SciGuide Lesson Plan

Theme: Farm

Title:
Chain of Food

Author(s):
FDA/NSTA

Grade Level: 5-8

Subject Area:
Life Science/Health

Standards Alignment-National Science Education Standards:

- Life Science
  - Regulation and Behavior.
    - All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.

- Science in the Personal and Social Perspective
  - Personal Health.
    - Natural environments may contain substances (for example, radon and lead) that are harmful to human beings. Maintaining environmental health means establishing or monitoring quality standards related to the use of soil, water and air.

Time Required:
One 45-minute class period, with further extensions if doing the entire unit.

Overall Lesson Goal:
Students will explore the path food takes along the Farm –to–Table Continuum. They will begin on the farm, and throughout the unit they will investigate food safety issues during processing, transportation, at restaurants and supermarkets, and finally, in their own homes. Teams will identify how food can become contaminated along the continuum and develop and present strategies for preventing contamination at each step.

Individual Learning Objectives:
- Students will be able to effectively collect and analyze data to determine how food contamination can occur.
- Students will be able to propose methods to prevent food contamination.

Prerequisite Knowledge; Misconceptions/Preconceptions:
There are many places on a farm that can be contaminated by harmful bacteria, so farmers have to make sure that the areas where food is handled are kept clean and at the right temperature. There are many innovations on the farm that help prevent the growth of bacteria — like special areas for washing vegetables, refrigerated storage areas for milk and eggs, and portable sanitation in fields.

Salmonella is a foodborne pathogen sometimes found in the intestines of chickens. It can be passed on in the meat and also in the chicken's eggs. The best way to reduce the risk of foodborne illness from eating contaminated chicken is to prevent the Salmonella from living in the animal in the first place.

Using a process called competitive exclusion, chickens ingest a blend of good bacteria, which ultimately shields them from pathogenic Salmonella microbes.

Young mammals are born with undeveloped gastrointestinal tracts. It's fertile ground for both good and bad bacteria. Whichever organisms get introduced to their systems first will take over.

Scientists developed mixtures of beneficial bacteria to prevent bad bacteria, like Salmonella, from colonizing and infecting the chickens. To make it work, scientists use a blend of nonpathogenic bacteria naturally found in the gastrointestinal tract of mature chickens and spray it on day-old chicks. Through the natural interactions of the chickens grooming each other, the bacteria enter their intestinal tracks.

Competitive Exclusion results in naturally disease-resistant, mature, healthy birds — making it virtually impossible for Salmonella to multiply. It also reduces Salmonella in the environment because there are fewer infected birds to contaminate the farm.

Another way farmers keep down the spread of bacteria is through composting.

Compost is actually made up of the decomposed parts of all the residuals that come from the farm operation — the waste from the animals, leftover food the animals didn't eat, hay/straw, etc. It all gets mixed together and heaped up so that the microbes can eat it and create compost, which the farmers use to fertilize their crops.

The microbes are basically getting a workout from eating all of the organic materials. As the microbes work at digesting the wastes in the compost, the temperature of the compost rises. The heat plays an important role because E. coli O157:H7 can't survive in temperatures above 131° F (55° C).

E. coli may be found in the manure that is used in the compost. So farmers have to be very careful about cross-contamination when the compost is used on any crops, but the risk may be greatest for low-growing crops, such as lettuce and strawberries.

Scientists are working to develop ways for farmers to assure that their compost reaches high enough temperatures to kill pathogens and make the compost safe for their crops. Note: This is still in the research stage.

Procedures/Instructional Strategy:

Introduction

Look surprised when someone mentions the hot dog or banana. Then go over, pick up the hot dog and banana and ask: Does anyone know where these foods came from? Let the students speculate for a few minutes. Then comment: I confess, I put them there, but let's look at who else played a part in getting the hot dog, bun, cheese, relish, and banana to us. Allow the students to review the Farm-to-Table Continuum steps (farm, processing, transportation, retail, and home) they learned in The Big Picture activity (Module 1).

- Tell the students: In the next few activities, you'll learn about people you never dreamed had a role in getting this food to you.
- What does science have to do with the farm? Give the students time to make a few suggestions.
- Then ask: What do you think could happen to food along the Farm-to-Table Continuum that could affect the safety of our food supply? List their answers on the board.
- Food doesn't start at the supermarket or restaurant. Today, we'll trace the path of food along the Farm-to-Table Continuum and discover some of the ways it can become contaminated. Then we'll develop and present strategies for preventing contamination at each step.

Procedure

1. Divide the class into 5 groups. Assign a food to each group (hot dog, bun, cheese, relish, and banana).
2. Have students begin researching their food. Using poster board, let each team trace their food from the farm to the table. This will serve as the "first draft" of their food journey chart. Remind students that some foods are imported from other countries, so be sure to trace them from their origin. (Students can find out where a variety of foods come from by visiting the Economic Research site at www.ers.usda.gov/db/fatus.)
3. Post the charts around the classroom, and keep them up during the unit. As the teams learn more about the continuum, they can add to or change the information.
4. Challenge the students to include all the people involved at each step (e.g., farmers, produce pickers, milkers, truckers, grocery workers, shelf stockers, restaurant workers, etc.). Create a competition that focuses on which team can identify the most people. This challenge comes in #5.
5. For each person the team identifies, they must include what that person does to help control the spread of bacteria. Students should label all the places where contamination of their food may occur, then write a strategy for preventing that

particular contamination. Use the 4 Cs to help develop the strategy. For example, in the video they learned about the potential contamination of crops at the farm — the compost must reach at least 131° F (55° C) to ensure that the compost doesn't contaminate the crops. One suggestion could be to develop ways for compost to reach high enough temperatures to kill pathogenic bacteria and to make the compost safe.

6. At the end of the unit on "Retail and Home," have each team share their food journey chart with the class. The team that traces the banana should also address the global issue. Ask students: What do these foods have in common? Where do the similarities and differences occur along the Farm-to-Table Continuum?

Outcome/Assessment:
Have each team add up the number of people they identified. Which food had the most people involved in the Farm-to-Table Continuum? Why?

Extensions:

- Visit the Economic Research Service Web site at www.ers.usda.gov/data/fatus, find your favorite food, and see how many different countries it comes from. Or, select a country and see how many foods we get from that country.
- Using the Web site above, look on a map and calculate how many miles your favorite food traveled from one of the countries to your state. For example, how many miles did the banana travel from where it was grown to your state?
- Relate your pathogen to this experiment andrecord the information in your food safety portfolio.

Internet Resources:

- Economic Research Service/USDA: www.ers.usda.gov/data/fatus
- Bringing Food Science into your Middle and High School Classrooms: http://www.foodsafety.gov/~fsg/teach.html

Classroom Resources:
Dr. X and the Quest for Food Safety video/DVD,
Module 2 — Farm

- Food Safety A to Z Reference Guide (page 15 [Farm-to-Table Continuum], page 16 [Farm-to- Table Initiative]), and Food Safety Farm-to-Table Illustration, pages 52–53
- Cooked hot dog on a bun
- Grated cheese
- Relish
- Banana
- Paper plate
- Poster board
- Markers