Activities for Chapter 3
Basic Facts about Microorganisms

1. ***Case Study: Food Mystery***
   (*Instructor Guide* pages 74-77)

2. ***Word Match***
   (*Instructor Guide* pages 78-79)

3. ***Case Study: Watch Me Do It Right!***
   (*Instructor Guide* pages 80-81)

4. ***Chapter 3 Action Plan—Basic Facts about Microorganisms***
   (*Instructor Guide* pages 82-83)

Chapter 3–Activity 1
Case Study: Food Mystery

Purpose: To demonstrate how a food can be contaminated and then how conditions promote growth of the harmful microorganisms.

Estimated Time: Approximately 30 minutes

Materials: For each small group, one complete set of clues to the "Food Mystery" (*Instructor Guide* pages 76-77). The 14 clues should be cut apart and placed in an envelope. Each small group should receive an envelope of clues at the beginning of the activity.

Directions:

- **Group Activity:** This activity was designed to provide a description of a situation that resulted in an outbreak of foodborne illness. To determine what caused the outbreak, participants must place 14 clues in the *correct sequence* of events leading up to the outbreak.
- Have enough envelopes of 14 clues for each small group. Distribute the envelopes and then provide the following directions. Explain to the groups that they can place their clues on a table in order to get them in order of when each part happened.
- Read these directions to the group: "One person in the group should remove the 14 clues from the envelope, being careful to keep them face down. Distribute the 14 clues, one by one, to each member of the group. Each member should have 2, 3, or 4 clues. When everyone has his or her clues, each person should take turns reading one clue. Then the group must work together, using all the clues to put them in order (by when they happened). When the clues have been organized, the food mystery will be solved and you will know what happened to cause the outbreak of foodborne illness."
- As the groups are working, circulate around the room to provide coaching and feedback.

Follow-up Discussion: When the groups have their clues in order, call on one group to begin by reading each clue in correct order. Check the correct order using *Instructor Guide* pages 76-77. After one group shares their clues 1 through 7, call on another group to complete the list. All groups should be checking their clues.

Lead a discussion about the food mystery.

- **How could the turkeys have been contaminated?**
  Answer: Who and When – At the processing plant; when they were washed and prepared for roasting in the school kitchen; when Frank took them out of the oven and put them in the cooler.

- **What conditions were in place that allowed the growth of the harmful microorganisms?**
  Answer:
  Food – Turkey
  Acidity – Some bacteria grow in the pH range found in raw poultry.
  Temperature – Turkeys were not thawed and were then cooked at a low temperature. The turkeys were removed from the oven and placed in the refrigerator when the internal temperature was probably in the temperature danger zone. The partially chilled turkeys were later placed back into the oven.
  Time – The turkeys were certainly in the temperature danger zone for many hours. Bacteria need time to grow and multiply.
  Oxygen – Some bacteria grow in the presence of oxygen; others do not.
  Moisture – Poultry is moist.

- **What should have happened on Wednesday when Betty reminded the staff that the turkeys should be cooked for Thursday and then Sara discovered that the turkeys had not been cooked?**
  Answer: Sara should have told Betty, the manager, who should have changed the menu since there was no way to thaw and cook the turkeys for Thursday lunch.

- **What should have happened when Betty, the manager realized on Wednesday that the turkeys were not done and they had been cooked from a frozen state at low temperature?**
  Answer: Turkeys should have been discarded.

- **What should have happened Thursday morning when Judy realized the turkeys were not done?**
  Answer: Turkeys should have been discarded.

Chapter 3: Activity 1- Handout
Food Mystery Clues

Instructor: Copy the 2 pages of clues and cut each clue apart. Place the set of 14 clues in an envelope for each group. The clues should not be in sequential order when placed in the envelope. Solutions may vary based on individual participant opinion.

Mary Jones, a cook, left work Monday without checking her work schedule. She was supposed to place 5 whole turkeys in the refrigerator to thaw so they would be ready to serve for Thursday lunch.

The school foodservice manager, Betty Brown, reminded the staff at the 7:15 a.m. meeting on Wednesday that the turkeys should be cooked early that day for Thursday's special lunch.

Sara, a cook, went to the refrigerator at 7:25 a.m. to get the thawed turkeys to roast. She could not find them.

At 7:30 a.m., Sara asked the manager if the turkeys had been thawed.

Betty talked to Judy, the regular meat cook, about how to thaw the turkeys that needed to be cooked for Thursday's special lunch.

Judy suggested that frozen turkeys could be cooked at a low temperature for a longer period of time. She helped Sara put the frozen turkeys on to cook.

At 2:25 p.m. on Wednesday, Betty checked on the turkeys and realized they were not done.

Betty had to leave immediately on Wednesday to attend a manager's meeting at the central office. She asked Judy to stay a little later and put the turkeys in the refrigerator when they were done.

Judy agreed to stay, but then realized that she had to leave before 3:00 p.m. for her dentist appointment. She found Frank, the school janitor, and asked him to take the turkeys out of the oven and put them in the refrigerator before he left.

