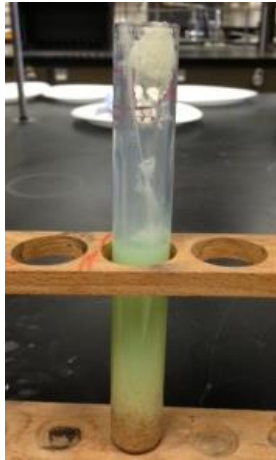




California State University of Bakersfield, Department of Chemistry

## DNA Extraction from Wheat Germ



### Standards:

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

### Introduction:

*Wheat germ is the DNA source in this protocol. Wheat germ comes from wheat seeds. The "germ" is the embryo, which is the part of the 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.*

### Materials:

- Raw wheat germ-1g or 1 tsp. (toasted wheat germ doesn't work)
- Dawn dishwashing soap-1mL or ¼ tsp.
- 95% ethyl alcohol or Everclear grain alcohol or 91% isopropyl rubbing alcohol-14mL or 1 tbs. (70% isopropyl rubbing alcohol makes it more difficult because it contains higher percentage of water)
- 50-60°C tap water-20mL or 1 tbs.

- 50 mL test tube
- Graduated Cylinder
- Eyedropper
- Vial (optional if you want to store your DNA)
- 50% alcohol(optional if you want to store your DNA)- To make 100mL of 50% alcohol with regular isopropyl rubbing alcohol, mix 71mL of 70% isopropyl rubbing alcohol with 29mL of distilled water; If using ethyl alcohol or Everclear grain alcohol mix 53mL of 95% ethyl alcohol (ethanol) with 47mL of distilled water.
- Paper towels or filter paper

**Safety:**

- Always have an adult with you to help you during your experiment.
- Always wear eye protection and gloves when doing chemistry experiments
- Rubbing alcohol is flammable, so it must be kept away from any open flames or heat.

**Procedure:**

1. Place the raw wheat germ in a 50 mL test tube.
2. Add hot (50-60°C) tap water and mix constantly for 3 minutes. The heat softens the phospholipids (fats) in the membranes that surround the cell and the nucleus. It also inactivates (denatures) the deoxyribonuclease enzymes (DNase) which, if present, would cut the DNA into such small fragments that it would not be visible. Denatured enzymes and DNA unravel, lose their shape, and thus become inactive. Enzymes denature at 60° Celsius, and DNA denatures at 80° Celsius.
3. Add detergent and mix gently for 5 minutes, trying not to create foam. Detergent contains sodium laurel sulfate, which cleans dishes by removing fats and proteins. It acts the same way in the DNA extraction protocol, pulling 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.
4. Use an eyedropper or piece of paper towel to remove any foam from the top of the solution.
5. Tilt the test tube. SLOWLY pour 14mL of alcohol down the side so that it forms a layer on top of the water/wheat germ/detergent solution. 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. Besides allowing us to see the DNA, the alcohol separates the DNA from the other cell components, which are left behind in the water solution. Do not mix the two layers together. If the alcohol mixes with the water, it will become too dilute and the DNA will not precipitate.
6. Let the tube 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 interference 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.

You can usually get more DNA to precipitate from the solution by using a paper clip hook to gently lift the water solution up into the alcohol. This allows more DNA to come in contact with the alcohol and precipitate. You may find it helpful to pour the water/detergent solution into a clean test tube, leaving behind the wheat germ, before adding the alcohol.

7. Use a paper clip hook to collect the DNA. If chosen to keep the DNA, store it in alcohol as stated in the materials or air dry it on a paper towel or filter paper.

**Data and Observations:**

Record your observations in this space

**Questions:**

What did you see? Anything you were not expecting? Describe it here.

**References:**

1. DNA Extraction from Wheat Germ. Genetic Science Learning Center.  
<http://learn.genetics.utah.edu/archive/wheatgerm/> (accessed August 1, 2013).