

BASIS Lesson Plan

Lesson Name:

Outbreak: Germs, Your Pet, and You!

Grade Level Connection(s)

NGSS Standards: Grade 3: Interdependent Relationships & Ecosystems (LS)

FOSS CA Edition:

**Note to teachers: Detailed standards connections can be found at the end of this lesson plan.*

Teaser/Overview

Have you ever thought about how disease outbreaks start? A germ finds the perfect imperfect environment and runs out of control! The germ jumps between species and on to you. How can we prevent this? Find out more with *Outbreak!*

Lesson Objectives

- Students will understand that the health of people is dependent on the health of animals and the environment
- Students will understand the importance of good communication between different professions
- Students will understand the need of vaccination
- Students will better understand the importance of protecting our environment
- Students will better understand disease transmission
- Students will see what health professionals are currently combating

Vocabulary Words

1. **One Health:** the beneficial collaboration of health professionals working with animals, people and their shared environment
2. **Species:** A group of organisms that are similar enough to one another that they can produce offspring together (ex. cats, dogs, humans)
3. **Zoonotic disease:** a disease that can jump between different species (ex. rabies, Leptospirosis)

4. **Vaccine:** something that strengthens a body's defense against a particular disease. (ex. flu vaccine)
5. **Epidemic:** the widespread occurrence of an infectious disease in a community at one time

Materials

Scientist Volunteers will bring:

To be reused for each lesson:

1. Large laminated pictures of:(2 vaccines:"part 1 of 2" & "part 2 of 2"; 1 disease; 1 clean water):



2. Scotch tape to put large laminated pictures on board
3. Colored plastic eggs (30-40 red/orange, 30-40 blue/green)
4. 15 small laminated pictures of vaccine (**15** hidden in red/orange eggs; there will be 15-18 empty red/orange eggs)
5. 18 small laminated pictures of clean water (hidden inside of 18 blue/green eggs)
6. 18 small laminated pictures of disease (hidden inside of 18 blue/green eggs)
7. Edited video of dogs on **USB drive**
8. 30-36 laminated role tags with neck pieces:
 - a. 15-18 tags with one side written: ADULT DOG
 - b. 15-18 tags with one side written: DOG OWNER

Materials teachers should provide:

Computer projector with screen

Chalk or whiteboard with writing materials

Space in the classroom for an egg hunt/searching activity

Classroom Set-Up

Student should start at the carpet area for the lesson introduction and activity overview. When we start the activity, students will need to be set up in pairs. We will need to hide plastic eggs around the classroom, so let the volunteer team know if there are areas that are off limits to students. After the game, we will need students to split up into three different (~10 person) groups for discussions. We will finish the lesson at the carpet area.

Classroom Visit

2. Introduction (10 minutes)

Role Model Introduction:

Being a role model for students is an important part of being a BASIS volunteer. Begin your lesson by introducing yourselves! Every team member should take a moment to explain who they are and what they study/do as a scientist. A bonus will be to tell your “story,” as if giving an elevator pitch to 8-year-olds: Why did you become a scientist? What made you interested in your topic? Why should students relate to you, or be interested in you? Feel free to draft a script of what you will say, here. And remember, you can also weave your story throughout your lesson through examples from your own life, and/or return to it with Q&A at the end.

Topic Introduction:

(1 person speaks, 1 person writes vocab on board, 1 person sets up video)

After you introduce yourselves as role models, take some time to introduce the topic of this lesson: *Disease Outbreaks: how they happen and how to prevent them with a One Health approach. It may be helpful to keep the suggested take-away in the back of your mind throughout the lesson: **collaboration between veterinarians, physicians, and environmental specialists is the key to prevent and solve the majority of disease outbreaks.***

Your topic instruction should follow the outline below. As much as possible, try to frame this information as questions posed to the class, rather than a lecture. This helps activate students’ prior knowledge and facilitates student-guided conversation.

