

Trypanosoma Leishmania



Trypanosoma Leishmania

- Phylum: **Euglenozoa**
 - Sub-phylum: **Kinetoplasta**
 - Class: Trypanosomatidea
 - Order: Trypanosomatida
 - Family: Trypanosomatidae
 - Genus: *Trypanosoma*
 - Genus: *Leishmania*

Trypanosomatidae

- *Trypanosoma* species are lancet form in the blood plasma of vertebrate and have a large vesicular nucleus in the middle.
- Their lengths are between 15-30 μm .
- They have a basal body, kinetoplast and a whip with undulated membrane.

- *Trypanosoma* species have a surface coat that have varying thickness and variable glycoprotein structure.
- The surface coat of this protozoa is a sign of escape from host's the immune response.
- Additionally, this structure allows to escape from the vaccine.

Developmental forms of Trypanosomatidae

- *Trypanosoma* and *Leishmania* species can change their shapes depending on host (mammalian or insect) during the developmental stage.
- This situation indicates that these protozoa can easily adapted to their host or environments.

Developmental forms of Trypanosomatidae

- Amastigote Form
- Promastigote Form
- Epimastigote Form
- Trypomastigote Form

Amastigote Form

- This form is round or oval shape and has a nucleus in the middle. In this stage, the flagellum is degenerated.
- The flagellum has a shape like a short thread and is not extend beyond the body of protozoa.
- Sometimes, this form does not has a whip.
- Basal body and kinetoplast are located next to and in front of the nucleus.
- This form is also called *Leishmania form*.
 - Developmental forms of *Leishmania* species in the vertebrates
 - Developmental form of *Trypanosoma cruzi* in heart muscle.

Promastigote Form

- This form is shaped like a long lancet with a nucleus in the middle.
- The basal body and kinetoplast are far from the nucleus and are on the front of the body.
- Flagellum comes out of the basal body and extends forward.
- has not an undulated membrane.
 - The forms of *Leishmania* species in the insect vector
 - The forms of *Leishmania* in the media.

Epimastigote Form

- This form has shape like a long lancet with a nucleus in the middle.
- The basal body and kinetoplast are the front of the nucleus.
- The flagellum has a short undulated membrane.
- This form is the developmental form of various *Trypanosoma* species in the vectors.

Trypomastigote Form

- This form has shape like a long lancet with a nucleus in the middle.
- The basal body and kinetoplast are behind the nucleus.
- The flagellum has a long undulated membrane.
- This form is the developmental form of *Trypanosoma* species in the vertebrate host.
- And this form can be accepted as last form of *Trypanosoma* in the vector.

Trypanosoma

- Definitive hosts
 - It varies by the protozoon species.
 - Cattle, sheep, horse, swine, cat, dog and human
- Intermediate hosts
 - It is biologically transmitted by vectors.
 - *Glossina* (tsetse), *Reduviidae* (kissing bugs)
 - Some species is mechanically transmitted by vectors.
 - *Tabanus* spp., *Melophagus* spp.
 - *T. equiperdum* is venerally transmitted.
- Development
 - They are multiply by binary division.
 - They can be found as trypomastigote form in the definitive host and as epi-, pro- and trypomastigote forms in vector.

- There are two main groups:
- **Salivaria group** includes the species transmitted by saliva of vectors and generally pathogen species.
- **Stercoraria group** includes the species transmitted by feces of vectors and generally nonpathogenic species.
- Although the transmission occurs by venerally in some species (*Trypanosoma equiperdum*), these species are classified in salivaria group because of genetic similarity.
- The protozoa that complete developmental stage in the vector and have a developmental ability in vertebrate hosts are called **metacyclic form**.

Salivaria Group

- Salivaria means saliva. The protozoa are transmitted by saliva of vectors to vertebrate host.
- It is typical that the metacyclic forms are biologically transmitted by the saliva of tsetse flies.
- The agents are taken by vector during blood-feeding and transform to epimastigote forms. They multiply with binary fusion.
- They transform to trypomastigote forms when they reach to the saliva gland.
- After they are covered a surface coat, the agents are given to host by the vector during blood-feeding.
- Some *Trypanosoma* species are also mechanically transmitted by contaminated mouth parts of arthropods.

