Chapter 2: Food Safety

SAFE PRACTICES

Food safety is handling, storing, and preparing food in ways to keep food safe. Poor food safety can make people sick. Any illness caused by food is called foodborne illness. For this reason, it is important to learn about the science of food safety. Your students can learn about food safety by practicing good food safety and sanitation habits. In this chapter, students will explore food safety concepts by learning how to read thermometers and measuring temperatures, about bacteria that we carry on our hands, potential disease-causing bacteria that can grow on food, and the health benefits of proper food safety practices.

FOOD EXPLORATION LABS

Lab I: Changing States

- Teacher Preparation
- Teacher Lab Answer Key
- Student Lab

Lab II: Invisible Creatures

- Teacher Preparation
- Teacher Lab Answer Key
- Student Lab

INVESTIGATING YOUR HEALTH

Fearless Food Safety

- Teacher Answer Key

Try This At Home: Wash Germs Away

SUPPLEMENTAL MATERIALS

Teacher Preparation Slides

Student Pre-Lab Slides & Videos

Food Explorations Lab I:
Changing States

TEACHER LESSON PREPARATION

Lesson Focus

Understand water-based state changes that occur at varying temperatures and the importance of instrument calibration.

Lesson Description

Students will learn how to calibrate a bimetallic stemmed thermometer. Students will also gather data and construct change of state diagrams (melting and boiling) for water.

Academic Content Standards

ELA Common Core Standards for Literacy in Science and Technical Subjects (R-reading, W-writing, SL-speaking and listening, L-language) Grades 6-8

R-1 Cite specific textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

R-3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

R-4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical content relevant to grade (6-8) text and topics.

R-7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g. in a flowchart, diagram, model, graph or table).

R-10 Read and comprehend complex literary and informational texts independently and proficiently.

W-2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

SL-1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade (6-8) topics, texts, and issues, building on others' ideas and expressing their own clearly.

L-1 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Next Generation Science Standards

Performance Expectations

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

MS-PS-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Disciplinary Core Ideas

PS1.A Structure and Properties of Matter

- Each substance has characteristic physical and chemical properties that can be used to identify it.
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.

Science and Engineering Practices

Analyzing and Interpreting Data: Analyze and interpret data to determine similarities and differences in the findings.

Developing and Using Models: Develop a model to predict and/or describe phenomena.

Background Information

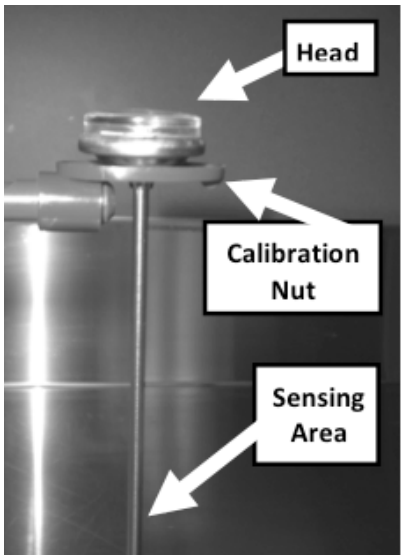
There are three main states of energy: **liquid, solid,** and **gas**. Let's take water as an example. When water is converted from liquid to solid, the molecules are locked together. They are not able to move around as they did when they were liquid. The molecules become interconnected and are unable to move freely. This process is considered a phase change, which is referred to as **freezing**. Energy can undergo phase changes when it is converted from one state to another. As another example, when water is converted from liquid to gas it undergoes **evaporation**. Gas molecules created by this change are able to move more freely. They are no longer slightly touching as in the liquid phase. The molecules are so far apart that they are at least 10 times their diameter apart from other molecules. Energy can also be converted back to its original state. For example, water that has been frozen can undergo another phase change, **melting**, which will return it to its liquid state.

Phase Change	Description	Impact of Heat on Phase Change
Melting	Solid □ Liquid	Breaks molecular bonds to allow melting to occur
Freezing	Liquid □ Solid	Leaves the liquid to allow tight molecular bonds to form
Vaporization (Evaporation/Boiling)	Liquid □ Gas	Moves into the liquid
Condensation	Gas □ Liquid	Leaves the gas
Sublimation	Solid □ Gas	Heat moves into the solid

State changes, like melting and vaporization, can be used to calibrate **thermometers** for cooking. Thermometers must be calibrated to ensure accuracy and ultimately prevent under- or over-cooking food. Consumption of under-cooked food can lead to **foodborne illness**. For example, consuming chicken before it reaches an internal temperature of 165°F could lead to **salmonella** poisoning. A thermometer must be calibrated to within +/- 2 °F (1.1 °C) of the actual temperature to ensure accuracy. There are two simple methods used to determine actual temperature: **Boiling Water Method** and **Ice Water Method**. A thermometer can be submersed in either boiling or ice water and calibrated to the respective temperature. Boiling water undergoes the process of evaporation. The ice water method involves the process of melting, allowing the heat to break the molecular bonds in the ice to form more liquid and a consistent temperature.

