

Strawberry DNA extraction

Target audience: 9-12

Notes: DNA is found in cells from Animals and Plants. DNA is a double stranded macromolecule composed of nucleotide bases pairing Adenine with Thymine and Guanine with Cytosine. DNA can be extracted from cells by a simple technique with household chemicals, enabling students to see strands of DNA with the naked eye. Two excellent websites are additional resources for this activity:

<http://www.carlinvilleschools.net/linke/Biology/DNA.htm>

http://carnegieinstitution.org/first_light_case/horn/DNA/dnaindex.html

Knowledge and skills:

- Students should know and be able to draw the basic structure of DNA.
- Students should be able to safely work in a laboratory setting using simple household chemicals and follow a recipe for DNA extraction.

Fundamental understanding:

- DNA is found in the cells of animals and plants.

Essential Questions:

- What is DNA? Where is DNA found? Does DNA have the same basic structure from all organisms?

National standard (s):

- *Content Standard C:* As a result of their activities in grades 9-12, all students should develop an understanding of the Molecular basis of heredity and Biological evolution.
- *Content Standard E:* As a result of their activities in grades 5-12, all students should develop an understanding of technological design and the relationship between science and technology.

State standard(s):

- North Carolina Biology Standard Course of Study Objective 2.01: Analyze the molecular basis of heredity/DNA.

Purpose: to extract DNA from the fruit of a strawberry plant

Safety Precautions:

- Do not eat or drink in the laboratory.
- Wear Safety Goggles.

Materials: (per student group)

- **Equipment:**
 1. 1 heavy duty zip-lock baggie
 2. 1 strawberry (fresh or frozen and thawed)
 3. cheesecloth
 4. funnel
 5. 100 ml beaker

6. test tube
7. wooden coffee stirrer

• **Reagents:**

1. DNA extraction buffer (One liter: mix 100 ml of shampoo (without conditioner), 15 g NaCl, 900 ml water **OR** 50 ml liquid dishwashing detergent, 15 g NaCl and 950 ml water)
2. Ice -cold 95% ethanol or 95% isopropyl alcohol

Procedure:

1. Place one strawberry in a zip lock baggie.
2. Smash strawberry with fist for 2 minutes.
3. Add 10 ml extraction buffer to the bag.
4. Mash again for one minute.
5. Filter through cheesecloth in a funnel into beaker.
6. Pour filtrate into test tube so that it is 1/8 full.
7. Slowly pour the ice-cold alcohol into the tube until the tube is half full.
8. At the interface, you will see the DNA precipitate out of solution and float to the top. You may spool the DNA on your glass rod or pipette tip.

Questions:

1. Where can DNA be found in the cell?
2. Discuss the action of the soap (detergent) on the cell. What is the purpose of the soap in this activity?
3. What was the purpose of the Sodium Chloride, include a discussion of polarity and charged particles?
4. Why was the cold ethanol added to the soap and salt mixture?
5. Describe the appearance of your final product?
6. Draw a diagram of DNA containing 5 sets of nucleotide bases labeling the hydrogen bonds between the bases.

References and Resources:

Adapted from *Berry Full of DNA* by Diane Sweeney for [Biology: Exploring Life](#) to be published by Prentice Hall.

Websites:

<http://www.carlinvilleschools.net/linke/Biology/DNA.htm>

http://carnegieinstitution.org/first_light_case/horn/DNA/dnaindex.html

Teacher Notes:

1. Thaw strawberries before class or if you forget just microwave them one per baggie.
2. Set up the extraction buffer in small bottles at each lab station with a 10.0 ml pipette or a 10.0 ml graduated cylinder.
3. Set the alcohol in an ice bucket with ice to be ice cold. (70% isopropyl from the drug store will work)
4. If funds and space, each student can do this experiment.

5. Alternately Bio-Rad has a nice kit that extracts DNA from saliva and is saved in a vial attached to a necklace.