonly called as round worm
- The worm is found in the small intestines of infected individuals
- The worm is oviparous and both adult form and ova are seen

Nematodes

- The adult worms are present in the small intestines and after sexual reproduction the gravid female ascaris worm passes fertilized ova in the stools on to the soil
- The ascaris infestation can cause nutritional deficiency especially in children.
- The demonstration of ova in the stools or detection of adult worm established the laboratory diagnosis. The ova are seen both in saline stool preparation as well as in the iodine preparation.



TERMINAL QUESTIONS

1. Discuss the morphology and pathogenicity of *Ascaris lumbricoides*.
2. Discuss the life cycle of *Ascaris lumbricoides*.
3. Draw a labeled diagram of the various forms of ova of *Ascaris lumbricoides*.



ANSWERS TO INTEXT QUESTIONS

40.1

1. *Ascaris lumbricoides*
2. *Ascaris lumbricoides*
3. Ascarron
4. Decorticated fertilized ova

MODULE

Microbiology



Notes