Stercoraria group

- **Stercus** means feces.
- The species belonging to this group develop as metacyclic trypomastigote form in the hindgut (last intestine) of the vector after they multiply as amastigote and epimastigote forms in the middle intestine of the vector. And, they leave from vectors via feces.
- The vector defecates to the bite wound (during blood-feeding) and the agents enter to the host body in this way. They can also enter to the host body via mucosa or conjunctiva. The transmission can occur by eating of vector.
- The species belonging to this group except for *T. cruzi* are nonpathogenic.

Trypanosoma

- Salivaria group
- *Trypanosoma brucei* complex (African trypanosomiasis)
 - Biological transmission by tsetse flies (*Glossina* spp.)
- *Trypanosoma evansi* and *T. equinum*
 - Mechanical transmission by *Tabanus* spp. and *Stomoxys* spp.
- *T. equiperdum*
 - Venereal transmission
- Stercoraria group
- *Trypanosoma cruzi* complex (America trypanosomiasis)
 - Biological transmission by kissing bugs (Reduviidae)
- *Trypanosoma theileri* (Mechanical transmission by *Tabanus* spp.)
- *T. melophagium* (Mechanical transmission by *Melophagus ovinus*)

Trypanosoma

- *Trypanosoma brucei* complex (African trypanosomiasis)
 - *T. brucei*, *T. congolense*, *T. vivax* (Nagana)
 - Horse, cattle, sheep, cat, dog, laboratory animals.
 - *T. rhodesiense*, *T. gambiense* (Sleeping disease)
 - Human and antelope
- *T. evansi*, *T. equinum* and *T. equiperdum* complex
 - *Trypanosoma evansi* (Surra)
 - Camel, horse and dog
 - Cattle are reservoir for horse.
 - *Trypanosoma equinum* (Mal de Caderas)
 - Horse, dog, sheep and goat
 - *Trypanosoma equiperdum* (Dourine)
 - Horse

Trypanosoma

- *Trypanosoma cruzi* complex
 - *Trypanosoma cruzi* (Chagas disease)
 - Human and dogs
 - Amastigote form in myocardium and CNS cells of definitive host
 - Trypomastigote form in blood plasma of definitive host
- *Trypanosoma theileri-melophagium* complex
 - *Trypanosoma theileri*
 - Cattle, apathogen
 - *Trypanosoma melophagium*
 - Sheep, apathogen
 - Both species are found as epimastigote form in lymph nodules and as trypomastigote form in blood plasma.

- *Trypanosoma equiperdum*
(Dourine, Exanthen Coital Paralyticum)

- Horses
- Venereal transmission
- Clinic (Incubation period 1 week-1 month)
 - Edema and discharge in genital organs.
 - Urticaria (silver coin appearance)
 - Paralysis

- Morphology

- Only trypomastigote forms are found in the host.

- *Trypanosoma equiperdum*

- Symptoms are seen in three different systems and the symptoms follow each other.
 - First clinical manifestations occur in genital organs
 - and are followed by lesions in the skin
 - then, disorders in the central nervous system are seen
 - Three different stages of the disease can be detected.
- The course of the disease is generally chronic and it lasts 1.5-2 years.

This disease locates in the list of the mandatory reportable disease in Turkey.

- *Trypanosoma equiperdum*

- **First stage:** Firstly, edema occurs in the genital organs. Mucoid vaginal discharge, ulcers on the mucosa of vagina, preputium and penis,
- and then, edema is formed under the abdomen to under the chest are seen in horses.
- In some cases, lesions on the vulva and penis heal, but there are white areas without pigments on their surface.
- Rarely, a viable fever can be seen.

- *Trypanosoma equiperdum*

- **Second stage:** Urticarias occur in the skin 4-6 week after the diseases begins.
- Especially these spotted areas occur the sides of the body and there is no itching.
- These urticarias can last for a few hours, even days, and the numbers can be increase.
- During this phase, the protozoa settle in blood plasma and reach various organs through blood.
- General symptoms occur according to the organs.

