

Extracting Strawberry Innards

Grade Level: 3 – 5

Introduction:

Have you ever wondered why some cereals say fortified, or that your parents give you a multivitamin to take? Although most kids in the United States don't suffer from malnutrition, that isn't true in other parts of the world. Malnutrition is when an individual isn't getting enough of the important nutrients that they need, such as Vitamin C, iron, or zinc. Malnutrition over long periods of time can cause major health problems.

Real World Connection:

In some places in the world, getting enough nutrients is a major health issue. Food with a lot of nutrients, like fruits and vegetables, aren't always available to families. Some places also don't have nearby doctor's offices or hospitals.

[Georgia Tech researchers have created a new way to test small amounts of blood for Zinc](#), a nutrient. They split open bacteria cells and use pieces of their insides to detect the Zinc. The test is cheap and uses a tiny amount of blood. The cost and easiness are two important features when working in rural communities without access to medical offices. By testing the blood samples of people, they can find if someone is at risk of having malnutrition.



Vocabulary to Know:

- ▶ **Malnutrition** – a condition caused by chronic lack of nutrients in an individual's diet
- ▶ **Innards** – the inside of an organism
- ▶ **Cell** – the smallest unit that has properties of life
- ▶ **DNA** – a molecule that contains the information the body needs to function; determines your eye color, hair color, etc.

Activity

Materials:

- Quart-sized plastic bag (Ziploc or similar)
- Strawberries
- Dish soap
- Salt (iodized table salt works best, the smaller the salt grains the better)
- Water
- Plastic cups (medium-sized, like a Solo cup or similar)
- Coffee filter
- Rubber band
- Rubbing alcohol (refrigerate prior to this activity)
- Skewer, chop stick, tooth pick, or similar
- Teaspoon measuring spoon
- Measuring cup

Continued.

Instructions:

1. Prep the strawberries by removing the green leafy tops. Place into the plastic bag, seal tightly, and crush the strawberries until they have a consistency similar to applesauce.
2. Add 2 teaspoons of dish detergent, 1 teaspoon of salt, and 2/3 cup of water into a cup. Stir well, and then add to the plastic bag with the strawberries.
3. After adding, gently mix the liquid in with the mashed strawberries. Mix gently to avoid creating a lot of bubbles and foam.
4. In a clean plastic cup, place the coffee filter inside the cup. Make sure the bottom of the coffee filter is about halfway down the inside of the cup, so that there is room at the bottom. Fold the left over filter over the top of the cup and secure it in place with a rubber band.
5. Pour the liquid in the plastic bag into the coffee filter. Let the liquid drain into the bottom of the cup for about 5 minutes.
6. After the liquid has drained through the filter, remove the rubber band and pull the filter out of the cup. It will likely still have some wet strawberry mash at the bottom, you can lightly squeeze the mash into the cup. Avoid squeezing too hard!
7. Take the refrigerated rubbing alcohol out of the fridge. Tilt the cup to the side (about 45 degrees -halfway to tipping over). Observe how much liquid is in the bottom of the cup. You'll want to pour as much rubbing alcohol into the cup as there is strawberry liquid. Pour the rubbing alcohol into the cup by pouring down the side. Don't pour straight into the middle of the cup so the rubbing alcohol hits the bottom. Instead, let the rubbing alcohol run down the side of the cup and into the strawberry liquid.
8. The rubbing alcohol should "sit" on top of the strawberry liquid. Wait and watch as white, fuzzy strings start to float into the layer of alcohol. This is the DNA of the strawberry - genetic information that is stored within the strawberry's cells.
9. You can remove the DNA strands by taking a toothpick or skewer and gently wrapping the DNA strands around it. Pull them up out of the layer and observe - you just extracted the innards of a strawberry cell!



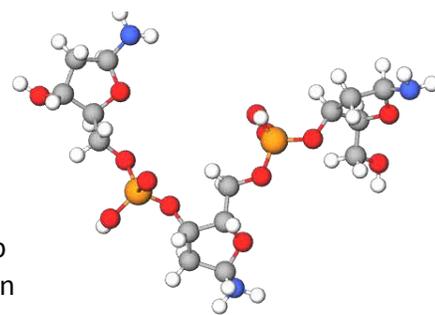
Exploration Questions:

1. Do you or someone in your family wear contacts? Try pouring the layer containing the DNA into a separate cup. Then add a few drops of contact solution and see what happens.
2. Play around with other fruits or food in your household. Can you extract the DNA from anything else? Do some fruits contain more DNA than others? Should all living things contain the same amount of DNA?

Explanation:

DNA is contained inside the cells of the strawberry. The smallest unit that has the characteristics of life, cells contain DNA and other important molecules for the body to function. Many of these molecules are large and do not dissolve in water.

Think about a time when your hands were dirty and you washed them. Before washing, your hands had big dirt particles on them that you could see. After washing with soap and making a bubbly foam on your hands, the dirt was washed down the drain. Soap works the same way on the big molecules contained inside the strawberry cell. The soap breaks open the strawberry cell and surrounds the large molecules. The DNA dissolved in the soapy bubbles then floats to the top of the alcohol layer.



Additional Resources:

- [See your own DNA](#)
- [At-home DNA experiments](#)