

The Mark Distribution:

- Total marks = 100%
- Course work = 60%
- Final Exam= 40%

Coursework: 60%

- Midterm: Theory (20%) + Practical (10%) = 30%
- Quiz Theory= 5%
- Quiz Lab = 5%
- Class activity: (Sample= 3%) + (Drawing= 4%)= 7%
- practical GSE exam= 5%
- Presentation = 8%

Final Exam: 40%

- Theory = 25%
- Practical =15%



**Medical Analysis
Department**

Introduction to Medical Parasitology (Helminthology)

Medical Parasitology II (MA302)

Summer School

Lecture 1

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August 13, 2026

Learning outcomes

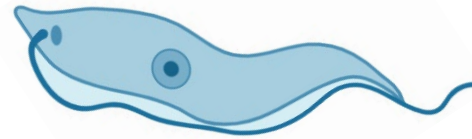
1. To define helminthes and explain their relevance in medical parasitology.
2. To describe the general characteristics and morphological stages of helminthes.
3. To discuss the impact of helminth infections on human health, including morbidity, mortality, and socioeconomic consequences.
4. To be able to perform and interpret general stool examination (GSE) for the detection of parasites, and apply this skill effectively in laboratory practice.

Introduction

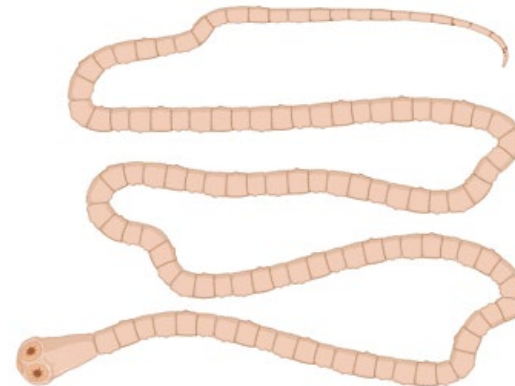
Medical parasitology deals with the parasites, which cause human infections and the diseases they produce.

It is broadly divided into two parts:

