ACTIVITY SHEET

Biology

Strawberry DNA extraction

Materials

Tip: Send your child on a scavenger hunt for the following items so they can perform the experiment. See the last page for a list you can hand to them.

- Strawberries (fresh or frozen)
- Sandwich bag(s)
- Bottle of water
- Clear cup (plastic or glass)
- Spoon
- Liquid dish soap
- Table salt
- Small paper or plastic cup
- Coffee filter or paper towel
- Liquid medicine dispenser or clear measuring cup
- Pencil and paper
- Isopropyl alcohol (rubbing alcohol) or ethyl alcohol (keep it in the freezer before using to yield better results)
- Wooden toothpick, kebab stick, or cocktail stirrer

Preparation

1. Gather your materials
2. Depending on the size of your strawberries, cut them in half
3. Place the strawberries into a sandwich-sized, resealable plastic bag and set aside (if your strawberries are frozen, you'll need to let them thaw)

Experiment

1. Pour 10 mL, or 2 Tbsp, of water into a clear cup
2. Place 5–10 drops of liquid dish soap into the water and mix gently with a spoon, being careful not to create bubbles
3. Add a generous pinch of table salt and mix until the salt is dissolved
4. Mash the strawberry inside the bag
5. Add the solution you just made to the bag with the mashed strawberry and gently mix for two minutes (try to avoid creating bubbles)
6. Create a funnel with a coffee filter or paper towel by folding it into a triangle and place it into the small paper/plastic cup
7. Slowly pour the strawberry slurry out of the corner of the plastic bag into the filter sitting in the cup
8. Allow the solution to drip into the cup (don't squeeze the filter as it make break); remove and discard the filter and remaining strawberry pulp once the solution stops dripping
9. If you're using a paper cup, you can create a spout in the side of the cup with the solution by creasing it; pour the solution into your liquid measuring cup or suck it up using the medicine dispenser and record the amount of liquid you recover
10. Pour/dispense the filtered solution into the clear cup/glass
11. Measure 2–3x the volume you recorded of alcohol using the liquid measuring cup or medicine dispenser and allow it to drip down the side of the cup/glass to create a layer on top of the strawberry solution; try not to disturb the two layers of solution
12. The DNA will precipitate out of the solution into strands that appear white/clear
13. To isolate your DNA from the solution, gently swirl your toothpick (or other) in the cup through the layer and observe the DNA strands sticking together and forming a white mass on your toothpick

An instructional video to accompany this activity can be found on YouTube by searching "Thermo Fisher Scientific Strawberry DNA Extraction Activity".

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The science behind the activity

DNA is nature's instruction manual for making an organism. It is usually packaged into structures called chromosomes that are housed within the nucleus of cells (Figure 1). Strawberries are an excellent source for extracting DNA because they contain 8 sets of chromosomes, which yield enough DNA to see with the naked eye. Scientists follow a similar process in laboratories to extract DNA from various cell types (plant, animal, etc.) in order to study genetic information, which can lead to the development of treatments for disease and identification of harmful microorganisms. DNA can also be used to determine ancestry, and in paternity testing and forensic science.

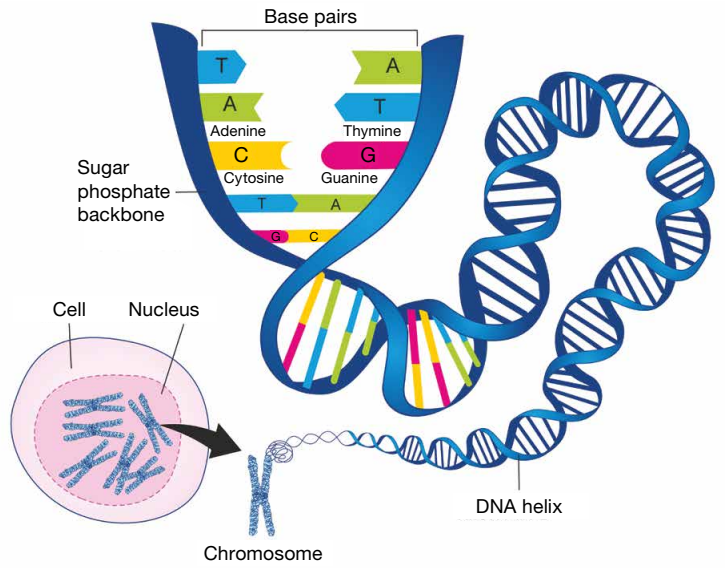

Figure 1

Discussion questions

Why do we use dish soap in this experiment?

The properties of dish soap allow it to interact with both water-like and oil-like solutions. Exposing cells to soap disrupts the cell membrane, creating holes that allow the proteins and DNA inside the cell to escape and float into the solution surrounding the cell (Figure 2).

