Eighth Grade Cells Physical Unit Study Kit

Written By Rachael Freed

The following resources are included in the physical kit and will need to be returned to HCOS:

1. What is Cell Theory? by Marina Cohen
2. Vaccine Innovators by S. Wood
3. Superbugs by John DiConsiglio
4. Plague and Pandemic Alert! by Julie Karner
5. Cells: How are Living Things Built? by Marina Cohen
6. Wonder of the Cell - Creation Library Series DVD
7. Parent Guide

All unit studies are checked to ensure links are working. You will need to access the parent guide online as they have clickable links. They can be found on our website: hcslearningcommons.org, under Distance Learning Resource, Unit Study Kits K-9. Or you can log in to L4U and search for the unit study title. The guides can be found in the title record at the bottom of the page, under Resources, and can be downloaded, (may not work in Chrome browser).

"For you created my inmost being;
you knit me together in my mother's womb.
I praise you because I am fearfully and wonderfully made;
your works are wonderful,
I know that full well.
My frame was not hidden from you
when I was made in the secret place,
when I was woven together in the depths of the earth.
Your eyes saw my unformed body;
all the days ordained for me were written in your book
before one of them came to be." (Psalm 139: 13-16 NIV)

Introduction

The Ministry of Education has recently changed the learning standards and competencies for the Province of British Columbia. This kit is designed with these standards in mind. Each activity in this Unit Study addresses the competencies of the new BCEd Plan, and is marked with the following labels:

Communication Competency	**Critical Thinking Competency**
Creative Thinking Competency	**Personal & Social Competency**
Thinking Competency	**Social Responsibility**

For further information on the pedagogy behind the kits please check out the context in this document. It will help give background to the new BC curriculum and our inclusion of these new learning standards in our Unit Study Kits.

How to Use This Kit

The Ministry of Education has made changes to the curriculum, learning strategies, and learning goals for students in the Province of British Columbia. This kit is designed with those goals in mind. On the next several pages you will discover the content that serves as the "bulk" of this kit. Rather than being divided by day, the unit plan uses the key questions to breakdown content, activities, and experiences.

Each key question will have books to read, videos to watch, and activities to share with your child. You will not be required to complete all activities listed under each key question, instead, you will be able to choose activities which most appeal to you and your child. Each key question featured in the unit will include recommendations on how many activities to complete in order to fully address the curriculum content and competencies. Finally, each activity will have icons showing which goals of the BCEd Plan the activity addresses.

*****You are encouraged to choose varied activities to ensure all goals are being addressed. In order to fully meet the goals of this kit, it is important to read many of the recommended books marked with ***.**

Reading and discussing/watching and discussing the books and videos listed in this unit will consistently address the following goals of the BCEd Plan:

It is our hope that our redesigned format will allow for flexibility, individual preference, and student-centered learning. When selecting activities to complete with your child we recommend selecting a variety of activities to ensure that you touch on each BCEd Plan goal throughout the unit. Most activities are designed to address multiple goals.

HCOS Subscriptions

HCOS families have access to a wide variety of wonderful subscriptions which can be used to enhance student learning. Several of these subscriptions are used throughout the unit. To find the login for these subscriptions, go to your parent homepage in Encom, choose "curriculum resources" from the menu at the top, to access the most recent password information.

Then scroll down to find the links and passwords to the subscription(s) you are interested in.

Unit Guide

Important Note: The recommended number of activities per section is meant to serve as a guide. Families are encouraged to make the kit their own and complete the number of activities that they, and their support teacher, feel are necessary. We recommend choosing three larger activities along with a combination of smaller, less time-consuming, activities. This kit is designed to be completed over a six-week period. Books marked with a *** are necessary for fully covering the content and ensuring a thorough understanding of the material.

