

LAB 6: Exercise 1. Extracting DNA

This week you are going to use simple items from around your home to extract DNA from fruits like bananas, strawberries or kiwi. Those fruits have been chosen simply because they are soft and easily “mashable”, but to be honest, you can use just about any fruit or vegetable you have in the refrigerator.

What do you need to get started? (be sure you have ALL these items on hand prior to beginning your experiment)

- Fruit (banana, strawberry, kiwi, etc.)
- Water
- Dish Washing Detergent
- Rubbing Alcohol (should be 70% or higher). Ethanol will work for this step equally well. Be sure whatever alcohol you use is ice cold! Put it in the freezer overnight before beginning.
- Table Salt
- A plastic bag
- A coffee filter
- A toothpick, chopstick or wooden skewer
- A couple of clean clear glasses (you can use test tubes if you access to them but you don't have to go make a special trip to get them)

Performing the Extraction

Again, as a reminder, before beginning the procedure, make sure your alcohol is ice cold in the freezer.

1. The first thing you will need to prep is the source for your DNA sample. Since DNA is found in all living things, use some inexpensive fruit or vegetable you have lying around. You will not need a lot of it. Maybe about 1/3 of a banana, or a couple of strawberries. That should give you an idea of your sample size to start with.

2. The next step is to break apart the plant matter. You can do this in a glass or a bowl, but placing the fruit inside a plastic bag helps to contain some of the mess. Seal the bag and use your hand or a spoon and mash the fruit up until it is a paste like consistency.

3. Fill a clear glass with ½ cup of room temperature water. Add ½ teaspoon of table salt and stir until all the salt has been dissolved. Then add 2 teaspoons of detergent to the salt water and mix it well. Try not to add bubbles to the mixture. Because the DNA is found inside the cells of your fruit, we need to get it out by breaking the cell walls down. Because these cell walls have a large lipid (or fat) content, the detergent will take care of this for us.

4. Now add about ¼ cup of this solution (salt/detergent/water) to your pulverized fruit. You do not have to measure exactly at this step. What you are looking for is a nice mixture that you cannot see through but is still liquid in consistency.

5. Seal the bag trying to remove all the air as best you can. Gently squeeze the mixture in the bag for a minute or two to thoroughly mix.
6. Incubate the mixture on the counter for about 20 minutes. This will allow the detergent time to break down the cell walls and release the DNA.
7. Place a coffee filter on top of another clean, clear glass and pour your fruit mixture through the filter. Any large particulates should be caught by the filter. You are not worried about this part. You are interested in the liquid that passes through the filter. You can squeeze the filter if you would like to get more liquid out of it, but be sure not to break it.
8. At this point, the DNA is soluble in the water that passed through the filter. To visualize it, we need to precipitate it with alcohol. The combination of the alcohol and salt already in the mixture will allow the DNA to fall out of the solution.
9. Take your alcohol out of the freezer and VERY CAREFULLY, pour it down the side of the glass containing the DNA mixture. You are trying to create a layer of alcohol that floats on top of the water solution. The DNA will come to the interface between the two liquids.
10. After a few minutes, you should begin to see some white stringy material (almost like cotton strands) forming in the glass. THAT IS YOUR DNA!! ** At this point – TAKE A PICTURE OF YOUR DNA IN SOLUTION! **
11. You can use the wooden toothpick, chopstick or skewer to pull the DNA out of solution. Swirl the stick around a little bit and the DNA will adhere to it. ** If you really did a great job with your isolation, you can take a picture of this DNA as well **
12. Finally, if you want to save your DNA, place it in a small container with alcohol and it will last for a very long time.

Feel free to experiment here a little bit as well. If you want to know what your own DNA looks like, when you make the salt water, gargle with it for a few minutes. I would suggest doing this prior to adding in the soap!! You can then proceed with the rest of the experiment and you should be able to see what your own DNA looks like.

For your submission for this lab, write a Lab Report detailing your experiment. You should address information of where your sample came from and why each step was performed. Your report should have an Introduction (state the purpose and variables studied); an Hypothesis (what did you expect to happen); a Materials list; your Procedure (with any notes of things expected or unexpected that occurred during the experiment; an Analysis of what you did and any predictions you might could make from your results; and a Conclusion addressing whether your findings or results matched your hypothesis and if they did not, possible reasons why.

Also, answer the following questions to be submitted:

1. What did the DNA in your sample look like? (Add the pictures you took to this question as well. You can embed them or simply attach to your emailed lab report submission.)

2. If DNA is so small that it fits in a single cell, how were you able to visualize it with your eyes after extraction?

3. Do you think there would be any visual differences in the DNA you extracted from your fruit sample to DNA extracted say from a steak you plan on grilling this weekend? Why or why not?

4. What are some of the uses of the DNA that was isolated? List some of the things that can be done with purified DNA.

5. Based on the experiment you performed as part of this laboratory, why do you think we use shampoo when we are taking a shower and washing our hair?