



Lesson Plan

Unit 2: Lesson 1 of 2

Food Contamination (Chemical, Physical and Biological Hazards)

Created: 08/2022 by the National FFA Organization

This lesson teaches students how to recognize the three main sources of food contamination (chemical, physical and biological hazards) and the difference between food safety and food quality concerns. This lesson will also prepare students to compete in the “Customer Inquiry” portion of the National FFA Food Science and Technology Career Development Event.

Student Learning Objectives:

After completing these activities, students will ...

1. Develop a letter to a company using correct terminology.
2. Describe three different hazards in food production: chemical, physical and biological.
3. Differentiate between food safety and food quality problems in the food industry.

Suggested Grade Level:

Grades 9 and 10 (This lesson is written so instructors can scale up or down based on class needs.)

Suggested Time: 60 minutes (*Time requirements may vary based upon student understanding and class schedule.)

Resources/References:

1. Textbook: *Principles of Food Science*, 4th Edition, Janet D. Ward (Facts/information in this lesson were obtained from the textbook.)
2. Video: <http://www.youtube.com/watch?feature=endscreen&NR=1&v=hPeRYJoWzZE>
3. For Optional/Extended Learning Activity: <https://www.fsis.usda.gov/careers>

Related Resources:

1. <https://www.fsis.usda.gov/food-safety>

Equipment and Supplies Needed:

1. Bellringer:
 - a. One copy per student of the handout “Food Quality and Safety Bellringer”
2. Introduction:
 - a. PowerPoint: “Food Safety and Defense Issues”
3. Activity 1:
 - a. One copy per student of the handout “Picasso Paints the Three Sources of Contamination”
 - b. Drawing supplies: crayons, markers, colored pencils, etc.
4. Follow-up Activity:
 - a. One copy of the “Customer Inquiry Letters: Student Packet” for each student (Print them in a packet to give to students.)
 - b. One copy of the “Student Answer Sheet” per student
5. Exit Ticket:
 - a. One copy of the “Create Your Own Complaint Letter” worksheet per student

Lesson Preparation:

1. Follow-up Activity: Be sure to have Customer Inquiry Letter Packet and Student Answer Sheets printed and ready for distribution in class (before class).
2. This lesson requires drawing materials: crayons, markers, etc.

Vocabulary:

1. Food safety
2. Food defense
3. Food quality
4. Pathogens
5. Spoilage organisms/bacteria
6. Good bacteria
7. Biological hazard
8. Pathogenic bacteria
9. Chemical hazard
10. Physical hazard
11. Radiological hazard
12. Unintended contamination
13. Intentional contamination

Cross-Curricular Connections:

Science	English/Language Arts	Technology
• Use correct scientific terminology	• Exit ticket requires students to write a letter to a company using specific terminology.	• Bell ringer activity requires students to use technology/internet to secure a news article on food contamination.

Virtual Instruction Ideas:

This lesson can be taught 100% online/virtually if needed. It is recommended the teacher speak with students learning virtually/online prior to this lesson to be sure students have access to materials needed for the lesson.

Student Activity Sheets:

Direct access to student activity sheets without lesson plan or answer key for easy upload to a learning management system or printing for classwork.

<https://ffa.box.com/s/cjztt5z7a1ahitmsv6xp35z0297xngu3> (Word)

<https://ffa.box.com/s/6lbnlfkv3uwleudtvqxethdlrmzi0w3k> (PDF)

<https://ffa.box.com/s/hrx97mgb88elkkj834808jlnbqw5otxs> (Non-Designed)

<https://docs.google.com/document/d/1dNtleq3NGzhpHJn27zLqYct8G40AnzQikyVmgu7JiBU/copy> (Google)

These Activities are Aligned to the Following Standards:

AFNR Performance Element

- FPP.01. Develop and implement procedures to ensure safety, sanitation, and quality in food product and processing facilities.

