

The Cell ©

<Narrative Notes>

H.E.L.P. for Kids 2008-2009

Teaching Messages:

1. All living things are made up of building blocks called cells.
2. Cells are very small and cannot be seen with our eyes alone. Microscopes make the cells look much larger so we can see them.
3. Cells divide and make more cells to help us grow and repair in a process called mitosis. The process is strictly regulated. If the regulation becomes defective, cells could become tumor cells.
4. All cells have the same basic parts to do specific tasks, including cell membrane, nucleus, mitochondria, and endoplasmic reticulum.
5. Cells differentiate to become specialized cells to carry out specialized functions. This process gives rise to many different types of cells, such as muscle cells, nerve cells, blood cells, and others.
6. Different cell types group together to form organs and organ systems. All systems work together to form a living and functional organism such as a human being.

Teaching Message 1 – All living things are made of building blocks, called cells.

All things are made of smaller units. Houses are built of individual bricks and pieces of wood. Cars are built of pieces of metal, plastic, and rubber. Think about your favorite toy. Think about what parts make up your favorite toy. All living things are made of smaller building blocks called cells, the smallest units of life. Some organisms are made up of just one cell while others are made up of many cells. This is true for bacteria, plants, insects, birds, fish, and of course HUMANS.

Where do you think cells are located in our body? Cells are located everywhere in our body. Humans are made up of cells that work together to build our muscles, bones, skin, and organs that allow us to survive and function. Every single one of us is made up of cells.

Teaching message 2 –Cells are very small and cannot be seen with our eyes alone. Microscopes make the cells look much larger so we can see them.

Cells are very small and cannot be seen with our naked eyes alone. We need special equipment to make cells look much larger and help us see them such as a **microscope**.

Has anybody ever used a microscope? Microscopes are like super-magnifying glasses that make things look bigger. They make the cells appear hundreds and thousands times bigger so we can see them and look into their insides.

How many cells do you think make up our body? There are 10 trillion cells that make up our body. To picture this humongous number, 10 trillion hamburgers would make a wall 1.3 feet high, 1 foot wide, and long enough to circle the entire earth! That is a lot of hamburgers.

Teaching message 3 – Cells divide and make more cells to help us grow through a process called mitosis.

Each one of us starts out as just ONE cell, a *fertilized egg*. It is made when two cells, an *egg* from the mother and a *sperm* from the father, fuse together. We will learn more about this in a later lesson.

But now we are made up of trillions of different kinds of cells. How do we end up with so many?

Yes, our cells *divide* and grow through a process called **mitosis**. The ability to grow and divide is one of the most unique characteristics of the cell. It is a very organized and controlled process. One of the most important results of this process is that our genetic information is passed on.

The single fertilized egg divides to make two new cells that are identical to each other and to the original cell. Each of these daughter cells grows back up to the same size as the parent cell and then divides again to form four cells, and again to make eight, and on and on. All of the daughter cells are exactly identical to the first cell that divided.

Why do our cells need to be continuously dividing if we eventually stop growing?

Many of the cells in our body are continuously dying and dividing to make new cells. As we speak, many of our cells are dying and are replaced by new cells. The cells in our bone, blood, and skin are some of the examples. Different types of cells can live for different periods of time. There are some cells that do not divide at all after we are born. One example is the nerve cells in the brain. (New research indicates that some of the neurons may be made to divide, though most do not.) We are born with what we have. If we damage these cells, they are gone forever. This is why nature gives us a hard skull to protect these cells.

The process of cell division is strictly regulated. If the regulation becomes defective, cells could divide uncontrollably and become **tumor cells**. These cells keep growing and eventually crowd out the normal cells that normally live there. In addition, they can acquire the ability to spread and grow in other parts of the body, and thus become cancer cells.

Teaching message 4 – All cells have the same basic parts to do specific tasks, including cell membrane, nucleus, mitochondria, and endoplasmic reticulum.

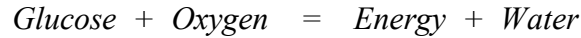
Just as we are made up of smaller parts called cells, even the cell is made up of smaller parts called **organelles** (little organs). No matter how different cells look, they have the same basic parts that do their jobs and keep the cells alive and functioning. It is like a soccer team. A soccer team has different players who play different positions and do different jobs, such as the goalie, forward, etc. Just as a team is only successful when all members work together, each part of the cell must function properly in order for the cell to work properly.

The **nucleus** is the control center or brain of the cell. It tells the cell what to do. It also has *genes* that we inherit from our parents, and that play an important role in determining what we look like, who we are, etc. The genes also determine what the cell is and what the cell does. (The only type of cell type in our body that does not have a nucleus is our red blood cells.)

The **cell membrane** is like the gatekeeper of the cell. It is the outer cover of the cell. It lets in what the cell needs to stay alive, such as oxygen, nutrients, and water, and it lets out waste products that the cell does not need, such as carbon dioxide. Inside the cell is cytoplasm.

