

# FOOD TIMES GAZETTE

VOL. 1 NO. 1

SECTION A

## EXTRA!



## EXTRA!

## Consumers Winning the Great Food Fight Food supply safer than ever! Food handling tips give consumers the edge

CHICAGO — Most Americans take our safe, abundant, affordable and nutritious food supply for granted and that confidence is well-founded.

Through research, the food industry has learned how to produce, maintain, preserve and enhance the safety and quality of food products. However, changing demographics, lifestyles, food preferences and other factors present future challenges in ensuring food safety.

Americans' eating habits are changing as we become more aware of health-related issues such as fat and fiber. In addition, as a nation "on the go," we rely on precooked, frozen, canned, dehydrated and "fresh-like" foods for convenience. Many of these foods must be cooked to a minimum internal temperature to destroy certain pathogens; however, heat-resistant pathogens may survive the cooking process and could be hazardous if the food is not properly handled.

Since we are also consuming more meals outside the home, there is a concentrated number of people in the food industry who are now preparing meals for the general public. That is why when an unsafe food problem does occur, many can be affected and the incident becomes widely publicized.

To be safe, consumers should still follow the old maxim, "Keep hot foods hot and cold foods cold," to ensure food safety.

However, the following guidelines offer consumers these additional tips to avoid foodborne illness at home, where many outbreaks occur:

- When shopping, buy cold food last, and get it home fast.
- When storing perishable food, keep it safe — refrigerate!
- When preparing food, keep everything clean; thaw in refrigerator.
- When serving food, never leave it out for more than two hours.
- When storing leftovers, use small shallow containers for quick cooling.
- When in doubt, *throw it out!*

Remember that foodborne illness can affect anyone, but those most at risk are the elderly, the young and those with weakened immune systems.

For questions on dairy products, canned goods and processed foods, call the U.S. Food and Drug Administration Office of Consumer Inquiries (301-443-3170). Questions on meat and poultry can be answered on the U.S. Department of Agriculture Meat and Poultry Hotline (800-535-4555).

## Food For Thought When Choosing A Career

CHICAGO — Students considering professions that are increasingly in demand, that provide challenge and variety, and that offer personal satisfaction should look at a career in the food sciences. Food science professionals are meeting a basic human need and working to ensure a safe, abundant and flavorful food supply for the world.

The Institute of Food Technologists says career opportunities exist in government regulatory agencies like the Food and Drug Administration (FDA) and Department of Agriculture, with commercial food processors and suppliers, academia and in the food-service industry. Positions range from those in the areas of food chemistry and engineer-

ing to careers in consumer-related services.

A high school student considering a career as a food technologist should take science courses, especially biology and chemistry. Further study at the college level should include nutrition, food chemistry and food microbiology. And don't be surprised if you're studying next to a pre-med student. Food scientists and doctors share many of the same course requirements and a commitment to health and nutrition.

For more information about careers in food science and technology, write to the Institute of Food Technologists, 221 North LaSalle Street, Chicago, IL 60601. ■

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## Synopsis of the Video, “The Great Food Fight”

“The Great Food Fight” (RT 13:15), sponsored by the Institute of Food Technologists, made possible by a grant from Pfizer Inc, presents important food safety information for students of all ages. An upbeat young spokesperson tells the audience about our early ancestors’ struggle for food and how food can and *does* fight back, even today. Students soon learn how this topic relates to them, since young people, the elderly and the sick are those most vulnerable to foodborne illness.

The program introduces students to various microorganisms, from the “good guys” in their bread and yogurt to the culprits like *E. coli* (O157:H7) in their burgers — friends and adversaries in “The Great Food Fight” against foodborne illness. Through the use of special effects and the help of cartoon-style microorganisms, students “see” how microorganisms contaminate food that has been improperly handled, prepared or stored.

The video presents food safety basics on how to kill bacteria, keep them out of food and slow down their growth to pre-

vent foodborne illnesses. A fast-paced step-through shows the importance of proper food handling procedures, cleanliness, storage and cooking temperatures. The program also addresses the difficulty of balancing consumer preferences for convenience and freshness with food safety issues, as well as the role of transportation and government regulatory agency inspections to help insure a safe food supply.

### Before-Viewing Questions

**1** How do you suppose people in the past saved their food from one harvest to the next without the benefit of electricity or refrigeration? What kinds of problems do you think they encountered with preserving their food?

**2** Has any one of you ever gotten sick from eating spoiled or contaminated food? How did you feel? Do you know someone who has gotten sick?

**3** How do you suppose food can make you sick when it smells and tastes okay? (Lead students to introduce the word “microorganism” in their discussion.)

**4** How many of you help with the family grocery shopping or meal preparation? How many work in the foodservice industry? What food handling and sanitation rules do you have at work that might apply to your kitchen at home?

