# KEEPING FOOD SAFE ON EARTH AND IN SPACE

FITNESS AND NUTRITION

## MISSION DESCRIPTION

In this activity, participants learn about food safety from the farm to the fork. This lesson includes information about food processing techniques, safe-handling techniques, and food hygiene to keep food safe. Youth participate in an interactive case study of a foodborne illness outbreak on Earth where they identify corrective actions to prevent a future outbreak.

Difficulty: **MODERATE**

Duration: **85 MINUTES**

Materials: **MINIMAL**

## MISSION PREPARATION

### TIMELINE

| Breakdown | Duration |
|---|---|
| Lesson | 20 minutes |
| Explanation of activity | 5 minutes |
| Activity #1 | 15 minutes |
| Activity #2 | 40 minutes |
| Wrap-up | 5 minutes |
| **Total** | **85 minutes** |

### MATERIALS

- Background
- Activity worksheet
- Laptops, computers, or tablets

### SET-UP

- Tablets/laptops/ computers ready for use
- Activity worksheets printed

## GOALS

To increase awareness of food safety, processing, and foodborne illness.

## OBJECTIVES

By the end of the lesson, participants will be able to

- Identify two ways to keep food safe during preparation at home;
- Identify one type of food product which is most susceptible to contamination;
- Identify the three most common food contamination methods during food production and processing.

### ACTIVITY 1: INTERACTIVE SAFE FOOD HANDLING GUIDE (15 MINUTES)

Participants can access the website http://health.canada.ca/en/health-canada/services/general-food-safety-tips/interactive-guide.html.

Participants can complete the interactive guide for “at the grocery store,” “in your kitchen,” “in your fridge,” and “in your dining room.”

### ACTIVITY 2: GROUP ACTIVITY TO KEEP FOOD SAFE (40 MINUTES)

In small groups, participants can work together to complete the case study scenarios.

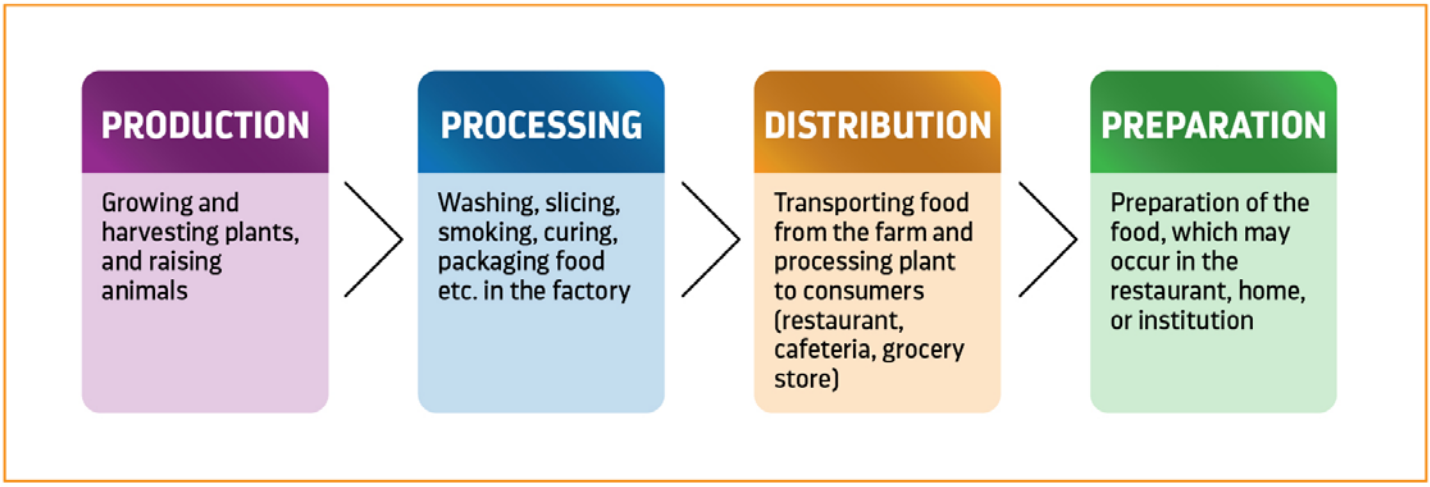
# BACKGROUND

## WHAT IS FOOD SAFETY?

Food safety is the practice and conditions of handling the preparation and storage of food to preserve its quality and prevent contamination and foodborne illnesses.

**Foodborne illness (commonly known as food poisoning):** an illness transmitted to human beings through food and water, caused by either an infectious agent (foodborne infection) or a poisonous substance (food intoxication).

Food can be contaminated with bacteria or physical contaminants throughout the food production chain.




*Food production chain*

Contamination can occur at any step of the food production chain, so farmers, factory workers, retail chains, and consumers must take precautions to avoid contamination and to thoroughly wash or cook food to destroy pathogenic (illness-causing) bacteria.

## WHAT IS FOOD PROCESSING?

This term refers to the steps undertaken to alter a food item. This can include changes in order to extend the shelf life and reduce foodborne illness by using ingredients, packaging, temperature, humidity, or pressure. Some of these steps can include:

- Temperature-controlled environments (chilling, freezing)
- Pasteurization
- Curing
- Drying
- Fermentation
- Addition of high pressure
- Lowering the pH
- Use of altered packaging where oxygen is displaced by nitrogen or another gas
- Canning
- Addition of preservatives

To help prevent contamination from occurring at the **processing** step, many factories use **hazard analysis and critical control points (HACCP)**.

HACCP is a food safety management system which aims to prevent contamination by identifying possible hazards or points where contamination could occur during food production and processing and by creating critical points where the risks are specifically controlled.

