

**PLANT AND ANIMAL CELLS**

**Project Overview:**

This experiment examines the differences and similarities between animal and plant cells in terms of organelles and structures:

* **Appropriate grade levels:** 3rd and up
* **Set-up and initial assessment:**About 45-120 minutes depending on depth of experimentation
* **Total days:** 1

**Materials Needed per Student:**

* 2 microscope slides
* 2 Cover slips
* 1 toothpick
* One piece of onion epidermis (onion should be cut by teacher).
* Water dropper
* Methylene blue stain
* IKI stain
* Gloves

**Safety:**

* Wear gloves while staining slides.
* Slides are glass. Be careful if broken.

**Introduction**:

Cells are the basic unit of life. Cells share some common features, but differ based on their specific jobs. Plant and animal cells are easy to distinguish from each other based on the presence of a cell wall or chloroplasts (in areas where photosynthesis occurs).

In this experiment, students will make a slide of their own cheek cell to examine an animal cell and make a slide of onion bulb epidermis to look at a plant cell.

At the conclusion of this experiment, students should be able to explain the basic structures of cells and distinguish between plant and animal cells.

One note: This activity is easy to customize to your classroom’s needs and time constraints.

* If you only want to spend around 45 minutes – 1 hour on this project – you can have students make a cheek cell slide only and use the prepared onion root slide. You also can have older students look through the other slides (Privot leaf, Cork, Aphiuma liver).
* An additional extension activity includes making cutouts of a ‘typical animal cell; using a paper plate and printout of cellular organelles. These resources are included on the STEM kits website.

**Background: Animal versus plant cells**

Animal cells are generally smaller than plant cells. Animal cells also tend to have an irregular shape because they lack a cell wall. Plant cells that are involved in photosynthesis also have chloroplasts, although these won’t be present in areas (such as roots) where photosynthesis is not occurring. Plant cells also tend to have one large vacuole, whereas animal cells may have several smaller vacuoles. However, plant and animal are both eukaryotic cells and share many other cellular organelles.

A cell contains the following cell organelles:

Nucleus – A large membrane bound structure that contains DNA and other genetic materials.

Endoplasmic Reticulum (ER) - This cellular organelle is composed of a thin, winding network of membranous sacs originating from the nucleus.

Cytoplasm - A jelly-like material which contains all the cell organelles, enclosed within the cell membrane. The substance found within the cell nucleus, contained by the nuclear membrane is called the nucleoplasm.

Golgi apparatus - A flat, smooth layered, sac-like organelle which is located near the nucleus and involved in manufacturing, storing, packing and transporting the particles throughout the cell.

Mitochondrion (plural – mitochondria) - Spherical or rod-shaped organelles with a double membrane. They are the powerhouse of a cell as they play an important role in producing ATP/energy.

Ribosome - Small organelles made up of RNA-rich cytoplasmic granules and they are the sites of protein synthesis.

Lysosome (Cell Vesicles) – Round organelles surrounded by a membrane comprising of digestive enzymes which help in digestion, excretion and in the cell renewal process.

Cell Membrane - A thin semipermeable membrane layer of protein and fats surrounding the cell. Its primary role is to protect the cell from its surrounding. Also, it controls the entry and exit of nutrients and other microscopic entities into the cell.

Cell Wall – Surrounds the outside of the cell membrane in plant cells only. Provides tensile strength and protection against osmotic and mechanical stresses.

Vacuoles – Small in animal cells and generally hold waste products. Much larger in plant cells and generally store water and help maintain water balance within the cell.

Chloroplasts – Found in plant cells only and are the site of photosynthesis.

https://byjus.com/biology/animal-cell/

**Procedure:**

**Making the Cheek Cell Slide**

Students should wear gloves while preparing slides. The stain isn’t toxic – but will stain their fingers!

Put a drop of water + Methylene blue stain on a slide.

Gently rub the inside of your cheek with a toothpick.

Swirl the toothpick in the drop of water.

Place the edge of a coverslip on the slide so that it touches the edge of the water.

Slowly lower the coverslip to prevent trapping air bubbles.

***Note:*** *Cheek cells are simple squamous epithelial cells. That means they are roughly shaped like a sunny side up egg (flat with the nucleus roughly in the middle of the cell). Students will see the nucleus, cell membrane and the cytoplasm. They will also see lots of bacterial cells which are small dots seen throughout. Although these can be found overlapping the cheek cells – they are not found in every cell and will also be seen outside the cells. This should help students determine that they are not part of the cells themselves.*

**Making the Onion Bulb Slide**

Students should wear gloves while preparing slides. The stain isn’t toxic – but will stain their fingers!

Put a drop of water + IKI stain on a slide.

Teachers - cut small pieces of onion bulb epidermis for the students.

* + Separate one layer of onion.
  + Fold the onion until it snaps – leaving just a thin layer of epidermis. Peel this layer and cut into small pieces.

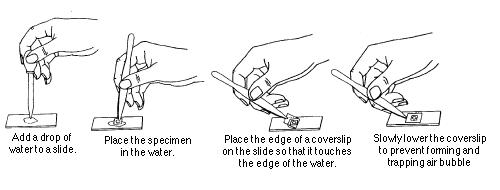
Students grab a small piece of onion epidermis.

Spread thin in the drop of water.

Place the edge of a coverslip on the slide so that it touches the edge of the water.

Slowly lower the coverslip to prevent trapping air bubbles.

***Note:*** *The IKI will stain starch molecules. In this slide, students will see the nucleus, cell wall and some small starch granules. Students will notice that the cells are very regularly shaped when compared with the animal cells. Chloroplasts will not be visible because the onion bulb is below ground and does not perform photosynthesis.*



**Questions to Ponder:**

1. What is the job of a cell wall in a plant cell?
2. What are the differences you noticed between plant and animal cells?
3. Can you see the chloroplasts in the onion cell? Why or why not?

**Science Standards Covered**

1. Structure and function in science
2. Visualizing data
3. Science inquiry and research
4. Becoming familiar with science equipment