

## The Day an Egg Solved the Mystery of the Cell



**Level :** Grades 4 - 6

**Subjects:** Science, Health, and Math

**AZ ACADEMIC STANDARDS:** SC04-S2C2, SC04-S1C3, SC05-S4C1, SC06-S1C3, SC06-S4C1

### **MATERIALS**

Copy for each student:  
Diagram Worksheet  
Science Notebook  
Observation Sheet  
Student Self-Evaluation Sheet  
Fresh Uncooked Eggs; the number of eggs needed will depend on whether you demonstrate with one egg, or allow students to work in groups or individually.  
Wide Mouth Jar(s): The number of jars needed depends on how many experiments will be conducted in the room. A mayonnaise or peanut butter jar works well. It needs a tight fitting lid. Cloth or paper measuring tape.  
White Vinegar: If multiple experiments are conducted, the gallon size is cheaper.  
Latex gloves, as needed.

### **VOCABULARY**

Arizona Grown egg, membrane, osmosis, porous, albumen, natural system, shell, nutrition, nucleus, cells, yolk, DNA

**RELATED LESSONS** Can You Walk on Eggs? Which Came First, The Chicken or the Egg?

### **SUPPORTING INFORMATION**

It seems a mystery...the way everything on Earth is

and everything alive on Earth is made up of cells. An entire living thing can be only one cell, or like in humans there can be billions of cells. The cell is considered to be the smallest structure in biology that has all the properties of living things. Most cells have similar basic structures. So, understanding cells and the basics of cell structure is critical to making sense out of biology. One of the main purposes of cells is to organize the process of our being alive. We don't tell our legs to walk, or our jaws to chew. We have brain cells, stomach cells, bone cells, and many other types. Each is different from the others and they are responsible for the processes of life. Let's look inside one of the nutrition cells.

(introduce *Diagram Sheet*; see *Teacher's Resource Guide*)

Some of our cells distribute nutrition to our body. It's not possible for us to take one of them out of our bodies to watch the system work. However, we can see a similar life system when we experiment with an egg. Although different, eggs are an excellent visual aid for learning how human cells work.

We are using Arizona Grown chicken eggs. Here in Arizona, there are chicken ranches that produce millions of eggs for our local grocery stores. We can be sure that Arizona eggs are fresh and quality

### **BRIEF DESCRIPTION**

Lesson will lead students to compare basic human cell structure to chicken egg structure. Experiment will allow students to gain a basic understanding of how nutrition (or possibly toxins) moves through cells. Students will solve the mystery by completing the experiment. Lesson includes hands-on and visual experiences.

### **OBJECTIVES**

- For students to recognize that by investigating diverse natural systems we can learn important things about ourselves.
- For students to gain experience identifying, observing, and predicting a sequence of events which establish a natural system.
- For students to consider ways of using this information to be responsible caretakers of their own bodies and the planet.

### **ESTIMATED TEACHING TIME**

Introduction: 30-55 minutes  
Begin the Experiment observations: 10 minutes a day for 3 days  
Follow-up discussion/results: 30-45 minutes

## SUPPORTING INFORMATION (cont'd)

eggs you had for breakfast end up moving through your nutrition cells. Let's begin by identifying the parts of an egg (*refer back to Diagram Sheet, see Teacher's Guide*) and see how it's alike, or different, from a human cell.

What happened? (3 days later) The eggshell is made of calcium carbonate, also known in nature as limestone. When the acid in the vinegar covered the shell there was a chemical reaction. The water in the vinegar was forced through thousands of tiny pores in the shell and in the egg membrane. This process is called osmosis, where one thing is absorbed into another. The egg gets bigger as more water is absorbed and the acid in the vinegar eats away or dissolves the shell.

The nutrition cells in our bodies act much the same way. They have a continuous life system where nutrition (good or bad) is constantly absorbed into the cells and fed to our bodies.

**We solved the mystery!** By looking at this well-used egg we can scientifically explain how nutrition is passed through our body's cells. Also, we can better understand that the choices we make about the food we eat and drink determine the quality of nutrition that is distributed throughout our bodies.

## GETTING STARTED

This is consumer protection information. Occasionally a student may have an allergy to eggs, if so, that student should only observe. After the project is completed everyone handling eggs should wash their hands with soap and water. Be sure that all eggs are kept in a

refrigerator or ice chest before use.