FFA Precept

- FFA.PL-A.Action: Assume responsibility and take the necessary steps to achieve the desired results, no matter what the goal or task at hand.
- FFA.PL-C.Vision: Visualize the future and how to get there.
- FFA.PL-E.Awareness: Understand personal vision, mission and goals.
- FFA.PG-J.Mental Growth: Embrace cognitive and intellectual development relative to reasoning, thinking and coping.
- FFA-CS-M.Communication: Effectively interact with others in personal and professional settings.
- FFA-CS-N.Decision Making: Analyze a situation and execute an appropriate course of action.

Common Career Technical Core

- AG-FD1 Develop and implement procedures to ensure safety, sanitation, and quality in food product and processing facilities.

NASDCTec

- AGPA01.02 Conduct food product development and research activities that demonstrate application of food science principles to enhance products.

AFNR Cluster Skills

- CS.03. Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

Common Core – Reading: Informational Text

- CCSS.ELA-Literacy.RI.9-10.2 Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.
- CCSS.ELA-Literacy.RI.9-10.6 Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose.

Common Core – Writing

- CCSS.ELA-Literacy.W.9-10.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

Common Core – Speaking and Listening

- CCSS.ELA-Literacy.SL.9-10.1.A Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- CCSS.ELA-Literacy.SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Common Core – Science & Technical Subjects

- CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CCSS.ELA-Literacy.RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- CCSS.ELA-Literacy.RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Common Core – Literacy in Science & Technical Subjects: Writing

- CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Common Core – Math Practices

- CCSS.MATH.PRACTICE.MP6 Attend to precision.

National Standards for Financial Literacy

- Buying Goods and Services, Benchmarks: Grade 12, Statement 7 Governments establish laws and institutions to provide consumers with information about goods or services being purchased and to protect consumers from fraud.

AFNR Career Ready Practices

- CRP.02. Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.
- CRP.04. Communicate clearly, effectively, and with reason. Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods.
- CRP.05. Consider the environmental, social and economic impact of decisions. Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organizations and the environment.
- CRP.06. Demonstrate creativity and innovation. Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization.

- CRP.07. Employ valid and reliable research strategies. Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies.
- CRP.08. Utilize critical thinking to make sense of problems and persevere in solving them. Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem.
- CRP.11 Use technology to enhance productivity. Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems.

Partnership for 21st Century Skills

- Critical Thinking and Problem Solving
- Flexibility and Adaptability
- Implement Innovations
- Information Literacy
- Productivity and Accountability
- Think Creatively

Lesson Plan:

1. Bell Ringer:

- a. Hand out the “Food Quality and Safety Bellringer” worksheet when students walk into the classroom.
- b. After all students are in their seats, the bell rings/class starts, tell students they will have another two minutes to prepare to share what they found with the class.
- c. Allow students to each share their findings. They should share: the name of the article, where it happened, what happened and any ideas they have on how it could have been prevented.
- d. Transition into the Introduction section of the lesson.

2. Introduction:

- a. Remind students it is wise to take notes during the following section. Show/discuss with students the PowerPoint titled “Food Safety and Defense Issues.” (Note: Video clip is approximately 12 minutes in length.)

3. Activity 1:

- a. Have crayons, markers and colored pencils available for students to use for this activity.
- b. Give each student the worksheet titled “Picasso Paints the Three Sources of Contamination” (Picasso e-moment activity).
- c. Read the directions with students. Ask students if they have any questions.
- d. Allow 15 to 20 minutes for this activity. Have students share their work when finished. Consider placing all pieces of art at the front of the room, across the board, etc. for all students to see. Teachers may consider hanging student work in the hallway, library, etc.

