Lesson Title	Typhoid Tootsie
Length of Lesson	50 minutes
Created By	Claire Babineaux
Subject	General Science
Grade Level	8th
State Standards	3.b,c,e,g, h
DOK Level	1, 2, 3
DOK Application	1: Identify, recognize, name, label 2: categorize, infer, construct, relate, estimate, cause/effect 3:assess, draw conclusions, differentiate, compare, investigate
National Standards	C
Graduate Research Element	Bacteria can be found in the sand in which the graduate student is studying and can be useful in determining the location from where the sand originated. Also, bacteria are useful in determining the age and location of various rocks in the rock and fossil record.

Student Learning Goal:
The learning goal for the students in this lesson is to understand and demonstrate how bacteria spread throughout environments.

State Standards:
3. Compare and contrast the structure and functions of the cell, levels of organization of living things, basis of heredity, and adaptations that explain variations in populations.

b. Compare and contrast the major components and functions of different types of cells. (DOK 2)
- Differences in plant and animal cells
- Structures (nucleus, cytoplasm, cell membrane, cell wall, mitochondrion, and nuclear membrane)
- Different types of cells and tissues (e.g., epithelial, nerve, bone, blood, muscle)

c. Describe how viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions. (DOK 1)

e. Explain energy flow in a specified ecosystem. (DOK 2)
- Populations, communities, and habitats
- Niches, ecosystems and biomes
- Producers, consumers and decomposers in an ecosystem

g. Research and draw conclusions about the use of single-celled organisms in industry, in the production of food, and impacts on life. (DOK 3)

h. Describe how an organism gets energy from oxidizing its food and releasing some of its energy as heat. (DOK 1)

National Standards:
C: (Structure and function in living systems) Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems.

- All organisms are composed of cells—the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.
- Cells carry on many functions needed to sustain life. They grown and divide, thereby producing more cells. This requires they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or organism needs.

Materials Needed (supplies, hand-outs, resources):
PowerPoint Lesson/Review, Stuffed animal-bacteria and virus examples, Tootsie rolls, contaminant, cloth gloves, black light

Lesson Performance Task/Assessment:
The task/assessment for the students will be a PowerPoint lesson/review about bacteria, a guided discussion on the types of bacteria, how the reproduce, what they need to survive, and uses of bacteria in nature.

Lesson Relevance to Performance Task and Students:
The task/assessment for the students will be a PowerPoint lesson about bacteria, a guided discussion on bacteria, and an activity based around the processes by which bacteria spreads.

Anticipatory Set/Capture Interest:
In order to capture the interest of the students, the teacher can show a video on how bacteria spreads, where bacteria lives, and how dangerous is bacteria. The teacher may also opt to show the students images of bacteria.

Guided Practice:
Depending on the stopping point of the lesson, whether this is a continuation of a lesson or the first day of the lesson, the teacher will lead the students in a discussion about bacteria and the following questions may be considered:

1. What is a prokaryote?
2. What are bacteria?
3. Where can bacteria are found?
4. What is respiration?
5. What is the importance of medicine?

After the discussion, the teacher may continue with the Typhoid Tootsie activity. The teacher will guide the students through the directions and then allow them to complete the activity. The solvent used for this experiment is Dit Ja Jow, and oriental medicine used to break up bruises. It was used because it is brown like the tootsie rolls. Other solvents may be used in place of Dit Ja Jow.

Independent Practice:
The students will continue and finish the Typhoid Tootsie activity and then complete the worksheet provided for independent practice. The students should use the notes they took during the PowerPoint lesson/review and their book to answer the questions on the worksheet.

Remediation and/or Enrichment:
Remediation: Individual IEP will be followed. Additionally, the teacher may have the students work together in pairs.

Enrichment: The teacher may implement an extra credit assignment for the students to present what they have learned about bacteria and the types of bacterial reproduction. Or the teacher may have the students do an extra credit assignment on antibiotic resistance.

Check(s) for Understanding:
In order to check for a thorough understanding of the concepts presented in this lesson, the following questions can be considered:

1. What are the parts of the cell structure?
2. What is the purpose of flagellum?
3. What are the differences in how autotrophs and heterotrophs obtain food and energy?
4. What is the importance of pasteurization?
5. What is determined by the chemical makeup of the cell wall?

Closure:
The closure for this lesson can be a teacher led discussion on how bacteria applies to the graduate student's research and how bacteria is being studied further at Mississippi State University in different applications.

Possible Alternate Subject Integrations:
This lesson was written for an 8^{th} grade general science class. The possible integrations for this lesson and activity could be:
Biology: to study the structure of viruses and bacteria
Mathematics: To study the rate of spreading

Teacher Notes: