Viruses

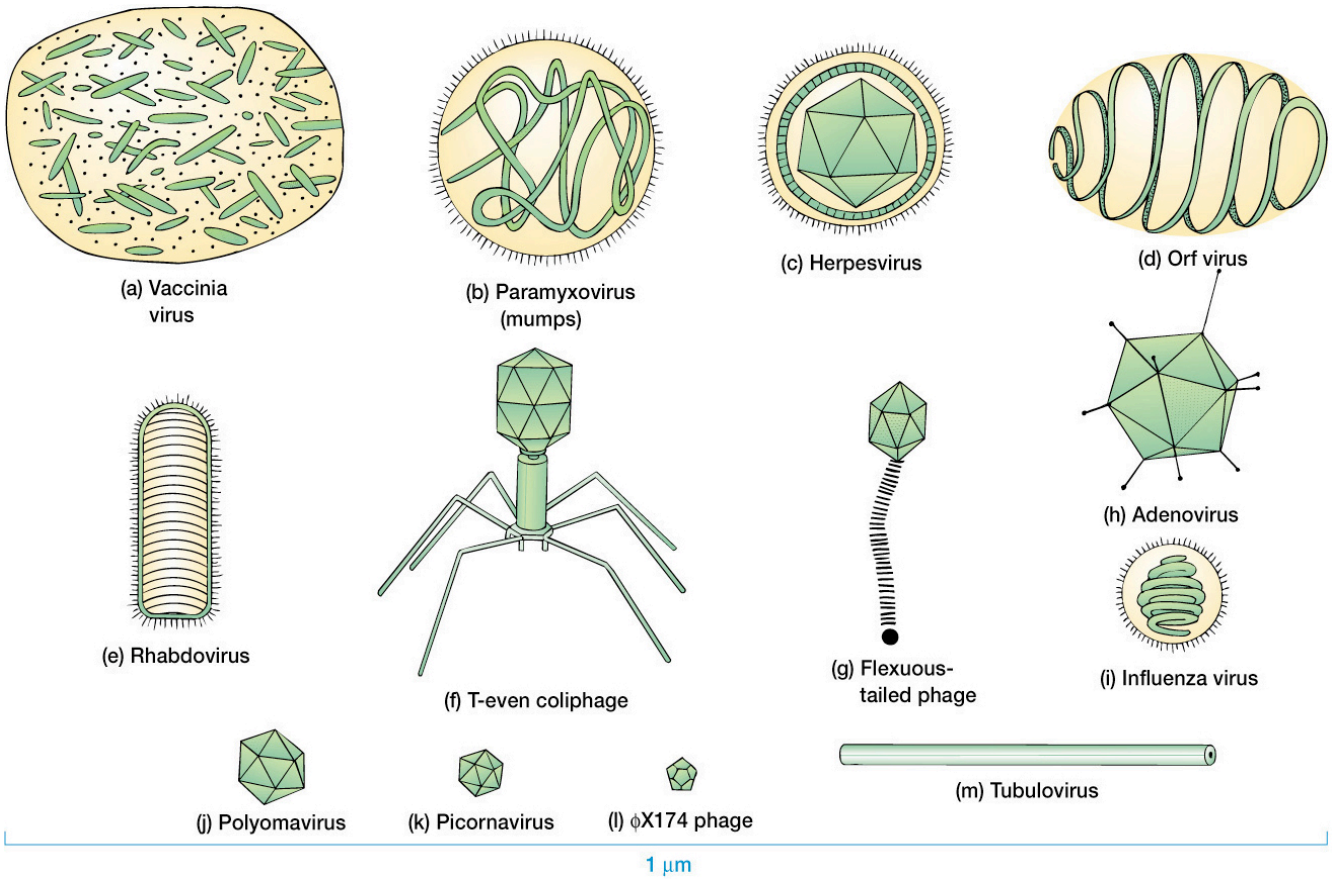
- Simple acellular infectious agents
- Consisting of one or more molecules of nucleic acids enclosed in a protein coat=capsid
- Protein coat or capsid could be icosahedral, helical, or complex in structure
- Varied in their genomic composition: dsDNA, ssDNA, dsRNA, or ssRNA
- May be covered by host derived membrane= envelope

