



THINK ABOUT IT  
BUSTED BY BIOLOGY



*“To a great mind, nothing is little.”*

—Sherlock Holmes, *A Study in Scarlet*

*Continued*

While DNA analysis can be a powerful tool to use in courts, scientists and lawmakers are still grappling with some of the tough questions that arise with new technologies, such as how to prevent human error when collecting and analyzing such important evidence. Mistakes such as mislabeling samples or accidentally contaminating evidence, combined with DNA’s reputation as infallible proof, have resulted in innocent people being put behind bars. However, DNA evidence has also been used to exonerate (free) hundreds of innocent people that were convicted before DNA testing was allowed. Using DNA evidence in courts clearly has both positive and negative aspects and it is important to carefully weigh these factors.

*Now What?*

DNA can be extracted from many living things. Try extracting DNA from fruits or vegetables such as strawberries, peas, onions, or zucchini. Just use a blender to puree the food, then follow the same procedure starting at step 3.



THE INTERNATIONAL EXHIBITION OF  
SHERLOCK HOLMES



BUSTED

by

BIOLOGY



*“...The little things are infinitely the most important.”*

—Sherlock Holmes, *A Case of Identity*

If Sherlock Holmes had lived in the 21<sup>st</sup> century, he would have used modern forensic technology to identify people and other living things by the unique clues found in hair, skin, fur, and organic matter. Every living thing has DNA—the unique

“BLUEPRINT”  
FOR LIFE

*that dictates your height, your hair color, and even if you’ll grow to be bald, like Dad.*

Have you ever wondered what DNA looks like? In this activity, you’ll take a sample of your own DNA from your cheek cells to see what DNA looks like up close.

THE INTERNATIONAL EXHIBITION OF

SHERLOCK HOLMES





EXPERIMENT

BUSTED BY BIOLOGY

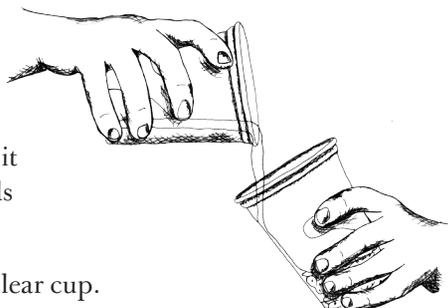


Materials

- Two clear cups (glass or plastic)
- One pinch of salt
- One spoonful of diluted dish soap (Make with 1/2 tablespoon soap in 1/2 cup of water)
- Cold rubbing alcohol (Isopropyl alcohol)
- One spoon

Procedure

1. Take a sip of the water and swish it around your mouth for 30 seconds to remove cells from your cheek.
2. Carefully spit the water into the clear cup.
3. Add one spoonful of the diluted soap to the clear cup.
4. Add a pinch of salt into the cup and stir **slowly** with a spoon.
5. **Slowly** pour alcohol so it runs down the side of the cup and gently floats on top of the cheek cell mixture. You can tilt the cheek cell cup to make this step easier. Continue to carefully pour until about 1 inch of alcohol is on top of the cheek cell mixture.
6. Put the cup down and wait 30–60 seconds.



pour alcohol **SLOWLY**



Alcohol

Cheek Cell Mixture



EXPERIMENT

BUSTED BY BIOLOGY



What's Going On?

See that white goo floating in the bottom of the alcohol layer? That's your deoxyribonucleic acid (DNA)! Individual pieces of DNA are too small to see with our eyes, but if we can get enough of them to clump together, we can see them! Even though it's too small to see without a microscope, a single piece of uncoiled DNA can be 2.8 inches long!

Each cell in your body carries copies of your DNA inside what's called the nucleus of the cell. Both the cell and the nucleus are surrounded by a membrane that protects what's inside.

These membranes are made up of fatty molecules called lipids. When we added soap to our cheek cell mixture, the soap broke down the fatty membranes in the same way soap breaks down the fat and grease when we wash the dishes! Even though this step released the DNA from the cells, we couldn't see it yet because DNA dissolves in water in the same way salt dissolves in water, making it invisible. Alcohol and DNA are both less dense than water, so they float to the top of our cup. Since DNA is not soluble in alcohol, we can see it once it floats into the alcohol layer!

Sherlock Holmes didn't have the technology to use DNA testing in his time, but today it plays an important role in our legal system. Although 99.9% of human DNA is the same in every person, enough of it is different that every person on Earth has a unique DNA "fingerprint". Since courts started using DNA analysis in the 1980s, many tough crimes have been solved with the help of this new form of evidence.