Directions for properly testing temperatures using a bimetallic stemmed thermometer:

Before measuring temperatures with a bimetallic stemmed thermometer, be sure to calibrate your thermometer first. The easiest way to calibrate your thermometer is with the Ice Water Method:



a. Fill a quart-size container with crushed ice and then add a small amount of clean tap water. You should have a lot of ice and only a little water.

b. Insert the thermometer so that the whole sensing area (from tip to dimple) is completely submerged for 30 seconds or until the indicator stops moving. (See illustration to the right.)

c. If the temperature is at 32°F, the thermometer is ready for use. If the temperature is not at 32°F, then hold the calibration nut (just below the temperature dial) securely with a wrench or other tool and rotate the head of the thermometer until it reads 32°F.

d. You should recalibrate the thermometer if you drop or bang it during use.

More tips on using a bimetallic stemmed thermometer:

- Before testing temperatures, be sure your thermometer is cleaned, sanitized, and properly dried.
- When checking the temperature of food (e.g. meat), be sure to measure internal temperatures in the thickest part. Be sure the whole sensing area is inserted. The thermometer should not touch bone, fat, gristle or the pan. For thin items such as hamburgers, insert the thermometer from the side into the middle of the meat.
- Cooking temperatures are typically reported using the Fahrenheit scale. The Fahrenheit scale of water is a scale of temperatures ranging from 32° (melting point of ice) to 212° (boiling point of pure water under standard atmospheric pressure).

Proper Cooking Temperatures

Ground Beef	160 °F
Poultry	165 °F
Pork	145 °F
Fish	145 °F
Leftovers	165 °F
Casseroles	165 °F

Materials

Teacher Materials

NOTE: Teacher material list is based on 6 groups of 4-5 students (24-30 students total).

Pre-Lab Preparation

12, 6 ounce Styrofoam cups
3 cups of water
6 cups of ice

Demonstration (see Suggested Instructional Plan steps 6-11)

Safety goggles
1 apron (optional)
1 oven mitt
1 hot plate or double burner
1 thermometer (Celsius or Fahrenheit)
1 kitchen timer or stopwatch
1 medium potfilled with water (½ to ¾ full)

Student Materials

NOTE: Student material list is based on 1 group of 4-5 students. Refer to the "Equipment and Material Lists by Chapter" on page XIV of the FoodMASTER Middle Teacher Edition for whole class estimates (24-30 students divided into 6 groups) for perishable and nonperishable materials.

1 cup of ice chips
1 cup of water filled ½ way
1 thermometer
1 kitchen timer or stopwatch

Teacher Pre-Lab Preparation

1. Review teacher background information, teacher preparation slides, student pre-lab slides/videos, student introduction, suggested instructional plan, and the student *Food Exploration* lab investigation procedures.

2. Prepare the following for each group:

   - 1 Styrofoam cup of water (filled half way) that has reached room temperature

3. Consider identifying one student group to help you with the teacher demonstration (e.g. set-up, recording data on the board).

4. You may use Celsius or Fahrenheit thermometers in this lab. Example answers are reported in Fahrenheit.

5. Consider providing your students with time to practice using Celsius and/or Fahrenheit thermometers correctly prior to beginning the lab.

TIMESAVER: Use the demonstration video in the student pre-lab materials in place of the in-class teacher-led demonstration. Provide students with the data found in Table A on page 36 of the Teacher Edition after your class has viewed the video.

Suggested Instructional Plan

1. Review scientific vocabulary and knowledge prerequisites:

Thermometer	**Temperature**	
State Change	**Fahrenheit Scale**	**Celsius Scale**

2. Consider having your students research the role temperature plays in changes of state (e.g. ice to water to gas) prior to beginning the lab investigation.

3. Distribute Materials:

   It is recommended that materials are organized into stations for easier distribution. Materials are recommended based on the amount needed for 1 class of 30 students. Students should be arranged in small groups of 4-5.

