Zoo 212 Parasitology (2+1)

Objectives:

Under standing and practicing the different methods and techniques applied for identification of parasitic infection. Identification of the main characteristics of the different stages of parasite. How to determine: the site of infection, diagnosis and diagnostic stages, pathogenicity and treatment. How to elucidate the life cycles of the parasite (hosts and mode of transmission). Mastering photography, measurement and report writing.

Contents:

- Introduction to Parasitology
- Helminthology Including Trematodes, Cestodes and Namatodes.
- Protozoology unicellular parasites
- *Leishmania* spp
- *Typanosoma* spp
- Toxoplasmosis
- *Plasmodium malaria*
- *Fasciola* spp.
- *Paragonimus westermani*
- *Taenia* spp.
- *Clonorchis sinensis*
- Ecology of the parasites

First mid-term	20 marks
Final exam	40 marks
Report and presentation	10 marks
Lab exam	30 marks

Some book suggestions
(for some of these titles newer editions might be available)

- Soulsby, E. J. L. (1982). Helminths, Arthropods and Protozoa of Domestic Animals. Bailiére Tindall.

- Schmidt, G. D. and Robsen, L. S. (1985). Foundation of parasitology. Times Mirro Mosby, College Publishing, Louis. 775p.

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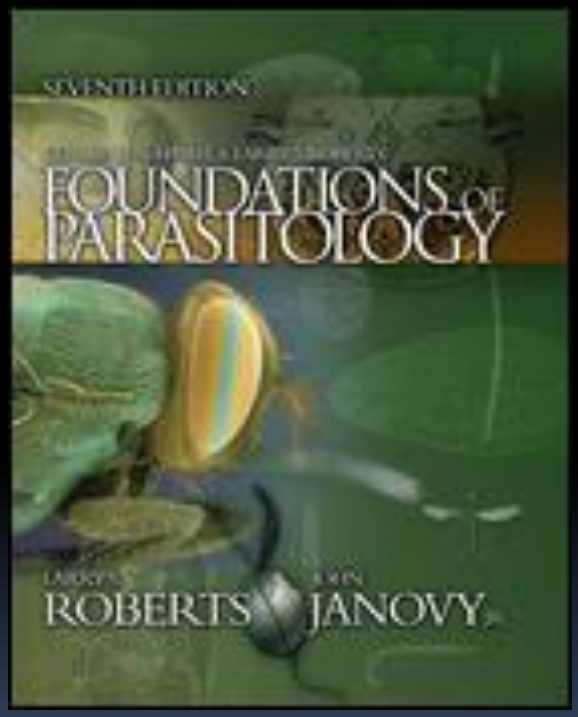
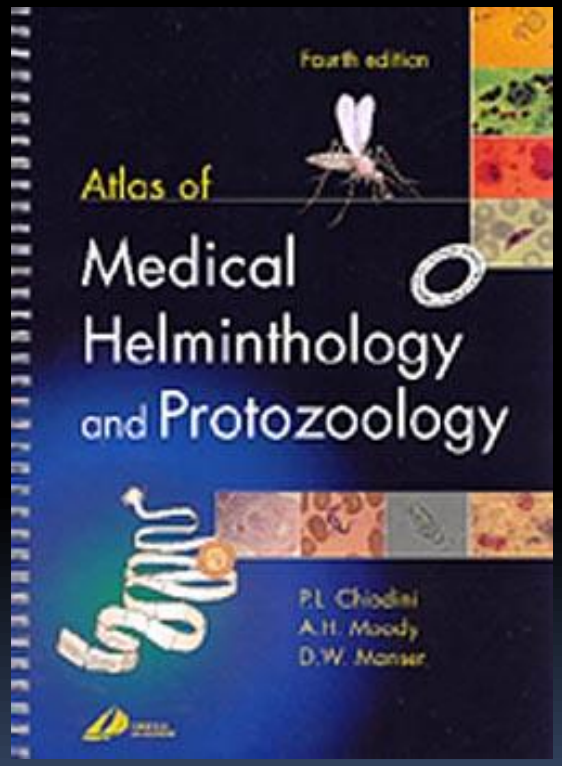




