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 الخيطيةin 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 drive a benefit and can successfully live apart.

4- Symbiosis: It is a close and long term beneficial relationship between two living organisms where both drive 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 by 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

Deals with parasitic worms

- 1-Phylum : Platyhelminthes (flat worms)
  - ➢ Class: Trematoda
  - ➢ Class: Cestoidea
- 2-Phylum : Nemathelminthes (round worms)
  - ➢ Class: Nematoda

Medical protozoology

Deals with unicellular parasites

- 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 *Schistsoma 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 *Schistsoma* 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 & *Naeglaria***
- **Duodenal aspirates (Enterotest): for examination of duodenal contents.**

- **Parasites which can be present as *Giardia lamblia*, *Strongyloides larva* &*Cryptosporidium parvum*.**

The End