



## Battling Vector-Borne Diseases: Factors That Affect the Mosquito Life Cycle

### INTRODUCTION

This activity is an investigative experiment which complements the Click & Learn [From Birds to People: The West Nile Virus Story](#).

Some viral diseases are not spread directly between people or other susceptible hosts. Instead, some viruses are carried by vectors: organisms that transmit the virus between hosts. Mosquitoes are vectors for many infectious diseases, including West Nile disease and dengue fever. Identifying factors that influence different stages of the mosquito life cycle can provide useful information about how these diseases spread and suggest ways for limiting or stopping their spread.

In this activity, you will generate hypotheses about what factors could affect the mosquito life cycle and choose one to test. You will set up mosquito-rearing chambers, which will allow you to monitor the mosquito life cycle from egg to adult. You will then observe the life cycle under different experimental conditions.

### PROCEDURE

- Become familiar with the mosquito life cycle:** The Click & Learn “Stopping Mosquito-Borne Diseases” at (<http://www.hhmi.org/biointeractive/stopping-mosquito-borne-disease>) provides a good introduction to the mosquito life cycle.
- Review the Mosquito Reference Document:** This resource contains information and illustrations about the mosquito life cycle.
- Begin brainstorming:** Form small working groups of three to five students. Each group should brainstorm for 5 to 7 minutes about mosquitoes and their environment. Think about variables in the natural environment that might affect the mosquito life cycle or mosquito survival. One member of the group should write down the group’s ideas. After your brainstorming session, share your ideas with the class.
- List and evaluate questions of interest:** Your group should develop three questions about factors that might affect the rate at which mosquitoes develop. As a class or in groups, you will evaluate them and decide which one can reasonably be adapted into a testable hypothesis.
- Consider the basic protocol for experimentation:** Review the “Mosquito Life Cycle Activity” handout to become familiar with the basic protocol for rearing mosquitoes and monitoring their life cycle.
- Formulate a hypothesis:** Review the question you chose to develop into a hypothesis. As you develop your hypothesis, keep in mind the basic experimental design for observing the mosquito life cycle. When you think you have formulated a good hypothesis, discuss it with your teacher.
- Identify variables:** You should carefully design your experiment so that all your mosquitoes are treated exactly the same way except for the one variable that you purposely manipulate. If you change more than one variable, you will not be able to determine which one has an effect. For instance, imagine that you are studying the timing of flowering in plants. If you increase both temperature and light exposure for one group of plants and find that they flower sooner than another group of plants, you will not be able to determine whether temperature or light is responsible for the result. Thus, your first task in designing your experiment is to identify your experimental variable, or the variable that you change, and list all the control variables that you will consider. Record this information, and ask your teacher to review your list before continuing.

8. **Design the experiment:** Your experimental design must be approved by your teacher before you start the experiment. The experimental design should:
  - Clearly state your hypothesis.
  - List all items needed for your experiment (materials).
  - Carefully describe all the procedures (methods) that you will use to test your hypothesis, including the variables that you will control and how you will control them, the variable that you will manipulate, and all the steps of your work.
  
9. **Conduct the experiment:** Once your experimental design is approved, it is time to get started! Follow the procedures that you outlined in your experimental design. Record daily observations, including the following:
  - Time, temperature, and number of eggs, larvae, pupae, or adults.
  - If feeding mosquitoes, details of when and how much.
  - Any other observations you can think of, including those that relate to your specific variable of interest.

When possible, observe the eggs, larvae, and pupae using a hand lens or dissecting scope, which may allow you to see subtle changes.
  
10. **Present your results/evaluation:** Your teacher may ask you to write a lab report as outlined in the Guidelines document or present your results in some other format, such as a poster or an oral presentation.