Introduction To Protozoa

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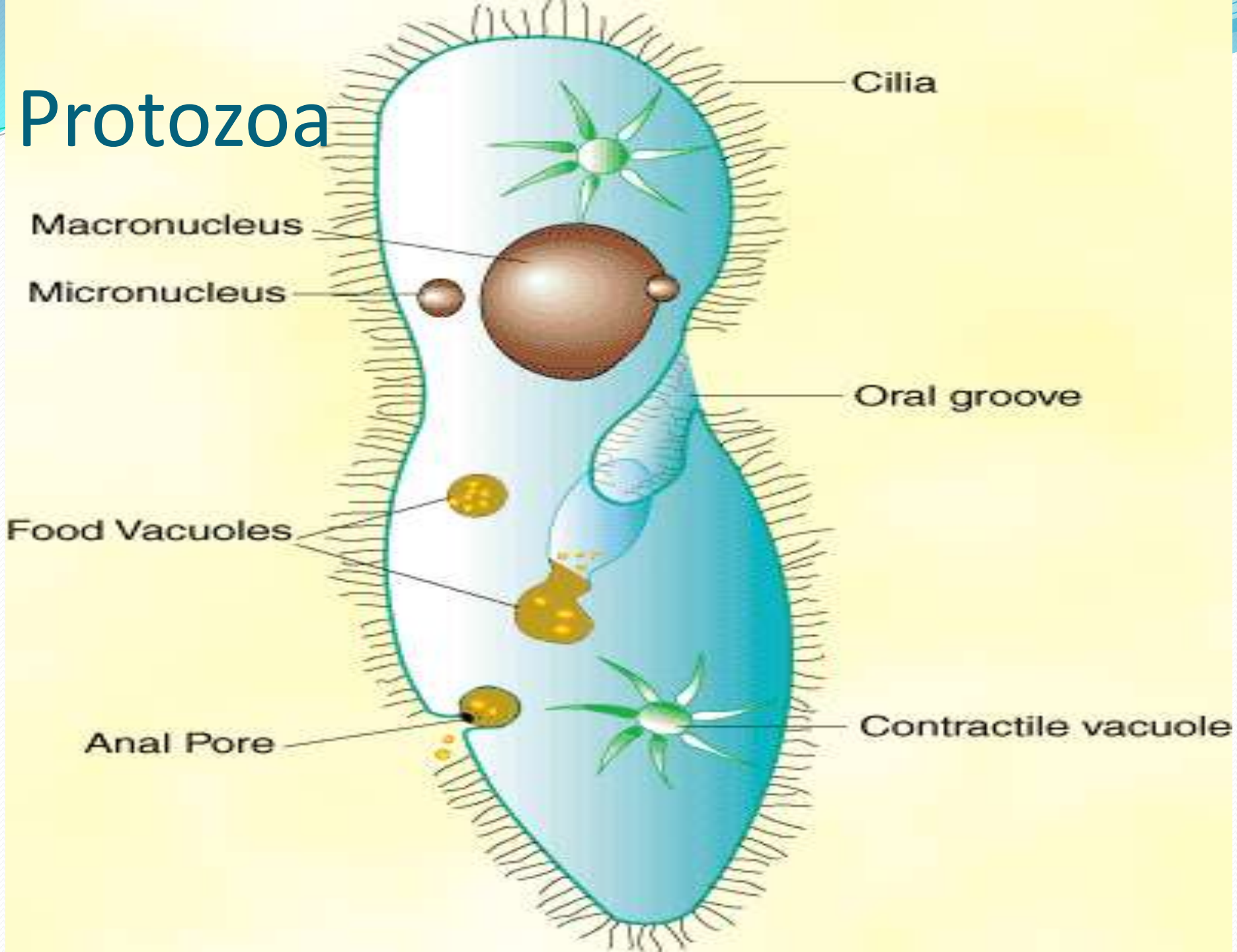
Objectives:

At the end of this presentation, the student will be able to :

- Understand the Protozoa
- Know about the characteristics of Protozoa
- Know about the Morphology of Protozoa
- Know about the Types of Protozoa
- Know about the Methods of reproduction in Protozoa
- Know about the disease cause by Protozoa
- Know about the drugs used against Protozoa

Protozoa


Cilia
Macronucleus
Micronucleus
Oral groove
Food Vacuoles
Anal Pore
Contractile vacuole

Protozoa:

- The word protozoa is come from Greek *protozoon* word meaning “First Animal”.
- Protozoa are unicellular (may be Multicellular) Eukaryotic microorganism.
- Protozoa constitute a large group of about 65,000 species. Most of which are harmless free living and inhabits water and soil
- A few species are pathogenic in nature parasitize human and other animals causing hundreds of million of infections in a year around the world

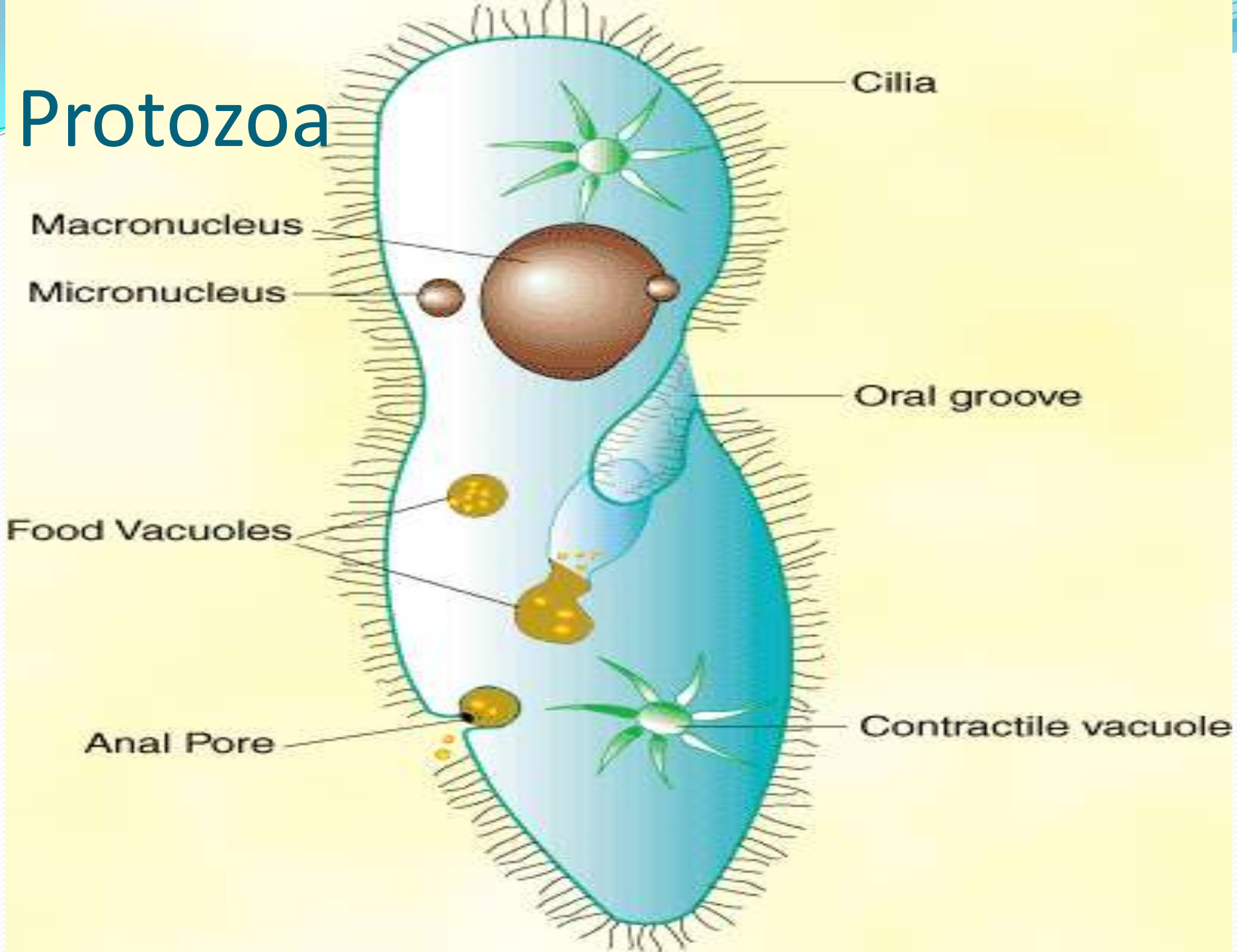
Characteristics

- Mostly Unicellular organism with fully functional cell
- Live freely, may be parasitic or symbiotic
- Protozoa are chemo-hetrotrops
- They are motile have locomotive organelles. E.g. Flagella and Cilia for movement

