Introduction to Parasitology

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Introduction to Parasitology

Objective

Students should learn the following

- To know Parasitism as a kind of ecological relationship
- What is medical parasitology
- Components of a “parasite – host” system
- Features of parasitic diseases
- Introduction in Medical Protozoology
- Characteristics of pathogenic protozoans ?

INTRODUCTION

- Parasitism is a permanent or periodic association between two organisms of different species in which one (a parasite) lives upon or within a body of other (a host) and obtains nourishment from it.
- Medical parasitology is the science that deals with the study of organisms living in the human body (the host) their distribution, diseases they caused, and the response generated by human against them
- A parasite is a living organism, which takes its nourishment and other needs from a host ;
- The host is an organism which supports the parasite.
- The parasites included in medical parasitology are protozoa, helminthes, and some arthropods
- Parasites can be a simple unicellular Protozoa or complex multicellular Metazoa

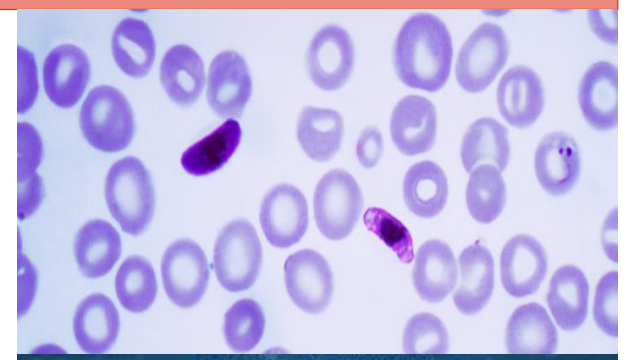
TYPES OF PARASITES

1. <u>Ectoparasite;</u> a parasitic organism that lives on the outer surface of its host, ex. Lice, ticks, mites etc.

2. <u>Endoparasites</u> parasites that live inside the body of their host e.g. *Entamoeba histolytica.*

TYPES OF PARASITES

- **3 - Obligate Parasite - This parasite is completely dependent on the host during a segment or all of its life cycle, ex. Plasmodium spp.**



- **4. Facultative parasite – an organism that exhibits both parasitic and non- parasitic modes of living and hence does not absolutely depend on the parasitic way of life and is capable of adapting to it if placed on a host. Ex. Naegleria fowleri .**

- **5. <u>Accidental parasite</u> – when a parasite attacks an unnatural host and survives. Ex. *Hymenolepis diminuta* (rat tapeworm).**

- **6. <u>Erratic parasite -</u> is one that wanders into an organ in which it is not usually found. Ex. Entamoeba histolytica in the liver or lung of humans**

Direct effects of the parasite on the host:

- Mechanical injury: The host may be inflicted by a parasite by means of pressure as it grows bigger, e.g the hydatid cyst causes blockage of ducts such as blood vessels producing infraction.
- Deleterious effect of toxic substances: The production of toxic substances may cause rigors and other symptoms, e.g., in malaria caused Plasmodium falciparum.
- Deficiency of nutrients, fluids, and metabolites: parasite may generate disease by opposing with the host for nutrients.
- Indirect effects of the parasite on the host
- Immunological reaction: tissue injury may be caused by immunological response of the host, e.g. in nephritic syndrome.
- Excessive proliferation of certain tissues due to invasion by some parasites can also cause tissue damage in human, e.g/, fibrosis of liver after deposition of the ova of blood flukes Schistosoma.
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Types OF HOSTS

1- <u>Definitive host</u> – a host that harbors a parasite in the adult stage or where the parasite undergoes a sexual method of reproduction.

2 - **<u>Intermediate host</u>** - harbors the larval stages of the parasite or an asexual cycle of development takes place. In some cases, larval development is completed in two different intermediate hosts, referred to as first and second intermediate hosts.

3- <u>Paratenic host</u> – a host that serves as a temporary refuge and vehicle for reaching an obligatory host, usually the definitive host,

i.e. it is not necessary for the completion of the parasites life cycle.

4- <u>Reservoir host</u> – a host that makes the parasite available for the transmission to another host and is usually not affected by the infection.

5- <u>Natural host</u> – a host that is naturally infected with certain species of parasite.

6- <u>Accidental host</u> – a host that is under normal circumstances not infected with the parasite .

Vector: “a living carrier (e.g. an arthropod) that transports a pathogenic organism from an infected to
a non-infected host”. A typical example is female Anopheles mosquito that transmits malaria.

Host adaptations

- In many host/parasite relationships the host defences reduces the parasite load to low levels but fails to eliminate the parasite completely and transmission continues.
- The defence to parasitic infection involves both non-immune and acquired immune mechanisms:
- 1. protective outer coverings (e.g., skin);
- 2. acidic medium of stomach;
- 3. biochemical changes (e.g., in sickle-cell anaemia);
- 4. immune system.