## PROCEDURES

Session 1.  
Introduce the mystery (use *Supporting Information*) to the students.

Using the *Diagram Worksheet* lead students through the basic structure of a human cell. Information on the *Teachers Resources Page* provides basic cell biology and facts to discuss. Still using the *Diagram Worksheet* point the students to the egg diagram and identify the parts.

If you were using one egg for illustration it would be beneficial to distribute dry broken pieces of eggshell among the students. To see the air cell hold the egg in front of a strong flashlight beam, or use the old fashioned way of passing it in front of a candle flame. The air cell is always at the large end of the egg. The older the egg, the larger the air cell.

To show the 1<sup>st</sup> membrane, break open an egg, empty it and loosen the membrane from the inside of the shell, it should lift up in sections. To show the 2<sup>nd</sup> membrane students will need to look at the yolk of the egg and realize there is a thin, clear membrane around it that holds the yolk together. Cooks call the albumen the egg white. Using a piece of eggshell or a spoon show the students what it looks like. Students will observe two consistencies of albumen: Nearest to the shell membrane is thin watery albumen that spreads around the thick, more jelly like, albumen. This 2<sup>nd</sup> albumen is a major source of protein. Show the yolk: the yellow portion of the egg. The intensity of the color depends on the mix of chicken feed.

Look for the chalaza (pronounced: cha laag) it is a twisted cord or thick stands of albumen among the egg white that maintain the yolk in the center of the egg.

Option (would add about 10 minutes to the lesson): individual students or student groups can take an egg(s) and dissect it, matching the actual parts to the Diagram.

Session 2.  
Introduce the experiment by explaining you will be using a fresh Arizona Grown chicken egg to illustrate the mystery of how human cells and eggs are alike.

Distribute the *Science Notebook Observation Sheet*. If there will be more than one experiment conducted, there is a paper measuring tape along the edge of the *Observation Sheet* that can be used by individuals or groups.

Continue in this order:

1. Measure the outside circumference of the egg.
2. Record that measurement on the *Observation Sheet*.
3. Carefully put the egg into the jar (if there are any cracks you must use another egg.)
3. Cover the egg with white vinegar.
4. Screw the lid on tight.
5. Students should record initial observations.
6. Set the jar(s) aside in a safe place for three days.
7. The next three days the students should document any changes they see in the jar.
8. After three days **CAREFULLY** take the egg out of the jar and measure around the middle of the egg (*The shell of the egg should be gone, and the egg should be rubber-like and larger than before*).
9. Students should record the measurement
10. Give students the opportunity to record all of

## PROCEDURES (cont'd)

the changes the egg has made: size, sight, smell, and touch.

Discuss: While the changes may seem mysterious, everything can be scientifically explained.

*(Supporting Information)*

Also, help them to understand that not just one thing happened, that instead there was a series of actions that result in a scientific system.

Optional Discussion: We can't tell our Nutrition Cells exactly what to do, however, we do influence whether the cells have good nutrition or worthless stuff to distribute. Remember: everything that we put in our mouth, we wear somewhere in our body. That is why our food and drink choices are so important. Finally, students should answer the evaluation questions on the *Science Notebook Observation Sheet* and complete the *Student Self-Evaluation Sheet*.

## EVALUATION OPTIONS:

1. Teacher evaluation of *Student Observation Sheet & Questions*
2. *Student Self-Evaluation sheet*

## EXTENSIONS AND VARIATIONS:

Drug/Alcohol Prevention  
Environmental Toxins as they impact birds, reptiles, and fish eggs.

## RESOURCES

Good education sites include: University of Illinois Extension Program

[www.urbanext.uiuc.edu/eggsEducationWorld](http://www.urbanext.uiuc.edu/eggsEducationWorld). Their

lesson planning includes Why all the EGGS-citement about eggs? An eggs-plosion of across-the curriculum eggivities for all grades.

[www.education-world.com](http://www.education-world.com)

Information about consumer safety, egg production, and business include:

Presidents Council on Food Safety - Egg Safety  
Educating individuals throughout the production to consumption continuum.

[www.foodsafety.gov/~fsq/ceggs](http://www.foodsafety.gov/~fsq/ceggs)

United States Department of Agriculture

[www.usda.gov](http://www.usda.gov) One of the most comprehensive information sources is:

Egg Nutrition Center  
An all-encompassing center of research, safety, business, marketing for the egg industry and the consumer.

