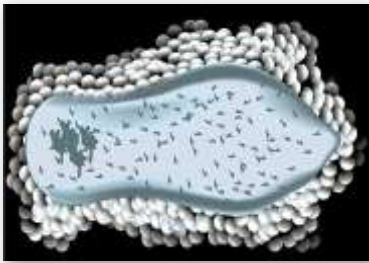


Mays alsherefy

MEDICAL PARASITOLOGY



General Introduction: Parasitology

1

Introduction

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

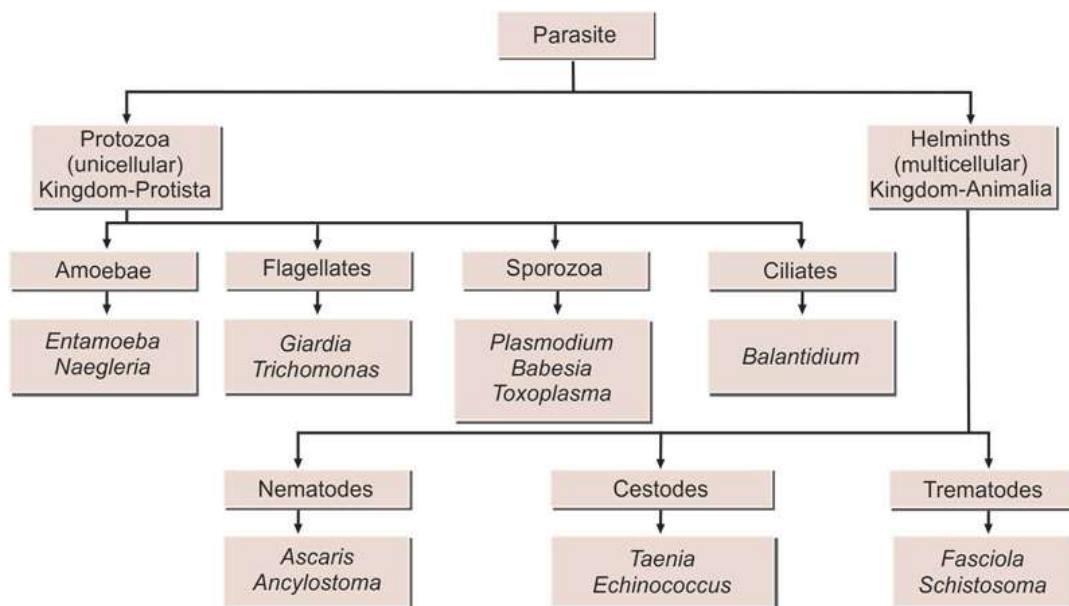
→ It is broadly divided into 2 parts

***Protozoology**

***Helminthology.**

Parasites

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



Mays alsherefy

➤ The term 'parasite' is usually applied to Protozoa (unicellular organisms) and Helminths (multicellular organisms)

➤ Parasites can also be classified as:

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

** **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.

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

➤ **Endoparasites can further be classified as :**

***Obligate parasite**: The parasite, which cannot exist without a host, e.g. *Toxoplasma gondii* and *Plasmodium*.

** **Facultative parasite**: Organism which may either live as parasitic form or as free living form.

*****Accidental parasites**: Parasites, which infect an unusual host are known as accidental parasites . *Echinococcus granulosus* infects man accidentally ,giving rise to hydatid cysts.

******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 .

Mays alsherefy

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.

➤ The host may be of the following types:

- **Definitive host:** The host, in which the adult parasite lives and undergoes sexual reproduction is called the definitive host, e.g. mosquito acts as definitive host in malaria.

The definitive host may be a human or any other living being. However, in majority of human parasitic infections, man is the definitive host (e.g. filaria, roundworm, hookworm).

- **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, 2 different intermediate hosts may be required to complete different larval stages. These are known as **first and second intermediate hosts**, respectively.
- **Paratenic host:** A host, in which larval stage of the parasite remains viable without further development is referred as a paratenic host. Such host transmits the infection to another host.
- **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, e.g. dog is the reservoir host of hydatid disease.
- **Accidental host:** The host, in which the parasite is not usually found, e.g. man is an accidental host for cystic echinococcosis.