### After-Viewing Questions

**1** Now that you’ve seen the video, what would you conclude is the most common cause of foodborne illnesses? (Answer: *Microorganisms resulting from improper food handling, storage or preparation.*)

**2** Who is most vulnerable to foodborne illness and microorganisms? (Answer: *The young, aged, those with weakened immune systems.*)

**3** Try to recall from the video the three most important things we must learn to do with microorganisms. Let’s list them on the board. (Answer: *Kill them; keep them out of food; slow down their growth.*)

**4** Are all microorganisms bad? (Answer: *No*) What are some foods that contain “good” microorganisms? (Answer: *Yogurt, cheese, bread*) What are the microorganisms called that poison food? (Answer: *Pathogens*)

**5** How many tips can we recall from the video about proper food handling, preparation and storage? Let’s list them on the board. (Refer to *Teacher Background and Purposes in Sections 2 and 4.*)



## What’s In This Unit?

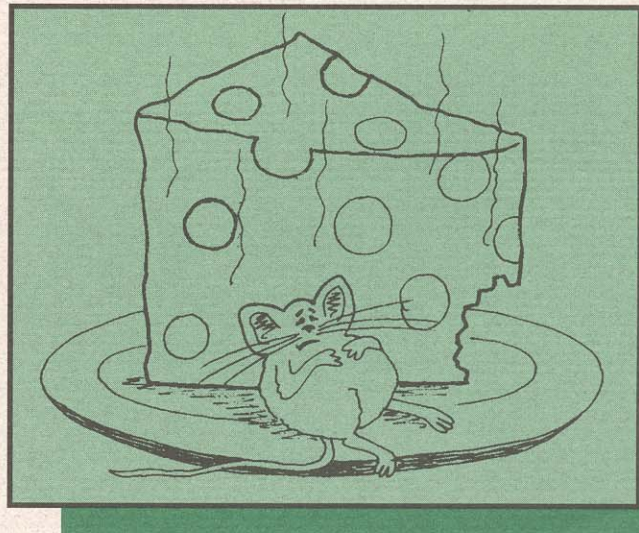
“The Great Food Fight” is a program sponsored by the Institute of Food Technologists to bring students in grades 4 through 12 the important message of food safety and the relationship of proper food handling, storage and preparation to ensure a safe food supply.

### Organization and Usage

The unit is organized into four sections, with activities designated for elementary and secondary levels. Please choose the activities that are most appropriate for the ability and maturity level of your students, as well as the resources and time available to you.

- Section 1: History of Food Preservation (preservation techniques)
- Section 2: From the Source to the Store/Restaurant (safe food transportation)
- Section 3: Microorganisms—Friend and Foe (microorganisms and foodborne illnesses)
- Section 4: It’s Up to You (safe food handling, storage and preparation)

The unit’s introduction and these four sections together provide one full week or more of lessons relating to food safety. However, its flexibility allows you to select only those topics or activities that are most appropriate to integrate into your curriculum *right now*. Not enough time to try them all? Save these materials for use later.



### Components

The unit contains the following components:

- Video, “The Great Food Fight”
- Teacher’s Lesson Guide  
Includes Teacher Background for each of the four topics, as well as complete lesson plans, including Objectives, Resources and Procedures.
- Wall Chart/Poster
- 12 Student Blackline Masters (Answer Key on page 8)
- Postage-paid Program Evaluation



## Introducing “The Great Food Fight”

Review the *Background* information provided for each topic in this teacher’s guide. Brainstorm with students to determine their level of understanding about the four concepts presented in this unit:

- 1 food preservation;
- 2 food transportation;
- 3 foodborne microorganisms;
- 4 proper food handling and preparation.

Guide them in establishing the interconnections among each of these concepts that help to ensure a safe food supply. To stimulate discussion, refer to the suggested questions for *Before- and After-Viewing the Video* on page 2. Then, show the video, “The Great Food Fight,” to introduce these four concepts. Review new vocabulary terms, which are highlighted in bold type throughout each *Background* section. Definitions are provided on the Blackline Master, “Glossary of Terms.”

**DON'T  
HESITATE...  
REFRIGERATE!**



## SECTION 1: History of Food Preservation

### Teacher Background and Purposes

This section provides an historical framework for understanding the basic concept of food preservation and its importance in providing a balanced variety of foods year-round. Students will apply this understanding to daily living while exploring the various methods of food preservation.

From prehistoric times, the need for food has kept people busy hunting, gathering and farming for survival. As people became more proficient at securing food, there was a need to preserve it. Those early **preservation** methods were determined by climate and geography.

Early societies dried nuts, grains and fruits.

**Drying** food reduces bulk and weight, provides a high concentration of nutrients, simplifies storage and transportation and is convenient to use.

In cool climates, **chilling** preserved food for short periods. Fruits and vegetables could be buried in cool, moist, dark environments, or tied to a rope and dropped into cool water. In warmer climates, during the winter, ice from nearby water sources could be cut and placed in a spring house to keep fruits, vegetables and meats cool until the ice melted.

**Freezing** food originated in Arctic zones and mountainous regions, where extreme temperatures limit agriculture and the inhabitants hunted their food supply. After a hunt, the animal would be cleaned and buried in ice. On expeditions to Labrador in 1912 and 1916, frozen food pioneer Clarence Birdseye observed this preservation method and developed the popular quick-freezing method. Today, electricity and packaging materials have made frozen food possible in all climates.

**Brining** was common in areas located near salt water. The early Greeks and Romans used vinegar in conjunction with brine to create a preservation technique called **pickling**.

**Smoking** was used to preserve meat and fish and was done by slow cooking at a low temperature for a very long time, sometimes in a special structure called a smoke house. The meat could then be kept throughout the year.

