

BACTERIOPHAGE

F.W. Twort and D. Herell (1915) discovered bacteriophage. A bacteriophage is a type of virus that infects bacteria. In fact, the word "bacteriophage" literally means "bacteria eater," because bacteriophages destroy their host cells. All bacteriophages are composed of a nucleic acid molecule that is surrounded by a protein structure.

Structure of bacteriophage

Bacteriophage consists of a DNA or RNA genome within a protein shell or capsid.

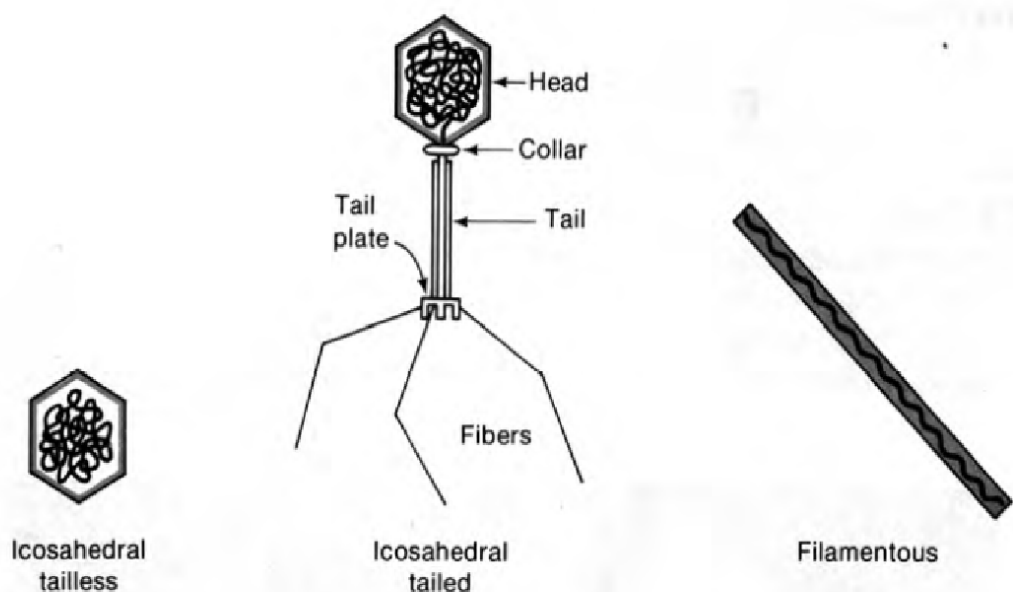
Some bacteriophage structures are simple consisting of a nucleocapsid with either icosahedral symmetry or helical symmetry.

Other bacteriophage structures are complex consisting of a head, tail, and tail fibers.

Bacteriophage may be small, having a genome with less than 10 genes, or large with more than 150 genes.

The viral coat proteins of the phage determine the species of bacteria it infects

Types of Bacteriophage



LIFE CYCLE

Bacteriophages may have a lytic cycle or a lysogenic cycle. The lytic cycle involves phage multiplication and the release of newly formed phage following host cell lysis. Phages that follow only lytic cycle known as virulent phage (e.g. T₄ phage) or lytic phage. The lysogenic pathway does not result in the production of progeny phage or bacterial killing. Those phages able to undergo lysogeny are known as temperate phages, their viral genome will integrate with host DNA (Prophage). Temperate phage (Lambda phage) can follow either the lytic or lysogenic pathway.

Steps in the lytic cycle of a virulent phage-

Adsorption - binding of phage coat protein to bacterial cell membrane receptors.

Introduction of the phage nucleic acid in the host cell while coat protein stays out.

Transcription of phage DNA and inhibition of host transcription.

Replication of phage DNA.

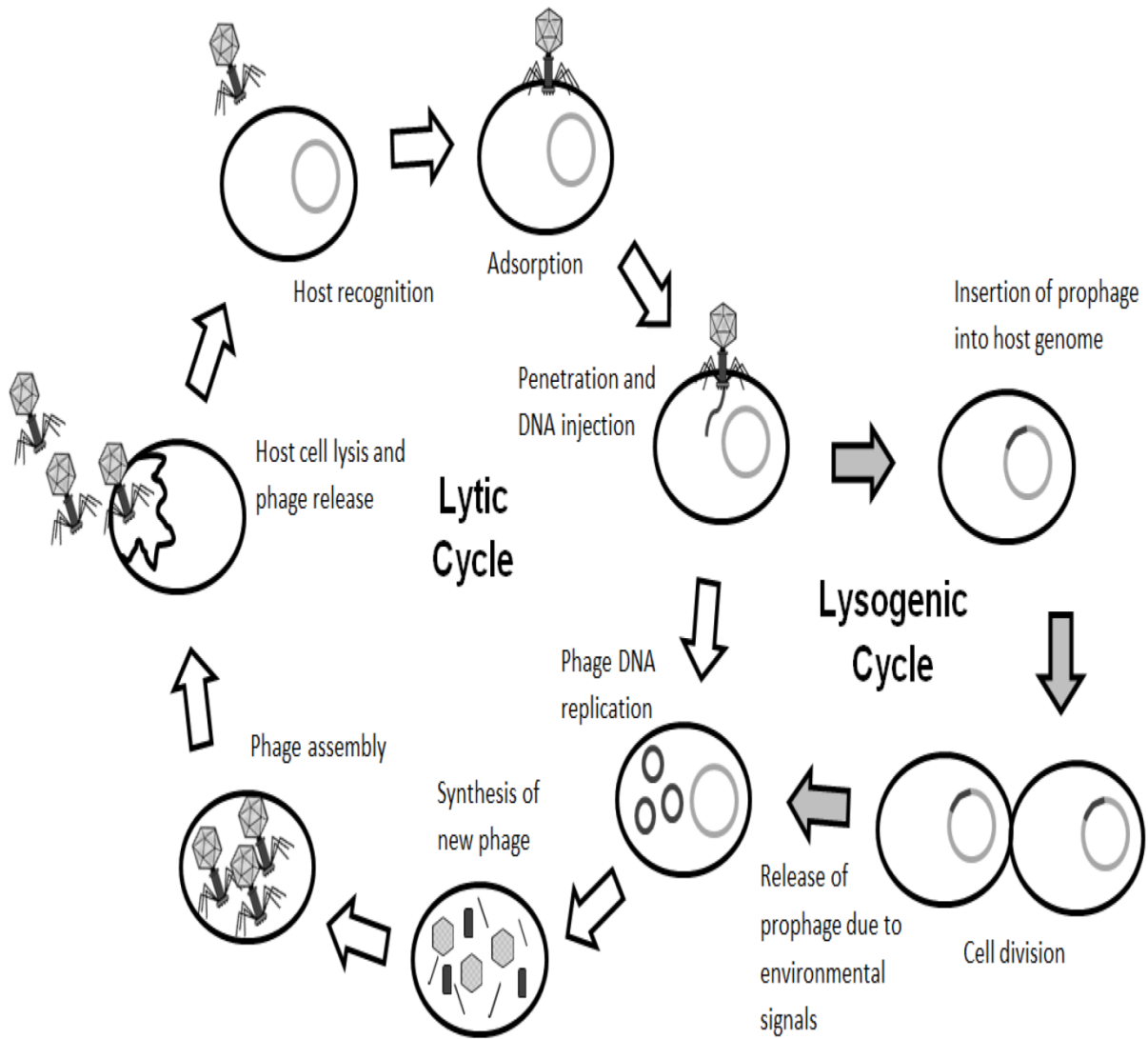
Synthesis of phage capsid proteins.

Morphogenesis and packaging of the phage genomes in to phage capsid.

Lysis of host cell and release of newly formed progeny to find new host.

Temperate phage cycle or lysogenic cycle-

Temperate phages, do not kill the bacterium immediately and have a choice of two types of infection (lytic or lysogenic). In lysogenic infection the phage DNA enters and integrates at a specific site in the bacterial chromosome or exist as a 'plasmid' and remains dormant for some time. The integrated phage DNA is called prophage. During multiplication of the bacterium the integrated phage nucleic acid is also copied to the new cell. The virus remains dormant until host conditions deteriorate, perhaps due to depletion of nutrients, then, the prophage become active and undergoes lytic cycle.



Life Cycle of Bacteriophage