

Introduction • Lesson 1

Microbes and Our Food

Class periods required: One 30-min. class period

Supplement section: Introduction PA PAS for FCS: 9.3.3 B, 9.3.6 B, 9.3.9 B

National Education Standards: FCS 8.2.1, 8.2.3, 9.2.1; SC 5; LA 2, 3, 035, 132, 278.

LESSON SUMMARY

Students will learn about foodborne illness and the microbes that cause it. They will then identify key pathogens and describe how these pathogens can contaminate foods.

Objectives

The students will be able to:

- Differentiate among bacteria, yeasts, molds, viruses, and parasites.
- Write/name five important foodborne pathogens and give examples of at least two sources, two symptoms of illness, and two ways to prevent contamination from these pathogens.
- Find a newspaper article about a case or outbreak of foodborne illness, determine how the person(s) got sick, and write a one-page report.

Materials Provided

Overheads:

1. Channel 8 Health News Report
2. Bacteria
3. Most Wanted: *Clostridium Perfringens*
4. Most Wanted: *Clostridium Botulinum*
5. Most Wanted: *Listeria Monocytogenes*
6. Most Wanted: *Staphylococcus Aureus*
7. Most Wanted: *Salmonella*
8. Yeasts and Molds
9. Viruses and Parasites

Worksheets:

1. Pathogens and Foodborne Illness
2. Vocabulary

Teacher Information Sheets:

1. Pathogens and Foodborne Illness worksheet key
2. Evaluation for Pathogen Poster or Pamphlet
3. Evaluation for NIE Activity
4. Pathogens and Foodborne Illness chart
5. Glossary of Bolded Terms

Suggested Presentation Aids

- Examples of spoiled food to show the class, e.g., a rotten apple, black banana, moldy bread, spoiled milk.
- Two baby bottles (one to be kept at room temperature, one to be refrigerated) containing formula prepared from powder (purchased commercially) and water.
- (Optional) An agar plate containing microorganisms. (For instructions on obtaining agar plates and bacteria, yeasts, or molds, please see the reference section at the end of this lesson plan).
- (Optional) Iowa State Web site Food Safety Lesson 1: What's Bugging You? The Web site contains interactive lessons about food safety and pictures of microbes that can be downloaded, if agar plates or microscopes are not available. For Web site address and instructions on getting the pictures, please see the reference section at the end of this plan.
- Newspapers, scissors, paper.

LESSON PLAN

Introduction

- (Overhead 1) Read the Channel 8 Health news report about a little girl who had a foodborne illness. Lead a class discussion in which students speculate about what kind of microorganism caused the illness and how it could have gotten into the cider.
- Explain that the organism causing the illness was *E. coli*, a type of bacteria, and that bacteria live everywhere in our environment, including in our food. These particular bacteria could have gotten into the cider from dirty apples, and since the cider was unpasteurized the bacteria could grow and cause people to get sick.

Lesson sequence

- Provide Worksheet 2 for students to write vocabulary word definitions.
- Bacteria are **microorganisms**, single-celled creatures that live everywhere in the world, including in air, water, dirt, our bodies, and even food. Other types of microorganisms that can cause problems in foods are yeasts, molds, and viruses and parasites.
- Many microorganisms won't hurt us, but a few make us sick. Microorganisms that are harmful to people are called **pathogens**.
- Pathogens like to eat a lot of the same things we do. One of the jobs of food scientists is to identify and detect pathogens growing in foods so they can keep these pathogens from causing people to get sick.
- **Bacteria** (Overhead 2) are microorganisms that can either be helpful or harmful to people. Bacteria are usually either shaped like a circle (cocci) or an oval (rod) and are so tiny they can be seen only when you look at them through a microscope. Different types of bacteria have been given Latin names so scientists can tell them apart.

- **Pathogenic Bacteria** (Overheads 3-7). Briefly describe each of the bacteria depicted on these posters, explaining how they can enter foods.
- **Yeasts and Molds** (Overhead 8). Yeasts usually don't make us sick, but they can spoil foods. Have you ever tasted some fruit juice, and it tastes yeasty, like bread? It probably had some yeast growing in it. Yeasts like to grow in foods with lots of sugar. We actually add yeasts to some foods, like bread, because they help it to rise. Molds are microorganisms that cause the fluffy, hairy growths you see on spoiled cheese or breads. They look almost like little trees, and the round things you see here are called fruiting bodies (point to picture of mold). They fall off this stalk and allow the mold to spread to other foods. (Show examples of moldy food. Ask if anyone has anything that looks like that in his or her refrigerator.)
- **Viruses and Parasites** (Overhead 9). Viruses are the smallest living things on earth. They are even smaller than bacteria. Viruses cause illnesses like colds or the flu. Viruses can get into food when you sneeze or cough on it, or don't wash your hands and touch the food after sneezing and coughing into your hands. Parasites are things like this amoebae (point to picture of amoebae). They are actually tiny animals that can be seen only with a microscope. Amoebas live in water and we can get sick from drinking them. That's why when you're traveling overseas you should always boil your water or drink bottled water.

