Phylum: Protozoa

Definition

Protozoa: A unicellular organism in which various activities of metabolism like locomotion, reproduction, nutrition, etc., are carryout by the organelles of the cell, and it is classified under the kingdom called Protista.

Protista: A kingdom lies between plant and animal and divided in to two subkingdom called Eukaryotic and prokaryotic.

Eukaryotic: Organisms with nucleus enclosed in a membrane, like protozoa, algae and fungi.

Prokaryotic: Organisms with diffuse nucleus within the cytoplasm, like bacteria, blue-green algae, rickettsia, etc.
Shape of protozoa: The shape of protozoa is differing among spherical, semi-spherical, oval, spindle, pear shape and irregular.

1. Family: Trypanosomatidae

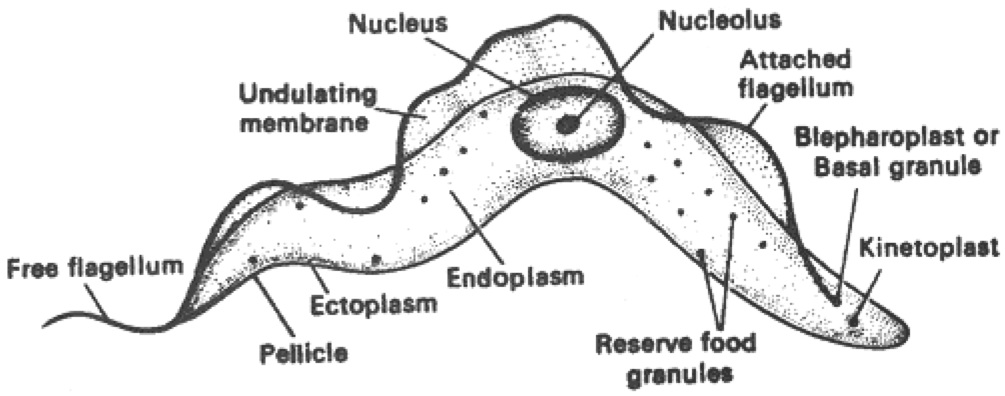
Member of these family are characteristics:

1-Leaf like shape or rounded, contain vesicular nucleus, flagellum arise from structure known as kinetosome.

2-(basal granule), posterior to the kinetosome there is a rod or spherical in shape called kinetoplast (parabasal body) which have the DNA, when the flagellum contact with the cell wall it is formed the undulating membrane and continue to give free part .

3- Most of species belong to this family are parasite in man and animals and cause a serious pathological changes which may lead to the death of the host.

4-Most of them are transmitted by blood sucking insects (biologically or mechanically), also the sexual transmitted can be take place.



Trypanosoma gambiense

The family developmental stages:

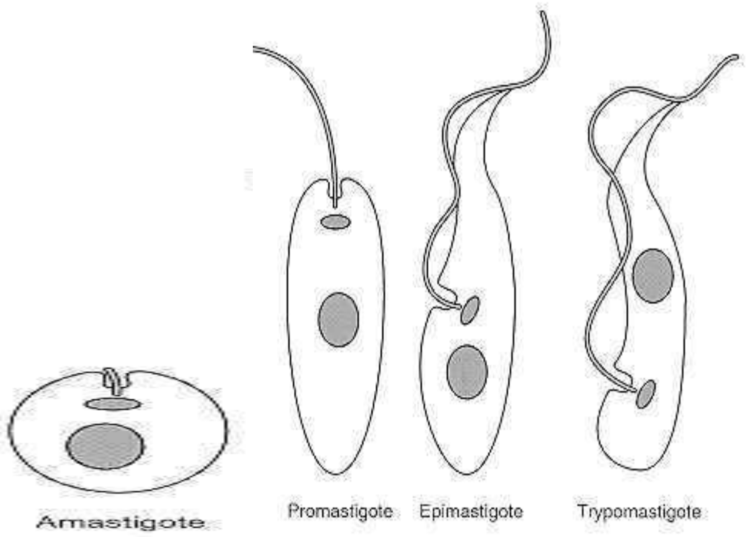
The members of this family are characterized by the developmental stages and there are four developmental stages:

1- **Trypomastigote form:** It is spindle in form, have a kinetoplast, undulating membrane and free flagellum, and this form is found in (invertebrate) insects and (vertebrate) final host.

2- **Epimastigote form:** spindle in form, the kinetoplast is lies in front of the nucleus, small part of undulating membrane is present in addition to free flagellum, and this form is found in insects and final host.

3- **Promastigote form:** Leaf like in shape, the kinetoplast is lies in anterior end, no undulating membrane and there is free flagellum, this form is found in insects and media.

4- **Amastigote form:** Round in shape, no undulating membrane, no flagellum, present of kinetoplast, found in final host.



Genus:1. ***Trypanosoma***

Members of this genus cause diseases known as sleeping sickness in man and animals. This parasite is visible in blood, lymph and organs of infected man or animal, and it is mainly transmitted by blood sucking insects.

There are two groups in this genus called salivaria and stercoraria group.

1- Salivaria group:

The infected form of this group is transmitted through the saliva of insects, and the infected form called metacyclic form which character by blunt posterior end, kinetoplast is terminal or subterminal and the free flagellum is present or no.

Most of them are pathogenic and transmitted by inoculation, no specific to their hosts and characterized by antigenic variation that which occur through change of parasite form (polymorphism) and there are three forms in this phenomenon:

A-**Cylinder form (type):** Spindle shape, kinetoplast and undulating membrane are present.

B-**Intermediate form**: Semi-circle with short free flagellum.

C-**Stumpy form:** Circle shape without free flagellum.

<u>Species of salivaria group:</u>

Human species:

-*Trypanosoma gambiense*

-*T. rhodesiense*

Animals' species:

-*T.brucei*

-*T.congulense*

-*T.vivax*

These above species are found in Africa and not found in Iraq, and they transmitted by *Tse tse* flay.

-*T.evansi* (infect camels and equines, found in Iraq)

-*T. equiperdum* (infect equines, found in Iraq)

2-Stercoraria group:

This group's parasites are transmitted through the feces of the insect to the intact host. For example *T. cruzi* which cause the Shagas' disease in South America which infect human and dog and transmitted by bugs called kissing bugs which put the feces on the mouth's corner of human during the sleeping and then the parasite will be penetrate the mucous membrane of the mouth and reach to the blood . The disease may cause death due to present of the parasite in the heart cells and cause heart failure.

Species of stercoraria group:

-*T. cruzi* / infect man and dogs / transmitted by bugs.

-*T. lewisi* / infect rats / transmitted by fleas.

-*T. melophagium* / infect sheep / not pathogenic / transmitted by insects.
-*T. theileri* / infect cow / not pathogenic / found in Iraq.

Sp. 1- *Trypanosoma evansi*

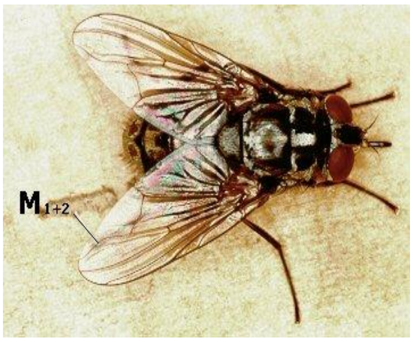
Cause Surra disease that is an acute disease in horses and chronic in camels (three years before death).

Host: Camel, horse, donkey, mule, cattle, sheep, goat, dog, and various wild animals.

Transmission

1- Hematophagous insects like *Tabanus* and *Stomoxys* are the vectors which transmit the infection.

2- There are other secondary routs of infection like hematophagous bats (in South America), placenta or through infected meat (not enter the stomach but by penetrate the mucous membrane of mouth).




(*Stomoxys calcitrans*) *Tabanus* (female) *Tabanus* (male)

Epidemiology:

The most important factor in the epidemiology of surra disease is present of the hematophagous insects.

Site of infection: blood stream

Clinical Signs:

1- Abdominal and behind legs odema.
2- Anemia.
3- The infected animals was isolated itself from the flock and toward to the sun.
4- Conjunctivitis.
5- Loss of appetite (anorexia).
6- Fall of hair.
7- Abortion.

Camel with Surra dis.

T. evansi (odema in camel)

Postmortem Sings:

1- Anemia.
2- Emaciation of visceral.
3- Enlargement of spleen and lymph nodes.
4- Petechial hemorrhage on liver and spleen.

Sp. 2-*T. equiperdum*

Cause disease called Dourine, which is a venereal disease of horses, donkeys and mules.

Transmission:

The transmission:

1-Manly occurs through the sexual contact.

2- By blood sucking insects (Very rarely).

3-There is other transmission to the foals may occur through the contact of the conjunctiva with the vaginal discharges of infected mares.

Clinical Signs:

The disease in donkeys and mules is without observing clinical signs (asymptomatic), while in horses it is an acute and the incubation period 2-12 weeks.

1-Odema: The first sign occur in genital organs and continue for 2-4weeks.

2- Ulcer with brownish spots appears in mucous membrane of penis and vulva, in addition to yellowish or colorless mucous discharges.

3-Urticarial plaques: Called Dollar spots appear on flank region (this spots contains a fluid filled with the parasites) these are continue 3-4 days and disappears.

4-Paralysis: Start with the muscles of the face and followed by general paralysis and death.

5-Frequency of urination, abortion of pregnant and weakness.

Pathogenesis: (*T. evansi and T. equiperdum*)

1- Odema: the odema of lower parts like abdomen, legs and genital organs, is due to the presence of prekallikrein enzyme, which is found in inactive form but when there is *Trypanosoma* infection the enzyme will be activated and lead to increase the blood vessel permeability and lead to odema.

2- Anemia: Occur due to:

A- R.B.Cs. lysis by complement due adhesion of parasite's coat with the R.B.Cs.

B- R.B.Cs. phagocytosis due to the same above reason.

C- Poisoning effect of the parasites on the bone marrow which lead to decrease the production of R.B.Cs.

3- Kidney damage: Due to deposition of immune complex (Ag-Ab complex) in kidney tissues and cause polynephritis (also may be occur in liver and kidney).

4- Paralysis (especially pathogenesis of *T. equiperdum*): Due to the toxin is liberated by the parasite and affected on the nerves supply to the organs.

Diagnosis:

1- Clinical signs.

2- Blood smear (wet film or thick smear).

3- Animals' inoculation (to increase the parasitimia).

4-Serological tests.

Control:

1- Early diagnosis of disease and treating the infected cases.

2- Discard of chronic cases.

3- Testing the horse before copulation (Dourine).

4- Keep the camels far off the Tabanus presents region.

5- Use of insecticides.

Treatment:

1- Surramin (Naganol). Horse, 4g/50kg B.W., I.V.

Camel, 1-2g/100kg B.W., I.V.

2- Antrycide 10% , 5mg/kg B.W., S/C.