- Intro: Today we are studying **One Health** (*write on board, using a Venn diagram with animals, humans, and the environment in three different circles. One Health is where they all come together*). Your health relies on the health of animals and the environment.
- 6. Who has had a vaccine? What is a **vaccine**? (*write on board, give example of flu vaccine: It often protects you from very bad degrees of disease. If a vaccinated person catches the flu virus then he/she will not get as sick as an unvaccinated person would. You would probably feel lousy but you likely would not die from the germ.*)
- Who has a pet? Did you know that animals also get **vaccines** too?
 - In the United States, one *mandatory* dog vaccine is the rabies vaccine. That is because people can get rabies too! It is a **zoonotic disease**. (*write on board and explain **species** at the same time*) How could a person get rabies from a dog? (*ex. the dog bites them*)
 - If a dog owner cannot prove to the city that their dog is vaccinated (up to date) for rabies then they will have to pay money to the government as a penalty. This is because rabies is a human health concern and the government does not want an **epidemic** (outbreak) of rabies. Many (>60%) human diseases are **zoonotic diseases**! Even though rabies in people is not common in the US (because of

mandatory dog vaccines), it can be seen in other areas of the world. One interesting sign of rabies in a person is that he/she is afraid of looking at water (“hydrophobia”)!

- What is an **epidemic**? (*write it on the board, it is a disease outbreak*) Certain health specialists (*mainly in Public Health*) study outbreaks by doing tests in the field and forming data and reports on the current state of various diseases. We will be doing this today too!
- First, let’s talk about another **zoonotic disease** called Leptospirosis (“*Lepto*” for short, *write on board*). This is a bacteria that can kill dogs and other animals including people. It is found in water where animals have peed in! This water can be found in parks, forests and even cities! Several wild animal species can carry it (sea lions, coyotes, wolves, squirrels, deer, pigs, opossums, skunks, cows, rats, etc.) and when they pee in puddles or small ponds, dogs that drink from those areas can get very sick if they are not **vaccinated** against it. (*point to word on board*) Right now, local wildlife veterinarians are fighting an **epidemic** of Leptospirosis in California Sea Lions. (*point to word on board*)

2. Learning Experience (40 minutes)

Activity One: “FROM THE EYES OF A DOG” VIDEO (5 minutes)

- Let’s first look at a **video** of several dogs having a fun time on hikes. *The dogs are doing several activities on the including: sniffing the ground, going to the beach, encountering wildlife, swimming in a pond.*
 1. Ask the students to make a list of places visited by the dogs. When could the dog pick up some germs (like Leptospirosis)? What wildlife do you see in the video? Where are the animals found? (woods, beach, pond, city) Remember, dogs can eat and drink funny things and can encounter wild animals anywhere!
 - Key to remember: Disease can jump between species!
 2. After the video is done, hold a class discussion on what the students wrote.
 3. Then repeat the video with a fun added bonus portion at the end which involves a squirrel carrying a Go Pro camera up into a tree. This shows wildlife is everywhere- even in the heart of cities!
- *After it rains, puddles form on the sidewalk – can they make a dog sick? (yes, if a rat has peed in it for example then Leptospirosis may be in the puddle along with other germs)*
- *Big Picture: People’s health is already impacted by the environment but the Earth is now suffering (climate change, pollution, deforestation, global warming). Scientists already see changes in a lot of different animals that are not expected to survive many more generations (ex. Polar bears are “vulnerable” today). If the Earth is no longer healthy, then most living organisms (including humans) will suffer incredible diseases. Humans will become endangered over time unless we start working together to help strengthen the environment.*

Activity Two: TAKE A HIKE! (sounds and role playing activity) (3-5 minutes)

- *This activity creates a model of a disease (Leptospirosis) outbreak. Every student will get a role of either a dog or a dog owner. The dog must stay with their owner while being out on “a nature hike” (like in the video). Each team of two (dog and dog owner) or three (2 dogs and one owner if there is an uneven number of students) will hunt for hidden red, orange, blue and green eggs (most eggs contain laminated pictures) throughout the classroom area (which has been designated by the teacher).*

In order to hide the eggs without the students suspecting anything, another activity is started (meanwhile, one volunteer will lower the thumbs of the “dogs” and every student will get their corresponding role tags (“DOG” and “DOG OWNER”) while all students’ eyes are closed. While the students’ eyes are closed, another volunteer will place eggs throughout the classroom for the teams to find.)

- Teacher puts students into pairs at desks
- The students are instructed to put their heads down on their desks and close their eyes with their thumbs up on the desk (like the game “7-up/Thumbs Up”). The volunteer directing the students will create a small contest by saying: “the student who makes the best animal sound with their eyes closed will get their thumb placed down and a surprise later on but be sure to keep your eyes closed or else you lose the surprise”. *(the surprise is the “dog” role)* “There are a lot of different animals that I will ask you to imitate so stay patient until we tell you to open your eyes. Remember, there is no wrong sound. These animal sounds will be from animals that can get sick from Leptospirosis”:
 - Dogs, sea lions, coyotes, squirrels, pigs, deer, opossums, wolves, skunks, cows, rats
 - Eyes open when all students have gotten their role tag and all eggs have been hidden.
- We will be role playing as dogs and dog owners! Each individual may or may not be exposed to dirty water (green/blue eggs) that has Leptospirosis. We’ll only find out later if you will be sick or not.
- Review the roles and rules: each student’s role tag means that they are either a dog owner or a dog. *(If there is an uneven number of students then ask the classroom teacher which “dog owner” student should be chosen to have 2 dogs instead of one.)*
- In the game, the dog and dog owner will travel together. EACH DOG and DOG OWNER team will find 1 red, 1 orange, 1 green, and 1 blue egg and head back to their seats.
- **Instruct the students to NOT open the eggs** until further directions and explanations are made.

Activity 3: OUTBREAK! (Compiling and understanding data) (10 minutes)

- Explain that the blue and green eggs represent water that you already drank from while on “the nature hike”
- Explain that the red and orange eggs represents a dog’s vaccine history
 - TWO vaccines are needed to protect a dog (*place two laminated large vaccine pictures on board*)
 - *If there are <2 vaccine pictures per team then the dog is not protected against Leptospirosis*
- ➔ 1. Instruct ALL students to open their own RED and ORANGE EGGS and determine if the dog is protected (or not) from Leptospirosis. Review that protection is only for the dog.
- ➔ 2. Instruct all DOG OWNER students to open up their own BLUE or GREEN EGG. If their own egg has clean water, they are safe. If their own egg has the disease, they are sick.
- ➔ 3. Instruct all DOG students to open up their own BLUE or GREEN EGG. If their own egg has clean water, they are safe. If their own egg has the disease, they are sick unless they have found 2 vaccines.
- ➔ Have students raise their hands to show who in the classroom got the disease.
 - Review that Leptospirosis can be spread between people and dogs
 - Review that Leptospirosis normally should be in <5% of the Bay Area’s dog population. *Therefore, in a class of 15 “dog” students, there is an epidemic if 1 or more dogs are sick.*
- ➔ Epidemic Spread: When an epidemic has been declared, share that if either the DOG or the DOG OWNER has Leptospirosis, that they pass it to the other (unless the dog has gotten 2 vaccines).
- ➔ Show that almost all students now have the disease.
- Emphasize that this is a typical data collection for health professionals (*epidemiologists*).
- Review that an **epidemic** (*point to board*) is the rapid spread of an infectious disease (like Leptospirosis) to a large amount of organisms (ex. dogs and/or people) in a given population within a short period of time, usually two weeks or less. It stops when the rate of speed of growth of the disease is under control.

