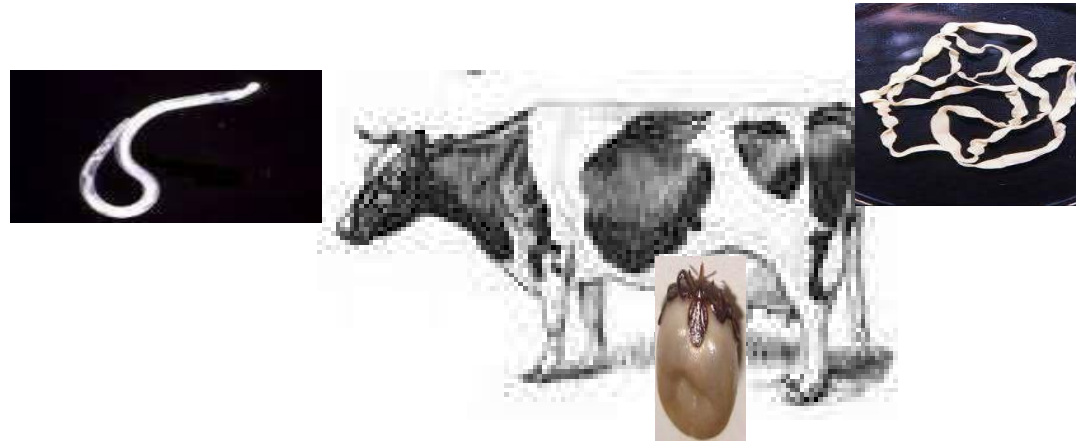


General Veterinary Parasitology

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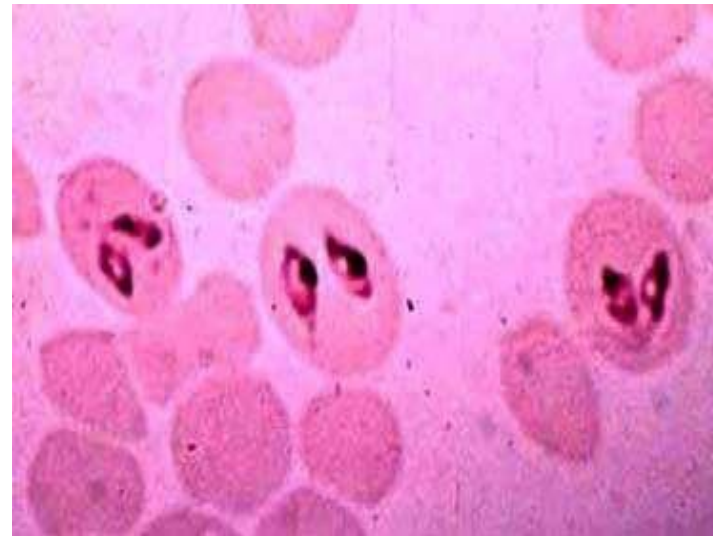
General Veterinary Parasitology

- ▶ **Veterinary Parasitology** is a branch of animal sciences which provides knowledge of taxonomy, morphology, biochemistry, physiology, cell biology, immunology, pharmacology, pathogenesis including symptoms seen in hosts, method of diagnosis, treatment and control of parasites and diseases caused by parasites in animals and birds.



Parasitology: The Branch of science in which deals with the phenomenon of parasitism.

- ▶ **Parasite:** The word parasite is derived from the Greek word (**Para** means beside and **sitos** means food).
- ▶ **Parasite-** An animal species which live in or on a large animal (host) and dependent metabolically on it.
- ▶ The main aim of parasite is to live and let live because death of host causes death of parasite.



- ▶ **Parasitoid:** parasitoids are insects that feed on the body of another insect or arthropod during the larval stage of their life-cycle. The host organism will die as a result. When the parasitoid completes its life-cycle it becomes a free-living insect, no longer dependent on the host.
 - ▶ Parasitoid always kills their host.
 - ▶ Host is ultimately of the same taxonomic class.
 - ▶ In comparison with the hosts they are of relatively large size.
 - ▶ Parasitoids are parasitic as larvae only, the adults spent free living form.
- ▶ **Pseudoparasite** – Any things resembling a parasite or can live as a parasite although it is normally not one.

Examples- pollen, plant cells, grain mites and psocid (book lice)

- ▶ **Parasitism:** It is a harmful association in which parasite is metabolically dependent on the host.
- ▶ **Symbiosis:** It is an obligatory and beneficial association of two organisms where both organisms are dependent on each other. Both organisms do not cause damage or harm each other. Both commensalism and mutualism come under it.

Example- Algae and fungi live together in Lichen

- ▶ **Commensalism:** Literally means “eating at the same table”. It is an association between two organisms where one organism benefits nutritionally from another at the same time without harming the benefactor.

Example- Relationship between Sea anemone and clown fish

- ▶ **Mutualism:** It is usually obligatory association of two organisms where both are benefited by each other.

Example- Intestinal flagellate protozoan present inside the termite.

- ▶ **Phoresis:** means “traveling together”. In this relationship two partners have no metabolic dependence. One organism is simply transported or shelters by the other organism. e.g. Bacteria and amoebic cysts are carried on the leg of fly.



Nomenclature of Parasites

- ▶ The animal parasites are named according to principle of **Bionomial Nomenclature**, given by **Carlos Linnaeus**.
- ▶ In the system of bionomial nomenclature, each parasite is given two names. The first name is called genus and 2nd is species name for single species. The names of the genus and species are expressed (printed) in Latin form or when written are underlined.
- ▶ The generic name always start with a **capital letter** while the specific name always begins with a **small letter** while those species names derived from the name of a person which may begin with either a capital or small letter.

SNOAPAD (Standardized Nomenclature of Animal Parasitic Disease) –

- ▶ To denominate animal parasitic diseases or infections.
- ▶ WAAVP formulated a uniform and proper terminology to denominate the animal parasitic disease or infections as follows –
- ▶ The suffix **–osis (plural= Oses)** is to be added to the stem of the names of the parasite taxon by the omission of the last one or two letters –

e.g. Trypanosoma - Trypanosom + osis = Trypanosomosis

Fasciola - Fasciola + osis = Fasciolosis

- ▶ By adding **–osis** in the genitive name where taxa end with **–x** in the nominative .

e.g. Demodex

Demodicis

Demodic + osis

Pulex

Pulicis

Pulic +osis

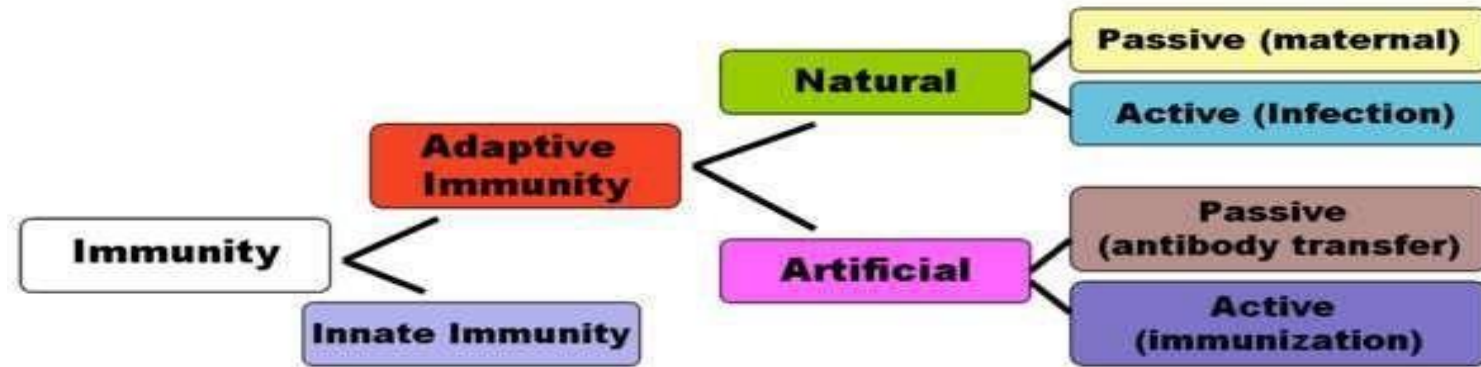
- ▶ By adding **–osis** in the full generic name of the parasite.