- *Trypanosoma equiperdum*

- **Third stage:** Deterioration in the general condition and anemia arises as a result of bone marrow damage total metabolic disturbances.
- Parasites also cross the cerebrospinal fluid.
- Atrophy in gluteal muscles, incoordination and face, neck, hind legs paralyses are seen and the whole body becomes paralyzed.

Morphology

Trypanosoma equiperdum;

- Long, lancet shaped
- 14-33 μm x 1,5-2,2 μm in size
- has a long-oval nucleus
- Conical or pound rear end, there are granules in the cytoplasm and the kinetoplast is near the rear end.
- has a flagella with undulated membrane.

Division

- *Trypanosoma equiperdum* multiplies by longitudinal binary division.
- Initially, kinetoplast is divided into two. Later, the flagellum and second parabasal body form.
- The nucleus division follows this.
- The division occurs from front to back.

STERCORARIA group

- *Trypanosoma cruzi* group (American trypanosomiasis)
 - Biological transmission by Reduviidae.
- *Trypanosoma theileri* (*Tabanus* spp.) and *T. melophagium* (*Melophagus ovinus*) group
 - Mechanical transmission
- *T. theileri*, *T. melophagium*, *T. cervi* and *T. lewisi* in animals.
- From these, *T. theileri* and *T. melophagium* have been reported in Turkey.

- *Trypanosoma theileri-melophagium* complex
 - *Trypanosoma theileri*
 - It is observed in cattle. It is considered nonpathogenic, but it can cause a disease in some cases of immunosuppression.
 - *Trypanosoma melophagium*
 - It is observed in sheep. It is considered nonpathogenic.

Leishmania

- Definitive hosts
 - Human, dog, cat and rodents.
- Vectors (sand flies)
 - *Phlebotomus* spp. (Old World)
 - *Lutzomyia* spp. (New World)
- Zoonotic disease
- Morphology
 - Amastigote form (intracellular) in the definitive host.
 - Promastigote form in the vector.
- Development
 - In definitive vertebrate host, amastigote forms multiply by binary fusion inside leucocytes in the skin, spleen and bone marrow.
 - Promastigote forms develop and multiply in the vector and they are infected to host during the blood-feeding.

Leishmania

Cutaneous Leishmaniasis

- *Local cutaneous Leishmaniasis*

Leishmania tropica (*L. tropica major* and *L. tropica minor*)

- Skin leishmaniasis
- It is seen in humans
- Dogs and cats are reservoir for this protozoa.
- is transmitted by *Phlebotomus* spp.
- The infection is limited to the skin (macrophages, subcutaneous lymph nodules), and does not spread to internal organs.

- *Mucocutaneous Leishmaniasis (Leishmania brasiliensis)*

- It is seen in humans
- It is common in South America
- is transmitted by *Lutzomyia* spp.
- The infection is found in skin, mucous membranes and cartilaginous tissues.

- *Diffuse cutaneous Leishmaniasis (L. mexicana complex)*

- It is seen in humans living South America.
- is transmitted by *Lutzomyia* spp.

Visceral Leishmaniasis

- *Leishmania donovani*
 - (Visceral leishmaniasis; Kala-Azar)
 - Human, dogs and other canids.
 - It is transmitted by *Phlebotomus* spp.
 - and is common in India and Africa.
- *Leishmania infantum*
 - Mediterranean Kala-Azar
 - Human (especially children)
 - Dogs and wild canids are reservoir.
 - It is common in Mediterranean countries.
 - It is transmitted by *Phlebotomus* spp.
- *Leishmania chagasi*
 - American Kala-Azar
 - Human (especially children)
 - Dogs are reservoir.
 - It is transmitted by *Lutzomyia* spp.

***L. infantum* infection in dogs**

- Splenomegaly
- Lymphadenopathy
- Anemia
- Dermatitis
 - periocular alopecia and incrustation
 - Ulcerative nodular dermatitis (nose, around the eyes, the tip of the ear)
- Muscular atrophy
- Eye disorders:
 - Keratitis.
 - Uveitis.
 - Chorioretinitis.
 - Corneal edema.
 - Glaucoma.
- Epistaxis
- Polyarthritits – intermittent claudication
- Pneumonia
- Nervous disorders

Biopsy (Amastigote form)

Cultivation (Promastigote form)