Science Safety: When completing science experiments, and all other science experiments, it is extremely important to be safe. Science is an amazing discipline, fun, intriguing, exciting, but it can also be dangerous. Following safety guidelines, having a plan before beginning an experiment, and ensuring that you have an adult present at all times can help to keep you safe when conducting experiments. Brainstorm a list of what you think some important science safety rules are. Then, watch this fun video from I Think School to learn more about lab safety. ***When working with chemicals and materials in science experiments, it is important that you never touch your eyes or your face. Never eat or drink food while you are conducting science experiments, always save your snacking until later.***

Cell Journal: After reading the books in this unit, you will be answering questions in your cell journal. A printable journal is available here. If you prefer, you could also answer the questions in a video or audio recording, using a Padlet, or in a word processing program such as Microsoft Word, Pages, or Google Docs. **The printable journal also has vocabulary activities that will be helpful to complete prior to beginning the unit.**

Unit Guide

Characteristics of Life

Books to Read:

*** Cells: How are Living Things Built? by Marina Cohen
After reading this book, you will be answering questions in your cell journal. A printable journal is available here. If you prefer, you could also answer the questions in a video or audio recording, using a Padlet, or in a word processing program such as Microsoft Word, Pages, or Google Docs. The printable journal also has vocabulary activities that will be helpful to complete prior to beginning the unit.

Videos to Watch (Select 3-5):

Learn 360:

Introduction to Life Science
Life Processes of Animals
Life Processes of Plants
Interdependence of Life
Life on Ice: David Attenborough's Natural Curiosities
Shocking Senses David Attenborough's Natural Curiosities
The Narwhal's Tusk: David Attenborough's Natural Curiosities
Young Wrinklies: David Attenborough's Natural Curiosities
Stretched to the Limit: David Attenborough's Natural Curiosities

Activities (Select 2-3):

The Definition of a Living Thing: In this activity you will be creating your own definition of a living thing. For this experiment you will need the following items: Corks, shells, seeds, plants or flowers (growing in pot of soil), cut or picked flowers, bark, bone, various pictures of plants, animals, running water, crystals, yeast, bacteria, viruses, molds, the sun, fire, etc. What do you think it means to be alive? How can you tell whether something is, or is not, alive? You probably have some idea of what it means to be a living thing. Before you begin the activity, jot down a

list of the things that all living organisms need or do. To start, take the objects and images you gathered, sort each of the items into a living pile, or a nonliving pile. Use the list you made about living organisms as your guide. Were there any items that were difficult to classify? Why or why not? What about objects that were once part of a living organism, such as bone or cork? Are these still alive? Are seeds alive? What about fire? Fire moves, grows, requires oxygen to survive, and reproduces—is fire alive? Once you have finished sorting, revise your list about living and nonliving things. Then, write a definition of what you think a living things is.

- Did your definition of a living organism change as you worked through the activity? How so?
- Which items could not be easily classified as living or nonliving?
- Why do you think scientists want to define what it means to be alive?
- As Christians, we believe that God created all life. How does belief in a creator God make life unique? Consider the characteristics of the items in your "living" pile. Have you ever considered how these living things first came into existence? Read this Bible verse: Romans 1:20. What does "divine" mean? What do you think when you consider that God created life out of nothing? In what ways do you think there is some "mystery" about the creation of earth and life on earth? How do these mysteries compare with what you observed about life from your "living" pile? What sets human life apart from all other life? In what way is human life similar to all other life?

Science Power: Explore the fabulous interactive on Classifying Living Things from Science Power (World Book Online). If possible, try the Experiment to see how living things can be sorted. This experiment requires buttons. Buttons can often be found at thrift stores.

Science Power: Explore the fabulous interactive on the Characteristics of Living Things from Science Power (World Book Online). Try the Experiment to learn more about the importance of proper nutrients for living things.

Research a Living Thing: Do you have a favourite plant or animal? What is it? What makes it unique? Why do you think God created this particular plant or animal? Does it have a particular purpose? Has God designed it in such a way to help it survive in nature? Do humans interact with it? How so? For this project you will be researching a plant or animal of your choosing, and then creating a Wix, Weebly, or Padlet about it. Use Explora and/or World Book Student. Your project should include the following information:

- The basic features of the plant or animal you chose. What makes this plant or animal unique?
- The location and range of this plant or animal. Where does it live? What makes it suited for that environment?
- Whether the animal or plant is endangered.
- The role the plant or animal plays in its environment?
- Basic information about the lifespan, diet, and habits of the plant or animal you chose.
- Multiple images. Explora has an excellent image search database.

Be certain to cite your sources of information in a bibliography!

The Value of Life: Do you think that life is valuable? Why or why not? If life is valuable, is all life equal in value, or is some life more valuable? Explain your thinking? In what ways are all living things connected? What evidence can be observed in living things to support your answer? (For example, think about how God created plants with the ability to reproduce through their seeds). What other examples can you think of, and how can these things be seen as evidence that God values life? Consider this Bible verse, Genesis 1:26-28. In what ways is human life different than other forms of life? If life is valuable, is all life equal in value, or is some life more valuable? Explain your thinking. In what ways are all living things connected, and in what ways are they different? Philosophy means the study of knowledge or reason. It thinks about the "why" behind things. A philosopher might ponder the meaning of life, or, in this case, the value of life. These are not necessarily scientific questions, they would fall into the realm of philosophy. For

this activity you will be taking on the role of philosopher. You will be answering the question "Why is life valuable." You can answer this question in several ways:

- A written paragraph.
- An art project.
- A video or audio recording.
- A skit or short play.
- A series of cartoons or comics.
- A song or poem.
- Another medium of your choosing.

Try to include Bible passages that support your understanding of the value of life.

Endangered Species Public Service Announcement: Sadly, there are many endangered species on our planet. You are probably able to think of two or three different animals that are considered endangered. Oftentimes, these species are endangered due to the actions of humans. For this project you will select an endangered species (this list is helpful and contains great information about each animal), research it using Explora and/or World Book Student and then create a PSA, public service announcement, about the animal you chose, fun facts about the animal and why it is important, why it is endangered/threats to its existence, and what people can do to help. This is your opportunity to share your passion with others. You want people to feel strongly about the animal you chose, and want to help it. Try to give practical ways that people can help your endangered species in your PSA. Your PSA could take many forms, a digital poster using Canva, a Wix or Weebly page, a video or radio announcement--or any interesting and engaging medium of your choosing. Have fun and be creative!

Cell Theory, Types of Cells and Cell Behaviour

Books to Read:

*****What is Cell Theory? by Marina Cohen**

After reading this book, you will be answering questions in your cell journal. A printable journal is available here. If you prefer, you could also answer the

questions in a video or audio recording, using a Padlet, or in a word processing program such as Microsoft Word, Pages, or Google Docs. The printable journal also has vocabulary activities that will be helpful to complete prior to beginning the unit.

Optional OverDrive Books and Resources for Further Study:

How Cell Processes are Regulated by Clementine Tucker
How Plant and Animal Cells Differ by Anna Kaspar
How Eukaryotic and Prokaryotic Cells Differ by Raina G. Merchant
Cell and Microbe Science Fair Projects by Kenneth G. Rainis
Cells by Angela Wagner
Cells: The Building Blocks of Life by Nat Reed
Cells by Matt Mullins

Videos to Watch and Talk About (Select 3-5):

Wonder of the Cell DVD Creation Library Series

Learn 360:

Cells
Simply Cells: Parts of Cells and Their Functions
Cells, Tissues, and Skin
The Magic of Cells
Cells: The Building Blocks of Life
Plant Cells and Photosynthesis

Discovery Education:
Cell Theory

Activities (Select 3-4):

Science Power: Explore the fabulous interactive from Science Power (World Book Online) about Plant and Animal Cells. Follow the Experiment instructions to simulate the process of osmosis.

Science Power: Explore the fabulous interactive on the Structure of Living Things from Science Power (World Book Online). Try the Experiment to compare plant and animal tissues. Observe the similarities and differences between the two.

Build a Model Cell: Now that you have more information about cells, your task is to design and build your own model of a plant or animal cell. This is a project with which you have free reign to choose and decide! You can use whatever materials you would like to construct your model cell. Lego, art supplies, food items, clay...whatever you want! Your model cell should show all of the key components of the cell. Find a clear image of a cell using Google Images that shows the different parts, and has each part labeled. You will need to label your model cell. Once you have built your model cell, present it to friends and family members. Try to explain the role that each part of the cell plays in its function.

An Introduction to the Cell: Cells are amazing things. Your entire body is made of cells--microscopic parts working together to create a dynamic, functioning whole. It is pretty miraculous! For this activity you will be creating an introduction to cells. This intro to cells can be addressed toward people the same age as you OR to younger students. Your intro to the cell should be fun and engaging. This is your opportunity to become the teacher. Your intro could take many different formats:

- A skit or short play with friends playing the different parts of the cell.
- A series of cartoons or comics.
- A Padlet, PowerPoint or other kind of presentation.
- A Wix or Weebly website.
- A children's story book using Storybird or another program.
- A song or a poem.
- Something of your choosing.

