**Unit 3 Hands-On Activity: DNA Extraction from a Banana**

# Introduction:

As you are learning in Unit 3, DNA is the blueprint for life and resides in the cells of all living things. In this experiment, you will extract DNA from a banana using a few basic ingredients, many of which you may already have around the house.

In order to extract the DNA from cells, the cell and nuclear membranes must first be broken open to allow the release of DNA. In a laboratory setting, this is done by mixing cells with a specific type of detergent, which breaks apart (or lyses) the cell and nuclear membranes. In this case, we will use kitchen dish detergent, which is a close cousin to the detergent used in labs. In order to then isolate the DNA away from cellular debris, salt and alcohol are used. DNA is polar, and therefore readily dissolvable in water. Salt and alcohol, however, reduce the polarity of the DNA, causing it to separate (or precipitate) away from the water and become visible to the naked eye as long, milky-looking strands. We will use table salt and 70% isopropyl alcohol (also known as rubbing alcohol) for this step.

# Materials:

* Banana
* Ziplock bag
* Measuring spoons and cups
* Ice-Cold Alcohol (70% Isopropyl Alcohol, or rubbing alcohol, stored in freezer for at least an hour before the experiment)
* Water
* Table Salt
* Liquid Dishwashing Detergent
* Coffee filter (paper towel can be substituted)
* Toothpick, wooden skewer or wooden coffee stirrer (optional)

# Instructions:

1. Place a 1-2 inch section of banana into a ziplock bag. Using your fingers, knead and squeeze the banana until it is a mushy consistency and no solid form remains.
2. Fill a measuring cup with ½ c lukewarm or room temperature water and add 1 tsp salt. Stir to dissolve most or all of the salt.
3. Add the salt water mixture to the banana, seal the bag, and shake gently to mix for 45 seconds to mix.
4. Add 1 tsp liquid dish soap and again shake the bag gently for 45 seconds. Shake or agitate gently to prevent too much dish soap foam from accumulating.
5. Set a coffee filter (or paper towel) over the top of a clear, narrow glass container, (a drinking glass will do), pushing the center of the coffee filter down into the container slightly, making a well, and overlapping the edges over the sides. If necessary, use a rubber band to hold the filter in place.
6. Pour the banana mixture through the filter until most liquid containing the released DNA has passed through, trapping the banana in the filter. You may have to pour the liquid several times, waiting for it to drip through each time before adding more. You may also discard the coffee filter and get a new one as the original one fills with banana making it more difficult for the liquid to flow through.
7. Tilt your glass container at an angle and very slowly pour the ice cold isopropyl alcohol down the inside of the container so that it slowly forms a layer on top of the DNA mixture. Continue to pour until the layer of alcohol is approximately 1-2 inches thick.
8. Observe the interface where the food mixture and alcohol meet for approximately 5-10 minutes. The DNA will begin to accumulate in the alcohol layer as a milky-white, stringy substance. You can gently swirl a toothpick or wooden skewer to observe the clumps of DNA, doing your best to not disturb the interface. Allowing the experiment to sit for longer (up to an hour) will allow for more DNA accumulation.
9. Take a picture of your results and upload it with your written assignment (below).

# To Submit For a Grade:

Please complete the following short answer question and submit it for your grade, along with a picture of your completed experiment.

1. Please describe the purpose for each of the following reagents (ingredients) in your experiment. In other words, why are these necessary in the DNA extraction process? Please use complete and descriptive sentences when formulating your answers.

*Banana (7 points):*

*Salt (7 points):*

*Dish Detergent (7 points):*

*Isopropyl Alcohol (7 points):*

1. A picture of your completed experiment (2 points):