Morphology

- Protozoa are Eukaryotic resemble to animal cell, contain major cell organelles (including Nucleus, Mitochondria)
- Their organelles are highly specialized for feeding, reproduction and movement
- The cytoplasm of protozoa are divided into an outer layer called *Ectoplasm* and an inner layer called *Endoplasm*

Protozoa


Cilia
Macronucleus
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Contractile vacuole

Morphology

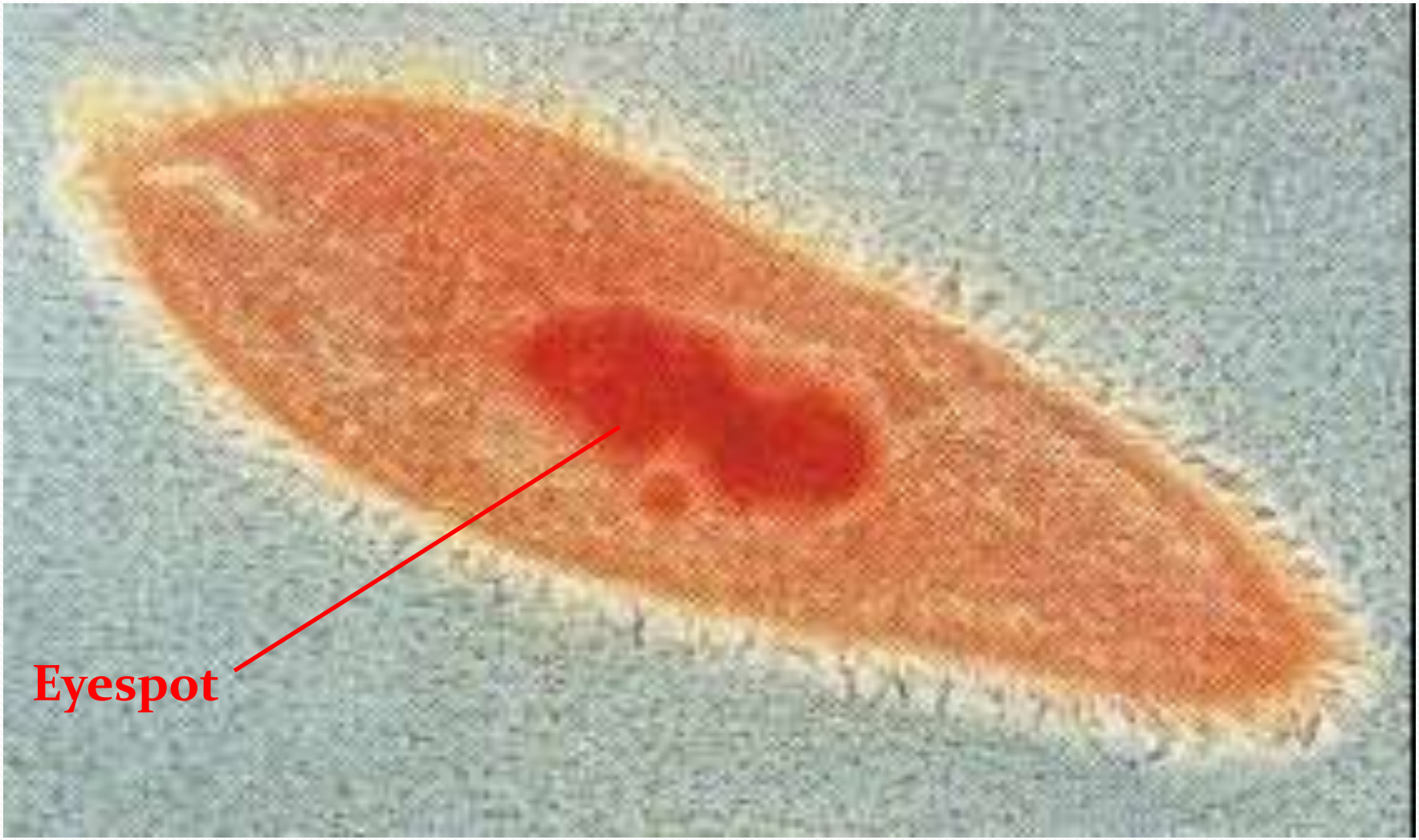
- Ectoplasm helps in movement, feeding and Protection
- Endoplasm houses Nucleus, mitochondria and food
- Some protozoa have special appendages **Flagella** and **cilia** that helps in their movements
- Freshwater protozoa have **contractile vacuoles** to pump out excess water
- Their shape may remain constant (specially in Ciliates) or change constantly (as seen in Amoeba)

