

## Medical Parasitology

### Protozoa ( Greek proto - first ; zoon - animal . )

#### General characteristics

- 1- Single celled organisms belong to animal kingdom
- 2- Free - living protozoa are found in all habitats , in deep ocean or in shallow fresh water, in hot springs or in ice, under the soil or in snow or mountain
- 3- Parasitic protozoa adapted to different host species.
- 4- Have a wide range of size, shape and structure.
- 5- The typical protozoan cell is bounded by a tri-laminar unit membrane supported by a sheet of controlling fibrils which enable the cell to change its shape and to move.
- 6- The cytoplasm differentiates into an outer homogeneous ectoplasm and granular inner endoplasm.
- 7- The ectoplasm serves as the organ of locomotion and for engulfment of food materials by putting forth pseudopodial processes, it also functions in respiration, in discharging waste materials, and also as a protective covering for the cell.
- 8- The endoplasm contains nucleus, nuclear membrane, nuclei, or karyosome endoplasmic reticulum, mitochondria, and Golgi bodies.
- 9- The active feeding and growing stage of protozoa is called trophozoite.
- 10- The cell may obtain nourishment from the environment by diffusion or by active transport across the plasma membrane. Larger food particles are taken in by phagocytosis through pseudopodia , some species ingest food through special mouth -

like structure or cytosome . Minute droplets of food may also enter by pinocytosis .

11- Several species possess a resting and resistant cystic stage (infective stage which enables prolonged survival under unfavorable conditions. The cystic stage may also involve reproduction by the nucleus dividing once or more to give to daughter trophozoites.

12- Reproduction is usually asexual . The most common is binary fission.13-In amoeba division occurs along any plane, but in flagellates division is along the longitudinal axis and in ciliated in the transverse plan.

### **Phylum: Protozoa**

Protozoa are eukaryotic organisms (with a membrane - bound nucleus) which exist as structurally and functionally independent individual cells. Protozoa have relatively developed complex sub - cellular features ( membranes & organelles ) which enable them to survive the rigors of their environments . Most protozoa are microscopic organisms, only a few grow to a size large enough to be visible to the naked eye. As unicellular eukaryotes, protozoa display all the same essential life activities as higher metazoan eukaryotes: they move about to survive, feed and breed..

### **Bio-diversity**

Four main groups of protozoa are recognized on the basis of their locomotion using specialized sub - cellular and cytoskeletal features :



- 1- **Amoebae:** Use pseudopodia (singular: pseudopodium) to crawl over solid substrates. Pseudopodia (or 'false feet') are temporary thread - like or balloon - like extensions of the cell membrane into which the protoplasm streams . Similar amoeboid motion has been observed in cells of many life-forms, especially phagocytic cells (e.g. human macrophages).
- 2- **Flagellates:** Use elongate flagella (singular: flagellum) which undulate to propel the cell through liquid environments. Flagella are whip - like ' extensions of the cell membrane, many organisms produce flagellated cells (e.g. human spermatozoa).
- 3- **Ciliates:** Use numerous small cilia (singular: cilium) which undulate in waves allowing cells to swim in fluids. Cilia are ' hair like ' extensions of the cell membrane similar in construction to flagella but with interconnecting basal elements facilitating synchronous movement . Ciliated cells are found in specialized tissues and organs in many other higher life - forms ( e.g. human bronchial epithelial cells ).

- 4- Sporozoa ('spore- formers') were originally recognized not on the basis of their locomotion, but because they are all formed non-motile spores as transmission stages. Recent studies , however , have shown that many pre-spore stages move using tiny undulating ridges or wave in the cell membrane.



### **Nonpathogenic Intestinal Amoebae Infection**

Some parasites that are commonly found in peoples' intestines and stool specimens never make them sick. Germs that don't cause illness are called "nonpathogenic." These parasites do not harm the body, even in people with weak immune systems

Several species of protozoans may be mistaken for *Entamoeba histolytica*. Care must be taken to correctly identify the infection so that the correct treatment can be administered or other infectious agents sought after.

**Entamoeba dispar** Morphologically identical to *E. histolytica* . It must be *Entamoeba* separated by isoenzymatic, immunologic or molecular analyses.

**Entamoeba hartmanni** Some consider this a separate species. It differs from *E. histolytica* by being smaller in size .

**Entamoeba coli** Distinguished from *E. histolytica* by having an eccentric endosome, and mature cysts with 8 nuclei. If chromatoidal bodies are present, they have splintered ends, rather than rounded as in *E. histolytica*.

**Entamoeba nana** This is a very small amoeba (6-15um) with a large , eccentric Endolimax endosome and thin nuclear envelope. Mature cysts contain 4 nana nuclei.

**Iodamoeba butschlii** Both the trophozoite and cyst have one nucleus with a large endosome . The cyst contains a large glycogen vacuole that stains darkly with iodine .

**Dientamoeba fragilis** Trophozoite with two nuclei connecting by a fibril , no cyst fragilis stage found Entameboeba

**Entamoeba gingivalis** Found only in trophozoite form with large food vacuoles , lives gingivalis around the teeth

