

Introduction To Parasitology

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❖ **Medical Parasitology:**

It is the science which deals with the parasites that infect man.

❖ **Parasite:**

Is an organism, which lives **on or **within** another organism (**host**) for survival.**

❖ **Host:**

Is a living organism that harbours the parasite.

- *Parasitic kingdom include three phyla*
- **I- Protozoa. II- Helminths. III- Arthropods.**
- **I- Protozoa:**
- Is a phylum of the animal kingdom consisting of unicellular parasites, divided into 4 classes according to the organ of locomotion:
- **1- Class sarcodina:** Parasites that move by means of pseudopodia example *Entamoeba histolytica*.
- **2-Class mastigophora :** Parasites that move by means of flagella example *Giardia lamblia*
- **3- Class ciliates :** parasites that move by means of cilia example *Balantidium coli* .
- **4- Class Sporozoa :** parasites have both sexual and asexual reproductive organs, all these parasites are intracellular and they have no organ of locomotion example Plasmodium parasites causing malaria.

- **II- Helminths:**
- They are metazoa (Multicellular parasite) wormlike parasite, divided into 3 classes:
- **1.Class Nematoda (Roundworms) :**
- **a-** Intestinal nematodes, e.g, *Ascaris lumbricoides* .
- **b-** Tissue nematodes, e.g, *Wuchereria bancrofti* .
- **2- Class Cestoda (Tapeworms) :**
- They are flattened and segmented worms e.g:
Taenia saginata .
- **3- Class Trematoda (Flukes):**
- They are flattened leaf- shaped worms e.g:
Schistosoma heamatobium.

- **III- Arthropods :**
- These parasites having exoskeleton and jointed legs, divided into 2 classes:
- **1- Class Insecta** :e.g. Mosquitoes, lice and fleas .
- **2- Class Arachnida** :e.g. Ticks and mites .

Types of parasite

1- Ectoparasite: A parasite that lives on the surface of the host (infestation).

Ex : Lice) القمل

2- Endoparasite: A parasite that lives inside the body of its host (infection).

Entamoeba Histolytica

3- Obligatory parasite: A parasite that is completely dependent upon a host for its survival.

4- Facultative parasite: A parasite that is capable of living both freely and as a parasite.

5- Permanent parasite: A parasite that spends its life cycle on or in the body of its host.

6- Temporary or Intermittent parasite: A parasite that visits its host only for a short period of time for its meal.

7- Opportunistic parasite: A parasite that causes disease **only in immunodeficient patients** (AIDS, cancer patients), while in **immunocompetent** individuals, the parasite may exist in a latent form producing no or mild symptoms.

8- Coprozoic or spurious parasite: An organism that passes through the human intestine without causing any disease and is detected in the stool after ingestion.

Types of hosts

- **1- Definitive host (D.H):** It is the host which harbours the **mature adult stage** of the parasite or in which sexual reproduction of the parasite takes place.
 - Ex : man in case of Taenia
- **2- Reservoir host (R.H):** The host which harbours the parasite and considered the source of human infection as
- Dog in case of kala – azar (الحمى السوداء) which is caused by the parasite (Leishmaniadonovani) .. It acts also as a source of infection to man and maintains the parasite in nature.

Types of hosts

- **3- Intermediate host (I.H):** It is the host which harbours **larval stage** (immature or non-sexually reproducing forms of the parasites).
 - Ex : Snail in case of Bilharzia .
 - القوقع
- **4 Accidental host:** The host which harbours the parasite which is not normally found .
 - Ex : the Toxo cara (dog nematode)) **الديدان الخيطية** in man

❖ **The relationship between the organism and its host occurs in the following forms:-**

1- Commensalism: It is a relationship between two living organisms where one gets benefit (commensal), while the other (host) is not harmed. (Entamoeba coli)

2- Parasitism: It is a relationship between two living organisms where one gets benefit (parasite), while the other (host) is harmed.

3- Mutualism: It is a beneficial relationship between two living organisms where both derive a benefit and can successfully live apart.

4- Symbiosis: It is a close and long term beneficial relationship between two living organisms where both derive a benefit and cannot live apart.

❖ Modes of transmission of parasitic infection:-

- 1- **Direct contact** through the skin.
- 2- **Penetration of the skin.**
- 3- **Ingestion of contaminated food or drinking water** containing the infective stage of the parasite.
- 4- **Inhalation of dust** carrying the infective stage of parasite.
- 5- **Congenital** from mother to foetus (transplacental) or may be **transmammary** (mother`s milk).

6- Sexual contact.

7- Autoinfection (either external or internal).

