



Lesson 1.2

Suspect Profiling

Estimated time: One 50 min period

Instructional overview

Lesson 1.2 will introduce students to criminal profiling techniques. Students will use these techniques to investigate the characteristics of five types of microorganisms commonly associated with food: bacteria, viruses, parasites, yeasts, and molds.

Instructional objectives

1. Identify five types of microorganisms and record definitions in the Case Notes.
2. Determine the characteristics of bacteria, viruses, parasites, yeasts, and molds associated with foods.
3. Record observations of five microorganisms using the prepared microscope slides and reference materials provided.

Assessment

Students will view materials using a microscope to illustrate and identify important cell structures, and describe 2-3 defining characteristics of five microorganisms as part of their Case File development. Students will score at least 70% according to the Grading Rubric.

Relevant learning standards - NSES-C

Equipment, supplies, and materials

1. PowerPoint presentation - PPT 1.2.
2. Case Notes 1.2 – one per student or use ppt template.
3. Investigation Activity 1.2 – one per student or use ppt template.
4. Microscopes.
5. Prepared Slides and reference booklet of bacteria, parasites, yeasts and molds.

References and background information

1. Food Science and Safety: George J. Seperich.
2. <http://www.microbe.org>
3. Swiss Criminal Profiling Scientific Research www.criminalprofiling.ch/introduction.html
4. Laboratory Fundamentals of Microbiology, 6th edition: Alcamo.
5. <http://www.denniskunkel.com/index.php>
6. <http://www.3dscience.com/index.php>
7. <http://www.asm.org/microbe/>
8. GAPsNET www.gaps.cornell.edu

Interest approach

Show PPT 1.2 slide that has bacteria, viruses, parasites, yeasts and molds. List the names of these organisms in a random order. Ask students to match each microorganism with its name. Review significant identifying structures of each to assist students with identification.

Optional: This activity also can be done by using printed images or overhead projections of the microorganisms if PowerPoint is unavailable.

Classroom Procedures

Teaching procedures	Content
<p>Review the foodborne illness outbreak from Lesson 1.1.</p> <p>Lead discussion to determine if students recall the organisms introduced in previous lesson: bacteria, viruses and parasites.</p>	<p>What were some of the clues we uncovered about the foodborne illness outbreak in the last lesson?</p> <ul style="list-style-type: none"> • How many states were affected? 3. • How many people became ill? Article does not reveal. • What was implicated as the food source? Mexican green onions (scallions). • What was the microorganism involved? Hepatitis A virus. • How was the Hepatitis A virus transmitted? Fecal-oral route. Produce can become contaminated from workers hands being contaminated with the virus or when produce is exposed to water contaminated with the virus. <p>What type of hazard was involved in the case? Biological hazard.</p>
<p>Use PPT 1.2 to lead class discussion on “Criminal Profiling”.</p> <p>This excerpt from the <u>S</u>wiss Criminal Profiling Scientific Research Site can help you in your discussion.</p>	<p>“Criminal profiling is used to narrow down an investigation to those suspects who possess certain behavioral and personality features that are revealed by the way a crime was committed. The primary goal is to limit and refine the suspect list so resources can be directed to where they might do the most good. Profiling does not reveal a specific individual but provides a general biographical description of the most likely type of suspect.”</p>

<p>State expectations for today's lesson.</p>	<p>Today we will look at viruses and other biological suspects that may be responsible for causing outbreaks and create a profile for each.</p> <p>By the end of today's investigation activity you will be able to:</p> <ol style="list-style-type: none"> 1. Identify five types of microorganisms and record their definitions in your Case Notes. 2. Determine the characteristics of bacteria, viruses, parasites, yeasts, and molds associated with food. 3. Record observations about five microorganisms. Use prepared microscope slides and materials provided as references.
<p>Review the use of Case Notes. Hand out Case Notes 1.2 or use the ppt template to help students organize their Case Notes.</p> <p>Go over the definitions with students. The glossary in Appendix C contains all definitions presented in the Unit.</p> <p>Note that yeasts and molds are both types of fungi and are grouped accordingly.</p> <p>To put viral size into perspective, a medium sized virus next to a flea is roughly equivalent to a human next to a mountain twice the size of Mount Everest.</p>	<p>Let's go over the definitions for each of these microorganisms.</p> <p>Bacteria: Single-cell microorganisms with no clearly defined nucleus (prokaryote) although they have an irregularly shaped region called a nucleoid. Bacteria are capable of self-replication and usually reproduce when one cell splits in two. Bacteria can use most carbohydrates, fats, and proteins as sources of nutrients. Because of this you can find them nearly everywhere. Some bacteria have the ability to form seed-like structures that allow them to survive when conditions are unfavorable for growth. This resistant form is called a spore.</p> <p>Viruses: Pieces of nucleic acid (DNA or RNA) surrounded by a protein membrane. A virus cannot reproduce on its own. It must infect the cell of another living organism before it can replicate.</p> <p>Viruses are submicroscopic, meaning that even with the most powerful optical microscopes they are unable to be seen.</p>

