

Apple Cells: Structure & Plasmolysis

TEACHER WORKSHEET
Years 11-12

OBJECTIVES

1. Identify the structure of a plant cell
2. Identify specific organelles and their function in a plant cell
3. Observe process of osmosis and changes to plant cell

BACKGROUND INFORMATION

Apple cells from the skin of a “red delicious” apple gives a clear illustration of the following structures: the cell wall, cytoplasm, chloroplasts, vacuoles, plastids and granular inclusions as well as impressive colourful anthocyanin pigments (red pigmentation) and tonoplasts (vacuolar membrane). Apple peel provides an excellent sample for demonstrating plasmolysis due to the ability to see the distinct vacuole of apple peel.



Plasmolysis is the shrinkage of the vacuole and cytoplasm that results from a loss of turgor pressure as water diffuses outward across the membrane. Water diffuses out of the vacuole and cytoplasm once the sample is exposed to a hypertonic solution (10% salt solution). The hypertonic solution has less water than the cell and water moves (diffuses) out of the cell. As water moves out of the cells there is a loss of turgor pressure and the plasma membranes detach from the cell walls as the cells shrink.

In comparison to onion cells and elodea cells, apple cells more time to induce visible plasmolysis. One hypothesis to account for this is that the cell wall of apple peel cells has a higher resistance to water movement perhaps due to impregnation with a waxy or other hydrophobic component.

WHAT YOU NEED

- “Red Delicious” Apple
- Sharp razor blade
- Microscope slide and cover slip
- Distilled water dropper bottle
- 10% salt solution
- Compound microscope
- Tweezers

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WHAT TO DO

1. First, you need to peel a very thin almost transparent slice of skin from your apple. It is best to do this by pressing the razor blade against the apple and skimming along downwards on a straight angle.
2. Place a drop of water on the slide. Using the tweezers, place your apple peel sample onto the slide.
3. Place the cover slip on the slide being careful not to create any airbubbles.
4. Observe the apple peel at 40X then 100X magnification. Observe and draw the following structures: cell wall, chloroplasts, vacuoles, colourful red pigments (anthocyanin pigmentation) and tonoplasts (vacuolar membrane).
5. Remove the slide from the stage of the microscope. Place 2-5 drops of the 10% salt solution on the slide, using the paper towel or kim wipe to draw as previously.
6. Return the slide to the microscope stage and repeat the observations of the cells at 40X and 100X. After several minutes, the shrinkage of the vacuole can be observed. Observe and draw structures listed in step 4.

QUESTIONS/ANSWERS

1. What happens to the content of the cell during plasmolysis? *Cell membrane and cell shrivels due to loss of water from the vacuole, cell membrane comes away from the cell wall*
2. Why didn't the outer boundary of the cell collapse? What organelle helped it retain its shape? *Because of the cell wall*
3. Identify 3 unique features of plant cells. *The cell wall, the chloroplasts and ability to produce own food, presence of large vacuoles and ability to withstand turgor pressure.*
4. Identify 3 functions of plastids. *Perform photosynthesis, gravity perception, storage of molecules.*
5. Name 3 things that can be stored in plastids. *Pigment, photosynthetic products, and starch.*

CURRICULUM

Science21

LS1: The cell is the lowest form of organisation that can perform all activities required for life. More complex organisation of cells involves tissues, organs and organ systems

Senior Syllabus

2. Organelles contribute to the structure and functioning of eukaryotic cells.
11. The external features and internal functioning of organisms together enable an organism to obtain its needs.

REFERENCES

1. Black, S., Moore, R., and Haugen, H. (Eds.) 2000. Biology Labs that Work: The Best of How-to-do-its, Volume 11. National Association of Biology Teachers:Marylands, USA.