10.2: Size and Shapes of Viruses

Skills to Develop

1. Compare the size of most viruses to that of bacteria.
2. List 4 shapes of viruses.

Size

Viruses are usually much smaller than bacteria with the vast majority being submicroscopic. While most viruses range in size from 5 to 300 nanometers (nm), in recent years a number of giant viruses, including Mimiviruses and Pandoraviruses with a diameter of 0.4 micrometers (µm), have been identified. For a comparison of the size of a virus, a bacterium, and a human cell, scroll down to how big is... on the Cell Size and Scale Resource at the University of Utah webpage (see Figure 1A, Figure 1B, and Figure 1C).
Shapes

Figure 1A: Sizes and Shapes of Viruses (Animal RNA Viruses)

Figure 1B: Sizes and Shapes of Viruses (Animal DNA Viruses)

Figure 1C: Sizes and Shapes of Viruses (Bacteriophages)

a. Helical viruses consist of nucleic acid surrounded by a hollow protein cylinder or capsid and possessing a helical...
structure (Figure 2A).
b. Polyhedral viruses consist of nucleic acid surrounded by a polyhedral (many-sided) shell or capsid, usually in the form of an icosahedron (Figure 2B).

- Transmission electron micrograph of Adenoviruses; courtesy of CDC.
- Transmission electron micrograph of poliomyelitis viruses; courtesy of CDC.
- Transmission electron micrograph of poliomyelitis viruses; courtesy of Dennis Kunkel's Microscopy.

c. Enveloped viruses consist of nucleic acid surrounded by either a helical or polyhedral core and covered by an envelope (see Figure 2C and Figure 2D).

- Transmission electron micrograph of Hepatitis B viruses; courtesy of CDC.
- Transmission electron micrograph of an Influenza A virus; courtesy of CDC.
- Transmission electron micrograph of HIV; courtesy of CDC.
- Transmission electron micrograph showing envelope and glycoprotein spikes Coronaviruses; courtesy of CDC.
- Transmission electron micrograph of herpes simplex viruses; courtesy of Dennis Kunkel's Microscopy.

d. Binal (complex) viruses have neither helical nor polyhedral forms, are pleomorphic or irregular shaped (Figure 3), or have complex structures (Figure 2F).
Exercise: Think-Pair-Share Questions

We just learned that most viruses are much smaller than bacteria.

1. Compare the sizes of viruses and bacteria.
2. Why are viruses able to be so much smaller than bacteria?

Summary

1. Viruses are usually much smaller than bacteria with the vast majority being submicroscopic, generally ranging in size from 5 to 300 nanometers (nm).
2. Helical viruses consist of nucleic acid surrounded by a hollow protein cylinder or capsid and possessing a helical structure.
3. Polyhedral viruses consist of nucleic acid surrounded by a polyhedral (many-sided) shell or capsid, usually in the form of an icosahedron.
4. Enveloped viruses consist of nucleic acid surrounded by either a helical or polyhedral core and covered by an envelope.
5. Binal (complex) viruses have neither helical nor polyhedral forms, have irregular shapes, or have complex structures.

Contributors

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