

# Parasitology

*Dr. Abdulmohsin Hameed Jassim*

*3<sup>rd</sup> stage*

*lec 1-2*

Parasitology / study of symbiosis (living together)

Symbiosis / close association between two different organism living together, either continuous or at interval in which one or both of them become so modified that is (are) unable to obtain food except in close association with the other member.

\_\_\_ Commonly one of them live in or on the body of another perhaps primarily for food getting on the part of one or both member of the group.

-it also involves protection or other advantages to one or both partners. The symbionts are of different species.

## Types of symbiosis:

1) Mutualism / type of symbiosis in which both of symbiont (partners, host and parasite) benefit from the association.

The mutualism is usually obligatory, that one mutual can't survive without the other.

E.g. termites and their intestinal protistan fauna.

= termites can't digest cellulose because they can't synthesize and secrete enzyme cellulase.

The myriad flagellates in termites intestine synthesize **cellulase** and consequently digest the wood eaten by the host. The termites which use molecules excreted as by-products of the flagellates' metabolism. If we kill the flagellates. the termites starve to death even if continue to eat wood.

Other example, blood sucking leeches can't digest blood but their intestinal bacteria do the digestion for the host.

2) **Commensalism** (eating at the same table) / kind of symbiosis in which one symbiont, the commensal, benefits, and other symbiont, the host, is neither harmed nor helped from the association, or at least not disadvantageous to the host. The commensal feeding on food (wasted) or not consumed by the host.

E.g. *Entamoeba coli*.

=live in the lumen of the host intestine feed on the Bacterial flora of the gut: the amoeba is supplied with food and protected from harm but no advantages or disadvantages occurs to the host.

+ *Entamoeba gingivalis* live in the mouth of humans feed on bacteria, food particles and dead epi. Cells, but never harm healthy tissues.

3) **Parasitism** / type of symbiosis or relationship in which one of the participants (symbiont/parasite) either harm or in some sense lives at the expense of their host.

May cause mechanical injury, e.g. boring a hole into the host or digging into the skin or other tissue, stimulate a damaging inflammatory or immune response or simply rob the host nutrition.

### **Effect of the parasite on the host:**

- Injures its host.
- By interference with vital processes of the host through the action of secretion, excretion or other products of parasite.
- Through invasion and destruction host tissue.
- Mechanical.

=*Entamoeba histolytica* erodes the intestinal wall destroying the tissue locally by means of secretion of proteolytic enzyme.

=Malarial parasites invade and multiply in RBCs, which are destroyed in the process. *Fasciolopsis buski* (trematode) may produce severe local damage to the intestinal wall by means of its powerful suckers.

= *Ascaris lumbricoides* may cause intestinal obstruction if present in large numbers or invade and obstruct appendix, bile duct and other tubes. Hookworms suck blood and cause anemia.

### **Effect of the host on parasite:**

1- **Genetic constitution of the host** may profoundly influence the host-parasite relationship.

E.g. Racial variation in resistance to *plasmodium vivax* (malaria) which is related to the presence or absence of the Duffy blood group, also (e.g):sickle Cell trait (inherited characteristic).

2-**Diet or nutritional status of the host:**

+High protein diet is unfavorable for development many intestinal protozoa.

+Low protein diet favor the appearance of symptoms of amoebiasis

+Carbohydrate-rich diet favors the development of certain tapeworms

+General nutritional status of the host important in both determining whether a particular infection will be accompanied by symptoms and influencing their severity if present.

+Major nutritional disturbances may influence resistance through their effect on the immune mechanism of the host.

3-**Immune processes :**

Natural resistance to infection as in certain strain of malarial parasite, the resistance may be a racial phenomenon (Natural resistance)

Acquired immunity can be demonstrated in many parasitic diseases but absolute immunity to reinfection rarely following protozoal infection and probably never with helminth infection in man.