Sugar is a key ingredient in preserving fruit. In the 1600s, European trade with the Americas made many commodities more affordable, including sugar. Sugar made the preserving process quicker and easier. Honey was also used to preserve meat and fruit, with the food placed in honey-filled containers and stored for extended periods of time.

In the early 1800s, **canning** was developed by a French confectioner who discovered that food heated in sealed jars lasted longer than

dried or cured food — a great asset to mobile armies requiring huge amounts of food and unable to rely on local sources for fresh foods.

**Freeze-drying** dates back to the early Peruvians, who crushed potatoes to allow moisture to escape, and would then leave the dried-out pulp to freeze overnight. This method was researched and perfected for space travel, and such foods are now used by campers, hikers and backpackers, as well as in areas where refrigeration is unavailable.

In recent years, the food industry has developed and introduced additives that not only enhance food preservation but also meet consumer demand for quality, convenience and appearance. Other food preservation processes enable us to conserve resources. A good example of this is “shelf-stable milk,” whose aseptic packaging and pasteurization process eliminate the need for refrigerated storage until it is opened. Such innovations allow many more types of foods to be sent to countries experiencing famine or food shortages, but where electricity and other resources are limited.



### Elementary Level Lessons

#### Objectives

- 1 Students will identify and understand food preservation methods used throughout history: salting, drying, smoking, pickling, preserving, canning, freezing and freeze-drying.
- 2 Students will follow the procedure for preserving a food and use the scientific method to observe its effect on the food’s appearance, taste and texture.

#### Resources

- 1 Several examples of foods representing the various food preservation methods being discussed: salting (country ham), drying (raisins, prunes), smoking (smoked fish or sausage), pickling (pickled beets or pickles), preserving (jam or fruit spread), canning (any vegetable, fruit, meat or fish in a can), freezing (any frozen fruit or vegetable) and freeze-drying (ice cream, available from camping supply stores).
- 2 Ingredients for making vanilla ice cream (avoid using raw eggs), ice cream freezer, one bag of freeze-dried ice cream, mixing bowl, plastic spoons for tasting; package of freeze-dried ice cream.

#### Activities

- 1 Display the foods representing the various methods of food preservation. If you choose, encourage students to taste the foods from each of the preservation methods to compare how each of these processes can change the taste and texture of familiar foods. Use the *Background* information to explain each of the processes. Then, divide students into small groups and have each group select a food preservation method to research and prepare a poster, classroom book or other presentation on the method they chose.
- 2 Assemble ingredients for making ice cream. Make ice cream in class, allowing students to



take turns checking on its progress. Store the ice cream in the school cafeteria's freezer overnight. Have students compare their ice cream with the freeze-dried ice cream (follow package directions) for flavor, texture, appearance, weight and bulk. Discuss their findings.



## Secondary Level Lessons

### Activity 1

#### Objectives

- 1 Students will provide examples of food preservation methods.
- 2 Students will explain how food preservation evolved.

#### Resources

- 1 Chart paper
- 2 Examples of food preservation equipment and supplies

#### Procedure

- 1 Divide students into cooperative groups to research methods of food preservation, including origin (location and time) and process. Have students develop reports including text, charts and other visual references, that might include a class presentation of some of the materials and/or equipment required for the process selected.
- 2 Have students conduct a home inventory to determine how many examples of food preservation methods they can find in their own kitchens and pantries. Have them develop a chart for each food selected, indicating how many preservation methods were found for each food. Follow with class comparisons.

### Activity 2

#### Objective

Students will observe and compare how food preservation methods alter the appearance, texture, weight, bulk and flavor of food.

#### Resources

- 1 Blackline Master, "Comparison Sheet: How Preservation Techniques Alter Food"
- 2 1 cup each of several foods available in two or more preservation forms, along with a fresh form [e.g., apricots (fresh, canned, dried); strawberries (fresh, frozen, preserves); green beans (fresh, frozen, canned); black-eyed peas (dried, frozen, fresh)]
- 3 Spring scale
- 4 Stove or hot plate, saucepans, utensils, bowls and potholders

#### Procedure

Choose several foods, comparing the appearance, flavor, texture, weight and bulk between the fresh and the preserved forms. Cook frozen or raw foods, as needed. Use the Blackline Master, "Comparison Chart" to record observations.

## SECTION 2: From the Source to the Store/Restaurant

### Teacher Background and Purposes

The purpose of this section is to provide students with an overview of how food gets from the source to the marketplace. They will become aware of the importance of proper handling and transportation to limit contamination as food products make their way from the field to the store. Students will have the opportunity to trace a food from source to market, and to understand the concept of food grading and inspection.

Federal, state and local governments, as well as private industry, take active roles in ensuring the safety of the food supply in this country. Government agencies are responsible for monitoring adherence to many agricultural processes, including the use of crop pesticides and fertilizers, the practices used in animal husbandry and additives used in food processing. State and local governments are responsible for various food inspections involving transportation, grading and preservation, as well as sanitation practices at food sources, processors, and wholesale and retail outlets. Also active in each phase in these processes in both government and private industry are food scientists and technologists, who are working to ensure food quality and safety.

All foods must be carefully inspected and properly stored at each stage of the transportation process. Different categories of food require different storage and transportation conditions. Food transportation experts are knowledgeable about proper temperatures for various food types, signs of deterioration, inspection (federal and state) of food products, sanitation standards and the vehicles required to transport each product.