Closure

- Let students look at examples of bacteria and yeasts on the agar plates or foods you brought. Show them the two bottles of baby formula. Ask them to record how the formula looks and smells in each bottle. Then place one of the bottles in a secluded area of the room and the other in

the refrigerator. The next day, ask the students to rate the bottles again. How has the formula changed? If possible, rate again in a week. Ask students to speculate on what kinds of organisms could be found in the bottles.

Suggested Learning Activities

- Using a newspaper, find an article about a case or outbreak of foodborne illness. Pretend you are a food scientist trying to discover why the person/people got sick, and write a one-page report answering the four questions below. Include a copy of the newspaper article with your report.
Hint: If you have trouble finding articles, look in microfiche databases or on Web pages.
1. What food caused the outbreak?
 2. Describe the pathogen that caused people to get sick. What is its scientific name? What kinds of food can it be found in?
 3. How do you think the pathogen could have gotten into the food in the first place?
 4. What was the result of the case/outbreak? Did anyone get sick? Did anyone die?

Evaluation

- Worksheet 1 and Teacher information answer sheet 1: Pathogens and Foodborne Illness. Match the terms to definitions to differentiate among bacteria, yeasts, molds, viruses, and parasites.
- Create a poster or pamphlet that identifies foodborne pathogens, food sources, symptoms of illness, and ways to resist or prevent them (Teacher information sheet 2).
- Newspaper article report about a case or outbreak of foodborne illness (Teacher information sheet 3).
- Quiz #1.
- Examination #1 at the end of the Introduction unit.

References

- Pathogens and Foodborne Illness chart: List specific details about pathogenic microorganisms. (Teacher information sheet 4)
- Glossary (Teacher information sheet 5)
- Agar plates can be obtained from:
Carolina Biological Supply Company
2700 York Road
Burlington, NC 27215
1-800-334-5551
Catalog number: D8-82-1860
Cost: \$14.50/10 plates

To inoculate the plate with microorganisms, swipe a clean Q-tip or sterile swab across the surface of moldy or spoiled food. Then wipe the swab across the surface of the plates. Make at least four plates from different parts of the food. Incubate the plates in a moist, dark, warm place like an incubator, bathroom, or closet, until growth is seen on the plates (may take one to ten days.) Molds will have a fuzzy appearance, while yeast colonies will appear round and yellow. Bacterial colonies will probably be small, round, and white or pink. Seal the agar plates shut with tape. These can be stored for up to one year in sealed plastic bags in a refrigerator. (Be careful not to contaminate food!)

- Iowa State University Extension Web site
To find pictures of pathogens, access the Web site at <http://www.extension.iastate.edu/foodsafety/>. Then click on Food Safety Lessons. Next click on "Lesson 1: What's Bugging you?" located on the menu. Next, scroll through pages until pathogen pictures are reached, using the "next" button in the side menu. This Web site can be used as a student reference as well as a teacher reference. It contains interactive lessons about food safety, as well as tests to assess students' knowledge.

Overhead 1

Channel 8 Health News

August 5, 1998

A young family in Waterbury recently lived through a nightmare. Their two-and--half-year-old daughter, Karissa, almost died when she drank contaminated apple juice. “It’s scary that something like that could be spread that way. You wouldn’t think something unseen could be so lethal,” said Greg Daly, Karissa’s father.”

An invisible organism made Karissa Daly deathly ill. Karissa’s mother, Raini, unknowingly gave her daughter apple cider contaminated with the organism. It almost took the life of this little girl. “She just had so much diarrhea and then the blood started scaring me,” said Raini Daly.

After several trips to the doctor, more bloody diarrhea, and vomiting, Karissa was rushed to the hospital.