	<p>Parasites: Organisms that live on or in another organism often at the expense of the host organism.</p> <p>Fungi: A kingdom of organisms that includes mushrooms, molds, and yeasts.</p> <p>Two types of fungi commonly associated with food are:</p> <p>Yeasts: Unicellular fungi that usually go through cell division by budding. Although they are unicellular (single cell) organisms, yeasts commonly grow together in groups to break down sugar and starches. Yeasts require moist or wet environments to grow.</p> <p>Molds: multi-cellular, filamentous fungi that grew very quickly by asexual reproduction. Molds need little water, but do need the right temperature and level of oxygen to grow. They prefer room or higher temperatures.</p>
<p>Hand out Investigation Activity 1.2 or show the Investigation ppt template to help students organize their notes.</p> <p>Assign students their Investigative Teams (see explanation in Unit Overview) and send them to a lab station.</p> <p>Each group should have a microscope with a prepared slide of bacteria, parasites, yeasts, and molds and the booklet provided with the prepared slides. Students will draw the virus from PPT 1.2 and determine characteristics.</p> <p>If no microscopes are available see PPT 1.2 for images.</p>	<p>Using the microscope, prepared slides, and reference booklets provided with the prepared slides, create a profile for each suspect category; bacteria, viruses, parasites, yeasts, and molds. Draw what you see under the microscope in the first column and label your sketch with the structures of the organism. Use the reference material provided to describe 2-3 characteristics of each and put them in the column on the right.</p> <p>Because viruses are so small we will use an image instead of a prepared slide.</p> <p>Students complete Investigation Activity 1.2 for their Case File.</p>

	<p>Who are the suspects? Bacteria, viruses, parasites, yeasts, and molds.</p> <p>Which three suspects are typically involved in foodborne illness outbreaks? Bacteria, viruses, and parasites.</p> <p>Which three suspects can also be beneficial and used for food production? Bacteria (yogurt), yeasts (root beer), and molds (blue cheese).</p> <p>Which three suspects are typically involved in food spoilage? Bacteria, yeasts, and molds.</p> <p>Food spoilage is the condition in which food becomes undesirable.</p>
Context with future instruction.	In the next lesson, we will be focusing our investigation on these suspects and eliminating the Good Samaritans from our profile.
Reflections for future use.	



Suspect Profiling

Case Notes 1.2

Name: _____ Date: _____

Why is Criminal Profiling used in investigations? _____

Microorganism	Definition
1.	
2.	
3. 3a. 3b.	
4.	



Suspect Profiling

Investigation Activity 1.2

Name: _____ **Date:** _____

When investigators profile likely suspects they look at large segments of the population and collect data on the backgrounds, characteristics, behaviors, and traits of various types of suspects.

Directions: Use the material provided, including the booklet accompanying the prepared slides, to create a profile for each category of likely suspects in our FSI foodborne illness outbreak investigation.

First – Sketch what you see under the microscope on each slide (Note: for virus use the PPT 1.2 image).

Second – Using the references provided, label your sketch with the structures of the organisms and describe 2-3 of the defining characteristics in the column on the right.

<p>Suspect Category 1 Bacteria</p>	<p>List 2-3 Characteristics</p>
<p>Suspect Category 2 Viruses</p>	<p>List 2-3 Characteristics</p>

Suspect Category 3 Parasites	List 2-3 Characteristics
Suspect Category 4 Yeasts	List 2-3 Characteristics
Suspect Category 5 Molds	List 2-3 Characteristics



This assignment will be graded using the following Grading Rubric:

Assessment Criteria	Maximum Points	Points Scored
The sketch provided accurately depicts what was seen and labels the organism's structures correctly.	6	
The student provided 2-3 defining characteristics for each category.	8	
The student completed the definitions for each microorganism in their Case Notes.	5	
The assignment was neat, organized, and handed in on time.	1	
TOTAL	/20 =	%