From Birds to People: The West Nile Virus Story

About This Worksheet

This worksheet complements the Click and Learn "From Birds to People: The West Nile Virus Story."

Author: Jason Crean, Lyons Township High School

Learning Objectives

- Think about how infectious diseases spread, and how they can be contained.
- Learn about the many factors that affect the spread of a mosquito-borne infectious disease.
- Understand the difference between the infectious agent, vector, and host, and that some hosts play a role in spreading a virus and others don't.
- Learn about what makes a vector effective in spreading an infectious disease.
- Understand that viral infection can have different effects in different hosts and in different individuals.
- Gain an appreciation for the range of studies needed to understand mosquito-borne diseases.

Instructions

1. Go to BioInteractive.org.
2. On the left, mouse over Topics – Infectious Diseases – Interactive.
3. Scroll down and click "From Birds to People: The West Nile Virus Story."
4. Proceed through the slides, watch the embedded video clips, and answer the following questions in the spaces provided.

Questions

1. Based on the Learning Objectives, what organism is the disease-carrying **vector** discussed in this interactive?

   _____

2. Write a summary sentence that explains why scientists study West Nile virus.

   _____

   _____

   _____

3. What group of animals tends to be affected most severely by West Nile virus?

   _____

4. When and where was West Nile virus first detected in the United States?

_____

5. a. What bird species was most noticeably impacted by West Nile virus when the virus was first detected?

_____

   b. Was this the only bird species affected by the virus? Explain your answer.

_____

   c. What is one question that scientists are trying to answer regarding West Nile virus infections in birds?

_____

_____

6. a. In what year did West Nile virus infections peak in the United States? _____

   b. Which states were most affected? _____

   c. How many cases of human disease were detected in *your* state? _____

   d. Compare the prevalence of West Nile virus infections when the virus was first detected to when it peaked. Support your observations with data from the maps.

_____

_____

_____

7. a. How severely are humans affected by West Nile virus infection?

_____

   b. According to Dr. Kilpatrick, what are the odds of contracting West Nile virus from a single mosquito bite?

_____

   c. Out of 10 people infected with the virus, how many will develop symptoms? _____

   d. What percentage of people with symptoms exhibit brain inflammation? _____

8. Which state was most affected by West Nile virus infections in 2012? _____

9. a. What is the West Nile virus genome composed of?

_____

   b. What happened to the West Nile virus genome that resulted in a new strain of the virus?

_____

c. Describe one advantage that the new virus strains had compared to the strain that was first detected in the United States.

_____

_____

10. a. Studying West Nile virus infection and spread can provide insights into other viral diseases. Name two of them.

_____

b. What do these diseases have in common with West Nile virus infection?

_____

_____

11. a. West Nile virus isn't transmitted directly from bird to bird or bird to human. How does the virus spread from one organism to another?

_____

_____

b. In your own words, what is a vector?

_____

_____

12. a. Watch the video of how a virus is spread by mosquitoes. Where in the body of a mosquito does the virus replicate, or make more copies of itself?

_____

b. To what organ inside the mosquito does the virus have to spread before the mosquito can infect other organisms?

_____

13. What genus of mosquitoes are the main vectors for West Nile virus in the United States?

_____

14. Explain in your own words three factors that make a vector effective in spreading a virus.

_____

_____

_____

15. What is meant by "host" when discussing a mosquito-borne infection?

_____

_____

16. a. What percentage of mosquito species in North America has been found to be infected with West Nile virus?

    _____

    b. What makes the *Culex pipiens* mosquito species a highly effective vector for West Nile virus?

    _____

    _____

17. a. An amplifying host is a host in which the level of pathogen can become high enough that a vector, such as a mosquito that feeds on it, will probably become infected. What is the amplifying host for West Nile virus?

    _____

    b. What is meant by the phrase, "Humans are a dead-end host"?

    _____

    _____

    c. How do humans become infected with West Nile virus?

    _____

    _____

    d. What is one difference between the mosquitoes that spread yellow fever and dengue and the mosquitoes that spread West Nile virus?

    _____

    _____

18. Name two factors that determine how infectious a host is for West Nile virus.

    _____

    _____

19. a. How do scientists know that robins are the preferred host for West Nile virus?

    _____

    _____

    b. What are two possible explanations for why mosquitoes feed more commonly on robins than on other birds?

    _____

    _____

    _____

20. How do scientists know that there are more mosquitoes in the canopies than closer to the ground?

    _____

    _____

21. What climate conditions are thought to have affected West Nile virus transmission in 2012?

_____

22. a. Describe two ways in which temperature affects the spread of West Nile virus infection.

   _____

   _____

   b. Why do scientists want to know how temperature affects virus transmission?

   _____

   _____

23. List three types of data that Dr. Kramer and Dr. Kilpatrick collect.

_____

_____

24. Look at the diagram on slide 21. What factors in the environment affect both the vector and the host?

_____

_____

25. Why are human vaccines not effective in preventing the *spread* of West Nile virus?

_____

_____

_____

26. Can you think of additional strategies for stopping West Nile virus spread that are not mentioned on slide 23?

_____

_____

_____

Extension Questions

As you proceeded through this activity, you may have thought of some questions about West Nile infection. In the space provided here, write one such question.

_____

_____

Propose a testable hypothesis related to your question above.

_____

_____

_____

Propose an experiment to test your hypothesis. Be sure to name the variables you will be measuring.

_____

_____

_____

_____

_____

_____

How will data be collected?

_____

_____

Will the data be qualitative or quantitative?

_____

What will these data tell you?

_____

_____

_____

_____

_____

_____

HHMI
HOWARD HUGHES MEDICAL INSTITUTE

Department of Science Education

4000 Jones Bridge Road, Chevy Chase, MD 20815
(301) 215-8500 • biointeractive@hhmi.org

About the Howard Hughes Medical Institute

The Howard Hughes Medical Institute is a nonprofit medical research organization that employs hundreds of leading biomedical scientists working at the forefront of their fields. In addition, through its grants program and other activities, HHMI is helping enhance science education at all levels and maintain the vigor of biomedical science worldwide. Headquartered in Chevy Chase, Maryland, HHMI is one of the world's largest philanthropies, with laboratories across the United States and grants programs throughout the world.

The views and opinions expressed in this publication are not necessarily those of the Trustees or management of the Howard Hughes Medical Institute.