

SEE YOUR OWN DNA

AT A GLANCE

Using everyday materials, students will extract DNA from cheek cells and learn about the use of DNA in forensic investigations.

OBJECTIVES

Students will:

- Conduct an experiment to extract DNA from their cheek cells
- Learn about how DNA is used in forensic investigations

KEY VOCABULARY

DNA: deoxyribonucleic acid, the unique hereditary material in humans and other organisms.

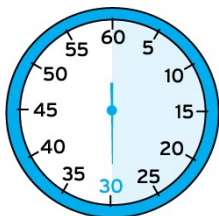
Forensic Biologist: forensic scientists that specialize in biology. Their specialties may include anthropology, pathology, serology, etc.

SUGGESTED GRADE

LEVELS: 4—12

PACE YOURSELF

30 MINUTES



NATIONAL SCIENCE EDUCATION STANDARDS

5-8:

NS 5-8.1 Science as Inquiry

NS 5-8.3 Life Science

NS 5-8.6: Science in Personal and Social Perspectives

9-12:

NS 9-12.1 Science as Inquiry

NS 9-12.3 Life Science

NS 9-12.6 Science in Personal and Social Perspectives



MATERIALS

Per Group:

Table salt

Dish soap

Rubbing alcohol (must be cold— place in the freezer at least 1 hour prior to activity)

Tap water

3 Tablespoons

Per Student:

4 small drinking cups

Teaspoon

Pair of gloves



WHAT YOU NEED TO KNOW

DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. With the exception of red blood cells, every cell in the body has DNA and every cell in a person's body has the same DNA. Most DNA is located in the cell nucleus, but a small amount of DNA can also be found in the mitochondria. The only people with exact same DNA are identical siblings. This is why DNA is so important to forensic cases. If DNA is found at the scene of a crime, **forensic biologists** can match it to a suspect with high accuracy. For more information on how forensic scientists use DNA, see the *Simulation of RFLP* lesson.

In this activity, student will see their own DNA. Keep in mind that the DNA you see in this activity is actually clumps of thousands of strands of DNA. To see the individual strands of DNA, you would need a electron microscope.

Salt helps loosen cells from the surface of the inside of the mouth.



SEE YOUR OWN DNA

The salt also helps shed the water molecules from the DNA and makes it easier for the DNA to clump together.

Now think about when you wash your dishes— what does the soap do to the oil on the dishes? It breaks it up. Cell membranes are also made of lipids. By adding soap to your cheek cells, it breaks up the membranes of the cell and nucleus and frees the contents of the cell, including DNA. So the DNA begins to float near the top of the soapy water.

DNA is soluble in water but not in alcohol. The alcohol helps the DNA precipitate or separate as a solid from a liquid solution. The result is a white clump of thousands of DNA strands that you can see with your naked eye.



ACTIVITY

1. In the first cup, mix a half glass of water (approximately 6 oz.) with 1 tablespoon of table salt. Label the cup 1.
2. In the second cup, mix 3 tablespoons of water and 1 tablespoon of liquid dish soap. Label the cup 2.
3. Take one teaspoon of the salt-water solution from the first cup and swirl it in your mouth for 30 seconds.
4. After 30 seconds, spit the salt water and whatever contents are moving around in your mouth into a third empty cup. Label the cup 3.
5. Collect 1 teaspoon of the saliva that is in cup number three, and transfer this to the fourth empty cup. Label the cup 4. Pour any extra spit down the drain.
6. Add 1 teaspoon of the soap solution to the spit in cup number three, and mix by gently swirling the cup for one minute.
7. After mixing, add three tablespoons of rubbing alcohol to the cup of saliva and soap. Try to gently pour the alcohol down the side of the glass so that it floats up on top of the saliva and soap without mixing.
8. Wait about one minute, and you will see a cloud of bubbles hanging at the bottom of the layer of alcohol. Those bubbles are attached to your DNA.



CHECK FOR UNDERSTANDING

1. What is DNA?
2. Why is DNA important to forensic science?



ET CETERA

- If you are unable to have the students work with saliva, try extracting DNA from strawberries.

MATERIALS

Water

Salt

Shampoo or dish soap (clear shampoo with EDTA, such as Suave Daily Clarifying, works best)

Cold 70% to 95% isopropyl alcohol (place in freezer overnight)

Ziploc-type bag

Strawberries or other foods like grapes, kiwi, tomatoes, bananas or lettuce

Test tube

Coffee filter

SEE YOUR OWN DNA

Plastic cup

Pipette

ACTIVITY

1. Create the DNA extraction buffer by mixing 450 milliliters of water with two teaspoons of salt. Gently add 50 milliliters of shampoo (this recipe is enough for 50 groups of students).
2. Place a strawberry in a Ziploc bag and gently mash for two minutes, being careful not to pop the bag.
3. Use a pipette to add 10 milliliters of the DNA extraction buffer to the bag and mash for one minute.
4. Assemble the DNA filter by draping a coffee filter over a plastic cup. Make sure the bottom of the filter does not touch the bottom of the cup, and the top of the filter is folded over the cup to hold it in place.
5. Pour the strawberry mixture into the coffee filter and let it drain for five to 10 minutes.
6. Pour a small amount (three to four milliliters) of the filtered strawberry solution into a test tube.
7. Tilt the tube and pour an equal amount of cold isopropyl alcohol into the test tube. The DNA will precipitate to the top of the solution and will resemble a white, fluffy cloud.