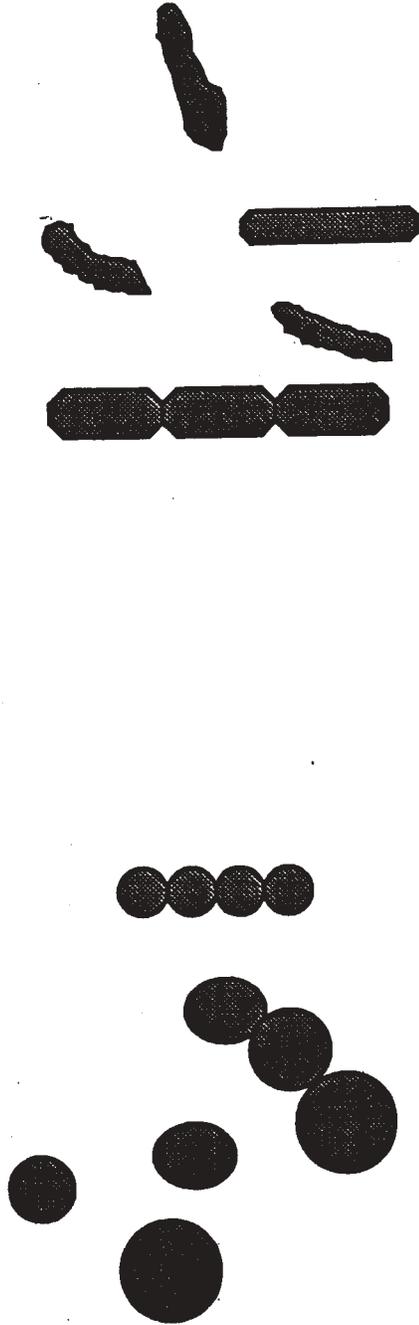
Karissa had H.U.S., hemolytic uremic syndrome, which can be fatal. She needed an emergency blood transfusion. Doctors said the microorganism was eating her red blood cells. Karissa was weak for quite a while. She did recover, but the H.U.S. still affects her.

Raini: “She’s always sick—maybe it’s just bad luck. I have no idea. We watch her all the time.” Now, the Dalys take extensive precautions to make sure their food is clean. Even Karissa helps out. They’re still nervous about food contamination, and they still live in the shadow of that dangerous microorganism.

Greg: “Check your dates on what you buy, wash everything, and clean it as best you can. You don’t want to lose your child.”

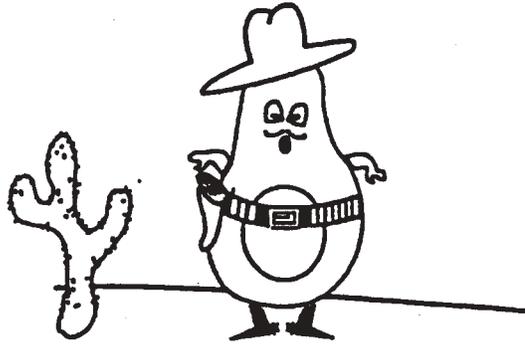
Overhead 2

Bacteria



Rods

Cocci

Overhead 3**MOST WANTED****CLOSTRIDIUM**
PERFRINGENS

Known Associates: High protein foods like meat, poultry, and eggs.

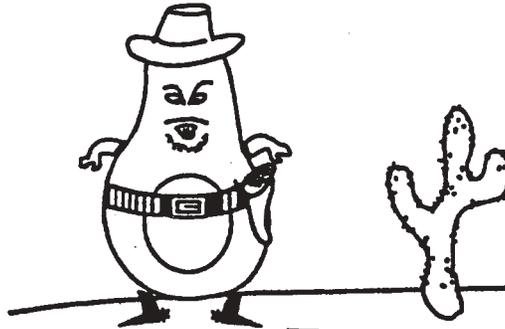
Hide-outs: Soil, sewage, dust, crops, meat, and poultry.

Crimes: Nausea, diarrhea, and gas pains 8 - 24 hours after eating.

Ways to Outsmart Them:

- Cook high protein foods thoroughly
- Keep hot foods hot
- Keep cold foods cold
- Refrigerate foods in shallow containers

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Overhead 4**MOST WANTED****CLOSTRIDIUM BOTULINUM**

Known Associates: Improperly canned low acid foods, like meat, poultry, fish, and most vegetables.

Hide-outs: Soil, water, produce, and other foods. They only grow in places that don't have oxygen, like the center of foods or in canned foods.