4. Follow-up:

- a. Students will be challenged to identify the three common contaminant groups and state the appropriate category. (Preparation for the “Customer Inquiry Letters” portion of the food science CDE.)
- b. Explain to students what they will be doing: *You will be given a packet of Customer Inquiry/Complaint Letters. You will need to read them and determine if the concern is (1) a food safety or food quality issue, and then (2) determine which contaminate it is: physical, chemical or biological. What questions do you have? You may not use the internet or another source for information — just your brain!*
- c. Give each student a “Customer Inquiry Letters: Student Packet” and “Customer Inquiry Letters: Student Answer Sheet.”
- d. Students may turn in their answer sheets when complete or sit quietly. Teachers should inform students what to do when they finish.
- e. When all students finish, be sure to read over the letters and go over the answers together. (Teachers may wish to do this on another date after grading student responses to letters.)

5. Optional – Extended Learning Opportunities (Not factored into time requirement):

- a. Using the following website, have students research career opportunities with the USDA in food science. Consider having students find answers to the following: What are the current available careers? Why work for the USDA in food science? What are the values and mindset of the USDA? Why join the FSIS workforce? Who works for the USDA? What is its history?
 - i. Website to direct students to: <https://www.fsis.usda.gov/careers>.

6. Exit Ticket:

- a. Students will write their own customer complaint letter using the handout provided.
- b. Give each student a copy of the “Create Your Own Complaint Letter.” Read directions with students. Ask if anyone has questions. Allow students to work on the assignment until the end of the class period. (Should take approximately five to 10 minutes total.)

Name: _____

Food Quality and Safety Bellringer

Directions:

Using the internet on your device, find one article in the news relating to food contamination. Read the article and be prepared to verbally share with your classmates what you learned. Be sure to include the following:

1. Name of the article: _____
2. Where did this issue happen?
3. In your own words, describe what happened.
4. How do you think this could have been prevented?
5. What impact do you think this had on the food science industry?

After listening to your classmates share the articles they found, what role does food safety and quality play in your life?



Name: _____

Picasso Paints the Three Sources of Contamination

Directions:

Using the information learned about the three sources of food contamination (physical, chemical, biological), draw three items that serve as an example of each contaminate. You may not use words, only drawings. Example: Physical Hazard — one could draw a glass jar, a metal bolt, a piece of jewelry. Be sure to have **three examples/drawings** for **each** of the contaminants listed below.

PHYSICAL:

CHEMICAL:

BIOLOGICAL:

Name: _____

Customer Inquiry Letters: Student Packet

Directions:

Carefully read each customer letter and determine if the scenario is a food quality or food safety issue. THEN determine if the hazard is biological, chemical or physical. Circle the correct answer for each question, using the answer sheet provided.

- Use the following for EVERY customer letter:
 - The issue represented in the scenario is a (choose 1) ...
 - food safety issue.
 - food quality issue.
- Is the concern or hazard primarily (choose 1) ...
 - biological?
 - chemical?
 - physical?

LETTER 1:

Quality Assurance Manager
Moe and Larry Ice Cream Company
600 Brutus Avenue
Horseshoe, OH 94837

To Whom It May Concern:

I just wanted to let you know that I was eating your Chunky Chocolate Frog ice cream the other day, and I must say it was the worst ice cream I have ever had. I used to like that flavor, but it's like you cheapened it up like a bad date. It is definitely not the premium product I used to buy.

First off, I noticed that the nutrition label was different from the last time I bought it. There was less fat. Granted, people are looking for lower fat products, but if I wanted to eat low fat, I wouldn't buy ice cream! Then, once I opened it up and started to scoop out the ice cream, I noticed that there were less chocolate frogs (I don't even think they are chocolate anymore, not that I could find one to eat), and the fudge swirl was almost non-existent.

When I ate the product, I was even more disappointed, the ice cream texture was horrible. Ice cream should be creamy and smooth; this was like I had an ice cream cone at the beach and it fell off in the sand and I was eating it anyway. It was very gritty. I tried to spit it out and see if there was actual sand in there, but that was just a messy endeavor. I got it all over everything trying to find one of the stupid grains and hold on to it ... Anyway, I finally got one of the little grains in my hand, but it wasn't sand, it was more like sugar.