Parasitism - a way of life

- **Parasite and Parasitism** are ecological terms that define a way of life rather than a coherent and evolutionary related group of organisms
- **Symbiosis, Commensalism, Mutualism, Parasitism**

- **PARASITE: The man who eat from others table!!!**

  From Greak:

  Para: beside or around

  Sitos: Wheat

Host – Parasite Relationships:

Symbiosis : Living together in close association between 2 organisms. This relationship can be either one of the following:

- **Mutualism:** Association between 2 organisms where **both are benefited** to the situation & **can exist independently** if separated.
- **Commensalism :** An association of 2 organisms where one is **benefited, the other is unaffected**. Remember parasites derive benefit from the host!!!!!.
- **Parasitism:** An association between 2 organisms where one is dependent upon another for existence and **one harms the other.**

Symbiotic Relationships:

- Symbiosis: living together with another organism in close association
- Types of (symbiosis):

MUTUALISM

PARASITISM

COMMENSALISM

Key definitions: What is ….?

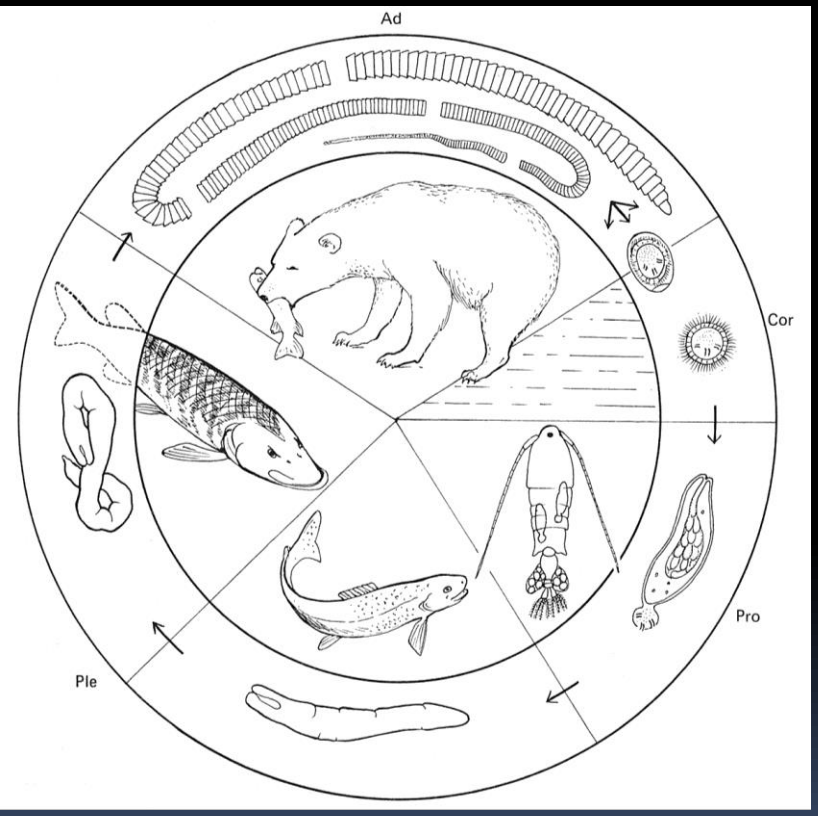
- **Medical Parasitology:** "the study medical implications of parasites that infect humans"
- **A parasite:** "a living organism that acquires some of its basic nutritional requirements through its intimate contact with another living organism". Parasites may be simple unicellular **Protozoa** or complex multicellular **Metazoa**
- **Eukaryote:** a cell with a well-defined chromosome in a membrane-bound nucleus. All parasitic organisms are eukaryotes
- **Protozoa:** unicellular organisms, e.g. *Plasmodium* (malaria)
- **Metazoa:** multicellular organisms, e.g. helminths (worms) and arthropods (ticks, lice)
- **An endoparasite:** "a parasite that lives within another living organism" – e.g. malaria, *Giardia*
- **An ectoparasite:** "a parasite that lives on the external surface of another living organism" – e.g. lice, ticks