   Each group should receive:

   - Student Lab Investigation Worksheets (1 per student)
   - Student Materials

4. Ask students to read *Safe Practices* and complete the focus questions for this lab investigation.

5. Before beginning the lab investigation:

   a. Require students to wash their hands.

b. Emphasize the importance of practicing good food safety behaviors by not consuming substances used as part of the lab investigation.

6. Launch the lab by completing the **teacher demonstration**. The demonstration should show students how to how to calibrate a thermometer using the Boiling Water Method. Students will also observe temperature and state changes that occur when water is heated.

7. Fill a medium pot half way with room temperature water. Insert a thermometer to measure the temperature of the water prior to heating. The thermometer should not touch the sides or bottom of the pot when measuring the temperature of the water. Also, be sure to keep the thermometer immersed in the water when taking the temperature. Remind students to practice this as well.

8. Turn on a burner and begin to warm the pot of water. Set your timer for 10 minutes.

9. Describe and show students how to read a thermometer during your demonstration.

IMPORTANT NOTE: Be careful when handling the thermometer. Due to heat transfer from the boiling water, the thermometer may be hot to touch. For safety, use an oven mitt when reading the thermometer.

10. Measure the temperature of the water every two minutes for 10 minutes (water needs to be heated to the boiling point). Have students record these temperatures in their lab notes.

11. Once the water reaches a rolling boil, wait 30 seconds and then read the temperature on the bimetallic thermometer. At sea level, the temperature should read 212°F while still submerged in the boiling water. If you are cooking at a higher altitude, water will boil at a slightly lower temperature due to the reduced air pressure. For example, at 2,000 feet above sea level, the boiling temperature of water is 208°F. If the thermometer reads a different temperature, adjust the thermometer to read the correct temperature. If you are unable to calibrate your thermometer simply add or subtract the difference (actual temperature +/- 32˚F). For more information on calibrating a bimetallic stemmed thermometer see *Background Information.*

12. As the water heats to boiling, your class should observe an increase in the water's temperature. Once the water reaches a rolling boil, the temperature should read 212°F or 100°C if the thermometer was properly calibrated. Additionally, students should begin observing water changing from a liquid state to a gaseous state.

13. Allow students to begin their lab investigation. Students will use the Ice Water Method to determine if a thermometer is calibrated correctly and to observe temperature/state changes.

14. After mixing room temperature water with ice, students should begin to observe a decrease in the water's temperature. After several minutes, the temperature should read approximately 32°F or 0°C (freezing) if the thermometer was properly calibrated. Students may not observe any immediate state changes; however, the warmer temperature of the water will cause the ice chips to slowly melt from a solid to a liquid. By the end of the class, students should clearly see this state change.

15. Allow students to work in small groups on the Student Lab Investigation worksheet to further explore the topic and respond to lab questions.

16. Follow-up with a class discussion about the importance of using accurate tools and methods of measurement. Remind students about the role temperature plays in food preparation and the prevention of foodborne illness. Follow-up this lesson with the *Investigating Your Health* investigation. See *Teacher Bites* for ideas on how to further extend this lesson.

Teacher Bites: Lesson Extension

- Use the calibrated thermometers to explore state changes in other substances
- Explore factors that can impact state changes (i.e. the addition of salt to ice or boiling water)
- Explore the different boiling points of various liquid substances

Food Explorations Lab II:
Invisible Creatures

TEACHER LESSON PREPARATION

Lesson Focus

Understand the importance of the proper hand washing technique for general health and disease prevention.

Lesson Description

Students will use Glo Germ™ and ultraviolet light to see the effectiveness of hand-washing on removing the simulated bacteria from their hands.

Academic Content Standards

ELA Common Core Standards for Literacy in Science and Technical Subjects (R-reading, W-writing, SL-speaking and listening, L-language) Grades 6-8

R-1 Cite specific textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

R-3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

R-4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical content relevant to grade (6-8) text and topics.

R-10 Read and comprehend complex literary and informational texts independently and proficiently.

W-2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

W-9 Draw evidence from informational texts to support analysis, reflection, and research.

SL-1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade (6-8) topics, texts, and issues, building on others' ideas and expressing their own clearly.

L-1 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Next Generation Science Standards

Performance Expectations

MS-LS2-2 Construct an explanation that predicts patterns and interactions among organisms across multiple ecosystems.