1. Protozoology (Unicellular)

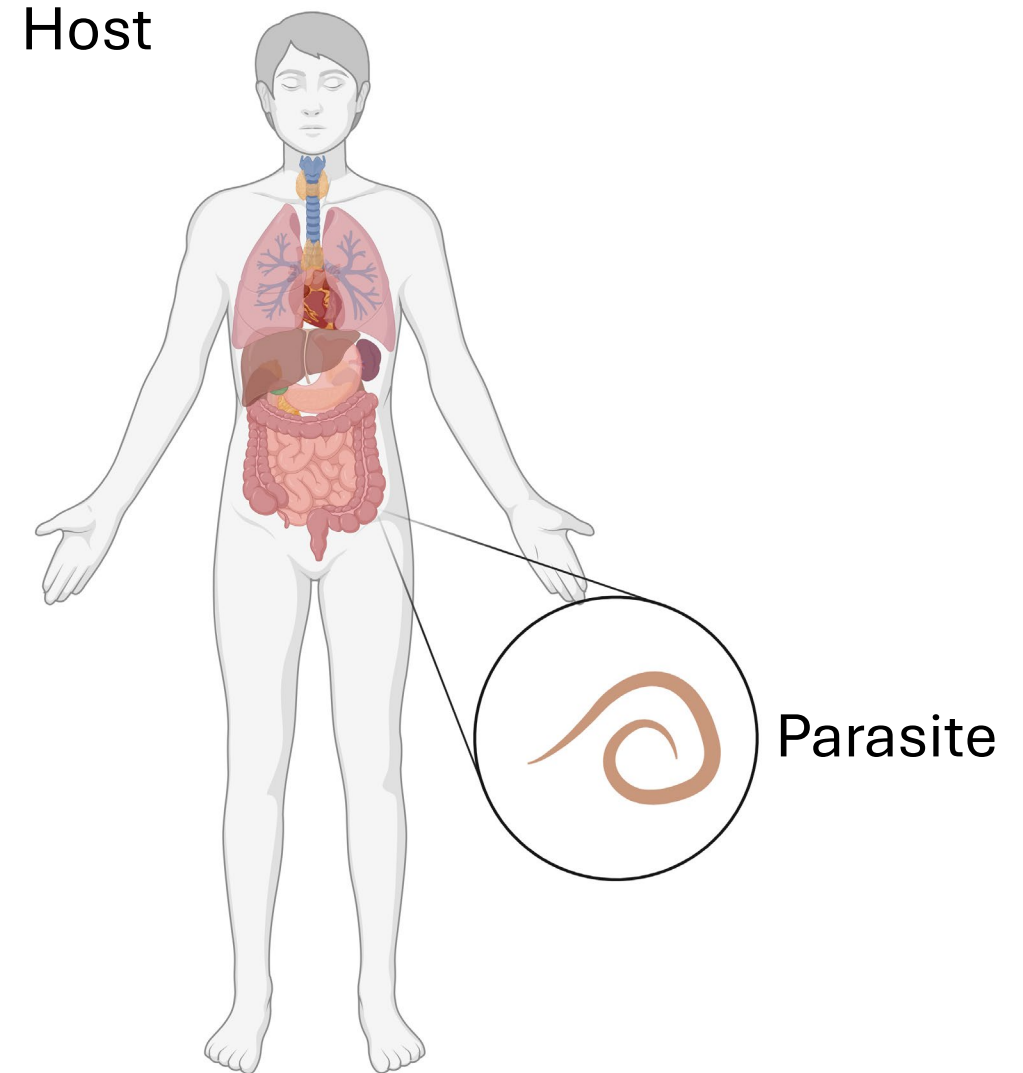


2. Helminthology (Multicellular)



Parasite

Parasites are living organisms, which depend on a living host for their nourishment and survival. They multiply or undergo development in the host.



Parasite

Protozoa
(unicellular)
Kingdom-Protista

Helminths
(multicellular)
Kingdom-Animalia

Amebae

Flagellates

Sporozoa

Ciliates

Entamoeba
Naegleria

Giardia
Trichomonas

Plasmodium
Babesia
Toxoplasma

Balantidium

Nematodes

Cestodes

Trematodes

Ascaris
Ancylostoma

Taenia
Echinococcus

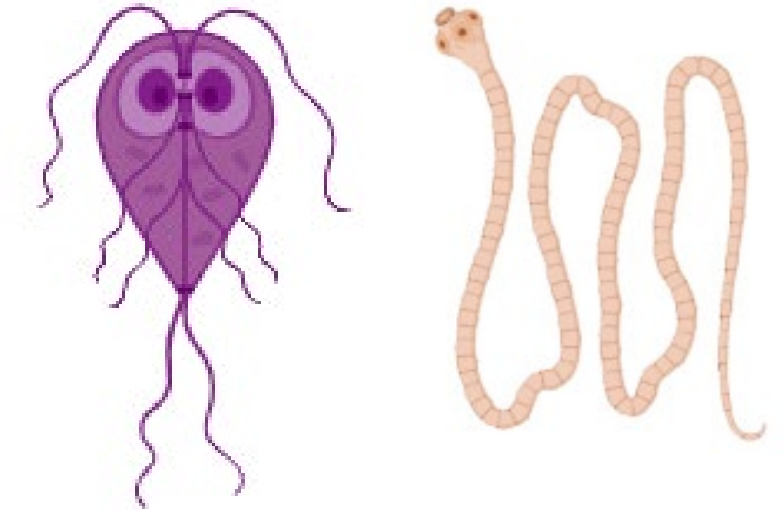
Fasciola
Schistosoma

Parasites classification according to location:

1. Ectoparasite: Ectoparasites inhabit only the body surface of the host without penetrating the tissue. Lice, ticks and mites are examples of ectoparasites.

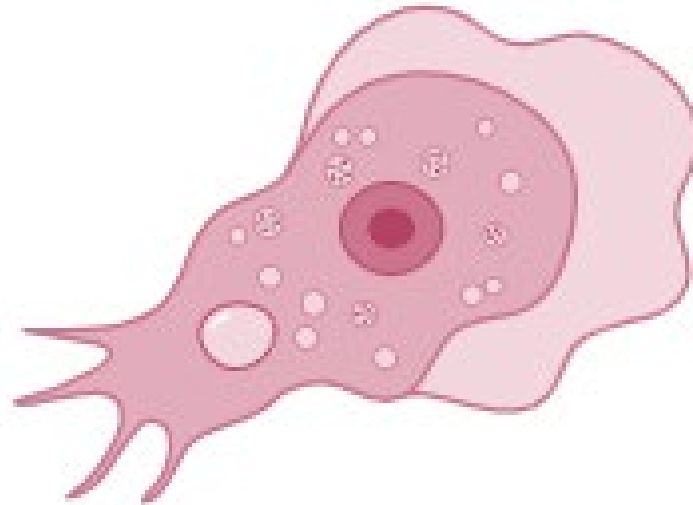


2. Endoparasite: A parasite, which lives within the body of the host and is said to cause an infection, is called an endoparasite. Most of the protozoan and helminthic parasites causing human disease are endoparasites.



