GRADE LEVEL: 6-8 | TIME REQUIREMENT: 4 HOURS

LIFE SCIENCE: BODY SYSTEMS

2 READINGS | 2 ACTIVITIES

INTRODUCTION

It can be challenging finding ways to teach the function of cells and body systems using a question- or phenomenon-driven approach. The resources in this section provide ways to teach about different cell types and body systems by starting with a story about WWII innovation.

There was a major effort in World War I to fight infections in the military of both sides and to stop the spread of disease. However, the basic science of medicine was not developed enough to make much headway. After World War I and the 1918 Flu Pandemic, scientists learned a great deal about the identity of the microbes and viruses that cause disease. They also learned much more about blood and how to treat trauma with blood products. Armed with more knowledge about human bodies, diseases, and bacteria, there were more possibilities to **apply** that knowledge and find treatments in World War II.

OBJECTIVE

These resources can be used individually or in tandem. Fungus Among Us and Antibiotic Targets can be used together to introduce or review cells, their organelles, and their specializations. Plasma for Trauma and Blood in a Bag can be used to introduce or review organs and organ systems. Together these resources provide experiences to understand body systems, and the research and problem solving of biologists studying body systems.

STANDARDS

NGSS DCI LS1.A
Structure and Function

NGSS DCI ETS1
Engineering Design

NGSS DCI ETS2
Links Among Engineering, Technology, Science, and Society

NGSS SEP
Developing and Using Models

NGSS SEP
Constructing Explanations and Designing Solutions

NGSS CCC
Cause and Effect

NGSS CCC
Systems and System Models

PERFORMANCE EXPECTATIONS

MS-LS1-1
Conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells.

MS-LS1-2
Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.

MS-LS1-3
Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

MS-ETS1-2
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

READINGS (2)

1. FUNGUS AMONG US

Description
A reading for students on the history of penicillin, the fungal product that became the first antibiotic. It introduces the challenge and basic facts.

2. PLASMA FOR TRAUMA

Description
A reading describing the story of the development of blood plasma as a life-saving, innovative treatment. The reading also shows the role of Charles Drew in that development and asks students to connect the development of basic research to its application as a treatment.

ACTIVITIES (2)

1. ANTIBIOTIC TARGETS

Description
An activity that can be used with or without Fungus Among Us. This activity introduces different types of cells that can cause diseases, and their characteristics, asking students to identify antibiotic targets that could be used to treat diseases.

Supplies
The handout and any additional resources you might want students to use in their research.

Instructions
Have the students look at the table of types of organisms that cause diseases. Assign, or have them pick, one to research and brainstorm. You may want to have students work in groups to pick a target treatment to brainstorm. Use Kagan strategies or other cooperative group structures to support their productive talk. By providing other resources like a textbook you can give them practice at reading to find information and summarization.

2. BLOOD IN A BAG

Description
An activity that has students create and then identify the components of a model of blood. Blood is an organ, though most people don't think of it that way. This activity encourages consideration of the definition of an organ or an organ system.

Supplies (per group)
1 Quart-sized Ziploc bag
2 Cups vegetable oil
20 Skittles
10 Mentos
10 Tic Tacs
1 Tsp candy sprinkles

Instructions
You can use other similarly-sized candies to replace these if the ones listed are not available.

Students will place the oil and the candies in the bag, and then, using the table, determine what each candy is supposed to represent in the model. Because it asks students to identify the parts of the model, it is using a higher domain of knowledge.

ADDITIONAL RESOURCES

To learn more about the development of antibiotics, try these books:

+ *The Mold in Dr Florey's Coat* by Eric Lax, Henry Holt, 2005.
+ *The Demon Under the Microscope* by Thomas Hager, Three Rivers Press, 2006.

ACTIVITY

ANTIBIOTIC TARGETS

INTRODUCTION

Why do antibiotics affect bacteria and not human cells?

Why do antibiotics affect some bacteria and not others?

Why don't antibiotics work on viruses?

Why don't antibiotics work on diseases like malaria?

The answer to these questions is in the details of cells and how they are made. Examine this table describing single-celled organisms and their makeup:

CELL (TYPE)	CELL WALL	ORGANELLES	NOTES
Plasmodium (eukaryote, protozooan)	None (has protein coat)	Nucleus, mitochondria, ribosomes, microneme	Parasite that causes malaria
Gram positive bacteria (prokaryote)	Thick peptidoglycan wall	None	Streptococcus, Staphlococcus, (more succeptible to antibiotics)
Gram negative bacteria (prokaryote)	Thin peptidoglycan inside a membrane	None	E. coli, Pseudomonas (less succeptible to antibiotics)
Yeast (eukaryote, fungus)	Chitin	Nucleus, mitochondria, ribosomes	Candida (can cause infections)
Algae (eukaryote, plants)	Cellulose	Nucleus, mitochondria, ribosomes, chloroplasts	
Viruses (not really cells)	Protein Coat		Rhinovirus and Coronavirus (DNA and proteins inside)

NAME: **DATE:**

Directions: Use the table to answer the questions below. Before answering consider the following:
Do you have enough information to fully answer the questions? What else would be helpful to know?

1. Why do antibiotics affect bacteria and not human cells? Why do they affect some bacteria and not others?

2.Why don't antibiotics work on viruses?

3. Why don't antibiotics work on diseases like malaria?

4. In a group, pick one of the disease-causing organisms in the table and propose a way to fight it. Use the organism's characteristics and its differences from the others in the table to guide your brainstorming.