Topic-Interaction between parasites in human body

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Introduction to Parasites

INTRODUCTION

- A parasite is an organism that lives on or inside another organism to the detriment of the host organism

- The study of parasites is called **Parasitology.**

PARASITISM

- A form of symbiosis in which one organism (called parasite) benefits at the expense of another organism usually of different species(called host).

Facultative parasite: parasites able to live both free living and parasite living e.g. Strongyloides species.

Obligate parasite: parasite living permanently in a host and cannot live without a host e.g.

Trichomonas species.

Coprozoic (spurious) parasites: foreign, pass through alimentally canal without affect.
Temporary Bed
bug visiting man for a blood meal.
Permanent : lice

Hyperparasitism

Aberrant *Toxocara canis (a dog*
parasite) in man.
Ectoparasite

Endoparasite

Facultative : Strongyloides stercoralis.

Clinical Parasitology: deals with animal parasites of man and their medical importance.

- Opportunistic
- Zoonotic
- Parasites are different from predators and parasitoids (which also derive benefits from certain interspecific interactions while harming the other participant) in that the host of a parasite is not necessarily killed. Instead, parasites derive benefits from their hosts,most often nutritional resources and shelter, over a longer period of time. It is in fact advantageous to parasites if they do not harm their hosts too badly, because that prolongs the period during which parasites can obtain benefits from hosts. However, in some cases, the impact of parasites on a host is great enough to cause disease, and in extreme cases, the death of the host may also occur (

ECOLOGICAL RELATIONSHIPS

SYMBIOSIS: neutral, antagonistic or synergistic relationship between two dissimilar organisms (SYMBIOTES, SYMBIONTS) living in close association with each other;

MUTUALISM (+/+): mutually beneficial relationship between two species

COMMENSALISM (+/0): relationship between two species in which one is benefited and the other is not affected, neither negatively nor positively

PARASITISM (+/-): relationship between two species in which one benefits (**parasite**) from the other (**host**); usually involves detriment to the host

MICROBIAL FLORA OF THE NORMAL HUMAN BODY (A.K.A., NORMAL FLORA)

SKIN

RESPIRATORY TRACT

Nose and Nasopharynx; Mouth and Oropharynx

EYE (Conjunctivae) and **OUTER EAR**

INTESTINAL TRACT

Stomach and Small Intestine; Large Intestine;

Intestinal Tract of Newborn

Antibiotic Alteration of Flora

Significance of Intestinal Flora

GENITOURINARY TRACT

External Genitalia & Anterior Urethra

Vagina

BLOOD and TISSUES

NORMALLY STERILE SITES IN THE HUMAN BODY

Colonization of one of these sites generally involves a defect or breach in the natural defenses that creates a portal of entry

Brain; Central nervous system
Blood; Tissues; Organ systems
Sinuses; Inner and Middle Ear
Lower Respiratory Tract: Larynx; Trachea; Bronchioles (bronchi); Lungs; Alveoli
Kidneys; Ureters; Urinary Bladder; Posterior Urethra
Uterus; Endometrium (Inner mucous membrane of uterus);
Fallopian Tubes; Cervix and Endocervix

FACTORS CONTROLLING GROWTH OF MICROORGANISMS

1. **NUTRIENT AVAILABILITY:** the accessibility of a necessary resource, substance or compound providing nourishment to maintain life, i.e. capable of conversion to energy and structural building blocks

Fastidious: an organism that has complex nutritional or cultural requirements, making isolation and culture more difficult

MAJOR ESSENTIAL ELEMENTS:

C, O, H, N, S, P, K, Mg, Ca, Fe, Na, Cl

MINOR ESSENTIAL ELEMENTS:

Zn, Mn, Mo, Se, Co, Cu, Ni, W

2. PHYSICO/ENVIRONMENTAL PARAMETERS:

WATER ACTIVITY/OSMOTIC PRESSURE:

