

DNA Fingerprinting



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Do you need an idea for a scientific study?

Try out one of our ideas or make one of your own.

Start learning right now about the basics of DNA fingerprinting and how this technique can be used to help settle court cases. Take the following brief quiz to see how much you already know about DNA fingerprinting. See the bottom of page 4 to check your answers.

1. About how long would the DNA in one human cell be if the DNA was unraveled into a strand?
 - a. 0.0000000001 centimeter
 - b. 0.001 centimeter
 - c. 1 centimeter
 - d. 2 meters
2. What is the charge on a DNA molecule?
 - a. positive
 - b. negative
 - c. neutral
3. During which time period was DNA evidence first used to help settle a court case?
 - a. late 1960's
 - b. late 1970's
 - c. late 1980's
 - d. late 1990's
4. What is a chimera?
 - a. a long strand of DNA that has coupled nitrogen compounds that form a base
 - b. an individual who has two types of DNA in his/her body cells
 - c. a process in which the human genome was identified to state the function of genes
 - d. a special type of rodent used in the study of DNA and genetics
5. About what percentage of DNA is identical in two unrelated individuals?
 - a. 10%
 - b. 40%
 - c. 70%
 - d. 99%



An experiment for you to try!

Crikey mate! Can you see a kiwi's DNA? Always remember to be safe.

Wear your safety glasses and other protective items!

Materials Required

100-mL ice water bath

2 kiwi fruit

30 mL of Dawn® dishwashing liquid

80 mL of water

funnel

250 mL Erlenmeyer flask

10 mL isopropyl alcohol

resealable plastic bag

3 grams sodium chloride

500 mL beaker

filter paper

glass stirring rod

Procedure

1. Pour about 10 mL of isopropyl alcohol (rubbing alcohol) into a test tube. Place the test tube in an ice-water bath.

2. Place 2 kiwi fruits in a resealable plastic bag. Remove as much air from the bag as possible, then seal the bag. Using your hands, crush and squeeze the fruit into very small pieces.

3. Add the following to a clean 500-mL beaker: a) 30 mL of Dawn® dishwashing liquid, 3 grams of sodium chloride (table salt), and 80 mL of water. Mix the ingredients.

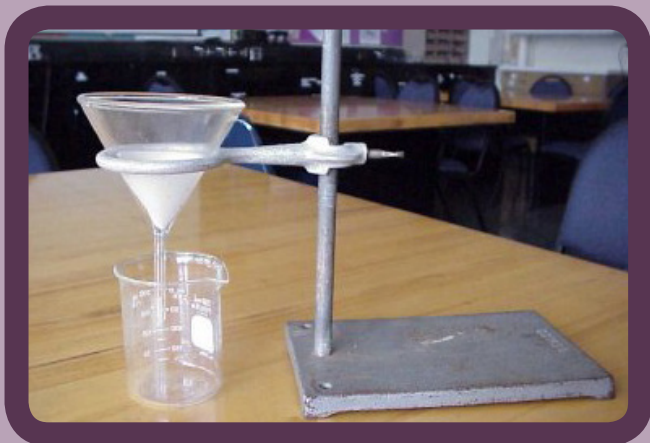
4. Add 50 mL of the mixture you made in step 3 to the kiwi fruit bag. Thoroughly mix for about one minute.

5. Set up a funnel with filter paper so it drains into a 250 mL Erlenmeyer flask. Slowly pour the kiwi fruit liquid mixture through the funnel so the liquid drains into the flask.

6. Pour the liquid from step 5 into a clean test tube. Tilt the test tube with the liquid inside to about a 45° angle. Slowly pour the cold alcohol from step 1 down the inside of the test tube containing the kiwi extract. Avoid mixing the two liquids – you want the alcohol to form a layer on top of the fruit liquid.

7. The white-cloudy material forming between the two layers is the DNA extracted from the cells of the kiwi fruit. Place a clean, glass stirring rod in the test tube and slowly twirl the rod. The DNA should collect around the rod.

8. Clean up and be proud that you have extracted DNA from a living cell!

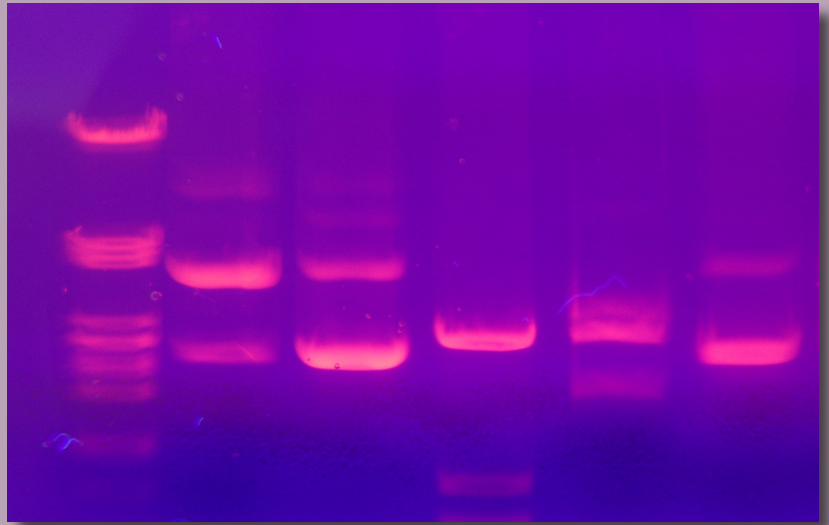


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DNA Profiling

The use of DNA fingerprinting, also called DNA profiling, has been used to free innocent prisoners, identify fathers in paternity cases, and convict individuals guilty of crimes. The technique and process have also been expanded to identify remains, track genetic disorders, and locate sources of food contamination. Although most of the scientific community agrees on the reliability of DNA profiling, a small number of individuals question the accuracy of the technique. Is there a true debate about the validity of DNA profiling? The following excerpt from an interview with DNA Forensics Authority Dr. Bruce Weir helps to clarify this misconception.

“There is a perception among the public that there is some debate within the scientific community. I believe that there is no such debate. When we look at the scientific literature, which is where science is discussed, the published peer-reviewed papers are overwhelmingly in favor of this technology and the protocols and analytic methods used. Much of the current debate has been outside of the scientific literature. It typically comes from court cases, where someone is on trial for a crime. The defendant and prosecutors each have expert witnesses, so it looks like half of the scientists are on one side and half on the other. This is quite misleading and is not the way science operates. There are very few people who have thought about and examined the issues carefully who remain critical of DNA profiling.”



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Answers: 1) d. 2) b. 3) c. 4) b. 5) d.

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