**Bio 111 Lab 4
Microscopic Life: Looking at Cells of Unicellular and Multicellular Organisms**

A **microorganism** is defined as an organism that cannot be seen clearly with the naked eye. Microorganisms are everywhere – in the air, soil, and water, and inside and on the surface of other organisms.

A microorganism can consist of a single cell (**unicellular**), as part of an unspecialized grouping of cells called a **colony**, or as a **multicellular** organism. In this lab you will have the opportunity to observe microorganisms of all three types and the cells of larger, multicellular plants, animals, and fungi. Thus, the organisms we will look at in this exercise span the evolutionary tree of life.

Some cells, such as bacteria, are **prokaryotic**, while others, such as animal, fungal, or plant cells, are **eukaryotic**. The table below lists some of the major differences between these two categories of cells:

|  |  |  |
| --- | --- | --- |
| **Characteristic** | **Prokaryotic Cells** | **Eukaryotic Cells** |
| Size | 1-10 μm | 10-100 μm |
| Membrane-bound organelles | Absent | Present |
| Chromosome structure | One, circular  | Several, linear  |
| Examples | Bacteria and Archaea | Protists, plants, fungiand animals |

Domain

Archaea

Domain

Eukarya

Domain

Bacteria

Include only unicellular or colonial prokaryotic microorganisms

Includes unicellular, multicellular, and colonial microorganisms as well as larger organisms

All life is categorized into the **three domain system** indicated on the evolutionary tree to the right. Bacteria and Archaea are both prokaryotic, but differences in their RNA, membrane lipids, and metabolism clearly separate them into different domains. The domain Eukarya includes all the members of the kingdoms Protista, Fungi, Plantae and Animalia. In this lab, we will examine organisms from the domains Bacteria and Eukarya.

 ***Domain Bacteria***

1. Common Bacterial Shapes slide: There are many different ways of characterizing bacteria for the purpose of identification. One way is to look at the shape. Look at the bacterial shapes slide under oil immersion magnification. In one of the drawing circles, draw and label coccus, bacillus and spirillum shaped bacteria.

2. Cyanobacteria – example *Oscillatoria*. Cyanobacteria are photosynthetic bacteria that can be found as single cells or in colonies, as you will see in *Oscillatoria*. Draw *Oscillatoria* using the high power objective.

***Domain Eukarya***

**I. Kingdom Protista**

The kingdom Protista is composed of many unrelated organisms that do not fit neatly into one of the other kingdoms. Most of the organisms in this kingdom are microscopic, although some can be quite large (for example, kelp is a protist). Protists can be unicellular or multicellular, and are often classified by the way they move around, or their **motility**.

**Ciliates:** Ciliates are single celled protozoa that have tiny hair-like structures along their outer surface. These structures, called cilia, move back and forth and allow the organism to move or obtain food. Be sure to observe and draw the cilia when you look at the organisms below.

1. *Paramecium* – a ciliate with central groove and clear contractile vacuoles. draw using low power.

2. *Spirostomum* – a ciliate with worm-like qualities. draw using low power.

3. *Stentor* – a cone-shaped ciliate that uses its cilia to bring in food. draw using low power.

**Flagellates:** Flagellates are single-celled protists with flagella. Flagella are “tail-like” structures that whip back and forth, propelling the organism forward.

4. *Euglena* – A flagellate that both consumes food and can perform photosynthesis. Use an adaptor or wet mount to observe the organism and the action of the flagella under low or high power. Note the location of the flagellum and the direction of movement in relation to it. Draw a *Euglena* cell.

5. *Volvox* – A colony of flagellates organized into a ball. The mother colony (outer sphere) gives rise to daughter colonies (inner spheres). draw under low and high power.

**Pseudopods:** Pseudopods are single celled protozoa that form pseudopods (false feet). Pseudopods change the shape of their cell membrane to move, as well as to surround a food source and use phagocytosis to consume it.

6. Amoeba - *Chaos* – Watch as this organism changes its shape in response to its environment. draw under low power.

 **II. Kingdom Fungi**

This kingdom includes the yeasts, molds and the mushrooms. Some fungi are considered to be microorganisms. Fungi can be unicellular (yeasts) or multicellular and filamentous or fleshy. Fungi decompose dead organisms to obtain food for energy, have cell walls made of **chitin**, and reproduce by **spores**. Multicellular fungi are composed of chains of cells called **hyphae**. Some of the fungi produce specialized fruiting bodies which bear the spores.

1. Yeast – *Saccharomyces* – Yeasts are simply single-celled fungi. Some yeasts can cause infections and others are used in the food industry. Make a wet-mount of yeast and draw single cells under high power. If you are patient, you may be able to see a cell dividing. In yeast, this process is called “budding.”

2. Mold – *Rhizopus* – This organism is commonly known as black bread mold. Make a wet mount and draw under low power. Include and label hyphae and **sporangia**, which are the structures that produce spores, in your drawing.

**III. Kingdom Plantae**

This kingdom includes photosynthetic multicellular organisms that have cell walls made of **cellulose** and well defined tissue layers. Plant cells may contain specialized, membrane-bound organelles called **plastids**, such as **chloroplasts**, **chromoplasts**, or **amyloplasts**. Plastids function in the synthesis and storage of pigments and carbohydrates.

1. Elodea – *Elodea* is an aquatic fresh water plant. Remove a leaf and make a wet mount. Draw a few individual cells under high power. Draw and label the cell walls and chloroplasts found in these cells.

2. Potato – A potato is a type of plant stem (called a tuber) whose function is to store sugar in the form of starch. Starch (a polysaccharide) is stored in the amyloplasts. Using a scalpel, slice a paper-thin piece of potato and put it on a slide. Add a drop of iodine and cover with a coverslip. Draw and label a few individual cells under high power, including the cell walls and the amyloplasts.

3. Onion – An onion is a modified stem and leaf system (called a bulb) whose function is to store sugar. The individual layers of an onion are the modified leaves. Peel the thin epidermal layer from an onion leaf and place it on a slide to make a wet mount. Draw the shape of one or two onion cells under high power, and label the cells walls and the nucleus.

4. Red pepper – A red pepper is a type of fruit. The red color comes from the chromoplasts, which contains red-orange pigments. Using a scalpel, slice a paper-thin piece of the red tissue and put it on a slide to make a wet mount. Draw and label a few individual cells under high power, including the chromoplasts found in these cells.

 **IV. Kingdom Animalia**

This kingdom is made up of multicellular organisms with well-defined tissue layers that must obtain their energy by consuming other organic matter. Animal cells do not have cell walls.

1. Rotifers – These are multicellular animals that live in freshwater ponds. Rotifers have an exoskeleton with “telescoping” abilities. Observe the spinning **corona** (cilia arranged in a circle; when they spin, they resemble a wheel in motion), whose cilia propel food into the stomach where it is “chewed.” draw under low power.

2. Nematodes – Also called roundworms, these organisms possess longitudinal muscles that restrict it to whip-like movement. The specimens that you are looking at are commonly called “vinegar eels” because they can be found in raw vinegar preparations. draw under low power.

**example:**

Organism:

Magnification:

Notes: