

Cell Structure: Comparing Cells from Organisms in the Domain Eukarya

Members of the Domain Eukarya share one common characteristic, all members of the Domain are made of cells which contain a nucleus. Some members of the Domain are single-celled organisms while others are multi-cellular. Some members are autotrophic (self-feeding) like the plants while others are heterotrophic (other or different feeder) like the protozoans, fungi, and animals. So while the cells of these organisms all have a nucleus, they can vary in some significant ways to reflect the diversity of their metabolism and functions.

The Domain Eukarya is subdivided into Kingdoms. There are 4 Kingdoms: Protista, Fungi, Plantae and Animalia. In this activity, you will examine cells from the various Kingdoms.

Kingdom Protista

Members of the Kingdom Protista are single-celled eukaryotic organisms. They are typically heterotrophic. Most of the organisms in this Kingdom are free-living, meaning they live without parasitizing or infecting other organisms. However a few members of this Kingdom are definitely human pathogens. For example, the organisms that cause malaria, trichomoniasis and giardiasis (daycare diarrhea) are all protozoans. Malaria is still a major killer in the world with ~40,000 people dying each month from this protozoan infection. Trichomoniasis is one of the most common sexually transmitted diseases in the United States. Giardiasis is an intestinal infection contracted by drinking or eating contaminated food or liquids and one of the major reasons you should never drink untreated water from streams or ponds.

Protozoans are further subdivided by how they move. Some protozoans are not motile. All of these non-motile protozoans are pathogenic. Another group of protozoans move by means of long cellular extensions called flagella. Members of the third group move using short extensions called cilia. The final group move via pseudopods (false feet). The cell uses its cytoskeleton to change the shape of the plasma membrane. The membrane stretches in one direction and the cytoplasm follows.

Materials

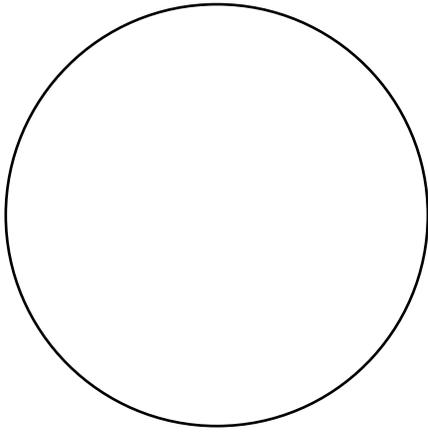
Prepared slides of amoeba, paramecium or other protozoans

Microscope

Procedure

1. Obtain a prepared slide of amoeba from the materials table.
2. Place the slide on the microscope and position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
3. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X.
4. Draw the field of view below. Include at least 3 cells. Label the nucleus, cytoplasm, plasma membrane and pseudopods.





Organism _____
Magnification _____

How does amoeba move? _____

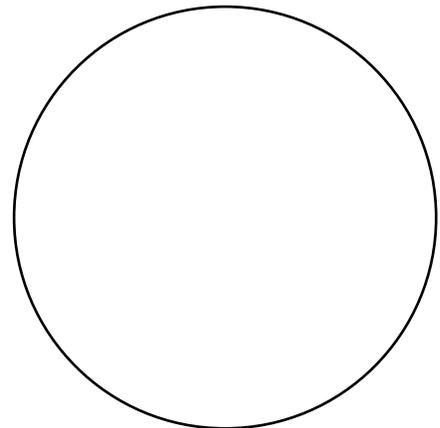
Procedure

1. Obtain a prepared slide of paramecium from the materials table.
2. Place the slide on the microscope and position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
3. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X.
4. Draw the field of view below. Include at least 3 cells. Label the nucleus, cytoplasm, plasma membrane and cilia.



Organism _____
Magnification _____

How does paramecium move? _____



Kingdom Fungi

Members of the Kingdom Fungi can be either unicellular (yeasts) or multicellular (mushrooms, puffballs and bracket fungi). Fungi are not plants! They are heterotrophs. They 'eat' by secreting digestive enzymes outside the cell. The nutrients are broken down and the smaller components diffuse back to the cell. Another distinguishing feature of the fungi is that they have a cell wall, but unlike plants the fungal cell wall is made of chitin. Chitin is the same compound found in shells of crustaceans and insects.

In this activity you will be observing a prepared slide of *Saccharomyces cerevisiae*, baker's yeast. The prepared slide has been stained.

Materials

Prepared slide of *Saccharomyces cerevisiae*

Microscope

Materials for Wet Mount

If prepared slides are not available, wet mounts can be prepared from a fresh suspension of yeast.

