Make a

DNA NECKLACE

...from your own cells

Great results every time!

Extraction of DNA from Human Cheek Cells

Purpose:

To extract DNA from human cheek cells.

Materials:

2 bottles of Isopropyl alcohol (Ethanol) (cold)
Sports drink like gatorade or generic brand
Pendant tubes (eg. 1.5 mL Eppendorf tubes)
Class set of 50 mL plastic Falcon tubes
5 or 6 pasteur pipets
Embroidery string

Cell Lysis Solution (refrigerated):

120 mL distilled H20
5 mL dish detergent
5 g baking soda
1.5 g table salt

Procedure:

1. Aliquot 2 mL of sports drink into each Falcon tube (the teacher has done this for you in advance).

2. Pour the sports drink from the clean 50mL tube (or plastic cup) into your mouth (do not swallow) and swish it around for 1 full minute. As you swish, gently and continuously scrape the insides of your cheeks with your teeth to help release the cheek cells.

2. After 1 minute, spit the contents of your mouth back into the Falcon tube.

3. Using a plastic pipet, add 2 mL of cell lysis solution to your collected cheek cells. Use the graduations on the plastic pipette to measure the 2mL amount.

4. Cap your 50 mL tube tightly and invert it **VERY SLOWLY AND CAREFULLY** five times. Too much aggravation will affect how the DNA precipitates out.

5. Hold the tube at an angle, and using a plastic pipet, carefully add 70% cold ethanol by running it down the inside of the tube. Add the ethanol until the total volume reaches 12-13 mL. You should have two distinct layers. **DO NOT MIX THESE LAYERS. HOLD THE TUBE UPRIGHT AT ALL TIMES.**

6. Place your undisturbed 50 mL tube upright in a test tube rack or beaker and let it stand undisturbed for a minimum of 10 minutes. During this time, DNA will continue to

precipitate out of solution and extend like a ribbon through the entire ethanol layer. DNA yields will naturally vary within the class and not all DNA samples will extend through the entire ethanol layer.

7. Tie the ends of your embroidery string together with a knot to form a loop. Make sure the loop can fit over your head, as this will become your necklace string.

8. Use your plastic pipet to transfer your precipitated DNA out of the 50 mL tube and into the pendant tube. Begin pipeting the DNA from the end of the most extended strand in the ethanol layer. As you pipet from this point, the DNA will be drawn up together. You should not move your pipet tip down into the cell lysate layer. If some of the DNA remains attached to the cell lysate, draw your pipet up until the DNA in your pipet detaches from the cell lysate. You do not need to transfer the entire precipitated DNA sample into your pendant tube. Before you transfer your DNA into the pendant tube, allow it to sink to the tip of the pipet so that it will enter the pendant tube first. If the DNA, does not sink, release ethanol into the 15 mL tube drop-wise until the DNA is in the pipet tip. Expel the DNA into the pendant tube and fill the remaining space drop-wise with ethanol. Do not overfill.

9. With the pendant tube open, place the loop of your embroidery string around the cap hinge. Close the cap and put on your DNA necklace. Invert your pendant tube to see your DNA move through the ethanol.

10. "Bling" your necklace using rhinestones and sequins for an individual touch!!

You may want to hot glue gun the lid shut as to avoid potential spills

Analysis & Conclusions

1. Describe how long strands of double-helical DNA fit into the nucleus of a single cell.
2. Why do you think a sports drink is used to collect the cheek cells instead of water?
3. What does the cell lysis solution do to the cell membranes of the cheek cells?
4. What function does the baking soda serve in the buffer?
5. Why do you think DNA becomes visible when ethanol is added to the cell lysate solution?
6. Why can you then see the extracted DNA molecule with the naked eye?
7. What do you think are some things that a scientist could do with extracted DNA from a human being, or from any organism?

Answers:

Analysis & Conclusions

1. Describe how long strands of double-helical DNA fit into the nucleus of a single cell.
   Answer: They coil around proteins called histones to pack tightly

2. Why do you think a sports drink is used to collect the cheek cells instead of water?
   Answer: To stabilize the cells since the sports drink is isotonic

3. What does the cell lysis solution do to the cell membranes of the cheek cells?
4. Answer: It breaks open the cell membranes to release the DNA from both the cell membranes and the nuclei.

5. What function does the baking soda serve in the buffer?
   Answer: The ions help buffer the solution preventing pH changes

6. Why do you think DNA becomes visible when ethanol is added to the cell lysate solution?
   Answer: DNA is insoluble in hydrophobic solutions and hence will precipitate out.

7. Why can you then see the extracted DNA molecule with the naked eye?
   Answer: Because it's long and uncoiled.

8. What do you think are some things that a scientist could do with extracted DNA from a human being, or from any organism?
   Answer: Clone or sequence the genes, transfer the genes to another organism, look for disease causing genes, compare sequences between species for evolutionary relationships.

Acknowledgements

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