Phylum- PROTOZOA

Protozoa *may be defined as "microscopic acellular animalcules existing singly or in colonies, without tissue and organs, having one or more nuclei".*

Protozoa are notable for their ability to move independently, a characteristic found in the majority of species. They usually lack the capability for photosynthesis, although the genus *Euglena* is renowned for motility as well as photosynthesis (and is therefore considered both an alga and a protozoan). Although most protozoa reproduce by asexual methods, sexual reproduction has been observed in several species. Most protozoal species are aerobic, but some anaerobic species have been found in the human intestine and animal rumen.

Protozoa are located in most moist habitats. Free-living species inhabit freshwater and marine environments, and terrestrial species inhabit decaying organic matter. Some species are parasites of plants and animals.

Protozoa play an important role as **zooplankton**, the free-floating aquatic organisms of the oceans. Here, they are found at the bases of many food chains, and they participate in many food webs.

Size and shape. Protozoa vary substantially in size and shape. Smaller species may be the size of fungal cells; larger species may be visible to the unaided eye. Protozoal cells have no cell walls and therefore can assume an infinite variety of shapes. Some genera have cells surrounded by hard shells, while the cells of other genera are enclosed only in a cell membrane.

Many protozoa alternate between a free-living vegetative form known as a**trophozoite** and a resting form called a **cyst.** The protozoal cyst is somewhat analogous to the bacterial spore, since it resists harsh conditions in the environment. Many protozoal parasites are taken into the body in the cyst form.

Most protozoa have a single nucleus, but some have both a macronucleus and one or more micronuclei. Contractile vacuoles may be present in protozoa to remove excess water, and food vacuoles are often observed.

Nutrition and locomotion. Protozoa are **heterotrophic** microorganisms, and most species obtain large food particles by **phagocytosis.** The food particle is ingested into a food vacuole.

Lysosomal enzymes then digest the nutrients in the particle, and the products of digestion are distributed throughout the cell. Some species have specialized structures called **cytostomes**, through which particles pass in phagocytosis.

Many protozoal species move independently by one of three types of locomotor organelles: flagella, cilia, and pseudopodia. **Flagella** and **cilia** are structurally similar, having a "9-plus-2" system of microtubules, the same type of structure found in the tail of animal sperm cells and certain cells of unicellular algae. How a protozoan moves is an important consideration in assigning it to a group.

General characteristics are:

1. There are about 50,000 known species of Phylum Protozoa.
2. Protozoans exhibit mainly two forms of life; **free-living** (aquatic, freshwater, seawater) and **parasitic** (ectoparasites or endoparasites). They are also **commensal** in habitat.
3. They are **small**, usually **microscopic**, not visualize without a microscope.
4. They are the **simplest** and **primitive** of all animals.
5. They have a simple body organization. i.e. with a **protoplasmic grade** of organization.
6. The body is **unicellular** (without tissue and organs).
7. They have one or more **nuclei** which are monomorphic or dimorphic.
8. Body **naked** or bounded by a **pellicle**, but in some forms may be covered with shells and often provided with an internal skeleton.
9. They are **solitary** (existing alone/single) or **colonial** (individuals are alike and independent).
10. Body **shape variables** may be spherical, oval, elongated or flattened.
11. Body **symmetry** either none or bilateral or radial or spherical.
12. Body form usually **constant**, varied in some, while changing with environment or age in many.
13. Body protoplasm is differentiated into an outer **ectoplasm** and inner **endoplasm**.
14. The single-cell body performs all the essential and vital activities, which characterize the animal body; hence only **subcellular physiological division of labor**.
15. Locomotory organs are fingers like **pseudopodia**, whip-like **flagella**, hair-like **cilia** or none.
16. Nutrition may be **holozoic** (animal-like), **holophytic** (plant-like), **saprozoic** or **parasitic**.

17. Digestion occurs **intracellularly** which takes place inside the food vacuoles.
18. Respiration occurs by **diffusion** through the general body surface.
19. Excretion occurs through the **general body surface**, but in some forms through a temporary opening in the ectoplasm or through a permanent pore called **cytopyge**.
20. Contractile vacuoles perform **osmoregulation** in freshwater forms and also help in removing excretory products.
21. Reproduction **asexual** (binary or multiple fission, budding, sporulation) or **sexual** (conjugation (hologamy), game formation (syngamy)).
22. The life cycle often complicated with alternation of asexual and sexual phases (**alternation of generation**).
23. **Encystment** commonly occurs to resist unfavorable conditions of food, temperature, and moisture, and also helps in dispersal.
24. The single-celled individual not differentiated into somatoplasm and germplasm; therefore, exempt from natural death which is the price paid for the body.
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26. Examples: *Euglena*, *Amoeba*, *Plasmodium*, *Paramecium*, *Podophyra*, etc.