

How Germs Spread

Grades 6-8

Health, Math, ELA, Science



Objectives

Students will identify behaviors that avoid or reduce health risks to self and others. Students will conduct scientific experiments to learn how germs are spread. Students will research diseases and identify the classification, transmission, symptoms and prevention or control and write a research paper. Students will collect and analyze data and make statistical calculations.

Vocabulary

bacteria—a group of single celled microorganisms that live in soil, water, the bodies of plants and animals, or matter obtained from living things and are important because of their chemical effects and disease causing abilities

biosecurity—management practices that reduce the chances that infectious diseases will be carried onto a farm by animals or people.

contagious—capable of being spread by direct physical contact with an infected person or surface or inhaled droplets or particles from the cough or sneeze of an infected person.

epidemic—a rapid spread of a disease in an area where the disease has not been widespread

fungus—any of a kingdom of living things (as molds, rusts, mildews, smuts, and mushrooms) that lack chlorophyll, are parasitic or live on dead or decaying organic matter, and were formerly considered plants

germ—a microscopic living thing, especially one that causes disease

infectious—disease spread directly or indirectly from animals to animals; animals to humans or humans to humans

pandemic—an outbreak of disease occurring over a wide area and affecting many individuals

pathogen—an agent that causes disease, especially a living microorganism such as a bacterium or fungus population—a group of organisms of the same species populating a given area

quarantine—a strict isolation imposed to prevent the spread of disease

virus—any of various simple submicroscopic parasites of plants, animals, and bacteria that often cause disease and that consist essentially of a core of RNA or DNA surrounded by a protein coat. Unable to replicate without a host cell, viruses are typically not considered living organisms

Background

HOW GERMS SPREAD

The most common way for **infectious** disease to spread is through the direct transfer of **bacteria**, **viruses** or other **germs** from one person to another. This can occur when an individual with the bacterium or virus touches, coughs on or kisses someone who isn't infected. These germs can also spread through the exchange of body fluids from sexual contact or a blood transfusion.

Animals carry many germs. Being bitten or scratched by an infected animal can make you sick. You might also become infected by scooping your cat's litter box or by cleaning mouse droppings in your house, barn or garage. The best way to prevent this is to wash your hands often.

How Germs Spread (continued)

Disease-causing organisms can also be passed along by indirect contact. Many germs can linger on surfaces, such as a tabletop, doorknob or faucet handle. When you touch the same doorknob grasped by someone ill with the flu or a cold, for example, you can pick up the germs he or she left behind. If you then touch your eyes, mouth or nose before washing your hands, you may become infected.

When you cough or sneeze, you expel droplets into the air around you. When you're sick with a cold or the flu—or any number of other illnesses—these droplets contain the germ that caused your illness. Crowded, indoor environments may promote the chances of droplet transmission.

Some disease-causing **pathogens** travel through the air in particles considerably smaller than droplets. These tiny particles remain suspended in the air for extended periods of time and can travel in air currents. If you breathe in an airborne virus, bacterium or other germ, you may become infected. Tuberculosis and SarS are two infectious diseases usually spread through the air, in both particle and droplet forms.

Some germs rely on insects—such as mosquitoes, fleas, lice or ticks—to move from host to host. These carriers are known as vectors. Mosquitoes can carry the malaria parasite, Zika or West Nile virus, and deer ticks may carry the bacterium that causes Lyme disease.

Another way disease-causing germs can infect you is through food and water. Escherichia coli (E. coli) and Salmonella are bacteria that can contaminate certain foods. Heat (170°F) kills germs like E. coli and salmonella, so the main risk is undercooked ground beef or poultry. Unwashed fruits or vegetables can also be contaminated if uncomposted manure or poultry litter was used as fertilizer or an infected worker handled the product without washing their hands. When you eat foods contaminated with E. coli, chances are you'll experience a foodborne illness, also referred to as food poisoning.

Public water supplies are tested regularly for coliform bacteria (E. coli) so the risk of getting sick from that source is minimal. Occasionally, you may see that a community water supply is under a “boil order”, which means that a germ has entered the water supply and to be safe, water should be boiled until the water treatment system has a chance to take care of it.

People should always be careful drinking from outdoor hydrants or water hoses for farm or garden use because disease carrying insects can enter the hydrant or water hose and deposit bacteria that can grow undetected - until the water makes someone sick. Many livestock and irrigation water wells are not regularly tested, so think twice before drinking untested/untreated water. While the soil does a great job of filtering contaminants from the ground water, water wells can have bacterial contamination.

We depend on animals for food, fiber, and many other products so it's important to protect them from becoming ill. Once an animal is sick, no one wants the disease to spread. That is where **biosecurity** comes into play. Biosecurity refers to management practices that reduce the chances infectious diseases will be carried onto a farm by animals or people.

The US Department of Agriculture (USDA) has safeguards in place to protect against the introduction of many diseases into the United States.

How Germs Spread (continued)

Livestock producers should use these five biosecurity precautions:

1. **Quarantine** all new animals for at least 30 days.
2. Properly vaccinate all animals.
3. Wash hands before and after dealing with livestock and wash boots and clothing after visiting another farm and after dealing with sick animals.
4. Contact proper authorities if an animal is sick or acting oddly or if a suspicious person has been around.
5. Limit all contact of animals with other animals (wild and domesticated) and with people from farms where proper hygiene is not practiced.

The USDA works closely with international organizations like the World Organization for Animal Health (OIE), the United Nations Food and Agriculture Organization (FAO), and World Health Organization (WHO) to assist avian flu-affected countries with disease prevention, management, and eradication activities. By helping these countries prepare for, manage, or eradicate animal flu outbreaks, the USDA helps control the spread of the virus.

Background sources:

US Department of Agriculture

Oklahoma State Department of Health, Communicable Disease Division

Nemours Foundation

Kids Health

Additional Reading

Crosby, Alfred W., *America's Forgotten Pandemic: The Influenza of 1918*; Cambridge University Press, 2003

Diamond, Jared, *Guns, Germs and Steel: the Fates of Human Societies*, W.W. Norton and Co., 1999

Hooper, Mary, *Petals in the Ashes*, Bloomsbury Children's, 2005

Kucharski, Adam, *The Rules of Contagion; Why Things Spread - and Why they Stop*, Basic Books, 2020

Oldstone, Michael B., *Viruses, Plagues and History; Past, Present and Future*, Oxford University Press, 2020

Sherman, Irwin W., *Twelve Diseases that Changed Our World: Diseases that Changed Our World and the Lessons They Teach*, ASM Press, 2007

Wright, Jennifer, *Get Well Soon: History's Worst Plagues and the Heroes Who Fought Them*, Macmillan Publishing Group, 2017

Pandemic Influenza Preparedness and Response: A WHO Guidance Document. Geneva: World Health Organization; 2009. 4, THE WHO PANDEMIC PHASES.

Websites

<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth>

<https://www.ncbi.nlm.nih.gov/books/NBK143061/>

How Germs Spread

Activity 1

Grades 6-8 Teacher Resources and Standards

Activity 1: Disease Spread, (Health, Math, Science) 1 50 minute class period

Students will participate in a simulation of how germs spread, analyze the data and calculate the percentage of positive and negative infections

Oklahoma Academic Standards

Activity 1: Disease Spread Simulation (Health, Math, Science)

Health 7.8.3 Demonstrate behaviors that avoid or reduce health risks to self and others.

6.D.1

7.D.1 Display and analyze data in a variety of ways.

PA.D.1

6.D.2 Calculate probabilities and reason about probabilities using proportions to solve real-world and mathematical problems.

7.D.2

PA.D.2

6.LS.1.1 Conduct an investigation to provide evidence that living things are made of cells: either one cell or many different numbers and types of cells

7.LS.2.1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

Materials:

- Measuring cups and spoons
- Red cabbage water. To make the cabbage solution: Cover 2 cups of finely chopped red (purple) cabbage with boiling distilled water and let stand in a glass or stainless steel container for 10 minutes or more to leach color from the cabbage. Or process cabbage with distilled water in a blender until it forms a pulp. Strain residue using a strainer or funnel lined with a coffee filter. Do not use tap water as it will affect the pH of the solution and the results of the activity. Can be prepared ahead of time and refrigerated in a sealed container for 2-3 days or frozen for several months.
- distilled water
- saturated baking soda solution - baking soda dissolved in water until no more can dissolve (about 1 Tablespoon of baking soda dissolved in 1 cup of distilled water) Allow solution to "settle" and pour off clear liquid for use in activity. Rinse solids down the drain with cool water.
- Citric Acid solution - $\frac{1}{4}$ cup citric acid crystals dissolved in 1 cup distilled water (this solution has the same pH as vinegar, but without the odor)
- numbered clear plastic 12-ounce cups
- Activity 1, Reading Page "What is a Pandemic?"
- Activity 1, Worksheet 1 "Infection Rate"

Procedures

1. Allow saturated baking soda solution to stand until clear. Pour $\frac{1}{2}$ cup of solution into a plastic cup and label the bottom to distinguish it from other cups. This will be the teacher's cup.

How Germs Spread

Procedures continued

2. Add $\frac{1}{2}$ cup of citric acid solution to 2-3 of the cups. Record the numbers on these cups for use in the activity to follow. **These cups have been “vaccinated” and the color change in these cups will represent the presence of antibodies.**
3. Set aside one cup each of the baking soda and citric acid samples to test at the end.
4. Add $\frac{1}{2}$ cup distilled water to the remaining cups
5. Have each student pick up a cup. **Instruct students to not drink from the cups.**
6. **Tell students an infected animal has entered the classroom, and one unknown person in the class will represent the infected animal.**
7. Students will predict if the infected animal will infect other animals and if so, at what rate.
8. Students will spend the next 5-10 minutes mingling and sharing water by pouring small amounts into each others' cups, being careful not to overfill the cups. Instruct students to share their cup with at least 5 other students.
9. The teacher will use the cup prepared ahead of time to participate in the mingling without letting students know of the baking soda addition.
10. After 5-10 minutes stop and ask these questions:
 - a. Did you “drink” after each other?
 - b. Did you walk in the contaminated “droppings” of another animal?
 - c. Were you in the same area as other animals (students)?
 - d. Do you think you shared any germs?
 - e. What biosecurity measures could you put into force to better protect your herd or flock?
11. Put 1-2 medicine droppers full of cabbage water into each student's cup.
12. Students will observe what happens:
13. If the water turns blue or blue green, a germ (represented by the baking soda) was shared. The samples “vaccinated” with citric acid will turn purple or pink depending on the concentration of acid. Depending on the degree of “sharing”, some samples may be murky. This indicates the presence of both the germ and the antibodies (from the vaccination)
14. Discuss the following:
 - a. Was your hypothesis correct? Did the sick animal infect other animals? To what extent?
 - b. Can germs be easily and unknowingly shared?
 - c. How did the contamination occur?
15. Reveal to students that the teacher was the “host animal,” and explain that cabbage water is an indicator and turns blue green when it comes into contact with a base (baking soda) and purple or pink when in contact with an acid.
16. Was there variation in the color change? Why do you think there was a difference?
17. Were there samples with minimal color change? Why do you think that might be?

After students complete the following worksheet, reveal the sample numbers which were “vaccinated” with citric acid prior to the activity. The acid neutralizes the baking soda, just as a vaccine helps the body form antibodies. Vaccinated samples should turn some shade of pink/purple, depending on their exposure to the infected sample.

Refer students to their previous list from the background and ask:

- “How does this activity simulate the transfer of germs?”
- “Which kind of transfer does this activity represent?”

Adapted from: *Infectious Disease Spread Activity*, Partnership for Environmental Education and Rural Health at College of Veterinary Medicine & Biomedical Sciences, Texas A&M University

A **pandemic** is an **epidemic** (an outbreak of an infectious disease) that spreads across a large region.

The World Health Organization's (WHO) pandemic alert system ranges from Phase 1 (a low risk) to Phase 6 (a full pandemic):

Phase 1: A virus in animals has caused no known infections in humans.

Phase 2: An animal virus has caused infection in humans.

Phase 3: There are scattered cases or small clusters of disease in humans. If the illness is spreading from human to human, it's not broad enough to cause community-level outbreaks.

Phase 4: The disease is spreading from person to person with confirmed outbreaks at the community level.

Phase 5: The disease is spreading between humans in more than one country of one of the WHO regions.

Phase 6: At least one more country, in a different region from Phase 5, has community-level outbreaks.

The 2020 Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), commonly known as COVID-19 is a present day example of a pandemic.

Medical and animal health professionals are always concerned about the influenza virus, Type A influenza infects many species of animals including humans, bats, swine, horses, poultry, waterfowl, and even cats. While it is uncommon for the virus to pass directly from animals to humans, sometimes these viruses combine or mutate and the fear is that the new influenza virus can be more deadly and more easily transmissible to humans which could cause a pandemic.

Influenza B viruses pass freely between humans, but do not infect animals.

When scientists classify influenza, the name system generally includes the letters "H" and "N" (example: H1N1). Influenza A viruses are divided into subtypes based on two proteins on the surface of the virus: the hemagglutinin (H) and the neuraminidase (N). There are 18 different hemagglutinin subtypes and 11 different neuraminidase subtypes. All known subtypes of influenza A viruses have been found among birds, except subtype H17N10 and H18N11 which have only been found in bats. For a complete list of "H" and "N" sub-types of influenza A and the animals these subtypes can infect, go to the Centers for Disease Control website: <https://www.cdc.gov/flu/other/animal-flu.html>

Prior to SARS-CoV-2, all identified pandemics that occurred during the past 100 years, resulted from strains of the influenza virus that most of the population had little, if any immunity to (either through vaccination or having formed antibodies after an earlier infection). The Black Death, which killed up to one-half of the population of Europe in the mid-1300's was caused by the plague, a **bacterial** infection spread by fleas. Pockets of plague still exist in the western United States and other parts of the world, but the use of antibiotics keeps the disease from reaching epidemic or pandemic levels.