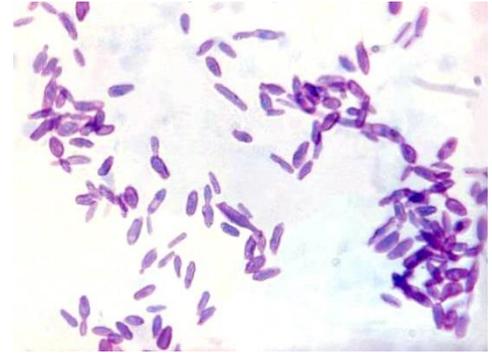
Iodine or methylene blue

Toothpick

Cover slip

Microscope slide

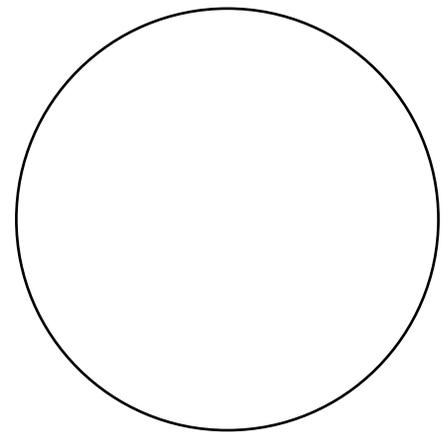
Microscope



Original image by CDC/ Dr. Lucille K. George edited by S. Finazzo

Procedure – prepared slide

1. Obtain a prepared slide of *S. cerevisiae* from the materials table.
2. Place the slide on the microscope and position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
3. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X. Draw the field of view below. Include at least 10 cells. Label the nucleus, cytoplasm, and plasma membrane.
4. How do the yeast cells differ from paramecium and amoeba?



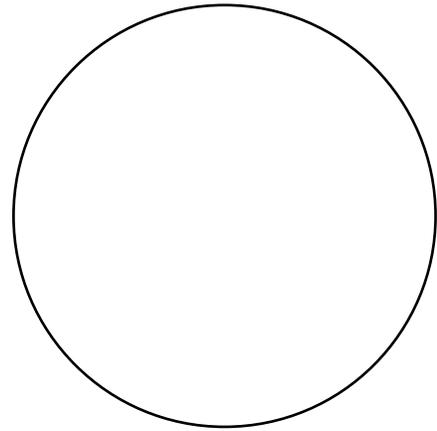
Organism _____

Magnification _____

5. Describe the yeast. Are all of the cell's the same size and the same shape?
6. How does this slide look different than the slides of bacteria, streptococci that you viewed in previous activities?

Procedure – wet mount

1. Obtain a microscope slide, coverslip and toothpick from the supply table.
2. Add a drop of distilled water to the center of the slide.
3. Insert the toothpick into the yeast suspension, mix the suspension with the toothpick. Withdraw the toothpick and insert the end into the distilled water in the center of the slide. Stir the toothpick around in the water.
4. Place the coverslip over the yeast suspension. Remember to angle the coverslip before dropping the coverslip over the suspension.
5. Add a drop of stain (iodine or methylene blue) to the slide at the edge of the coverslip. Place a paper towel on the opposite side of the coverslip and draw the stain across the slide.
7. Place the slide on the microscope stage. Position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
8. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X.
9. Draw the field of view below. Include at least 10 cells. Label the nucleus, cytoplasm, and plasma membrane.
10. How do the yeast cells differ from paramecium and amoeba?



Organism _____

Magnification _____

11. Describe the yeast. Are all of the cell's the same size and the same shape?

Kingdom Plantae

The members of the Kingdom Plantae are all photosynthetic. It includes are both unicellular and multi-cellular autotrophs. Most members of this Kingdom are surrounded by a cell wall composed of cellulose.

Materials

Microscope slide
Coverslip
Distilled water

Elodea
Microscope

Procedure

Wet mount of elodea

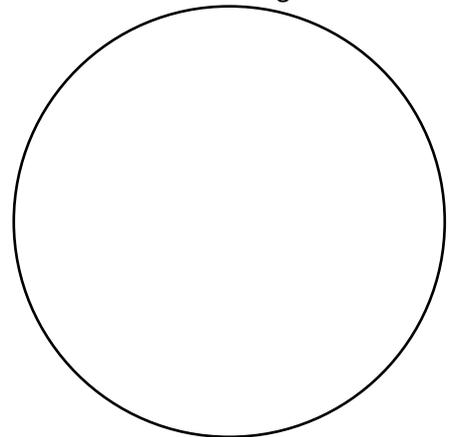
1. Remove a clean slide and coverslip from the materials box on the bench.
 2. Add a small drop of water to the center of the slide.
 3. Select a leaflet from the Elodea specimen. Pick a leaflet from the growing end.
 4. Suspend the slice in the drop.
 5. Pick up the coverslip and slide it across the slide at a 60° angle. Once the coverslip hits the drop, let the coverslip drop on to the specimen. Angling the coverslip, rather than dropping the coverslip flatly onto the smear minimizes the air bubbles that form under the coverslip.
 6. Place the slide on the microscope. Start with the scanning objective (4X). Then proceed to the 10X objective.
 7. You will see distinct green ovals within the cells in the leaflet. Those are the chloroplasts. Watch the chloroplasts for a few minutes. What do you see? Are the chloroplasts moving? If so, that is called cytoplasmic streaming. The cytoskeleton is moving the chloroplasts around the cell. Where are the chloroplasts? Are they equally distributed throughout the cell or are around the periphery? How do you explain this observation?
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9. Continue increasing magnification until you reach 400X. Don't forget to adjust the light levels as you increase magnification.
10. Draw at least 5 cells in your lab report. Remember to exaggerate the size of the cells. Label the cell wall, plasma membrane, chloroplast, nucleus, and cytoplasm. Make sure to include the magnification.

