

Be a Scientist - Extract DNA from a Banana in your Kitchen!



- ½ cup water
- ¼ teaspoon uniodized salt
- 1 teaspoon baking soda
- 1 teaspoon shampoo (without conditioner)
- 2 tablespoons 91% isopropyl alcohol (“rubbing alcohol,” well-chilled in freezer)
- kitchen knife and fork (plastic will do)
- flat plate (paper will do)
- coffee mug
- 1 banana
- paper coffee filter
- 2 small containers with tight fitting caps (such as baby food jars)
- Toothpick
- Paper towels for cleanup

Procedure:

1. Make a “DNA Extraction Solution” by mixing the water, shampoo, salt, and baking soda in the coffee mug. Mix well until all ingredients are dissolved.
2. Peel the banana and cut off about ½ inch slice. Using the knife and fork mash it onto the plate until it is a gooey paste. (**Tip: don’t let the mashed banana sit around too long because the DNA will break down; if that happens, the long strands in step 8 won’t be visible**)
3. Measure about 2-3 tsp of the mashed banana into one of the small jars and add 2 tbsp of the DNA Extraction Solution prepared in step 1.
4. Cap the jar tightly and shake it vigorously while counting to 120.
5. Wet the coffee filter with DNA Extraction Solution and place it (in a cone shape) into a small clean jar.
6. Pour the banana/extraction solution mixture from the first jar, through the coffee filter. Keep the liquid that flows through the filter and discard the coffee filter with the banana debris.
7. Add an equal volume of cold alcohol (1 to 2 tbsp), cap the jar and gently swirl the solution. Long strands of DNA should appear. It looks cloudy-white and will be stuck with tiny air bubbles. Note: alcohol should be used in a well-ventilated area.
8. Spool the DNA onto a toothpick by slowly swirling it in the solution. Lift it out and touch it. The DNA is the slimy mass.
9. Eat the leftover banana or add it to a smoothie.

What's Happening?

- Every living cell contains DNA. This includes animals, plants, bacteria, and fungi. A membrane made of lipids and proteins surrounds each cell and the nucleus inside the cell where DNA is found.
- **Step 2:** By **mashing** the banana you are physically disrupting the cells and the cell membranes are broken open, allowing the DNA to escape the nucleus and the cell.
- **Step 3:** Mixing the banana with the Extraction Solution allows the lipids and proteins to be solubilized by the **detergent in the shampoo**. The **baking soda** buffers the solution at an optimal pH for DNA (approx. pH = 7; this is why the DNA will break down if you wait too long to put the mashed banana into the Extraction Solution)
- **Step 6:** Cellular debris is trapped in the **coffee filter** but the DNA is able to flow through.
- **Step 7:** The **salt**, in combination with the **alcohol**, precipitates the DNA, because the DNA is not soluble in alcohol. This allows the DNA to be seen by the naked eye. DNA has a negative charge and the salt neutralizes this charge so the DNA can remain in helix form.