Parasites with man as intermediate or secondary host

- *Plasmodium spp.*
- *Babesia spp.*
- *Toxoplasma gondii*
- *Echinococcus granulosus*
- *Echinococcus multilocularis*
- *Taenia solium*
- *Spirometra spp.*

Zoonosis

The word zoonosis was introduced by Rudolf Virchow in 1880 to include the diseases shared in nature by man and animals .

Later, in 1959, the World Health Organization (WHO) defined zoonosis as “those diseases and infections, which are naturally transmitted between vertebrate animals and man

➤ It is of following types:

* **Protozoal zoonoses**, e.g. toxoplasmosis, leishmaniasis, balantidiasis, and cryptosporodiasis .

****Helminthic zoonoses**, e.g. hydatid disease, taeniasis

*****Anthropozoonoses**: Infections transmitted to man from lower vertebrate animals, e.g. cystic echinococcosis

Zooanthroponoses: Infections transmitted from man to lower vertebrate animals, e.g. human tuberculosis to cattle.

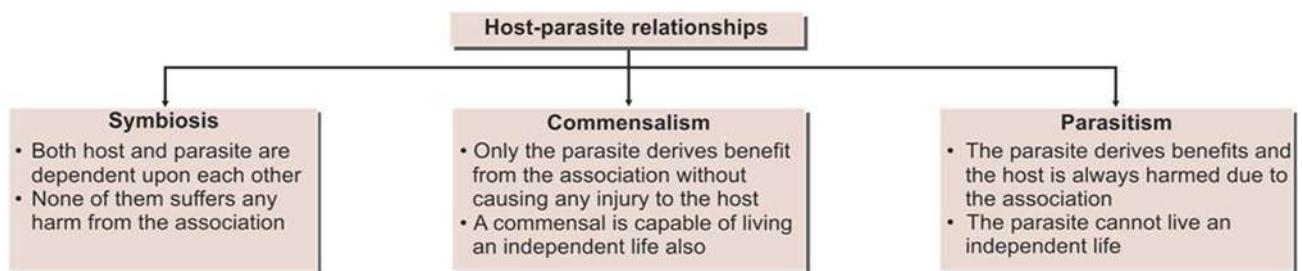
Host-parasite Relationships

Host-parasite relationships are of following types

*Symbiosis

**Commensalism

***Parasitism.



Life Cycle of Parasites

** **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.

****Indirect life cycle:** When a parasite requires 2 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.

Parasites having direct life cycle

Protozoa

- *Entamoeba histolytica*
- *Giardia lamblia*
- *Trichomonas vaginalis*
- *Balantidium coli*
- *Cryptosporidium parvum*
- *Cyclospora cayetanensis*
- *Isospora belli*
- *Microsporidia*

Helminths

- *Ascaris lumbricoides*
- *Enterobius vermicularis*
- *Trichuris trichiura*
- *Ancylostoma duodenale*
- *Necator americanus*
- *Hymenolepis nana*

Parasites having indirect life cycle

Parasite	Definitive host	Intermediate host
Protozoa		
<i>Plasmodium</i> spp.	Female Anopheles mosquito	Man
<i>Babesia</i>	Tick	Man
<i>Leishmania</i>	Man, dog	Sandfly
<i>Trypanosoma brucei</i>	Man	Tsetse fly
<i>Trypanosoma cruzi</i>	Man	Triatomine bug
<i>Toxoplasma gondii</i>	Cat	Man
Cestodes		
<i>Taenia solium</i>	Man	Pig
<i>Taenia saginata</i>	Man	Cattle
<i>Echinococcus granulosus</i>	Dog	Man
Trematodes		
<i>Fasciola hepatica</i>	Man	Snail
<i>Fasciolopsis buski</i>	Man, pig	Snail
<i>Schistosoma</i> spp.	Man	Snail
Nematodes		
<i>Trichinella spiralis</i>	Man	Pig
<i>Wuchereria bancrofti</i>	Man	Mosquito
<i>Brugia malayi</i>	Man	Mosquito
<i>Dracunculus medinensis</i>	Man	Cyclops

Sources of Infection

➤ Contaminated soil and water:

Soil polluted with embryonated eggs (roundworm & whipworm) may be ingested or infected larvae in soil, may penetrate exposed skin (hookworm)

- Infective forms of parasites present in water may be ingested (cyst of amoeba and *Giardia*)
- Water containing the intermediate host may be swallowed (cyclops containing guineaworm larva)
- Infected larvae in water may enter by penetrating exposed skin, (cercariae of schistosomes)
- Free-living parasites in water may directly enter through vulnerable sites (*Naegleria* may enter through nasopharynx).

➤ **Food:**

- Ingestion of contaminated food or vegetables containing infective stage of parasite (amoebic cysts, *Toxoplasma* oocysts, *Echinococcus* eggs)
- Ingestion of raw or under-cooked meat harboring infective larvae (measly pork containing *Cysticercus cellulosae*, the larval stage of *Taenia solium*).

- **Insect vectors:** A vector is an agent, usually an arthropod that transmits an infection from man to man or from other animals to man, e.g. female *Anopheles* is the vector of malarial parasite.

Mays alsherefy

Vectors can be:

- **Biological vectors:** The term biological vector refers to a vector, which not only assists in the transfer of parasites but the parasites undergo development or multiplication in their body as well. They are also called as **true vectors**. Example of true vectors are:
 - **Mosquito—Malaria, filariasis**
 - **Sandflies—Kala-azar**
 - **Tsetse flies—Sleeping sickness**
 - **Reduviid bugs—Chagas' disease**
 - **Ticks—Babesiosis.**
- **Mechanical vectors:** The term mechanical vector refers to a vector, which assists in the transfer of parasitic form between hosts but is not essential in the life cycle of the parasite.
Example of Mechanical vectors is:

- **Housefly—amoebiasis**

In biological vectors, a certain period has to elapse after the parasite enters the vector, before it becomes infective. This is necessary because the vector can transmit the infection only after the parasite multiplies to a certain level or undergoes a developmental process in its body. This interval between the entry of the parasite into the vector and the time it takes to become capable of transmitting the infection is called the extrinsic incubation period.

Mays alsherefy

Animals:

- Domestic:
 - Cow, e.g. *T. saginata*, Sarcocystis
 - Pig, e.g. *T. solium*, *Trichinella spiralis*
 - Dog, e.g. *Echinococcus granulosus*
 - Cat, e.g. *Toxoplasma*, *Opisthorochis*.
- Wild:
 - Wild game animals, e.g. trypanosomiasis
 - Wild felines, e.g. *Paragonimus westermani*
 - Fish, e.g. fish tapeworm
 - Molluscs, e.g. liver flukes
 - Copepods, e.g. guineaworm.
- **Other persons**, which may be carriers of the parasite or patients, e.g. all anthroponotic infections, vertical transmission of congenital infections.
- **Self (autoinfection)**
 - Finger-to-mouth transmission, e.g. pinworm
 - Internal reinfection, e.g. *Strongyloides*.

Modes of Infection

- **Oral transmission:** The most common method of transmission is through oral route by contaminated food, water, soiled fingers, or fomites. Many intestinal parasites enter the body in this manner, the infective stages being cysts, embryonated eggs, or larval forms. Infection with *E. histolytica* and other intestinal protozoa occurs when the infective cysts are swallowed.
- **Skin transmission:** Entry through skin is another important mode of transmission. Hookworm infection is acquired, when the larvae enter the skin of persons walking barefooted on

Mays alsherefy

contaminated soil. Schistosomiasis is acquired when the cercarial larvae in water penetrate the skin

- **Vector transmission:** Many parasitic diseases are transmitted by insect bite, e.g., malaria is transmitted by bite of female *Anopheles* mosquito, filariasis is transmitted by bite of *Culex* mosquito. A vector could be a biological vector or a mechanical vector.
- **Direct transmission:** Parasitic infection may be transmitted by person-to-person contact in some cases, e.g. by kissing in the case of gingival amoebae and by sexual intercourse in trichomoniasis.
- **Vertical transmission:** Mother to fetus transmission may take place in malaria and toxoplasmosis.
- **Iatrogenic transmission:** It is seen in case of transfusion malaria and toxoplasmosis after organ transplantation.