

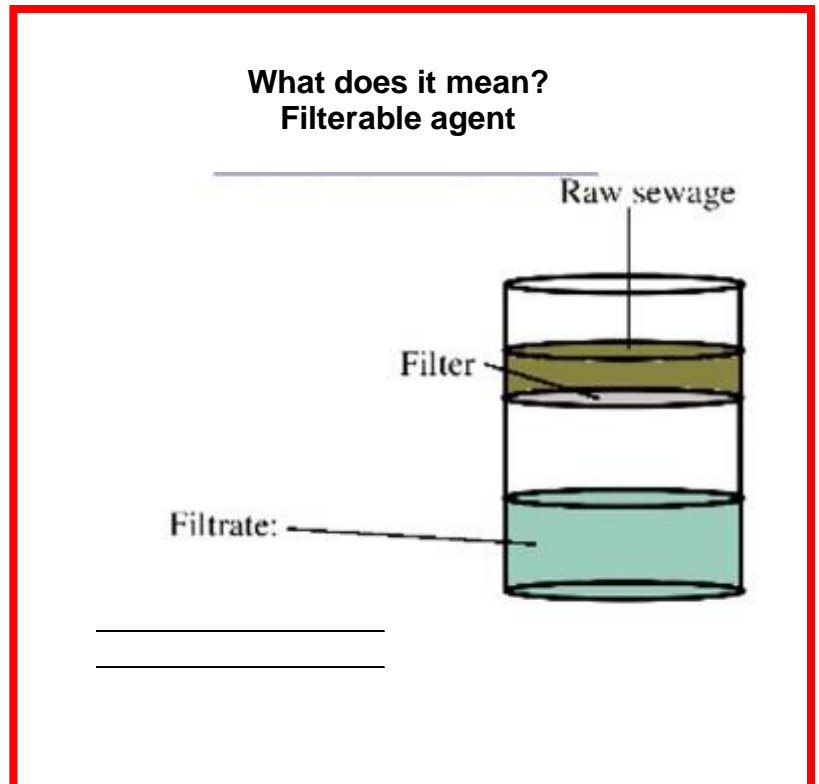
# Lecture 21

## I. Bacteriophages (also known as “phages”)

- A. A bacteriophage is a \_\_\_\_\_ that uses a \_\_\_\_\_ as its host cell.
- B. It is an \_\_\_\_\_.
- C. Phages have either an RNA or DNA genome which:
  - 1. Directs \_\_\_\_\_.
  - 2. Directs synthesis of a \_\_\_\_\_ that protects and transmits the genome between cells.
- D. Viruses are \_\_\_\_\_. (See What Does It Mean?, below)

## II. Types of Bacteriophages

- A. \_\_\_\_\_
  - 1. Phages that multiply rapidly in host cells and then destroy them through lysis (the \_\_\_\_\_).
  - 2. Bacteriophage T4 is a virulent phage.
- B. \_\_\_\_\_
  - 1. Phages that can follow either the lytic or lysogenic pathway (lambda bacteriophage)
    - i. In the lysogenic pathway, phages produce a repressor protein that prevents the replication of phage DNA. Instead, this DNA is \_\_\_\_\_ into the host cell's chromosomes and the phage is then called a \_\_\_\_\_. The host cell will then replicate and produce daughter cells that contain the prophage within their DNA. These cells are called \_\_\_\_\_ bacteria.



# What makes up a bacteriophage?



**III. Lytic phage replication cycle (based on bacteriophage T4 of *E. coli*)**

A. Step 1: \_\_\_\_\_

1. Adsorption proteins on the phage tail fibers attach to \_\_\_\_\_ on the surface of the bacterial cell.
2. As more tail fibers make contact with the bacterial cell, the \_\_\_\_\_ on the cell surface.

B. Step 2: \_\_\_\_\_

1. Conformational changes occur in the phage tail and the \_\_\_\_\_.
2. The phage genome is \_\_\_\_\_ out of the phage head, through the core and \_\_\_\_\_.