Crimes: General weakness, constipation, headache, double vision, impaired speech, trouble chewing and swallowing, death, within 12 - 36 hours after eating infected food.

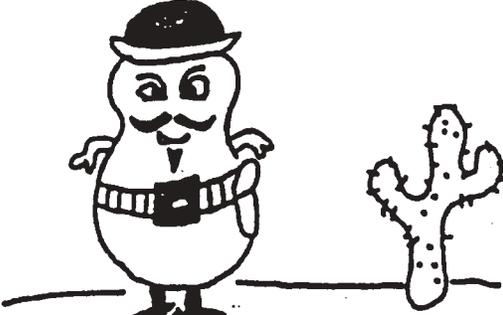
Ways to Outsmart Them:

- Follow recommended guidelines for home canning.
- Never taste food that smells foul or is in a can that leaks, bulges, or is badly dented.
- Never eat food from a can or jar that is cracked, has a loose or bulging lid, or that spurts liquid when it is opened.

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Overhead 5

MOST WANTED



LISTERIA MONOCYTOGENES

Known Associates: cole slaw, raw or unpasteurized milk, soft cheeses like brie, processed meats, leafy vegetables.

Hide-outs: Widespread in soil, water, and vegetation, therefore it is widespread. Both humans and animals can carry *Listeria*.
Listeria can actually grow under refrigeration.

Crimes: Mild flu symptoms like headache, fever, vomiting, diarrhea. The symptoms can be more severe in pregnant women, newborn babies, the elderly (meningitis), or sick people. Spontaneous abortions or stillborn births may occur.

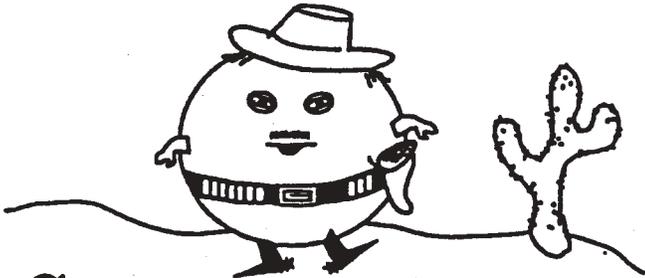
Ways to Outsmart Them:

- Don't drink milk or eat cheese made from raw or unpasteurized milk.
- Cook all foods properly; thoroughly reheat frozen and refrigerated meat and poultry that has been processed.

Adapted from *Producer Through Consumer: Partners To A Safe Food Supply*
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Overhead 6

MOST WANTED



STAPHYLOCOCCUS
AUREUS

Known Associates: Moist meat dishes, meat salads, sliced meats, potato salad, and cream-filled foods, such as eclairs, cream puffs, and cake fillings.

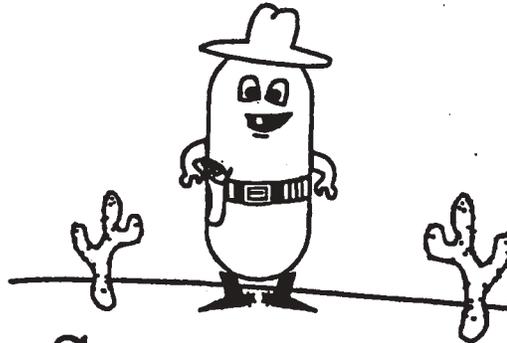
Hide-outs: Nasal passages of humans and animals and on skin, especially face and arms.

Crimes: Nausea, vomiting, diarrhea, and severe cramps within 3 - 8 hours.

Ways to Outsmart Them:

- Wear gloves or don't handle food if you have an infected cut.
- Wash hands before handling food.
- Clean utensils and countertops with hot, soapy water.
- Cook foods thoroughly.
- Cool or freeze food immediately after a meal.

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Overhead 7**MOST WANTED****SALMONELLA**

Known Associates: Raw meats, poultry, eggs, milk, and products made from them.

Hide-outs: On people, pets, insects, and rodents.

Crimes: Diarrhea, abdominal cramps, and vomiting within 12 - 36 hours after eating food containing bacteria.

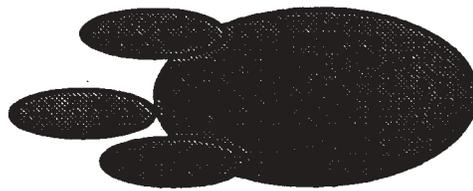
Ways to Outsmart Them:

- Cook foods thoroughly
- Keep hot foods hot
- Keep cooking surfaces and utensils clean
- Refrigerate or freeze foods promptly
- Reheat leftovers to at least 160° F.
- Wash hands before eating and after handling raw foods.

