

Bacteria, Protists & Fungi

I. Prokaryotes:

- includes heterotrophs and autotrophs
 - heterotrophs - get energy from consuming something else
 - autotrophs - get energy from sources like sun, heat, etc.
- Prokaryotes are divided into two main groups:
 - bacteria
 - archaea
- Come in three basic shapes:
 - cocci - sphere shaped
 - bacillus - rod shaped
 - spirochete - corkscrew shaped
- Some details:
 - archaea often thrive in extreme conditions:
 - extremely salty, hot, or anaerobic conditions are sometimes good places for archaea. Often, these conditions are good enough they can lead to “blooms”
 - prokaryotes are extremely important:
 - they break down leftover biological material (e.g., dead stuff).
 - fix nitrogen (make nitrogen available) for plants (and therefore for us)
 - live together with us:
 - in our gut (breaking down food)
 - in our mouth (preventing fungi from growing (though others do cause cavities))
 - make substantial contributions to oxygen in the atmosphere (cyanobacteria)
 - book mentions that there are more prokaryotes in your mouth than the entire human population (both past and present).
 - cyanobacteria
 - are autotrophs - bacteria that photosynthesize
- we discussed most structural details when we examined cells some time back. But one more important structure you should know about:
 - many bacteria have an “endospore”. A special “membrane/shell” inside the bacteria that allows the bacteria to survive extreme conditions.
 - this shell is resistant to many physical extremes:

- boiling, dehydrations, freezing, poisons, etc.
- many disease causing bacteria will also have an endospore.
- bacteria with an endospore can remain viable for centuries!

Finally, many bacteria do cause disease:

- generally, they release toxins, or have toxins in their plasma membranes, that cause serious problems for humans.
- the toxin produced by the bacteria that causes botulism is one of the most toxic substances known (1 gram could kill > 1,000,000,000 people).
- about half of the diseases humans get are caused by bacteria, including:
 - tetanus, anthrax, salmonella, tuberculosis, plague, Lyme disease & many more.
 - and, of course, antibiotic resistance is becoming an increasing problem.

II. Protists.

- A very diverse group. Probably should be split up into several groups.
- most are single celled and have mitochondria. Some have chloroplasts.

Several major groups (not necessarily a taxonomic breakdown):

1 - Protozoa

- use cilia, flagella, or pseudopodia to move around.
- most are heterotrophs, but some autotrophs are also in this group.
- examples are amoebas, paramecium, euglena, even some diseases like malaria, sleeping sickness and giardia.

2 - Slime molds

- are single celled, though some of them can be multicelled during part of their life cycle.
- some can get large
- many feed on bacteria, and live on rotting logs or other rotting material.

3 - Algae (photosynthetic).

- many algal forms are eukaryotes. Some are actually multicelled and can get enormous (giant kelp off the West Coast).

- multicelled green algae are thought to be closely related to plants.

III. Fungi.

The main difference between fungi and plants is that fungi are heterotrophs. They do NOT photosynthesize.

- they generally get their energy from other organisms, by breaking down (usually dead) tissue and absorbing the nutrients they need.
- molds, mushrooms, fungi, are all in this group.

Fungi have thin filaments called hyphae. These weave together to form a mat/network called a mycelium.

- various enzymes are released by the mycelium which digest the needed nutrients, which are then absorbed.
- many fungi have visible reproductive structures (also composed of mycelium). The above ground parts of mushrooms, various fungi you see growing on trees, etc.

Lichen:

- consist of fungi living together with green algae (or sometimes cyanobacteria).
- the fungi gets energy from the algae, the algae gets a place to live (the fungus also provides water and nutrients for the algae).
- these two organisms live together so closely that lichen are usually named and identified as species.

Some fungi are important due to being pests or causing diseases (generally by being parasitic):

- dutch elm disease, corn smut, chestnut blight (wiped out North American Chestnuts)
- Athletes' foot.
- some molds are extremely toxic

But fungi are also extremely important:

- act as decomposers, getting rid of dead stuff.
- we rely on many for food (mushrooms, truffles).
- we use them to provide flavor (cheese is ripened by fungi).
- lets not forget that yeast is a fungi!
- many are used to make antibiotics (antibiotics were first discovered Penicillin).