Websites

<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth>

<https://www.ncbi.nlm.nih.gov/books/NBK143061/>

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Activity 1 Worksheet 1: Infection Rate



Name: _____ Date: _____

Infection Rate

As cabbage juice is added to each cup, record the results in the chart below. Each cup has a number. Use the following letters in each blank:

If the liquid turns blue or blue-green, write the letter **B**

If the liquid turns pink or purple, write the letter **P**

If the liquid turns gray or brown, write the letter **G**

If there is no change, write the letter **N**

| | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. |
| 8. | 9. | 10. | 11. | 12. | 13. | 14. |
| 15. | 16. | 17. | 18. | 19. | 20. | 21. |
| 22. | 23. | 24. | 25. | 26. | 27. | 28. |
| 29. | 30. | 31. | 32. | 33. | 34. | 35. |

Count the number of squares with each letter and record the results below:

B= _____ P= _____ G= _____ N= _____ Total Samples _____

Express your answers as fractions to show each part of the set of sample

$\frac{\mathbf{B}}{\mathbf{Total}}$

 $\frac{\mathbf{P}}{\mathbf{Total}}$

 $\frac{\mathbf{G}}{\mathbf{Total}}$

 $\frac{\mathbf{N}}{\mathbf{Total}}$

Can any of the fractions be reduced? If so use the space above to do so.

Express each fraction as a decimal (B, P, G or N ÷ Total)

B= _____ P= _____ G= _____ N= _____

Multiply each decimal by 100 to calculate the percentage.

B= _____% P= _____% G= _____% N= _____%

How Germs Spread

Activity 2

Grades 6-8 Teacher Resources and Standards

Activity 2: Bacteria, Fungus or Virus (Health, ELA, Math, Science)

1 50 minute class period

Students will simulate exposure to multiple germs simultaneously. Students will chart frequency and number of exposures. Students will investigate contagious diseases. Students will create a summary chart which includes classification, whether the germ infects humans, animals or both and how the germ is transmitted. Students will choose one germ for further research, complete a research outline and write a research paper

Oklahoma Academic Standards

Activity 2: Bacteria, Fungus or Virus, (Health, ELA, Math, Science)

Health 7.8.3 Demonstrate behaviors that avoid or reduce health risks to self and others.

6.D.1 Display and analyze data in a variety of ways.

7.D.1

PA.D.1

6.6.R.3 Students will determine the relevance, reliability, and validity of the information gathered

7.6.R.3

8.6.R.3

6.LS.1.1 Conduct an investigation to provide evidence that living things are made of cells: either one cell or many different numbers and types of cells

7.LS.2.1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

Materials:

- Hand sanitizer
- Clear disposable gloves
- Fine glitter (assign three colors to represent bacteria, fungi and virus)
- Reading page: Bacteria, Fungus or Virus
- Activity 2 Worksheet 1 “**Bacteria, Fungus or Virus**”
- Activity 2 Worksheet 2 “**Disease Comparison Chart**”
- Activity 2 Worksheet 3 “**Research Outline**”
- Reading Page “**Are Your Sources Reliable?**”

Procedures

1. To demonstrate how germs spread: • Teacher, “We are going to do an experiment to see how fast germs spread.”
 - Select 2-3 students to be “sick” and squirt a good amount of hand sanitizer on their gloved hands and have them rub around (do not rub it in)
 - Sprinkle with fine glitter (each student needs a different color to represent bacteria, fungi and virus). One color might be a cold, one salmonella and one ringworm.

How Germs Spread

Activity - 2 continued

Grades 6-8 Teacher Resources and Standards

Procedures continued

2. Have all other students put gloves on
3. Give “infected” students one minute to high five as many people in the group as they can.
4. To control group - all other students will stand still with hands up.
5. Once a student has been high fived, they can high five those beside them without moving.
6. After one minute, check to see if anyone is still “healthy” (no glitter).
7. If someone has managed not to high five and is still “healthy” then ask, “Is it really possible to avoid all germs without living in a bubble?” Usually everyone will have multiple colors of germs on them.
8. Have students try to dust the glitter off, wipe it off - glitter won't usually come off and if it does, it is still on their clothes, so students can see the "germs" and how quickly they spread.
9. Have students stand in a straight line. Ask students to step forward by the following groups:
 - a. students with no germs
 - b. students with bacteria
 - c. students with fungus
 - d. students with virus
 - e. students with bacteria and fungus
 - f. students with bacteria and virus
 - g. students with fungus and virus
 - h. students with bacteria, fungus and virus
10. Record the results on the board and have students record the number in each category on Worksheet 1, “**Bacteria, Fungus or Virus**” and then plot the numbers on the graph.
11. Have students dispose of gloves and wash hands if needed.
12. Ask students the following questions:
 - “How does this activity simulate the transfer of germs?”
 - “Which kind of transfer does this activity represent?”

Worksheet 2 - **Disease Comparison Chart**

Have students read **What is a Germ?** and **Are Your Sources Reliable?**, then use internet or library sources to complete Worksheet 2.

Worksheet 3 - **Research Outline**

Students will choose one of the diseases from Worksheet 2 for further research and complete Worksheet 3.

If desired, have students write a research paper using the information from the Research Outline.

How Germs Spread

Activity 2 Worksheet 1: Bacteria, Fungus or Virus



Name: _____ Date: _____

Record the following information from the activity:

- # students with no germs _____
- # students with bacteria only _____
- # students with fungus only _____
- # students with virus only _____
- # students with bacteria and fungus _____
- # students with bacteria and virus _____
- # students with fungus and virus _____
- # students with bacteria, fungus and virus _____

Plot the data in the graph below:

| | | | | | | | | | |
|-----------|----|----------|----------|--------|-------|-------------------|------------------|----------------|--------------------------|
| Frequency | 25 | | | | | | | | |
| | 20 | | | | | | | | |
| | 15 | | | | | | | | |
| | 10 | | | | | | | | |
| | 5 | | | | | | | | |
| | | No germs | Bacteria | Fungus | Virus | Bacteria & Fungus | Bacteria & Virus | Fungus & Virus | Bacteria, Fungus & Virus |
| Variables | | | | | | | | | |

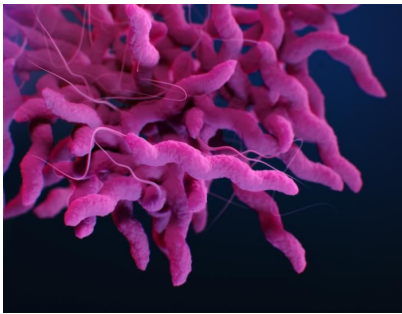
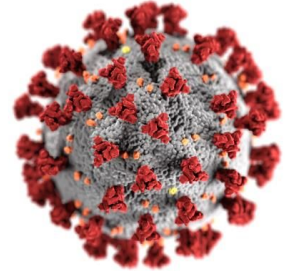
List three situations where you might be exposed to multiple disease causing germs at the same time:

- 1.
- 2.
- 3.

What is a Germ?

The term “**germ**” refers to any microorganism, especially those microorganisms that cause disease. Included in this category are certain **viruses**, **bacteria**, and **fungi**.

Viruses are simple organisms that are so tiny they can only be seen with a special, very powerful microscope called an “electron microscope.” They are so simple that they are technically not even considered alive, since they are not able to metabolize, grow, or reproduce on their own. Instead they must take over a host cell that provides these functions.



Bacteria are much larger than viruses and can live anywhere. There are bacteria in the soil, at the depths of the ocean, on the surfaces of teeth and in the digestive tracts of humans and animals. Most bacteria are not pathogenic (disease-causing). In fact, many bacteria are very helpful to us. There are species that decompose trash, clean up oil spills, and even produce medicines.

Fungi are larger, plant-like organisms that lack chlorophyll (the substance that makes plants green and converts sunlight into energy). Since fungi do not have chlorophyll to make food, they have to absorb food from whatever they are growing on. Fungi can be very helpful— making bread rise, decomposing trash—but they can also be harmful if they steal nutrients from another living organism.



When conducting research, make sure you use reliable information from legitimate sources. Reliable information is well-researched from sources that are well-respected and as objective, or neutral, as possible. The best way to find legitimate sources is to go to the library and use scholarly journals, reference books and other well-researched sources.

Another place to find information is the Internet. Conducting research on the Internet is convenient, but it can also be tricky. There are many thousands of Web pages that have little actual content and are mainly links to other pages, which may be links to other pages, and so on. Anyone can post anything to the Internet. To make sure you have found a reliable source of information, ask yourself these questions:

1. Who is responsible for the Web site? Is the Web page associated with a reliable organization, such as a university or a government agency? What interest does the organization responsible have in the information presented. For example, will the organization profit from the information presented?
2. Who wrote the information? If the author is not listed or has no credentials, it may not be a credible source. Pay attention to the author's credentials or experience. Is the source really an authority on this particular matter or someone with an impressive title that has no connection to the subject matter?
3. When was the information written? Is it current? Is it still relevant?
4. Are there other sources that agree with statements made on the site, or do other sources contradict this source? In that case you may need to search further. It's always a good idea to gather more than one source.
5. Are any sources cited? If the author does not document anything, then the information may simply be someone's opinion. If statistics used come from a survey, how was the data gathered? Who conducted the survey or poll? Was the sample representative of the population? How many were surveyed? What percent of the population?

When choosing between the library and the Internet keep in mind that up to 90 percent of the contents of college library collections are not on the Internet. Because of copyright laws it is too expensive to put all scholarly work on the Internet. This means that the most comprehensive source of information is still the library.

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Activity 2 Worksheet 2: Disease Comparison Chart



Name: _____ Date: _____

Research the diseases listed below and complete the table

| Disease | Classification Bacteria, fungus or virus | Can infect Human, animal or both | Transmission Direct contact, droplets in air, body fluids, insect bites, food, etc. |
|----------------------------|--|--|---|
| Aspergillosis | | | |
| Athlete's foot Ringworm | | | |
| Brucellosis | | | |
| Common Cold | | | |
| Distemper | | | |
| Hepatitis A | | | |
| Hepatitis B | | | |
| Influenza | | | |
| Lyme Disease | | | |
| Measles | | | |
| Parvovirus | | | |
| Salmonella | | | |
| Strep Throat | | | |
| Tuberculosis | | | |
| West Nile | | | |
| Whooping Cough | | | |

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Activity 2 Worksheet 2: Disease Comparison Chart- ANSWER KEY



Name: _____ Date: _____

Research the diseases listed below and complete the table

| Disease | Classification Bacteria, fungus or virus | Can infect Human, animal or both | Transmission Direct contact, droplets in air, body fluids, insect bites, food, etc. |
|--|---|--|--|
| Aspergillosis | fungus | human | direct contact |
| Athlete's foot Ringworm | fungus | both | direct contact |
| Brucellosis | bacteria | both | direct contact; food |
| Common Cold | virus | human | direct contact, droplets |
| Distemper | virus | animals | direct contact, droplets |
| Hepatitis A | virus | human | direct contact, food |
| Hepatitis B | virus | human | bodily fluids or blood |
| Influenza | virus | both | droplets or direct contact |
| Lyme Disease | bacteria | both | bite from infected tick |
| Measles | virus | human | droplets |
| Parvovirus Parvovirus B19 | virus | dogs human | direct contact with feces droplets or blood |
| Salmonella | bacteria | animals carry but humans get sick | food, water, direct contact with infected animal or feces, etc. |
| Strep Throat | bacteria | humans | droplets, direct contact |
| Tuberculosis | bacteria | both | droplets |
| West Nile | virus | both | bites from infected mosquitoes |
| Whooping Cough | bacteria | humans | droplets |

How Germs Spread

Activity 2 Worksheet 3: Research Outline



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease:

Scientific name of disease:

Name of organism that causes disease (including sub-type if applicable):

Classification (bacteria, fungus, virus, etc.):

Does disease infect humans, animals (if so which ones), or both?

How is the disease transmitted?

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

How can spread of this disease be prevented and/or controlled?

Is a vaccine available?

Use the information you collected to write a research paper.

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Aspergillosis**

Scientific name of disease: **Aspergillosis**

Name of organism that causes disease (including sub-type if applicable):

Aspergillus (The strain *Aspergillus*, *A. fumigatus* is resistant to many antifungal treatments)

Classification (bacteria, fungus, virus, etc.): **Fungus - mold spores**

Does disease infect humans, animals (if so which ones), or both?

Primarily humans, although some cases in dogs have been noted

How is the disease transmitted?

The mold that triggers the illness is everywhere. Most strains are harmless, but a few can cause serious illness. The spores are transmitted through the air in areas where where decaying vegetation and mold are more prevalent. In Oklahoma, the disease is more common east of HWY 177. Those with weakened immune systems should also be careful after natural disasters like tornadoes, hurricanes and flooding because of mold in building materials and disrupted vegetation.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Aspergillus can cause allergic reactions in sinuses and lungs including wheezing, shortness of breath, stuffiness, cough, fever, etc. People with a weakened immune system may develop chronic pulmonary aspergillosis or invasive aspergillosis, which can spread beyond the lungs to the bloodstream and other organs. Aspergilloma occurs when a ball of Aspergillus grows in the lungs for sinuses.

How can spread of this disease be prevented and/or controlled?

Protect yourself from the environment by avoiding areas with lots of dust or close contact with soil or decayed vegetation, such as yard work or gardening. If you will be in that environment, wear an N95 respirator (face mask) and wear shoes, long pants/long sleeved shirt and gloves when doing yard work or gardening.

People with weakened immune systems (organ transplant or stem cell transplant) may be prescribed oral antifungal medications to help prevent infection.