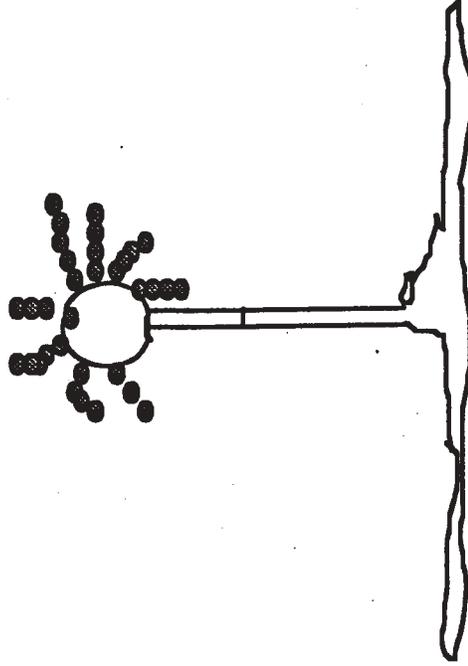
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Overhead 8

Yeasts and Molds



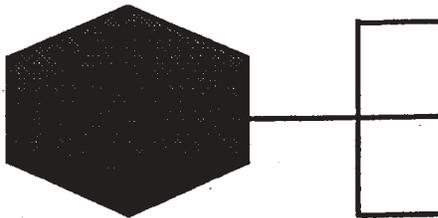
Yeast



Mold

Overhead 9

Viruses and Parasites



Virus



Amoeba

Worksheet 1

Name _____

Class/Period _____

Date _____

Pathogens and Foodborne Illness**Directions**

Matching: Draw a line from the terms on the left side of the page to the descriptions that apply on the right side.

- | | |
|---------------------|--|
| 1. <i>S. aureus</i> | Single-celled organisms that can grow in food and may cause people to get sick. Can be shaped like a rod or cocci. |
| 2. Bacteria | Can cause hepatitis. The smallest type of microorganism. |
| 3. Molds | The name describing microorganisms that make people sick. |
| 4. <i>E. coli</i> | Found in nasal passages and on skin. Grows in salads and in cream-filled foods. |
| 5. Viruses | Bacteria that live in intestines. Grow in undercooked hamburgers. Can give people bloody diarrhea. |
| 6. Pathogen | Organism that causes fuzzy growths on peanuts and cheese. |
| 7. <i>Listeria</i> | Live in processed meats and soft cheese. May cause spontaneous abortion in pregnant women. |

Worksheet 2

Name _____

Class/Period _____

Date _____

Vocabulary Words

1. Microorganisms:
2. Pathogens:
3. Bacteria:
4. Yeasts:
5. Molds:
6. Viruses:
7. Parasites:
8. Foodborne illness:
9. *Salmonella*:
10. *Clostridium perfringens*:
11. *Clostridium botulinum*:
12. *Staphylococcus aureus*:
13. Cocci:
14. *Lysteria monocytogenes*:
15. Pasteurization:

Teacher information sheet 1

Answer Key

Pathogens and Foodborne Illness

Directions

Matching: Draw a line from the terms on the left side of the page to the descriptions that apply on the right side.

- | | |
|---------------------|--|
| 1. <i>S. aureus</i> | Single-celled organisms that can grow in food and may cause people to get sick. Can be shaped like a rod or cocci. |
| 2. Bacteria | Can cause hepatitis. The smallest type of microorganism. |
| 3. Molds | The name describing microorganisms that make people sick. |
| 4. <i>E. coli</i> | Found in nasal passages and on skin. Grows in salads and in cream-filled foods. |
| 5. Viruses | Bacteria that live in intestines. Grow in undercooked hamburgers. Can give people bloody diarrhea. |
| 6. Pathogen | Organism that causes fuzzy growths on peanuts and cheese. |
| 7. <i>Listeria</i> | Live in processed meats and soft cheese. May cause spontaneous abortion in pregnant women. |

Teacher information sheet 2

Name _____

Class/Period _____

Date _____

Evaluation for Pathogen Poster or Pamphlet

Grade the poster or pamphlet on the following criteria using the 0-4 rating scale. Four is the highest rate and zero is the lowest rate. Write comments in the boxes under the rating for each criterion.

