

# The Cell ©

## <Lesson Plan>

*Grade 6*

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.

### **Equipment:**

- Laptop and Projector

### **Materials for Small Group Activities:**

- Play-doh in multiple colors
- Construction paper
- Yarn or Markers

**Teaching Message #1:**

**All living things are made up of building blocks called cells.**

All things are made of smaller units. All living things are made of building blocks called cells. 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.

**Activity 1 – Introduction to Cells and Cell division (20 mins)**

For this activity, you will show two online animations (1) to demonstrate the microscopic size of a cell and (2) to illustrate cell division.

**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 so small that we cannot see them just with our naked eyes. We need special equipment to help us see them such as a **microscope**.

*Has anybody ever used a microscope?*

(Spend a couple of minutes to get volunteers to respond and ask what they saw.) 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?*

(Wait for answers) 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.

**1. Show Animation “How Big is a Cell?”**

< <http://www.cellsalive.com/howbig.htm> >

Show the animation from the “Cells Alive” website which zooms in step-by-step and demonstrates the relative size of a red blood cell compared to objects that the students are familiar with. Particularly point out the comparisons in size to the tip of a needle, a dust mite, a strand of human hair, and a grain of pollen. This animation is an important tool to emphasize that cells are much too small to see with the naked eye.

### **Teaching Message #3**

**Cells divide and make more cells to help us grow and repair in a process called mitosis.**

Each one of us starts out as just ONE cell, a *fertilized egg*. It is made when an *egg* from the mother and a *sperm* from the father, fuse together.

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

Our cells *divide* through a process called **mitosis**.

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. (When viewing the video clip of cell division, be sure to point out the division from one cell into 2, 4, 8, and so on as each occurs.)

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

(Wait for answers.) Many of the cells in our body are continuously dying and dividing to make new cells. As we speak, many of our cells, which are old or damaged, are dying and are replaced by new cells. The cells in our bone, blood, and skin are some 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 divide, though most do not. We are born with what we have. If we damage these cells, they are gone forever.

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*.

## **2. Introduce mitosis and show video clip of cell division:**

<[http://www.youtube.com/watch?v=GO5YN\\_t1fqw](http://www.youtube.com/watch?v=GO5YN_t1fqw)>

For this activity, you will show a video of a cell (frog embryo) undergoing mitosis. After viewing this video mention that the video has sped up the process of cell division, which normally occurs much slower.

Explain that the cell undergoing division in the video is a frog embryo, which starts out as one single cell that is *1.6 million* times bigger than a single cell of an adult frog. The single cell will undergo millions of division just as those in the video before it becomes an adult frog.

## **Activity 2 – Organelles and Different Types of Cells (20 mins)**

For this activity, you will show Slide 2 – Slide 6 of “The Cell” PowerPoint. Introduce the students to the different organelles that most cells have in common: the nucleus, cell membrane, cytoplasm, mitochondria and endoplasmic reticulum. *Inform the students that they will be able to build their own cell for an activity at the end of class.* Next, familiarize them with different kinds of specialized cells, emphasizing that they come in a variety of different shapes and sizes by showing pictures of nerve cells, red blood cells, muscle cells, and sperm and egg cells.

### **1. Show Slide 2 of “The Cell” PowerPoint**

#### **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 many of 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 **cell membrane** is like the gatekeeper of the cell. It lets in what the cell needs, such as oxygen, nutrients, and lets out what the cell does not need, such as carbon dioxide.

The **cytoplasm** is a jelly-like substance that fills the cell. It holds the parts in place and allows things to travel through the cell.

The **mitochondria** make energy to keep the cell alive and do its work. It is like the battery of the cell.

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.

## 2. Show Slide 3 – Slide 6 of “The Cell” PowerPoint.

Show “The Cell” Powerpoint (Slide 3 “Nerve Cells”, Slide 4 “The Red Blood Cell”, Slide 5 “Muscle Cells”, and Slide 6 “Egg and Sperm Cells”). Introduce the each type of cells one at a time emphasizing how different they are in size, shape, and function.

### **Teaching Message #5:**

**Cells differentiate to become specialized cells to carry out specialized functions to result in many different types of cells such as muscle cells, nerve cells, blood cells, and others.**

Our cells divide, grow, and differentiate into various shapes and sizes resulting in many types of cells that do different jobs 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.

### **Activity 3 – Cells, Organs, and Organ Systems (15 mins)**

This activity is designed to demonstrate how cells, organs and organ systems are related. Introduce the teaching message. After presenting some examples of organs and organ systems, such as the circulatory, respiratory, and digestive systems, show the short video clip (Cell PowerPoint, Slide 7) about the organization of specialized cells into specific organs and finally complete organ systems to review.

**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 team work of 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.

**Show video on Slide-7 of “The Cell” Powerpoint.**

**Activity 4 – Building the Cell (20 mins) – Eastside Prep Only**

This will be the last activity of the class. Show the cell again. Walk through the process of constructing the cell, explaining which organelles each of the materials represents, and 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 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.

<b>Review of the Lesson</b>
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Review the teaching messages and ask the class questions to check their understanding of the concepts. If time permits, go over a worksheet (*What Do These Words About Cells Mean?*).

- **Teaching Message 1 (All living things are made of cells):** Do [chairs, tables, dogs, plants, etc.] have living cells? Make sure they understand why some of these objects have cells and why others do not.
- **Teaching Message 2 (Cells are very small):** Can we see cells with our eyes? If not, what helps us see cells?
- **Teaching Message 3 (Cells divide and make more cells to help us grow):** If we all started out as one cell, how did we get so big? Do you think cells in our body are dividing right now? Why do cells have to grow after they divide? What would happen if every time a cell divided, it did not grow bigger?
- **Teaching Message 4 (All cells have the same basic parts to do specific tasks):** Ask what the different parts of the cell do. There are some parts all cells have—what are they? If you have time, go over the worksheet *What Do These Words About Cells Mean?* If not, have them do it for homework.
- **Teaching Message 5 (There are many different types of cells in our body doing many different jobs):** How does the shape of a [nerve cell] help to [carry messages throughout the body]? (The long shape of the nerve cell allows it to carry messages from the brain all the way to the different parts, like the foot).
- **Teaching Message 6 (Cells form organs, which form organ systems):** What are some examples of organs? Why do we need organ systems? Make sure students understand the organizational hierarchy from cells to organ systems.