Is a vaccine available? **No**

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Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Athletes Foot/Ringworm**

Scientific name of disease: **tinea or dermatophytosis**

Name of organism that causes disease (including sub-type if applicable):

Approximately 40 different species of fungi can cause athlete's foot/ringworm. The scientific names for the fungi are: Trichophyton, Microsporum, and Epidermophyton. This family of fungi are responsible for fungal infections in other areas, such as scalp, groin (jock itch), beard and finger or toenails.

Classification (bacteria, fungus, virus, etc.): **Fungus**

Does disease infect humans, animals (if so which ones), or both?

Humans, cats, dogs, cows, goats, pigs, guinea pigs, and horses all have fungal infections. About 13% of human ringworm infections come from infected cats.

How is the disease transmitted?

The infection is highly contagious and is passed from person to person through direct skin contact or via contact with contaminated items such as toilet articles, clothing, and even by contaminated shower or pool surfaces.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Symptoms typically appear between 4 and 14 days after skin comes in contact with the fungus and vary based on location on the body: General symptoms include itchy skin; a ring shaped rash; red, scaly, cracked skin and hair loss. Athlete's foot is generally between toes. In animals, there is almost always a circular rash area where hair falls out.

How can spread of this disease be prevented and/or controlled?

Avoid walking barefoot in public bath/shower areas; do not share personal items (clothing, towels, etc.); keep skin clean and dry; shower immediately after athletic activity (especially those with body contact); keep sports gear and uniforms clean; wear shoes that allow air to circulate; change socks and underwear at least once a day; wash hands with soap and water after playing with pets or handling livestock. If a pet becomes infected, restrict animal to one area and clean/disinfect areas the pet has spent time in. Fungal infections of the skin and scalp can be treated with non-prescription creams, lotions and powders. Veterinarians often recommend the same type of products for pets. animals.

Is a vaccine available? **No**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Brucellosis**

Scientific name of disease: **Brucellosis**

Name of organism that causes disease (including sub-type if applicable):

Brucella species vary by animal type. B. abortus infects cattle; B. melitensis infects goats and sheep

Classification (bacteria, fungus, virus, etc.): **bacteria**

Does disease infect humans, animals (if so which ones), or both?

Humans can get the disease when they are in contact with infected animals or animal products contaminated with the bacteria. Animals that are most commonly infected include sheep, cattle, goats, pigs and dogs.

How is the disease transmitted?

Person to person spread is extremely rare. The most common way is consuming undercooked meat or unpasteurized/raw dairy products. When sheep, goats or cattle are infected, their milk and meat becomes contaminated with the bacteria. Veterinarians, animal health workers, people who work in slaughterhouses and meat packing plants can also get the disease by inhaling the bacteria or through skin wounds or mucus membranes. Hunters can also get the disease when handling and dressing game (primarily bison, elk, caribou, moose and wild hogs).

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

In humans, initial symptoms can include: fever, sweats, lack of appetite, headache, pain in muscles, joint or back and fatigue. Although dairy herds are tested regularly, one of the first signs of infection within a herd is a higher than normal percentage of aborted fetuses or premature calves.

How can spread of this disease be prevented and/or controlled?

Avoid eating undercooked meat (any species) and unpasteurized milk, cheese or ice cream. Pasteurization heats dairy products to a high temperature for a short time, which kills any harmful bacteria that might make the milk unsafe to consume. People who handle animal tissues and fluids should protect themselves with rubber gloves, goggles, masks and gowns or aprons. The disease is treated with antibiotics. In livestock, vaccination and testing/isolating new animals before integrating into the herd provided effective control.

Is a vaccine available? **A vaccine for heifer calves between 4 and 12 months (age varies by state) has been in use since 1996 as a part of the APHIS Brucellosis Eradication Program.**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Common Cold**

Scientific name of disease: **Rhinopharyngitis**

Name of organism that causes disease (including sub-type if applicable):

Most colds are caused by rhinoviruses. These viruses can also trigger asthma attacks and have been linked to secondary sinus and ear infections. Other viruses that can cause colds include respiratory syncytial virus, human parainfluenza viruses, adenovirus, human coronaviruses, and human metapneumovirus.

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

The common cold only infects humans. Dogs can have colds of their own, but their version does not cross species. In doing research on Middle East Respiratory Syndrome (MERS), scientists discovered that camels carry one of the viruses that causes the common cold and the virus is capable of infecting humans.

How is the disease transmitted?

Viruses that cause colds can spread from infected people to others through the air and close personal contact. You can also get infected through contact with stool (poop) or respiratory secretions from an infected person. This can happen when you shake hands with someone who has a cold, or touch a surface, like a doorknob, that has respiratory viruses on it, then touch your eyes, mouth, or nose.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Symptoms usually include: sore throat, runny nose, coughing, sneezing, headaches and body aches. Most people recover within about 7-10 days. However, people with weakened immune systems, asthma, or respiratory conditions may develop serious illness, such as bronchitis or pneumonia

How can spread of this disease be prevented and/or controlled?

Wash your hands often with soap and water. Wash them for 20 seconds. If soap and water are not available, use an alcohol-based hand sanitizer. Viruses that cause colds can live on your hands, and regular hand washing can help protect you from getting sick. Avoid touching your eyes, nose, and mouth with unwashed hands. Stay away from people who are sick. Sick people can spread viruses that cause the common cold through close contact with others. If you have a cold, stay home when you are sick and avoid close contact with others. Cough or sneeze into a tissue, then throw it away or if a tissue is not available, cough or sneeze into elbow or upper arm. Disinfect frequently touched objects like doorknobs, counters, etc.

Is a vaccine available? **No.** Over 200 variants of the virus exist, making it impossible to create an effective vaccine.

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Distemper**

Scientific name of disease: **Canine Distemper and Feline Distemper.**

Name of organism that causes disease (including sub-type if applicable):

The feline parvovirus (FPV) causes distemper in cats. In dogs, distemper is caused by a paramyxovirus.

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

In addition to cats and dogs, distemper is also found in wildlife such as foxes, wolves, coyotes, raccoons, skunks and ferrets and has been reported in lions, tigers, leopards and other large cats as well as seals. The disease does not pass to humans.

How is the disease transmitted?

Transmission occurs from contact with infected saliva, urine, feces or respiratory secretions in either feline or canine species. Fleas can also spread the disease, making the rate of spread in feral cat colonies very high.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Canine distemper virus (CDV) causes fever, anorexia and respiratory tract issues, gastrointestinal illness, thickening of the nose and foot pads, and a neurologic phase that has symptoms similar to rabies and can be difficult to distinguish as a result.

Feline distemper causes vomiting, diarrhea/bloody diarrhea, dehydration, weight loss, high fever, anemia, rough hair coat, loss of appetite and lack of coordination. About 90% of cats that get the disease die quickly (usually from dehydration).

How can spread of this disease be prevented and/or controlled?

Vaccination of puppies and kittens is the most effective prevention. The virus can be dormant in the environment for up to a year making vaccination especially important for animals that live outdoors. If the disease infects a large group of outdoor animals (barn cats), it is important to remove and destroy carcasses and decontaminate the area.

