

# DNA Extraction

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## **Standards of Learning**

Science LS.1, LS.2, LS.3, LS.13

Math 6.9

English 6.1, 6.5, 7.1

## **Objective**

The student will

- follow a process and extract DNA from living tissue by using every day items.

## **Materials**

- DNA source (soybeans or other seeds, strawberry, banana, tuna juice, onion, celery)
- Water
- Salt
- Blender
- Coffee filter
- Detergent
- Test Tube
- Alcohol
- Wooden Stick

## **Background Knowledge**

Deoxyribonucleic acid is a nucleic acid that contains the genetic instructions used in the development and functioning of all known living organisms and some viruses. The main role of DNA molecules is the long-term storage of information. DNA is often compared to a set of blueprints since it contains the instructions needed to construct other components of cells, such as proteins and RNA molecules. The DNA segments that carry this genetic information are called genes, but other DNA sequences have structural purposes, or are involved in regulating the use of this genetic information. Chemically, DNA consists of two long polymers of simple units called nucleotides, with backbones made of sugars and phosphate groups joined by ester bonds. These two strands run in opposite directions to each other and are therefore anti-parallel. Attached to each sugar is one of four types of molecules called bases. It is the sequence of these four bases along the backbone that encodes information. This information is read using the genetic code, which specifies the sequence of the amino acids within proteins. The code is read by copying stretches of DNA into the related nucleic acid RNA, in a process called transcription.

Within cells, DNA is organized into X-shaped structures called chromosomes. These chromosomes are duplicated before cells divide, in a process called DNA replication. Eukaryotic organisms (animals, plants, fungi, and protists) store most of their DNA inside the cell nucleus and some of their DNA in the mitochondria (animals and plants) and chloroplasts (plants only)<sup>[1]</sup>. Prokaryotes (bacteria and archaea) however, store their DNA in the cell's cytoplasm. Within the chromosomes, chromatin proteins such as histones compact and organize DNA. These compact structures guide the interactions between DNA and other proteins, helping control which parts of the DNA are transcribed.



DNA is present in the cells of all living organisms. This procedure is designed to extract DNA from a food source in sufficient quantity to be seen and spooled.

### **Procedure**

1. Place the following ingredients into a blender:  
100 ml or ½ cup of DNA source material  
200 ml or 1 cup of water  
1 gram or 1/8 tsp salt
2. Blend on high for 15 seconds
3. Strain the mixture through a sieve to remove the unblended material
4. Add 20 ml or 2 TBSP of detergent. Swirl to mix. Let sit for 5-10 minutes
5. Fill a test tube about 1/3 full with the mixture.
6. Add a pinch of enzymes (Meat tenderizer) to each test tube and stir carefully.
7. Tilt the test tube and slowly pour an equal amount of alcohol down the side of the tube so that it lies on top of the mixture.
8. Stringy DNA should appear at the boundary between the mixture and the alcohol.
9. Use a wooden stick or a hook to gently move the mixture up into the alcohol so that more DNA will precipitate out; you can also let the tube sit for 30 minutes or more.
10. You can keep the DNA indefinitely in a sealed container with alcohol or dry it on paper.

### **Extension**

- Try the same experiment with another DNA source such as spinach, chicken liver, onions and strawberries.
- Use a different type of detergent and/or enzyme and compare results.
- Observe DNA under a microscope.
- Try extracting DNA from things that you think might not have DNA.

Lesson adapted from ***Soybean Science Kit*** from Indiana Soybean Board.

