Experiments

EFFECTS OF STORAGE ON EGGS

COLLECT

- Fresh Dozen Eggs
- 3-4 Week Old Dozen Eggs
- Sauce pan add enough water to fill pan
- Heat Source
- Dozen Plates

PROCEDURE

1. Hold a dozen eggs in refrigerator for 3-4 weeks.

2. Place 6 fresh eggs and 6 3-4 week old eggs in sauce pan and wait to see what happens. Describe what you see.

   The Fresh eggs will sink and the old eggs will float. The size of the air cell will determine if the egg will sink or float. The older an egg is the larger their air cell is.

3. Take the eggs out of the sauce pan and break open into individual plates keeping your fresh eggs and old eggs separated. Describe the difference in the floaters/sinkers.

4. With the other 6 fresh eggs and 6 3-4 week old eggs. Hard-cook the eggs (see Recipes - Cooked in the shell). Peel the eggs and describe the difference in peeling and appearance of the fresh eggs versus the old eggs.

EGG IN A BOTTLE

A peeled hard-cooked egg is placed on a narrow-mouthed jar after burning matches have been dropped into the jar. It bounces quickly, and then slowly slides down into the container. Sometimes, the white is stripped away from the yolk as it slides into the jar. The white falls onto the table and the yolk is inside the jar!

This experiment can be a great discrepant event, a way of creating a pause where you look at something and it is not quite right. You are puzzled and need to search for a resolution for your discomfort.

COLLECT

- Narrow-mouthed jar
- Two hard-cooked eggs
- Wooden matches

PROCEDURE

1. Peel the shells off the eggs.

2. Place one of the eggs on the mouth of the jar. What happened?

The egg sits there and does not move. There is a balance between the air pressure pushing down on the egg, the air pressure pushing sideways, and the air pressure up from inside the jar. Gravity pulls the egg down, but the bottle pushes it up.

3. Remove the egg and drop two well lit matches into the jar.

4. Immediately replace the egg on the jar.

5. Observe the egg.

6. Remove the egg by breaking it up with a knife and pouring the contents into a garbage can. (If you "flick" your wrist while holding the bottle over a garbage can, you risk letting go of the bottle and it might shatter).

7. Repeat the experiment, focusing on the bouncing of the egg after it is placed on the mouth of the jar.

DISCUSS

What happened to the egg? It was pushed into the jar by the air in the room. It is a misconception to say it was "sucked" into the jar.

When you changed the balance of pressure, the egg moved. In this experiment, you removed some of the air inside the bottle and it is not able to push up with the same pressure as it did before the experiment.

Some of the air was removed during the process of burning the matches. More air was removed when the heated air inside the jar tried to escape. As it heated, it took up more space and it escaped the jar causing the egg to bounce.

EXTENSION

What would happen if you did not put the egg on the jar immediately? Hypothesize and experiment to find the answer.

What would happen if you tried this experiment with a small water balloon? Would the balloon be pushed into the container? Explain.

HINT

There must be a seal between the egg and the bottle. If your egg seems to have a gap, you might get it wet with water or coat it with a small amount of oil.

Eggs are made in the shape of an arch which, from the outside, is one of the strongest shapes we have.

Modified from Teaching Scientific Things...Like Eggs by Barbara Bannister.

FLOAT OR SINK YOUR EGG (Answer Sheet)

An egg floats or sinks in water depending on its density compared to the water. The density of water can be increased by adding salt. By setting it up ahead of time, this activity can be a good discrepant event. You can use it to get students to problem solve something that looks unusual. It will generate great discussions in your classroom.

COLLECT

- Salt
- Water
- Salt water solution*
- 2 hard-cooked, unpeeled eggs
- Large serving spoon
- Clear containers, such as, wide graduated cylinders or clear tennis ball containers with the labels removed
- Index cards for labels for the two containers

PROCEDURE

1. Use a large spoon to lower an egg gently into a container half full of water, labeled "fresh water".

DISCUSS: Why does it sink?

The egg is denser than the fresh water. Density is a concept that is easy to misunderstand. Listen to their answers and clarify that density is the amount of material in a certain volume of a substance. It is not simply how much something weighs. It is not how heavy the egg is compared to the water. You must compare the amount of material in the water to the amount of material in the egg. The easiest way to compare density at the elementary level is to compare the same volume. Imagine you had a force field that surrounded water that was the same shape as this egg. Since the egg sinks, there must be more stuff packed inside the egg that in the same amount of water contained inside this force field.

2. Lower an egg gently into a container half full of saturated salt water labeled "salt water".

DISCUSS: Why does it float?

There is less stuff in the egg than in the salt water. The difference is the salt that has been added to the water.

3. Predict what will happen if you add fresh water to the salt water container that has the egg at the bottom. Explain your prediction.

4. Add fresh water to the salt water container.

Be patient at this point. If you pour too quickly, the egg will rise quickly to the top of the liquid. If you pour slowly, it will rise very slowly to the top or even seem to hover in the middle. Usually, I add about as much salt water as fresh water already in the container.

DISCUSS: What happened? Why? Was it what your predicted?

EXTENSION

What will happen if you leave the egg hovering in the water? If the water evaporates over time, will the remaining water be more salty and the egg will tend to float? Will the egg absorb salt and then tend to sink? Since you have taken the time to set up the experiment, after a class discussion of possibilities, leave the experiment in an undisturbed location and watch each day. By placing a ruler behind the egg, you can keep track of the egg's "elevation" by looking directly through the water at the ruler in back. You might even make a graph as a class and chart the movement of the egg to determine if there is a pattern.

* To make clear salt water solution: boil water, remove from heat source and pour in as much salt as can be dissolved quickly. Stir briskly for a minute or two. Set aside to allow the sodium silicate, an anticlotting agent, to settle. Pour off the salt water after it has cleared, rinse the container completely, and store the salt water for future use.

Modified from Teaching Scientific Things...Like Eggs by Barbara Bannister.

FLOAT OR SINK YOUR EGG WORKSHEET

An egg floats or sinks in water depending on its density compared to the water. The density of water can be increased by adding salt.

COLLECT

- Salt
- Water
- Salt water solution*
- 2 hard-cooked, unpeeled eggs
- Large serving spoon
- Clear containers, such as, wide graduated cylinders or clear tennis ball containers with the labels removed
- Index cards for labels for the two containers

PROCEDURE

1. Use a large spoon to lower an egg gently into a container half full of water, labeled "fresh water".

DISCUSS: Why does it sink?

2. Lower an egg gently into a container half full of saturated salt water labeled "salt water".

DISCUSS: Why does it float?

3. Predict what will happen if you add fresh water to the salt water container that has the egg at the bottom. Explain your prediction.

4. Add fresh water to the salt water container.

DISCUSS: What happened? Why? Was it what you predicted?

5. What will happen if you leave the egg hovering in water?

* To make clear salt water solution: boil water, remove from heat source and pour in as much salt as can be dissolved quickly. Stir briskly for a minute or two. Set aside to allow the sodium silicate, an anticlotting agent, to settle. Pour off the salt water after it has cleared, rinse the container completely, and store the salt water for future use.

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HARD-COOKING AN EGG

During the process of cooking an egg, a chemical change takes place in the material that makes up the egg. Air is released from the egg and a compound sometimes forms what appears as a dark ring around the yolk.

COLLECT

- 12 raw eggs
- Sauce pan add enough water to cover the eggs
- Teaspoon of table salt or tablespoon of vinegar
- Heat source
- Plate
- Kitchen paring knife
- Large slotted spoon
- Pencil

PROCEDURE

1. Mark one raw egg with a "C" to show it is the control egg; it will be used to compare the changes made by heating the other eggs. Set it aside for later. Place the other 11 eggs in the pan and cover with cold water. Add the salt or vinegar.

2. Place the pan on a heat source and allow it to come nearly to a boil.

3. Turn down the heat to simmer, and begin to count the minutes. At the end of every second minute, remove an egg from the water, and mark it with the number of minutes it was cooked. Place it in cold water. Remove when cool and place in a carton with the control egg.

4. Continue until all eggs are cooked. If your class becomes restless, you might ask them to draw, with crayon or colored pencils, their guess of how the eggs will look when you cut them open.

5. Use the paring knife to cut the eggs open lengthwise. Start with the egg that was cooked the longest; it will be the easiest to cut. Use the serrated edge of the knife to get you started through the shell. Continue until you come to the egg that was the control, the raw egg.

As you cut the eggs open talk about what they look like. Predict what you will see with the next egg. How are the eggs changing? Place the eggs in a row on the plate from cooked the longest to cooked the least amount of time. Is there a pattern to what you see? What do the eggs feel like?

RECORD

Draw a picture of each. (You can provide a tagboard cut-out of an egg shape to allow student to trace the eggs).

DISCUSS

What happens to an egg as it is cooked? How does its appearance change? Does the change occur in a gradual, predictable way, or do there appear to be definite changes at intervals instead?

Did any eggs crack? How do they look?

EXPLANATION

While an egg is in hot water, the organization of its protein molecules is changed. The egg protein in the white is a molecule that curls up, coiling into a ball normally. When bombarded by water molecules as it is heated, it is forced to open up from its curl. Now, places are exposed where other molecules can bond with it and randomly that is what happens. A loose, flowing substance becomes semirigid and immobile due to molecular bonding.

Imagine putting on a coat that has the hooks part of Velcro down the front and on the sleeves. You can curl up and cover all those spots and no one can "bond" to you. But, if you uncurl and someone else with a looped part of Velcro coat comes along, you can become bonded and then you won't be able to curl up again.

This gas collects in the coolest part of the egg. If the coolest part is the yolk, the iron in the yolk bonds with the sulfur and kicks out the hydrogen. This iron sulfide forms the dark ring around the outside the yolk.

If you cool the eggs immediately after cooking, the ring does not form because the gas collect near the shell, the coolest part of the egg because of the cold water. Without the iron from the yolk, the gas is simply released.

Modified from Teaching Scientific Things...Like Eggs by Barbara Bunnister.