I don't know what you have done to your product, or even if the two problems are related, but I am very disappointed in the product. When I pay \$4.50 for a pint of ice cream, I want to enjoy every last bit of the ice cream. I let my dog eat this one. It was the most expensive dog treat I ever bought. When you change back to the food I have grown to love, let me know. Until then, I will no longer be a customer of yours!

Sincerely disappointed,

Mary Potter
EX MOE & LARRY ICE CREAM LOVER!
25 Burrow Lane
Hogwart, MA 56901

Name: _____

LETTER 2:

Hometown Meats
948 Meats Blvd
Meatmarket, IN 37898

To whom it may concern,

Yesterday in the evening, on March 1, I bought packaged beef at your store on 31 Rosemary Street. Unfortunately, this product not only did not meet any quality requirements, but it also gave me a number of serious inconveniences.

I am extremely dissatisfied and disappointed with your products because after eating dishes cooked from this beef, I had severe vomiting, fatigue and bloody diarrhea. My health condition did not allow me to go out, so I had to call for a doctor at home. Considering that the packaged beef from your store was the only product that I consumed since yesterday, I am rather sure it is the reason for my illness. I am waiting test results to confirm what I may have contracted through consumption of your meat.

I am your long-time and loyal client. I was always satisfied with the quality of products and services in your store. I hope we can come to a peaceful agreement on this issue.

Thank you,
Rosie Red

Name: _____

Customer Inquiry Letters: Student Answer Sheet

Directions:

Carefully read each customer letter and determine if the scenario is a food quality or food safety issue. THEN determine if the hazard is biological, chemical or physical. Circle the correct answer for each question, using the answer sheet provided below:

1. The issue represented in the scenario is a (choose 1) ...
 - food safety issue.
 - food quality issue.

Is the concern or hazard primarily (choose 1) ...

- biological?
- chemical?
- physical?

2. The issue represented in the scenario is a (choose 1) ...
 - food safety issue.
 - food quality issue.

Is the concern or hazard primarily (choose 1) ...

- biological?
- chemical?
- physical?

3. Describe why you selected the answers you did for each letter.

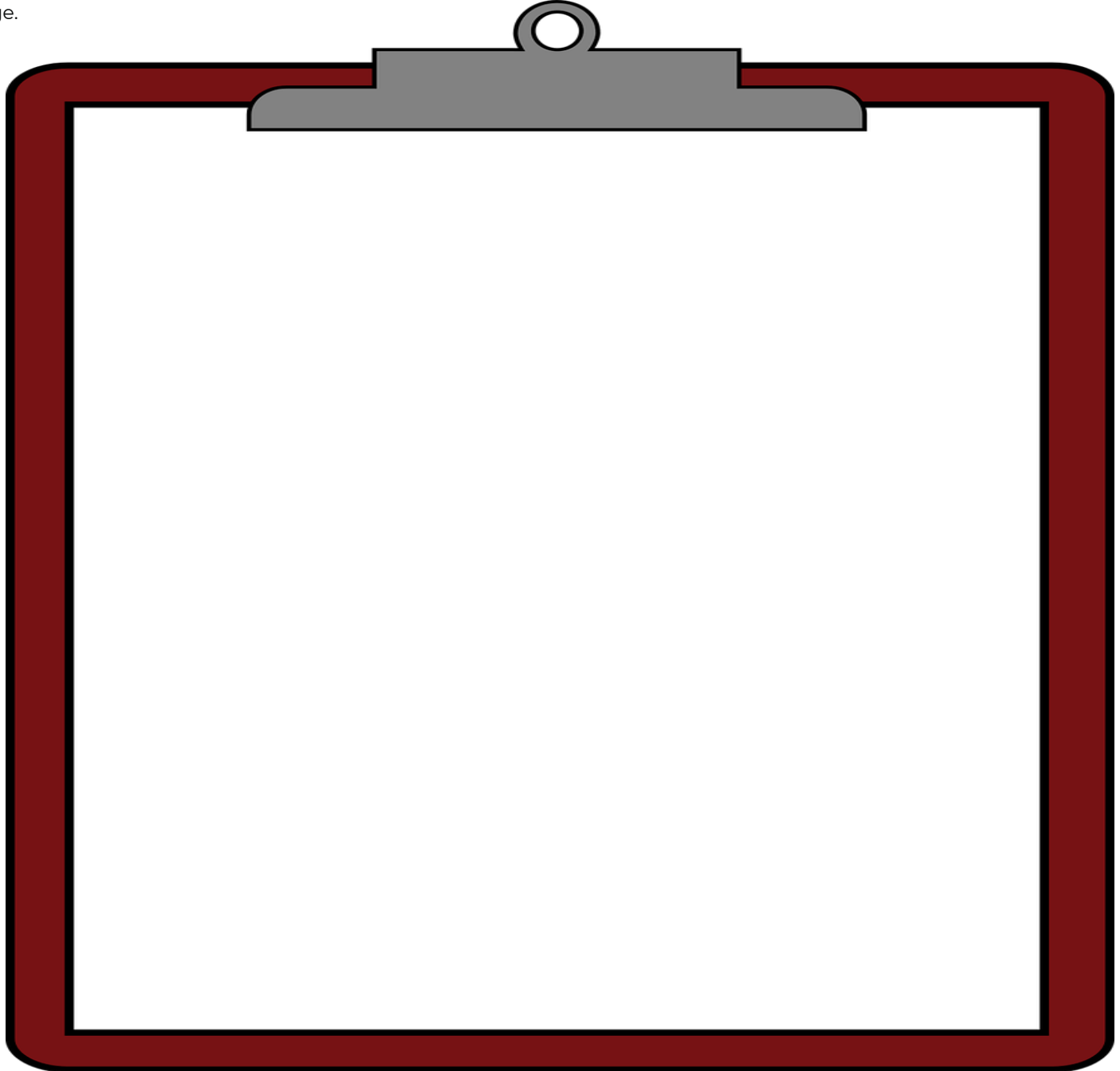
4. What is 1 possible cause of the problems addressed in Letter 1? Describe your answer.

Name: _____

Aligned to the following standards: FPP.01; FFA.PL-A.; FFA.PL-C.; FFA.PL-E.; FFA.PG-J.; FFA-CS-M.; FFA-CS-N.; AG-FD1; AGPA01.02; CS.03; CCSS.ELA.RI.9-10.2; CCSS.ELA.RI.9-10.6; CCSS.ELA.W.9-10.2; CCSS.ELA.SL.9-10.1.A; CCSS.ELA.SL.9-10.4; CCSS.ELA.RST.9-10.1; CCSS.ELA.RST.9-10.2; CCSS.ELA.RST.9-10.3; CCSS.ELA.WHST.9-10.2; CCSS.ELA.WHST.9-10.4; MP6; Buying Goods and Services, Benchmarks: Grade 12; CRP.02; CRP.04; CRP.05; CRP.06; CRP.07; CRP.08; CRP.11.

Create Your Own Complaint Letter

Directions: Using the space provided below, create your own customer inquiry/complaint letter based on the article you found and reported on in the bellringer for this lesson. Be sure NOT to use what was already done in class in previous letters. Provide as much detail as possible in your letter. Provide the categories that your letter belongs in at the end of the page.



- This letter is an example of a (circle one) food quality issue OR food safety issue.
- This letter is an example of which type of contaminant (circle one)?
Biological Physical Chemical



Name: _____

KEY: Customer Inquiry Letters

1. Food quality; physical
2. Food safety; biological
3. Answers will vary. Letter 1: Quality is the concern (texture, taste). Letter 2: Safety is the concern (someone got sick from a meat product).
4. Texture and taste were very different. Causes for this could be the use of different ingredients, a change in how much of the chocolate was added, a change in how ingredients freeze together and/or it was frozen and held at the wrong temperature.