What role does the salt have in the experiment?

Salt helps to remove proteins that are bound to the DNA. It also helps to keep the proteins dissolved in the solution throughout the experiment.

Why does alcohol cause the DNA to clump?

When molecules are soluble, they are able to be dissolved in a liquid, such as sugar and salt in water. Insoluble molecules are unable to be dissolved in liquid, and form a separate layer, as in the case of water and sand (Figure 3). DNA is soluble in water but not soluble in alcohol; therefore, the addition of alcohol makes the DNA strands clump together and become visible.

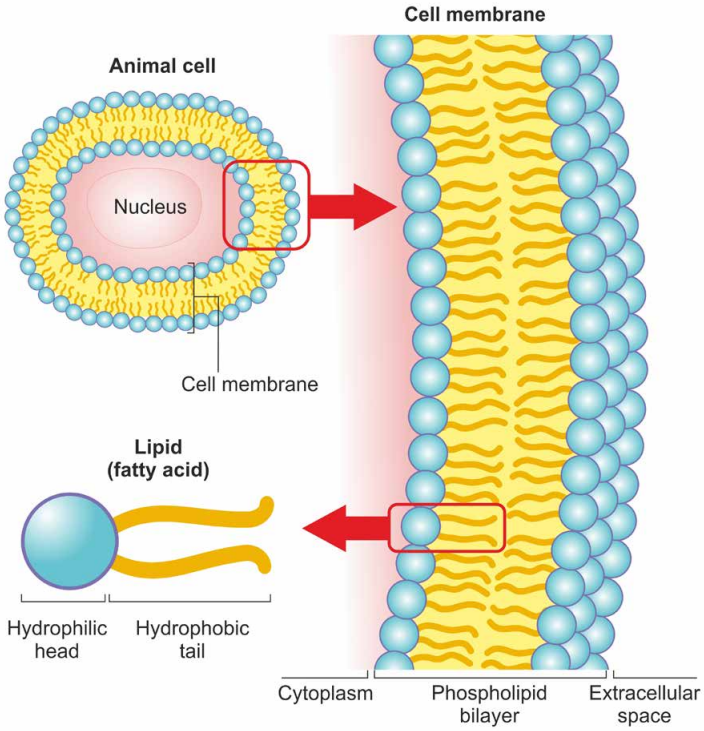

Figure 2

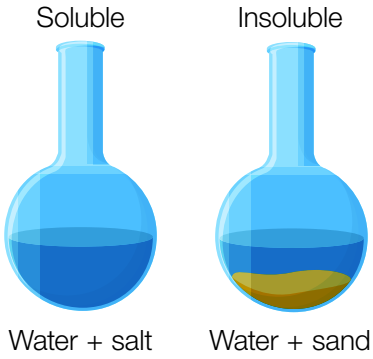

Figure 3

Careers in biology

Personality traits that make a good biologist

- Someone who is fascinated by living things, like plants, animals, and people
- Someone who is observant and curious about the world around them
- Someone who likes learning and using knowledge to solve problems
- Someone who seeks to understand how things work

Careers as a biologist

- **Cell/molecular biologist**—studies cells to learn how they work and interact with other living organisms; some cell biologists work in the medical field and use their knowledge to develop treatments for disease
- **Microbiologist**—studies microorganisms, like bacteria, to understand how they help or hurt other living things, and how they can be
- **Bioinformatician**—uses technology to interpret data from biology experiments

Careers with an education in biology

- **Technical writer**—communicates about biological or experimental processes
- **Sales person**—uses knowledge of biology to help customers identify the right products to meet their experimental needs
- **Marketing/product manager**—uses understanding of biological experiments to identify end users and help them realize their need for a particular product

Biology happens all around us and in every aspect of the way we live. From the time you eat breakfast and your saliva and stomach start breaking down the food, to the minute you lay your head on your pillow at night and begin to have dreams. Have you wondered how your muscles work? How a caterpillar becomes a butterfly? How a flower knows to open up just as the sun hits its petals? The answers to all of these questions and more can be found through biology.

People who study and work in biology influence our lives and society and contribute to moving discovery forward.

Scavenger hunt

Find the following items around your house so that you can perform this experiment

- [ ] Strawberries (fresh or frozen)
- [ ] Sandwich bag(s)
- [ ] Bottle of water
- [ ] Clear cup (plastic or glass)
- [ ] Spoon
- [ ] Liquid dish soap
- [ ] Table salt
- [ ] Small paper or plastic cup
- [ ] Coffee filter or paper towel
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Find out more at **thermofisher.com/csr**

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