Your intro should include information about how cells work, the different parts of the cell, and why cells are important. Be certain to showcase your introduction. You can conduct necessary research using Explora and/or World Book Student.

Shrinking Cells Experiment: Try this fun experiment to see what happens when cells are exposed to salty water. For this experiment you will need two glasses, warm water, salt, and a carrot. Fill each of your glasses half-full with warm water. Dissolve three tablespoons of salt into one of the glasses. Break a carrot in half and place the cut end of each piece into each glass. Leave your carrots to sit overnight. What do you predict will happen to the carrot in the salty water? What do you predict will happen to the carrot in the regular water? Write down your predictions on your experiment recording sheet. What happens? What happens to each carrot? Was your prediction accurate? Why do you think each carrot responded the way it did? (Explanation is on the last page of this guide).

Plasmolysis: For this experiment you will need an onion, water, microscope slides, iodine, salt, and a microscope. To start, peel a layer of skin from an onion. Place a drop of water on your slide and place the onion skin in the water. Add another drop of water, and a drop of iodine over the onion. Cover with a glass slip. Examine your slide under a microscope. Draw what you see on your experiment recording sheet. Next, add 5 grams of salt to 100 milliliters of water. Place a few drops of the solution to one side the microscope slide. What happens? How has the onion skin change? Draw what you see. Repeat the process, this time using 10 grams of salt mixed with 100 milliliters of water on a new slide. What happens? How does the onion skin change? Draw what you see. Why do you think these changes occurred? (Explanation on last page of this guide). Use your experiment recording sheet throughout.

Osmosis: For this experiment you will need room temperature water, salt, sugar, and potatoes. Fill three bowls with room temperature water. Add salt to one bowl, sugar to the second bowl, and nothing to the third bowl. To start, place one slide

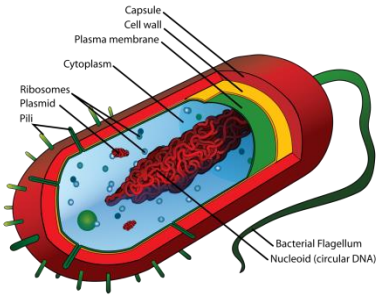
from the centre of a potato in each bowl. What do you think will happen to the slice in the salt water? What do you think will happen to the slice in the sugar water? What do you think will happen to the slice in the plain water? Record your predictions on your experiment recording sheet. Remove the slices after 30 minutes to examine them. What happens to the salt water slice? What happens to the sugar water slice? What happens to the slice in the plain water? Why do you think this happened? (Explanation on the last page of this guide). Now that you have learned about osmosis, try the following **challenge question:** *you are away at summer camp when you come down with a horribly sore throat. You were supposed to sing in the talent competition tomorrow night, but you don't think you will be able to. Your cabin leader tells you to gargle with warm, salty water to help your throat feel better. You aren't convinced that this will work, but after suffering with the sore throat for a while, you decide to give it a try. Remarkably, it works--but why? Why do you think gargling with warm salty water can help a sore throat? How can you test your theory? Do you think osmosis is involved? Why or why not? Explain your thinking. Can you think of a better method for healing a sore throat than gargling with salt water? What is it?*

Build-a-Membrane: Research cell membranes using Explora. What purpose do they serve? How do cell membranes function? What happens to a cell when the membrane is damaged? Print pages 4-7 of this document to build a model of a small portion of a cell membrane. Then, colour this animal cell.

Cell Theory Collage: What is cell theory? You have been learning about cells and cell theory throughout this section of the unit. Now, it is time to create a project that will help you to remember the different components of cell theory. To begin, spend some time reviewing the components of cell theory. They should be recorded in your Cell Journal. If not, you can review cell theory using Explora and/or World Book Student. You will be using Padlet to create a collage using words and images that remind you of the components of cell theory. For example, you might use the phrase "all known living things are made up of one or more cells," you would then choose words and images that reflect that understanding. Can you think of any Bible passages to include in your collage that remind you of cell theory and creation?

Design an Experiment: You have probably conducted many experiments throughout this unit. Experiments are a wonderful way to learn more about God's creation. Scientists use a specific process when conducting an experiment known as The Scientific Method. The Scientific Method must be used to achieve high-quality, accurate results. It is important not to start with a conclusion before conducting your experiment. Scientists begin with a question they would like to answer, they conduct research, and then they develop a hypothesis. This can be a long process! Watch Using the Scientific Method from Learn 360. Now, what is a question you have about matter? It is important that it is not a "yes" or "no" question, if you can answer your question with "yes" or "no," that question won't work for your experiment. Use Popplet to create a mind map. Write your BIG question in the centre of your mind map, and write your small questions around the outside. Now, use Explora, Science Power, and World Book Student to conduct some research about your questions. You can use this form to organize your research. Use the information you gather to create your hypothesis (prediction about what will happen) and design your experiment. What will you do to find an answer to your question? How many times will you repeat the experiment? Where will you conduct the experiment? What materials will you need? How will you document your experiment (paper, camera, video etc.)? For the most accurate results, conduct your experiment at least twice. Have fun! Parents and teachers can use this handy rubric for assessing the project. Consider reflecting on your project using this helpful document from BIE. Use your experiment recording sheet.

The Relationship of Microorganisms with Living Things



Books to Read and Talk About:

***** Plague and Pandemic Alert! by Julie Karner**

After reading this book, you will be answering questions in your cell journal. A printable journal is available here. If you prefer, you could also answer the questions in a video or audio recording, using a Padlet, or in a word processing program such as Microsoft Word, Pages, or Google Docs. The printable journal also has vocabulary activities that will be helpful to complete prior to beginning the unit.

***** Vaccine Innovators by S. Wood**

After reading this book, you will be answering questions in your cell journal. A printable journal is available here. If you prefer, you could also answer the questions in a video or audio recording, using a Padlet, or in a word processing program such as Microsoft Word, Pages, or Google Docs. The printable journal also has vocabulary activities that will be helpful to complete prior to beginning the unit.

Superbugs by John DiConsiglio

About this book: *Superbugs, bacterial infections and diseases that have become immune to current antibiotics, are becoming more common. What makes a superbug and why are they becoming more frequent? Is there anything we can do to protect ourselves from superbugs?*

Videos to Watch and Talk About (Select 6-8):

Learn 360:
Bacteria
The Bacteria Kingdoms
Bacteria
Disease Prevention: Dirty Secrets Exposed
Resistant Bacteria
What's the Difference Between a Bacteria and A Virus
Resistant Bacteria
How Do Bacteria Become Resistant?
Virologists Determine How Ebola Infects Cells
Virus Crisis
What is a Virus?
Immune System: White Blood Cells
Immunity
Doomsday Flu
How Airports Influence the Spread of Disease
Strength to Strength
The Black Death
Pathogens and Disease Transmission
Antibiotics: The Wonder Drug
Ray Kurzweil Predicts the End of Disease
Science & Disease
Butterflies And Bats Reveal Clues About Spread Of Infectious Disease: Science Nation

All About Vaccines
Virus Evolution
Viruses and Monerans
Polio Vaccine
Biological Vectors
How Do Vaccines Work: Ask Smithsonian
Synthetic Vaccines
Vaccines and Antibiotics
A Paralyzing Fear: The Story of Polio in America
Vaccinations

Discovery Education:

Types of Vaccinations
Vaccination
Immunology

Activities (Select 3-4):

Growing Bacteria: For this experiment you will need petri dishes, agar (available from Amazon or from many grocery stores), sterile cotton swabs, and a magnifying glass. Swab a surface in your home with a cotton swab, rub the swab over the agar in the dish and seal with a lid. Next, use a second swab to swab under your fingernails or between your toes. Repeat the same procedure with the agar. Place the dishes in a warm area for two to three days, spend time observing the changes each day. Record what you see on your experiment recording sheet. What are the differences between the swab of furniture and the swab from your body? How rapidly does the bacteria in the dishes grow? Which dish had bacteria grow the fastest? Why do you think this is? When you are finished with your dishes, wrap them in plastic, and throw them in the garbage. **Do not open the lids.** If you repeat the experiment, what are some things you could swab? What do you think the dirtiest thing in your home is? The cleanest? How much bacteria do you think there is on the door handles of stores? On elevator buttons? Sidewalks? Earbuds? The handle of your refrigerator door? What else could you test?

Understanding Bacteria and Viruses: When was the last time you were sick? Did you know what you had? Was it caused by a bacteria or a virus? How would you know? Bacteria and viruses can both cause illness, but they are very different. The way we treat and address viruses is different than the way we treat and address bacterial infections. In your life, you have probably been infected with both viruses and bacteria. To begin, spend some time watching Investigating the Immune System from Learn 360. What is the immune system? How does the immune system work? Does the human immune system protect us against both bacterial infections and viral infections? How so? Does the immune system always work effectively?

Next, watch Viruses and Monerans and Bacteria, both from Learn 360. What are the primary differences between bacteria and viruses? Create a venn diagram to compare the differences and similarities. How are viruses treated by medical professionals? How are bacterial infections treated by medical professionals? Are antibiotics effective against viral infections? Now that you have learned about bacterial infections and viral infections, select a virus or infection to design an informational pamphlet on. You can use Canva Brochure Maker, Google Docs, Microsoft Publisher, paper and art supplies, a Wix or Weebly page, a Padlet, or, if you prefer, create a 5-minute informational video about the disease you selected. You will need to conduct research on your disease. The CDC website and the World Health Organization website can both be helpful. Be certain to include whether the disease is a viral or bacterial infection, the origin of the disease (if known), how it is spread, symptoms, and how it is treated.

Understanding Epidemics and Pandemics: Although many people think of the flu as being a fairly mild illness, throughout history the flu has killed millions. Each year in the United States alone 20,000+ people die from the flu. In the 2003/2004 flu season, 48,000 people died from the flu. In 1918/1919 between 20 million and 50 million people died from Spanish Influenza. The flu can be extremely serious, and it doesn't just affect people who suffer from other medical ailments, the flu can strike and kill healthy, young people as well. Epidemics and pandemics are a serious threat to human society. It is especially difficulty, in this day and age, to prevent the spread of serious viruses due to the prevalence of air travel. Watch How

Pandemics Spread. After watching the video, answer the following questions on a blank page in your cell journal:

- What is the difference between an epidemic and a pandemic?
- According to the film, why are epidemics and pandemics relatively recent phenomena?
- How do war zones and natural disaster sites become breeding grounds for disease?
- What happens to the influenza virus every 20-40 years?
- What role do airports play in the spread of disease?

Research a pandemic or epidemic of your choosing using Explora and/or World Book Student and create a fact-sheet about it to add to your cell journal.

Ebola Virus Outbreak--Become an Epidemiologist: In December of 2013, an outbreak of the Ebola virus began in Western Africa. Ebola is an extremely serious virus, and, unfortunately, there is not currently a reliable cure or vaccine to protect against the disease. In this lesson you will learn about the Ebola virus, and then design a strategy to control the epidemic. Through this series of activities, you will develop a good understanding of the steps organizations such as WHO (the World Health Organization), the CDC (Centers for Disease Control), and others take when faced with a serious outbreak. You are playing the role of an epidemiologist.

Step One: Read about the epidemiologic triangle.
Step Two: Watch Flu Attack: How a Virus Invades Your Body from NPR.
Step Three: Watch What You Need to Know About Ebola.
Step Four: Read "This is How You Get Ebola."
Step Five: Follow the instructions on the worksheet to analyze the Ebola outbreak data. You can use a calculator to solve the math-related questions.
Step Six: Learn more about the environment that is home to the Ebola virus by watching West and Central Africa from National Geographic.

Step Seven: Now it is time to develop your strategic plan! Use this document from PBS to help you as you develop your plan to contain and fight the Ebola virus! Congratulations, you have become a world-class epidemiologist!

Antibiotics and Antibiotic Resistance: Have you ever taken antibiotics? What were they for? Did they help? Antibiotics play a huge role in the modern fight against disease. Antibiotics are only effective against bacterial infections, and should never be given for viral infections. To begin, watch Antibiotics: The Wonder Drug from Learn 360. How were antibiotics developed? What was fighting diseases like prior to the discovery and manufacture of antibiotics? Can you imagine how different life would be without antibiotics? Now, watch Antibiotic Guardian. What are some of the problems facing antibiotics? What has caused this antibiotics? Why do scientists no longer spend significant time researching and developing new antibiotics? What is the correct way to use antibiotics? What are the dangers of using antibiotics inappropriately. Have fun playing Antibiotic Resistance from BrainPop. Now, create a poster, comic, graphic, slogan or song that will help remind people of appropriate uses for antibiotics.

