

Biology 196 Laboratory

Purification of DNA From Strawberries

Laboratory Objectives

After completing this lab you should be able to:

- Extract DNA from plants using household chemicals.
- Describe the role of each of the household materials in the extraction process.
- Describe the chemical and physical properties of purified nucleic acids.

Introduction

DNA is a very important chemical. The long strands of DNA store the "recipe" for creating the proteins and other molecules which are so important for life processes. It is present in every cell of the body (as well as in the cells of the foods we eat, which were once from living plants and animals). Each human cell, which is only tenths of a millimeter long, contains about two meters of DNA! In an average meal you eat about 55,000 cells, or approximately 93,205 MILES of DNA! The purpose of this demonstration is to extract DNA so that you can see it and observe some of its physical and chemical properties.

To extract DNA from tissue it is necessary to break down most cellular structures in order to release the nucleic acids. Common household detergents are **surfactants** which will dissolve the lipid components of the cell membrane and expose the proteins and nucleic acids within the cell. The detergent then forms complexes with these lipids and proteins, allowing them to be filtered out of solution, leaving the nucleic acids behind. We will use table salt and an alcohol solution; the salt acts as a **counter ion** and allows the DNA to **precipitate** out of solution when it is placed in an alcohol solution.



“Spooling” purified nucleic acids

Procedure:

Work in groups of two for this procedure.

1. In a small (100 mL) beaker, make a solution of:
 - 10 drops of household laundry detergent
 - 2 “pinches” of sodium chloride (table salt)

In the meantime your instructor will blend some strawberries in 250 mL of distilled water for 15 to 20 seconds until it is a mixed.

2. Add 20 mL of deionized water. Dissolve the salt and detergent by stirring slowly with a wooden dowel to avoid foaming. *Do not shake it.*
3. Add 30 ml of the strawberry mixture from Step #1. Mix the solution slowly with a dowel for 5 minutes. By mixing the strawberry extract you are homogenizing the lipid cell membranes (and nuclear membrane) with the detergent, exposing the DNA to the aqueous solution. Again, avoid foaming the mixture.
4. Set up a filtering station by taking a coffee filter and draping it inside a NEW (empty) beaker so that the filter doesn't touch the bottom of the beaker. Fold the filter over the edges of the beaker rim.

5. Add your strawberry mixture from Step #3 to your filtering station. Let it drain for several minutes until at least 5 mL of filtrate (at least a teaspoon) covers the bottom of the beaker.
6. Obtain a test tube of very cold ethanol (wait until the last moment to take it out of the refrigerator or ice bath provided). *Very slowly* pour the strawberry filtrate (that went through the coffee filter) into your test tube.
7. Let it sit for 5 minutes on ice, undisturbed. DO NOT SHAKE THE TUBE.
8. Take a wooden dowel and SLOWLY twirl it at the alcohol interface in the test tube. Can you pull the strands of DNA out of the test tube? This is called “spooling” the DNA.

Study Checklist

To perform well on the first quiz, you need to have a thorough knowledge of the following:

- You should know and understand all of the terms which appear in **boldface** type.
- Understand the function of each of the components and steps in the extraction method.
- Describe the chemical properties of DNA that allow it to be purified in this manner.
- Describe the physical properties of the purified DNA (i.e. its appearance and consistency).