Foods from meat and poultry sources are regulated by the U.S. Department of Agriculture. All other foods are regulated by the Food and Drug Administration. Animals may carry and transmit disease, and protein foods are highly **perishable**. Farmers are expected to carefully monitor the health of their livestock and to report any prevailing health problems.

Fresh and processed meats and poultry are inspected to assure that the food is from healthy animals slaughtered and processed under sanitary conditions and is safe for human consumption. Some foods are **graded** according to USDA standards. Eggs are graded for **wholesomeness**, freshness and size. Evidence of these inspections and grades are stamped on wholesale cuts of meat, on egg cartons and packaged meat products.

For safety, all meat products require inspection. However, the grading of meat is optional and actually is a rating of its eating and sensory qualities (e.g., grades such as prime, choice, standard, etc.), *not* its safety. Cutability is also rated by yield grades.

The processing of milk is stringently regulated. Milk and milk products are graded according to self-imposed industry standards and are regulated by federal and state pasteurized milk ordinances on the basis of bacterial count or degree of sanitation. Also, milk must be free of antibiotics.

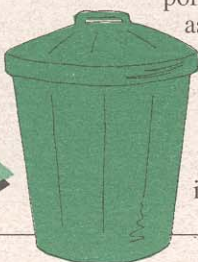
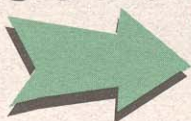
The agriculture and commercial processing of fruits, vegetables and grains must conform to government regulations, but most inspections take place at the actual food processing sites. For non-animal source foods, grading tends to reflect factors such as quality and appearance. Sanitation conditions under which they are processed are often determined by how the foods will be marketed. Fruit at a roadside stand, for example, may not even be washed, while fruits or vegetables in a grocery store may have been rinsed or even waxed to enhance their appearance. Still others would have been thoroughly washed, prepared and preserved during the freezing or canning process.

Sanitation practices at food processing sites are closely monitored throughout the food industry, as are the personal hygiene

When  
in  
Doubt...



THROW  
IT OUT!





of food handlers and the cleanliness of equipment. Temperatures are carefully regulated in the processing, storage and transportation of foods. However, even processed foods prepared under these careful conditions are shelf-dated, and store employees check their stock regularly to ensure that only the freshest foods reach your table.



## Elementary Level Lessons

### Objectives

- 1 Students will determine the vehicles which transport certain foods to stores and restaurants, noting their characteristics and requirements.
- 2 Students will trace a food from its agricultural source to the market.
- 3 Students will determine that safe handling procedures are necessary when food is being transported to avoid spoilage.

### Resources

- 1 Blackline Master, "Food Transporters"
- 2 Blackline Master, "Interview Checklist"
- 3 School cafeteria or chain restaurant manager
- 4 Paper plates; wall map of the world; crayons or markers; straight pins or markers; calculators

### Activities

- 1 Copy and distribute the Blackline Master, "Food Transporters." Review with students the categories of the various foods and their transportation requirements. Have students match the food with the proper transportation vehicle.
- 2 Discuss what would happen to our food if the proper vehicle were not used to transport it. (*If not transported under the proper conditions and using the proper procedures, produce and other food would spoil; frozen foods will thaw; foods can become contaminated.*) Have students prepare a class bulletin board with drawings or pictures of the vehicles and other modes of transportation used for various foods and include facts on their characteristics (size, shape, temperatures maintained, foods transported, etc.).
- 3 Divide the class into pairs. Using the Blackline Master, "Interview Checklist" as a guide, have each student pair write questions for interviewing the school cafeteria manager or restaurant manager. Role play the interviews within the class. (Remind students about introductions, manners and taking notes to assure a quality interview.) Afterward, have students write an essay or an article for the school newsletter or a class newspaper on

what they learned in the interview about transportation methods, freshness dating, proper storage, sanitation standards, inspections and grading. (For assessment, consider having students create a "special edition" class newspaper on food safety at the conclusion of the unit.)

- 4 Have students illustrate a favorite meal on a paper plate and select one or more items in the meal to determine the origin of each. Identify the origin on a wall map, marking with a straight pin or marker. Calculate the distance these food items were transported to get to each plate. Have students draw a flow chart that traces the food from its source to the store, noting the inspections, grading, sanitation procedures, processing and the transportation methods used.



## Secondary Level Lessons

### Activity 1

#### Objective

Students will explain how the government and food scientists actively work to assure that the food supply is safe to eat.

#### Resources

Guest speaker from FDA, USDA, local university food science department, local health department, inspecting agency, county extension service or local food processor spokesperson.

#### Procedure

Invite the guest speaker to discuss where food inspections are conducted, the criteria for grades and inspection seals for various food categories, and standards for safe food processing and storage.

### Activity 2

#### Objectives

- 1 Students will observe a commercial foodservice operation.
- 2 Students will describe temperatures and sanitation constraints required in the processing and storage of different categories and forms of food.