Activity 4: One Health in Action (discussion) (Time: 15 minutes)

- Break up students into three groups (of ~10 people) to solve this **Epidemic** problem by answering a common question. Each volunteer is in charge of asking the question pertaining to their own area of interest (animal health, human health, environmental health). Each student group will talk as if they are the local specialists: local veterinarians (group 1), the local doctors (group 2) and the local environmentalists (group 3). Each group will physically move every 5 minutes to the next station to meet a new BASIS volunteer.
 - **Group 1:** How could veterinarians prevent or treat this **Epidemic**? (*educate owners about Leptospirosis in the environment, vaccinate dogs, treat infected dogs and educate owners on how to prevent spread to other dogs, the environment and people. Can also notify the state public health department.*)
 - **Group 2:** How could doctors prevent or treat this **Epidemic**? (*Review that the majority of human diseases are **zoonotic**!! Doctors need to educate patients, treat patients and review how to prevent disease transmission in the future, if a sick person has a sick pet then they should see their own doctor right away and tell doctor about household sickness. Doctors also need to report diseases to the state public health department.*)
 - **Group 3:** How could environmental scientists prevent or treat this **Epidemic**? (*water testing- but this is expensive , Educate the public to avoid contaminated water, prevent public access to contaminated water sources (prevent deforestation), notify physicians, veterinarians, and the state public health department when water testing comes up positive in a 150 mile radius.*)

3. Wrap Up: Review and Discuss the Learning Experience (5-10 minutes)

- Bring students back together on the rug and ask:
 - How can all 3 professionals work **together** to prevent and treat this **Epidemic**? (*Frequent meetings and discussions of each discipline's concerns (ex. vets can be educating pet owners but when owners go talk to their own physicians, there is not much information given to them). Veterinarians and physicians can speak to their clients and patients about the importance of respecting the environment and staying away from possible disease sources. They also need to emphasize the importance of disease transmission between different species. Everybody can use the educational material put out by the public health department.*)
 - How can environmental professionals work with veterinarians? (*Through ecology, conservation, research*)
 - How can environmental professionals work with physicians? (*engineering— food, building materials*)

- How can the three groups work together to prevent **zoonotic** diseases (in general) from happening? (*frequent meetings and giving updates*)

4. Connections & Close (5 minutes)

Connections to the real world around students:

Why should students care about the phenomenon they've been exploring? How does their exploration fit into the bigger picture of why scientists study it? What connections can students draw to their own lives? How can they learn more?

- One Health includes animal, human and environmental health. The problem with One Health today is that the professionals in each discipline are not speaking much with each other. How can that be corrected? (*Professionals from each discipline needs to work together to improve the health of the planet as a whole.*)
- What are the potential problems that are standing in the way of the 3 groups now working together? (*laws/policies that do not protect the environment, insufficient money, strong lobbyist groups*)
- How can we encourage people with different strengths to work together? (*show them that different strengths are needed to combat serious events like Epidemics*)
- How can technology help this situation? (*mobile tracking devices and apps help local populations*)
- How can you convince somebody that One Health is important? (*explain what was learned today*)
- How can you (the student) make a difference with One Health? (*they can tell others about what they learned today*)

Close:

Wrap up as a role model by leaving a few minutes for students to ask questions about science, about being a scientist, and about becoming a scientist. Then, thanks and goodbye!

Follow Up: After the Presentation

Teachers who wish to extend the impact of this lesson may find the following CRS web pages useful:

- <http://www.crscience.org/educators/helpfulreports>
- <http://www.crscience.org/educators/treasuretrove>

<http://www.sfexaminer.com/major-outbreak-bacterial-disease-affects-hundreds-california-sea-lions/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2231387/>

<https://www.ecohealthalliance.org/wp-content/uploads/2018/03/Hotspots-of-canine-leptospirosis.pdf>

<https://ucdavis.box.com/v/livingsafelywithbats-flipbook>

<http://outbreaknewstoday.com/rabies-survivor-milwaukee-protocol-saves-brazilian-teen-96855/>

http://webadventures.rice.edu/ed/Teacher-Resources/_games/MedMyst-Original/_301/Game-Overview.html

Standards Connections