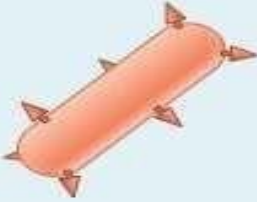


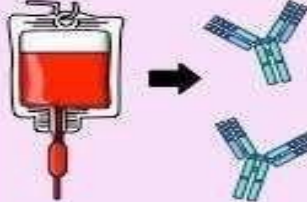
Hepatozoon - Hepatozoon+ osis = hepatozoonosis

- ▶ Any parasitic infection which may or may not produce clinical signs in a host called **parasitosis**. e.g. Trypanosomosis in buffaloes.

Immunity against parasitic infections/infestation

- ▶ Immunity- Capability of host to protect himself against the entry or invasion of organisms or parasites.
- ▶ Classification of immunity :



ACTIVE IMMUNITY		PASSIVE IMMUNITY	
Natural	Artificial	Natural	Artificial
 Infection	 Vaccination	 Maternal antibodies	 Monoclonal antibodies

- ▶ **Innate immunity**- Naturally acquired immunity present in the body. e.g. saliva, tears, mucus, skin and mucous membrane. It provides first line of defence from infection in a non-specific manner.

- ▶ **Acquired immunity**- It is acquired by animal as a result of previous exposure of parasitic infection or by artificial means (vaccination etc.). It is two types-
 - (a) **Active immunity** – It is long duration immunity which occurs as a result of the administration of live infection (an antigen) or dead culture or culture filtrate. Premunity, Sterile immunity and autoimmunity are the examples of active immunity.

 - (b) **Passive immunity**- It is short time immunity occurs due to passive transfer of immunity i.e. readymade antibodies from the immunized animal to unimmunised. e.g. Foetus in the womb of mother and also new born receive immunity through colostrums or milk. Serum of hyperimmune animal is injected to a healthy animal for immunization. e.g. Antitetanus serum (ATS) contains readymade globulin against tetanus causing bacteria.

▶ **Humoral immunity** – It is antibody mediated immunity in which B-lymphocytes play major role. T- helper cells (Th1 & Th2) have also play role in this immunity. e.g. Haemoprotozoan infections. Antibodies (Abs) act in any of the following ways-

