

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Student Exploration: Disease Spread Simulation

**Vocabulary:** disease, epidemic, infect, infectious disease, pathogen

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. Why do you think it is important to cover your mouth when you cough? \_\_\_\_\_

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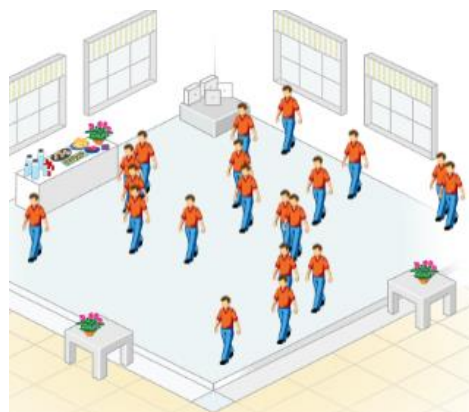
2. Why should you always wash your hands before you eat? \_\_\_\_\_

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### Gizmo Warm-up

When a person has a **disease**, his or her normal body functions are disrupted. Some diseases, such as diabetes and most cancers, are not spread from one person to another. But other diseases, such as the flu and strep throat, can be spread. These diseases are known as **infectious diseases**. Infectious diseases are caused by viruses, bacteria, and other agents known as **pathogens**.



In the *Disease Spread* Gizmo


(<https://www.explorelarning.com/index.cfm?method=cResource.dspDetail&ResourceID=379>), you will be able to observe how various pathogens can spread through a group of people. Click **Play** (▶) and observe.

1. Describe what happened on the SIMULATION pane: \_\_\_\_\_

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2. Look at the color key on the bottom right of the Gizmo. What is happening when a person changes color? \_\_\_\_\_

<b>Activity A:</b> <b>Person-to-person transmission</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>Click <b>Reset</b> (↺).</li> <li>On the <b>CONTROLS</b> tab under <b>Active Diseases</b>, turn off <b>Foodborne</b> and turn on <b>Person to person</b>.</li> <li>Set the <b>Number of people</b> to 5.</li> </ul>	
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**Question: What factors affect how quickly a pathogen spreads from person to person?**

1. Predict: Some pathogens are spread directly from one person to another. This can happen when people come into direct contact or share items, such as drinking glasses. What do you think might affect how quickly a pathogen is spread from person to person?

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2. Identify: Select the **SIMULATION** tab on the left and the **TABLE** tab on the right. (You will want the table tab open to answer question C.)

A. What does the purple person represent? \_\_\_\_\_

B. Click **Play**, and observe the simulation for a while. What must happen for the disease to spread from one person to another? \_\_\_\_\_

C. How long did it take to **infect** five people? \_\_\_\_\_

3. Experiment: Click **Reset**. Change the **Number of people** to 15. Click **Play**, and record how long it takes to infect five people. Repeat this four times for a total of 5 trials, and calculate the mean time. Repeat the experiment when there are 25 people and 35 people in the room.

Number of people	Time to infect five people, 5 trials (h)	Mean time (h)
15		
25		
35		

4. Interpret: Study the data you collected. What trend do you see in the data, and how would you explain it? \_\_\_\_\_

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5. Experiment: Not all pathogens are equally infectious. Click **Reset**. Set the **Number of people** to 20. Under **Probability of transmission**, select **Low** for **Person to person**.

On the SIMULATION tab, click **Play**. Record the time it takes to infect five people for five trials, and find the mean. Then repeat the experiment with a medium and high probability of transmission. (Note: For the “Medium” setting, move the slider half-way between the **Low** and **High** positions.)

Transmission probability	Time to infect five people, 5 trials (h)	Mean time (h)
Low		
Medium		
High		

6. Interpret: Study the data you collected in the table above. What trend do you see in the data, and how would you explain it? \_\_\_\_\_

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7. Analyze: On the CONTROLS tab, place the **Probability of transmission** slider under **Person to person** half-way between **Low** and **High**. Select the SIMULATION and GRAPH tabs. Click **Play**.

- A. At what time did the disease spread most slowly? Most quickly? \_\_\_\_\_

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- B. How could you explain this change in the rate of the disease’s spread? \_\_\_\_\_

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8. Apply: An **epidemic** is the rapid spread of an infectious disease. How do you think a government could try to prevent an epidemic of a dangerous person-to-person pathogen?
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<b>Activity B:</b>  <b>Foodborne and airborne transmission</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Click <b>Reset</b>.</li> <li>• On the CONTROLS tab under <b>Active diseases</b>, turn off <b>Person to person</b> and turn on <b>Foodborne</b>.</li> </ul>	
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**Question: How do foodborne and airborne pathogens spread?**

1. Predict: How do you expect the spread of a foodborne disease to be similar to and different from the spread of a person-to-person disease? \_\_\_\_\_

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2. Observe: Select the SIMULATION tab. Click **Play** and closely watch the people moving around the room.

- A. What does each person do just before becoming infected? \_\_\_\_\_

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- B. How are foodborne pathogens transmitted? \_\_\_\_\_

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- C. If a person in the simulation never eats or drinks anything from the buffet table, is it possible for them to become sick with the foodborne disease? Explain your answer.

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3. Analyze: Select the GRAPH tab, and wait for every person to become infected.

- A. At what time did the disease spread most slowly? Most quickly? \_\_\_\_\_

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- B. How could you explain this change in the rate of the disease's spread? \_\_\_\_\_

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4. Compare: How does the spread of a foodborne pathogen compare to the spread of the person-to-person pathogen you studied in activity A? \_\_\_\_\_

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5. Predict: How would you expect the spread of an airborne disease to be similar to and different from the spread of a foodborne disease and a person-to-person disease?

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6. Experiment: Run a few simulations with the airborne pathogen.

A. What patterns do you notice in how the airborne pathogen spreads? \_\_\_\_\_

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B. How does the spread of an airborne pathogen compare to the spread of foodborne and person-to-person pathogens? \_\_\_\_\_

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7. Think about it: Suppose there is an infectious disease at a party. How could doctors tell if the disease was foodborne, airborne, or transmitted person to person?

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