Medical Mystery: In this activity you will be able to solve a virtual medical mystery! To begin, watch Viruses and Vaccines from BrainPop. What are the different roles that scientists play in solving problems such as outbreaks? What steps do they take? What do they try to do to address the problem? How do scientists work collaboratively to solve the problem? For this activity you will get to take on the role of an epidemiologist, microbiologist, and veterinarian. You will be playing MedMyst: Animal Alert--take enough time to play each of the career paths. Which role did you enjoy the most? How did each of the different career paths work together? How did each of the career paths work independently? What is the most important thing you learned during this activity is?

Stop Deadly Disease--Technology Time: Have fun and test your knowledge by stopping deadly diseases with a team of scientists in this excellent interactive.

Understanding Vaccines: In 1796, Edward Jenner created and tested the first vaccine against smallpox. This changed the way we fight disease forever. Spend some time exploring these excellent graphics showing the way incidents of vaccine-preventable diseases dropped dramatically following the introduction of the vaccine. These graphics show results from the United States, however, the results are the same in all developed countries. You can also explore this timeline of the history of vaccines. Vaccines have made a huge difference in terms of life-expectancy and illness prevention. For example, according to the World Health Organization:

- *Measles is a highly contagious, serious disease caused by a virus. In 1980, before widespread vaccination, measles caused an estimated 2.6 million deaths each year. The disease remains one of the leading causes of death among young children globally, despite the availability of a safe and effective vaccine. Approximately 134 200 people died from measles in 2015 – mostly children under the age of 5. Measles vaccination resulted in a 79% drop in measles deaths between 2000 and 2015 worldwide. In 2015, there were 134 200 measles deaths globally – about 367 deaths every day or 15 deaths every hour.*

- *Polio (poliomyelitis) mainly affects children under 5 years of age.1 in 200 infections leads to irreversible paralysis. Among those paralyzed, 5% to 10% die when their breathing muscles become immobilized. Polio cases have decreased by over 99% since 1988, from an estimated 350 000 cases then, to 37 reported cases in 2016. As a result of the global effort to eradicate the disease, more than 16 million people have been saved from paralysis.*

- *Immunization prevents illness, disability and death from vaccine-preventable diseases including cervical cancer, diphtheria, hepatitis B, measles, mumps, pertussis (whooping cough), pneumonia, polio, rotavirus diarrhea, rubella and tetanus.*

- *Immunization currently averts an estimated 2 to 3 million deaths every year. An additional 1.5 million deaths could be avoided, however, if global vaccination coverage improves.*

- *Before the whooping cough vaccines were recommended for all infants, about 8,000 people in the United States died each year from whooping cough.*

Today, because of the vaccine, this number has dropped to fewer than 20 per year. Whooping cough is most dangerous for babies and young children. In fact, babies younger than 1 year old who have whooping cough may: need to be cared for in the hospital, develop pneumonia (a serious lung infection), Have seizures, and even suffer brain damage. Whooping cough can even be deadly. Since 2010, up to 20 babies have died each year from whooping cough in the United States. Most of these babies don't have protection against whooping cough because they are too young to get the shots.

- You can read more factsheets about common vaccines from the CDC.

Now that you have learned a little more about vaccines, it's time to delve a little deeper into the fascinating world of medical science. Begin by learning about How Vaccines are Made, then, learn about How Vaccines Work, next, learn about some of the risks associated with vaccines, and compare these to other risks in the Understanding Risks interactive, to finish, learn about Herd Immunity and why it is so important.

As you may be aware, there is some debate around vaccines and vaccine safety. There are many differing perspectives on vaccines. Now that you have learned about vaccines, it is time for you to choose a perspective, research it in greater depth, and then share your opinion. You can choose the way you share your opinion:

- A video
- A Padlet journal-style entry
- A poster or digital presentation
- A report or essay
- A Wix or Weebly page
- A newspaper article using Issuu
- A medium of your choosing

You can use Advanced Google to conduct your research. Remember, it is very important to use reputable sources when conducting your research. If you aren't certain whether a source is reputable or not, you can consult this resource.