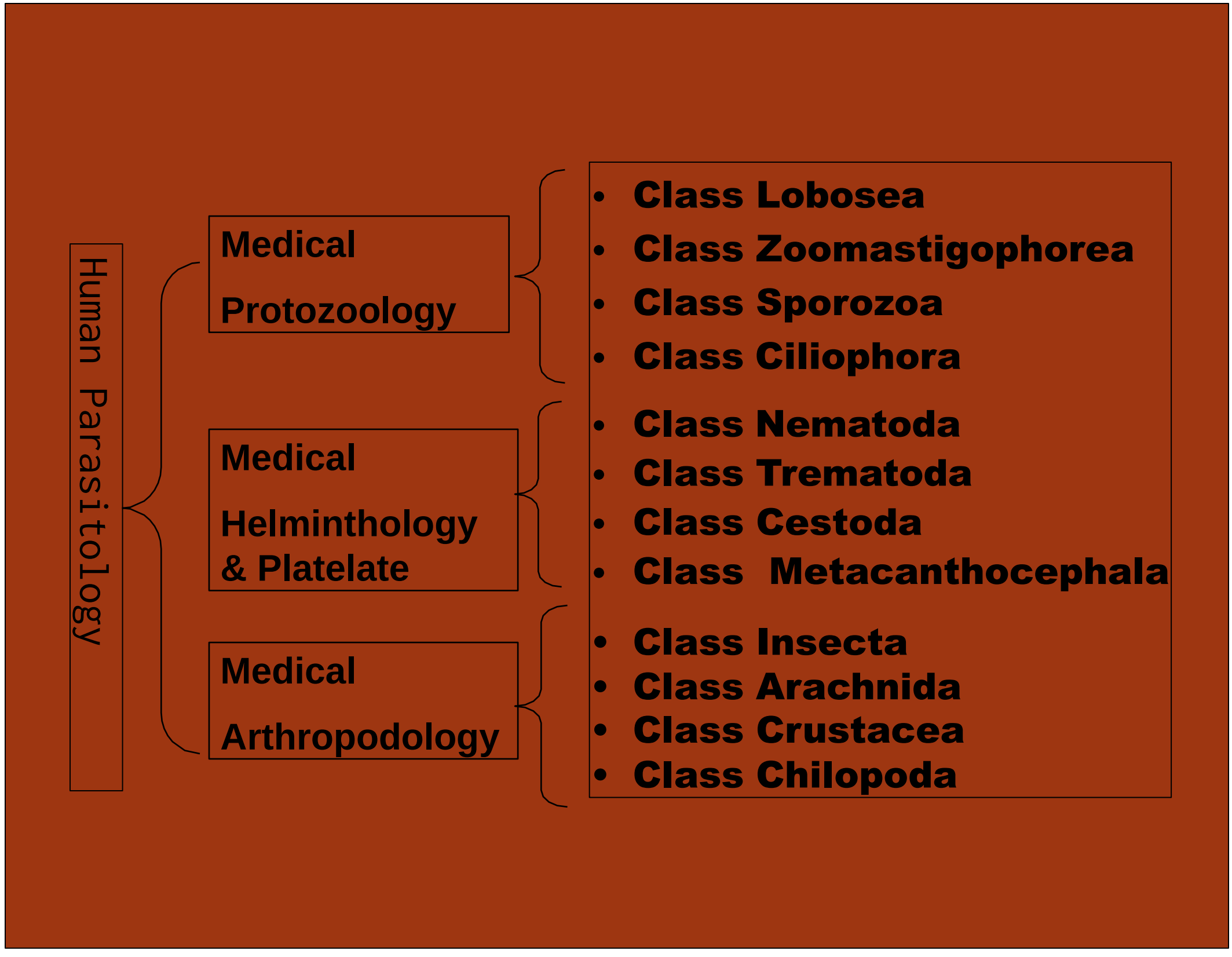
Relationships between parasites and hosts

Symbiosis : Two different organisms live together and interact , in this association one partner lives in or on another one's body. including 3 types: **Mutualism** , **Commensalism** , **Parasitism.**

- (1) **Mutualism** : is a permanent association between two different organisms that life apart is impossible , two partners benefit each other, such as termites and flagellates.

(2) **Commensalism** : is the association of two different organisms, in which one partner is benefited while the other neither benefited nor injured, such as *E. coli* and man.

(3) **Parasitism** : is the association of two different organisms, in which one partner is benefited while the other is injured, such as *Ascaris lumbricoides* and man.