Water activity (a_w): represents the available water

Osmotic pressure (p): expressed in atmospheres; reflects the concentration of solute in an aqueous solution

OXYGEN: metabolic oxygen requirements; **OBLIGATE** or **FACULTATIVE**, **ANAEROBIC** or **AEROBIC**, or in between, (**MICROAEROPHILIC)**

pH: power of hydrogen; a measurement of the amount of hydrogen ion in solution; the logarithm of the reciprocal of the hydrogen ion concentration in an aqueous solution used to express its acidity or alkalinity (0-14)

TEMPERATURE:

Psycrophile (psychrophilic): liking cold temperatures; Optimal growth at 15º to 20ºC

Mesophile (mesophilic): liking moderate temperatures; Optimal growth at 20º to 45ºC

Thermophile (thermophilic): liking elevated temperatures; Optimal growth at 50º to 70ºC

3. **COMPETITION:** the simultaneous demand by two or more organisms or species for a necessary, common resource or physical space that is in limited or potentially limited supply, resulting in a struggle for survival

4. **HOST IMMUNE SYSTEM:** the cells and tissues involved in recognizing and attacking foreign substances in the body

Parasitology

Divisions of Parasitology:

1. **Protozoa**
   2. Helminthes
   a. Roundworms (nematodes)
   b. Flatworms – Cestodes (tapeworm)
   Trematoda (fluke)

- **Parasitism:**

organism depend upon another for living, one is living at the expense of the other and harmful, called Parasite, the other organism is called Host.

- **Host:** organism harboring the parasite species may be affected or not.

- **Classification of Hosts:**

  1-Definitive host:

  harbors the adults or final stages or sexual stages (♂♀) in the development of parasite ex: man.

- man is DH for *Schistosoma haematobium, while female Anopheles mosquito is DH for Plasmodium species* (malaria parasites).

  2-Intermediate host:

  in which you have the larva stages or Inter mediate stages in the development.

- **Ex:** Taenia adult------ man
  Larva —--- cattle

- man is IH of malaria parasites. Two intermediate hosts termed 1st and 2nd IH may be needed for completion of a parasite's life cycle, e

3-RESERVOIR HOST (CARRIER):

The carrier host is well adapted to the parasite and tolerates the infection but serve as source of the infection to other organisms.(maintains the life cycle of the parasite in nature and is therefore, a reservoir source of infection for man. e.g. sheep are RH for *Fasciola hepatica.)*

4-PARATENIC HOST

Transport host in whom the parasite does not undergo any development but remains alive and infective to another host. bridge gap between the intermediate and definitive hosts. For example, dogs and pigs may carry hookworm eggs from one place to another, but the eggs do not hatch or pass through any development in thesanimals.

- Vector is an arthropod that transmits parasites from one host to another, e.g. female
- sand fly transmits *Leishmania parasites*

HOST PARASITE RELATION

- Parasites utilize nutrition from host resulting in damage
- Loss of nutrition e.g. Iron def in hookworm infestation, Vit B_{12} def in *Diphyllobothrium latum*

- Morbidity-due to tissue injury e.g. *E histolytica* dysentery, severe itch due to *Enterobius vermicularis*

- Mortality- fulminant diarrhea due to *Cryptosporidium parvum* inf & hyperinfection due to *Strongyloides stercoralis* in HIV
- Immunological mechanisms(I-IV)
- Induction of neoplastic changes

ATTRIBUTES OF HOST THAT RESIST INFECTION

- Non specific defence(physical barrier, phagocytes, complement: cell wall attack, attracts phagocytes, stimulate inflammation)

- Specific defence (INNATE AND ACQUIRED)
- Natural and artificial

- **General classification:** animal parasites are classified according tointernational code taxonomy – Each parasite belong to a:

  Kingdom
  Phylum
  Class
  Order
  Family
  Genus
  Species

  Some have further divisions to:
  Sub – order, super family, sub – species
  in classification, scientific parasitic name is of 2 parts:
  Genus name and species name. Ex: *Plasmodium Falciperum*
  Genetic name (one word): *plasmodium*
  Species name (two words): *plasmodium falciperum*.
  Genus: means group of close related species.
  Species: means population with the same genetic characters.

