

Plant vs. Animal Cell Compariset



Introduction

Are animal cells really different than plant cells? Which organelles are the same in both plant and animal cells and which are unique to only one? In this activity, the various parts of animal and plant cells will be identified.

Concepts

- Plant cells
- Animal cells
- Cell structures

Background

Before beginning this activity, inform students of the organelles that should realistically be observed using the compound microscope available in the classroom. The most prominent feature students should notice when examining animal cells is the overall circular shape of the cell. They should also be able to identify the nucleus and nucleolus. Plant cells are not round like animal cells—they are more rectangular and are stacked or organized like bricks. Identifiable features in plant cells include the cell membrane and cell wall, nucleus and nucleolus, and the vacuole.

The purpose of this activity is to allow students to examine four slides—two plant cell slides and two animal cell slides—and observe the key differences between the two types of cells. Students will also gain a thorough understanding of why certain organelles are found only in plant cells, animal cells, or both, based on their cell functions.

Materials (for each demonstration)

Allium cepa slide*

Compound microscope

Immersion oil

**This BioFax! was developed to correspond with the plant versus animal cell compariset, ML1396.*

Lens paper

Lumbricus slide*

Pinus stems slide*

Squamous epithelium slide*

Safety Precautions

Although this activity is considered nonhazardous, please follow all normal laboratory safety guidelines.

Procedure

1. Obtain one of the four slides listed in the *Materials* section. Hold the slide by its edges to avoid smudges or fingerprints.
2. Hold the slide up to the light to see if the slide is clean. If necessary, gently clean the slide with lens paper.
3. Place the slide on the microscope stage and view using the 4X objective. Adjust the coarse and fine focus knobs as needed to clearly view the cells on the first slide.
4. Once the image is focused, switch first to the 10X objective and then to the 40X objective to view the smaller components of the cell. After viewing with the 40X objective, continue with the oil immersion objective if available. *Note:* The fine focus knob should be used to clarify the image when the objectives are changed to 40X and 100X (if available).
5. Repeat steps 1–4 with the three remaining slides.
6. Sketch the identifiable organelles on the Plant and Animal Compariset Worksheet. Consult your textbook or the Internet to obtain more information about the organelles in order to complete the worksheet.

Disposal

Place slides back in their original containers and store for future use.

Tips

- This lab may reasonably be completed in one 50-minute class period.
- Depending on the students' experience or background, they may be informed of the common names of the cells in the slides. *Lumbricus* is a type of worm, squamous epithelium is a human mouth smear, *Pinus* is a type of coniferous tree, and *Allium cepa* is a garden onion.
- Discuss with students the items they should reasonably be able to locate using the microscopes available to them. The smallest diameter object that can be seen with a 100X oil immersion microscope is about 0.0002 mm or 0.2 μm . Organelles between 0.2 μm and 0.3 μm in diameter, such as ribosomes, Golgi bodies, and lysosomes, typically appear as small grains. Organelles between 3 and 6 μm in length, such as mitochondria and chloroplasts, will appear as small circles or ovals. A nucleus of about 10 μm .
- Not all the major cell organelles are included on the worksheet. The main purpose of the worksheet is to highlight the functions of organelles that are found specifically only in animal cells, only plant cells, or both.
- In order to visualize mitochondria, please call Flinn Scientific to request the *BioFax* Publication No. 10769, "Mitochondria in Action," which is also available as part of a student laboratory kit, Catalog No. FB1823.

Discussion

Distinguishing features between plant and animal cells is an important skill in understanding how cells function in different organisms. A key difference between plant and animal cells is the shape of the cell. The animal cells supplied in the comparison generally have a round shape and are bound by a cell membrane. Plant cells are bound by both a cell wall and a cell membrane and have a more rectangular shape.

Students should also notice the location of the nucleus in both plant and animal cells. The nucleus is often not found in the exact center of the cell, but it is not attached to the cell membrane or cell wall either. Instead, it is found floating inside the cell, not perfectly centered but near the middle.

Plant and animal cells have many organelles in common, including the nucleus, nucleolus, nuclear envelope, rough endoplasmic reticulum, smooth endoplasmic reticulum, golgi apparatus, ribosomes (free and attached), cell membrane, and mitochondria. However, some organelles are specific to plant cells or animal cells. Centrioles, which help organize cell division, are found only in animal cells. Lysosomes, which are also unique to animal cells, are digestive organelles where macromolecules (such as food molecules) are hydrolyzed and broken down. Plant cells contain organelles that are not found in animal cells. Vacuoles, for example, serve as sites for the storage of food molecules, breakdown of waste products, and hydrolysis of macromolecules. The enlargement of plant cell vacuoles is a major mechanism of plant growth. Unfortunately, not all of these organelles are visible with microscopes traditionally found in a middle school or high school classroom. Nevertheless, it is important to realize that organelles serve specific functions in cell life.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

Evidence, models, and explanation

Form and function

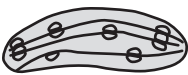





Content Standards: Grades 5–8

Content Standard C: Life Science, structure and function in living systems

Content Standards: Grades 9–12

Content Standard C: Life Science, the cell

Sample Data Table

Organelle	Sketch	Plant	Animal	What is the function of this organelle?
Chloroplast		X		The function of chloroplasts is to convert light energy to chemical energy in a process known as photosynthesis.
Mitochondria		X	X	Mitochondria are the sites for cellular respiration, which generate the majority of the ATP needed by the cell.
Nucleolus		X	X	The nucleolus is located inside the nucleus and is involved in the production of ribosomes.
Nucleus		X	X	The nucleus contains the nuclear envelope, nucleolus, and chromatin (genomic DNA). The nucleus contains the genomic DNA and controls the expression of genes throughout the organism.
Vacuole		X		The vacuole's functions include storage, breakdown of waste products, and hydrolysis of macromolecules. The enlargement of the vacuole is a major mechanism of plant growth.
Lysosome	Not visible		X	Lysosomes are the digestive organelles of an animal cell—they are the place where food macromolecules are hydrolyzed.
Cell Wall		X		The cell wall is the outer layer of a plant cell—helps maintain cell shape and protects the cell from mechanical damage.

Answer to Post-Lab Question *(Student answers will vary.)*

Allium cepa and *Pinus* stems are both plant cells, while *Lumbrius* and squamous epithelium cells are both animal cells. If you were give two unknown slides, how would you determine whether they contained plant or animal cells, respectively?

If the cell is round in shape, it would most likely be an animal cell. If the cell is rectangle in shape with a cell wall, it would be a plant cell. Also, if there is a large circular organelle in the middle of a rectangularly-shaped cell, it would confirm it is a plant cell.

References

Campbell, Neil A. *Biology*. Pearson Benjamin Cummings; San Francisco, 2005. Seventh Edition, p. 100–101.

Materials for *Plant vs. Animal Cell Compariset* are available from Flinn Scientific, Inc.

Catalog No.	Description
ML1396	Plant vs. Animal Cell Compariset®

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.

Plant vs. Animal Cell Worksheet

Data Table

Organelle	Sketch	Plant	Animal	What is the function of this organelle?
Chloroplast				
Mitochondria				
Nucleolus				
Nucleus				
Vacuole				
Lysosome				
Cell Wall				

Post-Lab Question

Allium cepa and *Pinus* stems are both plant cells, while *Lumbrius* and squamous epithelium cells are both animal cells. If you were give two unknown slides, how would you determine whether they contain plant or animal cells, respectively?