Parasitology
2nd Class

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Parasitology:- is a science that deals with interaction between parasites and their hosts. Chester S. Levine 1971 he classifies intestinal protozoa. Levin's classification provided the diagnosis and treatment of parasitic diseases.

Parasite:- is an organism living temporarily or permanently in or on another organism (host) from which is physically or physiologically dependent upon other. the term parasite refers to organisms, which belong to protozoa (i.e., Amoebas, Flagellates, Ciliates and Sporozoa). Helminthes (Nematodes, Cestodes and Trematodes).

Classification of parasites:-

There are three major groups of clinically significant parasites:-

1- Protozoa
2- Helminthes
3- Arthropodes

Types of Parasites :-

I. According to their habitat:

a. Ectoparasites*:* parasites living on or affecting the skin surface of the host. e.g. lice, tick, etc.

b. Endoparasites: Parasites living within the body of the host. e.g. *Leishmania* species, *Ascaris lumbricoides, etc.*

According to their dependence on the host:

1. Permanent (obligate) parasites: The parasite depends completely upon its host for metabolites, shelter, and transportation. This parasite cannot live outside its host. e.g. *Plasmodium* species, *Trichomonas vaginalis,* etc.

2. Temporary (facultative) parasite: The parasite is capable of independent existence in addition to parasitic life. e.g. *Strongyloides stercoralis, Naegleria fowleri,* etc.

Types of Hosts:-

1. **Definitive host:-** Depending on the parasitic species, it is either a host which harbors the adult stage of a parasite or most highly developed form of the parasite occurs; or sexually mature stages of a parasite and fertilization takes place in it, e.g., human is the definitive host for trypanosomes.

2. Intermediate host:- Is a host harboring immature or larval stage of a parasite and in which no fertilization takes place in it. e.g. Cow is the intermediate host for *Taenia saginata.*

3. Reservoir host:- A wild or domestic animal which harbors a parasite and acts as sources of infection to humans.

4. Carrier host:- A host harboring and disseminating a parasite but exhibiting no clinical sign.

5. Accidental (Incidental) host:- Host that harbors an organism that usually does not infect it.

6. Vector: is usually an arthropod that transmits the parasite to its host.

Host – Parasite relationships:-

Host-parasite relationships are of following types:-

1- **Symbiosis**
An association in which a close and prolonged association between two organisms (host and parasite) of different species that one cannot live without the help of the other.

2- **Commensalism**
An association in which only parasite derives benefit without causing any injury to the host.

3- **Mutualism**
an association in which mutually beneficial interactions between members of the same or different species both members benefit from the relationship.

4- Parasitism

is a close relationship between species, where one organism (the parasite) lives on or inside another organism (the host) causing it some harm, and is adapted structurally to this way of life.

Sources of Parasitic Infections

A. Contaminated soil:- Soils polluted with human excreta is commonly responsible for exposure to infection with *Ascaris lumbricoides, Strongyloides stercoralis, Trichuris trichiura* and hook worms.

B. Contaminated water:- Water may contain
(a) Viable cysts of Amoeba, flagellates.
(b) Cercarial stages of human blood fluke.

C. Insufficiently cooked meat of pork and beef which contains infective stage of the parasite. *e.g., Trichinella spiralis*, *Taenia* species.

D. Blood sucking arthropods:-These are responsible for transmission of: e.g.,
1. Malaria parasites by female anopheles mosquito
2. *Leishmania* by *phlebotomus*

E. Animals (a domestic or wild animals harboring the parasite), e.g. dogs are direct sources for human infection with the Hydatid cyst caused by *Echinococcus granulosus*.
F. Sexual intercourse :- such as *Trichomonas vaginalis*
G. Autoinfection :- such as *Enterobius vermicularis*

Portal of parasitic entry into the body:-

1- Mouth:- This mode of transmission is referred to as faecal – oral route, such as *Entamoeba histolytica*, *Enterobius vermicularis*,…..etc.

2- Skin:- Some parasites can enter directly through the skin like *Ancylostoma duodenale*, others are transmitted by insect bites such as *Plasmodium* spp.

