

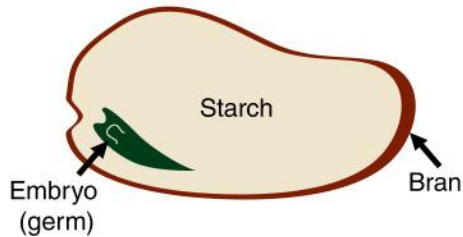
Name: _____

TOC #: _____

DNA EXTRACTION (15 pts)

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. The DNA we will be extracting today comes from wheat seeds, specifically, raw wheat germ. The "germ" is the embryo, which is the part of the

Cross Section of a Wheat Seed



seed that can grow into a new wheat plant. When wheat seeds are milled into white flour, the wheat germ and wheat bran are removed, leaving only starch. Wheat germ contains many nutrients while wheat bran consists of fiber. Whole wheat flour contains all parts of the wheat seed and is therefore more nutritious than white flour while also providing important fiber for digestion.

We can extract the DNA from the wheat germ using several steps. Heat softens the phospholipids (fats) in the membranes that surround the cell and the nucleus and will inactivate enzymes. Then adding detergent/soap will pull apart the fats (lipids) and proteins that make up the membranes surrounding the cell and nucleus. Once these membranes are broken apart, the DNA is released from the cell. The DNA released from the cell nucleus is dissolved in the water/detergent/wheat germ solution and cannot be seen. DNA precipitates out of solution in alcohol, where it can be seen.

Pre-Lab Questions:

1. What is the purpose of this lab activity? (1pt)
2. What do you think the DNA will look like? (1pts)
3. Where is DNA found? (1pts)

Materials:

Raw wheat germ - 1 gram

50 ml beaker

Liquid detergent – 6 drops

Test Tube

70% Isopropyl Alcohol - 14 ml

Wooden Stick

50-60° Celsius tap water - 20 ml

Paper Clip

Instructions

Flow Chart of Instructions (3 pts)

1. Answer Pre-Lab questions.
2. Create flow chart of instructions.
3. Use the digital scale and mass 1 gram of raw wheat germ in a 50 ml beaker.
4. Using a graduated cylinder, add 15 ml of hot (50-60 °C) tap water and mix constantly for 3 minutes using a wooden stick. It must be the correct temperature.
5. Add 6 drops of detergent/soap and mix **VERY GENTLY** for 30 seconds and then rest for 30 seconds, for 5 minutes. Do not to create foam.
6. Allow the solution to settle in the beaker for 1 minute, or until almost all wheat germ has settled to the bottom and there is a light yellow solution on top.
7. Very slowly, pour the water/detergent solution into a clean test tube leaving as much of the wheat germ behind as possible.
8. Tilt the test tube at an angle. **SLOWLY** pour 8 ml of 70% isopropyl alcohol down the side of the test tube so that it forms a layer on top of the water/wheat germ/detergent solution. **DO NOT POUR QUICKLY BECAUSE THE LAYERS WILL MIX.** DNA precipitates at the water-alcohol interface (the boundary between the water and the alcohol). Therefore, it is crucial to pour the alcohol very slowly so that it forms a layer on top of the water solution. If the alcohol mixes with the yellow solution, it will become too dilute and the DNA will not precipitate.
9. Let the beaker sit for a few minutes. White, stringy, filmy DNA will begin to appear where the water and alcohol meet. You will usually see DNA precipitating from the solution at the water-alcohol interface as soon as you pour in the alcohol. If you let the preparation sit for 15 minutes or so, the DNA will float to the top of the alcohol.
10. Use a paper clip hook or a wooden stick to examine the DNA.
11. Clean up: wince beaker, test tube, and graduated cylinder with warm water, make sure no soap is left. Place beaker with wooden stick inside, test tube, and graduated cylinder where you found them.
12. Answer Analysis questions

Conclusion and Analysis

1. It is important that you understand the steps in the extraction procedure and why each step was necessary. Each step in the procedure aided in isolating the DNA from other cellular materials. Match the procedure with its function (1 pt):

PROCEDURE

A. Mix wheat germ and warm water

B. Add detergent and mix off and on

C. Pour in isopropyl alcohol

FUNCTION

_____ all DNA to precipitate out of water solution

_____ soften membranes and inactive enzymes

_____ pull apart membranes (lipids and proteins) that surround cell and nucleus

2. What did the DNA look like? (1pt)
3. Compare and contrast the DNA from today and the slime from the previous lab. What about the chemical structure of DNA and slime causes these properties? (2pts)
4. Explain what happened in the final step when you added isopropyl alcohol to the test tube with the wheat germ extract. (1pt)
5. A person cannot see a single cotton thread 100 feet away, but if you wound thousands of threads together into a rope, it would be visible much further away. Is this statement analogous to our DNA extraction? Explain. (1 pt)
6. Why might scientists need to be able to remove DNA from an organism? List two reasons.(2pts)
7. Why do we use wheat germ and not the whole wheat seed? Is DNA in found in any food? (1pt)