Ectoplasm and Endoplasm

Morphology

- The size of Protozoa is range between 3 to 300 micrometer.
- Few ciliate and Amoeba are larger enough to be seen with naked eyes (they are about 4 to 5 mm).
- Except Sporozoates, all types of protozoa are motile either through Flagella, cilia or Pseudopodia
- Have Eyespot that can detect change in light
- Respond to **light & learn by trial & error**

Eyespots



Nutrition

- Mostly protozoa feed on dead plants and animal debris while some (trophozoites) feed on bacteria and Algae.
- Parasitic Protozoa feeds on the fluids and tissues of their host(e.g. Plasma and blood cells)
- Some Protozoa live in symbiotic relationship with other plants and animals

Classification of Protozoa

- Protozoa are classified on the basis of their motility and method of reproduction
- They are classified into Four main types

- Flagellates
- Ciliates
- Sarcodina
- Sporozoates

Flagellates

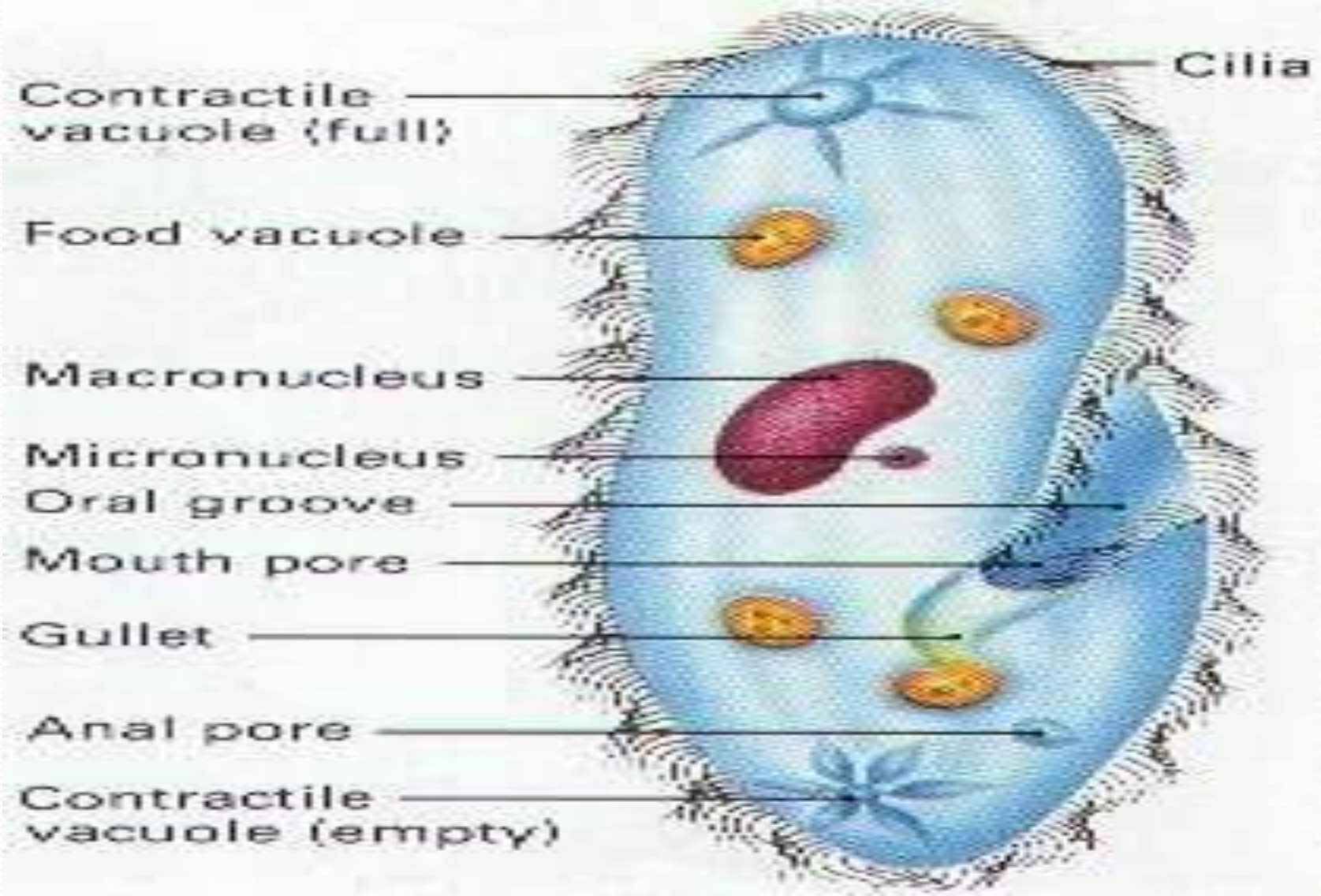
- Flagellates move by help of Flagella (a tail-like structure). The movement is whip like
- Example of Flagellates are

- Trypnosoma, Leishmenia (blood pathogen)
- Giardia (intestinal parasite)
- Trichomonas (reproductive tract pathogen)

Ciliates

- Ciliates protozoa have movement through cilia(fine hair like structure attached with their body).
- Some protozoa have special kind of cilia for feeding and attachment.
- Most are harmless. Only one species Balantidium Coli is pathogenic for human causes a rare and server form of Dysentery.

Ciliates


Cilia
Contractile vacuole (full)
Food vacuole
Macronucleus
Micronucleus
Oral groove
Mouth pore
Gullet
Anal pore
Contractile vacuole (empty)

Sarcodina

- Major loco-motor organelles in Sarcodina is pseudopodia (Pseudo means false, *podia* means Foot)
- Common example of Sarcodina is Amoeba
- Most species are harmless
- Enaemoba is a parasitic for human causes intestinal disease

Sporozoates

- Sporozoates are the only non-motile form of protozoa.
- Sporozoates have well developed sexual and asexual stages
- Entire group is parasitic in nature and are harmful
- Some common examples of Sporozoates and their infections are
- Plasmodium (causative agent of Malaria, causes 100 to 300 million infection world wide)
- Toxoplasma Gondii (causes Toxoplasmosis)

Reproduction in Protozoa

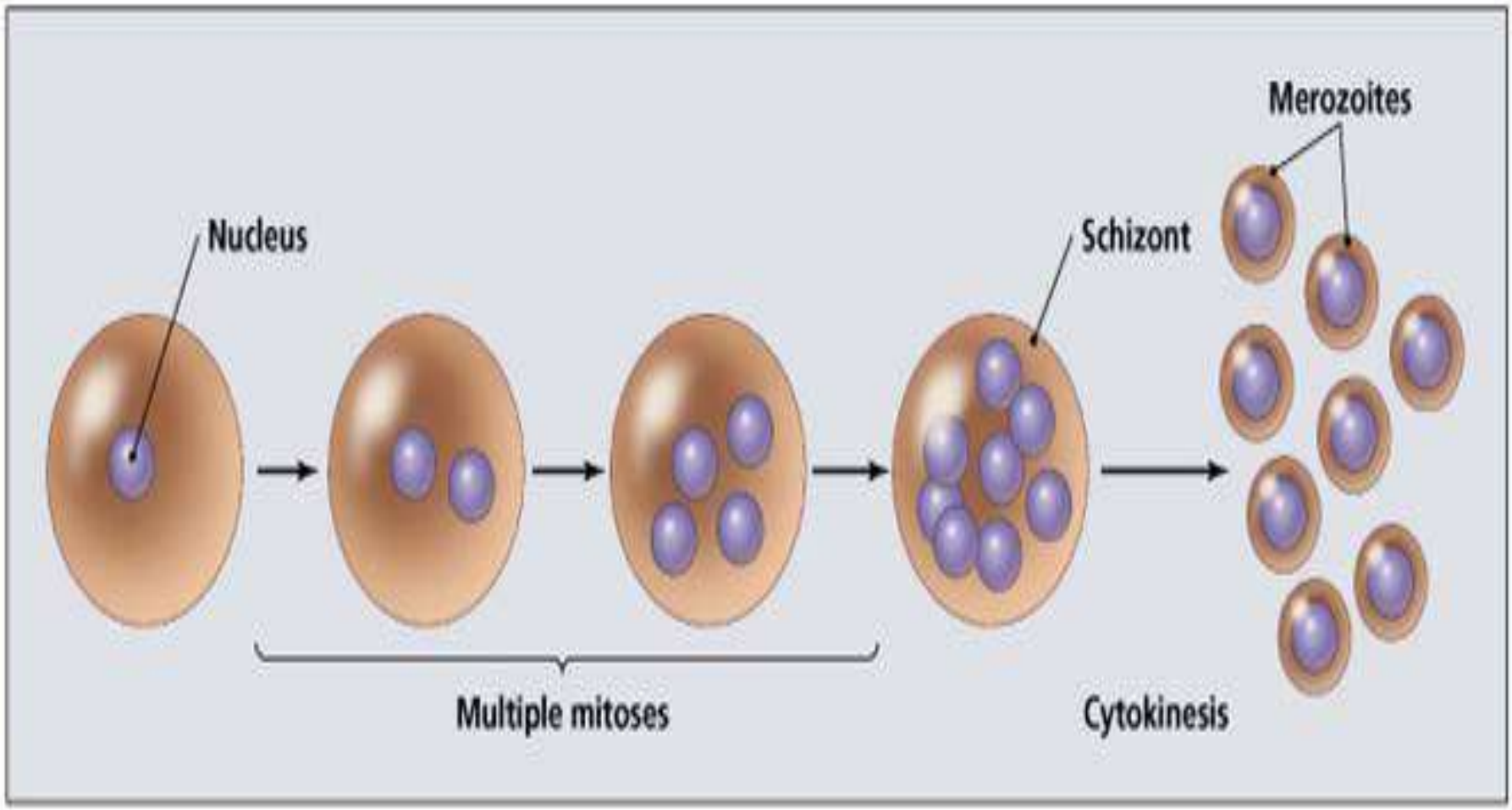
- Protozoa can reproduce their off spring by both Sexual and Asexual methods

- Asexual methods of reproduction are:
  - Budding
  - Binary Fission
  - Schizogony or Multiple Fission
- Sexual Methods
  - Conjugation
  - Gametogony

Schizogony

- It is the method of multiple fission in which first the nucleus undergoes multiple division, form many nuclei that a small portion of cytoplasm concentrate around each nucleus and than protozoan cell is divide into many daughter cells

Schizogony


Merozoites
Nucleus
Schizont
Multiple mitoses
Cytokinesis

Sexual Reproduction

- **Conjugation:**
  - Two protozoa meet together and exchange their genetic material
- **Gametogony:**
  - Union of two sexually differentiated cells

Disease Caused Protozoa

Disease	Causative Agent
Malaria	Plasmodium (P. Falciparum, P. Oval,P. Vivax, P.malariae)
Giardiasis (diarrhea)	Giardia intestinalis
Amoebic Dysentery	Entamoeba histolytica
Toxoplasmosis (immune deficiency)	Toxoplasma Gondii
Cryptosporidiosis	Cryptosporidia
Sleeping sickness	Trypanosoma
Leishmmaniasis (kala-azar)	Leishmania

Antiprotozoal Drugs

- Examples of antiprotozoal drugs include: Chloroquine Mefloquine and Pyrimethamine.
  These are used in malaria treatment.

- Metronidazole was developed as an antiprotozoal drug. It induces strand breaks in the DNA of sensitive organisms and also disrupts membrane integrity.

- Other antiprotozoal agents are Sulphonamides and trimethoprim, inhibit folic acid synthesis