

FACS: DNA--Expressions In Agriculture (Ag)

Summary

This lesson plan highlight careers in biotechnology and agriculture fields centered around the activity of extracting DNA from a strawberry.

Time Frame

2 class periods of 45 minutes each

Group Size

Large Groups

Life Skills

Thinking & Reasoning

Materials

- [Strawberry DNA Necklace kit](#)
(makes 200 DNA necklaces)
Biotech WebQuest worksheet (see downloadable lesson plan)

Background for Teachers

Although principles of biotechnology have been in use for over 6,000 years, the scientific field of biotechnology is relatively new. Biotechnology is the study of scientific and practical applications of biology to help humans in various fields. Some examples of biotechnology are using microorganisms to clean oil slicks, finding cures for human diseases by identifying certain DNA sequences, and improving crop yields by transferring DNA from one organism to another to modify the genetic makeup of that organism.

Gregor Mendel was the first person to trace the characteristics of successive generations of a living thing (peas). He was not a world-renowned scientist of his day. Rather, he was an Augustinian monk who taught natural science to high school students. His discovery of trait transfer was, at first, a theory. Genetic theory is no longer questioned in anyone's mind. Many diseases are known to be inherited, and pedigrees are typically traced to determine a hereditary disease. Plants are now designed in laboratories to exhibit desired characteristics. The practical result of Mendel's research not only changed the way we perceive the world, but also the way we live.

With the modern processes of biotechnology, scientists can be selective in what types of traits an organism will receive and speed up in the lab what would happen slowly and by season in the field. In agriculture, biotechnology is being used to increase crop yields, produce insect- and weed-resistant plants, and enhance vitamin and mineral content in food. It is also used to increase milk production and make cheese.

In this activity, students will be able to model a process that scientists use to extract DNA strands. What is DNA? DNA, 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. Yes, DNA is in all your food! The main role of DNA molecules is the long-term storage of information. DNA is often compared to a set of blueprints--a recipe, or code--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. In this "strawberry DNA" lab, students will extract strands of protein from the nuclei of the strawberry cells. The nuclei contain molecules called DNA, and the DNA strands contain genetic information. For more information about genetics and easy to understand tutorials, visit the Genetic Science Learning Center, <http://learn.genetics.utah.edu>.

In terms of careers, a plant scientist or genetic engineer may use biotechnology as a tool; these scientists may also employ biotechnologists. Biotechnologists have a very diverse and interesting careers They work with living organisms, both plant and animal, in manufacturing and industrial settings. Often the plant and animal materials that the biotechnologist works with are not the complete plant or animal, rather just microorganisms that may be contained within the larger plant or animal structure.

Biotechnologists can be hired to help develop new medicines and medical treatment options, help with environmental concerns, develop new plants or animals or even enhance already existing plants and animals. Biotechnologists conduct genetic engineering of plant and animal cells and products. Biotechnologists work in many different sectors including hospitals and research facilities, government agencies, private food or animal production companies, pharmaceutical companies or even food processing plants. They come from backgrounds in science, engineering or a combination of several educational groups including chemistry, biochemistry, microbiology, life sciences and pharmacy sciences. A biotechnologist works in a laboratory setting under carefully controlled conditions to make changes to the minute systems that exist within a single cell.

Instructional Procedures

Follow the preparation instructions included in the Strawberry DNA Necklace kit, 24 hours before the activity.

Review the "Background" information in this lesson. Provide each student or a pair of students with the Biotechnology WebQuest Worksheet. Consider providing this worksheet to the students electronically. The PDF in this lesson is a fillable form that can be completed on the computer, saved, and emailed as an attachment.

Review the student WebQuest responses.

Explain and demonstrate how the DNA will be extracted from the strawberries. To speed up the activity, you could filter the strawberry slurry in advance.

Evaluation

Ask students what kinds of careers in biotechnology would rely on DNA extraction. Guide the conversation so that students make a connection between the DNA they have extracted and the scientists who rely on similar methods to research and create genetically modified organisms (GMOs).

Ask students about some of the pros and cons of biotechnology.

List careers that would use biotechnology tools and information.

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