Parasites classification according to location:

3. **Free-living parasite:** It refers to nonparasitic stages of active existence, which live independent of the host, e.g. cystic stage of *Naegleria fowleri*.

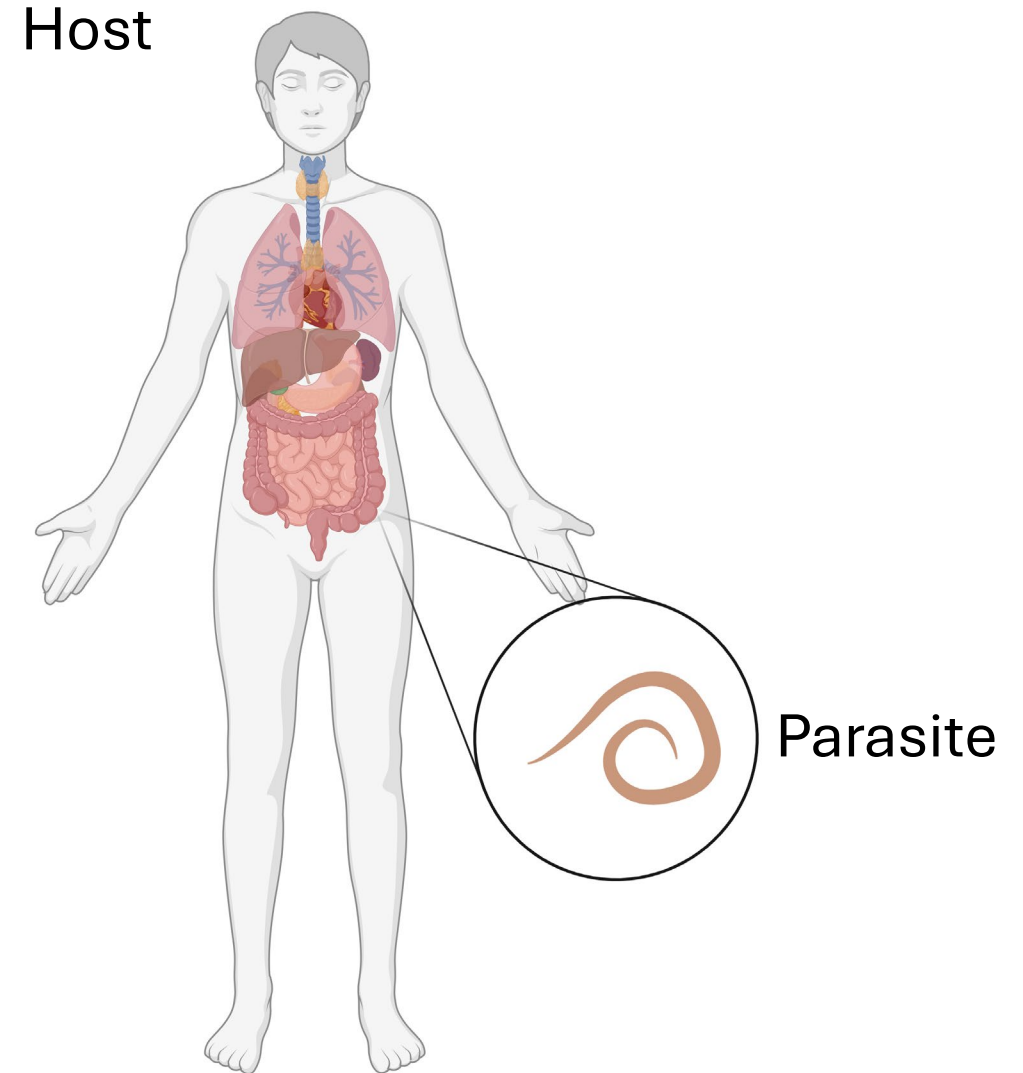


Endoparasites can further be classified as:

1. **Obligate parasite:** The parasite, which cannot exist without a host, e.g. *Toxoplasma gondii* and *Plasmodium*.
2. **Facultative parasite:** Organism which may either live as parasitic form or as a free-living form, e.g. *Naegleria fowleri*.
3. **Accidental parasites:** Parasites, which infect an unusual host, are known as accidental parasites. *Echinococcus granulosus* infects man accidentally, giving rise to hydatid cysts.
4. **Aberrant parasites:** Parasites, which infect a host where they cannot develop further, are known as aberrant or wandering parasites, e.g. *Toxocara canis* (dog roundworm) infecting humans.

