**Vanderbilt Student Volunteers for Science**

**The Cell**

**Spring 2012**

Goal: To help students understand the structure and physiology of cells by making a “shrinky dink” cell.

**Materials – for 30 students**

**2 ovens (toaster)**

**60 pieces of plastic (shell container, recycle code 6), hole punched**

**Many permanent markers (colored)**

**60 bracelet strings**

**Oven mitts, spatulas,**

**15 Animal Cell diagrams in sheet protectors**

**15 Plant Cell diagrams in sheet protectors**

**I. Background - What is a cell?**

* The cell is the smallest unit of life.
* All living things are made up of cells, and there are millions of different types of cells.  There are cells that are organisms themselves, such as yeast, microscopic bacteria cells and protists.
* All plant and animal cells are many-celled organisms.  Every cell has a unique function and different features.  In the body, there are brain cells, skin cells, liver cells, stomach cells, and the list goes on. A plant has different cells in the different parts – root cells, stem cells, leaf cells…
* All the different types of cells have the same basic components.

**II. Activity – Drawing a Plant and Animal Cell**

Materials

Markers

1 piece of plastic labeled “Plant cell”

1 piece of plastic labeled “Animal cell”

Tell students to draw the parts as they are discussed. They will draw both an animal and plant cell, and note the differences.

1. Plant cells are **usually larger** than animal cells.
2. Plant cells are usually shaped like a box. Animal cells are not.
3. **All cells have a 'skin'**, called the cell membrane, is the doorway of the cell, protecting it from the outside environment.  The cell membrane regulates the movement of water, nutrients and wastes into and out of the cell.

**Direct student to use a black marker draw the cell membrane of the 2 cells onto their plastic.**

1. **Cell wall.** Plant cells have a thick stiff structure outside of the cell membrane. It gives the plant cell a defined shape, which helps support individual parts of plants.  The cell wall is composed of a molecule called cellulose. If you have ever eaten celery, you are familiar with cellulose: it is the stringy part of the celery.

Animal cells do not have a cell wall. Many animals have skeletons to give their body structure and support. Plants do not have a skeleton for support.

**Direct students to use a colored marker draw the cell wall outside the cell membrane in the plant cell only.**

1. Inside of the cell membrane are the working parts of the cell.  At the center of the cell is the **cell nucleus**.  It controls the cell activities. The cell nucleus contains the cell's DNA, the genetic code.

**Direct students to use a colored marker draw the nucleus inside both cells.**

1. In addition to the nucleus, there are many **organelles inside the cell**. The suffix –elle means small. Organelles are “small organs” that help carry out the day-to-day operations of the cell. The reason organelles are not a cell themselves is that they cannot live on their own. They must be inside of a cell just like your stomach cannot work outside of your body. Organelles have special, specific duties just like the organs in your body.
2. **Vacuole** is the storage tank - mainly stores water and other nutrients needed by the cell. There are one or two **large** vacuoles **in plant cells.** Animal cells have several small vacuoles.

**Direct students to use a colored marker draw the vacuoles inside both cells. The plant vacuole needs to be large.**

1. **Mitochondria** (many mitochondrion) are often referred to as the **power plants** of the cell. Food is burned here to give the cell energy. The cell cannot survive without energy. They are found in both animal and plant cells.

**Direct students to use a colored marker to draw the Mitochondria inside both cells.**

1. **Chloroplasts**. Are found in plant cells only. Chloroplasts contain chlorophyll that gives plants their characteristic green color and convert sunlight into energy. Plants make their own food from the sunlight (using their chloroplasts), but animals must consume food and get their energy from other sources. If your cells contained chloroplasts, you could use the sun as “food” too!

**Direct students to use a green marker to draw the Chloroplasts inside plant cells only.**

1. **Cytoplasm** is clear, jellylike material that fills the cell. It is mostly water but contains some dissolved nutrients, and cell by-products (waste).

**Direct students to color the “empty” spaces of their cells (or they can leave it uncolored).**

When students are ready, have them take their cells to the VSVS members to “cook” in the oven. After they have cooled, students can string them onto the braid to make a necklace, bracelet, keychain ….

**Other cell parts, not discussed at this level) include:**

Endoplasmic Reticulum (ER): The ER is broken down into two different parts. The Smooth ER is responsible for the synthesis of membrane lipids and other fats. The Rough ER is named for its rough appearance because ribosomes are attached on the outside of the membrane creating a surface with multiple little bumps (the ribosomes). The Rough ER is the site of some protein synthesis in the cell. The proteins and lipids produced by the Rough and Smooth ER are sent to the Golgi Apparatus or to the cell membrane.

Ribosomes: help make proteins that the cell needs and are located in two different parts of the cell. Free Ribosomes are found floating in the cytoplasm of the cell. Proteins produced by these ribosomes are utilized within the cell. Attached Ribosomes are found on the endoplasmic reticulum. Proteins synthesized on the Rough ER are sent to the Gogli Apparatus or to the cell membrane for secretion from the cell.

Lysosomes: aid in the digestion of nutrient molecules and other materials. They are the

cleanup crews for the cell, break down large food molecules into smaller ones that can then be processed by the mitochondria to produce energy. Lysosomes are not common in plant cells because plant cells make their own food in the form of simple sugars that do not need to be broken down before being converted to energy.

Golgi Bodies:packages large molecules, such as proteins, into vesicles before they are shipped to other parts of the cell including the lysosomes and cell membrane for secretion.

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Animal Cell

Plant Cell

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