

# 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. *Trichomonos* species.

**Coprozic (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 (

# Parasitology

## Divisions of Parasitology:

1. Protozoa
2. Helminthes
  - a. Roundworms (nematodes)
  - b. Flatworms – Cestodes (tapeworm)  
Trematode (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 Intermediate 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 the animals .

- 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<sub>12</sub> 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

## Relationships between organisms:

- **Symbiosis:** permanent association between two organisms
- **Mutualism:** two organisms living together, the two organisms benefit.
- **Commensalism:** Two organisms Living together, one is benefited and the other is not been affected.
- When the other organism become affected, then the relationship turns = **Parasitism.**
- **Zoonosis:** disease of animals but can be transmitted to a man. Ex: *Hymenolepis nana*.

# Classification of parasites

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

- **Kingdom**

- **Phylum**

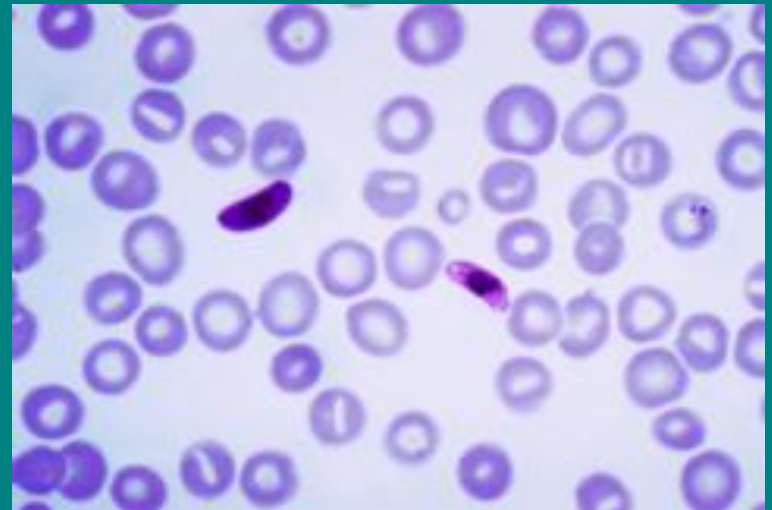
- **Class**

- **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.

# Classification of parasites

## Parasites

```
graph TD; Parasites --> Protozoa; Parasites --> Helminthes; Protozoa --> Intestinal; Protozoa --> Urogenital; Protozoa --> Blood_and_tissue[Blood and tissue]; Helminthes --> Cestodes; Helminthes --> Trematodes; Helminthes --> Nematodes;
```

Protozoa

Helminthes

Intestinal

Urogenital

Blood and  
tissue

Cestodes

Trematodes

Nematodes

# Protozoa

```
graph TD; A[Protozoa] --> B[Intestinal]; A --> C[Blood and tissue]; A --> D[Urogenital tract]; B --> B1[Entamoeba histolytica]; B --> B2[Giardia lamblia]; B --> B3[Cryptosporidium]; C --> C1[Malaria]; C --> C2[Toxoplasma]; C --> C3[Trypanosoma]; C --> C4[Leishmania]; D --> D1[Trichomonas vaginalis];
```

