# Department of Veterinary Parasitology

## TOPIC- MODE OF TRANSMISSION OF PARASITES

**Robin Singh**
**Assistant Professor**
**Veterinary Parasitology**

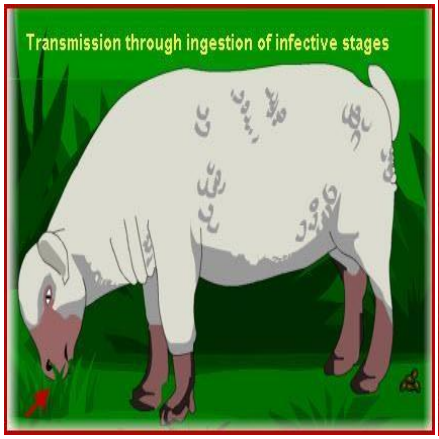
- Parasites have distinct routes of entering a host.

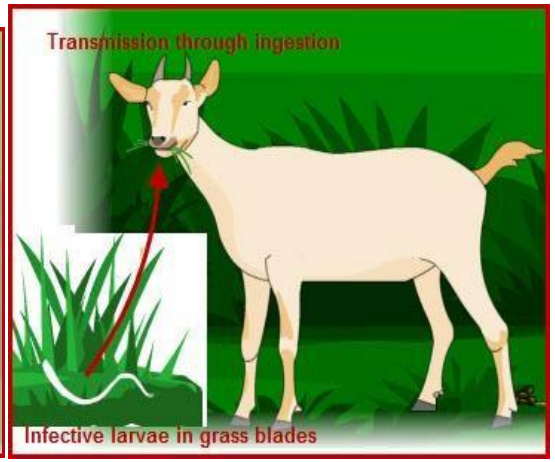
- Endoparasites enter the hosts in general through natural openings on the exterior of the body or through the skin.

- Parasites are transmitted from one animal to another by
  - Ingestion
  - Skin penetration
  - Contact
  - Predation
  - Coitus
  - Transplacental/Tranmammary transmission

# THROUGH INGESTION

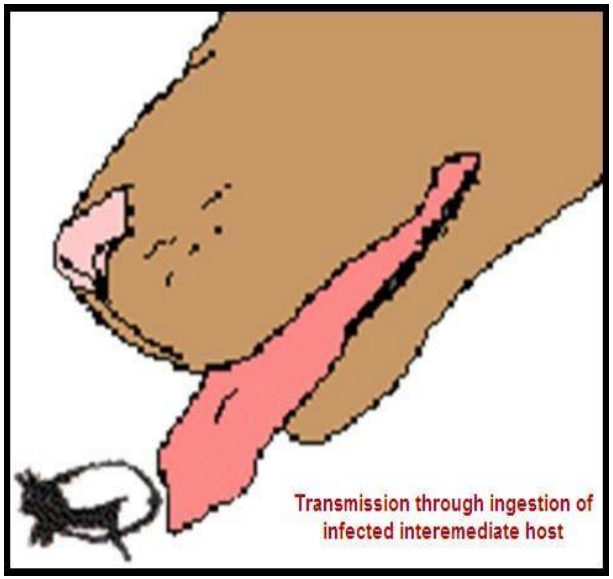
- The most common mode of transmission of parasites is through ingestion. The host may become infected by direct ingestion of an infective stage through contamination of food and water or by ingestion of an intermediate host or transport host containing infective stages.
- For parasites with direct life cycles, the infective stages viz., egg containing the second larval stage (ascarids), cysts (*Entamoeba* and *Giardia)* and oocysts (coccidia) find their way into the feed and water of the host thereby gaining access to the host or the infective stages (third larval stage) may climb up the vegetations and wait for the host to ingest.