#### Resources

- 1 School district or local Health Department foodservice rules and regulations from cafeteria manager
- 2 School foodservice area/cafeteria; foodservice regulations to review

#### Procedure

Visit the school food service area. Ask the manager to describe the ordering and receiving processes. What does he/she check for when the food is delivered, and what is done if a food is not acceptable? Watch demonstration taking food temperatures, checking samples and weighing deliveries. Ask the manager to show storage areas for fresh, canned, refrigerated and frozen foods and explain why foods are stored as they are.

## Activity 3

### Objectives

- 1 Students will identify and explain the significance of grades and inspection stamps found on the packaging of different types of foods.
- 2 Students will categorize foods by group.
- 3 Students will trace a food from its source to the store/restaurant.

### Resources

- 1 Samples of inspections, grades and standards from cafeteria manager
- 2 Blackline Master, "From the Source to Store/Restaurant"

### Procedure

Have students survey foods at home, bringing in samples of grades and inspection stamps from packaging. Group foods into categories such as: meat, poultry, fish and shellfish, eggs, milk and milk products, fruits and vegetables, imported produce and grain. Distribute and have students complete the Blackline Master, "From the Source to Store/Restaurant." Then, assign cooperative learning groups to research a food category, select a food, and trace it from its source, through gathering, inspection and grading, cleaning, processing, packaging, storage and transporting, using the Blackline Master as their model.

## SECTION 3: Microorganisms — Friend and Foe

### Teacher Background and Purposes

The purposes of this section are to help students: 1) distinguish among beneficial, detrimental and neutral **microorganisms**; 2) recognize the conditions under which they grow; and 3) determine how to avoid food contamination and prevent **foodborne illness**.

We can't see them, but they surround us. Microorganisms are classified into three categories: beneficial, detrimental and neutral. Examples of beneficial microorganisms include yeasts which are purposefully introduced in the preparation of bread products and specific beneficial bacteria that give cheeses their characteristic flavors and textures. Certain microorganisms, however, are detrimental, giving food a fuzzy appearance, slimy surface or undesirable odors and flavors. Still others, called **pathogens**, can cause foodborne illness. Many microorganisms naturally present in raw foods are considered neutral, since their presence harms neither the food nor the consumer.



## 6 -Great Food Fight

Foodborne illness may be caused by **bacteria, viruses, parasites or fungi**. Pathogens, the microorganisms that cause foodborne illness, thrive in specific environments. Some microorganisms are **aerobic**, requiring oxygen, and others are **anaerobic**, growing in the absence of oxygen. Favorable moisture levels, temperature ranges (40°F to 140°F, 4°C to 60°C —the “**danger zone**”) and **pH** levels are the three most important factors that affect microbial growth. The foods which best support microbial growth are those with a neutral pH, including milk and milk products, poultry, meat, fish, seafood and some vegetables such as potatoes and corn.

Negligence is the leading cause of perpetuating pathogens in food. When preparing, serving or storing food, remember to keep hot foods hot and cold foods cold — *out of the danger zone!*

In addition to following proper food storage, preparation and serving methods, good personal hygiene, such as hand-washing and proper sanitizing of equipment and work surfaces, are important to prevent contamination and reduce the risk of foodborne illness. To sanitize washable equipment and food contact surfaces, refer to the “Sanitize It!” box on page 8.

If, in spite of these precautions, a case of foodborne illness is suspected, one should seek medical advice right away. Classic physical symptoms include diarrhea, vomiting, cramps and nausea. These symptoms can be very dangerous and even fatal to the very young, the elderly and those with a compromised immune system.



### Elementary Level Lessons

#### Objectives

- 1 Students will define and correctly use the terms identified in the unit.
- 2 Students will correctly identify the source and effects of five common pathogens that cause foodborne illness.
- 3 Students will observe and chart the growth rate of a microorganism.

#### Resources

Blackline Master, “Glossary of Terms”  
Blackline Master, “Know Your Foe”  
Blackline Master, “Microorganisms and You”  
Bag of uncooked rice  
Microscopes, slides, eye droppers, measuring cups, packet of active dry yeast, plain warm water, sugar, graph paper, 100-watt bulb, drape

#### Activities

- 1 Refer to the “Glossary of Terms” to discuss vocabulary introduced in the Background and on the Blackline Master, “Know Your Foe.” List the words the

students already know. Distribute the “Microorganisms and You” crossword puzzle for students to complete.

- 2 Organize students into five cooperative groups. Assign each group to one of the five microorganisms on the Blackline Master, “Know Your Foe,” that causes foodborne illness. Instruct students to use the information on the chart to create a “Wanted” poster for each pathogen. The poster should identify potential “hideouts” (source) and “crime” (effects).

- 3 Refer to the video and discuss the rapid rate at which microorganisms can grow. Demonstrate this concept by having students count uncooked rice grains to replicate microorganism growth as they double themselves at each division.

- 4 Divide a package of active dry yeast in half. Add 4 ounces of warm water (110°-115°F, 43.3°- 46.1°C) to two cups. In one cup, add 1 teaspoon of granulated sugar plus half the yeast. In the other cup, add only the rest of the yeast. Stir to mix. Have students, working in pairs or teams, place a large drop of both yeast mixtures onto slides. Students will observe the two sets of yeast mixtures after 10 minutes and every hour thereafter, recording their observations and charting the rate of yeast growth. How does the sugar (carbohydrate) affect the growth rate? (*It accelerates it.*)

Students may also observe how heat affects yeast growth by placing 1/2 package of active dry yeast in each of two cups filled with 4 ounces of warm water, as above. Place a large drop of each mixture onto separate slides. Keep one slide at room temperature and place the other in an “incubator” devised with a heat lamp or high-wattage (100-watt) light and drape. How does temperature affect growth? (*Heat increases growth rate, but yeast dies at 140°F [60°C] or higher.*)



### Secondary Level Lessons

#### Activity 1 Objective

Students will identify five microorganisms known to cause foodborne illness, their source and the common symptoms manifested with each.

#### Resources

Blackline Master, “Glossary of Terms”  
Blackline Master, “Microorganisms and You”  
Blackline Master, “Know Your Foe”

#### Procedure

- 1 Discuss the concept of beneficial and detrimental microorganisms, and review with students the information on the pathogen chart, “Know Your Foe.” Then, using the “Glossary of Terms” and “Know Your Foe” Blackline Masters for refer-

ence, have students complete the crossword puzzle, “Microorganisms and You.”

- 2 Working in cooperative groups, have students research a recent incident of food poisoning. Ask them to report back to the class on their findings regarding the type of food poisoning and its origin. Discuss what might be done to avoid a similar incident in the future.

#### Activity 2

##### Objective

Students will measure the effect of temperature on microorganisms.

##### Resources

Rye, sourdough and any unleavened bread (pita, matzo)  
Microscopes or hand lenses, petri dishes, tape for labeling  
Temperature-adjusted areas (normal refrigeration, incubator at 99°F or 37°C)

##### Procedure

- 1 Divide class into teams of 6 students each. Have pairs from each team place 1/4 slice of rye, sourdough and any unleavened bread into clean petri dishes. Label each with the type of bread and the variables being tested. Team 1 = refrigerate bread; Team 2 = incubate bread; Team 3 = store bread at room temperature.
- 2 Each team will monitor the effect of temperature on mold growth for the various breads with their assigned variable. Observe, record and graph several days’ growth. Note any points at which growth increased, decreased or stabilized.
- 3 Discuss results. At which temperature did mold grow best? (*Room temperature.*) Compare the effect of temperature on mold growth for each type of bread.

#### Activity 3

##### Objective

Students will understand the difference between beneficial and detrimental microorganisms by making yogurt.

##### Resources

Blackline Master, “Microorganisms with Culture,” ingredients and supplies listed on master

##### Procedure

- 1 Create teams of 6 students each. Have each team divide into 3 pairs to make yogurt from 1%, 2% and skim milk. Copy and distribute the Blackline Master, “Microorganisms with Culture.”
- 2 Have each team follow the instructions on the Blackline Master to complete the data sheet.
- 3 Have classes start the yogurt culture on day one and follow with data recording on day two. *Note: If students make comparisons, they will learn that there are no differences among the yogurts made with three different bases, even though they might have expected there to be.*



## SECTION 4: Now It's Up To You!

### Teacher Background and Purposes

Today, the foods we eat come from all over the world. As we learned in Section 2, they often are transported from great distances under carefully controlled conditions from their source to the market and, ultimately, to our plates. Proper food handling in our own homes is the next step in ensuring that our food *remains* fresh and continues to be safe.

The purpose of this section is to stress to students the importance of four key concepts in proper food handling: 1) identifying signs of food **spoilage**; 2) demonstrating proper storage and preparation; 3) observing cleanliness procedures; and 4) preventing **cross-contamination**.

Recognizing food spoilage and knowing when to look for it are very important. Food spoilage can occur at any of several stages. Food that has not been properly processed or transported can spoil quickly. This is also true of food that is not stored properly either before or after preparation, or that has not been held at the proper temperature during serving.

In general, consumers can trust that the fresh and processed food they are purchasing at the market or eating at a restaurant has been safely handled. However, once food arrives at home, it is up to each of us to practice safe food storage, handling and preparation procedures that will guard against foodborne illnesses.

We can start winning the great food fight by selecting only the freshest foods. When buying fresh produce, check for firmness, bruising, discoloration and variations in texture. Fresh meat and seafood should smell fresh, not be discolored and not carry a strong odor. Do not select meat or fish whose freshness date has passed. Do not buy frozen food that has thawed, and never refreeze frozen foods. In addition, check the **shelf dating** on the labels of fresh, frozen and other processed foods.

Once your food is home, store it under the right conditions. Organize food storage areas using the “**FIFO**” system (first in, first out). This will ensure that foods are used at their peak of freshness. The Blackline Master, “Food Storage Facts,” provides proper storage guidelines for most canned, dry, frozen and refrigerated foods. Also, be sure to keep food storage areas, such as pantries, as clean as preparation areas to discourage insects and rodents.

Preparation is a critical phase in safe food handling procedures. First, if preparing a food that was frozen, observe proper thawing procedures. Always thaw meats in the

refrigerator, *never* at room temperature. For frozen and other processed foods, always follow the thawing and preparation instructions on the package.

Cleanliness is the second rule in safe food handling. Thorough and frequent hand washing is one of the most important practices for any food handler. It is equally important to know the proper methods for cleaning and sanitizing equipment and to keep all work surfaces clean during the food preparation process. Disinfectants and antibacterial cleaners are commercially available for this purpose.