Science and Engineering Practices

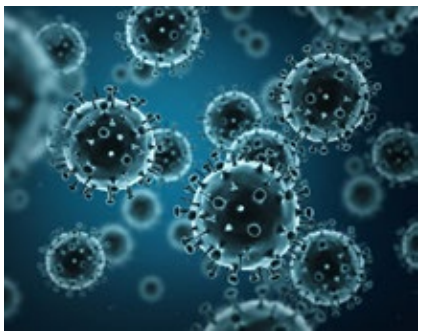
Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.

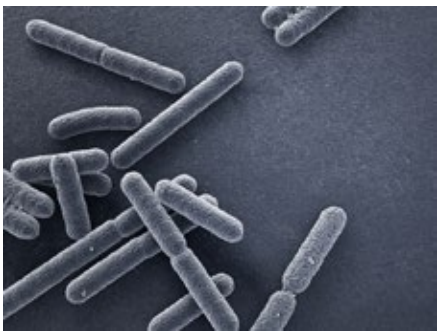
Crosscutting Concepts

Patterns can be used to identify cause and effect relationships.

Background Information

Bacteria are single-celled organisms. They are found in everything, including our food. Bacteria do not have a nucleus; rather, they have DNA that forms a nucleoid. We come into contact with bacteria everyday. It is important that we protect ourselves from harmful bacteria by washing our hands. We use our hands all the time, exposing them to harmful bacteria, or germs. Because we use our hands for many purposes, germs can be found all over our hands, including under our fingernails. While bacteria can sometimes be harmful to us, there are other types of bacteria that can be good for our health. For example, a healthy digestive system is full of good bacteria. These bacteria can also be found in food, like yogurt. See *Chapter 5: Milk & Cheese Lab II* to explore healthy bacteria further.





Materials

Student Materials

NOTE: Student material list is based on 1 group of 4-5 students. Refer to the "Equipment and Material Lists by Chapter" on page XIV of the FoodMASTER Middle Teacher Edition for whole class estimates (24-30 students divided into 6 groups) for perishable and nonperishable materials.

Safety goggles
aprons (optional)
Glo Germ™
1 UV Light
Soap
Access to warm water
Colored pencils or markers

Teacher Pre-Lab Preparation

1. Review teacher background information, teacher preparation slides, student pre-lab slides/videos, student introduction, suggested instructional plan, and the student *Food Exploration* lab investigation procedures.

2. Prepare materials for each group.

3. Student groups should share the Glo Germ™ and UV light.

   IMPORTANT NOTE: Glo Germ™ is a liquid, gel or powder that contains plastic simulated bacteria. The UV light will illuminate the simulated bacteria to allow students to test the effectiveness of their hand washing practices. It is important for students to understand the glowing bacteria on their hands are not real bacteria, but rather simulated bacteria from the Glo GermTM product.

4. Glo Germ™ only works with a UV light, and simulated bacteria are best observed in a darkened room. Guide students through the procedure together, so that the room can be darkened during periods of observation.

5. If you do not have access to a sink in your classroom, consider assigning 1-2 students (or 1 student per group) to participate in the hand-washing portion of the lab. These students can return to the classroom and demonstrate the remaining portions of the lab.

Suggested Instructional Plan

1. Review scientific vocabulary and knowledge prerequisites:

   Bacteria **Germs**

2. Consider having your students research the role bacteria (unicellular organisms) play in spreading disease prior to beginning the lab investigation.

3. Distribute Materials:

   It is recommended that materials are organized into stations for easier distribution. Materials are recommended based on the amount needed for 1 class of 30 students. Students should be arranged in small groups of 4-5.

   Each group should receive:

   - Student Lab Investigation Worksheets (1 per student)
   - Student Lab Materials

4. If applicable, ask students to read *Safe Practices* and complete the focus questions for this lab investigation.

5. In this lab, students should *not* wash their hands prior to beginning the lab investigation.

6. Launch the lab by asking students to respond to the investigation question about where bacteria are most concentrated on their hands.

    a. *Palm:* The palm of the hand should show simulated bacteria. The bacteria will likely be concentrated within the creases of the palm.

    b. *Finger Nails:* Fingernails should show a large concentration of simulated bacteria, particularly around the bed of the nail.

    c. *Wrist:* The wrist should show some simulated bacteria, particularly on the underside.

    d. *Fingers:* Fingers may show some simulated bacteria, especially within the creases of the knuckles.

    e. *Thumb:* The thumb should show a good amount of simulated bacteria present.

7. Following their predictions, students should put a small amount of the Glo Germ™ on their hands (about the size of a nickel). Students should rub the gel all over their hands, including between their fingers and around the nails and thumbs. After applying the gel, the whole hand should glow under the UV light, showing that we can have germs all over our hands.

8. Instruct the students to wash their hands using warm water and soap.

9. After the hand washing, students should again view their hand under the UV light. Many may still observe a large amount of bacteria present around the nail bed, on the wrist, and the back of the hand. These are areas people tend to forget about when washing their hands.

10. Allow students to work in small groups on the Student Lab Investigation worksheet to further explore the topic and respond to lab questions.

11. Follow-up with a class discussion about the importance of proper hand washing for preventing the spread of bacteria. Follow-up this lesson with the *Investigating Your Health* investigation. See *Teacher Bites* for ideas on how to further extend this lesson.

Teacher Bites: Lesson Extension

- Use petri dishes to grow bacteria obtained on the body or from various surfaces in the school environment

Food Explorations Lab III:
Multiplying Organisms

TEACHER LESSON PREPARATION

Lesson Focus

Understand the factors that impact mold growth and its application to food safety.

Lesson Description

Students will place three types of food (i.e. apple, cheese, bread) in two different environments (aerobic and anaerobic) to determine which food type and environment is best for the growth of mold.

Academic Content Standards

ELA Common Core Standards for Literacy in Science and Technical Subjects (R-reading, W-writing, SL-speaking and listening, L-language) Grades 6-8

R-1 Cite specific textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

R-3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

R-4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical content relevant to grade (6-8) text and topics.

R-10 Read and comprehend complex literary and informational texts independently and proficiently.

W-2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

W-9 Draw evidence from informational texts to support analysis, reflection, and research.

SL-1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade (6-8) topics, texts, and issues, building on others' ideas and expressing their own clearly.

L-1 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Next Generation Science Standards

Performance Expectations

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Disciplinary Core Ideas

LS1.C Organization for Matter and Energy Flow in Organisms.

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with non-living factors.
- Growth of organisms and population increases are limited by access to resources.

Science and Engineering Practices

Analyze and interpret data to provide evidence for phenomena.

Crosscutting Concepts

Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Background Information

There are four main types of microorganisms that can cause disease: bacteria, viruses, molds, and fungi. These microorganisms are also referred to as **pathogens**. It is important to understand pathogens and how they grow to prevent disease. **Bacteria** are single-celled microorganisms that can be found in many environments. Some can even thrive in extreme temperatures. Not all bacteria are harmful, but it is important to prevent the spread of harmful bacteria by taking proper food safety precautions. **Viruses** require a living host, like people or animals, to survive. They only survive to multiply, which is harmful for its host. **Molds** are multi-celled organisms that can be found on food. Most molds prefer warmer temperatures; however, some molds can survive on salt and sugar, making it easier to survive in colder temperatures. These molds can thrive on foods in the refrigerator, like fruit and salty meats. There are many factors that can affect microbial growth. To remember what these factors are use the mnemonic device **FAT TOM** (Food, Acidity, Time, Temperature, Oxygen, Moisture). **Fungi** are eukaryotic organisms that are found in soil. Foods such as sweet potatoes, corn, and nuts have been found to grow pathogenic fungi. Food high in protein, like milk and eggs, are more susceptible to microbial growth. To prevent microbial growth, food must not be in the temperature danger zone (40 - 140 °F) for more than two hours. Foods susceptible to microbial growth contain certain nutrients that can be found in protein-rich foods, like milk and eggs. Foods with little to no acidity are considered the best host for pathogen growth; however, bacteria can thrive in a slightly acidic pH (4.6) as well. Most microbes, or pathogens in this case, are **aerobic** and require oxygen for growth. Those that do not require oxygen are called **anaerobic**. Foods high in moisture promote microbial growth because many pathogens require water for growth. In the end, molds can be harmful or beneficial. Harmful molds grow on the surface of dry foods like bread. Beneficial molds grow inside of foods, like Blue cheese.

Materials

Teacher Materials

NOTE: Teacher material list is based on 6 groups of 4-5 students (24-30 students total).

6 paper plates for holding prepared samples
1 apple cut into 12 slices
6 slices of white bread
12 pieces of hard cheese cut from a cheese block (e.g. cheddar)

Student Materials

NOTE: Student material list is based on 1 group of 4-5 students. Refer to the "Equipment and Material Lists by Chapter" on page XIV of the FoodMASTER Middle Teacher Edition for whole class estimates (24-30 students divided into 6 groups) for perishable and nonperishable materials.