- **Host:** "the organism in, or on, which the parasite lives and causes harm"
- **Definitive host:** where the parasite lives & complete their life cycle (final host-human-trypanosome) = also harbors the mature /adult/ sexual /stage of the parasite
- **Intermediate host:** "the organism in which the parasite lives during a period of its development only"
- **Parasitic Zoonosis:** "a parasitic disease in which an animal is normally the host - but which also infects man"
- **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 the female *Anopheles* mosquito that transmits malaria.
- **Reservoir host:** Other animal that harbors the same parasite. = ensures continuity of the parasites life cycle. = act as additional source of human infection.

Endoparasites can exist in one of two forms: **intercellular parasites** (inhabiting spaces in the host's body) or **intracellular parasites** (inhabiting cells in the host's body). Intracellular parasites, such as protozoa. An example of this interaction is the transmission of malaria, caused by a protozoan of the genus *Plasmodium*, to humans by the bite of an anopheline mosquito.

An **epiparasite** is one that feeds on another parasite. This relationship is also sometimes referred to as *hyperparasitism*, exemplified by a protozoan (the hyperparasite) living in the digestive tract of a flea living on a dog. **Is a parasite whose host is a parasite.**

Hosts and life cycles



- The **definitive host** is by definition the one in which the parasite reproduces sexually
- Host which actively transmit parasites to humans are often called **vectors**
- In **paratenic** or transport hosts no parasite development occurs
- **Reservoir host** are alternate animal host from which the parasite can be transmitted to humans (zoonosis) or domestic animals.

Accidental host

A host in which the parasite is not commonly found, nevertheless it is one suitable for the parasite's development. In some instances (e.g. cysticercosis) the accidental host becomes a "dead end" because even though the parasite develops through its appropriate stages, it fails to find a portal of exit and is thus blocked from continuing its life cycle.

Protozoology - study of single-celled **animal (Protozoa)**

Helminthology- study of worms and worm like organism
(roundworms, flukes, tapeworm)
Acanthocephalans

Arthropodology - study of jointed -**legged organism like the arthropods (flea, mite, mosquito, ticks ..etc.)**

Types of parasitism:

Obligate: Organism which are completely dependent on the host for existence. = cannot exist without a host (nematodes)

Facultative / Opportunistic: When a parasite is capable of living even without a host . Can exist as free – living or as parasite

Incidental - **parasite** the establishes itself in a host in which it does not ordinarily live.

Permanent - parasite that remains on or in the body of the host from early life until maturity or for its entire life. (*Ascaris*)

Pathogenic - **parasite** that causes injury to the host by its mechanical or other pathological mechanism

Vectors: النواقل
are biological system that transmit parasite

Mechanical vector: الناقل الميكانيكي Transmit a parasite without being a host = transmit Parasite to host, parasite stay in the host but does not undergo development . Not essential to the life cycle of the parasite. Example flies

Biological vector: الناقل البيولوجي serves both as a vector and a host for the development stage of the parasite eg. *Anopheles* mosquito as in malaria and Tsetse fly in *Trypanosoma*.

Source of exposure to parasitic infection(transmission)انتقال العدوى

Contaminated water and soil= most common= utilized by most parasite

Contaminated H_2O

Protozoa = *Giardia* . *Cryptosporidium*

Nematodes = *Ascaris* = *Trichiuris* = *Enterobius*

Contaminated Soil

(Ex: Hookworm,) larva of parasite penetrate skin goes to venous circulation heart lungs alveoli (air sac) rupture bronchioles bronchi trachea esophagus swallowed into the stomach