Cross-contamination can be prevented by observing these same procedures throughout the food preparation process. Washing your hands, cutting board and knife with hot soapy water between preparation of different foods kills microorganisms present on those surfaces and that could be transferred, for example, from the meat to the salad course of your meal.

Food should be properly cooked to kill harmful microorganisms. Follow the recommendations on the package where available. Cook eggs until the white has solidified. Hamburgers should be cooked until the meat is no longer pink and the juices run clear. Use a meat thermometer for roast beef, chicken, turkey, lamb and pork. Generally, cook red meat to 145°-160°F (62°- 70°C), ground meat to 160°F (70°C), and poultry to 180°F (81.4°C).

Once food has been cooked, temperature continues to play an important role in safe serving and storing. When storing foods, keep them out of the **danger zone** (40°F to 140°F, 4°C to 60°C). Consumers should always follow the adage, “Keep hot foods hot and cold foods cold.” When serving foods, do not let them remain at room temperature for more than two hours. When storing leftovers, remember to cool them *quickly* to at least 40°F (4°C). This is best accomplished by using shallow containers with airtight lids. To reheat leftovers, bring the food to an internal temperature of 165°F (74°C) for at least 15 seconds.

Remember, the most important rule to help avoid foodborne illness is, “When in doubt, throw it out!” It’s up to you to keep your food safe.



### Elementary Level Lessons

#### Objectives

- 1 Students will recognize common signs of spoilage in food.
- 2 Students will demonstrate proper hand-washing techniques and discuss the importance of good personal hygiene.
- 3 Students will understand why food must be properly stored and recognize correct storage procedures.

4 Students will be able to demonstrate the use of a thermometer and discuss safe food-storage temperatures.

5 Students will identify ways to prevent cross-contamination.

#### Resources

- 1 Store-bought food items (or packaging only) that display shelf dating.
- 2 Blackline Master, “Food Storage Facts and Spoilage Indicators”
- 3 Blackline Master, “Proper Handwashing Techniques”
- 4 Thermometers, tea kettle, hot plate or microwave, measuring cup, refrigerator, several shallow and tall containers
- 5 Magazines
- 6 Cutting board, plastic knife

#### Activities

1 Display a variety of store-bought food items or packages. Students will identify the packaging dates on the different items. Discuss the different ways consumers can identify freshness and signs of spoilage in foods. Emphasize that leakage, off-odors, bulging can ends, or liquids that spurt out of cans when opened are sure signs of spoilage. Have students conduct a home survey for foods that may show signs of spoilage. Ask them to use the “Food Storage Facts and Spoilage Indicators” Blackline Master to compare the dates on packaged meats stored in the freezer against the recommended storage time; check dry and canned foods for signs of spoilage; and look at “Best If Used By” dates on various foods for freshness.

2 Distribute the Blackline Master, “Proper Handwashing Techniques,” and demonstrate the proper hand-washing technique with the students. Teach students to say the Hand Washing Rap (from Youth Food Safety Curriculum, University of Nebraska) that appears on the Blackline Master. It takes only 20 seconds to say the rap — the time necessary to make sure hands *are thoroughly washed!*

3 Have students construct a classroom bulletin board using magazine cut-outs to represent the different foods in the food pyramid. Students will refer to the Blackline Master, “Food Storage Facts” to list the proper storage locator of each food and how long each food can be stored for best quality.

4 Review with students how to read a thermometer. Using a hot plate and tea kettle, heat water to boiling. Use the measuring cup to pour the same amount of water into a shallow container and a tall slim container. Place both containers in a refrigerator. Have students work in cooperative groups to predict which container will drop to the safe level (40°F, 4°C) most quickly. Have students insert the thermometers in each container every 10 minutes to check the water temperature. After students have reached a conclusion about the rate of cooling in relation to the container size and



shape, relate this concept to the cooling of foods (referred to in the video).

**5** Discuss and define **cross-contamination**. Show a cutting board and knife to students. Ask if these items can ever cause cross-contamination. Based on the information in the video and presented in the Teacher's Background, demonstrate how cross-contamination may occur. (Example: cutting raw meat, wiping the cutting board, then cutting vegetables for a salad or cutting a sandwich.) Discuss how microorganisms from the meat are transferred from the cutting board to the vegetables, and from the knife to the sandwich. Repeat the demonstration, but now follow the procedures described in the "Sanitize It!" box below.

### Sanitize It!

Sanitize washable equipment by soaking in a solution of 1 tablespoon of bleach to one gallon warm water (75°F, 23.8°C) for one minute, then remove and allow to air dry. Wash countertops, tables and other food contact surfaces clean with hot soapy water and rinse well. Follow by rinsing for one minute with a solution of 1/2 tablespoon of bleach to each gallon of water.



## Secondary Level Lessons

### Activity 1

#### Objective

Students will demonstrate proper hand-washing techniques and discuss the importance of good personal hygiene.

#### Resources

Sink with hot and cold running water, soap with disinfectant, paper towels

#### Procedure

Safe food handling includes washing hands before eating or preparing food. Hand-washing should always follow any touching of hair, nose, mouth, skin rashes, bites, using a tissue, contact with unclean surfaces, handling money, touching raw or unwashed food or soiled dishes. Review with students the proper technique for hand-washing. Have students demonstrate the technique, with classmates observing to critique their peers for thoroughness.