C. Step 3: \_\_\_\_\_

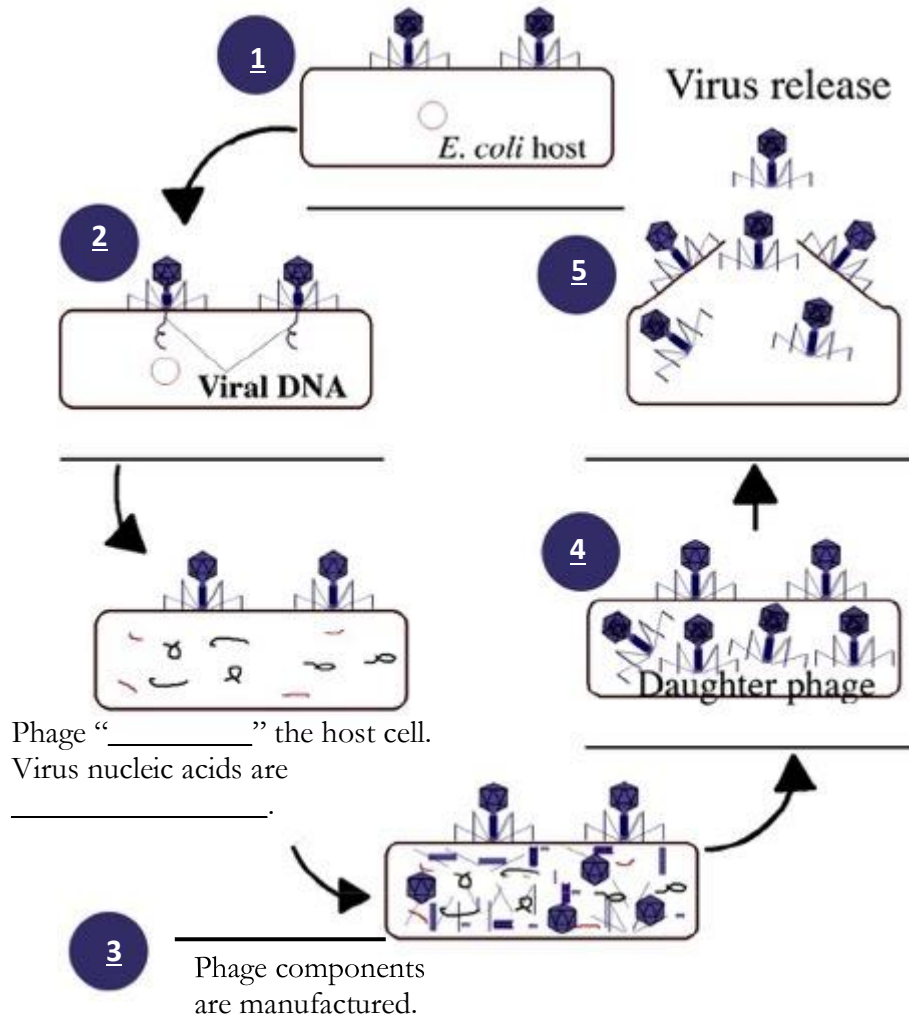
1. The phage \_\_\_\_\_ transcription and translation of the bacteria's mRNA. The host RNA polymerase starts synthesizing phage mRNA encoding for protein factors and enzymes required to \_\_\_\_\_, degrade host DNA and manufacture viral nucleic acids.
  - i. \_\_\_\_\_ of the phage genome are made.
  - ii. Many copies of the \_\_\_\_\_ are also produced.

D. Step 4: \_\_\_\_\_

1. Capsid head and the tail proteins are \_\_\_\_\_ into mature phage particles and the DNA is \_\_\_\_\_ within the phage head. The newly assembled phages are called \_\_\_\_\_.

E. Step 5: \_\_\_\_\_

1. Daughter phages lyse the host cell and are released to infect other bacteria.



Phage “\_\_\_\_\_” the host cell.

Virus nucleic acids are \_\_\_\_\_.

Phage components are manufactured.