Safety goggles
1 slice of white bread
2 pieces of cheese
1 plastic sandwich bag
1 black marker
2-3 microscope slides (optional)
aprons (optional)
2 slices of apple
1 paper plate
1 plastic knife
1 microscope (optional)

Teacher Pre-Lab Preparation

1. Review teacher background information, teacher preparation slides, student pre-lab slides/videos, student introduction, suggested instructional plan, and the student *Food Exploration* lab investigation procedures.

2. Prepare the food samples for each group.

3. Food samples may take as long as three weeks to grow mold. Preservatives can negatively impact mold growth. However, organic or home baked (i.e. bread) versions of food may produce more mold, more quickly.

4. If leaving food out on paper plates is problematic, you may place these samples in plastic bags or a cardboard box. However, make sure the bag or box has good airflow. The aerobic food samples need to be exposed to air.

TIMESAVER: Prepare food samples ahead of time for student observation and quicker lab completion. You may also consider having one set of samples for the entire class versus each group.

Suggested Instructional Plan

1. Review scientific vocabulary and knowledge prerequisites:

   Bacteria **Aerobic** **Anaerobic**

2. Consider having your students research examples of recent outbreaks of foodborne illness prior to beginning the lab investigation (see *Investigating Your Health*).

3. Distribute Materials:

   It is recommended that materials are organized into stations for easier distribution. Materials are recommended based on the amount needed for 1 class of 30 students. Students should be arranged in small groups of 4-5.

   Each group should receive:

   - Student Lab Investigation Worksheets (1 per student)
   - Student Lab Materials

4. If applicable, ask students to read *Safe Practices* and complete the focus questions for this lab investigation.

5. Before beginning the lab investigation:

   a. Require students to wash their hands.

   b. Emphasize the importance of practicing good food safety behaviors by not consuming substances used as part of the lab investigation.

6. Launch the lab by asking students to respond to which food type and environment (aerobic or anaerobic) will produce the most mold growth.

   a. **Aerobic**: Some mold growth may be observed on the foods that were exposed to the aerobic environment. The foods should be dry and in some cases smaller in size due to the loss of moisture content.

   b. **Anaerobic**: A significant amount of mold growth should be observed on the foods that were exposed to an anaerobic environment. The most mold growth will likely occur on the cheese.

7. Allow students to work in small groups on the Student Lab Investigation worksheet to further explore the topic and respond to lab questions.

8. Follow-up with a class discussion about mold growth on food and its relevance to food safety. Follow-up this lesson with the *Investigating Your Health* investigation. See *Teacher Bites* for ideas on how to further extend this lesson.

Teacher Bites: Lesson Extension

- Explore how temperature impacts mold growth

Investigating Your Health:
Fearless Food Safety

STUDENT HEALTH INVESTIGATION

Lesson Focus

Explore ways to prevent foodborne illness. Students will research correct methods for proper hand washing as one aspect of food safety.

Lesson Description

Students will keep a log of daily hand washing and describe occasions when washing hands is necessary and proper methods of hand washing. The students will also research ways foodborne illness can occur and how to prevent it.

Academic Content Standards

ELA Common Core Standards for Literacy in Science and Technical Subjects (R-reading, W-writing, SL-speaking and listening, L-language) Grades 6-8

R-1 Cite specific textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

R-4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical content relevant to grade (6-8) text and topics.

R-10 Read and comprehend science/technical texts in the grades 6-8 text.

W-2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

W-7 Conduct short research projects to answer a question (including a self-generated question) drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

W-9 Draw evidence from informational texts to support analysis, reflection, and research.

Next Generation Science Standards

Performance Expectations

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

Disciplinary Core Ideas

LS1.C Organization for Matter and Energy Flow in Organisms: Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with non-living factors.

Science and Engineering Practices

Analyze and interpret data to provide evidence for phenomena.

Crosscutting Concepts

Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Suggested Instructional Plan

1. Review scientific vocabulary and knowledge prerequisites:

   Food Safety **Cross Contamination** **Foodborne Illness**

2. Instruct students to research ways to prevent foodborne illness. Students should also seek to identify proper hand washing techniques as one aspect of food safety.

3. See the Teacher Edition workbook for answers to the *Investigating Your Health* lab questions.

4. If completed in-class, allow students to work in small groups on the Investigation worksheet to further explore the topic and respond to questions.

5. Follow-up with a class discussion about the importance of hand washing and student generated ideas for preventing foodborne illness.