Host

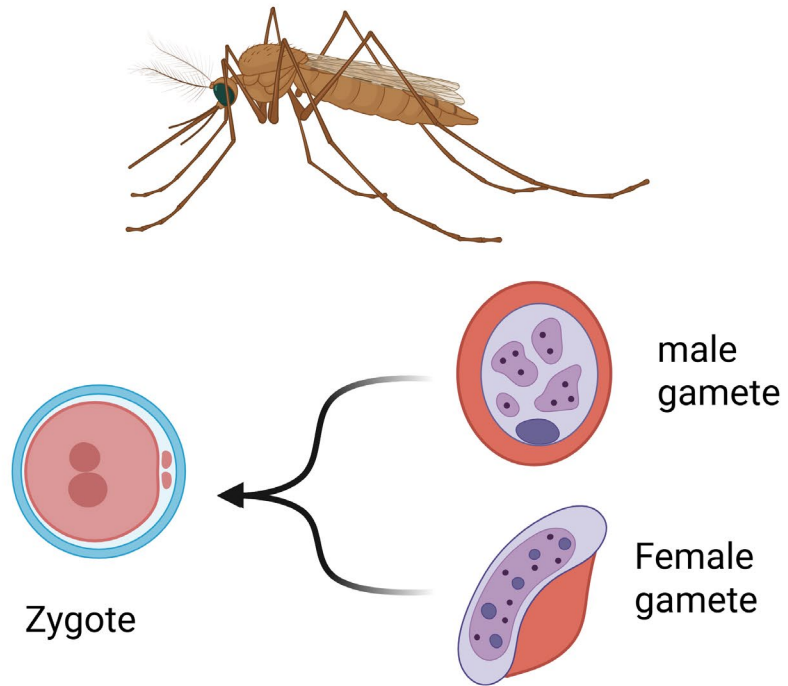
Host is defined as an organism, which harbors the parasite and provides nourishment and shelter to latter and is relatively larger than the parasite.



Types of host

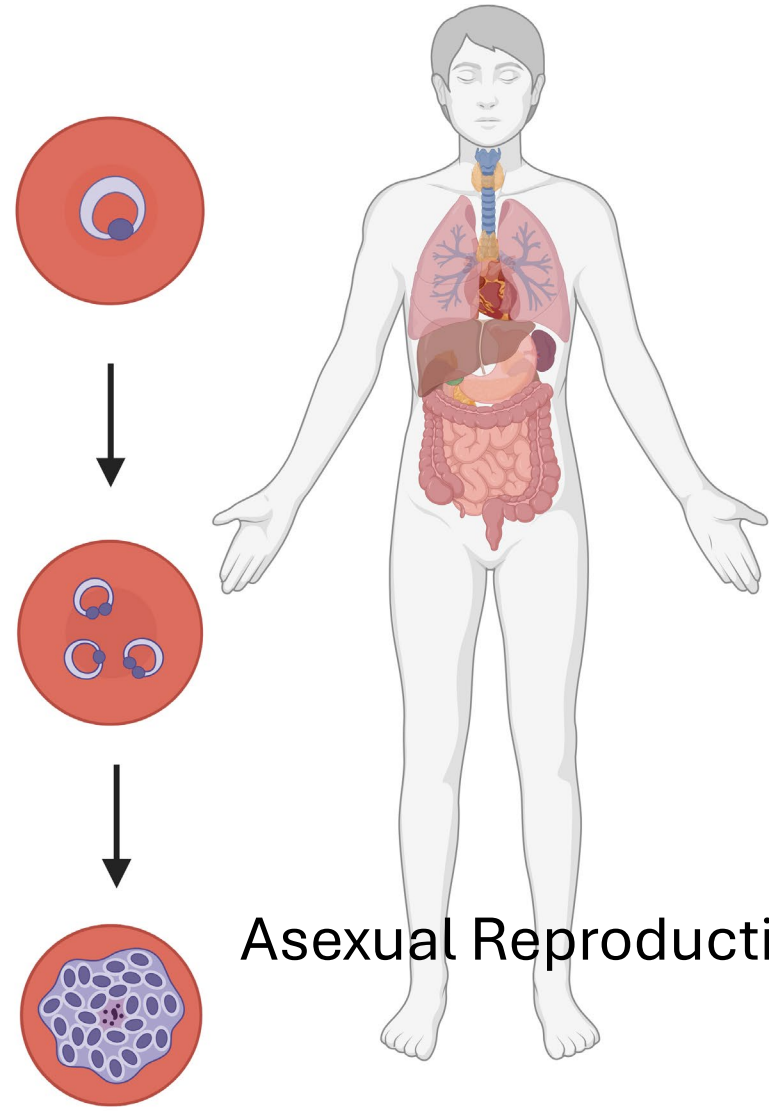
1. **Definitive host:** The host, in which the adult parasite lives and undergoes sexual reproduction is called the definitive host
2. **Intermediate host:** The host, in which the larval stage of the parasite lives or asexual multiplication takes place is called the intermediate host. In some parasites, two different intermediate hosts may be required to complete different larval stages. These are known as first and second intermediate hosts, respectively