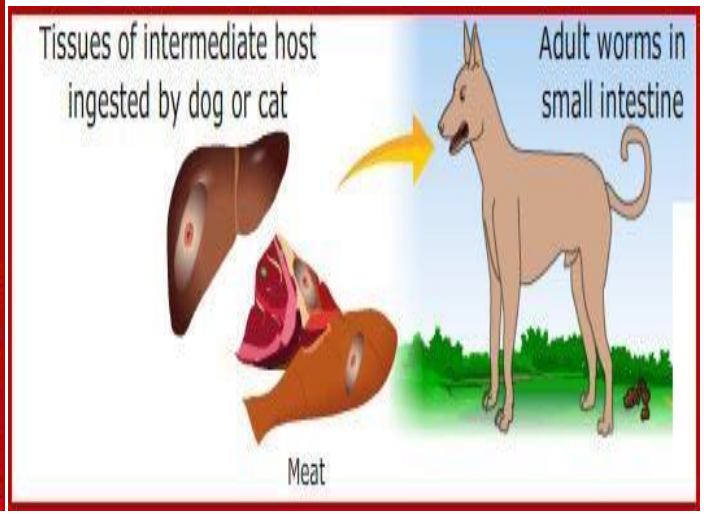


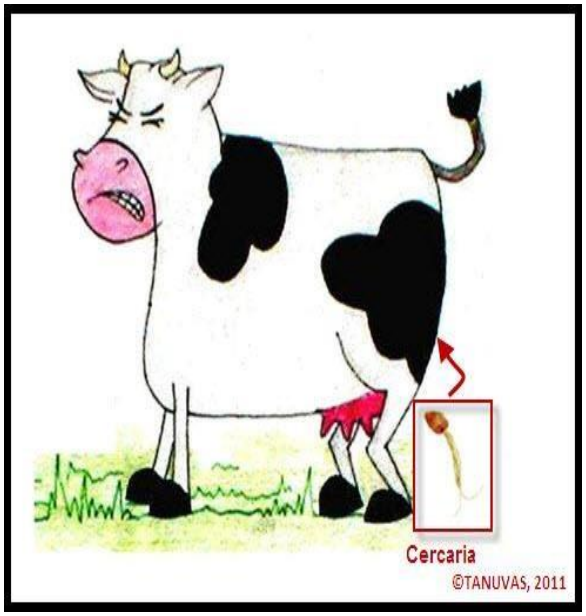
- For parasites with indirect life cycle, the host becomes infected by ingestion of an intermediate host or transport host containing infective stages.

- In certain parasites, the definitive hosts are infected through ingestion of infective stages (larval stages) in intermediate hosts (fish for *Diphyllobothrium latum* and crabs for *Paragonimus* sp) and through ingestion of raw or undercooked meat/organs/milk of intermediate hosts (*Taenia solium*, *Echinococcus granulosus).*



# THROUGH SKIN PENETRATION

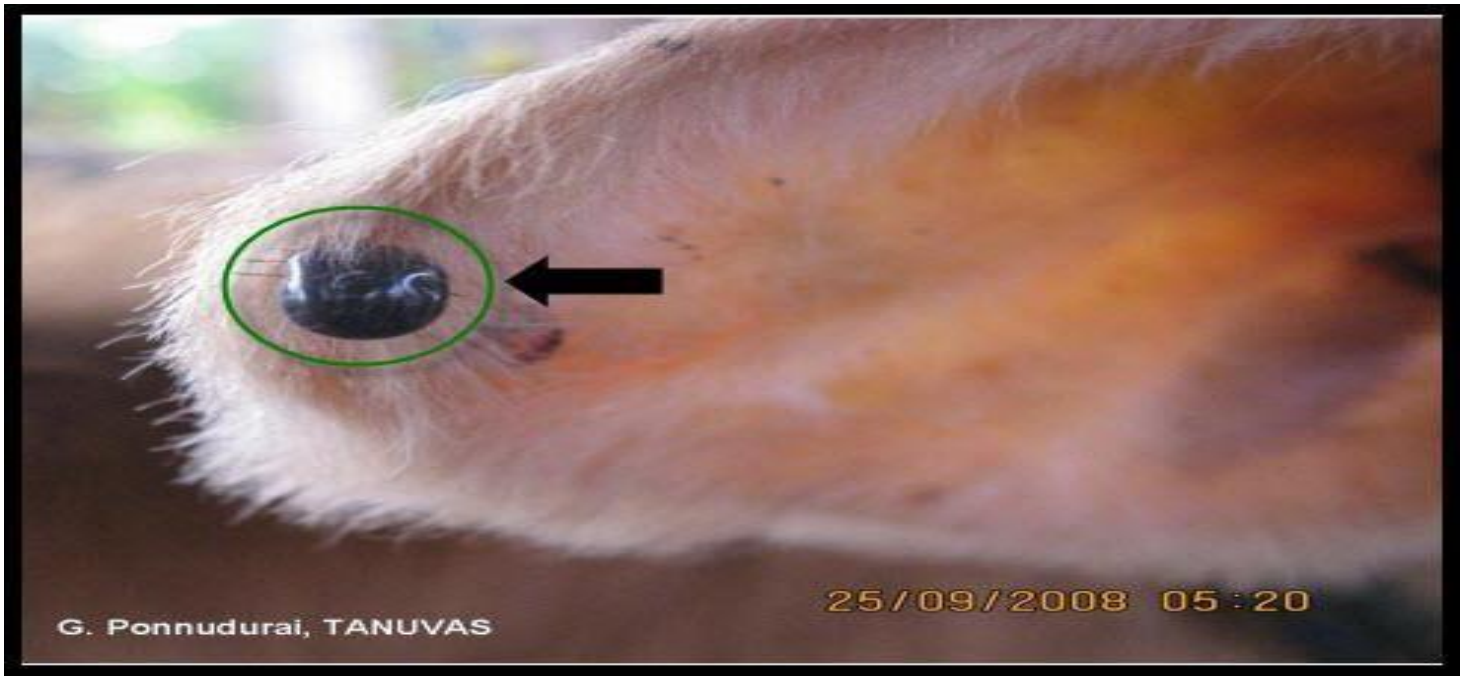



- After mouth, skin is the most common route of entry for many parasites.

- The infective stages of the parasite may actively penetrate the skin and in this process, the secretions of the parasite help to digest the host tissue (cercariae in schistosomes).

- Penetration of the host's skin is the predominant route by which the infective larvae of hookworms enter their hosts, although they also enter through the mouth.

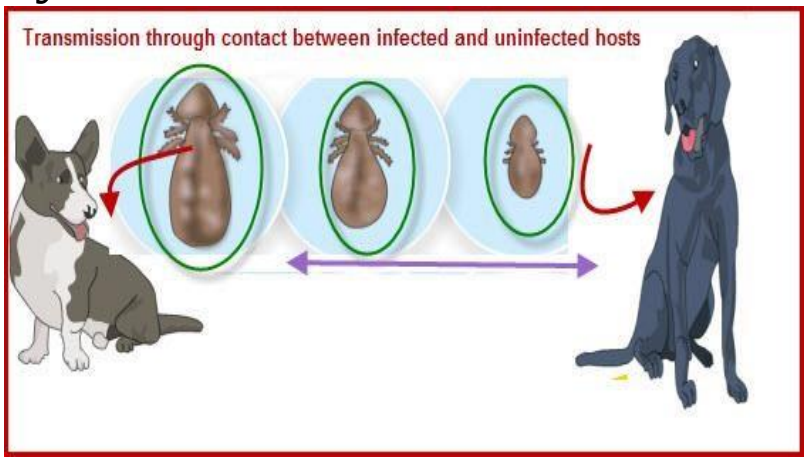
- Certain parasites enter the hosts via the bite of an intermediate host serving as a vector. These parasites develop in blood sucking insects and ticks and when these vectors feed to obtain the blood and tissue fluids from hosts, the infective stages of the parasites are introduced into the host.



# CONTACT AND PREDATION

Parasites are transmitted between animals by contact especially when they are confined in sheds or houses. Eg. Lice infestation and mange is chiefly transmitted between animals by contact.

Transmission by direct contact (eg. lice, mites, etc.)