Primary infection with *Leishmania* seems to confer a degree of immunity to reinfection. Many protozoal and helminthic infections stimulate resistance

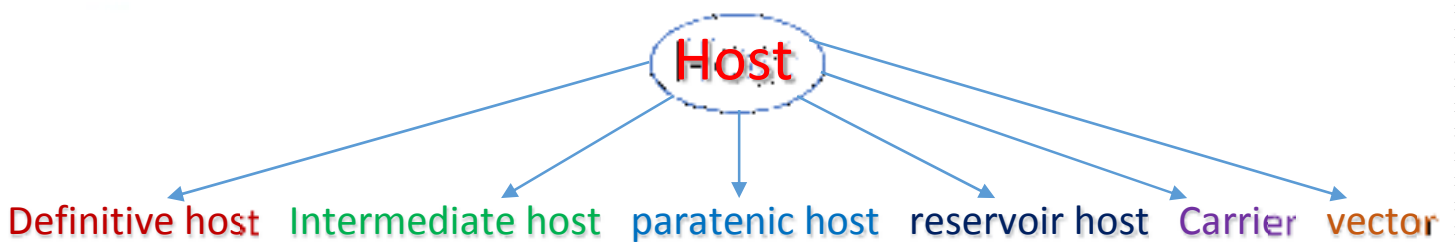
while the parasite is still in the body. This resistance to hyperinfection, known as premonition which is of great importance in endemic areas in limiting the extend of infection with **plasmodia, hookworm**, and others.

**Acquired immunity** modifying the severity of disease in endemic area (Malaria, Schistosomiasis, filariasis). In infants born in such areas to a semi-immune parent are at birth, and for some time thereafter, partially protected by maternal antibodies acquired transplacentally or the disease is less severe. Repeated infection keep acquired immunity at a high level and symptoms correspondingly mild, but no immunity if the host leaves the endemic areas.

**Host**/ an organism which carries the parasite or an organism in or on which the parasite lives.

**Parasite** / an organism lives in or on, and at the expanse of, another organism.

Or an organism which adapts itself to live in or on another organism(the host)



**Definitive host:** host in which parasite achieves sexual maturity (sexual reproduction of parasite occur). Or host at which adult or final stage of parasite develop or sexual reproduction occur.

**Intermediate host:** host in which intermediate or larval stage of parasite develops or asexual reproductions occur.

**paratenic host** (transport host): is one in which parasite is transported and neither gains nor lose its infectivity for its definitive host. The parasite doesn't undergo any development but in which it remains alive and infective to another host (may be another paratenic host or definitive host).

**reservoir host:** any animal species that harbors an infection that can be transmitted to the human.

The parasite depends on the animal for its survival in nature thus serves as source of infection for other susceptible host including man.

It is essential host for maintains the infection when active transmission is not occurring.

**Carrier:** Host transmits the pathogen to other host yet himself, show no related signs and symptoms.

**Vector:** transmitters of parasites from host to host, usually it is invertebrate animal. Two type of vector=

- a) **Mechanical vector/** a vector that conveys pathogens to a susceptible host without essential biological development or multiplication of pathogens in the vector. (*E. histolytica* and house fly). **Not essential to life cycle of the agent( the parasite).**
- b) **Biological vector/** a vector in which the agent multiplies or/and develops before being transmitted to another host (malaria and anopheles' mosquito) **(essential to lifecycle of the parasite)**

**Infestation/** presence of arthropods on or in the surface 'skin' of the body.

**Ectoparasite/** organism that live in or on the skin of their host. (lice, tick, mange)

**Endoparasite/** organism live inside the body tissues or organs.

**Infection/** the relationship between Endoparasite and their host.

**Obligate parasite/** parasite that must always live in contact with their host.

It's entirely dependent on their host. (all or part of time)

**Facultative parasite/** parasite that are capable of living either free or in or on host.

Accidental or incidental parasite/ the parasite that enters or attaches to the body of the species of host different from normal one.

Spurious parasite/ organism that **parasitize** other host passing through the human intestine and are detected in Stool after ingestion, not true infection. (ingestion of animal liver containing *capillaria*)

Zoonthronosis/ zoonosis that normally maintained by human but can transmit to other vertebrate.

Zoonosis/ disease of animals that normally maintained by animals but can be transmitted to human (*Cryptosporidium*). May be a common or incidental occurrence.

Athropozoonosis/ zoonosis maintained in the nature by animals and transmitted to the human.

Pathogens/ organism that cause injury to their host or produce a disease state.

Pathogenesis/ the development of pathological damage or lesion either by mechanical effect, lytic (enzyme), toxic or allergenic in nature.

