

At Home Activities

Human DNA extraction



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Ideal for 8-13 years



Adult involvement recommended

Overview

In this activity, you'll obtain DNA from your own cheek cells.

DNA is a remarkable molecule. It's found inside the nucleus in just about every cell in your body. DNA determines your physical attributes, including hair colour, eye colour, skin colour and blood type. Scientists use a range of different techniques to extract DNA from human cells for further analysis.

Materials

- Narrow glass container like a spice jar or test tube (the narrower the container, the better)
- 10ml (2 teaspoons) ice cold isopropyl alcohol (80% or higher)
- 10ml (2 teaspoons) dishwashing liquid
- 1/4 teaspoon salt
- 1-3 drops pineapple juice
- 90ml water
- Small glasses or cups for mixing
- Water for initial mouthwash
- Skewer or fine sieve

Notes: This activity uses isopropyl alcohol. You can purchase it at a hardware store or pharmacy. Isopropyl alcohol can be hazardous in the case of eye irritation, inhalation or ingestion of the liquid. Ensure safe use of throughout the activity, and if contact with alcohol does occur, wash affected area thoroughly or provide fresh air to clear fumes. And a friendly reminder, that biological samples (mouthwash, cheek cell DNA) should only be handled by the person from whom they are taken. If you are a teacher wanting to carry out this activity, please consult your school's risk assessment guidelines.

Did you know?

The extraction and processing of DNA is a forensic technique used to identify the suspect, or to provide possible characteristics of the 'unsub' (unknown subject) for detectives to investigate further.



Method

Note: Put the isopropyl alcohol in the freezer the night before the activity. It won't freeze, but it'll be a nice ice-cold temperature for the activity.

1. Pour a small amount of water into a glass.
2. Take a mouthful of water and swish vigorously in the mouth for at least two minutes. Do not swallow the water.
3. Spit the water into a small cup.
4. In another cup, pour 90ml water and add the 2 teaspoons of dishwashing liquid. Stir the soap solution gently, minimising bubble formation.
5. Add 2 teaspoons of this soap solution into the water cup containing mouthwash (your spit).
6. Add salt to the mixture and stir using a spoon.
7. Transfer the liquid cell solution to the narrow jar until the jar is one-third full.
8. Add a few drops of pineapple juice into the jar and slowly spin the narrow jar to mix the juice.
9. Take the isopropyl alcohol out of the freezer and pour a small amount of the alcohol into a cup.
10. Pour 2 teaspoons of isopropyl alcohol into the jar slowly, allowing the alcohol to travel down the side of the jar and form a layer above the liquid cell mixture. (We recommend tilting the jar as you pour in the alcohol.

Be careful, ensure no liquid spills from the jar and return to upright position).

11. Leave the jar stand for at least 5 minutes.
12. You should now be able to see a small amount of white web-like substance within the clear layer of the narrow jar. These are strands of your DNA clumped together!
13. The DNA strands can be a bit difficult to remove from this layer. If you want to give it a go, you can try using a sieve or using a skewer.

Optional step: removing the DNA

1. Skewer: Here's the tricky part, gently insert the skewer into the top layer of the alcohol where a mass of white web-like strands should be forming. Twirl the skewer very gently in one direction only and lift the strands from the jar, placing them on a dark background.
2. Sieve: Tilt the jar and slowly pour the alcohol layer through the thin sieve, then place the DNA strands on a dark background.

Remember the DNA strands are fragile and must be handled with care.

For Discussion

1. Ask questions about each step of the process
2. Why are we using dishwashing liquid?
What does it do to the cells?
3. Dishwashing liquids (detergents) break open cells by destroying the fatty membranes that enclose them. This releases the cells' contents, including DNA, into the solution.
4. Why did we use the pineapple juice?
5. Pineapple juice contains enzymes (proteases).
6. These enzymes help strip away proteins, including those associated with the DNA.
7. Why did the isopropyl alcohol need to be cold?
8. DNA is soluble in water but much less soluble in alcohol. By adding alcohol, DNA precipitates out of the solution and collects at the interface of the alcohol and soap layer. The colder the alcohol, the less soluble the DNA will be in it.
9. What role does the salt play?
10. Salts, such as sodium chloride, greatly aid in precipitating DNA. Record the colour change.

11. Next, add 1ml of red cabbage solution to each of the five known substances.
12. Record the colour change of each of these substances.
13. Compare the resulting colours to determine which known substance most closely matches the mystery powder.
14. You can now identify your mystery white powder.

Ask questions to check understanding about DNA

Where is DNA located in a cell? And is it in every cell?

It's in the nucleus of a cell and it's in just about every cell in your body. It's not in some cells, like mature red blood cells, which don't have a nucleus.

Are individual strands of DNA visible to the naked eye?

No, a high-powered microscope (like an electron microscope) is needed to see individual strands of DNA. The white strands of DNA that you're producing in this experiment are clumps of DNA strands that come from the nuclei of many cells.