Definitive host



Sexual Reproduction

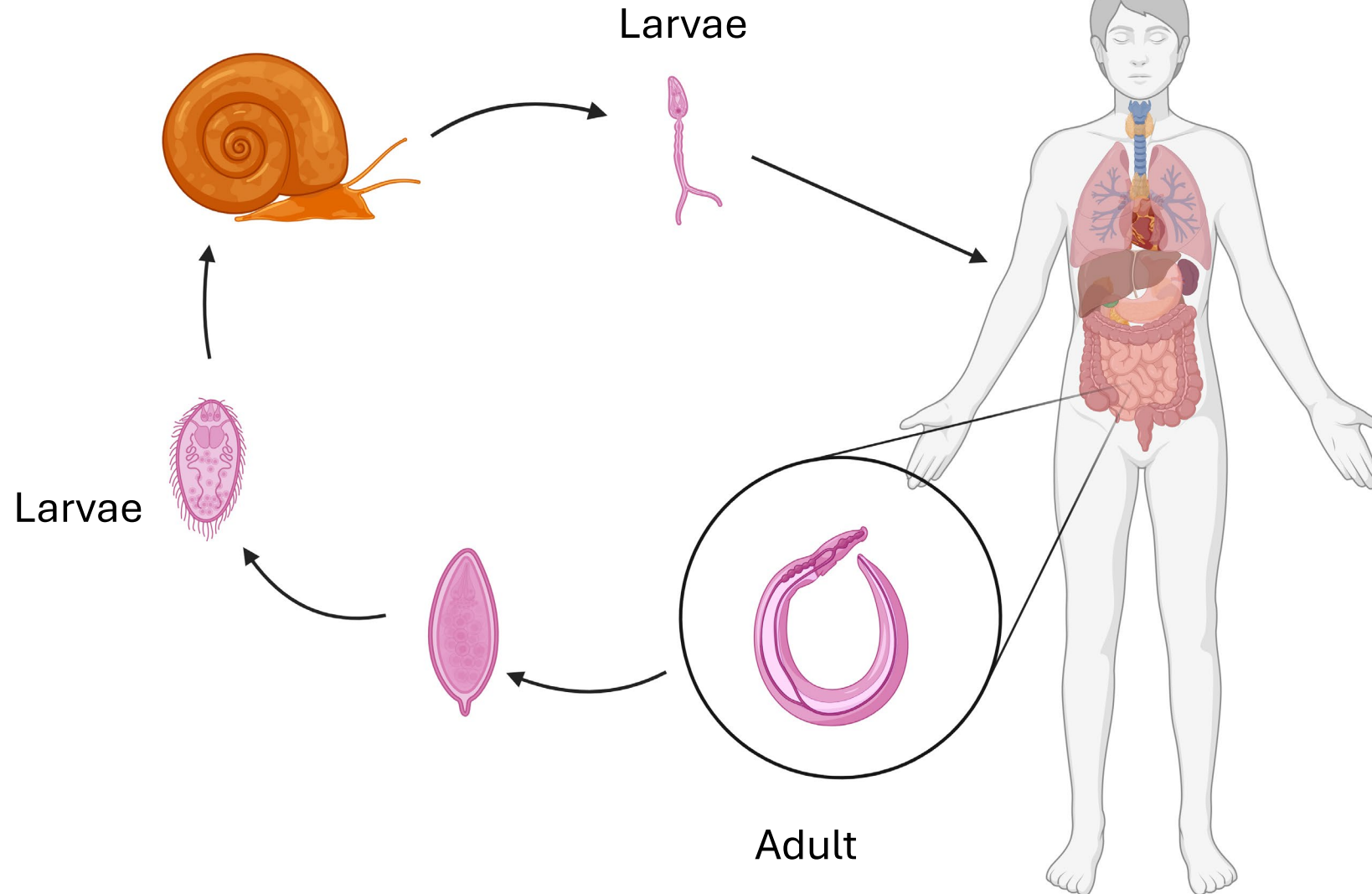
Intermediate host



Asexual Reproduction

Intermediate host

Definitive host

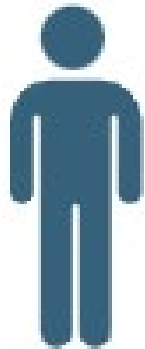
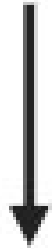
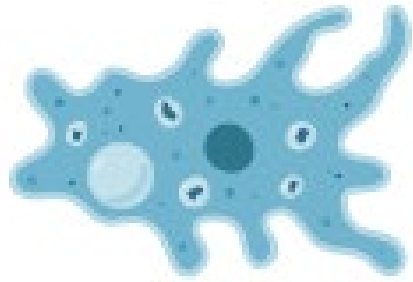


Types of host

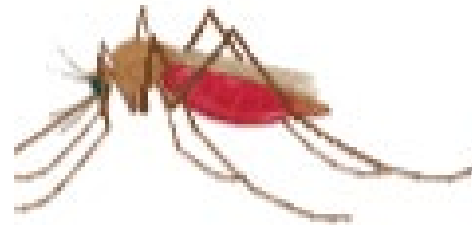
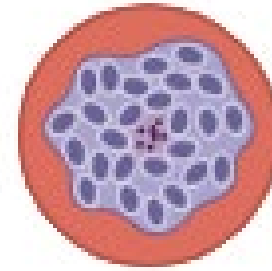
- 3. Reservoir host:** In an endemic area, a parasitic infection is continuously kept up by the presence of a host, which harbors the parasite and acts as an important source of infection to other susceptible hosts,

Life cycle of parasites

1. **Direct life cycle:** When a parasite requires only single host to complete its development, it is called as direct life cycle, e.g. *Entamoeba histolytica* requires only a human host to complete its life cycle.
2. **Indirect life cycle:** When a parasite requires two or more species of host to complete its development, the life cycle is called as indirect life cycle, e.g. malarial parasite requires both human host and mosquito to complete its life cycle