[www.enc-online.org](http://www.enc-online.org)

In Arizona be sure to check these websites:

State of Arizona Dept. of Agriculture - ARIZONA GROWN Program, 1688 W. Adams, Phoenix, AZ 85007, (602) 542-4373.

[www.agriculture.state.az.us](http://www.agriculture.state.az.us)

Hickman's Egg Ranch

This website has some interactive kid activities.

Arizona can be proud of this homegrown business.

[www.hickmanseggs.com](http://www.hickmanseggs.com)

## CREDITS

All of these websites were helpful in the development of this unit, especially the Egg Nutrition Center.

It's also important to the universe to acknowledge my own flock of chickens that faithfully produce 18 or so beautiful brown and blue eggs every day. I also give credit to Henrietta, a stray chicken that has lived several years on our school campus.

## EDUCATORS' NOTES

### CURRICULUM DESIGN

Anita R. Easley  
6<sup>th</sup> grade teacher  
Gilbert Elementary School

This Arizona Grown Specialty Crop Lesson Plan was paid for by a grant from the AZ Department of Agriculture office of Marketing and Outreach.

*Amazing Egg: The Day an Egg Solved the Mystery of the Cell*

**Science Notebook Observation Sheet**

Technician's Name

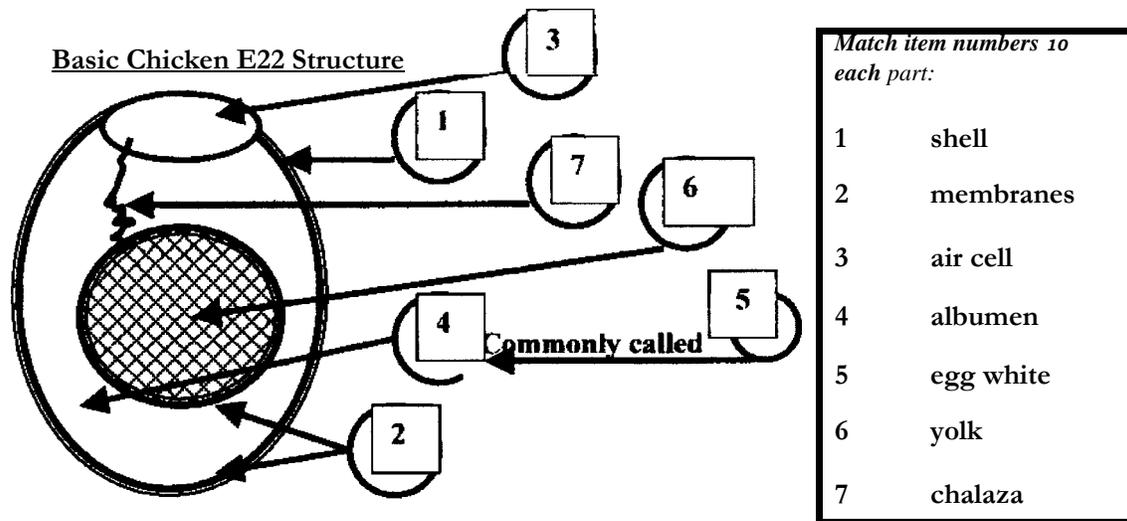
Experiment Started: \_\_\_\_\_ Experiment Ended:-  
*Write or illustrate your daily observations*

DAY 1
DAY 2
DAY 3
DAY4
DAY 4

**ANSWER THESE QUESTIONS ON THE BACK OF *THIS PAGE***

1. Use complete sentences and describe what you enjoyed most about this experiment.
2. How are chicken eggs and a human cells alike? How are they different?
3. How can you use this experience in your daily life?

Teacher Key and Lesson Resource Sheet: Amazing Egg — Cell Diagram Worksheet



**REMINDER:** The purpose of this comparison is for the students to become aware of the common elements of a living cell. Microscopes are necessary to look at human cells. By using an egg as a visual aid students can see a similar structure.

1. Around the egg: a shell

The shell is calcium carbonate or limestone. Even though the shell is hard it is covered with almost ten million pores. The pores allow water and gases to pass through. An egg may be white, brown, or blue, depending on the breed of chicken. Most Arizona Grown eggs are white because white Leghorn chickens are the most common.

2. Inside the egg: an inner and outer membrane One membrane is just inside the shell and provides a protective barrier against germs and bacteria. The second membrane is a thin sack that contains the yellow yolk.

