TIKRIT UNIVERSITY
COLLEGE OF PHARMACY

MICROBIOLOGYII
MEDICAL PARASITOLOGY

MEDICAL PARASITOLOGY

PRESENTED BY

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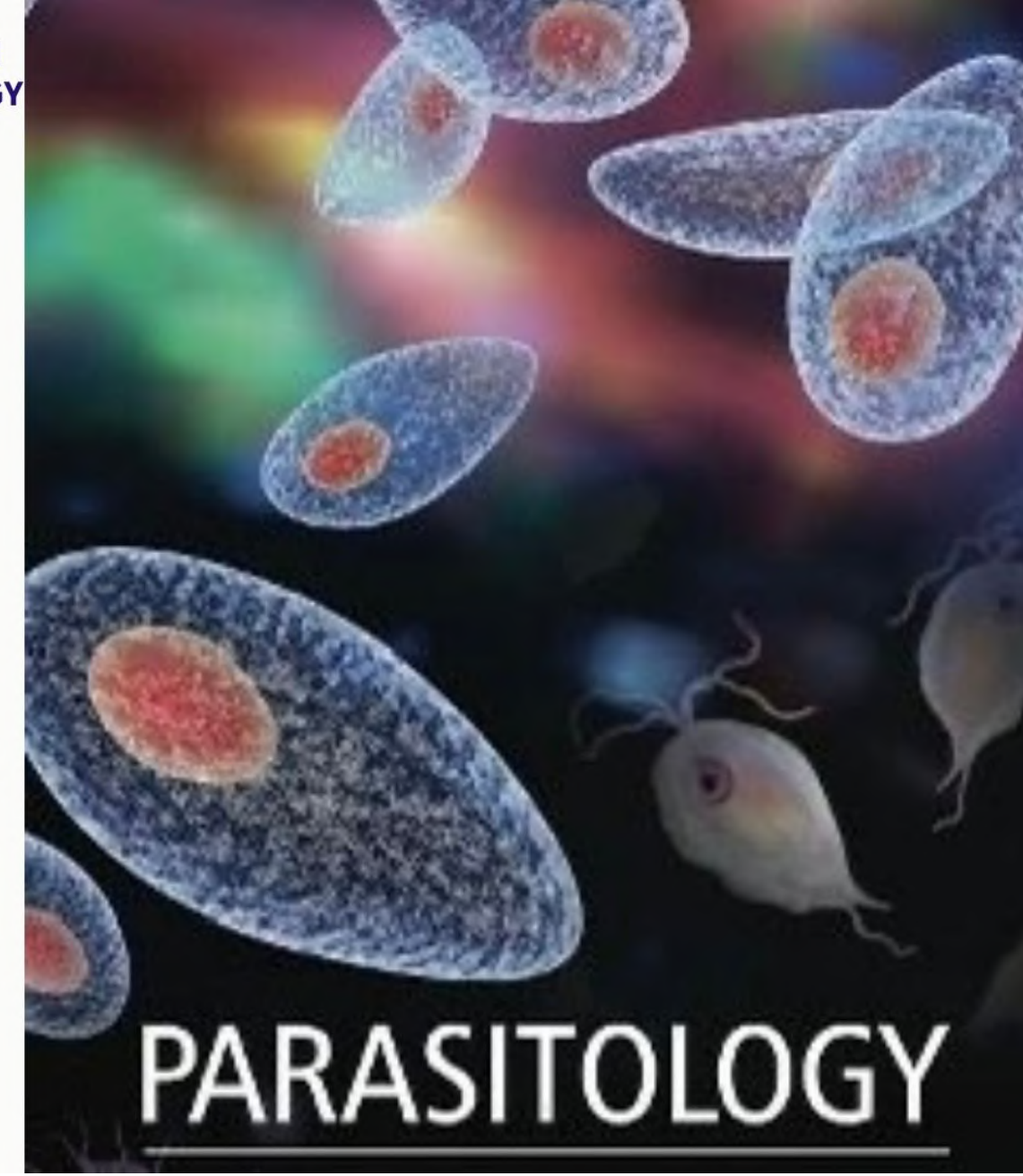
Lecture 1



Introduction

Parasitology is the branch of biology concerned with the phenomenon of dependence of one living organism on another. Medical parasitology deals with the parasites which infect man, the diseases they produce, the response generated by him against them, and various methods of diagnosis, prevention and treatment.

Medical Parasitology :

It 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.

Parasitology - the science or study of host-parasite relationships.

Medical parasitology - Study of parasites which infect humans.

parasites are of two types:

1. Microparasite: small, unicellular and multiplies within its vertebrate host, often inside cells. Protozoa are microparasites.

2. Macroparasite: large, multicellular and has no direct reproduction within its vertebrate host. This category includes helminths.

Type of Parasites :

1.Ectoparasite: Ectoparasites inhabit only the body surface of the host without penetrating the tissue. Lice, ticks, and mites are examples of ectoparasites. The term infestation is often employed for parasitization with 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.

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 free living form.

