

Strawberry DNA Extraction Lab Activity Sheet

Name: _____

Before you get started

In order to effectively understand the unique makeup of a strawberry, first we have to understand what makes up a strawberry. We know that a strawberry is a living thing and that all living things are made up of cells, right? Yes!!! So why are cells important? Cells carry the information that makes up all living things, but what makes us unique is our DNA.

The Question

We know that all living things are made up of cells and our cells carry our DNA. What is DNA? Deoxyribonucleic acid (DNA) is a long molecule that contains the genetic instructions used in the development and functioning of all known living organisms, including the plants we eat. This incredible molecule can be easily seen with the naked eye when collected from thousands of cells. Even in our STRAWBERRY!

Purpose of the Lab

In this lab, you will extract strands of DNA from the nuclei of strawberry cells. Did you know that strawberries are an octoploid? Meaning they have eight copies of each chromosome, so they have a lot of DNA.

STEPS of the lab

First, you will place your strawberry(ies) into a plastic bag. Add the buffer solution to the bag. Then you begin to gently mash the strawberries to break down the cells' walls and expose the inner membranes.

What you will see: The cells will mix with the DNA extracting solution, which is a mixture of soap, salt, and water.

What is it doing?: The soap from the solution dissolves the lipid bilayers (inner membranes) of the cells and nuclei, exposing the DNA. The salt breaks up proteins bound to the DNA and helps the DNA solidify and appear when the rubbing alcohol is added.

Next, use a coffee filter to filter the mixture. This will get rid of the strawberry cell parts that are bigger than DNA.

Finally, add rubbing alcohol to the remaining strawberry material. This will cause the DNA to come out of the solution and make it become visible. Side note: make sure the rubbing alcohol is cold.

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Pre-lab questions:

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

Materials Needed:

- Ziploc bag containing 3 strawberries and 3 tablespoons of DNA extracting solution
- Funnel
- Plastic cup
- 2 squares of cheesecloth
- Graduated test tube
- Pipette
- Microcentrifuge tubes (1 for each member of the group)
- Yarn (1 piece for each member of the group)
- 3 ml rubbing alcohol

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Procedure:

1. Collect your materials.
2. Place your strawberries into the Ziploc bag. Pour in DNA extracting solution or buffer solution. Remove most of the air from the bag. Seal the bag well.
3. Gently mash the strawberries through the bag. Be careful not to break the bag, but mix the strawberry mash thoroughly.
4. Place the funnel in the plastic cup. It should sit on the rim of the cup.
5. Place the two squares of cheesecloth or coffee filter(s) into the funnel, forming a liner for straining.
6. Carefully pour the strawberry mixture into the funnel, making sure to catch the solids with the cheesecloth or coffee filter. After filtering the mixture, remove the filter (place it into the Ziploc bag for disposal).
7. Add 5 ml of the filtered strawberry material to the graduated test tube using the funnel. Hold the tube near the top so that the heat from your hand does not affect the extraction.
8. Remove the funnel, and use the pipette to add 3 ml of the isopropyl or rubbing alcohol to the test tube. *Take care not to tilt or tip the test tube; do not mix the two liquids.*
9. Observe the line between the strawberry mixture and the alcohol. You will notice a white, thread-like cloud appearing at this line. This is the strawberry DNA. The DNA will clump together and float to the top of the alcohol layer.
10. Holding the tube still, observe the tubes of others around you. Do you notice any differences?
11. Using the pipette, add some DNA strands and some of the alcohol in the test tube to each person's microcentrifuge tube. Repeat steps 6 to 8 if necessary to collect enough DNA for everyone's microcentrifuge tube.
12. Close the cap of the microcentrifuge tube tightly around a piece of yarn and tie the ends of the yarn to make a necklace.
13. Clean up! Dump the remaining strawberry solution where instructed, throw away the Ziploc bags, and collect the cups, test tubes, funnels, and pipettes to clean so they can be used again.

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Conclusions and Analysis

Each step in the extraction procedure aids in isolating DNA from other cellular materials. Explain why each step was necessary and put the DNA extraction procedure into context by drawing pictures and writing your responses.

Questions	Explanation	Drawing
What was the purpose of mashing the strawberries:		
What does adding DNA extraction or buffer solution do:		
What happened when the alcohol was added:		
What did the DNA look like:		
What was the purpose of the salt in the DNA extraction:		

Extension: Could the information found from extracting strawberry DNA be important to strawberry farmers?

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ANSWER KEY

Pre-lab questions:

1. What do you think the DNA will look like? Student perception, possible answers may include cloudy, white, stringy material, double helix, etc.
2. Where is DNA found? In the nucleus of the cell
3. What is an octopoid? An organism or living thing that has eight copies of each chromosome, so they have a lot of DNA.

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Conclusions and Analysis

Each step in the extraction procedure aids in isolating DNA from other cellular materials. Explain why each step was necessary and put the DNA extraction procedure into context by drawing pictures and writing your responses.

Questions	Explanation	Drawing
What was the purpose of mashing the strawberries:	To create a more malleable material, almost to the consistency of a liquid.	
What does adding DNA extraction or buffer solution do:	It breaks down the lipid bilayer of the cell wall.	
What happened when the alcohol was added:	The DNA separated from the other material. DNA is not soluble in alcohol, but it is soluble in water.	
What did the DNA look like:	White, cloudy, clumpy	
What was the purpose of the salt in the DNA extraction:	To break up the proteins attached to the DNA.	

Extension: Could the information found from extracting strawberry DNA be important to strawberry farmers?

Yes, farmers may not use this method on the farm, but scientists, such as botanists, agronomists, etc. use this method to help provide strawberry farmers with information to help grow a good quality product. In understanding the genetic makeup of the strawberry, scientists and farmers can distinguish the different varieties and have an idea of what the plant needs to survive and thrive and what type of product they will produce.