Is a vaccine available? **Yes - puppies and kittens should be vaccinated**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Hepatitis A**

Scientific name of disease: **hepatitis anacodiatrochious**

Name of organism that causes disease (including sub-type if applicable):

The hepatitis A virus

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

The hepatitis A virus only infects humans, however, the term "hepatitis" is used to describe several diseases in dogs that cause inflammation of the liver. Infectious Canine hepatitis is caused by Canine Mastadenovirus A

How is the disease transmitted?

Hepatitis A is highly contagious and is transmitted through the fecal-oral route which includes: close person to person contact with an infected person, sexual contact (particularly anal sex) with an infected person or consumption of contaminated food or drink. Food becomes contaminated when an infected person goes to the bathroom and then handles food without proper handwashing.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Not everyone has symptoms, but it can take up to 7 weeks for symptoms to appear. These can include: yellow skin or eyes, loss of appetite, upset stomach, vomiting and diarrhea, fever, dark urine or light colored stools, joint pain or fatigue.

How can spread of this disease be prevented and/or controlled?

Vaccination and proper handwashing are the best prevention. A person can transmit the virus for up to 2 weeks before symptoms appear.

Is a vaccine available? **Yes. Without an exemption (religious, medical, etc.), this vaccine is required to attend public schools and most child care facilities. There are two types of hepatitis A vaccine. One type is two shots given 6 months apart. The other is a combination of Hepatitis A and B that is a three shot series and only given to individuals over the age of 18.**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Hepatitis B**

Scientific name of disease: **HBV is a species of the genus Orthohepadnavirus, which is a part of the Hepadnaviridae family of viruses.**

Name of organism that causes disease (including sub-type if applicable):

The hepatitis B virus

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

The hepatitis B virus only infects humans, however, the term "hepatitis" is used to describe several diseases in dogs that cause inflammation of the liver. Infectious Canine hepatitis is caused by Canine Mastadenovirus A

How is the disease transmitted?

Hepatitis B is spread when blood, semen or other bodily fluid infected with the virus enters the body of someone who is not infected. People can become infected from: birth (from an infected mother), sex with an infected partner, sharing needles or drug preparation equipment, sharing toothbrushes, razors or medical equipment (like a glucose monitor) with an infected person or direct contact with blood or sores of an infected person.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

There are two types of infection - acute (short term) and chronic (long term). Up to half of those with acute infections show symptoms, which begin between 8 weeks and five months after exposure. . These can include: yellow skin or eyes, loss of appetite, upset stomach, vomiting and diarrhea, fever, dark urine or light colored stools, joint pain or fatigue. Most people with chronic infections do not have symptoms, do not feel sick and remain symptom free for many years. However, liver damage is still taking place, even without symptoms.

How can spread of this disease be prevented and/or controlled?

Vaccination and avoiding contact with blood or bodily fluids of a potentially infected person.

Is a vaccine available? **Yes. Without an exemption (religious, medical, etc.), this vaccine is required to attend public schools and most child care facilities. There are two types of hepatitis B vaccine. One type is a series of shots (2, 3 or 4, depending on the manufacturer) given at prescribed intervals. The other is a combination of Hepatitis A and B that is a three shot series and only given to individuals over the age of 18.**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Influenza (Seasonal Flu)**

Scientific name of disease: **Influenzavirus (one word).**

Name of organism that causes disease (including sub-type if applicable):

There are 3 Types of influenza viruses that humans and some other animals get: influenzavirus A, influenzavirus B, and influenzavirus C. The seasonal flu is a combination of hemagglutinin (H) and neuraminidase (N) proteins that have merged to form a unique virus each year. Because of this constant recombination of proteins, we must be vaccinated for the flu every year.

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

Almost all known subtypes of influenza A have been found in birds. Other sub-types are specific to swine, bats or other animals. For a complete list of “H” and “N” sub-types of influenza A and the animals these subtypes can infect, go to the Centers for Disease Control website:

<https://www.cdc.gov/flu/other/animal-flu.html>. Influenza B viruses circulate widely only among humans. Scientists believe that humans can transmit influenza A to cats, but it is unlikely that a cat could transmit to a human. There are also influenza a subtypes that infect dogs, but there have been no reported cases of transmission from dogs to humans.

How is the disease transmitted?

Influenza is contagious from one day before symptoms develop and up to 5-7 days after becoming sick. It can spread to others about 6 feet away through droplets made when people infected with influenza cough, sneeze or talk. These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled in the the lungs or by touching a contaminated surface or object and then touching their own mouth, nose or eyes.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Fever/chills, cough sore throat, runny/stuffy nose, muscle or body aches, headaches (often severe with sudden onset), fatigue with occasional vomiting and diarrhea.

How can spread of this disease be prevented and/or controlled?

Getting the annual vaccine and good hygiene are the best prevention methods. Stay home if you are sick and if you are healthy, avoid close contact with people who are sick. Wash hands often with soap or use alcohol based hand sanitizer. Avoid touching your eyes, nose or mouth without washing your hands first. Clean and disinfect frequently touched surfaces. Individuals with a compromised immune system should avoid crowds during periods of flu activity.

Is a vaccine available? **Yes.** The Centers for Disease Control recommends that everyone 6 months of age and older should get a flu vaccine every year.

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Lyme Disease**

Scientific name of disease: **Lyme borreliosis**

Name of organism that causes disease (including sub-type if applicable):

Lyme disease is caused by *Borrelia burgdorferi* and rarely, *Borrelia mayonii*

Classification (bacteria, fungus, virus, etc.): **bacteria**

Does disease infect humans, animals (if so which ones), or both?

Lyme disease is the most common vector-borne disease in the United States. In addition to humans, dogs, horses and cattle can get Lyme disease from the bite of an infected tick. Among wildlife, white tailed deer, mice, chipmunks, gray squirrels, opossums and racoons can not only be infected, but serve as carriers for the disease and hosts for ticks.

How is the disease transmitted?

It is transmitted to humans and animals through the bite of infected blacklegged ticks.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Typical symptoms in humans include fever, headache, fatigue, and a characteristic skin rash called erythema migrans. If left untreated, infection can spread to joints, the heart, and the nervous system. Lyme disease is diagnosed based on symptoms, physical findings (e.g., rash), and the possibility of exposure to infected ticks. Lyme disease is difficult to diagnose in animals, because the characteristic “bullseye” rash is not visible. In dogs, the disease often resolves itself without treatment, but horses can have significant joint damage and lameness if untreated.

How can spread of this disease be prevented and/or controlled?

The best prevention is to avoid tall grass and wooded areas during times when ticks are active. Keep grass and weeds mowed or sprayed in the yard or pasture to make the environment less desirable for ticks. Use EPA registered insect repellents containing DEET, picaridin, IR3535, oil of lemon Eucalyptus (OLE), para-menthane-diol (PMD), or 2-undecanone. People diagnosed and treated early with antibiotics usually recover quickly. Horses often required antibiotics to fully recover as well

Is a vaccine available? **There is no vaccine for humans or animals. The best prevention is to limit exposure**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Measles**

Scientific name of disease: **Rubeola**

Name of organism that causes disease (including sub-type if applicable):

Measles is caused by the rubeola virus

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

Only humans get measles. However, the virus that causes Canine Distemper is in the same family of viruses. It cannot be transmitted from humans to dogs or dogs to humans

How is the disease transmitted?

Measles is a highly contagious virus that lives in the nose and throat mucus of an infected person. It can spread to others through coughing and sneezing. Also, measles virus can live for up to two hours in an airspace where the infected person coughed or sneezed. If other people breathe the contaminated air or touch the infected surface, then touch their eyes, noses, or mouths, they can become infected. Measles is so contagious that if one person has it, up to 90% of the people close to that person who are not immune will also become infected. Infected people can spread measles to others from four days before through four days after the rash appears.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Measles typically begins with high fever (may spike to more than 104°), cough, runny nose, and red, watery eyes (conjunctivitis). After 2-3 days, tiny white spots may appear inside the mouth. After 3-5 days, the rash begins, with flat red spots, followed by small raised bumps on top of the red spots. Because the measles vaccine program has been so successful in the US, many pediatricians have little to no practical experience with the disease. When outbreaks occur (generally in unvaccinated populations), timely diagnosis is a challenge.

How can spread of this disease be prevented and/or controlled?

Because measles is so contagious, the only effective prevention is vaccination. Those families who choose not to vaccinate must be aware of any localized outbreaks and isolate.

Is a vaccine available? **The measles vaccine was developed in 1963 and an improved version was licensed for use in the US in 1968. As other vaccines were developed, it was combined with vaccines for mumps and rubella (MMR) or combined with mumps, rubella and varicella (MMRV).**

This vaccine is required for admission to most public schools and child care programs.

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Parvovirus/Parvovirus B19**

Scientific name of disease: **Erythema infectiosum**

Name of organism that causes disease (including sub-type if applicable):

The Parvoviridae are a family of small viruses, known collectively as parvoviruses. There are currently more than 100 species in the family

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

The B19 parvovirus was the first human parvovirus discovered. Dog owners are more familiar with canine parvovirus (CPV) is a highly contagious viral disease of dogs that commonly causes acute gastrointestinal illness in puppies. Wildlife species that can be infected with parvoviruses include coyotes, wolves, foxes, raccoons, minks, and bobcats. With more than 100 species of parvoviruses, current theory is that each parvovirus is specific to a species and does not pass from one to another.

How is the disease transmitted?

Parvovirus B19 is highly contagious and spreads through respiratory secretions, such as saliva, sputum, or nasal mucus, when an infected person coughs or sneezes. It can also spread through blood or blood products. A pregnant woman who is infected with parvovirus B19 can pass the virus to her baby.

Canine parvovirus can be found in almost any environment, but not every dog who comes into contact with the virus becomes infected.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Parvovirus B19 most commonly causes fifth disease, a mild rash (often called the “slapped cheek” rash) illness that affects children more often than adults. The rash is usually accompanied by fever, runny nose and headache..

Symptoms often associated with CPV include lethargy, depression, and loss or lack of appetite, followed by a sudden onset of high fever, vomiting, and diarrhea. It affects puppies more often than adult dogs.

How can spread of this disease be prevented and/or controlled?

Because there is no vaccine for parvovirus B19, pregnant women should try to isolate during an outbreak. General hygiene (hand washing, cleaning surfaces, covering coughs and sneezes, etc) are the most effective prevention. Puppies should be vaccinated for CPV and kennels, dog runs, etc should be cleaned regularly, since the virus is transmitted through feces.

Is a vaccine available? There is not a human vaccine. CPV vaccines should be given between 6 weeks and 6 months.

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Salmonella**

Scientific name of disease: **Salmonellosis**

Name of organism that causes disease (including sub-type if applicable):

Although there are more than 2,500 serotypes of salmonella, fewer than 100 serotypes account for most human infections. *Salmonella* Enteritidis is the organism generally associated with foodborne illness.

Classification (bacteria, fungus, virus, etc.): **bacteria**

Does disease infect humans, animals (if so which ones), or both?

Salmonella live in the intestines of people and animals but generally does not cause the disease in the host animal.

How is the disease transmitted?

People can get *Salmonella* infection from a variety of sources, including eating contaminated food, drinking contaminated water or touching infected animals, their feces, or their environment. When uncomposted manure or poultry litter is used as fertilizer, fruit and vegetable crops can become contaminated with salmonella.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Most people with *Salmonella* infection have diarrhea, fever, and stomach cramps. Symptoms usually begin six hours to six days after infection and last four to seven days. However, some people do not develop symptoms for several weeks after infection and others experience symptoms for several weeks. *Salmonella* strains sometimes cause infection in urine, blood, bones, joints, or the nervous system (spinal fluid and brain), and can cause severe disease.

How can spread of this disease be prevented and/or controlled?

Cooking all poultry and eggs to an internal temperature of 170°F before consumption kills salmonella. Keep hot foods above 140°F and cold foods below 40°F when serving. Always wash hands after contact with animals, after using the toilet or helping someone clean up after using the toilet. Don't let children under 5 touch high risk animals (turtles, frogs, chickens or ducks) or their belongings or habitats.

Is a vaccine available? There is no vaccine. Good hygiene and proper end point and serving temperatures are the best control.

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Strep Throat**

Scientific name of disease: **Streptococcal Pharyngitis**

Name of organism that causes disease (including sub-type if applicable):

Group A Streptococcus

Classification (bacteria, fungus, virus, etc.): **bacteria**

Does disease infect humans, animals (if so which ones), or both?

Group A strep infects humans. Group C and G strep are most common in cattle and horses, but can spread through raw (unpasteurized) milk. While dogs cannot directly infect people with group A strep, they can serve as carriers in the household, which can create a cycle of infection and reinfection.

How is the disease transmitted?

Group A strep live in the nose and throat and can easily spread to other people. It is important to know that all infected people do not have symptoms or seem sick. People who are infected spread the bacteria by coughing or sneezing, which creates small respiratory droplets that contain the bacteria. People can get sick if they: Breathe in those droplets; touch something with droplets on it and then touch their mouth or nose; drink from the same glass or eat from the same plate as a sick person; touch sores on the skin caused by group A strep (impetigo). Rarely, people can spread group A strep through food that is not handled properly.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

The most common symptoms of strep throat include: sore throat that can start very quickly; pain when swallowing; fever; red and swollen tonsils, sometimes with white patches or streaks of pus; tiny, red spots on the roof of the mouth and swollen lymph nodes in the front of the neck. Other symptoms may include a headache, stomach pain, nausea, or vomiting — especially in children. Someone with strep throat may also have a rash known as scarlet fever (also called scarlatina).

How can spread of this disease be prevented and/or controlled?