## HOW IS HACCP RELATED TO SPACE?

NASA created HACCP in the 1960s specifically for the space food program. They had to ensure that the food provided would not cause foodborne illness. The HACCP system mitigated foodborne illness risks throughout the life cycle of space food—ingredient procurement, transportation, packaging, and storage. HACCP is now implemented as a food safety standard in food production and processing across Canada and the United States.

**Common routes of contamination**

**Production:** During food production and harvest, food can be contaminated via contaminated irrigation water, manure, farm workers with improper hygiene, wildlife, and bacteria internalized in the plants.

**Processing:** Unsanitary factory equipment, dust particles, insects, factory workers who are sick or have improper hygiene, improper storage conditions, improper temperature control in the factory.

**Distribution:** Improper temperature control during transportation, sick workers handling produce, improper storage.

**Preparation:** Improper storage of products in the fridge such as raw meat on a shelf above fresh produce, cutting board cross-contamination, improper hygiene and hand washing, and meat not being cooked to safe internal temperatures.

If produce is contaminated, it is a higher risk than meat products because many types of produce are not cooked, whereas meat products can be cooked at a high temperature which would reduce the risk of foodborne illness.

Cooking foods at a high temperature can destroy heat-sensitive bacteria such as *E. coli, Salmonella,* and *Listeria monocytogenes*. Foods should be cooked to the following safe internal temperatures:

- 63 °C for medium-rare steak
- 74 °C for ground poultry
- 82 °C for whole poultry
- 74 °C for leftovers
- 74 °C for hot dogs
- 71 °C for ground meat

**Anybody handling food should follow these food safety tips:**

- Wash hands before and after you touch raw meat;
- Wash hands with soap and warm water for at least 20 seconds;
- Use separate cutting boards for meat and for produce;
- Do not keep food leftovers on the counter at room temperature for longer than two hours;
- Use a digital food thermometer when cooking meat;
- Defrost food in the refrigerator and do not re-freeze thawed food;
- Always assume contamination; you cannot see pathogenic bacteria on food.

**Food safety on the International Space Station (ISS)**

All foods sent to the ISS undergo microbiological testing to ensure they are free from bacterial contamination which could cause foodborne illness. Every effort is made to avoid foodborne illness in space, especially because medical care available for astronauts on the ISS is limited.

Further information can be found at the following links:

https://www.canada.ca/en/services/health/publications/food-nutrition/infographic-safe-internal-temperatures.html

https://www.canada.ca/en/health-canada/topics/food-safety.html

https://www.canada.ca/en/health-canada/services/general-food-safety-tips/food-safety-you.html

http://www.inspection.gc.ca/food/information-for-consumers/fact-sheets-and-infographics/food-handling/eng/1331871496701/1331871695247

http://www.inspection.gc.ca/food/information-for-consumers/fact-sheets-and-infographics/food-poisoning/eng/1331151916451/1331152055552

# KEY FOR ACTIVITY WORKSHEET

**Case Study:** You are a food scientist and would like to create a food item for astronauts living on the International Space Station (ISS).

In the space below, describe **three steps** you might take to make the food safe. Please explain your reasoning.
*Hint: think about hygiene, food processing, and food packaging steps.*

**Answers could be any of the following:**

- Cook the item at the correct temperatures
- Properly clean the factory equipment before processing the food item
- Factory staff or food scientist wash their hands before and after using the washroom
- Sick factory workers stay home; food scientist does not handle food while sick
- Food handlers wear gloves and change them frequently or wash their hands for 20 seconds with warm, soapy water before and after handling food
- Store the food item at the proper temperature
- Make sure that the packaging material is clean and not contaminated
- Use separate cutting boards for meat and for produce
- Do not leave raw meat, poultry, fish, seafood, or leftovers at room temperature for longer than two hours
- Use digital food thermometers when cooking meat
- Perform microbiological tests on the food item to make sure there is no harmful bacteria present before sending to space.

**Case Study:** You are an astronaut chef on the planet Mars. You are the head chef for the restaurant "Mars in the Stars," and you need to teach the other chefs how to safely handle meat and produce. **List four food safety tips for handling meat and produce** you can teach your staff.

**Answers could be any of the following:**

- Wash hands before and after touching raw meat
- Defrost meat in the refrigerator
- Cook meat to the correct internal temperatures, using a digital food thermometer
- Use separate cutting boards for produce and meat to prevent cross-contamination
- Thoroughly wash produce
- Do not store fresh produce underneath raw meat in the fridge
- Use different knives when chopping produce and meat

Between meat and vegetables, which one will be more likely to make you sick if it is contaminated with illness-causing bacteria? Why?

**Answers:**

Vegetables/produce because you may not cook them—lettuce, parsley, cilantro, etc.

Meat, on the other hand, is most often cooked before consumption which destroys pathogenic bacteria if the safe internal temperature is reached.

# ACTIVITY WORKSHEET

**Instructions:** Read the scenario and answer the corresponding question with your group.

**Case Study:** You are a food scientist and would like to create a food item for astronauts living on the International Space Station (ISS).

In the space below, describe **three steps** you might take in the kitchen or food factory to make the food item safe. Please explain your reasoning. *Hint: think about hygiene, food processing, and food packaging steps.*

**Case Study:** You are an astronaut chef on the planet Mars. You are the head chef for the restaurant "Mars in the Stars," and you need to teach the other chefs how to safely handle meat and produce. **List four food safety tips for handling meat and produce** you can teach your staff.

Between meat and vegetables, which one is more likely to make you sick if it is contaminated with illness-causing bacteria? Why?