- Parasites are also transmitted during predation by a host. For example, when cats predate on rats, cats may acquire an infection with parasites.

Transmission through predation (eg. *Toxocara cati, Toxoplasma gondii*)

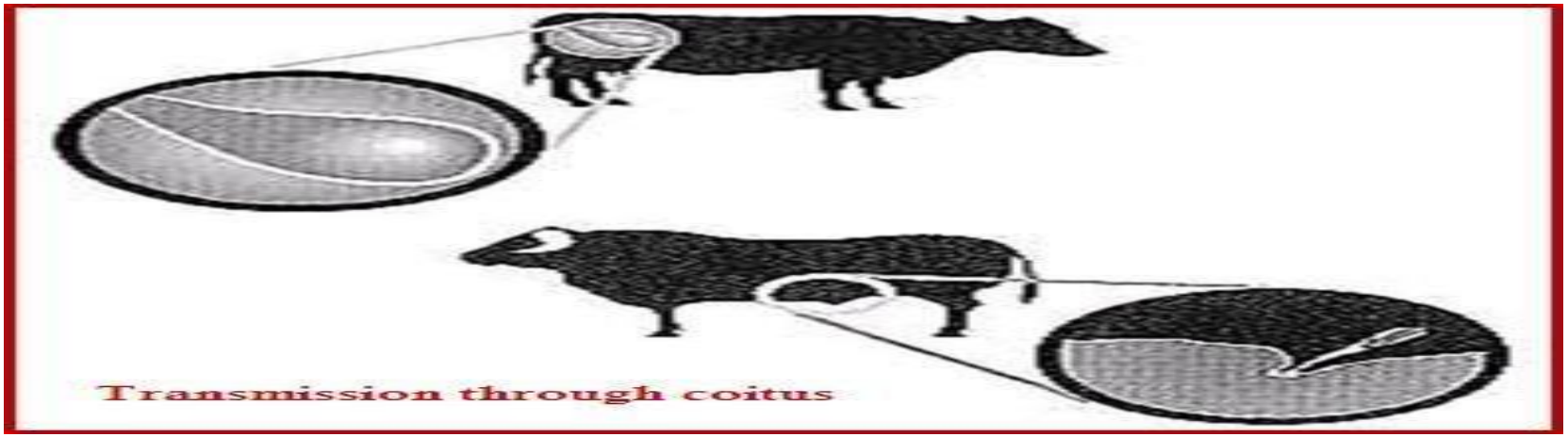
# ENTRY THROUGH NOSTRILS

***Oestrus ovis***, the nasal bot fly, deposit its young larvae around the nostrils of the host, where upon they crawl upward and enter the nasal sinuses.

***Naegleria fowleri***, a fresh water amoebae present in surface water of polluted pools gains access to the hosts through the intranasal route.


## ENTRY THROUGH EXTERNAL GENITALIA

*Tritrichomonas foetus*, the protozoan parasite that causes abortion in cattle and *Trypanosoma equiperdum*, the protozoa that causes dourine in horses are transmitted during coitus.



