

# Host-parasite relationship

*By Dr. Raghed M. Jassem*

# What is microbiology

It is the science that deals with study of microorganisms, those being unicellular (single cell), multicellular (cell colony), or acellular (lacking cells)

While the term Medical microbiology, is a branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases.

## The branch of microbiology are :-

- Bacteriology: the study of bacteria
- Mycology: the study of fungi
- Phycology/algology: the study of algae
- Parasitology: the study of parasites
- Protozoology: the study of protozoa
- Nematology: the study of nematodes
- Immunology: the study of the immune system
- Virology: the study of viruses

## **Parasitology**

It's the science that deals with parasite ( types, life cycle, pathogenesis, clinical sings, diagnosis, treatment, control and prevention).

**Medical parasitology** deals with the parasites which infect man, the diseases they produce, the response generated by man against the parasites and various methods of diagnosis and prevention.

**Parasites** – Microbes establishing and multiplying themselves in hosts. There are four types of host-parasite relationships

## Relationship between parasite and host

1- **Commensalism** is a relationship that is beneficial to the microbes which live in the host, but does not help or harm the host. Most of the bacteria that reside within the bodies of humans .

2- **Mutualism** both the microbes and the host will get benefit. For example, there are several kind of bacteria which live inside the mouth, nose, throat, and intestines of humans and animals. These bacteria receive a place to live and feed while keeping other harmful microbes from taking up residence. This we called normal flora.

3- **Parasitism** in this relationship the microbes will get benefit while the host is harmed, it cause disease, by resisting the host's defenses and microbial growing in the host.

4- **Symbiosis**-It is relationship in which both are so dependent upon each other that one cannot live without the help of the other. None of the partner suffers any harm from the association

## Type of parasites

According to the nature of the host –parasite interactions and environmental factors , parasites classified according to the following criteria

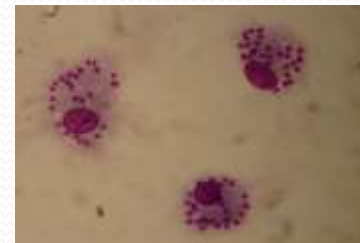
### 1- According to the presence of the parasite within the hosts

**1- Ecto-parasite (external parasites):**Lives on the external surface of their host – e.g. lice, ticks which are present on human skin (image A)

**2- Endo-parasite (Internal parasite)-**lives inside the body of the host, in the blood, tissues, body cavities, digestive tract and other organs.

a. **intercellular parasites** : inhabiting spaces in the host's body (between cells).(image B)

b. **intracellular parasites:** inhabiting host's body cells (inside cells).(image C)



## 2- According to their duration within their host

**1- Temporary parasite** -Visits its host for a short period (for feeding and leaving it) ex-Bed bug or spend part of its life cycle in the host

**2-Permanent** :- The parasite spend it life (whole period) throughout the same host ex- Lice

## 3- According to the nature of living :-

**1- Free living**-The term free living describes the non parasitic stages of existence **ex:-** *Entamoeba coli*

**2- Facultative parasite**- The parasite can change its life style between free-living in the environment and parasitic according to the surrounding conditions **ex:-** *Strongyloides stercoralis*

**3- Obligatory parasite** :- Cannot exist without a parasitic life **ex:-** *Entamoeba histolytica*



## **Host :**

is an organism, which the parasite live in or on and providing nourishment to the parasite

**Type of host:** are classified according to their role in the life of the parasite in to :-

- Definitive host (DH):-
- Intermediate host
- Carrier host
- Reservoir host
- Transport host
- Vector host

**1- Definitive host (DH) :** Either the host will carry the adult stage of the parasite ex:- *Taenia solium* definitive host is man

Or the parasite undergoes sexual reproduction ex:- Anopheles mosquito is the DH for *Plasmodium* spp. (malaria parasite)

**2- Intermediate host (IH) :** The host carries the larval stages or asexual immature stages (in whom Asexual reproduction stages occur ) ex:- man is IH For *Plasmodium* .

**3- Carrier host (CH) :** Is the host that carries the infective stages of parasites but without displaying any signs and symptoms and can transmit the parasites to others (the carrier either temporary ,transient or chronic )

**4- Reservoir host (RH):** Also known as Temporary host. Reservoir host (mostly are animals) become the source of Infection to regular hosts ex.- Monkey is reservoir host for *Plasmodium*.

**5- Transport host (TH):-** In this type of the host the parasites does not undergo any development but remains alive and infective to another host. TH is act as a bridge between intermediate and definitive hosts ex:- Dogs & pigs may carry hookworm eggs from one place to another but the eggs does not hatch or undergo any development inside these animals

**6- Vector host:** is an arthropod that transmits parasites from one host to another It present in types-

1) Biological Vector part of parasite life cycle occur in it such as mosquitoes.

2) Mechanical Vector only transports the parasite such as flies for transport of Amoeba cysts.

## **Life cycles of the parasite :-**

are differ between major types of the parasites and generally classified into direct and indirect

**1- Direct life cycles:-** do not require an intermediate host ,only one definitive host is required and the parasites reaches to sexual maturity and produces progeny.

**2- In direct life cycles:-** may involve one or more intermediate hosts in order to complete its life cycle.

## **Sources of infection:-**

- Human Beings :- Patients , Carriers which either healthy or chronic
- Animals :- which either Zoonosis or Reservoir
- Insects :- which either Mechanical or Biological
- Soil :- which either from food and water

## Methods of transmission of infections

- ❖ **Contact**
- ❖ **Congenital**
- ❖ **Inhalation**
- ❖ **Ingestion**
- ❖ **Insects**
- ❖ **Contaminated equipment**
- ❖ **Nosocomial infection**

## Infective stages of parasite :-

Infective stage is a part of the life cycle of the parasite , which upon its contact with host cause infection. The stages are vary according to different parasites and its include the following

1- **Egg or ovum** :- which enter to the host with food and drinks as in the case of some intestinal worms

2- **Larva** :- Which enter the host through the skin as in *Ancylostoma* or blood as *Wuchsreria* or meet as in *Taenia* or vegetable as in *Fasciola*.

3- **Cyst** :- Which enter the host with contaminated food and water like *Entamoeba histolytica* .

4- **Adult** :- as in the case of lice

## The classification of parasite will depend on

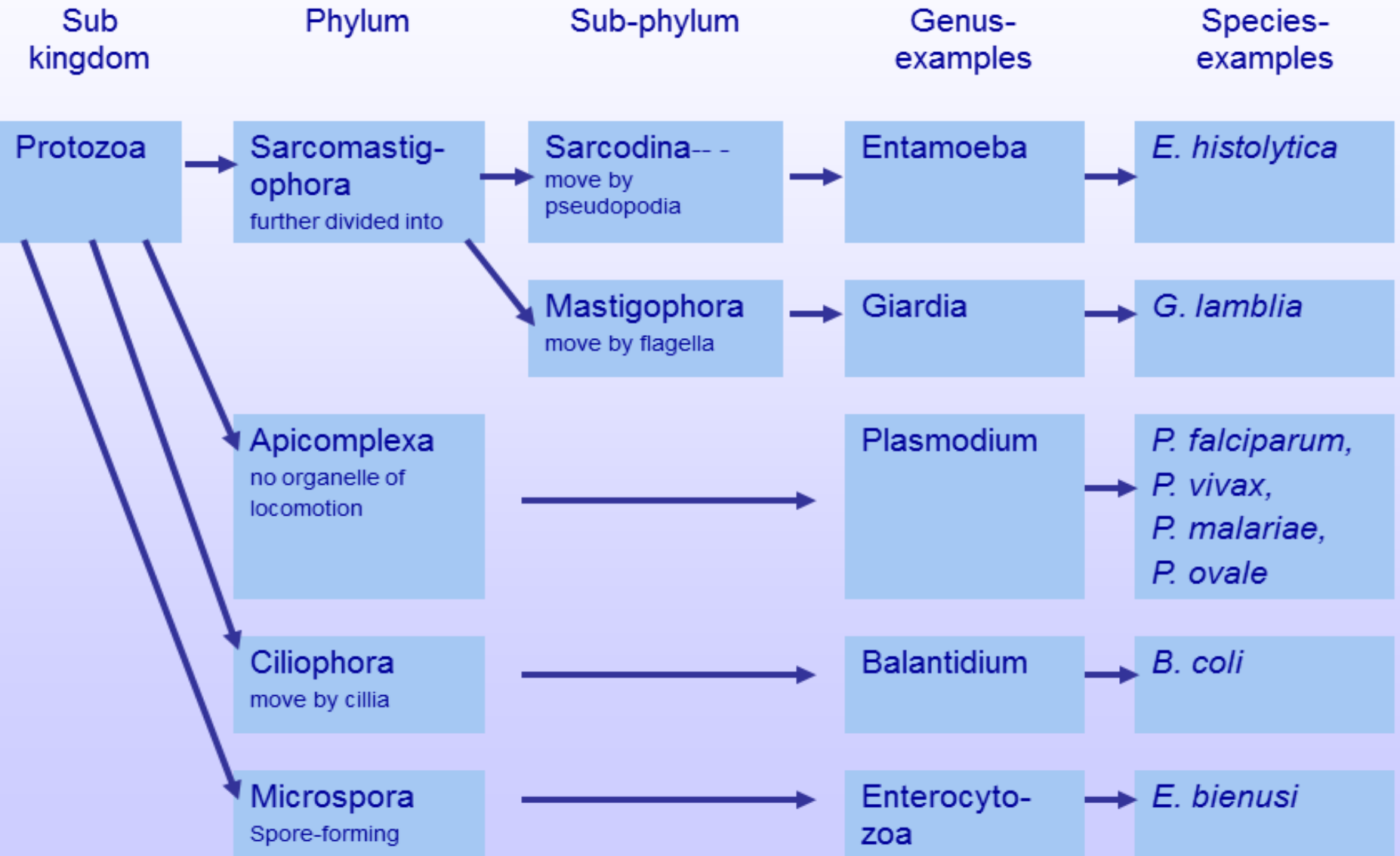
- 1) **Types of the parasites** :- which classified into three major groups ( protozoa, helminths and arthropods).
- 2) **Life cycle**:- how the parasite developed (parasite stages, sexual and asexual reproduction).
- 3) **Pathogenesis**: how the parasite establish the infection in/ on the host, rout of transmission...ect
- 4) **Clinical sings**: the symptom appear due to parasitic infection.
- 5) **Diagnosis**: how to identified the parasite ( type of specimen, lab diagnosis.....ect).
- 6) **Treatment** : control and prevention.

## Pathogenesis and symptomatology

- Pathogen:- is a parasite that causes disease
- Pathogenicity :- is the ability of the pathogen to produce a disease
- Infection :- is the establishment of pathogen in its host after invasion
- Virulence :- is the degree or intensity of pathogenicity
- Infectivity :- is the ability to secrete toxin
  
- ❖ **Symptoms:** They are the manifestation of pathological processes
- ❖ **Zoonosis** :- are diseases which naturally transmitted from animals to human and vice versa



# Taxonomic classification of protozoa



# Examples of important metazoa – intestinal nematodes