### Activity 2

#### Objectives

**1** Students will identify proper food storage techniques and procedures.

**2** Students will demonstrate the use of a thermometer and discuss proper temperatures for food storage.

### Resources

**1** Several types of kitchen thermometers such as refrigerator, oven, instant-read, meat, candy, etc.

**2** Tea kettles, measuring cups

**3** Stove, microwave or hot plate, refrigerator

**4** 1 shallow and 1 tall container (able to hold 1 cup of water) for each team of 4-5 students

### Procedure

**1** Set up a display of kitchen thermometers used in relation to food storage and preparation. Discuss and/or demonstrate the use, purpose and importance of each.

**2** Divide class into 4- or 5-person teams. Have each team boil 2 cups of water and pour one cup of water each into the shallow and tall containers. Place containers in refrigerator. Have teams insert thermometers to check water temperature in each container every 5-10 minutes over the class period and record and graph their observations on a data sheet.

**3** Ask students in which container does the temperature drop below the danger zone to a safe level (under 40°F, 4°C) first? (*Shallow container.*) How does this principle apply to cooling hot foods or leftovers? (*Foods cool most quickly in shallow containers.*) How does this information affect decisions on food storage containers at home or in restaurants? (*Foods should be stored in shallow containers after cooking to hasten cooling.*)

### Activity 3

#### Objective

Students will recognize signs of spoilage and/or poor-quality foods when shopping or being served.

#### Resources

**1** Cafeteria manager

**2** Blackline Master, "Package Dates: What They Mean"

**3** Blackline Master, "Food Storage Facts and Spoilage Indicators"

#### Procedure

**1** Invite the food service/cafeteria manager to class to explain shelf dating, FIFO, storage times and temperatures, and indicators of food spoilage.

**2** Use Blackline Master, "Package Dates: What They Mean." This chart describes how the consumer should use package and shelf dating to determine the freshness of fruits and produce, and what to look for in fresh meats, dry foods, frozen foods, canned goods, eggs and dairy products.

**3** Copy and distribute the Blackline Master, "Food Storage Facts and Spoilage Indicators." Students will identify indicators of spoilage for dry goods, fresh fruits and vegetables, meats, canned goods, dairy products, eggs, etc.

### Activity 4

#### Objective

Students will identify contamination and cross-contamination points in a recipe and how to prevent it.

#### Resources

**1** Utensils, school's own recipe and ingredients for chicken salad

**2** Kitchen, stove

#### Procedure

**1** Copy and distribute chicken salad recipe. In cooperative groups, have students write out the steps involved in preparing the recipe and identify the steps at which the food may be in danger of becoming contaminated and where cross-contamination may occur.

**2** Have students discuss the procedures required to prevent contamination and keep the food safe. (*Example: Do not take the chicken or mayonnaise out of the refrigerator until ready to use.*)

**3** Discuss and define **cross-contamination**. Show the cutting board and knife to students. Demonstrate how these items might cause cross-contamination. (*Example: Use the same knife and cutting board to cut raw chicken, then to chop the vegetables for the salad, then finally to make and slice the chicken salad sandwich, with the knife and cutting board only being wiped, not washed, between each food preparation step.*) How does cross-contamination occur? (*Microorganisms from the meat are transferred to the cutting board and the vegetables, and from the knife to the sandwich.*) Ask students to demonstrate the proper procedure for controlling cross-contamination by following the instructions in the "Sanitize It!" box on this page.

## ANSWER KEY

### Microorganisms and You

Across		Down	
1. Clostridium	19. Red	1. Cool	14. Cheese
7. Anaerobic	22. Date	2. Sanitize	17. Yeast
8. Acid	23. Pathogens	3. Microorganisms	18. Soap
10. Toxin	25. More	4. FDA	20. Nausea
11. pH	26. Store	5. USDA	21. Botulism
12. Hygiene	30. Kill	6. Staphylococcus	24. Aerobic
15. Board	31. Salmonella	9. Contaminate	27. E coli
16. Eye		12. Heat	28. Clean
		13. Food	29. Zone

### From the Source to the Store/Restaurant

- Farm.** Cows are loaded and shipped by truck to processing plant from the farms where they were tended.
- Processing Plant.** Cows are slaughtered. Beef is inspected, processed and graded according to USDA guidelines.
- Transport.** Using appropriate vehicles, beef intended for consumers is trucked to cold storage warehouses.
- Wholesalers' Cold Storage Warehouse.** Beef is cut for retail distribution and organized for delivery to retail stores.
- Restaurant Cold Storage Warehouse.** Large restaurant chains organize beef delivery from central warehouse facilities to various regional or national restaurant locations.
- Retail Stores.** Beef delivered to grocery chains, independent food markets and meat markets from wholesalers' cold storage warehouse. May be cut further into retail consumer sizes.
- Restaurants.** Beef delivered to restaurants from its cold storage warehouse facility.

### Food Transportation

**Hopper:** watermelons, apples  
**Refrigerated truck:** eggs, fresh packaged poultry  
**Livestock rig:** beef cattle, hogs  
**Tanker truck:** unprocessed milk, orange juice (bulk)  
**Beverage truck:** bottled water  
**Freezer truck:** frozen poultry, ice cream, frozen fish