Direct lifecycle



Indirect lifecycle

Helminthes

The helminthic parasites are multicellular (metazoa) bilaterally symmetrical animals having three germ layers (triploblastic metazoa) and belong to the kingdom Metazoa.

The term helminth (Greek helmins-worm) originally referred to intestinal worms, but now comprises many other worms, including tissue parasites as well as many free-living species.

Classification of Helminthes

Helminths, which occur as parasite in humans belong to two phyla

1. Phylum Platyhelminthes (flatworms): It includes two classes:

- Class: Cestoda (tapeworms)
- Class: Trematoda (flukes or digeneans)

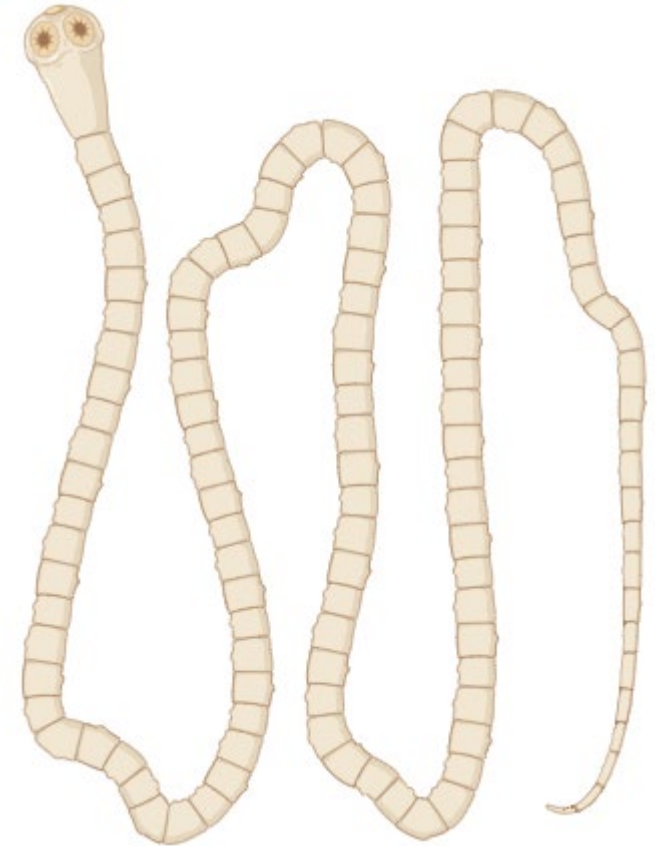
2. Phylum Nemathelminthes: Nematoda

Phylum Platyhelminthes

1. The Platyhelminthes are tape-like, dorsoventrally flattened worms.
2. They either lack alimentary canal (as in cestodes) or their alimentary canal is incomplete, lacking an anus (as in trematodes).
3. They are mostly hermaphrodites (monoecious).
4. Phylum Platyhelminthes includes two classes:
 - Class: Cestoda
 - Class: Trematoda.

