

Berry Full of DNA – a DNA extraction lab

Question: What properties of DNA can be observed in a test tube?

Overview: In this lab you will observe the physical properties of DNA. You will break open strawberry cells, prepare a filtered extract containing strawberry DNA, and separate out molecules of DNA in a test tube.

Background: Grocery store strawberries are a good source of DNA because they have 8 copies of each type of chromosome. (This is called octoploid). You will break open the cells of a strawberry, and then separate the DNA from the remaining cell parts. You will never be able to eat a strawberry again without thinking about how much DNA is in it! After the lab, you may be able to take home a sample of pure strawberry DNA.

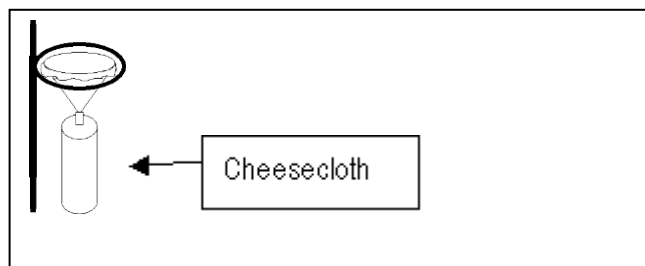
Answer Pre-lab Questions RIGHT NOW! Do not proceed until you have done a teacher check.

Materials:

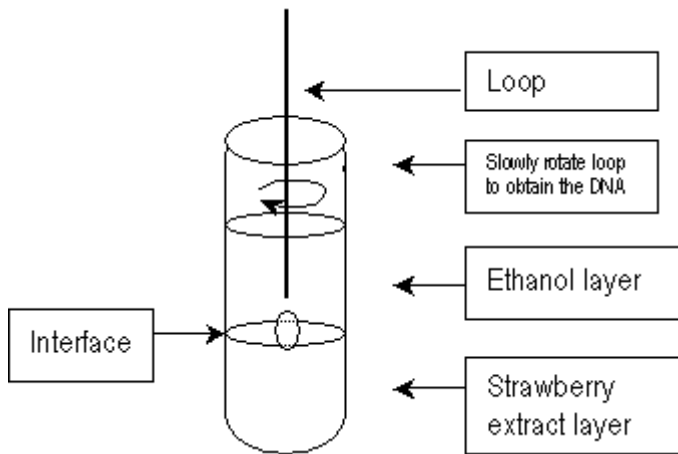
- Zip-lock freezer bags
- 1 strawberry (fresh or frozen)
- 10 ml DNA extraction buffer (Recipe: 50 ml Dish Soap; 15 g NaCl, 900 ml water)
- Filtration Apparatus: cheesecloth or gauze, funnel & small beaker
- Ice-cold ethanol (90% or higher concentration) in a dropper bottle
- Large size test tubes
- Glass rod or inoculating loop (or use a file on a coffee stirrer to roughen bottom surface)

Procedure:

1. Place one strawberry in a self-sealing Zip-lock freezer bag. Press the air out and seal it. Gently mash the bagged strawberry with your fist and fingers for 2 minutes.
2. Add the 10 ml of extraction buffer to the bag. Press the air out carefully and seal the bag.
3. Mash the bagged strawberry with the DNA extraction buffer for 1 minute. **CAUTION:** You do not want this mixture to be really bubbly. *The fewer bubbles the better your results.*
4. Cut off the bottom corner of your baggie and squeeze the squished strawberry liquid into the filtration apparatus. Let it drip into the test tube as shown.



- When the test tube is about 1/8 full, take the funnel out of the test tube. (You can discard any extra mashed strawberry pulp with the cheesecloth.)
- Slowly** drizzle **ice-cold** ethanol from the dropper bottle **along the side of the test tube**, until the test tube is about half full with the liquid. (equal parts strawberry mixture to ethanol)
- Dip the loop or rod into the tube exactly where the ethanol and extract layers are in contact with each other, as shown below. Keep the test tube at eye level so you can see what is happening! Pay attention to the characteristics of the DNA as it precipitates.



Interface – is where the ethanol separates from the strawberry

Waste & Disposal: (per 2 students)

- Throw out cheesecloth
- Wash and rinse test tubes and funnel
- Rinse and dry inoculating loop

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Pre Lab Questions:

1. Match the letter of each lab step with its effects on strawberry cells.

Lab Steps	Effects on Strawberry Cells
a. Mash the fruit to a slush	_____ breaks open the cells
b. Filter the strawberry extract	_____ dissolves plasma membranes
c. Add extraction buffer	_____ clumps DNA together
d. Layer cold ethanol over filtered extract.	_____ Separates organelles and cell debris, such as fragments of cells walls

2. If a molecule of DNA is invisible even under a microscope, how will you be able to see the strawberry DNA you extract?

3. Why do you think the clump of DNA molecules has a ropelike shape?

Post Lab Analysis:

1. DNA is soluble in water (will mix with water), but not in ethanol. What does this fact have to do with the method of extraction you used? Explain what happened when the ethanol came in contact with the strawberry extract?

2. A person cannot see single cotton thread 100 feet away. But if thousands of threads are wound together into a rope, the rope can be seen at some distance. How is this statement an analogy to the DNA extraction you did?

3. In order to study human genes, scientists must first extract the DNA from human tissues. Would you expect the method of DNA extraction for Human DNA to be the same as the method you used to extract DNA from strawberries? Why or why not?

4. Would the DNA be the same in any cell in the human body? Hint: Remember that each person starts out as a single cell--the fertilized egg!

5. If you wanted to extract DNA from a living person, what cells would you use and why?