3.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

4.Accidental parasites: organisms that attack an unusual host e.g. Echinococcus granulosus in man.

5.free-living : it it describes the nonparasitic stages of existence , which are live independently of a host ,e.g. hookworms have active free-living stages in the soil.

Host :

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

Types of hosts:

1.Definitives 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.

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, 2 different intermediate hosts may be required to complete different larval stages. These are known as first and second intermediate hosts, respectively.

3.Reservoir host: 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, eg. dog is the reservoir host of hydatid disease.

4.Accidental host: One that parasitic an organism other than the usual host e.g Toxocara canis dog parasites infects human.

5. Comeromised host: it is the one in whom normal defense mechanisms are impaired e.g. AIDS, absent (e.g. congenital deficiencies) or bypassed (e.g., penetration of skin barrier). Such hosts are extremely susceptible to a variety of common and opportunistic pathogens.

Host-Parasite relationships

1. Symbiosis: an association in which both host and parasite are so dependent
upon each other that one cannot live without the help of the other. Neither of the partners suffers from any harm from this association.

2. Commensalism: an association in which only the parasite derives benefit without causing any injury to the host.

A commensal lives on food residues or waste products of the body and is capable of leading an independent life, as in the case of Entamoeba coli in the large intestine of man (One partner benefits, the other is not hurt).

3. Parasitism: Parasitism is a relationship in which a parasite benefits and the host provides the benefit. The host gets nothing in return and always suffers from some injury because the parasite lives on the expense of the host. The degree of dependence of a parasite on its host varies.

Zoonosis :

This term is used to describe an animal infection that is naturally transmissible to humans either directly or indirectly via a vector. Examples leishmaniasis, South American trypanosomiasis, rhodesiense trypanosomiasis, japonicum schistosomiasis, trichinosis, fascioliasis, hydatid disease and cryptosporidiosis.

Portals of entry into the body.

1. Mouth

The commonest portal of entry of parasites is oral, through contaminated food, water, soiled fingers or fomites. Many intestinal parasites, e.g. Entamoeba histolytica, Giardia lamblia, Balantidium coli, Enterobius vermicularis, Trichuris trichiura, Ascaris lumbricoides, Trichinella spiralis, Taenia solium, Taenia saginata, Diphyllobothrium latum, Fasciola hepatica, Fasciolopsis buski, Clonorchis sinensis and Paragonimus westermani, enter the body in this manner.

2. Skin

Entry through the skin is another important portal for the entry of parasites.Infection with Ancylostoma duodenale, Necator americanus and Strongyloides stercoralis is acquired when filariform larvae of these nematodes penetrate the unbroken skin of an individual walking over faecally contaminated soil.Schistosomiasis caused by Schistosoma haematobium, S. mansoni and S. japonicum is acquired when the cercarial larvae in water penetrate the skin.

A large number of parasites, e.g., Plasmodium spp. Wuchereria bancrofti, Trypanosoma brucei gambiense, T. b. rhodesiense, T. cruzi, Leishmania spp. and Babesia spp. are introduced percutaneously when bloodsucking arthropods puncture the skin to feed.

3. Sexual contact

Trichomonas vaginalis is transmitted by sexual contact. E. histolytica and Giardia lamblia may also be transmitted through sexual practices.

4. Kissing

Entamoeba gingivalis is transmitted from person to person by kissing or from contaminated drinking utensils.

5. Congenital

Infection with Toxoplasma gondii and Plasmodium spp. may be transmitted from mother to foetus transplacentally.

6. Inhalation

Airborne eggs of Enterobius vermicularis may be inhaled into the posterior pharynx leading to infection.