Criteria	4	3	2	1	0
Content: Information is correct, complete, and useful.					
Neatness: Clean, organized, and not sloppy.					
Spelling: All words spelled correctly.					
Handed in on time: Handed in on due date. A point is deducted for each day late.					
Time Management: Time used wisely and working on project at allotted time.					

Teacher information sheet 3

Name _____

Class/Period _____

Date _____

Evaluation for NIE Activity

Grade the NIE activity on the following criteria using the 0-4 rating scale. Four is the highest rate and zero is the lowest rate. Write comments in the boxes under the rating for each criterion.

Criteria	4	3	2	1	0
Content: Information is correct, complete, and useful.					
Neatness: Clean, organized, and not sloppy.					
Spelling: All words spelled correctly.					
Handed in on time: Handed in on due date. A point is deducted for each day late.					
Time Management: Time used wisely and working on project at allotted time.					

Teacher information sheet 4

Pathogens and Foodborne Illness

Bacteria

Organism	Source	Disease and Symptoms
<i>Bacillus cereus</i> (<i>B. cereus</i>)	Grows in cream, mashed potatoes, cereal dishes, meat loaf, rice, starchy foods, etc. Can survive exposure to high temperatures by becoming a spore.	Disease: <i>B. cereus</i> gastroenteritis Symptoms: causes either diarrhea or emetic (nausea) symptoms.
<i>Campylobacter jejuni</i> (<i>C. jejuni</i>)	Found in and on poultry, meat, and unpasteurized milk. Can be spread to other foods by cross-contamination from contact surfaces such as cutting boards, sinks, and countertops. Occurs in under-cooked meat and poultry.	Disease: campylobacteriosis Symptoms: cramps, diarrhea, headache, or fever. In some cases bloody stool and pain mimicking appendicitis.
<i>Clostridium botulinum</i> (<i>C. Botulinum</i>)	Found in improperly canned vegetables, meats, and seafood. Grows well in environments where there is little or no oxygen and low acid. Very heat resistant.	Disease: botulism Symptoms: nausea, vomiting, fatigue, dizziness, lack of fever, and finally paralysis and death.
<i>Clostridium perfringens</i> (<i>C. perfringens</i>)	Found in and on meat and meat products and is spread by contact with containers, handlers, or meat juices. Can grow in gravy at temperatures between 120 and 130°F. Outbreaks often caused by improperly reheated foods.	Disease: <i>C. perfringens</i> gastroenteritis syndrome Symptoms: acute abdominal pain, diarrhea, nausea, fever, and vomiting. May be asymptomatic.
<i>Enterohemorrhagic Escherichia coli</i> (<i>E. coli</i>) 0157:H7, 026,011	Outbreaks have been associated with growth of <i>E. coli</i> in under-cooked ground beef, unpasteurized soft cheese, cider, sprouts, and salami. Can also be found in water and raw milk.	Disease: <i>E. coli</i> gastroenteritis hemorrhagic colitis, hemolytic uremic syndrome Symptoms: Can include diarrhea, fever, nausea, bloody diarrhea, and kidney failure.

Bacteria (continued)

Organism	Source	Disease and Symptoms
<i>Listeria monocytogenes</i> (<i>L. monocytogenes</i>)	Found in meats, raw milk, soft cheeses, poultry, and seafood. Can be spread by air, water, soil, and contact with contaminated surfaces. Can grow at refrigeration temperatures and survive freezing.	Disease: listeriosis Symptoms: headache, nausea, vomiting. Can cause death of fetuses and newborns. Especially dangerous for pregnant women, elderly persons, and cancer and AIDS patients.
<i>Salmonella</i> species (<i>S. typhimurium</i> , <i>S. enteritidis</i> , <i>S. anatum</i>)	Most commonly associated with raw chicken and turkey. Can be found in dairy products, unpasteurized orange juice, sprouts, vegetables, and beef or pork. Grows on the outside and inside of unrefrigerated eggs. May be found in potato and egg salads.	Disease: salmonellosis Symptoms: flu-like accompanied by muscular weakness, moderate fever, and diarrhea.
<i>Shigella</i> species (<i>S. dysenteriae</i> , <i>S. flexnari</i> , <i>S. boydii</i> , <i>S. sonnei</i>)	Outbreaks associated with shellfish, fruits, vegetables, chicken, and salads. Spread by fecal-oral route and improper hand washing. Grows quickly if food is unrefrigerated for more than two hours at picnics, etc.	Disease: bacillary dysentery or shigellosis Symptoms: abdominal cramps, diarrhea, fever. In some severe cases vomiting or blood and mucus in stools.
<i>Staphylococcus aureus</i> (<i>S. aureus</i>)	Found in temperature-abused cream-filled bakery products, pork, beef turkey, chicken, and eggs. Outbreaks most often occur when foods are left out at room temperature. May be spread by sneezing on food, open sores on hands and fingers, or contamination with hair or acne-causing bacteria.	Disease: staphylococcal food poisoning Symptoms: nausea, vomiting, abdominal cramps, diarrhea, sweating, headache, and prostration.
<i>Vibrio parahaemolyticus</i> (<i>V. vulnificus</i>)	Live in sea and coastal waters and are found in fish, shellfish, squid, shrimp, etc. They are most numerous in warm weather. Caused an outbreak in Louisiana from boiled shrimp eaten at a picnic.	Disease: vibriosis Symptoms: diarrhea, cramps, weakness, nausea, chills, headache and sometimes vomiting. In severe cases, death.