Mode of infection/ it the route of entrance of the parasite into host (orally, through skin, .....).

*Th*

*e pathogenesis depends on:*

- 1) Potential virulence of the agent.
- 2) Amount of inoculum.
- 3) Rapidity with which the parasite multiply in the host tissue.
- 4) Site of inoculation.
- 5) Single or repeated infection.
- 6) Tolerance or resistance of the host to particular strain of the agent.
- 7) General threshold of resistance of the host.
- 8) Secondary bacterial contamination.

**Symptom/** the manifestation of the pathological processes resulting from the effect of the agent.

**Out break/** the occurrence of disease among people in a community from single source.

**Host specificity/** degree to which a parasite is able to mature or develop in more than one host species.

If parasite infect only one host is called **highly specific parasite.**

if parasite infect number of different host is called **less specific parasite.**

**incubation period/** time span from introduction of the disease causing organism until symptoms occur.

**Prepatent period/** time between infection of the host and beginning of egg production or other diagnostic stage.

**Endemic disease/** disease present in a localized community or area at all time.

**Epidemic disease/** disease that spread rapidly and infect many people in community of area, usually within short time frame.

### Host parasite relationship:

- The host/
  - 1) bigger than the parasite
  - 2) provide nutrition for the parasite
  - 3) susceptible to infection with parasite
  - 4) has ability to produce immune response
- the parasite/
  - 1) has high reproductive ability

2) Has ability of infection and transmitting the disease

3) Has pathogenic ability

The outcome of the host-parasite relationship depend on:

1) Specificity (low or high)

2) Duration of the infection (short or long)

3) Interaction (mechanical or molecular, Ab)

## Classification of parasites:

The parasite classified according to;

1) Morphological features.

2) Type of life cycle

3) Biochemical analysis

4) DNA and RNA (genetic analysis)

-the parasite classified in 4 major groups;

1) protozoa

2) helminths (worms).

a- cestodes (tapeworms)

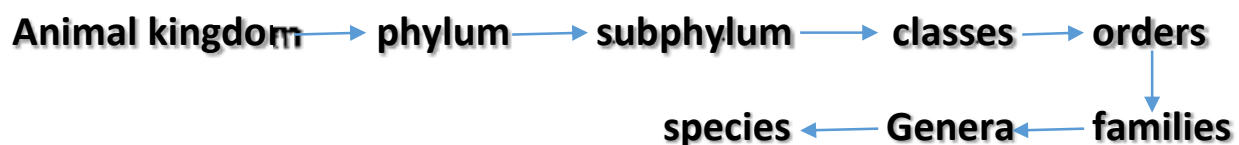
b-trematodes (flukes)

c-nematode (round worms)

3)Arthropods

4)Molluscs (snails)

These groups are arranged in;





species/ the member of which have essentially the same genetic characters and are capable of continued reproduction of their kind but can't interbreed with individual of other species.

Genera/ is a group of closely related species.

## diagnosis of parasitic disease

- 1- non-specific diagnosis depends on clinical pictures of the disease (symptoms and signs) ( suspected diagnosis)
- 2- specific diagnosis depend on recovery of diagnostic stages of stool, urine, CSF, blood, tissue biopsy, skin scrap, adult stool sputum , lymphnode aspirate.( definitive diagnosis)
- 3- serological test ( detection of antibodies in serum)
- 4-DNA and RNA technique

### **Epidemiological classification of parasites diseases:**

- 1- filth- borne or contaminative  
e.g. intestinal protozoa , sarcoptic mange, lice)
- 2- contracted from soil or water (ingestion of infective stage ( ***Ascaris*** , ***Trichuris***) or through skin as with infective larvae of hook worm or blood flukes and ***Strongyloides stercoralis***.)
- 3- food-borne infection contracted:
  - a-from rows meat or fish , ***Trichinella*** in pork , fish tapeworm. .
  - b- ingestion of encysted larvae in aquatic plants as in sheep liver fluke.
- 4-arthropod-borne infection (vector , as in malaria and anopheles, sand fly and ***Leishmania***)
- 5- infestation with arthropods ( myiasis)
- 6-arthropods evenomation : (spiders , scorpions)

done by; Hassan alkabi

