



A PILOT DVD PROJECT

WAITING FOR THE MICROBE TO STRIKE

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SENIOR HIGH SCHOOL**

Title: Waiting for the microbe to strike
HHMI Holiday Lectures: 2000 and Beyond-Confronting the Microbe Menace (1999)
Course: AP Biology, Biology, Integrated Science
Goals: The goal is for students to understand why some viral diseases take longer than others to show symptoms.
Standards: National Science Education Standards; National Committee on Science Education Standards and Assessment, National Research Council 1996. Individuals have some responsibility for their own health. Students should engage in personal care-dental hygiene, cleanliness, and exercise-that will maintain and improve health. Understandings include how communicable diseases, such as colds, are transmitted and some of the body's defense mechanisms that prevent or overcome illness. (page 140) Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage by infection by other organisms. (page 157)
Objectives: Describe the latent and the lytic cycle of a virus. List some triggers that make a virus enter the lytic cycle. Understand how a host cell can protect itself from a virus.

Activity A: Virus Cycle**Time frame:** 45 min.**Material List:** HHMI Holiday DVD lecture 1:29-38; lecture 4: 5-20. Construction paper glue, pipe cleaners, tape, used toilet paper rolls, beads, paper fasteners, or any other material suitable for making a 3-D model of the two cycles.**Teacher Directions**

The teacher should show the segment from the DVD and discuss the difference between the latent cycle of a virus, when its nucleic acid reproduces along with the host cell, and the lytic cycle of a virus, when it bursts out of the cell to infect other cells. It is during the lytic cycle that organisms acquire disease symptoms. The herpes virus reproduces along with the host in the latent phase, but does not become incorporated into the host genome, whereas HIV does become part of the host genome.

Student Directions

- Study the illustration of the model from the overhead or handout
- Construct a virus and host showing the stages of the lytic cycle
- Students will need to draw or design a blueprint of their viral model before picking up materials.
- The virus should contain nucleic acid, a protein coat, and capsule, if appropriate.
- Students will use the material provided to create a suitable 3-D model.
- Keep in mind the size proportions of the model
- Present the model to the class and complete the black line copy

See attached Data Sheet

Evaluation: Students will be assessed on the accuracy and creativity of the model.**Extensions:** Students can research latency of other viral diseases and bacterial diseases.**Web Connections**

- www.dac.nev.edu

Activity B- Viral lysis

Timeframe - 45 minute

Material List: Hot plates-two per group; 150 ml beaker- three per group; water; gelatin capsules filled with potassium permanganate powder (may be substituted for other dye) three per group; thermometers.

Teacher Directions: The teacher should show the segment from the DVD and discuss the difference between the latent cycle of a virus, when its nucleic acid reproduces along with the host cell, and the lytic cycle of a virus, when it bursts out of the cell to infect other cells. It is during the lytic cycle that organisms acquire disease symptoms. The differences between viruses mentioned on the DVD could be discussed. For example, the herpes virus reproduces along with the host in the latent phase, but does not become incorporated into the host genome, whereas HIV does become part of the host genome.

Student Directions

- Take a gelatin capsule with colored dye inside. Potassium permanganate will make a dramatic color change when the capsule is “lysed”.
- Place one capsule in a beaker of water at 40⁰C, one in a beaker of boiling water, and one in a beaker at room temperature. The capsule is a bacterium filled with viruses. As the capsule burst the viruses are released.
- The capsule in boiling water will have a shorter latency than the capsule at 40⁰C, and the one with the longest latency (which may not lyse at all) will be the room temperature capsule.

Evaluation

Students should write a lab report and answer the following questions:

1. What is the latency period from the time the capsule was put in the water until it lysed for each temperature?
2. What triggers the entry into the lytic cycle in this experiment?
3. What could trigger the lytic cycle in a human host?
4. How long is the average latency of the HIV virus?
5. How long is the average latency for the herpes virus?

Extensions

Several different temperatures may be used. The experiment should be repeated and the average for each temperature used as the data point. A graph can be plotted showing the relationship between temperature and latency

Activity C: Playing host

Time frame: 45 minutes

Materials List: game board, game pieces (counters or buttons may be used), and dice.

Activity: Level 1 and 2: the students play a board game (prototype provided) demonstrating the interaction between the latent and lytic parts of the viral life cycle.

Teacher directions:

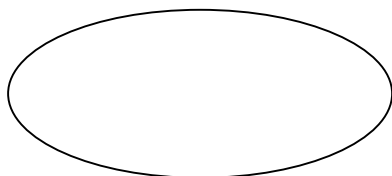
Discuss viral mechanisms of penetrating host cells, and bacterial and other host cell strategies for defending themselves. Viruses penetrate the host by attaching to cell receptors and incorporating its genetic material into host DNA. Host cells may defend themselves by mutating the receptors to which viruses attach and by an immune response. Strategies that trigger the lytic cycle include phosphorylation of a transcription factor, hormonal imbalance or other stresses in the host cells. Following the game students can write a summary of the competition between virus and host cell.

Evaluation: Students will be evaluated on their participation and the accuracy of their summary.

Extension: Level 3 students can design their own card game to demonstrate the latent and lytic cycle. They can employ viral versus host strategies.

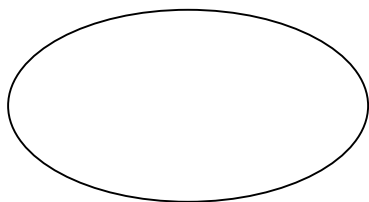
DATA SHEET

A.



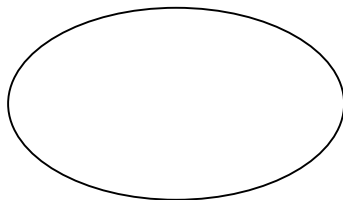
STEP A _____

B.



STEP B _____

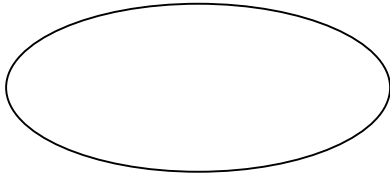
C.



STEP C _____

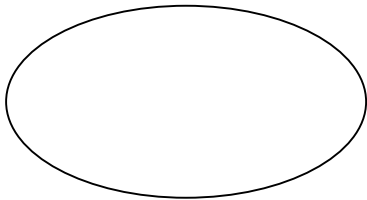
DATA SHEET

D.



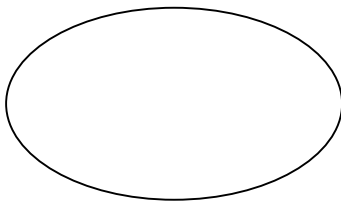
STEP D _____

E.



STEP E _____

F.



STEP F _____