7. Iatrogenic infection

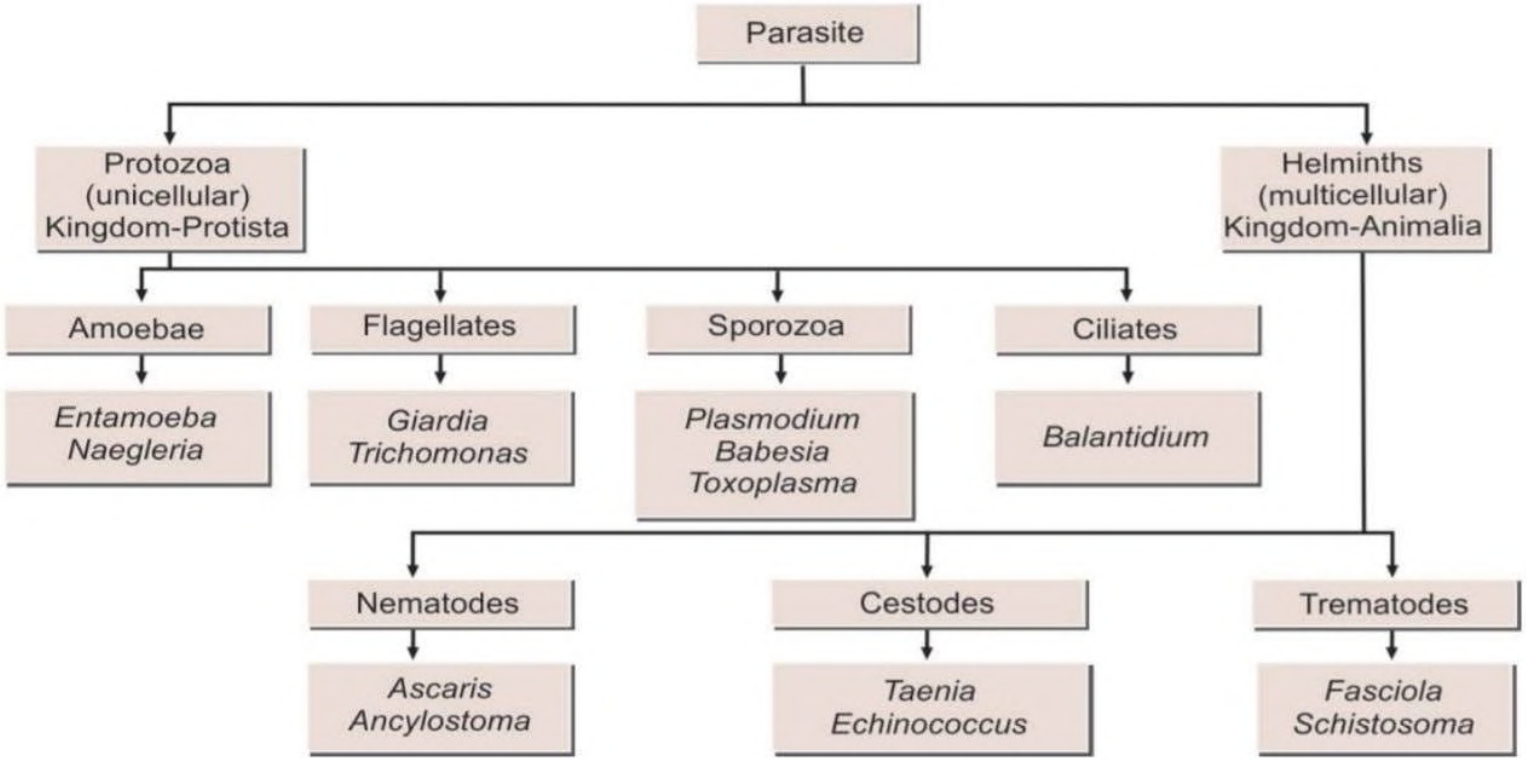
Malaria parasites may be transmitted by transfusion of blood from a donor with malaria containing asexual forms of erythrocytic schizogony.This is known as trophozoiteinduced malaria or transfusion malaria. Malaria parasites may also be transmitted by the use of contaminated syringes and needles. This may occur in drug addicts.

The Vector

An agent, usually an insect transmits the infection from one human host to another.It is of two types:

1. Mechanical vector: the term used to describe a vector which assists in the transfer of parasitic forms between hosts but is not essential in the life cycle of
the parasite, e.g. a housefly and Cockroaches in the case of Entamoeba which transfers the cysts of the parasite from the infected feces to food that is eaten by humans.

2. Biological vector: in which the pathogenic organism develops andmultiplies before being transmitted to the next host, therefore, it is essential in the life cycle of the parasite.The vector is only helping in the transfer of the pathogen to complete its life cycle, while intermediate host existence is essential for the completion of some parts of the life cycle (asexual only).


Parasite
Protozoa (unicellular) Kingdom-Protista
Helminths (multicellular) Kingdom-Animalia
Amoebae
Flagellates
Sporozoa
Ciliates
Entamoeba Naegleria
Giardia Trichomonas
Plasmodium Babesia Toxoplasma
Balantidium
Nematodes
Cestodes
Trematodes
Ascaris Ancylostoma
Taenia Echinococcus
Fasciola Schistosoma

Classification of animal parasites and vectors :

Kingdom/ Phylum/ Subphylum/ Class/ Order/ Family/ Genus/ Species

All of the names must be in Greek or Latin. The Genus is a group of closely related species. The species designates a population, the members of which have essentially the same genetic characteristics and are capable of continuous reproduction of their kind, but usually cannot interbreed with individuals of other species.

The scientific designation of a species is a combination of the genus and species name. This is referred to as binomial nomenclature. Ex. Entamoeba histolytica.

The groups of the parasites

Protozoa

Protozoa are unicellular eukaryotic organisms, have all the essential organelles that help them in their essential activities. All of them are microscopic; most of them live singly, but many others live in colonies. Each cell unit performs all the necessary functions of life.

Classification of the Protozoa

Human parasites in the kingdom Protista, subkingdom Protozoa are classified under four phyla:

1. Phylum Sarcomastigophora (containing amoeba and flagellates). This phylum is subdivided into two subphyla:

a. Subphylum Sarcodina, and b. Subphylum Mastigophora

1. Phylum Apicomplexa (containing Sporozoa).
2. Phylum Ciliophora (containing Ciliates).
3. Phylum Microspora.