3. Inside the egg: an air cell A pocket of air forms at the large end as the egg cools. The healthy internal temperature of a chicken is about 107 degrees F, so an egg is very warm when laid.

4. & 5. Inside the egg: the albumen or egg white

There are two kinds of albumen (also called egg white). Just inside the shell a thin, watery albumen protects the inner thick egg white. The thick egg white is very nutritious with riboflavin and half of the egg's protein.

6. Surrounded by egg white: the yolk The yellow yolk is rich with vitamins, minerals, protein, and some fat. A thin membrane or sack holds the egg yolk together.

7. Floating in the egg white: the chalaza

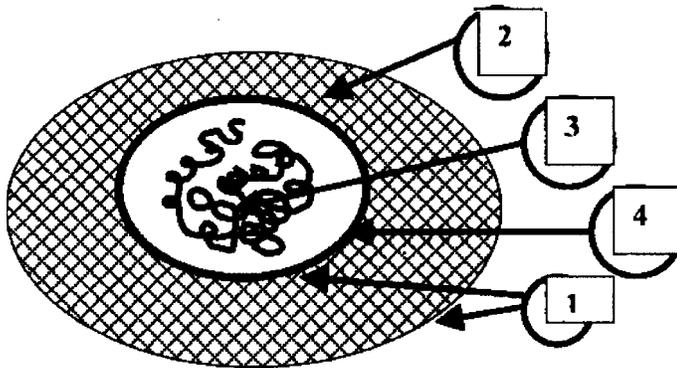
The chalaza is extra thick strands of albumen that anchor the yolk and prevent it from being thrown against the side of the egg. The more prominent the chalaza the fresher the egg.

Amazing Egg: The Day an Egg Solved the Mystery of the Cell

Teacher Key and Lesson Resource Sheet Cell Diagram

Worksheet

Basic Human



Match item numbers to each part:

1	membranes
2	cytoplasm
3	DNA
4	nucleus

**REMINDER:** The purpose of this comparison is for the students to become aware of the structure and operation of the basic human cell: Healthy human cells usually have four things in common.

1. Around the cell: a cell membrane

According to its function, the cell membrane is selectively permeable. This means some materials are allowed to pass into or out of the cell, but not others. You can explain it to the students like this:

The cell membrane can be compared to human skin. While coloring eggs for Easter, if you put your hand into the dye, it will also dye your skin. The colored water moves into the skin pores and leaves behind color.

Now, if you put your hand into a cup of chocolate syrup will the same thing happen? No, your skin will be sticky and messy. Why? The chocolate is too thick and doesn't pass into or through the skin.

2. Within the cell membrane is: cytoplasm Cells are filled with a water-based solution called cytoplasm. Within the cytoplasm are the tools necessary for the cell to do its job.

3. Within the cytoplasm is: a nucleus You may remember that not all cells have a nucleus; that's another lesson in the wonderful world of biology. Today, let's keep it simple — a cell has a nucleus.

4. Within the cell membrane, contained in the cytoplasm, and usually inside the nucleus is: DNA

The science of DNA is changing the world.. For this lesson the important fact is that DNA is a ladder-like twisted molecule that is in the cytoplasm of most cells.



**Amazing Egg: The Day an Egg Solved the Mystery of the Cell**



Name: \_\_\_\_\_

Teacher: \_\_\_\_\_  
Title of Work: \_\_\_\_\_

	Criteria			Points
	1	2	3	
Science Concepts	I <b>don't get</b> it yet.	I get some of it.	I get it.	My ideas shine! i can teach it to a friend.
Science Notebook Observation Sheet	I did not record.		I did record and I did record details	I started to record.
Team Member	I didn't help my team. I was off task.	<b>I did less than shared was off task bit.</b>	I did some of the work. I <b>helped clean up and quite a , the work</b> the time.	I worked well with my team, cleaned up, stayed on task <b>work equally.</b>
Vocabulary	Many of the <b>vocabulary</b> ° words are still confusing to me.	Some of the vocabulary words are confusing to me.	I feel like f can use the <b>vocabulary</b> words most of the time.	I can <b>understand</b> and use the <b>vocabulary</b> correctly.
Neatness	<b>Rarely used legible handwriting.</b>	<b>Sometimes used legible handwriting.</b>	Usually used legible handwriting.	Consistently used <b>legible</b> handwriting. <b>Total--&gt;</b>

Teacher Comments: