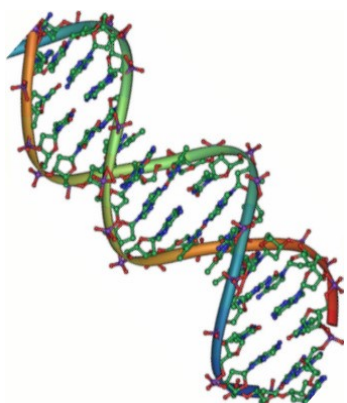


“Breaking Down Bread”

A Lesson on DNA Extraction



BACKGROUND INFORMATION:

The process for discovering biotechnology begins with a strong foundation of understanding DNA. DNA is found in all living things. Sections of DNA are referred to as genes. These genes code for specific amino acids. Amino acids form together to make long chains which are called proteins. These proteins are expressed to give an organism its unique characteristics.

When farmers are making decisions about what varieties of wheat to plant, they are thinking about the unique characteristics they want in their crop. Each kind of wheat has DNA that contains certain characteristics to help it grow better in a particular region, season, etc. When a farmer chooses to use a genetically modified variety of wheat that is drought or pest resistant, or has some other desirable quality, he/she is using wheat that has had its DNA purposefully altered.

OBJECTIVES:

1. Students can explain that desired genes can be inserted into bacteria to be replicated by a process called genetic engineering.
2. Students followed the DNA extraction procedures and isolated DNA with a scoop to retrieve from one sample. Or the student was not able to extract DNA but analyzed the procedures and evaluated where an error in the procedures may have happened.
3. Students can explain function of the restriction enzymes, bacterial plasmids, bacteria and antibiotics during genetic engineering.

VIDEO NEEDED:

“Genetic Engineering” by MIT K12 Videos
<https://www.youtube.com/watch?v=nfC689EIUVk> (7:20)

MATERIALS NEEDED:

- Water
- 1 Beaker
- Raw Wheat Germ (not cooked)
- Liquid Detergent (clear referred)
- Spoon
- Stirrer
- Baking Soda
- Meat Tenderizer
- Pipette
- Test Tube
- Denatured Alcohol
- Paper Towels

LEVEL: High School

STANDARDS:

NEXT GENERATION SCIENCE
STANDARDS

LS1.B—Growth and Development of Organisms
LS3.A—Inheritance of Traits
LS3.B—Variation of Traits

ACTIVITY DESCRIPTION:

Students will actively take part in an experiment to see if they can extract DNA from wheat.

SOURCE:

Saint Louis Science Center
Bringing Biotechnology to Life

PROCEDURE:

1. Pour 100 ml of water into a cup/beaker.
2. Add one spoonful of raw wheat germ and stir a few times.
3. Add one squirt of liquid detergent, stir a few more times, but not so hard that you generate bubbles.
4. Add 1 tsp baking soda and 1/8 tsp meat tenderizer; stir for 5-10 minutes, then let solids settle to the bottom.
5. Pipette off some of the liquid at the top (avoid solids at the bottom) into a test tube.
6. Add denatured alcohol until you have the same amount of alcohol as the mixture. and watch the DNA appear.

DISCUSSION:

Compare your DNA sample with those of other classmates and discuss the following questions:

1. Did everyone's DNA look the same?
2. Why did some people have more DNA?
3. Why is isolating DNA an important process?
4. What do you think scientists can learn from studying DNA?

QUESTIONS TO CONSIDER:

1. What are genes?
2. What is genetic engineering?
3. What is the role of bacterial plasmids in genetic engineering?
4. What is the role of bacteria in genetic engineering?
5. What is used to separate the desired gene from the other genes after plating the bacteria?

OPTIONAL EXTENSION OPPORTUNITIES:

1. Weigh the wheat germ prior to testing, and the DNA after separating. Create a class graph evaluating the relationship between weight and amount of DNA collected.
2. Increase the variables (e.g. hot vs cold alcohol, type of soap used in buffer, frozen vs. unfrozen samples, etc.) and compare results.