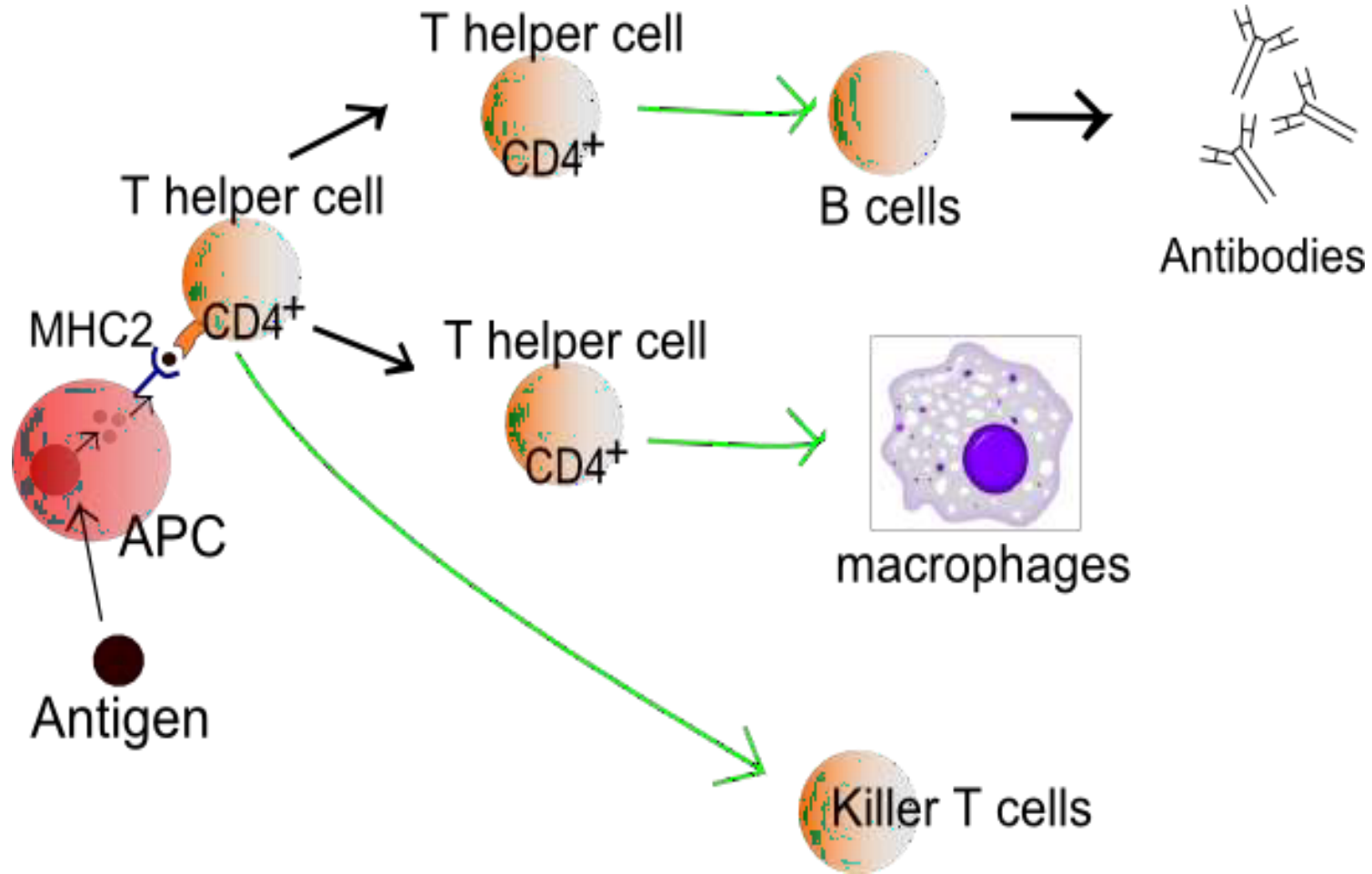
1. Abs bind to the epitopes of the antigens (Ags) resulting in neutralization of parasites.
2. Abs cover certain sites on the surface of parasite which results inhibition of penetration to the host cells as well as feed intake.
3. Abs cause lysis of parasites in presence of complement.
4. Abs help to induce Type-I hypersensitivity reaction.

▶ **Premunity** - It is an incomplete immunity or concomitant immunity in which presence of a low level persistent infection which prevents further infection.

▶ **Autoimmunity** – The immunity which occurs against self-antigen. Autoimmunity commonly occurs in haemoprotozoan (*Trypanosoma*, *Leishmania*, *Babesia* and *Plasmodium* species) infections which leads anaemia due to destruction of erythrocytes in which even the uninvaded cells are also destroyed.

▶ **Sterilising immunity** - This is life long solid immunity occurs after cutaneous leishmaniasis in man, *T. parva* infection in cattle, *Babesia* infection and Coccidiosis. The immunity remains in absence of the parasites.