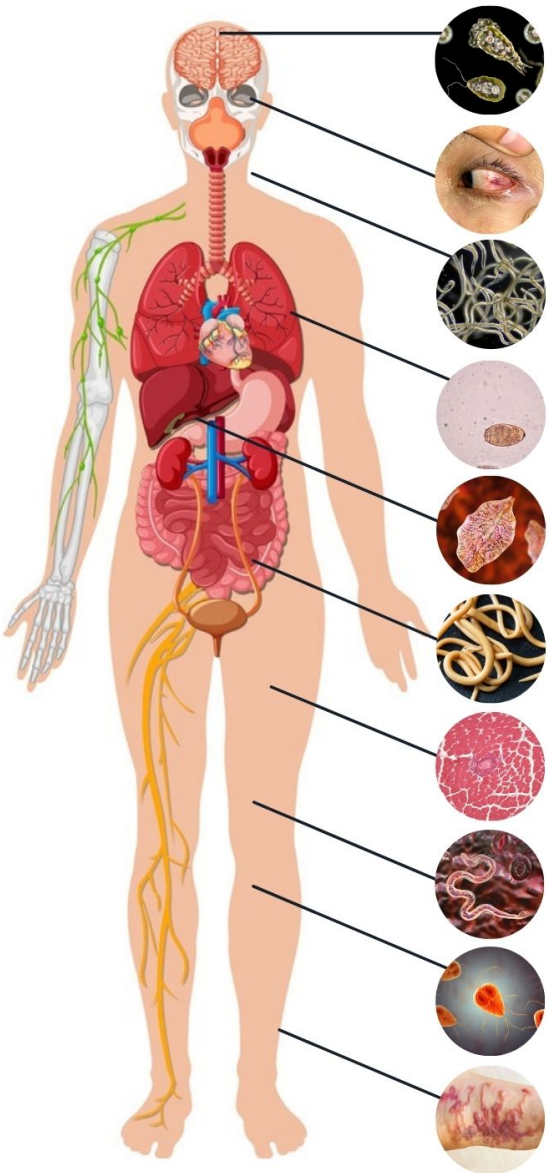
3- Sexual contact:- such as *Trichomonas vaginalis*.

4- Congenital:- transmitted from mother to fetus transplacentally like *Toxoplasma gondii.*

5- Inhalation:- airborne eggs of *Enterobius vermicularis* may be inhaled and leading to infection.

WHERE CAN PARASITES LIVE IN THE HUMAN BODY,

AND WHAT BODY PARTS THEY CAN INFECT



BRAIN
BRAIN-EATING AMOEBA INFECTION, CAUSED BY PARASITE NAEGLERIA FOWLERI

EYES
OCULAR LARVA MIGRANS IN EYE

LYMPH
NEMATODES OF THE FAMILY FILARIODIDEA CAUSE LYMPHATIC FILARIASIS

LUNGS
PARAGONIMUS WESTERMANI EGG - THE MAJOR SPECIES OF LUNG FLUKE THAT INFECTS HUMANS, CAUSING PARAGONIMIASIS

LIVER
LIVER FLUKES CAN CAUSE LIVER AND BILE DUCT DISEASE

INTESTINES
DIFFERENT TYPES OF PARASITES LIVE MOSTLY IN THE INTESTINES, ESPECIALLY IN THE SMALL INTESTINE

MUSCLES
TRICHINELLA SPIRALIS LARVAE IN MUSCLE TISSUE

BLOOD
BRUGIA MALAYI IN BLOOD

JOINTS
GIARDIA INFECTION MAY LEAD TO ARTHRITIS

SKIN
CUTANEOUS LARVA MIGRANS AT FOOT

Reproduction of Parasites:-

Human parasites have many forms of reproduction such as:

1- Asexual reproduction by cell duplication:-With this form, an individual will duplicate itself into two new individuals, this form of reproduction is common in protozoan parasites such as flagellates, amoeba, malaria,..etc.

2- Sexual reproduction: is a form of reproduction performed by mating between males and females such as roundworms, hookworms, pinworms,...etc.

Types of life cycle:-

1- The direct life cycle:- a life cycle in which a parasite is transmitted directly from one host to the next without an intermediate host or vector of another species.

2- The indirect life cycle:- parasites with indirect life cycles are characterized by two host stages, which require a definitive host and an intermediate host.

Specimens for laboratory diagnosis:-

1- Stool :-

Examination of stool is important for the diagnosis of intestinal parasitic infections in which trophozoites and cysts stages for many protozoa such as *Entamoeba histolytica* and *Giardia lamblia* can be demonstrated in wet mount of stool and helminthic infections of the biliary tract in which infections eggs, larvae and adult worms may be demonstrated.

2- Blood:-

In those parasitic infections, where the parasite itself, or in any stage of its development, circulates in the blood stream, the examination of thick and thin blood film forms specific diagnosis for many parasites such as *Plasmodium* spp. inside the erythrocytes and *Leishmania donovani* inside monocytes.

3- Urine:-

When the parasites localizes in the urinary tract, the examination of urine is useful diagnosis such as eggs of *Schistosoma haematobium* and trophozoites of *Trichomonas vaginalis*.

4- Genital specimens:-

Trophozoites of *Trichomonas vaginalis* may be demonstrated in the vaginal and urethral discharge and in the prostatic secretions.

5- Sputum:-

Eggs of *Paragonimus westermani* may be demonstrated in the sputum specimen and trophozoites of *Entamoeba histolytica* may be found in the sputum.

6- Tissue biopsy and aspiration:-

There are more than one parasite can be demonstrated here such as aspiration of spleen for demonstration of amastigote form of *Leishmania donovani* and aspiration of duodenum may be demonstrated trophozoites of *Giardia lamblia*.

Control and prevention:-

Control and prevention of parasitic disease depends on an adequate knowledge of interactions among factors such as human behavior, the environment, and the life cycles of parasites. The main determinants are poverty, low educational level, deficiencies in home technologies, high demographic density, and ruralism.