When Frank finished cleaning the restrooms near the cafeteria about 3:30 p.m., he went to the kitchen and took the turkeys from the oven and placed them in the refrigerator.

Thursday morning, Judy's first task was to take the turkey meat off the bone and slice it for Thursday lunch. With the first turkey, she realized it was not completely cooked. She knew if one turkey was not completely cooked, none of them were.

Judy decided to place the turkeys back into the oven for about two hours.

At the end of that time, Judy took the turkeys from the oven, and sliced the meat. The sliced turkey was served at 11:00 a.m. to 400 elementary school children.

After school, the principal's ten-year-old son began getting sick. By the next morning, many children who ate lunch at school were sick with nausea, vomiting, and diarrhea. The principal asked Betty to come to her office to talk about what could have happened.

Chapter 3–Activity 2
Word Match

Purpose: To provide participants an opportunity to check their learning.

Estimated Time: Approximately 20 minutes

Materials:
- For each participant, one copy of the Word Match (*Instructor Guide* page 79)

Directions:
- **Independent Activity:** Allow participants to work independently on this activity.
- Explain the directions and do item one together as a group to model the activity. Then allow participants to work independently. When everyone has completed the matching, discuss the answers.

Follow-up Discussion: Call on various participants to share their answers. Relate answers to information learned in Chapter 3. Emphasize that different microorganisms need different conditions to grow and multiply.

ANSWERS

A. 1
B. 3
C. 2
D. 6
E. 3
F. 4
G. 5
H. 6
I. 2

Chapter 3–Activity 2–Handout
Word Match

Directions: Write in the correct number of one of the "Conditions of Growth of Microorganisms" beside the letter describing that condition. The numbered items can be used more than one time.

Conditions of Growth of Microorganisms

1. Food
2. Acidity
3. Temperature
4. Time
5. Oxygen
6. Moisture

A. All animal products and some fruits and vegetables

B. Bacterial spores can survive very high _____ or very low _____ and grow again when the conditions are right

C. pH between 4.6 and 7.0

D. Low levels make foods resistant to bacteria

E. Only way to check is with a thermometer

F. To control bacterial growth, control _____ and temperature

G. Some bacteria can grow only with it, some can grow only without it, and some can grow with or without

H. Sugar products, cereal products, dried fruits, jams and jellies do not have lots of it

I. A meat marinade with vinegar or fruit juice has increased

Chapter 3–Activity 3
Case Study: Watch Me Do It Right!

Purpose: To provide practice in identifying correct procedures used to control the growth of harmful microorganisms.

Estimated Time: Approximately 20 minutes

Materials: For each participant, one copy of the case study (*Instructor Guide* page 81)

Directions:
- Provide a copy of the case study to each participant.
- Read the case study aloud and explain the directions. Begin by modeling the activity as a large group. Identify one correct procedure and the condition needed for growth of microorganisms that is controlled by using the correct procedure.
- Allow the participants to work independently, in pairs, or in small groups to identify the correct procedures being used to control the conditions needed for growth of microorganisms.
- Remind participants that controlling the growth of microorganisms can be done by controlling food, acid, temperature, time, oxygen, and moisture.

Follow-up Discussion: Call on various participants to share a correct procedure and the condition it controlled.

SUGGESTED ANSWERS

(1. FOOD)	Later that morning Gene set up all three service lines for lunch.
(3. TEMPERATURE)	He checked to see that the heating units were working properly**.**
(2. ACIDITY)	One of the ingredients in the marinade was white vinegar**.**
(3. TEMPERATURE)	The internal temperature of cooked foods was checked**.**
(3. TEMPERATURE)	Foods that were to be held for service were placed in a hot holding cabinet with the temperature set to 140 °F.
(3. TIME; 4. TEMPERATURE)	Mary was assigned to check temperatures every 30 minutes for foods being held in cabinets and on the service line.
(3. TIME; 4. TEMPERATURE)	Any food that was not at or above 140 °F was to be pulled and reheated to 165 °F for 15 seconds.
(3. TIME; 4. TEMPERATURE)	Spaghetti sauce was leftover so it was chilled in shallow pans using the correct cooling procedure, then tightly covered, labeled with name and date, and stored in the freezer.
(3. TIME; 4. TEMPERATURE)	The delivery was checked and then stored immediately.

Chapter 3–Activity 3–Handout

Case Study: Watch Me Do It Right!

Directions: Read the case study below and identify all the ways that this foodservice staff has controlled conditions to prevent the growth of microorganisms. Write the number of the condition from the list below beside the sentence describing a condition.

1. **Food**
2. **Acidity**
3. **Temperature**
4. **Time**
5. **Oxygen**
6. **Moisture**

_____ Veronica prepares, serves, and is the cashier for breakfast in a small elementary school. Students go through the line and basically serve themselves.

_____ This morning, the ham biscuits were on the baking pan brought to the serving line.

_____ They were pre-wrapped, and the children picked them up as they passed down the line.

_____ Veronica had finished cashiering and was counting money when some students arriving on a late bus came for their breakfast.