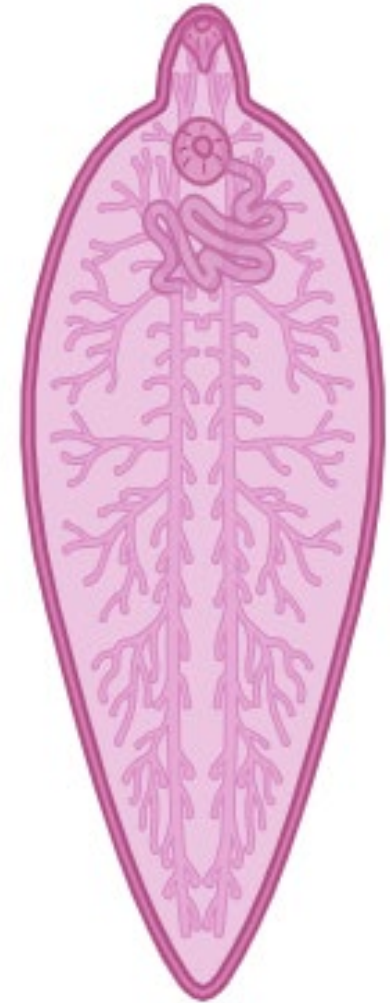
Class Cestoda

- Cestodes have tape-like, dorsoventrally flattened,
- segmented bodies.
- They do not possess an alimentary system.
- The head carries suckers, and some also have hooks.
- They possess scolex, neck and proglottids.
- They are monoecious and body cavity is absent.
- They are oviparous



Class Trematoda

- Trematodes have flat or fleshy, leaf-like unsegmented bodies.
- The alimentary canal is present but is incomplete, i.e. without an anus.
- They possess suckers but no hooks.
- The sexes are separate in the schistosomes, while the other flukes are hermaphroditic.
- They are oviparous.



Phylum Nematelminthes

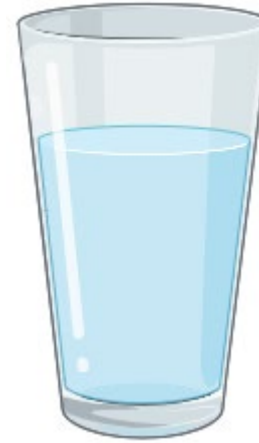
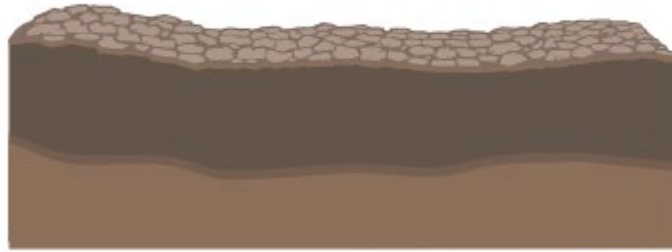
Class: (Nematoda)

- Nematodes are elongated, cylindrical worms with an unsegmented body.
- They possess a relatively well-developed complete alimentary canal, with an anus.
- Body cavity is present.
- The head does not have suckers or hooks, but may have a buccal capsule with teeth or cutting plates.
- The sexes are separate (diecious) .
- They are either oviparous or viviparous.

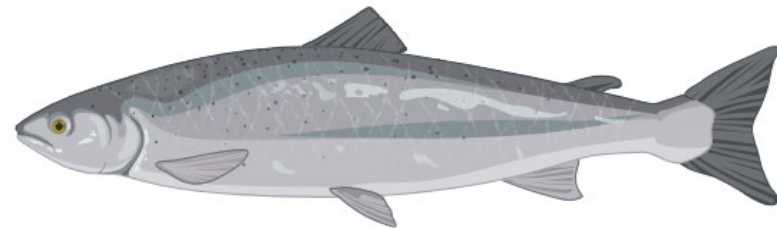
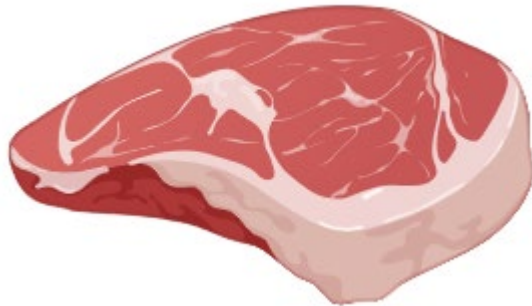


