9.1B: Nature of the Virion

A virion is a complete viral particle consisting of RNA or DNA surrounded by a protein shell, constituting the infective form of a virus.

Learning Objectives

- Illustrate the attributes of a virion

Key Points

- The virion shell or capsid protects the interior core that includes the genome and other proteins. After the virion binds to the surface of a specific host cell, its DNA or RNA is injected into the host cell and viral replication occurs, resulting in the spread of the infection to other host cells.
- A virion is the infectious particle that is designed for transmitting the nucleic acid genome among hosts or host cells.
- Virions are produced in the cytoplasm of complex viral ‘factories,’ the virus.

Key Terms

- capsid: The outer protein shell of a virus.
A virion is an entire virus particle consisting of an outer protein shell called a \textit{capsid} and an inner core of nucleic acid (either ribonucleic or deoxyribonucleic acid—RNA or DNA). The core confers infectivity, and the capsid provides specificity to the virus. In some virions the capsid is further enveloped by a fatty membrane, in which case the virion can be inactivated by exposure to fat solvents such as ether and chloroform. Many virions are spheroidal—actually icosahedral (the capsid having 20 triangular faces)—with regularly arranged units called capsomeres, two to five or more along each side. The nucleic acid is densely coiled within. Other virions have a capsid consisting of an irregular number of surface spikes, with the nucleic acid loosely coiled within. Virions of most plant viruses are rod-shaped; the capsid is a naked cylinder (lacking a fatty membrane) within which lies a straight or helical rod of nucleic acid.

Virion capsids are formed from identical protein subunits called capsomeres. Viruses can have a lipid “envelope” derived from the host cell membrane. The capsid is made from proteins encoded by the viral genome and its shape serves as the basis for morphological distinction. Virally coded protein subunits will self-assemble to form a capsid, in general requiring the presence of the virus genome. Complex viruses code for proteins that assist in the construction of their capsid. Proteins associated with nucleic acid are known as nucleoproteins, and the association of viral capsid proteins with viral nucleic acid is called a nucleocapsid. The capsid and entire virus structure can be mechanically (physically) probed through atomic force microscopy.

Figure: \textbf{Virion capsid}: Structure of a capsid and the organization of molecules that constitute it.