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.

READING

PLASMA FOR TRAUMA

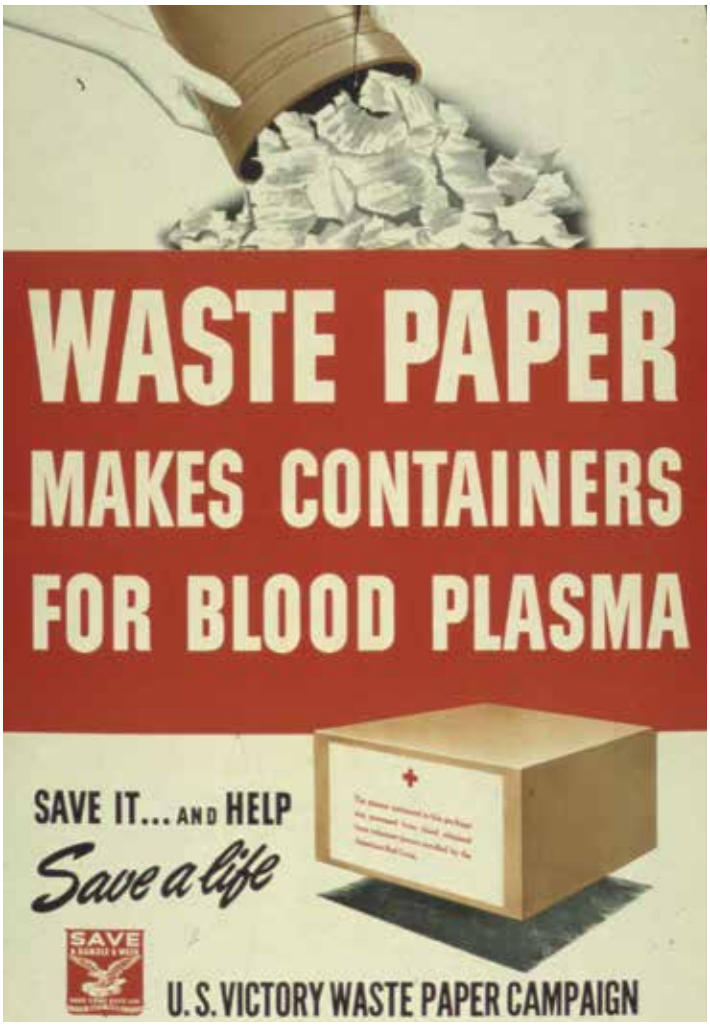
Charles Drew was studying to be a medical doctor and researcher at Columbia University, one of the best teaching hospitals in the world. With his advisor, John Scudder, Drew studied how to diagnose and treat shock. Shock, a result of trauma due to wounds or severe disease, affects the circulatory system. Drew was the first African American scientist Scudder had agreed to mentor, and his achievements impressed his advisor.

In the late 1930s, when Drew was doing his research, it was possible to preserve blood and set up blood banks. However, the process depended upon the region in which a blood bank was set up. Because of this, the quality of blood to treat patients often was different from place to place, sometimes even between different hospitals in the same city. Drew decided to develop a system to make sure that blood was collected and stored in the best way possible. He developed screenings for donors—the best ways to draw and store blood—and with his advisor, developed a new blood bank at their hospital.

The entry of the United States into World War II may have surprised some, but it did not surprise everyone. When the Germans invaded Poland in 1939, the National Research Council began an investigation into our country's ability to provide blood for injured soldiers. During the Battle of Britain the following year, the United States began a program called Blood for Britain. The plan to collect, store, and then send blood for transfusions was written by Drew and Scudder.

After writing the plan, Drew went to Howard University where he became a professor. Because he was African American, Howard was the only university that would hire him in the United States. Drew continued his research on treatments using blood. His research included separating plasma from blood and using it to treat shock and that finding had led him to develop a procedure to dry plasma.

Dried plasma could be stored without refrigeration and could be transported more easily than blood. Because of his success in leading the Blood for Britain program, Drew was recruited to lead a similar effort to mass produce dried plasma for the Red Cross in New York. Drew was again successful in setting up a program that saved thousands of lives from death after trauma. Blood plasma kits became widespread in Allied medical centers and field hospitals in Europe, Africa, and Asia.



A US government poster encouraging recycling.
(Image: The Education Collection of The National WWII Museum.)

Wounded Marine treated by medics on Guam.
(Image: The National WWII Museum, 2010.130.080.)

NAME: **DATE:**

One tragic part of history is that segregation affected all parts of life in the United States during World War II, including the blood program. In spite of its complete irrelevance, race was a factor in who received what blood and what plasma. Supplies were segregated just like bathrooms and dining rooms. In his acceptance speech in 1944 for a medical award recognizing his efforts, Drew said, "It is fundamentally wrong for any great nation to willfully discriminate against such a large group of its people. . . . One can say quite truthfully that on the battlefields nobody is very interested in where the plasma comes from when they are hurt. . . . It is unfortunate that such a worthwhile and scientific bit of work should have been hampered by such stupidity."

Once Drew had the system for plasma production established, he returned to Howard where his wife and young daughter were living. He said his most important ambition was to set up a great surgical education program at Howard. Sadly, Drew died young, at age 45, in 1950, of trauma from a car accident.

Do you know your blood type?

Do you know the blood types of your parents or siblings?

Do you know someone who has been treated with a blood transfusion or blood plasma?

Drew took his knowledge of medicine (how blood is made, and how it is involved in shock) and used it to develop something very necessary for World War II (blood banks, and kits to administer powdered plasma). **Does this follow the pattern of Adoption, Adaptation, or Application? Why is this important?**

People have learned a lot about blood since World War II: what's in it; what diseases are involved in it; and what can cause these diseases. **What have scientists learned since World War II that you think might be able to be applied as a way to prevent or cure one of these diseases of the blood or other parts of the body?**

A medic administers blood plasma to a wounded soldier.
(Image: The National WWII Museum, 2000.325.010.)