Skin = penetration of infective stage larva to skin Directly

Ex: Cercaria of *Schistosoma*

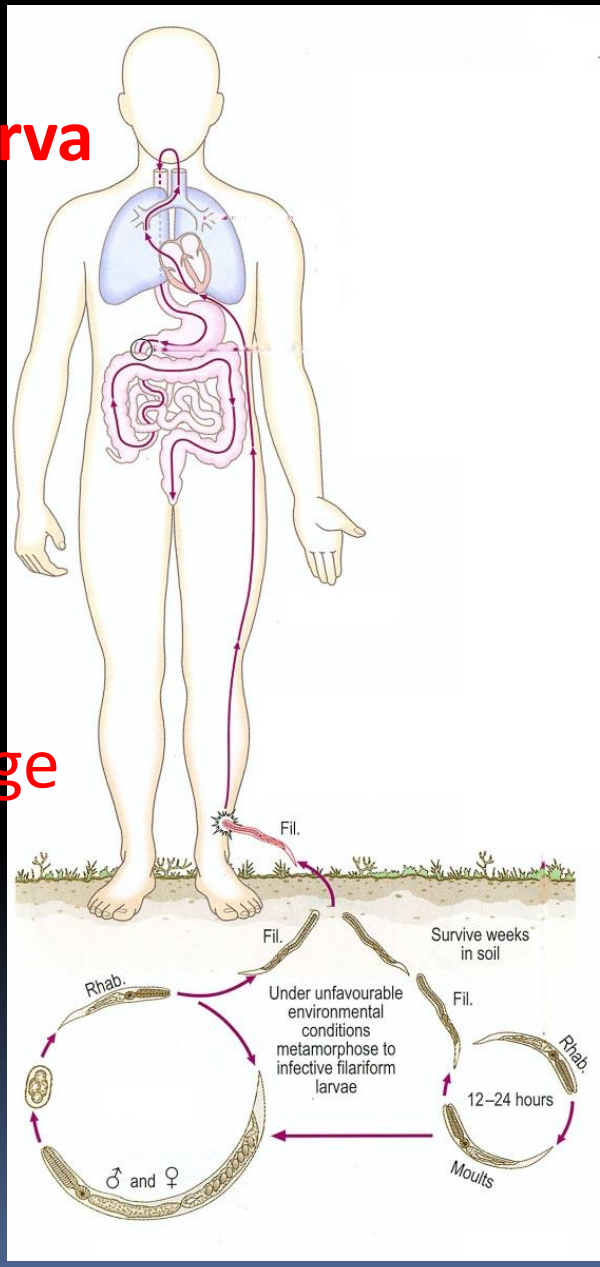
Filariform larva of hookworm

Filariform larva of *S. stercoralis*

Indirectly

Through insect vectors eg: Infective stage larva of *Trypanosoma* and *Leishmania*