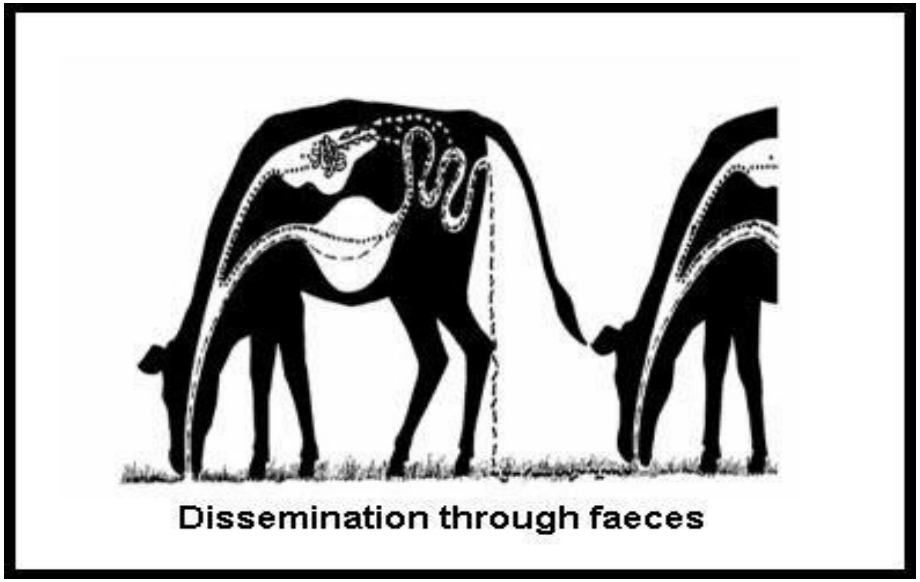

## TRANSPLACENTAL/TRANSMAMMARY TRANSMISSION

Transplacental or prenatal infection refers to transmission from mother to foetus across the placenta as in *Toxocara canis* and transcolostral or transmammary transmission refers to transmission from infected dams to nursing offspring via colostrum or milk as in *Toxocara vitulorum or Toxocara cati.*

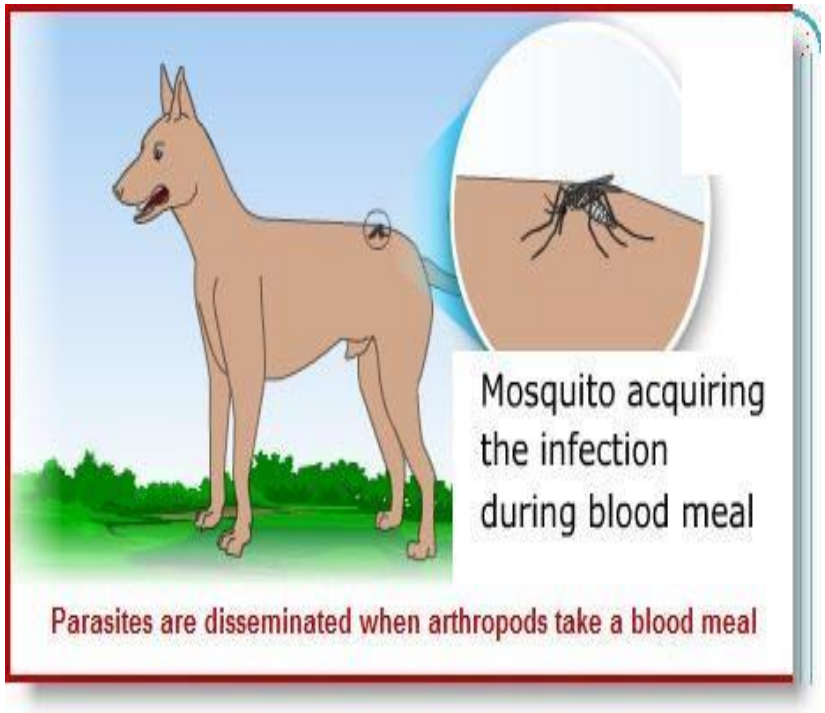
# METHODS OF DISSEMINATION OF THE INFECTIVE STAGES OF PARASITES

- Most of the parasites leave the host passively through excretions of the host.
- Many exit from the hosts through faeces as eggs (ascarids, strongyles, flukes etc.), cysts (*Entamoeba*, *Giardia*) and oocysts (coccidia).


Parasites disseminated through faeces



- Few exit through urine (Eg. *Schistosoma haematobium*, *Stephanurus dentatus*) and some leave through genital discharges (Eg. *Tritrichomonas foetus*).
- Some parasites are imbibed by arthropods inadvertently when they feed on a host (eg. Malarial parasites transmitted by mosquitoes) while the extraintestinal stages of parasites may be removed from the host during predation and the parasite subsequently infects the predator and leaves it passively through their faeces (eg. Cyst forming coccidia).

- Once parasites are outside the hosts, they have to survive in the environment until they find a suitable host. As the environmental conditions are generally adverse to their survival, the infective stages of parasites are endowed with resilience. These resistant stages have the capability to survive the adverse conditions and remain infective to find a host.