Bacteria (continued)

Organism	Source	Disease and Symptoms
<i>Yersinia enterocolitica</i> (<i>Y. enterocolitica</i>)	Isolated from cakes, vacuum-packaged meats, seafood, chicken, vegetables, and raw milk. Children are more susceptible than adults. Can be spread by fecal-oral route.	Disease: yersiniosis Symptoms: include gastroenteritis, appendicitis-like pain, colon and neck abscesses, and peritonitis.

Parasites

<i>Cryptosporidium parvum</i>	Lives in people's intestines. Transmitted by contaminated water and undercooked meat.	Disease: cryptosporidiosis Symptoms: diarrhea, gastrointestinal discomfort
<i>Cyclospora cayentanensis</i>	Spread by water. Can contaminate fresh produce.	Disease: cyclosporiasis Symptoms: watery diarrhea, explosive bowel movements.
<i>Entamoeba histolytica</i>	Live in the intestines of people. Transmitted by poor personal restroom hygiene or exposure to contaminated water and polluted soil.	Disease: amoebic dysentery Symptoms: loose stools containing mucus and blood. Can include weight loss, fever, and vomiting.
<i>Giardia lamblia</i>	Primarily transmitted by water that has been contaminated by the fecal matter of muskrats and beavers. Can spread from infected food handlers.	Disease: giardiasis Symptoms: cramps, abdominal distention, nausea, and weight loss.

Virus

Hepatitis A virus	Can be present in shellfish (oysters, clams, etc.) when they are exposed to raw sewage. Can be spread to vegetables if contaminated fertilizers are used. Cooking does not always kill viruses.	Disease: viral food poisoning Symptoms: malaise, appetite loss, nausea, vomiting and fever. May cause liver damage and death.
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Molds

<i>Aspergillus flavus</i> and <i>Aspergillus parasiticus</i> Aflatoxins	Comes from moldy peanuts, corn and wheat. Can also be found on cheese. Can be spread by exposure to dust and damp conditions.	Disease: Toxicosis Symptoms: Can be carcinogenic, or cause liver disease.
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Teacher information sheet 5

Glossary of Bolded Terms

Microorganisms: Tiny single-celled organisms that can be seen only with a microscope. Examples are bacteria, yeasts and molds, and viruses and parasites.

Pathogens: Harmful microorganisms that can make people sick.

Bacteria: Microorganisms that can be either helpful or harmful in foods.

Escherichia coli: A type of bacteria that can live in undercooked beef and cause foodborne illness.

Yeasts: Microorganisms that allow bread to rise but can cause other foods to spoil.

Molds: Microorganisms that cause fuzzy growths on cheese and bread.

Viruses: The smallest living organism on earth. One type can cause hepatitis A if they get into foods.

Parasites: Tiny, microscopic animals such as amoebas. Can cause amoebic dysentery.

Foodborne illness: Sickness caused by ingesting pathogens in foods.

Outbreak: An incidence of foodborne illness in which many people get sick from eating the same kind of food.

Salmonella: A kind of bacteria that live on chickens and poultry and cause foodborne illness.

Rod: An oval-shaped bacterium.

Clostridium perfringens: The kind of bacteria known for living in high-protein foods. Can cause foodborne illness.

Clostridium botulinum: A kind of bacteria that can live in cans and cause them to dent or bulge. Forms spores and can live without oxygen.