Source of infection

1. Contaminated soil and water



2. Food

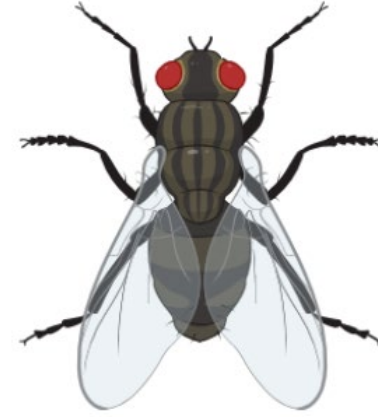


Source of infection

3. Vector

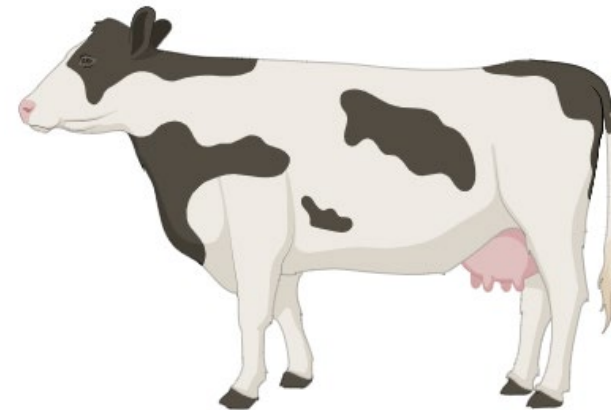


Biological



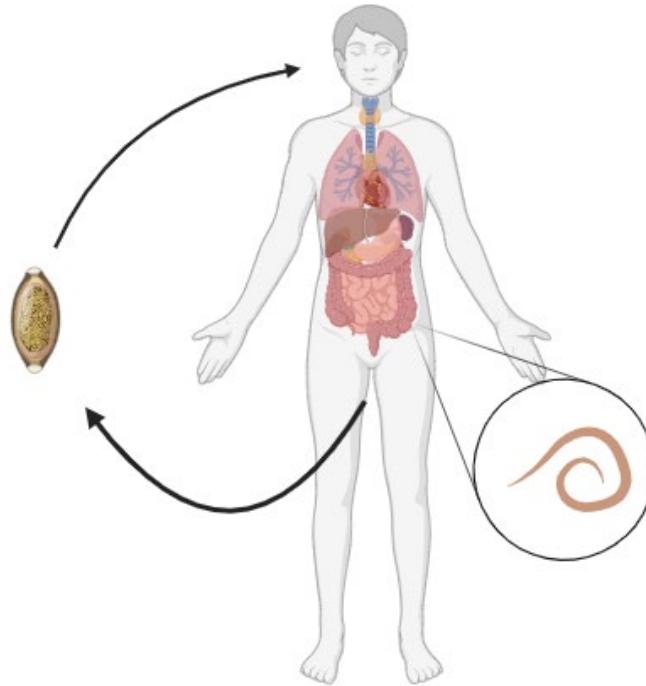
Mechanical

4. Animal



Source of infection

5. Self (Autoinfection)



Mode of transmission

1. **Fecal-oral route:** Ingestion of infective eggs or larvae from contaminated food, water, or hands.

Examples: *Ascaris lumbricoides* (eggs)

2. **Skin penetration:** Infective larvae penetrate intact skin from contaminated soil or water.

Examples: *Necator americanus* / *Ancylostoma duodenale*

3. **Ingestion of undercooked or raw intermediate host:** Eating meat, fish, or aquatic plants containing larval stages.

Examples: *Taenia saginata* (beef tapeworm)

4. **Vector-borne transmission:** Bite of an insect that delivers infective larvae.

Examples: *Wuchereria bancrofti*,

Why We Study Medical Helminthes – Medical Importance

1. Public health – Many causes widespread illness, malnutrition, and disability.
2. Diagnosis & treatment – Recognize infections and provide correct therapy.
3. Epidemiology & prevention – Break transmission cycles and control outbreaks.
4. Zoonoses – Prevent diseases passed from animals to humans.
5. Research – Develop new drugs, vaccines, and control strategies.

References

- Paniker, C. K. J. & Ghosh, S. 2021. *Paniker's textbook of medical parasitology*, New Delhi, Jaypee Brothers Medical Publishers.
- <https://www.cdc.gov/pinworm/hcp/clinical-overview/index.html>