Intestinal

*Entamoeba histolytica*  
*Giardia lamblia*  
*Cryptosporidium*

Blood and tissue

Malaria  
Toxoplasma  
Trypanosoma  
Leishmania

Urogenital tract

Trichomonas  
Vaginalis

# Protozoa

Amoeba

Pseudopodia

Flagellates

*Giardia,*  
*Leishmania,*  
*Trichomonas*

Sporozoa

Alternation of  
generation,  
*plasmodium,*  
*Toxoplasma*

Ciliates

Balantidium

# Helminthes



***Ascaris lumbricoides***  
(Roundworm)

Elongated, cylindrical,  
unsegmented,  
Coelom present, separate sexes



***Taenia saginata***

Tape like segmented,  
Alimentary absent,  
Coelom absent



**Bilharzia**  
(Schistosomiasis)

Leaf like, hermaphrodite,  
Coelom absent,



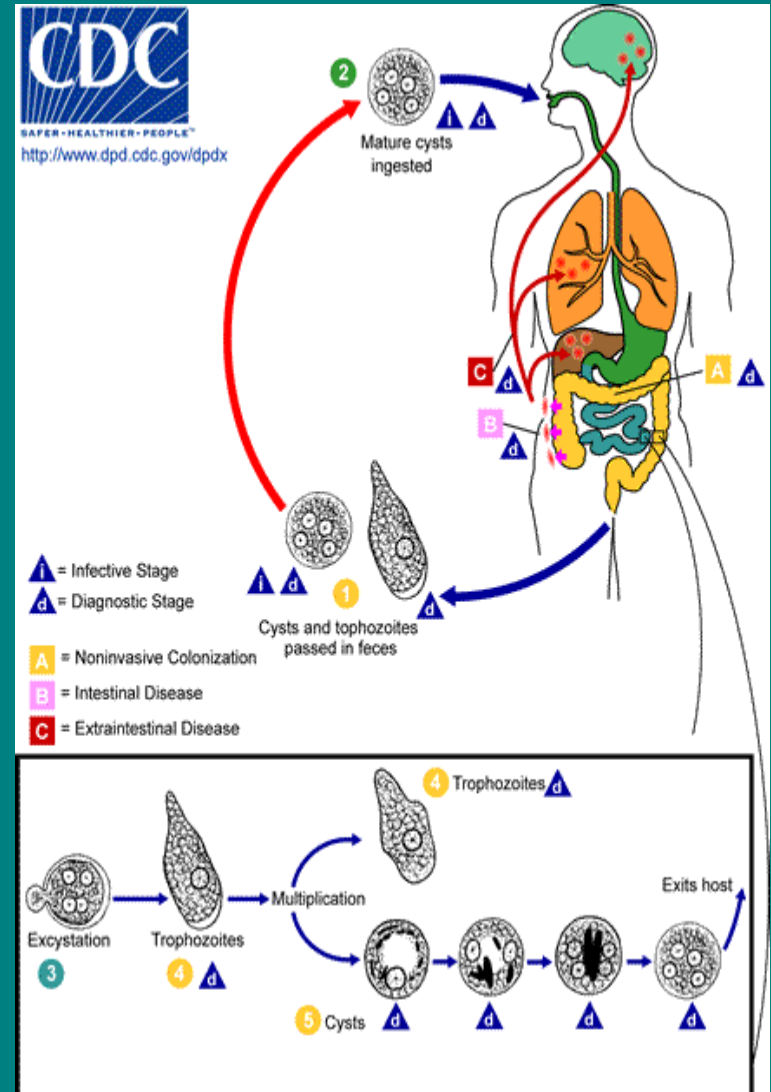
## COMMON PARASITIC DISEASES

- ❑ 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

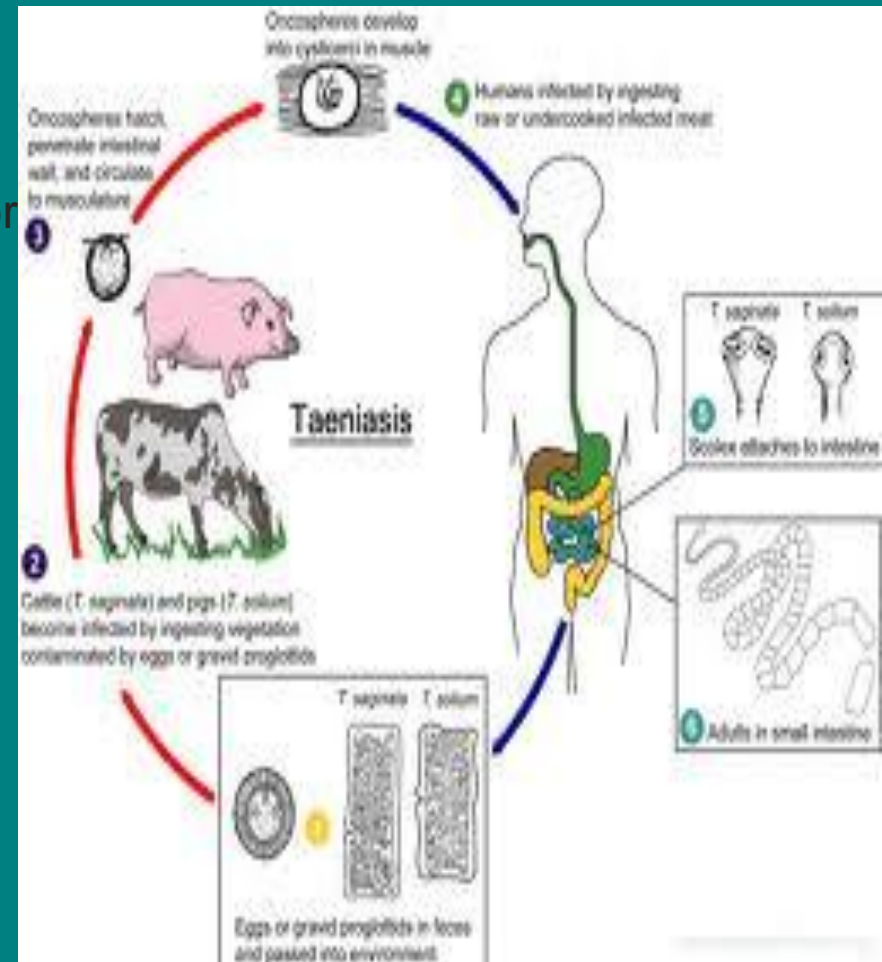
Direct Life cycle  
Only humans are host

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.