

Extracting DNA From Fruit

Pre Lab: You were to have read about the extracting DNA article

Cells are the functional units of living things. They reproduce, in part, by making and passing deoxyribonucleic acid (DNA) from the parent cell to the offspring cell during cell division. All DNA in every living thing on earth is made up of the same chemical bases, **adenine, thymine, guanine, and cytosine**. The order of the bases determines the proteins the cell makes and the functions the cell performs which will be different for us as it would be different for a bear or a mosquito.

In this activity, students extract DNA (and also some RNA) from 30g-40g of bananas, strawberries and apples and will compare and contrast how much DNA they will produce with each sample by comparing data with their classmates.

- **DNA is a component of living and once-living things.**
- **DNA can be extracted and observed.**
- **Every individual has the same DNA in all of their cells**

Key Terms

DNA: Deoxyribonucleic acid, which is the hereditary material in cells that contains the instructions for producing proteins in the cell and enabling it to function, and repair and reproduce.

Extraction Solution: A solution that breaks down lipids

Filtrate: The material collected after a solution or mixture passes through a filter

Precipitate: Solid material that comes out of solution as a result of a chemical or physical change

Materials:

- *Extracting DNA from Fruit* Student Handout
- DNA article from UMBI
- 1 sample of fruit with a mass around 30-40g
- ¼ cup or 50ml of extraction solution –(*distilled water, Pantene shampoo, salt*) placing the plastic baggie
- 15 ml 99% isopropyl (i.e., rubbing alcohol) in 25 ml or 50 ml sealed test tube; chill the alcohol in ice
- 1 set of measuring spoons and a measuring cup with 1/4-cup markings
- 1 paper coffee filter and rubber band or tape
- 2 glass stirring rods
- 2 250 ml beaker
- 1 plastic pipette
- test tube holder
- Bag of ice
- Plastic baggies
- stop watch
- test Tube

Procedure

1. In your group choose who is going to be the *Director, Spokesperson, Tech, and Reader*
Start by reading the article on **DNA Extraction**.

2. Reader: start by reading through the entire procedure

3. Take a piece of fruit, (strawberry or banana) into a plastic baggie

4. Mash the fruit with your hands for 30-60 seconds making sure the it is completely pulverized.

5. Put 1/4 cup of *Extraction solution*. Agitate the bag for 10 minutes.

Extraction Solution: (distilled water, Pantene shampoo, salt)
to the plastic bag with the fruit.

Debrief:

Salt *in the water helps the DNA precipitate (solidify and appear) when alcohol is added.*

What is the Pantene for? *Hint: it breaks down oils and grease, what is made of oils/lipids in the cell?*

What is EDTA? Pantene contains EDTA a preservative it prevents DNA from breaking down and DNase (enzyme) from forming

Why does the fruit have to be pulverized?

6. Insert a filter into a clean glass beaker 250 ml glass beaker **IT IS EXTREMELY IMPORTANT** that the filter does not touch the bottom of the cup. If necessary, use a rubber band to secure all sides of the filter around the glass beaker.

7. Pour the mixture from step 3 into the filter. After 3-5 minutes, some liquid, called the filtrate, should have collected in the bottom of the cup. Gently stir with a glass stirring rod the mixture in the filter and let it sit for another minute so that all the filtrate will filter down into the glass. Be extremely careful not to break the filter, or you will have to start your collection over.

8. Remove the filter and throw away in the garbage. Be sure not to get any of the foam in the beaker. *Cold water helps keep the DNA intact during the extraction process. How? Cooling slows down enzymatic reactions. This protects DNA from enzymes that can destroy it.*

9. Get a test tube of 15 ml cold alcohol and place in a cold water bath using the second beaker and ice

Debrief:

Why must the alcohol be kept cold?

Keeping the alcohol cold and ice-cold water will increase your yield of DNA. The cold water protects the DNA by slowing down enzymes that can break it apart. The cold alcohol helps the DNA precipitate (solidify and appear) more quickly.)

Why is it important not to get any foam into the bottom filtrate material?

10. Use a pipette or eyedropper to collect your fruit filtrate. Add it to the alcohol in the test tube. Slowly running the DNA **filtrate** down the side of the test tube

11. Place the test tube with the alcohol and filtrate in a beaker ice bath for 3-5 minutes. Let it sit undisturbed. The white material coming out of solution as a **precipitate** is DNA.

12. Dip the glass rod into the tube, slowly rotating it to spool out the DNA. Look closely. The DNA may be lingering between the two layers of alcohol and pea soup. Try to help the DNA rise to the top, alcohol layer. Dip a glass rod stick into the fruit mixture and slowly pull upward into the alcohol layer. Also, look very closely at the alcohol layer for tiny bubbles. Even if your yield of DNA is low, clumps of DNA may be loosely attached to the bubbles.

14. Now look at your *student version DNA Extraction Lab* and finish answering the questions and the writing up the lab. **Make sure to answer the Debrief Questions in the lab.**