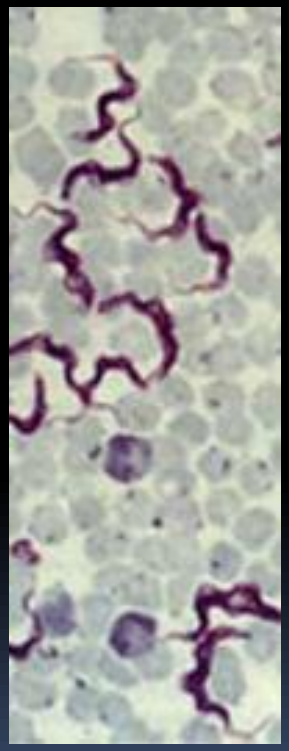
Infective stages of *Plasmodium*



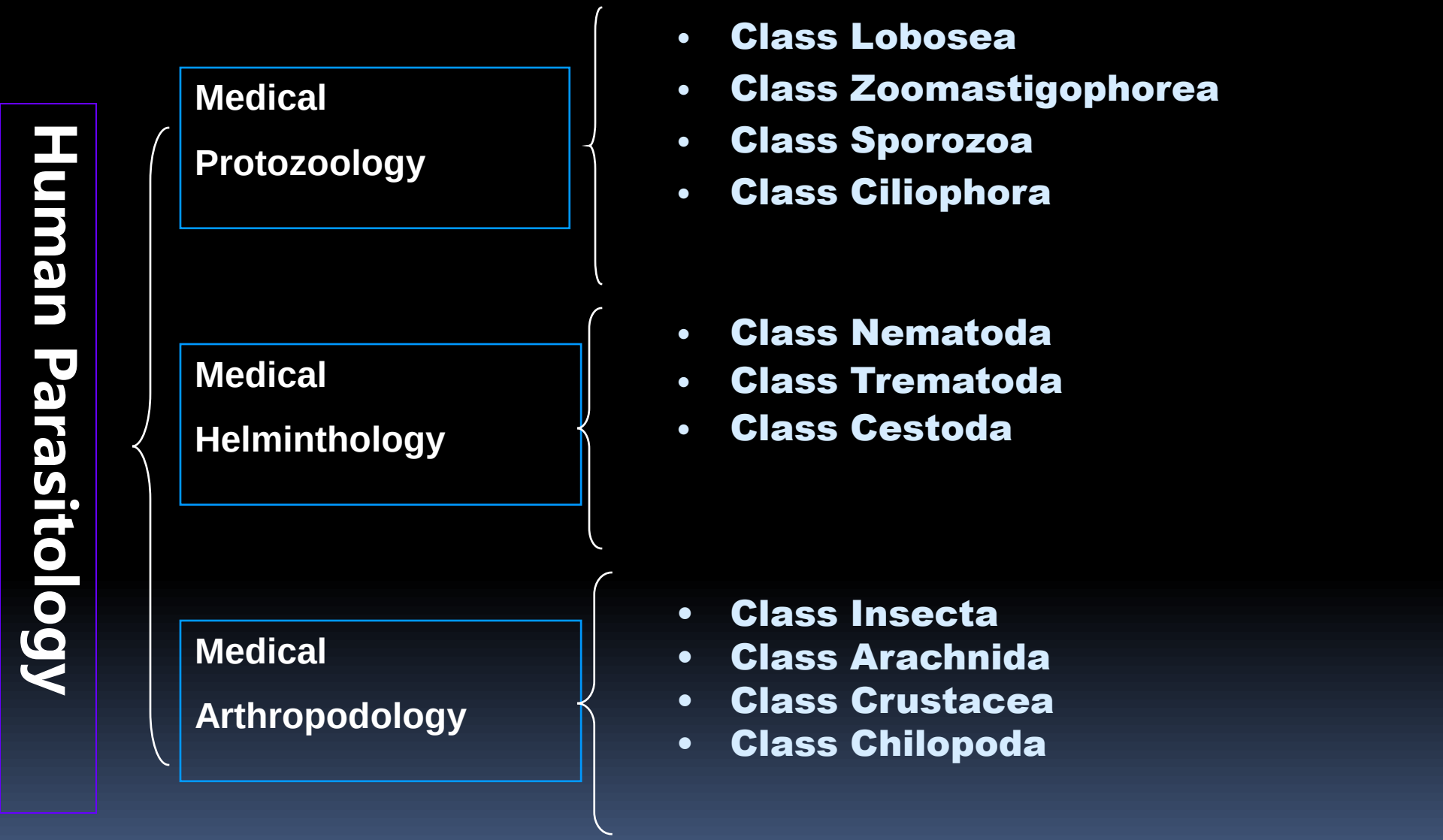
Disease terminology

- **Prepatency**: infected but parasite presence can not be detected yet.
- **Patency**: established infection, parasite stages can be detected (malaria parasites in blood smears, worm eggs in feces etc.).
- **Incubation period**: time between infection and the development of symptoms.
- **Acute disease** can lead to crisis which can resolve in spontaneous healing, chronic infection or death.
- **Convalescence**: Period after healing, absence of infectious agents, no symptoms, in certain case immunity to reinfection.

Infection & infestation



- **Infectious diseases** are caused by transmittable parasitic agents including bacteria, viruses, fungi, protozoa and a variety of metazoans commonly referred to as helminths or worms.
- **Infection** usually implies replication of the agent resulting in a growing number of pathogens
- **Infestation** is characterized by a **constant number of pathogens**. Severity of disease often depends on infection dose.


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