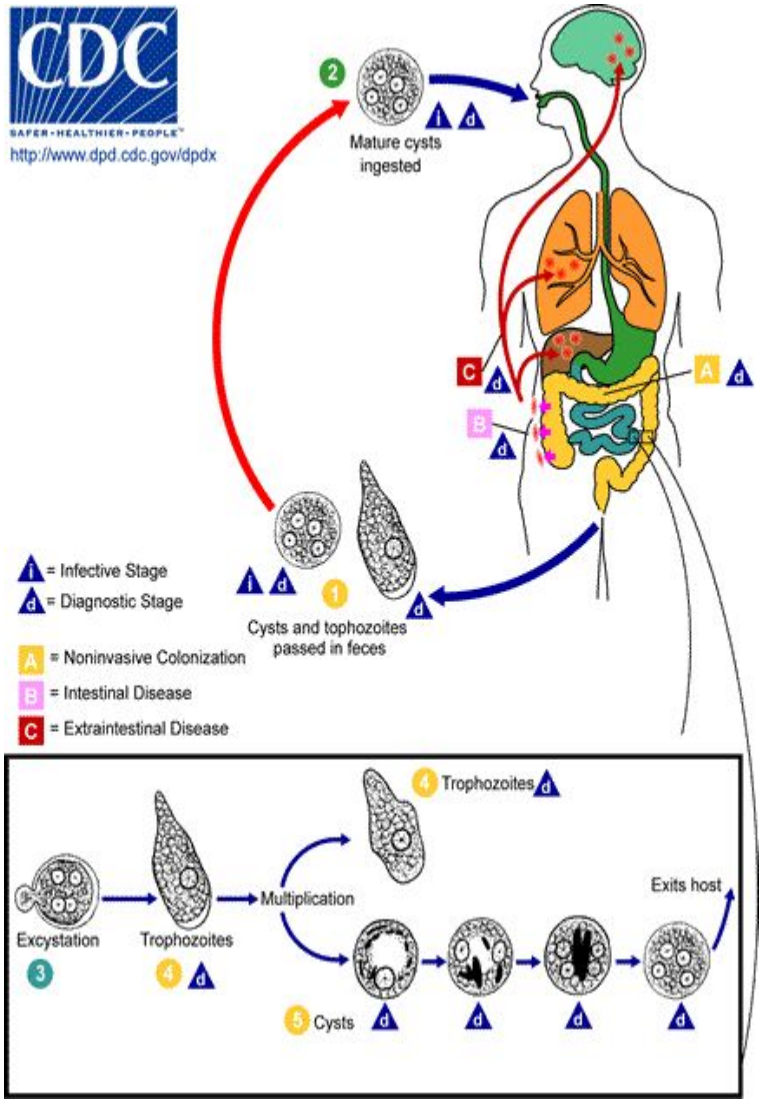
COMMON PARASITIC DISEASES

- Amoebiasis: *Entamoeba histolitica*
- Giardiasis: *Giardia lamblia*
- Leishmaniasis: *Leishmania donovani*
- Malaria: *Plasmodium falciparum*
- Hook worm: *Ancylostoma duodenale*
- Round worm: *Ascaris lumbricoides*
- Echinococcosis: *Echinococcus granulosa* (tape worm)
- Pin worm: *Enterobious vermicularis*
- Scabies: *Sarcoptes scabiei*