_____ There were no wrapped ham biscuits left, but Veronica quickly washed her hands, put on gloves, and served unwrapped ham biscuits from the warmer.

_____ After breakfast, Gene was assigned to clean the service line, which he did, then sanitized it with a bleach solution.

_____ Later that morning Gene set up all three service lines for lunch.

_____ He checked to see that the heating units were working properly.

_____ Each of the cooks used recipes to prepare the assigned menu items.

_____ One of the cooks was assigned to prepare skinless chicken breasts to marinate overnight for Chicken Fajitas (USDA Recipe D-40) to be served the next day.

_____ One of the ingredients in the marinade was white vinegar.

_____ The internal temperature of cooked foods was checked.

_____ Foods that were to be held for service were placed in a hot holding cabinet with the temperature set to 140 °F.

_____ Mary was assigned to check temperatures every 30 minutes for foods being held in holding cabinets and on the service line.

_____ Any food that was not at or above 140 °F was to be pulled and reheated to 165 °F for 15 seconds.

_____ Spaghetti sauce was leftover so it was chilled in shallow pans using the correct cooling procedure, then tightly covered, labeled with name and date, and stored in the freezer.

_____ Right after lunch, a delivery was made.

_____ The delivery was checked and then stored immediately.

Chapter 3–Activity 4

ACTION PLAN

Basic Facts about Microorganisms

Purpose: To provide an opportunity at the end of Chapter 3 for the participants to describe how they will use what has been learned.

Estimated Time: 15 minutes

Materials: For each participant, a copy of the Action Plan (*Instructor Guide* page 83).

Directions:

- **Independent Activity:** This activity should be done at the end of Chapter 3.
- Explain the directions for completing the Action Plan. Allow participants to work independently to complete each item on their individual Action Plan.

Follow-up Discussion: Allow participants to work on their individual Action Plan. When everyone has completed their form, call on several participants to share one plan for change.

Chapter 3–Activity 4–Handout

ACTION PLAN

Basic Facts about Microorganisms

Participant Outcomes

1. The participant will identify foods on the menu that need improved handling in order to prevent foodborne illness.
2. The participant will describe changes to be made to improve control of conditions for microorganism growth (food, temperature, and time).

Directions: You have completed Chapter 3 and learned about major foodborne illnesses caused by bacteria, viruses, fungi, and parasites. You have also been introduced to the six conditions to control growth of harmful microorganisms in your foodservice operation.

1. Identify the foods on your menu that you think need improved handling in order to prevent foodborne illness. For example, you may need to be sure to wash fresh produce more carefully whether or not it will be peeled or cooked.

_____

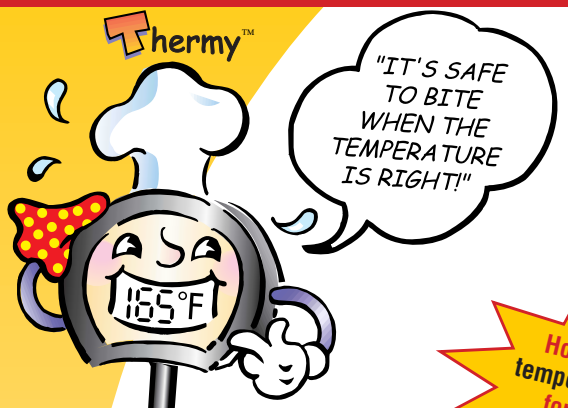
_____

2. Review the pages where the conditions for growth of microorganisms were described and list below changes that need to be made to improve control of the conditions. Controlling the conditions of Food, Temperature, and Time will be your highest priorities.

Change to be Made	*Who is Responsible*	*When*
FOOD		
TEMPERATURE		
TIME		

Name _____ Date _____

Temperature Rules! Cooking for Food Service



Hold all hot food at 140 °F or above after cooking

Hold at specified temperature or above for 15 seconds unless otherwise stated

Minimum Temperatures and Holding Times

165 °F (15 seconds)
- Poultry—chicken, turkey, duck, goose—whole, parts or ground
- Soups, stews, stuffing, casseroles, mixed dishes
- Stuffed meat, poultry, fish and pasta
- Leftovers (to reheat)
- Food, covered, cooked in microwave oven (hold covered **2 minutes** after removal))

155 °F (15 seconds)
- Hamburger, meatloaf and other ground meats; ground fish*
- Fresh shell eggs—cooked and held for service (such as, scrambled)*

145 °F (15 seconds)
- Beef, corned beef, pork, ham—roasts (hold **4 minutes**)*
- Beef, lamb, veal, pork—steaks or chops
- Fish, shellfish
- Fresh shell eggs—broken, cooked and served immediately

140 °F (15 seconds)
- Ham, other roasts—processed, fully cooked (to reheat)
- Fruits and vegetables that are cooked

*For alternative times and temperatures, see the **FDA Food Code 2001** **http://vm.cfsan.fda.gov/~dms/foodcode.html**

USDA Meat and Poultry Hotline
1-800-535-4555

FDA Food Information Line
1-888-SAFE FOOD

Food Safety and Inspection Service
U.S. Department of Agriculture

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