Mechanism of Immune system



Evasion of Immune response

- ▶ Parasite can survive and proliferate in the host may be due to the adaptation of various mechanism of immune response by the parasites-
- ▶ Antigenic variation- It is a phenomenon in which parasites shed the outer variant surface glycoprotein (VSG) coat and replace it with another one on every 7-10 days. Therefore, immune response developed against preceding VSG, can not work with subsequent antigenically different VSG and the parasites thus evade the host immune response. Example- *Trypanosoma* spp.
- ▶ Antigenic disguise or Antigenic mimicry- it is mechanism where the parasites mask their antigens by incorporating host molecules. e.g. *Schistosoma* spp.

Harmful effects caused by parasites

- ▶ Various types of harmful effects occurred during parasitic infections are as follows-
- ▶ Utilization of host's food- some parasites utilize the food ingested and digested by the host which results malnutrition in host and weakness. e.g. *Diphyllobothrium latum* absorb Vitamin B12 from the host which result pernicious anaemia.
- ▶ Feeding on the host materials- they take or feed host's body tissues, blood , lymph etc. and cause harm to the host.

Body tissues- *Fasciola*, Amphistomes.

Blood- *Haemonchus*, *Ancylostoma*, Ticks etc. can suck blood which results anaemia in the infected host.

Blood suck :-

Ancylostoma caninum - 0.1 ml/worm/day

Haemonchus contortus - 0.05 ml/worm/day

Female tick - 0.5-2 ml/tick/day

- ▶ Mechanical blocking of different tracts and ducts-
Intestine- *Toxocara*, *Moneizia* etc. Bile duct- *Fasciola*, *Clonorchis* etc.
Respiratory tract- *Dictyocaulus* (Lung worms)
Blood vessels- *Dirofilaria immitis* (heart worm of dog)
- ▶ Haemorrhage- *Eimeria* (coccidia) and *Fasciola* caused haemorrhage in intestine and liver, respectively.
- ▶ Parasitic infection usually decreased growth rate, body weight, milk production, egg production, reproduction capacity etc.
- ▶ Abortion- *Tritrichomonas foetus* causes bovine abortion in cattle whereas *Toxoplasma gondii* causes abortion in sheep and women.
- ▶ Parasitic infection may leads to reduced the value of hide and skin and even death of the infected animals.

Tissue reactions caused by parasites

- ▶ Various types of tissue reactions occurred during parasitic infections are as follows-
- ▶ **Atrophy (pressure atrophy)**- decrease in size of tissue or organ that had reached their normal size. e.g. Hydatid cyst of *Echinococcus* spp.
- ▶ **Hypertrophy**- Increase in size of cells but their number remains same e.g. R.B.Cs. infected with *Babesia* spp.
- ▶ **Hyperplasia** – increase in number of cells by cell division. e.g. *Eimeria stiedae* infected liver, *Fasciola* and *Dicrocoelium* species infected Bile ducts etc.
- ▶ **Metaplasia** – Transformation of tissue without alteration of the embryonic tissues. e.g. *Paragonimus wetermanii* (lung fluke of man) and *Ostertagia* species infections.
- ▶ **Necrosis**- Death of tissues or cells in the living animals. e.g. *Trichinella spiralis*.

- ▶ **Nodule formation-** e.g. *Oesophagostomum* (pimply gut), *Railletina echinobothrida* infections.
- ▶ **Fibrosis** – e.g. Milk spots in liver of pig is caused by *Ascaris suum* and liver flukes infection.
- ▶ Cirrhosis in liver and calcification of bile duct- e.g. *Fasciola* spp.
- ▶ **Tumour** - *Spirocera lupi* infection may leads to osteosarcoma in oesophagus of dog . *Clonorchis sinensis* infections may results cholangiocarcinoma in man.
- ▶ Excessive production of mucus and Flask shaped ulcers- e.g. *Entamoeba histolytica*.
- ▶ Enlargement of prescapular lymph nodes – e.g. *Theileria annulata* infection.
- ▶ **Allergic and immune reactions** – e.g. Cercarial dermatitis, Eosinophilia in schistosomosis, anaphylactic shock due to rupture of the hydatid cyst in the body and also in Fleas infestations.



THANK YOU...