Glossary

Shrinking Cells Explanation: Plant and animals behave like tiny water balloons. The membrane of cells is semi-permeable. This means that certain substances can get through, but not others. The cells balance the saltiness in the water by releasing cell water through the cell wall to the surrounding salt water. This causes the cells to lose the water they need to live--they collapse and die. The carrot in the plain water absorbed the water into the cells causing it to expand. Can you think of any other situations in which something similar would happen?

Plasmolysis Explanation: The salt caused the protoplasm in the cell to shrink in a process called plasmolysis.

Osmosis Explanation: The salt water slice will become soft and flexible, the sugar water slice will be less flexible, and the plain water slice will be more rigid. Cells allow water to pass in and out. Cell water tends to move toward dissolved chemicals--this includes salt and sugar. In the salt water, the water inside the cells moved from the inside the cells to the outside causing the potatoes cells to collapse. The same thing happened with the sugar water, however, the cells of a potato contain more sugar than salt, this means that the potato didn't lose as much cell water in the sugar water as it did in the salt water. In plain water, the cells of the potato moved water from the outside into the cells. This caused the cells to swell and become stiff.

Big Ideas

"Big ideas are statements that are central to one's understanding in an area of learning. A big idea is broad and abstract." (CT) Big ideas represent the overarching theme of each unit. They contain references to the content and key questions students will be investigating throughout the unit. Big ideas are often cross-curricular in nature. Similar themes can be found in many different subject areas within each grade-level.

Science

Life processes are performed at the cellular level.

Content and Key Questions

Content refers to the topics that will be investigated throughout the unit. The key questions serve as a guide as you and your child explore the content. Throughout this unit the key questions will be the starting point for learning.

Science

Content: Characteristics of life
Elaborations: living things respire, grow, take in nutrients, produce waste, respond to stimuli, and reproduce; there is debate as to whether or not to classify viruses as living things

Content: Cell theory and types of cells
Elaborations:

- **Elaborations:** vaccination can prevent the spread of infectious disease
- **Elaborations:** antibiotics are effective only against living organisms, such as bacteria, and not against viruses; overuse of antibiotics can lead to the development of antibiotic-resistant strains of bacteria ("superbugs")
- **Elaborations:** regional outbreaks (e.g. smallpox, measles)

Elaborations: global outbreaks (e.g. Spanish flu, SARS)

- living things are made of one or more cells
- all cells come from preexisting cells
- the cell is a basic unit of life
- prokaryotic and eukaryotic cells
- plant and animal cells
- cells contain structures that carry out essential functions

Content: Photosynthesis and cellular respiration

Content: The relationship of microorganisms with living things:

- basic functions of the immune system
- vaccination and antibiotics
- impacts of epidemics and pandemics on human populations
- Elaborations:

- microorganisms are key to nutrient recycling in ecosystems as they act as decomposers
- viruses and bacteria can cause disease and can also be used in industry (e.g., production of cheese and salami) and agriculture (e.g., production of striped tulips)

Elaborations:

- the immune system provides a barrier to infections and a number of nonspecific and specific responses to fight infection (e.g., fever, antibodies, phagocytes, inflammation)
- different populations have greater immunity to certain infections than other populations (e.g., impact of smallpox epidemic on First Peoples)

Bibliography

"Amazing Cells." *University of Washington*, University of Washington, gsoutreach.gs.washington.edu/files/amazingcellsbook.pdf+.

"Ebola Outbreak – Lesson Plan." *PBS*, Public Broadcasting Service, www.pbs.org/newshour/extra/lessons_plans/ebola-outbreak-lesson-plan/.

"Fun Science Experiments on Cells." *Sciencing*, sciencing.com/fun-science-experiments-cells-8066655.html.

Public, Operated By, and Health England. "E-Bug, Young Adult." *e-Bug*, www.e-bug.eu/lang_eng/young_adult/teacher/Young_Adult_Antibiotic_Full_Pack.pdf.

"Scientist Role Play Lesson Plan: MedMyst Animal Alert! Game." *BrainPOP Educators*, BrainPOP, educators.brainpop.com/lesson-plan/scientist-role-play-lesson-plan-medmyst-animal-alert-game/?bp-topic=vaccines.