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
BLOOD IN A BAG

INTRODUCTION

Even though it might not seem like it, our blood is an organ.

WHAT IS BLOOD MADE OF?

First, there's plasma, which is most of human blood by volume. Plasma is water with proteins, clotting factors, and antibodies suspended in it, and with ions dissolved in it.

Then there are blood cells, both white and red. Red blood cells bind oxygen and carry it through the body. Red blood cells have markers on their surface which determine which type of blood you have. White blood cells are part of the human immune system. There are many fewer white than red blood cells. Finally, there is another kind of cell called platelets, which help in healing and blood clotting. There are even fewer platelets than there are white blood cells.

An organ is defined as a bunch of different cells that work together for a function. By that definition blood is an organ.

When people are injured badly, they can go into shock. Shock is a bodily response to injury that helps conserve blood. One of the best ways to treat shock is to give the injured person a transfusion of blood.

However, blood combines lots of immune cells and can cause problems when one person receives another person's blood. A transfusion is like a transplant, and so it can only work if the blood types of the two people match. Blood also needs to be preserved at a low temperature (refrigerated) until it is used and also needs to be in a liquid form, which makes it difficult to transport.

In World War II, doctors learned how to use just blood plasma to treat shock. Because plasma doesn't have types and can be dried, it is easier to use in the field. Eventually the patient would need a blood transfusion, but until then plasma would help the injured person stay alive.

Your teacher will give your group the following:

- 1 Quart-sized Ziploc bag
- 2 Cups vegetable oil
- 20 Skittles
- 10 Mentos
- 10 Tic Tacs
- 1 Tsp candy sprinkles

NAME: **DATE:**

Directions: Put the ingredients together to make a model of blood. Use the proportions above in the description of blood to decide which candies to use for each role. Make sure the proportion and size of the blood components match between your model and the description of blood. Fill in the table below to show what each component in the model represents:

COMPONENT	REPRESENTED BY	FUNCTION
Plasma		
Red Blood Cells		
White Blood Cells		
Platelets		
Clotting Factor		
Antibodies		
Ions		

1. Which model components would an injured person receive in blood plasma?

2.Why doesn't plasma have blood types?

3. How might plasma prevent shock?