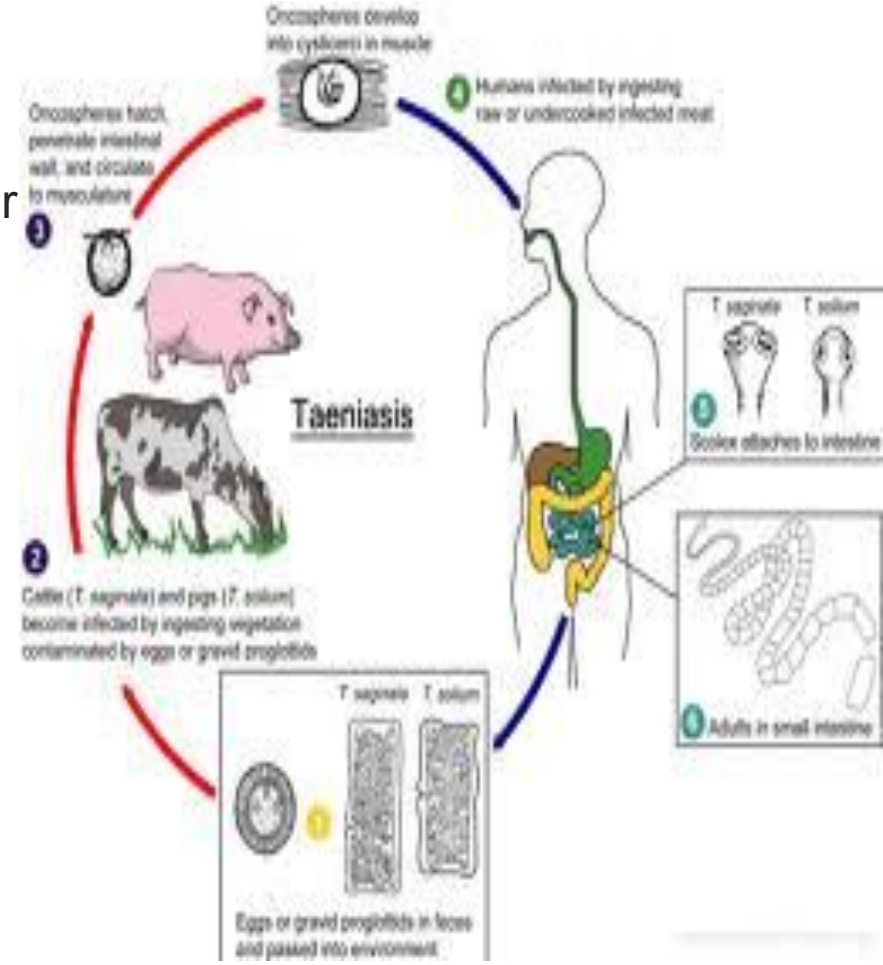
LIFE CYCLE

Direct Life cycle
Only humans are host

Infective stage like ovum, cyst, larva passed out of body that infect healthy person
Example *E histolytica*, *Giardia*, *Ascaris lumbricoides*.



- Indirect Life cycle
- Multiple hosts or involvement of vector
- Definitive host, Intermediate host
- Example *Taenia saginata* spp, *Schistosoma* spp etc



ROLE OF VECTOR

Vector, a Latin word meaning "carrier“
Imp in transmission of parasite
No direct damage by vector
The *Anopheles* mosquito transmit Malaria,
Sandfly is vectors for Leishmaniasis
Domestic cats-vector of *Toxoplasma gondii, Echinococcus granulosis*

Diagnosis of parasitic diseases depends on several laboratory methods, imaging techniques and endoscopy in addition to clinical picture and geographic location. Parasitic diseases may be presented by a wide variety of clinical manifestations according to the tissue invaded. Direct microscopy is based on detection of the parasite by examination of different specimens (stool, urine, blood, CSF and tissue biopsies).

Immunodiagnostic techniques include antigen and antibody-detection assays. Molecular-based diagnostic approaches offer great sensitivity and specificity. Recently, nanotechnology can be applied as diagnostic procedures utilizing nanodevices. Control and prevention of parasitic diseases depend on the interactions among many factors

such as the environment, the human behavior, and socio-cultural factors that determine transmission and persistence of parasites.

THANK YOU