**8- Vectors, through bite or feces of infected vector or
by swallowing the vector.**

**9- Blood transfusion or through contaminated
syringes.**

10- Organ transplantation.

Terms used in parasitology

- **Habitat:** The natural site where the parasite lives.
- **Carrier:** A host in a state of equilibrium with parasite **without or with minimal symptoms** of the disease, but he is **infective to others.**
- **Zoonosis:** Transmission of an infection from animal to man either **directly or indirectly via intermediate** host e.g. viruses transmitted by arthropod vectors (arbovirus).

➤ **Infective stage (I.S):** The stage by which the infection takes place.

➤ **Diagnostic stage (D.S):** The stage by which we can diagnose the parasitic infection (disease).

Medical parasitology is classified into

Medical helminthology

Medical protozoology

Deals with parasitic worms

Deals with unicellular parasites

**1-Phylum :
Platyhelminthes
(flat worms)**

**2-Phylum :
Nemathelminthes
(round worms)**

➤ **Class: Trematoda**
➤ **Class: Cestoidea**

➤ **Class: Nematoda**

1-Class: Rhizopoda:

(move by pseudopodia)

2- Class: Ciliata

(move by cilia)

3-Class: Zoomastigophora

(move by flagellae)

4-Class: Sporozoa

(move by gliding movement)

Pathogenesis of parasitic infection

❖ Occurs through the following:-

1) **Mechanical:** The parasite may obstruct normal passage like intestine or bile tract.

2) **Traumatic :-**

✓ **External** due to invasion of the skin.

✓ **Internal** by attachment to intestinal mucosa by buccal capsule producing ulcers.

3) **Toxin production:** Circulation of parasitic products (toxins and waste products).

4) **Tissue damage and necrosis:** Due to enzymes secreted by parasites.

5) Cellular destruction: As RBCs or RES damage.

6) Immune stimulation: Parasitic antigens produce humoral /or cellular immune response → cellular proliferation and infiltration → formation of fibrous encapsulation around parasites (ex: hepatic granuloma in *Schistosoma mansonia*).

7) Allergic reaction due to insect bites or parasitic toxins.

□ The pathogenesis of the parasite **depends on** the number, size and morphology of the parasite, its activity (movement and migration), site (habitat), specific toxin and host reaction.

Diagnosis of parasitic infection

I) Clinical diagnosis:-

Depends on the characteristic signs and symptoms related to the parasitic infection.

II) Laboratory diagnosis:-

❖ **Direct methods** (to detect the diagnostic stage):-

Microscopical examination of the tested samples (ex:

1- stool, 2- urine, 3- blood , 4- tissue biopsy, 5- sputum & 6-aspirates.

1-Stool Examination

- 1- **Must collected in clean, dry, tight fitting lid containers.**
- 2- **Macroscopic examination:** for consistency, composition, color and presence of adult parasites such as *Enterobius vermicularis*, *Taenia* segments & *Ascaris* worm.

3- Microscopic examinations:

- **Direct saline smear or iodine smear: when helminthic eggs & protozoa cyst are in large numbers.**
- **Concentration techniques: if the parasites is scanty.**
- **Permanent stained smear : for correct identification of most protozoa.**

2- Urine examination

- The urine sample is examined macro& microscopically.
- Certain parasites can be detected in urine as *Schistosoma haematobium* eggs, *Trichomonas vaginalis* trophozoites & eggs of *Enterobius vermicularis*.

3- Blood examination

- **Thin blood film:** to demonstrate the morphological features of the parasites.

- **Thick blood film:** to obtain large amount of blood which increase possibility of detecting light infection. Parasites detected in the blood are: **Malaria, *Leishmania*, Filaria & Trypanosomes.**

4-Tissue biopsy

Tissue biopsy specimens are recommended for diagnosis of a number of parasitic infections for example:

Muscle biopsy : In *Trichinella spiralis*.

Rectal biopsy : In detecting *Schistosoma ova*.

5- Sputum examination

- **Sputum is examined to detect parasites:**
 - ✓ living in the lung.
 - ✓ migrating through the lung.
 - ✓ parasites which result from rupture of cysts in the lung.
- **Parasites detected in the sputum are:** Eggs of *Paragonimus*, trophozoites of *E. histolytica*, parts of ruptured hydatid cyst & migrating larvae of *Ascaris*, *Ancylostoma* & *Strongyloides*.

6- Aspirates examination

- ❑ Cerebrospinal fluid may be used for detection of certain parasites of CNS as *Trypanosoma* spp & *Naegleria*
- ❑ Duodenal aspirates (Enterotest): for examination of duodenal contents.
 - Parasites which can be present as *Giardia lamblia*, *Strongyloides larva* & *Cryptosporidium parvum*.

The End