GENERAL PARASITOLOGY

- PRIORITAT RULES

- NAMING OF PARASITES (NOMENCLATURE)
- NAMING OF PARASITIC DISEASES

- ORIGINS OF PARASITE

PRIORITAT RULES

- The names given to the parasites are guaranteed by the "Prioritat Rules".

According to this rules;

- In order to the name given to a parasite to be valid, a description and the figure (photo, drawing) from which it can be diagnosed must be published together.
- Parasite must be named on the basis of nomenclature rules.
- According to the Prioritat rules, the oldest name given to a living thing is valid.

Nomenclature: Naming of parasites

- Every living thing has been proposed to be named with two words by Linnaeus (Linne) in 18th century. This offer has been accepted by scientists.
- Nomenclature depends on unchangeable rules.
- The important ones of these rules are;

1) UNINOMINAL: Class, order, suborder, superfamily, family and subfamily are named by single name

	Suffix	Example
Sınıf (Class)	-a	Nematoda
Takım (Order)	-ida	Rhabditida
Takım altı (Suborder)	-na	Ascaridina
Familya üstü (Superfamily)	-oidea	Ascaroidea
Familya (Family)	-idae	Ascaridae
Familya altı (Subfamily)	-inae	Ascarinae

2) BINOMINAL: Every parasite has two name. One of them is genus other is species name.

- Genus name starts a capital letter, species name starts lower-case letter.

Genus	species	Genus	species
Ascaris	lumbricoides	Leishmania	tropica
Fasciola	hepatica	Taenia	saginata

- If the species name come from the person who found this species, species name starts a capital letter.

Trypanosoma Cruzi Schistosoma Mansoni

3) TRINOMINAL: Sometimes, subspecies name of parasite need to remark after the species names.

Genus	species	subspecies
Sarcoptes	scabiei	hominis

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4) QUATRINOMINAL: Sometimes subgenus and subspecies names need to remark after the genus and the species names.

Genus	subgenus	species	subspecies
Trichonema	(Trichonema)	nassatum	parvum

5) Sometimes, genus name different but species name must be same.

Trichomonas hominis
Isospora hominis
Gastrodiscoides hominis

Toxocara cati
Toxocara canis

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6) The first of all parasite' genus and species name are written. Then, the finder person name is written and a comma are put . Then, finding date of parasite is added. Finder name and finding date can be written in a bracket.

- Fasciola gigantica Cobbold, 1885 / Fasciola gigantica (Cobbold, 1885)
- Toxocara canis Werner, 1782
- Fasciola hepatica Linnaeus,1758
- Taenia saginata Goeze,1782

7) If the parasite has just been recently found,

- next to the genus name n. g. (Novum genus=new genus) letters
- next to the species name n. sp. (Novum species=new species) letters are written and published like this.

Acceptance of the name is finaly came true at international congresses.

SNOPAD=Standardized Nomenclature for Parasitic Diseases

Fasciol**iasis** ..... Fasciol**iosis**

Toxoplasm**osis** ..... Toxoplasm**ose**

Echinococc**osis**

-OSE, -IOSIS, -IASIS, -IASE : Certain suffixes are used in naming diseases. These are brought to the end of the genus name.

SNOPAD=Standardized Nomenclature for Parasitic Diseases

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OSE	**Ascariose**
IASIS ★	**Ascariasis**
IOSIS	**Ascariosis**
IASE	**Ascariase**

Fascioliasis …… Fascioliosis

Toxoplasmosis …… Toxoplasmose

Echinococcosis

TRANSMISSION

Definition : Mode of transfer of diseases to a new host.
Parasites must be migrate to certain tissue or/and organs within the host/intermediate host in order to complete their life cycle

Route of transmission :

1) Direct transmission : From one host to another,
either a) vertically or b) horizontally

a) Vertical transmission : From parent to offspring
b) Horizontal transmission : From one member of a population to another

2) Indirect transmission: Infection via a vector or intermediate host

Vector or intermediate host:

- Mechanical: Vector is not essential to life cycle of parasite
- Biological: Parasite spends some part of life cycle in vector

How Do Animal Get Parasites

1. Oral Route/Alimentary tract

Fasciola hepatica, Ancylostoma caninum, Taenia saginata, Toxocara canis, Giardia canis,..)

- The most significant entrance tract. The hosts ingest the parasite's eggs, larvae or cyst by orally with contaminated food and drink.
- In addition, ingestion of the intermediate hosts with food and water.

Toxocara canis

- Final host: dogs
- Dogs/humans are infected by eating infected eggs from soil contaminated by dogs feces (food, water…)
- Paratenic hosts can also be important

Taenia saginata

- Final host: humans
- Intermediate host: cattle
- Humans can be infected by eating raw or undercooked beef (IH) containing larvae
- Cattle becomes infected with grass/pasture contaminated by eggs

Ancylostoma caninum

- Final host: dogs
- Infection become by ingestion of infective larvae or by skin penetration of infective larvae.
- Paratenic hosts can also be important

Giardia spp.

- Final host: dogs, cats,…
- Cysts are responsible for transmission of giardiasis. Both cysts and trophozoites can be found in the feces. The cysts are can survive several months in cold water.
- Infection occurs by the ingestion of cysts in contaminated water, food or, by the fecal-oral route (hands or fomites in human).

2. Airborne Transmission/Inhalation

- This way is less common seen. Oestrus ovis, Echinococcus granulosus

- Oestrus ovis, female flies spray their larvae on sheep's or goat's nostril while they are flying. The batch of larvae in sheep or goat's nostril migrate to the frontal sinuses and into the nostrils.

Echinococcus granulosus

- Final host: dogs
- Intermediate host: ruminants,humans
- *Ruminants* or humans can ingest E. granulosus eggs with inhalation and then cysts can develop in the lungs from these eggs. But, the most significant entrance tract is oral route.
- Dogs becomes infected by eating liver, lung, spleen etc. containing larvae (cyst hidatid in IH)

3. Skin or Mucous Membrane Entry

- This route is occured by parasite by penetration of the skin. It can be direct or indirect. The indirect way is that, intermediate host called as vector in transmission. During the vectors feed on tissue and blood, the larvae penatrate to the host's skin (Hypoderma) or circulatory system (D. immitis).

3.1. Indirect/Biological (Vector-borne)

Many parasites that are carried by vectors are often found in the blood of humans and animals. A vector is an agent which transfers a parasite from one host to another. Fleas, ticks and mosquitoes are common biological vectors of diseases.

Hypoderma spp.

The eggs contact and larvae penetration of skin

Hypoderma eggs attache to the hairs in rows on the body (in late spring and early summer). Following penetration through the skin, the larvae migrate through tissue to back (the region of thoracic and lumbar vertebrae), where they overwinter. The larvae live in cyst under the skin of the host. They make breathing holes through the skin. Then again in spring the mature larvae crawl out of the cyst and fall to the ground.

Dirofilaria immitis

- Final host: dogs
- Intermediate host: mosquito
- Microfilariae can transmit by mosquitoes from dog to dog, cat or dog to humans.

Intermediate host is mosquito. Microfilariae are ingested by mosquito during feeding from dogs. The microfilariae develop to larva in the mosquito. During the suck the blood, larvae of Dirofilaria immitis into the skin of the dog (definitive host) , where they penetrate into the bite wound. Larvae migrate to heart, pulmonary arteries in dogs.

Babesia spp.

- Final host: cattle
- Intermediate host: ticks
- Sporozoites (intracellular protozoa) are found in red blood cells and spread by infected ticks

Babesia life cycles consist of merogony, gamogony and sporogony. Infection is acquired when sporozoites are transferred during tick feeding. Sporozoites then invade erythrocytes and develop into trophozoites. Trophozoites produce merozoites. Trophozoites develop into gametocytes which can initiate infection in the tick vector. In the tick gut gametocytes develop into' (Sk) which fuse to form a zygote developing into a kinete. Kinetes gain access to the hemolymph of the tick, replicate and invade various organs.

3. Skin or Mucous Membrane Entry

3.2. Direct/Mechanical (penetration of skin)

This route is occurred by parasite by penetration of the skin.

Schistosoma haematobium furcocercariae, Uncinaria stenocephala and *Ancylostoma caninum* larvae penetrate in the skin then migrate from there to other side in the body.

4. Direct Contact Transmission

- Touch, contact/skin-to-skin (louse, flea, scabies, etc.)

The transmission of louse infection occurs when animals make direct contact with each other (skin-to-skin/head-to-head).

Mites (scabies) are contagious and spread by direct contact with other dogs and animals, so keep an eye out for scratching if your dog has recently stayed in a kennel or sniffs around areas where local wildlife might live.

Ticks can live nearly anywhere and be found in all seasons. Ticks are often picked up in tall grass or wooded areas. They attach around ears, legs, toes, skin folds. Checking after every walk or trip outside can prevent ticks from latching on and biting or climbing onto other (human and furry) members of your household.

Fleas are wingless insects that feed on blood, can jump up to two feet high and are persistent in the environment. The transmission of flea can be reached by direct contact between individuals.

5. Urogenital, Galactogen and Placental Transmission

- Sexual activity: Parasites like *Trypanosoma equiperdum* and *Trichomonas vaginalis* can be transmitted by sexual contact.
- Placental=transplacental=prenatal: In the pregnant animals, prenatal infection can occurs (*Toxocara canis, Toxoplasma gondii,……*).
- Transmammary=galaktogen: The suckling animals may be infected by ingestion of 3th stage larvae in the milk during the first 3 weeks of lactation (*Toxocara vitulorum, Toxocara canis, Ancylostoma caninum,……*).

Trypanosoma equiperdum (Dourine)

- Final host: horse, donkey, mule
  - Stallions-to-mare most common
  - Occasionally mare-to-stallion
  - Found in vaginal secretions, seminal fluid, exudate from the penis
- It is primarily a tissue parasite that rarely invades the blood. Parasite, which are present in the seminal fluid and mucous membranes of the genitalia of the infected donor animal, are transferred to the recipient during sexual intercourse.

Toxocara canis

- Final host: dogs
- Eggs ingested from environment. Larvae migrate to various organs where their development is arrested.
- In the pregnant and lactating dogs, the larvae can be reactivated and cause intestinal infection in the mother and/or infection of the offspring (by transplacental and transmammary transmission)

Toxoplasma gondii

- Final host: cats (Oocysts)
- Intermediate host: sheep, pork, chicken, human
- When passed in feces and then ingested, the oocysts can infect humans and other IH. Consuming food or water contaminated with cat feces. Eating undercooked meat of animals harboring tissue cysts.
- Transplacentally from mother to fetus (If a pregnant woman becomes infected, tachyzoites can infect the fetus via the bloodstream)

6. Auto infection

- Strongyloides stercoralis is a soil-transmitted helminth, but it can be completed in the human host as known as autoinfection.
- The larvae are usually excreted in the feces, but some can mature to the filariform stage and reinfect the host by penetrating the last part of the intestine or the perianal skin (autoinfective cycle). The infective larvae can penetrate either the intestinal mucosa (internal autoinfection) or the skin of the perianal area (external autoinfection).