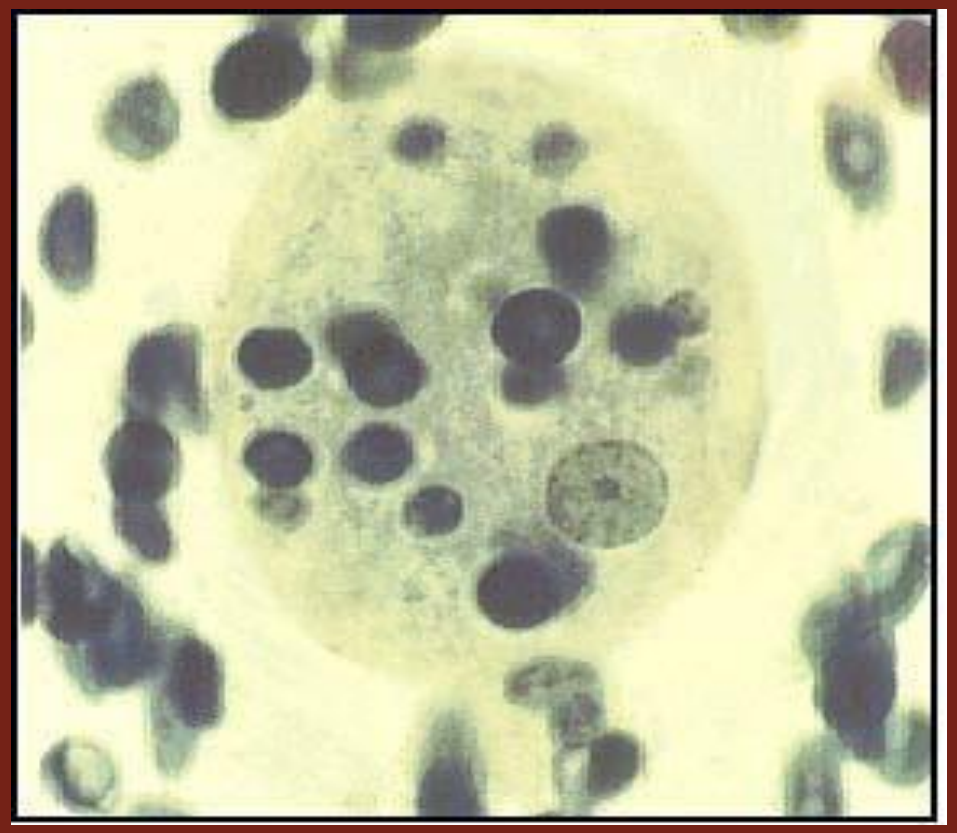

Human Parasitology
Medical Protozoology
Medical Helminthology & Platelate
Medical Arthropodology
Class Lobosea
Class Zoomastigophorea
Class Sporozoa
Class Ciliophora
Class Nematoda
Class Trematoda
Class Cestoda
Class Metacanthocephala
Class Insecta
Class Arachnida
Class Crustacea
Class Chilopoda

Classification of parasites

Parasites

- **Protozoa** (Unicellular) — **(Endoparasite)**
- **Helminthes** (Multicellular) — **(Endoparasite)**
  - **Nematodes**
  - **Trematodes**
  - **Cestodes**
- **Arthropods** **(Ectoparasite)**