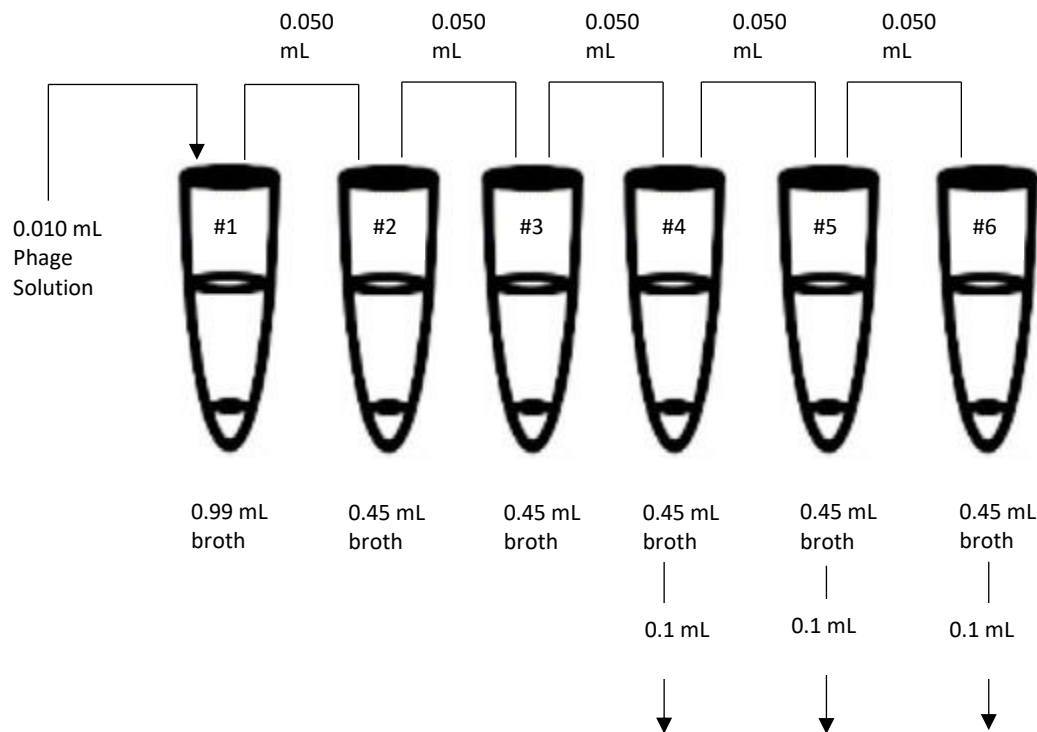
IV. How to isolate viruses

- A. First, the host (bacteria, mammalian cells, etc.) has to be \_\_\_\_\_ with the virus. The virus is then able to replicate and is \_\_\_\_\_.
  - B. Next, the host cell must be \_\_\_\_\_. This allows the viruses to \_\_\_\_\_ (liquid in which the cells were grown).
  - C. The supernatant is then \_\_\_\_\_. The filter allows the viruses to pass through with the fluid but does not allow pieces of the lysed cells to pass.
  - D. The end product is a fluid that should \_\_\_\_\_. During the last lab period, we spotted this fluid onto three quadrants of a TSA plate inoculated with *E. coli*. Today, we should see a lawn of *E. coli* with some small \_\_\_\_\_ where phages have infected and lysed the bacteria. These clear zones are called \_\_\_\_\_.
- Remember that, theoretically, \_\_\_\_\_.

V. Determining bacteriophage titer

- A. Viruses are too small to be seen using a light microscope, so we look at plaques to determine their titer.

1. Titration of bacteriophage



Placed into soft agar with host cells and plated

- B. \_\_\_\_\_ traps the *E. coli* and the diluted virus between the two layers of agar leading to \_\_\_\_\_.

**Notes for Experiment 23:**

- Make sure everything is ready before you go to the water baths so the soft agar \_\_\_\_\_ prematurely.
- Next time, we will count the plaques and determine the virus titer.

