

English Translation — Flagellates and Sporozoa

Phylum: Mastigophora = Flagellates

- These are protozoa having one or more flagella used for locomotion.
- Reproduction: longitudinal binary fission.
- Respiration: diffusion of O₂ through the cell wall.
- The beating of the flagella promotes exchanges.

Classification

- Two classes: Phytomastigophora and Zoomastigophora.

Class 1: Phytomastigophora — Euglena

- Family: Euglenaceae.
- Genus: Euglena.
- Small colorless algae possessing branched chloroplasts (described as star-shaped).
- The name Euglena derives from the Greek words eus and glêne, meaning “good eye”, referring to the sensor (stigma), which functions as a rudimentary eye.
- Specific photoreceptor system.
- Abundant in fresh, stagnant water, where they may “bloom” in sufficient numbers to color the surface of ponds and ditches green with *Euglena viridis* or red with *E. sanguinea*.
- Autotrophic or heterotrophic; a mixotrophic organism.
- A particular flagellar apparatus not found in any other type of organism.
- They also possess discoid mitochondrial cristae.
- Size: 20–300 µm.
- Typically cylindrical, oval or spindle-shaped, with the appearance of a single flagellum.
- Contrary to many descriptions, it is a bikont, but its very short second flagellum does not emerge from the reservoir.
- Multiplies by longitudinal division.

Anatomy of an Euglenid with stigma

Class 2: Zoomastigophora or Zooflagellates

- Free-living, parasitic or symbiotic.
- Locomotory apparatus consisting of one or more flagella of variable length.
- Longitudinal binary fission.
- Four orders: Kinetoplastida, Choanoflagellida, Diplomonadida and Hypermastigida.

Order 1: Kinetoplastida — Suborder Trypanosomatina

- Spindle-shaped body.
- Flagellum directed forwards and connected to the cytoplasmic mass by an undulating membrane.
- Flagellum inserted at the level of the blepharoplast.
- Presence of a parabasal apparatus and a large kinetoplast.
- Parasitic.

1. Genus Trypanosoma

- Dixene or heteroxenous parasites living in the blood or cerebrospinal fluid of various vertebrates.

- Inoculated by blood-feeding biting invertebrates (leeches, insects).
- They cause trypanosomiasis.
- Longitudinal binary fission.
- Four species: *T. gambiense*, *T. cruzi*, *T. brucei* and *T. evansi*.

T. gambiense

- Heteroxenous parasite (tsetse fly and human).
- Lives in blood plasma and cerebrospinal fluid.
- Causative agent of sleeping sickness, transmitted to humans by the bite of a dipteran fly: *Glossina palpalis*.
- Affected humans present irregular fever, various nervous disorders and some ocular disorders.

T. cruzi

- Causative agent of Chagas disease, transmitted to humans by a South American kissing bug: *Rhodnius prolixus* (assassin bug).

T. brucei

- Causative agent of Nagana, transmitted to equids and bovids by a tsetse fly.

T. evansi

- Causative agent of Surra (equids) and Debab (camelids), transmitted by a dipteran.

2. Genus Leishmania

- Heteroxenous parasites transmitted by a biting dipteran (sandfly).
- They cause leishmaniasis and occur in two forms:
- *Leishmania* form: inside the blood cells of the definitive host, without a flagellum.
- *Leptomonas* form: in the digestive tract of the sandfly, an extracellular flagellated form.
- Two main known species: *Leishmania donovani* and *L. tropica*.

Leishmania donovani

- Intracellular parasite.
- 2-4 microns.
- Agent of visceral leishmaniasis or Kala-azar.
- Transmitted by a dipteran (*Phlebotomus perniciosus*).

L. tropica

- Agent of cutaneous leishmaniasis, Biskra button or Oriental sore.
- Transmitted by the bite of *Phlebotomus papatasi*.

3. Genus Trichomonas

- Monoxenous cavitary parasites of humans and several vertebrates.
- Main known species:
- *T. intestinalis*: lives in the caecum and colon; feeds on bacteria; its pathogenic role is disputed.
- *T. vaginalis*: causes vaginitis in women and urethritis in men.

Phylum: Sporozoa

- Small in size.
- All are obligate intracellular parasites.

- Immobile and lacking locomotory organelles.
- They possess membranes and contain, at the apical end of their bodies, a complex of organelles.
- Reproduction occurs by alternation between schizogony and gamogony.
- The biological cycle always begins with a very slender, small, uninucleate germ cell: the sporozoite.

Classification

- Four classes: Gregarinomorpha, Coccidimorpha, Sarcosporidies and Cnidosporidies.

Class 1: Gregarinomorpha

- Large size: 70–5000 microns.
- Monoxenous parasites of the digestive tract of various invertebrates (annelids, insects), notably Blaps: *Blaps macronata*, a small black beetle inhabiting dark, humid places.
- The vegetative individual, the trophozoite, is mobile and moves through the intestine of its host by gliding.

Class 2: Coccidomorpha

- Small in size and immobile in the vegetative state.
- Cycle alternates between schizogony and gamogamy.
- Gametes are very dissimilar (anisogamy).
- The biological cycle takes place in one host (monoxenous coccidia) or two hosts (heteroxenous coccidia).
- Example 1 — Monoxenous coccidia: *Eimeria perforans* causes “big belly” disease in rabbits.
- Example 2 — Heteroxenous coccidia: *Plasmodium falciparum* is the causative agent of malaria in humans.
- Transmitted by a mosquito: the female *Anopheles*.
- The reproductive cycle comprises two modes: sexual or sporogony in the insect; asexual or schizogony in humans.
- During asexual reproduction, the stages produced are released into the blood and fever rises.
- It hides in blood and liver cells to escape attacks by antibodies.

Class 3: Sarcosporidies

- Parasites of invertebrates or vertebrates (in red blood cells).
- Carried by ticks.

Class 4: Cnidosporidies

- Parasites with a spore form parasitizing invertebrates and fish.
- The term Cnidosporidies groups three categories of parasitic protozoa: Microsporidia, Acetosporea and Myxozoa.

1. Microsporidia

- Very small organisms (2–8 microns).
- They complete their entire parasitic cycle in the same host.
- The internal part of the spore (sporoplasm) penetrates a cell where it produces schizonts.
- After one or more divisions, the schizonts become sporonts that produce spores.
- The spores can be transmitted to the host's offspring.
- They mainly infect fish: *Pleistophora ovariae* and *Chloromyxum truttae*, but also invertebrates such as insects.
- *Nosema bombycis* causes pebrine disease (black spots) in the silkworm *Bombyx mori*.

- *Nosema apis* causes nosemosis in bees, a very serious disease that can destroy an entire hive.

2. Acetosporea

- They are divided into two groups: haplosporidians and paramyxidians.
- They mainly parasitize marine invertebrates: oligochaete and polychaete worms, and molluscs such as oysters (*Bonamia* and *Marteilia*).

3. Myxozoa

- Parasites of invertebrates and fish.
- They occur in the form of plasmodia (tumor-like structures in adults).
- Example: *Myxobolus pfeiffeiri* and *M. tuberosa* attack respectively the muscles and dermis of cyprinid fish, where they cause cysts (lumpy disease).

Life cycle of *Myxobolus pfeiffeiri*

- It lives as a parasite in the muscles of freshwater fish (*Barbus*), which become infected by ingesting mature spores.
- Contamination occurs through ingestion of a spore by a fish.
- The spores are released through destruction of the plasmodia.
- The amoeboid germ undergoes several schizogonies.
- The released schizonts form large plasmodia in the connective tissue.