The best way to keep from getting or spreading group A strep is to wash your hands often. This is especially important after coughing or sneezing and before preparing foods or eating. To practice good hygiene you should: cover your mouth and nose with a tissue when you cough or sneeze; put your used tissue in the wastebasket; cough or sneeze into your upper sleeve or elbow, not your hands, if you don't have a tissue; Wash your hands often with soap and water for at least 20 seconds; Use an alcohol-based hand rub if soap and water are not available

Is a vaccine available? **There is no vaccine for group A streptococcus**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Tuberculosis**

Scientific name of disease: **Mycobacterium tuberculosis**

Name of organism that causes disease (including sub-type if applicable):

It is caused by three specific types of bacteria that are part of the Mycobacterium group: *Mycobacterium bovis*, *M. avium*, and *M. tuberculosis*.

Classification (bacteria, fungus, virus, etc.): **bacteria**

Does disease infect humans, animals (if so which ones), or both?

Tuberculosis affects both humans and animals. Cattle tuberculosis (*M. bovis*) has affected animal and human health since ancient times. No other TB organism has as great a host range as bovine TB, which can infect all warm-blooded vertebrates. *M. avium* can affect all species of birds, as well as hogs and cattle. *M. tuberculosis* primarily affects humans but can also be transmitted to hogs, cattle, and dogs.

How is the disease transmitted?

TB bacteria are spread through the air from one person to another. The TB bacteria are put into the air when a person with TB disease of the lungs or throat coughs, speaks, or sings. People nearby may breathe in these bacteria and become infected.. TB is NOT SPREAD by shaking hands, sharing food or a drink, touching surfaces sharing a toothbrush or kissing. It must be inhaled.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

TB bacteria can live in the body without making you sick. This is called latent TB infection. In most people who breathe in TB bacteria and become infected, the body is able to fight the bacteria to stop them from growing. Someone with a latent TB infection has no symptoms, doesn't feel sick, usually has a positive TB skin test or blood test and may develop TB disease without treatment. TB bacteria become active if the immune system can't stop them from growing. When TB bacteria are active (multiplying in your body), this is called TB disease. Symptoms include: a bad cough that lasts 3 weeks or longer, chest pain, coughing up blood or sputum, weakness or fatigue, loss of appetite, chills, fever and night sweats

How can spread of this disease be prevented and/or controlled?

Controlling the disease in cattle (through the Federal Tuberculosis Eradication Program) has greatly reduced exposure for all species, including humans. People should be cautious when traveling to countries where TB is common. Use of masks when around someone with TB disease can help prevent inhaled droplets.

Is a vaccine available? There is a vaccine for *M. tuberculosis*, but it is not widely used in the US. It is given to infants and small children in other countries where TB is common. Occasionally health care workers in settings with a high percentage of TB patients are vaccinated

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **West Nile**

Scientific name of disease: **Flaviviridae**

Name of organism that causes disease (including sub-type if applicable):

West Nile Virus (WNV) is a member of the *flavivirus* genus and belongs to the Japanese encephalitis antigenic complex of the family *Flaviviridae*

Classification (bacteria, fungus, virus, etc.): **virus**

Does disease infect humans, animals (if so which ones), or both?

The virus can infect horses, humans and many different species of birds. Wild birds serve as reservoir hosts.

How is the disease transmitted?

WNV is transmitted by infected mosquitoes. Wild birds serve as the host reservoir. When mosquitoes feed on infected birds they become infected and can transmit the virus to other birds, horses, and humans during subsequent blood meals (bites). The virus was introduced into the US in 1999 and since then 27,000 horses have been infected. WNV is considered an endemic (always with us, like the common cold) disease.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Most people (8 of 10) do not develop any symptoms. About 1 in 5 develop a fever with other symptoms such as headache, body aches, joint pain, vomiting, diarrhea or rash. A very small percentage (1 in 150) develop encephalitis or meningitis. About 35% of horses that contract WNV die from neurological damage. Clinical signs generally appear in 15 days after a bite from an infected mosquito. Infected horses may be asymptomatic or they may have fever, lack of coordination, hind-end weakness, depression, lack of appetite, muscle tremors, teeth grinding, trouble swallowing, head pressing, excessive sweating, behavior change and inability to get up.

How can spread of this disease be prevented and/or controlled?

The most effective way to prevent infection from West Nile virus is to prevent mosquito bites. Mosquitoes bite during the day and night. Use insect repellent, wear long-sleeved shirts and pants, treat clothing and gear, and take steps to control mosquitoes indoors and outdoors. If large numbers of dead birds are found, report to a veterinarian and the local health department for testing.

Is a vaccine available? **Effective vaccines are available for horses, but not yet available for people. Horses should be vaccinated annually with boosters more frequently in areas with WNV activity.**

How Germs Spread

Activity 2 Worksheet 3: Research Outline **ANSWER KEY**



Name: _____ Date: _____

Investigate one of the diseases from Worksheet 2 and complete the outline below.

Common name of disease: **Whooping Cough**

Scientific name of disease: **Pertussis**

Name of organism that causes disease (including sub-type if applicable):

Whooping Cough is caused by the Bordetella pertussis bacterium.

Classification (bacteria, fungus, virus, etc.): **bacteria**

Does disease infect humans, animals (if so which ones), or both?

Whooping Cough (Pertussis) only infects humans. However, dogs do get a similar infection, commonly known as kennel cough, which is caused by a different germ.

How is the disease transmitted?

Whooping Cough is highly contagious during the first two weeks of infection. People with pertussis usually spread the disease to another person by coughing or sneezing or when spending a lot of time near one another where you share breathing space. Many babies who get pertussis are infected by older siblings, parents, or caregivers who might not even know they have the disease. These bacteria attach to the cilia (tiny, hair-like extensions) that line part of the upper respiratory system. The bacteria release toxins (poisons), which damage the cilia and cause airways to swell.

What are the symptoms? If the disease affects humans and animals are symptoms different in humans and animals? Do symptoms vary between animal species?

Early symptoms include runny nose, low grade fever, mild cough and apnea (a pause in breathing). Later symptoms include fits of rapid coughs followed by a high pitched “whoop” sound, vomiting, and exhaustion. An untreated infection can last 10-12 weeks. In China, pertussis is known as the “100 day cough”. The disease is most severe in babies. Half of infants younger than one year old will need hospital care. The disease is treated with antibiotics and early treatment is important.

How can spread of this disease be prevented and/or controlled?

The best way to prevent pertussis (whooping cough) among babies, children, teens, pregnant women, and adults is to get vaccinated. Also, keep babies and other people at high risk for pertussis complications away from infected people. If someone in the home is infected practice good hygiene, which includes: cover mouth and nose with a tissue when you cough or sneeze, put used tissue in the trash, cough or sneeze into your upper sleeve or elbow (not your hands) if you don't have a tissue, wash hands with soap and warm water for at least 20 seconds and use alcohol-based hand sanitizer if soap and water are not available..

Is a vaccine available? **Two vaccines in the United States help prevent whooping cough: DTaP and Tdap. These vaccines also provide protection against tetanus and diphtheria.**