Viruses (continued)

- Unable to reproduce independently=
  - Obligate intracellular parasites
  - Rely on host protein synthesis, enzymes
- Extremely small
- Have specific host range defined by host receptor
  - Species
  - Tissue
- Classified by several factors:

Host
Capsid symmetry
Envelope
Nucleic acid composition
Disease caused by eukaryotic viruses

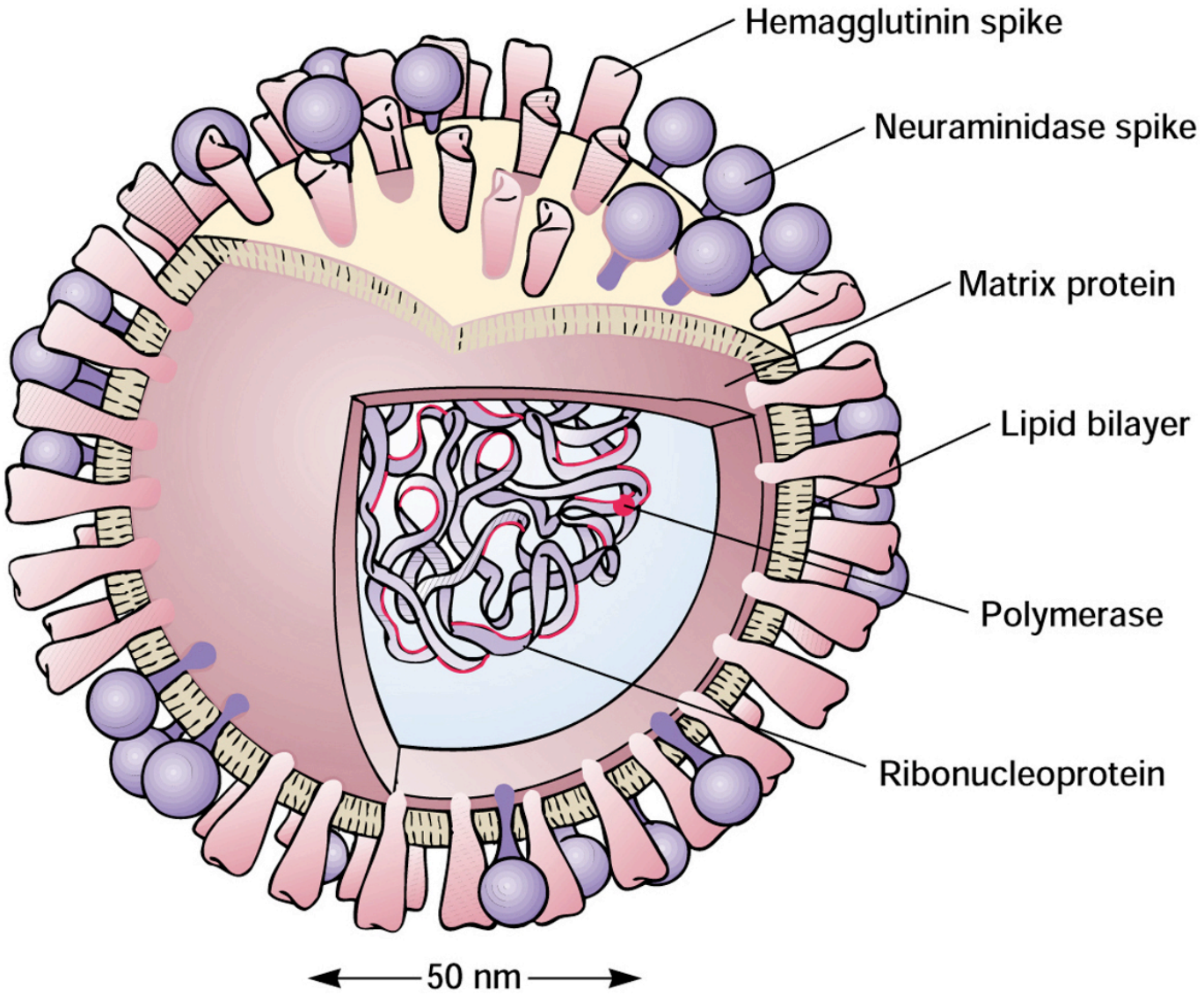
Size and Morphology



- Shape
  - Helical
  - Icosahedral
  - Complex
- Outer surface
  - Naked
  - Enveloped