The **cytoplasm** is a jelly-like substance that fills the cell and suspends the organelles. It holds the organelles in place and allows them to move around the cell.

The **mitochondria** make energy to keep the cell alive and do its work. It is like the battery or powerhouse of the cell. Energy is generated in the form of ATP (adenosine triphosphate). Energy is needed for everything that the cell does. It is generated by using glucose from foods and oxygen from air.



The energy currency of cells is *ATP*, adenosine triphosphate.

The **endoplasmic reticulum** is where proteins are made. Proteins are the building blocks of our cells and of our body. Some also carry out important activities to help us survive such as digesting food, etc.

Teaching message 5 – Cells differentiate to become specialized cells to carry out specialized functions. This process gives rise to many different types of cells, such as muscle cells, nerve cells, blood cells, and others.

Cells differentiate into cells of different sizes and shapes; they assume different functions to help us survive, function, and grow. Cells that are able to differentiate into many cell types are called **stem** cells. Some examples of specialized cells include red blood cells, nerve cells, muscle cells, eggs and sperm.

Red Blood Cells: Blood is made up of millions of red blood cells in a liquid. Red blood cells carry oxygen to be transported to all parts of our body.

Nerve Cells: Nerve cells, or **neurons**, look different and have different functions from red blood cells. They carry and transmit messages, acting as telephone wires. Some of these cells may reach 2 meters long!

Muscle cells help us move by contracting and relaxing.

Eggs and **sperm cells** are involved in reproduction.

Teaching message 6 – Different cell types group together to form organs and organ systems. All systems work together to form a living and functional organism.

It takes a great deal of teamwork from specialized cells to make it possible for us to live the life we live, including breathing, eating, hearing, seeing, and so on. It is like a baseball team where we have players who pitch, players who catch, outfielders, and others.

These specialized cells group together to form organs. Heart, lungs, brain, and stomach are so examples.

Many of the tasks that our body needs to do are quite complicated. It takes a group of organs to work together to form an organ system to carry out the task. An example is how we use the food we eat. We need the digestive system, which is made up of different organs, including the mouth, the small intestines, the large intestines, and others, each doing a different job.

We will learn more about these systems as we go on in our course. For example, we will learn more about our respiratory system when we discuss smoking, and we will learn more our nervous system when we discuss alcohol and drugs.

Glossary

Cell(s) – what every living thing is made of. They are very small, come in many shapes and sizes, and do different jobs.

Cell Membrane – This is the outer part of the cell that acts like a gate – it lets some things in and others out.

Cytoplasm – It is the jelly-like substance that fills the cell.

Microscope – the special tool that works like a very powerful magnifying glass to help us see very tiny things – such as cells.

Mitosis – cell division. One cell divides into two cells that are the same. Each of these daughter cells divides into another two cells that are the same, so on and so on.

Mitochondrion(a) – This is the part of the cell where energy is made.

Nucleus – It is the control center of the cell. It contains the genes.

Video clips/Animations/PowerPoints

- “How Big is a Cell?”
 - <http://www.cellsalive.com/howbig.htm>
 - This animation allows the viewer to zoom in on a red blood cell and demonstrates its relative size compared to objects that the students should be familiar with (needle, dust mite, strand of human hair, grain of pollen)
- Frog embryo division video clip:
 - http://www.youtube.com/watch?v=GO5YN_t1fqw&feature=Playlist&p=1D824E7842D7B3C4&index=0
 - This video shows early cleavage in a frog embryo undergoing mitosis.
- “The Cell” PowerPoint.
 - Slide-2: Diagram of an animal cell and important organelles: nucleus, mitochondria, endoplasmic reticulum, cytoplasm, and cell membrane.
 - Slide-3 to Slide-6: Pictures of specialized cells: red blood cells, nerve cells, muscle cells, egg and sperm.
 - Slide-7: Video introducing the concept that specialized cells form organs and organ systems.

Activities

Building the Cell:

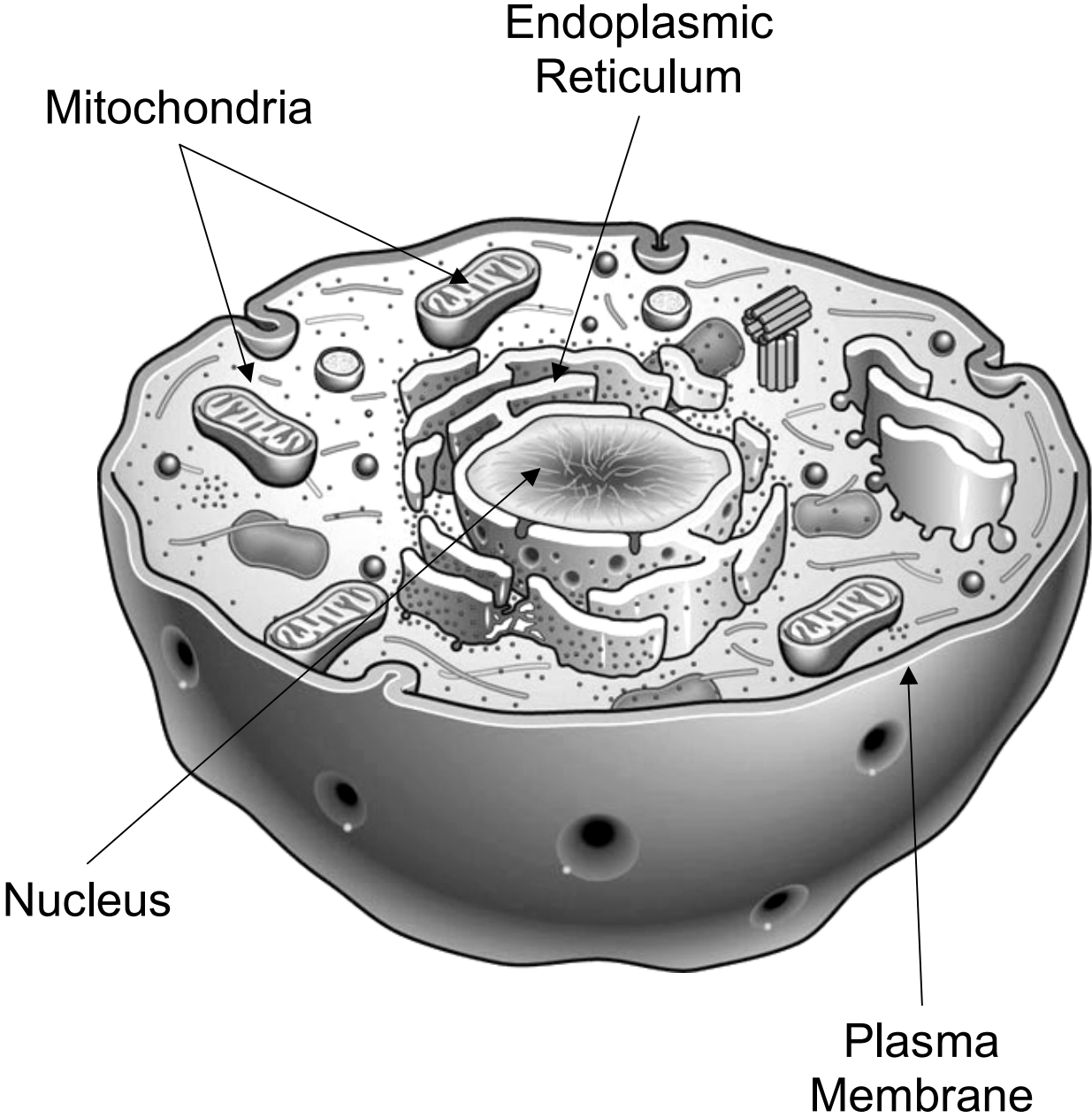
Materials: Play-doh in multiple colors, Construction paper, Yarn

At the end of the cell lesson, show the cell again, and walk through the process of constructing the cell, explaining which organelle each of the materials represents. To review, ask students to state the function of each organelle as it is added to the cell.

1. Divide students into groups with one teacher working with each group.
2. Place a piece of construction paper on each student’s desk on which to build his/her cell.
3. Use a long piece of yarn to represent the **cell membrane**. Form any shape. Make sure that the two ends close. (Alternatively, using a marker, draw a large circle on the construction paper to represent the cell membrane.)
4. Using Play-doh, demonstrate to the class how to make a round shape to represent the **nucleus**.
5. Use Play-doh to make several lima bean shapes to represent **mitochondria**.
6. Roll out some Play-doh to make small pipe-like structures to represent **endoplasmic reticulum**.

At the end of the Cell activity, ask the students to draw a cell and its parts on the worksheet in the Student Packet and label different organelles. Alternatively, the students can do it as homework if there is a shortage of time. In addition, there is also homework on What Do These Words Mean in the Student Packet the kids are supposed to do at home.

Diagram of an Animal Cell



Mini Quiz

1. Where can cells be found in our bodies?
 - A) Our muscles
 - B) Our skin
 - C) Our bones
 - D) All of the above

2. Mitochondria in the cell are responsible for
 - A) Making energy for the cell
 - B) Keeping the cell dry
 - C) Eliminating waste products from the cell
 - D) Movement of the cell

3. Cells divide and multiply and help us grow through a process called
 - A) Mitosis
 - B) Migration
 - C) Transportation
 - D) Osmosis

4. The nucleus in a cell
 - A) Is the control center of the cell and tells it what to do
 - B) Stores water
 - C) Holds all the parts of the cell in place
 - D) Provides energy for the cell

5. In order to make cells look larger so that we can see them, we must use a
 - A) Mirror
 - B) Telescope
 - C) Laser
 - D) Microscope