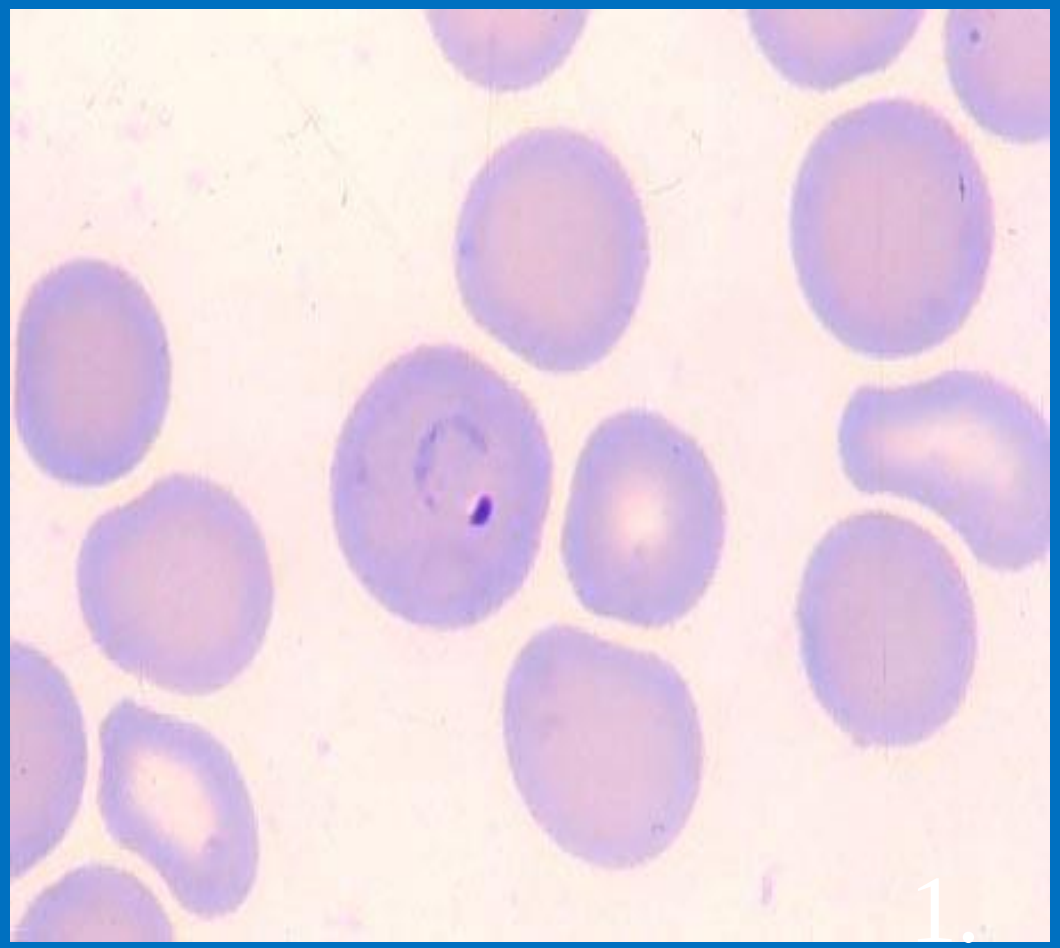
Class Lobosea



Entamoeba histolytica

Non-pathogenic amoeba

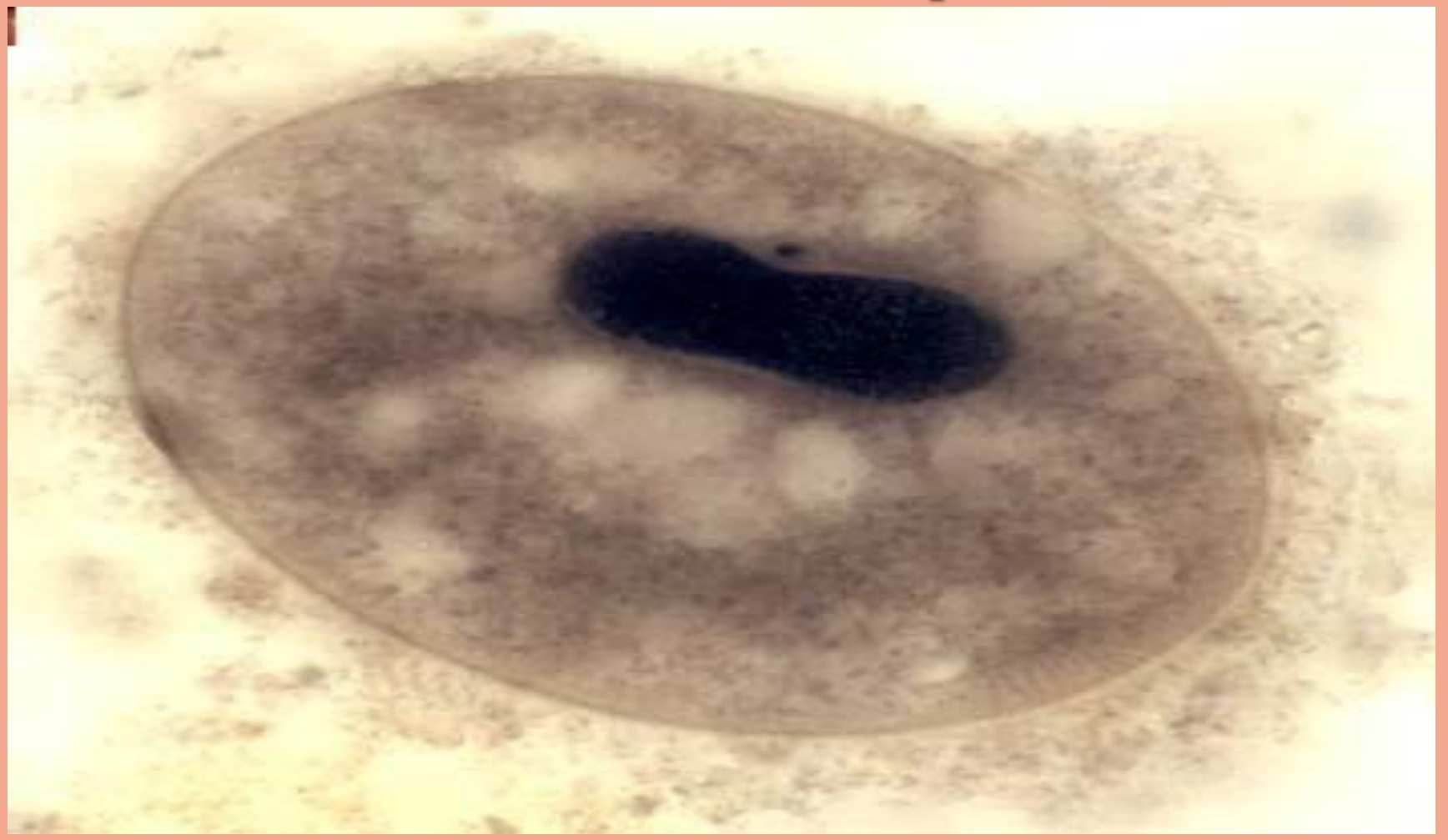
Class Sporozoa



- **Plasmodium spp**

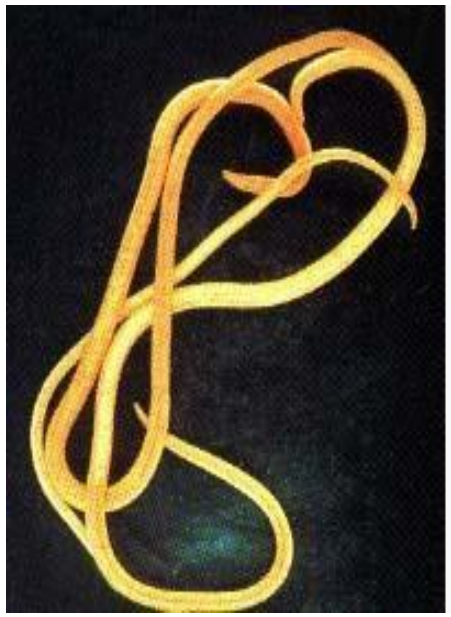
1. Toxopasma gondii
2. Pneumocycstis carinii

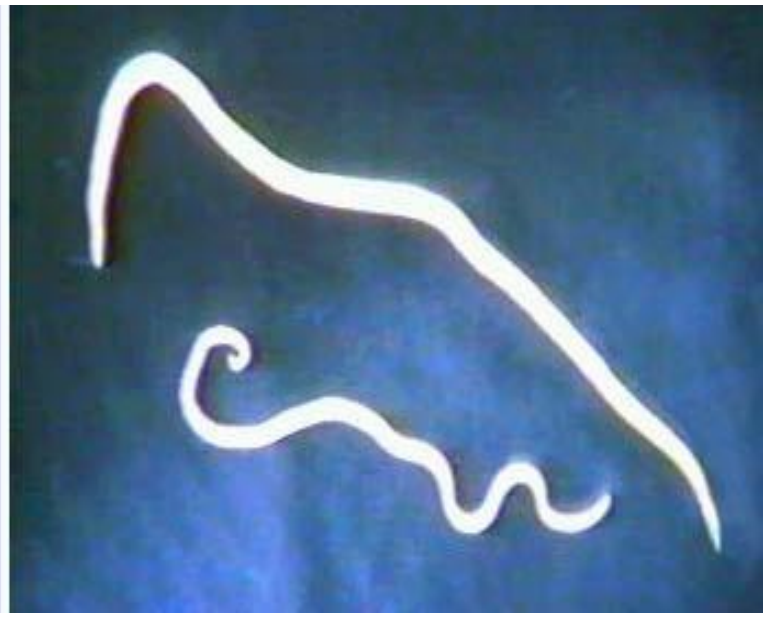
Class Ciliophora



– *Balantidium coli*

Class Nematoda





- ✓ ***Ascaris lumbricoides***

-Trichuris trichiura

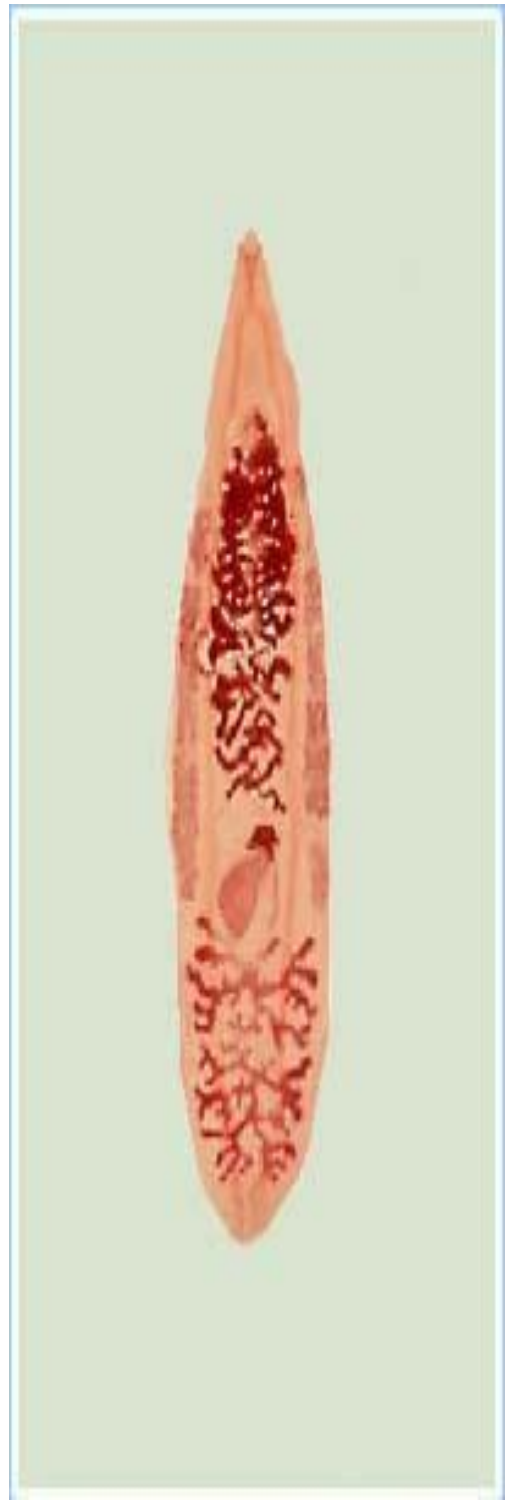
- Hookworm

Enterobius vermicularis

Filaria

Trichinella spiralis

Class Trematoda

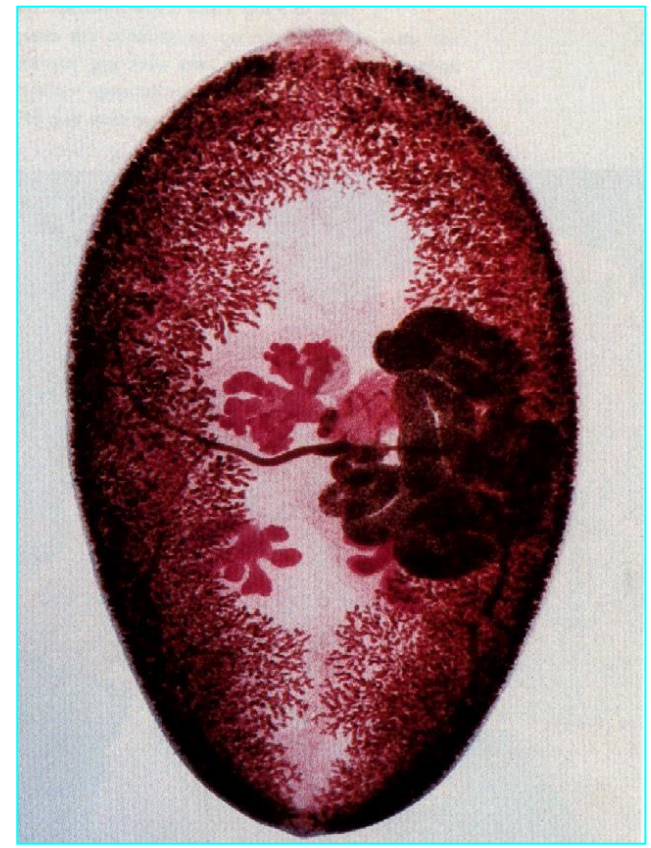


- ✓ ***Clonorchis sinensis***

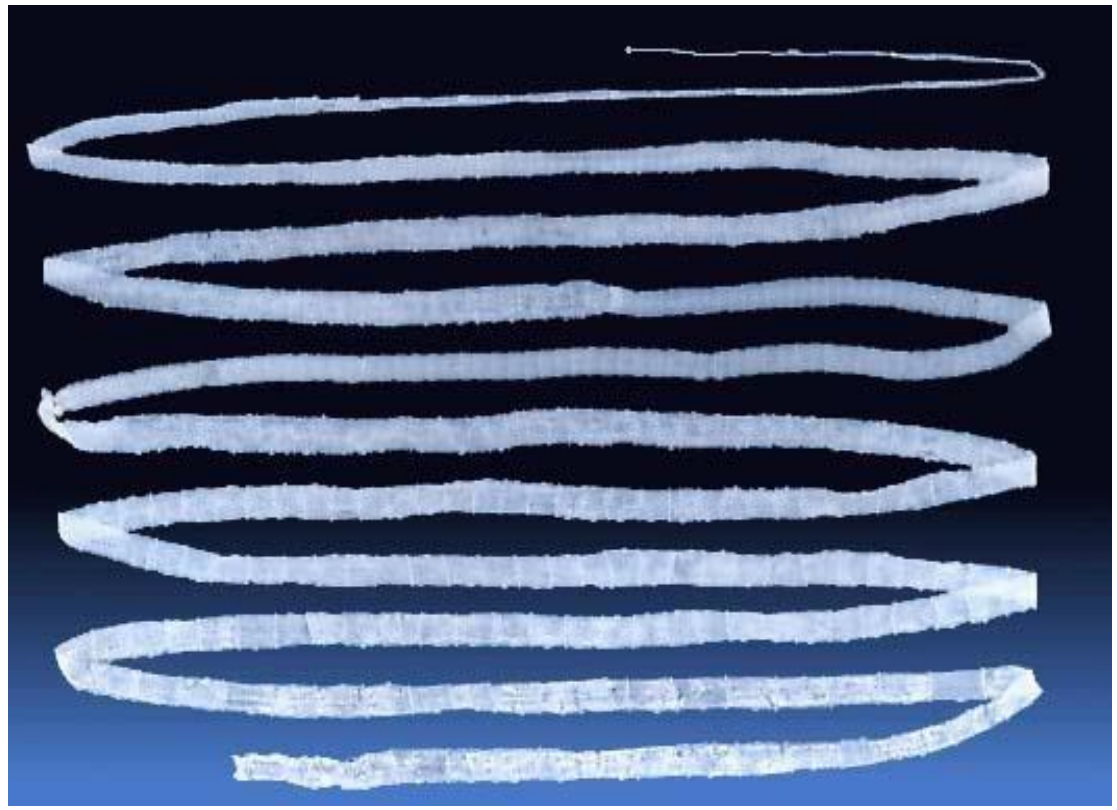
Fasciolopsis buski

Paragonimus westermani

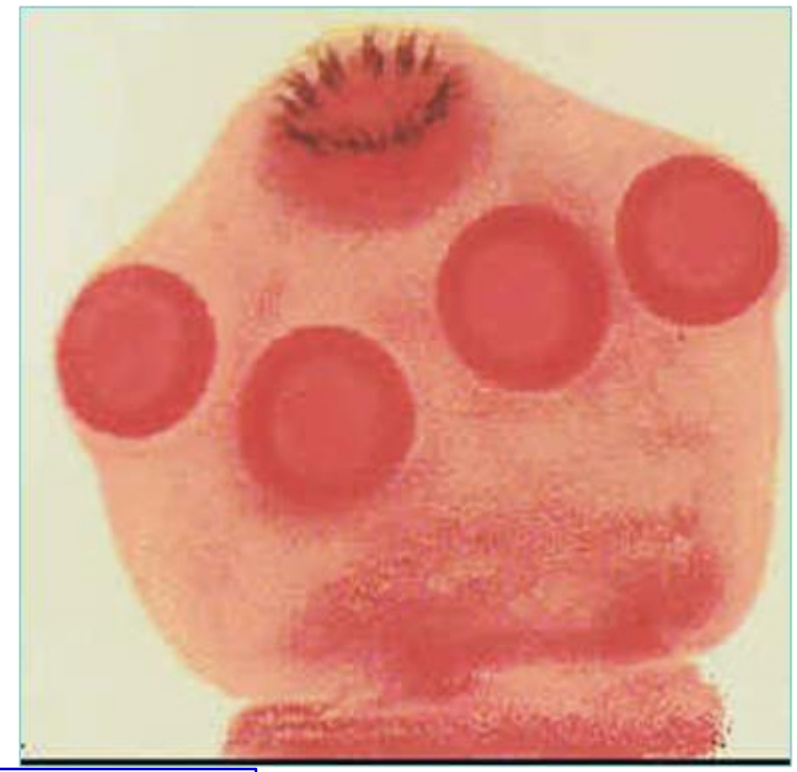
Schistosoma japonicum



Class Cestoda



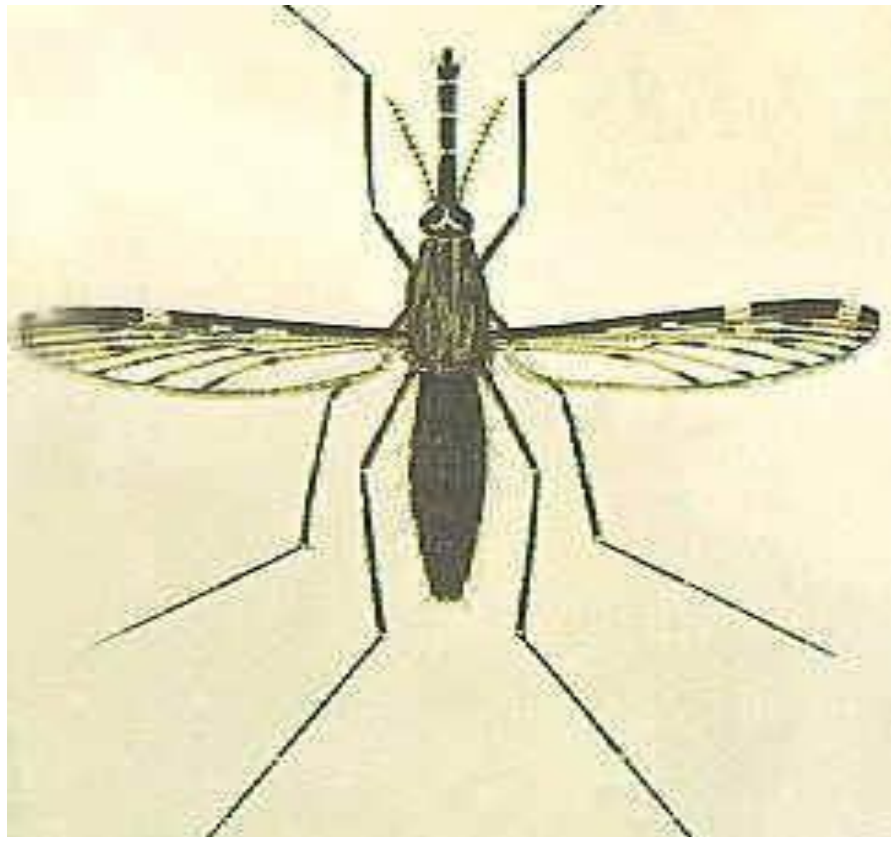
- *Taenia solium*



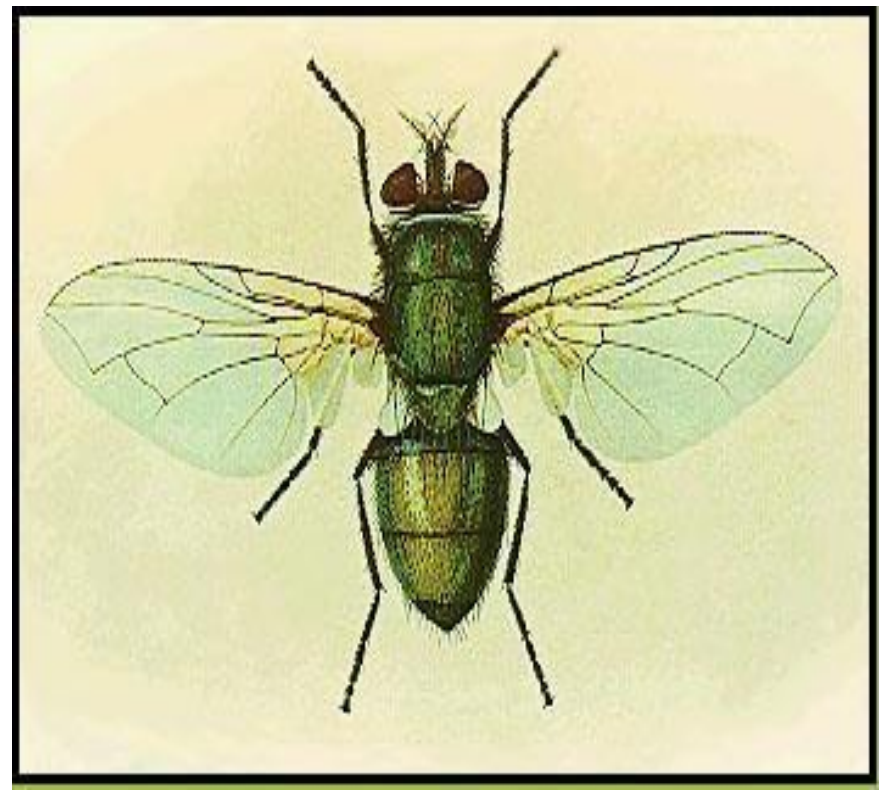
Taenia saginata
Echinococcus granulosus

Class Insecta

Anopheles sinensis



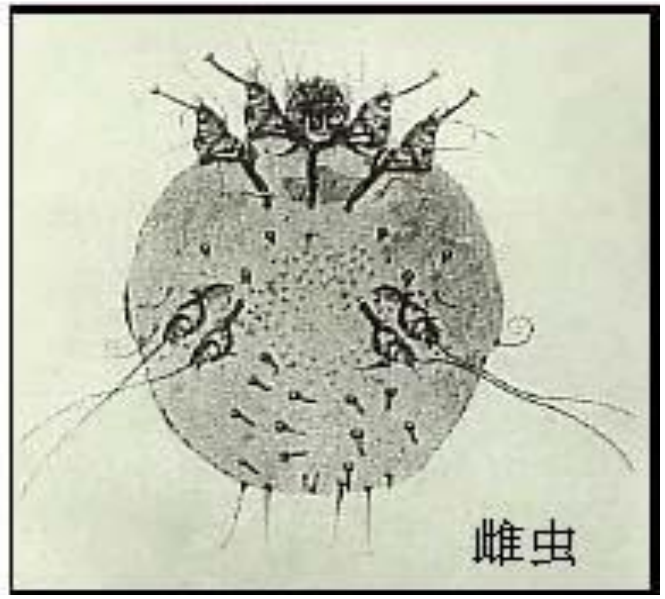
Lucilia sericata



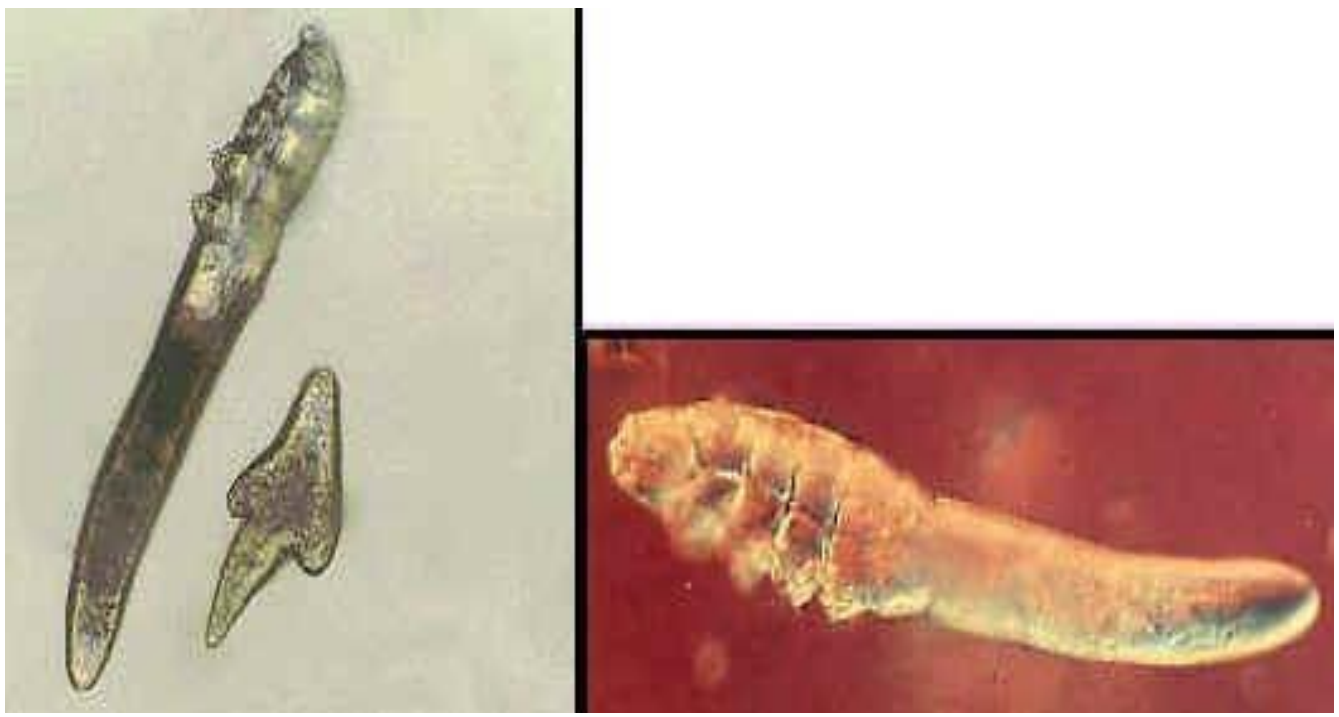
Lice , Sandflies , Fleas

Class Arachnida

Ticks; Mites

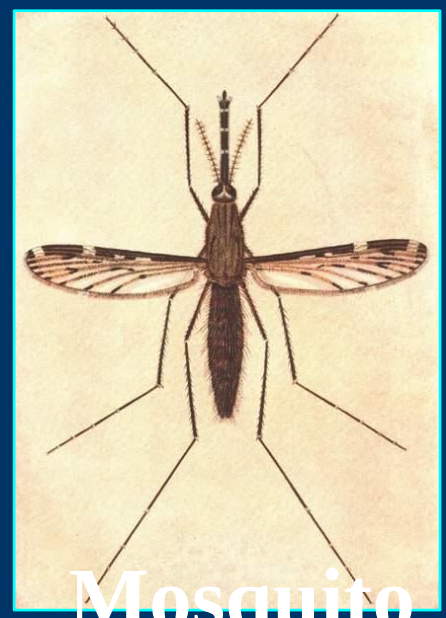


Sarcopes scabiei



follicle mite

Medical arthropods

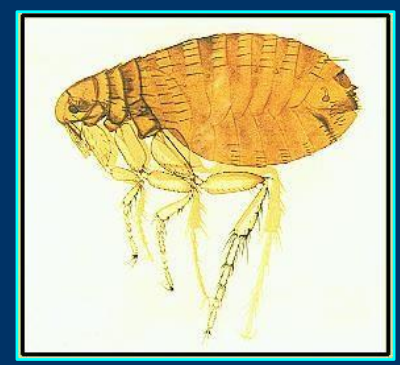


Mosquito

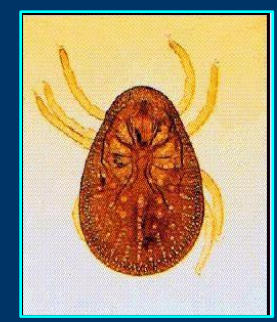
Fly

Sandfly

Louse



Flea



Soft tick

Hard tick

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