Lab 6

Extracting DNA from Onions

PROBLEM

How can the DNA in onions be extracted?

BACKGROUND

The process of obtaining DNA from cells is the first step in many biotechnology laboratory procedures. Researchers must be able to separate the DNA gently from the unwanted substances in the cells so the DNA is not broken up or sheared. The procedure for this laboratory exercise is a modified version of the *Marmur preparation*. The Marmur preparation is used worldwide in biotechnology laboratories.

In this laboratory exercise you will make an extract of onion treated with salt, distilled water, and detergent. Onion is used because it contains very little starch, which allows the DNA to be seen more clearly. The salt causes the negative phosphate ends of the DNA molecules to come closer together so they will precipitate out of a cold alcohol solution. The detergent first disrupts the cell membranes. Then the detergent forms complexes with lipids and proteins, causing them to precipitate out of solution. Finally, you will add alcohol to the extract so that you can wrap the DNA around a rod when the DNA precipitates.

OBJECTIVES

- Prepare samples of DNA from onions.
- Observe a sample of DNA.

Materials (per group)

25 g diced onion
knife
2 250-mL plastic beakers
graduated cylinder
hot-water bath
ice bath
20 mL extraction buffer
coverslip (optional)
Pasteur pipette or thin glass rod
square of cheesecloth
funnel
test tube
5-mL pipette with safety filler bulb
5 mL ice-cold isopropanol or ethanol
hand lens or microscope (optional)
microscope slide (optional)

Safety 


1. Be sure to wear a laboratory apron during this investigation.


2. Be sure to wear safety goggles during this investigation.


3. Handle the knife carefully.

4. Handle electrical equipment carefully. Be aware of shock hazards.


5. Be careful of burns when using a hot water bath.


6. CAUTION: Do not drink the isopropanol or ethanol. Both are poisonous.

Procedure

1. Read through the entire procedure. Before you start the procedure, predict the appearance of DNA. Write your prediction on your laboratory recordsheet. Put on your laboratory apron and safety goggles.

2. Obtain an onion. Use a knife to cut the onion into very small pieces. Place approximately 25 g of the onion pieces into a blender with a little distilled water. Use the blender to make a fine slurry.

3. Transfer the onion slurry to a 250-mL beaker, and add 20 mL of extraction buffer to the beaker. Incubate the beaker at 60°C in a hot-water bath for 15 minutes.

4. Quickly cool the beaker to approximately 20°C in an ice bath. Keep the mixture at 20°C for approximately 3 to 5 minutes.

5. Filter the mixture through cheesecloth into a second 250-mL beaker. Save the liquid that passes through the cheesecloth.

6. Transfer approximately 5 mL of the liquid that passed through the cheesecloth into a 20-mL test tube. Use a pipette with a safety filler bulb to add 5 mL ice-cold isopropanol, or ethanol, by carefully pouring it down the inside of the test tube.

7. Using a Pasteur pipette or a thin glass rod with a small hook, gently swirl the DNA onto the pipette or rod.

8. Examine the DNA with a hand lens or a compound microscope, if they are available. Describe DNA's appearance in your laboratory recordsheet. Then complete the analyses and conclusions section of the recordsheet.

Name_____ Class_____ Date _____

Laboratory Recordsheet 6

Extracting DNA from Onions

PREDICTION

OBSERVATIONS

Describe the characteristics of the extracted DNA, such as color, shape, size, and consistency. Record whether the observation(s) were made with the unaided eye, a hand lens, or a microscope.

ANALYSES AND CONCLUSIONS

1. Were you surprised by the appearance of the DNA? Explain why or why not.

2. What other vegetables might be used for this lab? Explain the reasons for your suggestions.

3a. Name three properties of DNA that are demonstrated by this lab.

b. Do you think that any of the three properties would be useful for identifying DNA? Explain your answer.

c. How could you be certain that the substance you extracted was DNA? Explain your reasoning.

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4. The DNA obtained by this extraction process is commonly used by scientists for cloning experiments. The extraction method can be used with *Escherichia coli* bacteria and some strains of yeast. What are the common biological characteristics among *E. coli,* yeast, and an onion that allow this technique to be used with all three?

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GOING FURTHER

1. Do research to learn about the methods that scientists use to identify DNA. Report these methods to your teacher.

2. Extract the DNA from another organism. Compare the appearance and properties of the DNA from two different organisms.