Staphylococcus aureus: Bacteria that live on the skin and hands of people and can get into foods when you forget to wash your hands.

Cocci: A round-shaped bacteria.

Lysteria monocytogenes: A kind of bacteria that can grow in the refrigerator. Causes foodborne illness.

Pasteurization: The act of heating a food to a high temperature at a short time to kill bacteria.

160° F: The correct final temperature to cook meat in order to kill bacteria.

Quiz 1**Unit: Introduction****Lesson: Microbes and Our Food**

Name _____

Class/Period _____

Date _____

Matching: Match the vocabulary terms in column A with the definitions in column B. Write the letter of the definition in column B in the space next to the terms in column A.

A	B
_____ 1. Bacteria	A. Microorganisms that can either be helpful or harmful to people.
_____ 2. Pathogen	B. Single-celled organisms that don't make us sick but can spoil foods.
_____ 3. Virus	C. Microorganisms that cause the fluffy, hairy growths seen on spoiled cheese or breads.
_____ 4. Foodborne illness	D. Tiny microscopic animals such as amoebas that can cause foodborne illness.
_____ 5. Microorganisms	E. The smallest living organism on earth. One type can cause hepatitis A if present in foods.
_____ 6. Yeasts	F. Sickness caused by the presence of pathogens in foods.
_____ 7. Molds	G. Microorganisms that are harmful to people.
_____ 8. Parasites	H. Singled-celled creatures that live everywhere in our environment.

Short answer: Write short answers to the following questions and statements. Use complete sentences when answering questions.

1. In class we talked about *Listeria monocytogenes*, *Staphylococcus aureus*, and *Escherichia coli*. Describe what kinds of foods each of these pathogens are found in and what symptoms of foodborne illness they cause.

a. *Listeria monocytogenes*

b. *Staphylococcus aureus*

c. *Escherichia coli*

2. Name two helpful bacteria and two harmful bacteria.

3. How are yeasts different from parasites?

4. How can a foodborne illness outbreak be harmful to people?

Quiz 1 Key

Unit: Introduction

Lesson: Microbes and Our Food

Matching: Match the vocabulary terms in column A with the definitions in column B. Write the letter of the definition in column B in the space next to the terms in column A.

A	B
<u>A</u> 1. Bacteria	A. Microorganisms that can either be helpful or harmful to people.
<u>G</u> 2. Pathogen	B. Single-celled organisms that don't make us sick but can spoil foods.
<u>E</u> 3. Virus	C. Microorganisms that cause the fluffy, hairy growths seen on spoiled cheese or breads.
<u>F</u> 4. Foodborne illness	D. Tiny microscopic animals such as amoebas that can cause foodborne illness.
<u>H</u> 5. Microorganisms	E. The smallest living organism on earth. One type can cause hepatitis A if present in foods.
<u>B</u> 6. Yeasts	F. Sickness caused by the presence of pathogens in foods.
<u>C</u> 7. Molds	G. Microorganisms that are harmful to people.
<u>D</u> 8. Parasites	H. Singled-celled creatures that live everywhere in our environment.

Short answer: Write short answers to the following questions and statements. Use complete sentences when answering questions.

1. In class we talked about *Listeria monocytogenes*, *Staphylococcus aureus*, and *Escherichia coli*. Describe what kinds of foods each of these pathogens are found in and what symptoms of foodborne illness they cause.

a. Listeria monocytogenes: Found in milk, soft cheeses, and vegetables. Causes mild flu symptoms in most people but can cause abortion or death in pregnant women or sick people.

b. Staphylococcus aureus: Found in meat dishes, potato salad, and cream-filled foods. Causes nausea, vomiting, and diarrhea.

c. Escherichia coli: Found in meat, cider and sprouts. Causes diarrhea, fever, and sometimes death.

2. Name two helpful bacteria and two harmful bacteria.

Good bacteria

a. yeasts

b. starter culture used in yogurt or cheese.

Bad bacteria

a. molds

b. *E.coli*

3. How are yeasts different from parasites?

Yeasts usually don't make us sick. They like to grow in foods with a lot of sugar. When added to bread dough, yeasts help the bread rise.

Parasites are tiny animals that can be seen only with a microscope. Amoebas are examples of parasites that can live in drinking water. If we drink the water, we can get sick.

4. How can a foodborne illness outbreak be harmful to people?

Harmful bacteria can make people sick and in some instances cause death. It can become widespread and infect hundreds of people.

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