

- 1  **Overview of Viruses and Virology**  
Chapter 10
- 2  **10.1 General Properties of Viruses**
  - 
  - Virus:
    - genetic element
  - Virology: study of viruses
  - Virus particle:
    - extracellular form
  - Virion:
    - infectious particle
    - nucleic acid (DNA or RNA) & protein coat
- 3  **10.1 General Properties of Viruses**
  - Taxonomy
    - classified by host
      - Bacterial viruses (bacteriophages)
      - Animal viruses
      - Plant viruses
- 4  **10.2 Nature of the Virion**
  - Viral Structure
    - Capsid:
      - protein shell
      - Composed of repeating protein molecules
    - Capsomer:
      - subunit of capsid
- 5  **10.2 Nature of the Virion**
  - Nucleocapsid:
    - nucleic acid & protein in the virion
  - Enveloped virus:
    - lipid bilayer & embedded proteins
- 6  **10.2 Nature of the Virion**
  - Nucleocapsids are highly symmetric
    - Helical symmetry:
      - rod-shaped viruses (tobacco mosaic virus)
    - Icosahedral symmetry: spherical viruses
      - efficient arrangement of subunits
- 7  **10.2 Nature of the Virion**
  - Complex Viruses
    - Virions composed of several parts
    - bacterial viruses most complex
      - icosahedral heads & helical tails
- 8  **10.2 Nature of the Virion**
  - Some contain enzymes critical to infection
    - Lysozyme
    - Nucleic acid polymerases
    - Reverse transcriptase
    - Neuraminidases:
      - cleave glycosidic bonds
- 9  **10.3 The Virus Host**
  - replicate only in certain cells or organisms

- Bacterial viruses easiest to grow
  - Animal viruses (& some plant viruses) can be cultivated
  - Plant viruses most difficult often requires whole plant
- 10  **10.4 Quantification of Viruses**
- Titer
    - # infectious units per volume of fluid
  - Plaque assay
    - accurate way to measure virus infectivity
    - Plaques
      - are clear zones on lawn of host cells
      - Each plaque = infection by single virus
- 11
- 12  **10.5 General Features of Virus Replication**
- Viral Replication
    - Attachment (adsorption)
    - Entry (penetration)
    - Synthesis
    - Assembly
    - Release
- 13  **10.5 General Features of Virus Replication**
- typical one-step growth curve
  - Latent period: eclipse + maturation
  - Burst size: number of virions released
- 14  **10.6 Viral Attachment and Penetration**
- Attachment of virion to host cell is highly specific
    - complementary receptors
    - normal functions for cell (uptake proteins)
    - Permissive cell:
      - host cell allows complete replication cycle of a virus to occur
- 15  **10.6 Viral Attachment and Penetration**
- Many eukaryotes combat viral infections
    - immune defense mechanisms, RNA interference
  - bacteria employ restriction-modification systems
    - effective against double-stranded DNA viruses
    - Restriction enzymes
    - Host DNA modification prevent cleavage of own DNA
      - glycosylation or methylation
- 16  **10.7 Production of Viral Nucleic Acid and Protein**
- Retroviruses:
    - animal viruses
      - certain types of cancers & acquired immunodeficiency syndrome (AIDS)
    - Class VI and VII viruses
    - Require reverse transcriptase
- 17  **10.8 Overview of Bacterial Viruses**
- Bacteriophages are very diverse
  - Most contain dsDNA genomes
  - Most are naked, some have lipid envelopes
- 18  **10.8 Overview of Bacterial Viruses**
- Viral Life Cycles
    - Virulent mode:

- viruses lyse host cells after infection
  - Temperate mode:
    - viruses replicate genomes (prophage) in tandem with host without killing host
- 19  **10.11 Overview of Animal Viruses**
- entire virion enters the cell
  - animal viruses leave host cell & remove part of host cell's lipid bilayer for their envelope
- 20  **10.11 Overview of Animal Viruses**
- Consequences of Virus Infection in Animal Cells
    - *Persistent*
    - *Latent*
    - *Transformation*
- 21  **10.12 Retroviruses**
- Retroviruses:
    - RNA viruses using DNA intermediate
    - Enveloped viruses
    - reverse transcriptase
- 22
- 23  **10.14 Viroids**
- Viroids: infectious RNA lack a protein coat
    - Cause a number of important plant diseases
- 24  **10.15 Prions**
- Prions: infectious proteins
    - disease in animals (transmissible spongiform encephalopathies)