- Temperature and moisture are two important factors that facilitate or deter parasite survival and development.

- Parasites generally do not develop below 10oC or above 40oC. When climatic conditions are hostile (freezing temperatures), parasites cease development in hosts (arrested development) and wait for the conditions to improve before they resume development and discharge their eggs in faeces.

# Dispersal of parasites

- Parasites are disseminated in the environment mechanically through the agency of water and fomites beside human interventions.

- Water is an important agent for dissemination of parasites especially for those that require an aquatic habitat for development (eggs of many trematodes, larvae of *Dracunculus* etc).

- Trematodes whose intermediate hosts are aquatic snails are carried by the surface water into water bodies where they develop in aquatic snails. Similarly, larvae of *Dracunculus* require water bodies for gaining access to cyclops.

- Parasites that require aquatic habitats for developments such as mosquitoes and black flies are carried to long distances by streams and rivers.

- Human interventions such as construction of irrigation canals directly facilitate breeding of snails' thereby aiding dissemination of trematode parasites besides aiding breeding of insects.

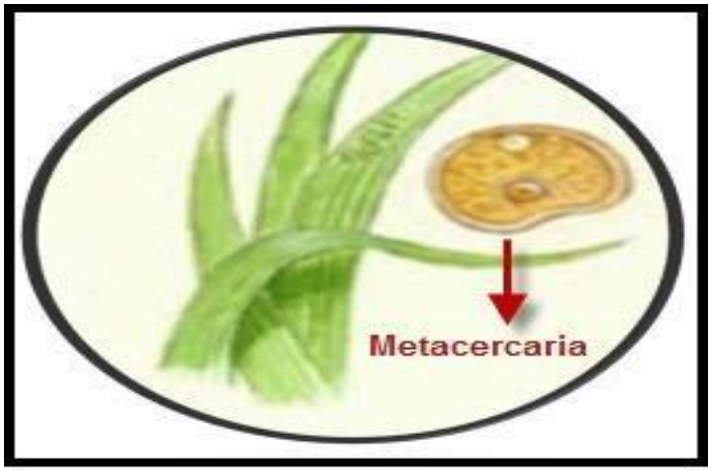
- The use of sewage and sludge to fertilize pasture is another potential method of dissemination of parasites.
- Fomites such as insects mechanically disseminate the parasites from one place to another.
- The fungus Pilobolus aids in the dispersal of the lungworm infective larvae from faecal pats to the pasture thereby facilitating infection of cattle hosts.
- Wild animal hosts may serve as a reservoir of infection for domesticated livestock.
- Wild reservoir hosts are important factor in the epidemiology of Fasciolosis. Overcrowding of hosts also facilitates dispersal of parasites.

## Parasite induced host behavioural changes

- Metacercariae of *Dicrocoelium* enters the brain of ants and paralyse them thereby aiding dissemination of parasite infected ants for herbivores during grazing.
- Grasshoppers infected with tetramers and beetles infected with cysticercoids of tapeworms become sluggish thereby facilitating ingestion of definitive hosts.
- Ruminants heavily infected with hydatid cysts become debilitated, making them easier prey for carnivores.

## Strategies adopted by parasites to infect hosts

- Some parasites employ certain strategies to augment their chances of finding a host. Liver fluke encysts on green parts of plants and on higher parts of the plants to facilitate ingestion by herbivore hosts.




Metacercaria about to encyst on grass blades

- As cattle are reluctant to feed on herbages near faeces, the motile gravid segments of *Taenia saginata* leave the faeces to contaminate the herbage and increase its chances of being eaten by an herbivore as against the non motile gravid segments of *Taenia solium* which does not have to leave the faeces because pigs being coprophagic consume the faeces and pick up the infection.

- Some parasites are endowed with sensory organs to locate hosts. Warmth, CO2, fatty acids, amines etc., serve as stimuli for parasites especially arthropods to locate hosts.


THANK YOU...