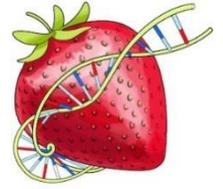


Strawberry DNA Extraction



Background: The long, thick fibers of DNA store the information for the functioning of the chemistry of life. DNA is present in every cell of plants and animals. Strawberries are octoploid, meaning they have eight copies of each type of chromosome, therefore they yield more DNA than other fruit.

Pre-lab discussion questions:

1. Where is DNA found?
2. What do you think the DNA will look like?

Materials:

- Quart Ziploc bag - 1 per person
- Strawberries – 2-3 per person (frozen strawberries need to be defrosted and room temperature if used)
- Dish detergent (shampoo works too) – 2 teaspoons per person
- Non-Iodized Salt – ½ teaspoon per person
- Water – ½ cup per person
- Plastic cups – 2 per person
- Coffee filter – 1 per person
- Rubbing alcohol {95% ethanol or 100% isopropyl} (cold) – ½ cup per person
- Coffee stirrer or popsicle stick – 1 per person
- Measuring cup and spoon

Ingredients Purpose:

- **Detergent** helps to dissolve the cell membrane, which is a lipid bilayer.
- **Salt (Sodium Chloride)** helps to remove proteins that are bound to the DNA. It also helps to keep the proteins dissolved in the aqueous layer so they don't precipitate in the alcohol along with the DNA.
- **Ethanol or isopropyl alcohol** causes the DNA to precipitate. When DNA comes out of solution it tends to clump together, which makes it visible. DNA is not soluble in ethanol. The colder the ethanol, the less soluble the DNA will be in it.

Procedure:

1. Gather all your supplies. Make sure your rubbing alcohol is cold.
2. Place the strawberries into the Ziploc bag, squeezing as much air out as possible. Frozen strawberries work great because defrosted they are squishy and easier to mash and can be found year round.
3. Use your fingers and hands to mash the strawberries for about a minute. The DNA is inside the cells, this step starts to break open the cells.
4. Make your extraction solution in one of your plastic cups, stir gently: 2 teaspoons detergent, ½ teaspoon salt and ½ cup water



5. Slowly pour your extraction solution into your Ziploc bag, trying to get only a few bubbles. Squeeze as much air out as possible.
6. Lay the Ziploc bag on the desk or table and slowly mix solution around gently with your fingers. You do not want to create bubbles. This step will dissolve cell membrane and help remove proteins so DNA can be released.
7. Place a coffee filter over a plastic cup and pour strawberry mixture from Ziploc over filter. Carefully squeeze the liquid into the cup making sure all of the solid pieces stay in the filter.
8. Take your plastic cup with the strawberry extract (liquid filtered out) and tilt it slightly, slowly pour the cold alcohol into the cup. The alcohol causes the DNA to precipitate out of the solution. Set the cup down and observe. *I could only find 91% isopropyl alcohol at the drug store and the lab still worked with that percentage.
9. Dip the popsicle stick into only the top layer of the cup and extract the DNA. Do not use the popsicle stick to stir up everything in the cup. The DNA kind of looks like snot or slime.

Assessment/Evaluation:

1. It is important to understand each step of the extraction procedure and why they are necessary. Match the procedure with its functions:

PROCEDURE

- A. Filter strawberry slurry through filter
- B. Mash strawberry with salty/soapy solution
- C. Initial smashing of strawberry
- D. Addition of alcohol to filtered extract

FUNCTION

- _____ To precipitate DNA from solution
- _____ Separate components of the cell
- _____ Break open cells
- _____ Break up proteins and dissolve cell membranes

2. What did the DNA look like? Relate what you know about the chemical structure of DNA to what you observed today.
3. Explain what happened in the final step when you added the alcohol to your strawberry extract.
4. Why is it important for scientists to be able to remove DNA from an organism? List two reasons.
5. Is there DNA in your food? _____ How do you know?

Lesson adapted from the following resources:

UGA Extension:

Science Behind Our Food: Food Science Lesson Plans

University of Washington:

Department of Genome Sciences: The GENETICS Project

National Human Genome Research Institute

www.genome.gov/activities