Specimen: _____

Magnification: _____

Description: _____



Kingdom Animalia

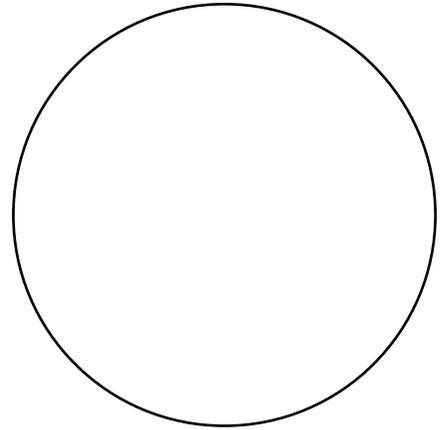
Members of the Kingdom Animalia are multi-cellular heterotrophs that lack a cell wall. Cells differentiate during development. The cell's function fits its purpose.

Materials

Prepared slides: kidney, skeletal muscle, cheek cells, neurons
Cheek cells can also be prepared as a wet mount.

Procedure – prepared slide

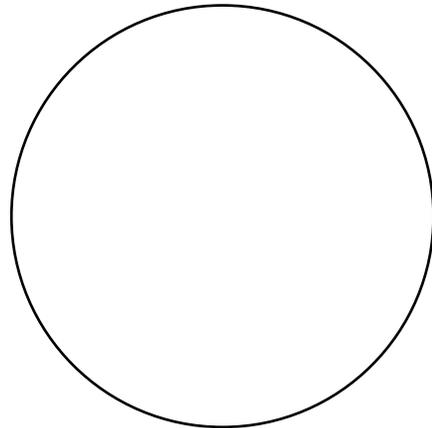
1. Obtain a prepared slide of kidney from the materials table. The kidneys filter blood to remove waste products. You are looking for ducts and cells surrounding them.
2. Place the slide on the microscope and position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
3. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X.
4. Draw the field of view below. Include at least 10 cells. Label the nucleus, cytoplasm, and plasma membrane.



Tissue _____

Magnification _____

5. Obtain a prepared slide of cheek cells from the materials table. Cheek cells are epithelial cells that line and protect the tissue of the mouth.
6. Place the slide on the microscope and position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
7. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X.
8. Draw the field of view below. Include at least 10 cells. Label the nucleus, cytoplasm, and plasma membrane.



Organism _____

Tissue _____

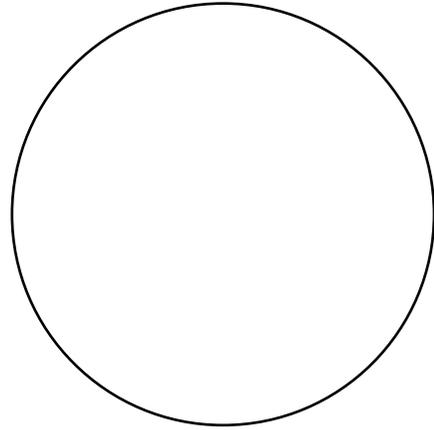
Magnification _____

9. Obtain a prepared slide of skeletal muscle cells from the materials table. Muscle cells are contractile cells. They shorten, contract to effect movement. The arrangements of fibers that accomplish contraction, give skeletal muscle tissue a striated appearance. They are one of the few polynucleate cells found in the human body.

10. Place the slide on the microscope and position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
11. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X.
12. Draw the field of view below. Include at least 5 cells. Label the nucleus, cytoplasm, striations and plasma membrane.

Tissue _____

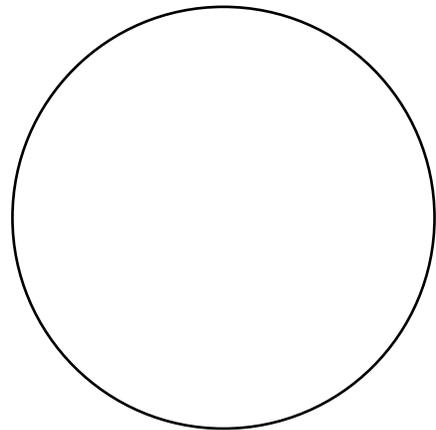
Magnification _____



13. Obtain a prepared slide of giant motor neurons from the materials table. Neurons are excitable cells that convey stimulation and store information.
14. Place the slide on the microscope and position the slide under the 4X objective. Move the slide back and forth and front to back until you see colored bodies.
15. Focus on the colored bodies. Increase the magnification to 100X and re-focus. Increase the magnification to 400X.
16. Draw the field of view below. Include at least 2 cells. Label the nucleus, cytoplasm, cell extensions and plasma membrane.

Tissue _____

Magnification _____



17. Consider the structure of the cells you observed in the kidney, the skeletal muscle fibers, cheek cells, and neurons, how were they similar?

18. Consider the structure of the cells you observed in the kidney, the skeletal muscle fibers, cheek cells, and neurons, how were they different?

19. Give at least one explanation for the structure of each of these cells with respect to their function.