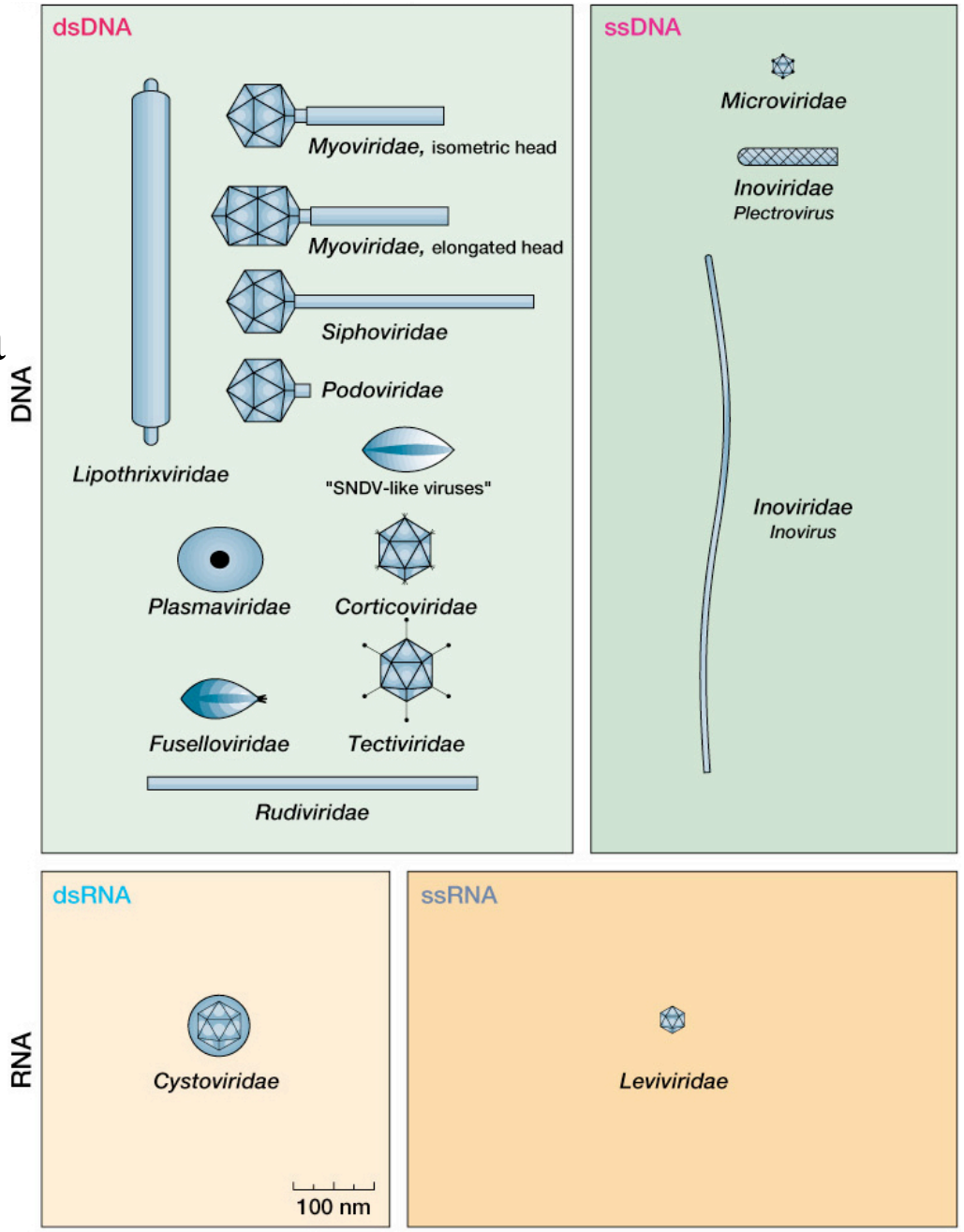
Fig. 16.10

Influenza virus

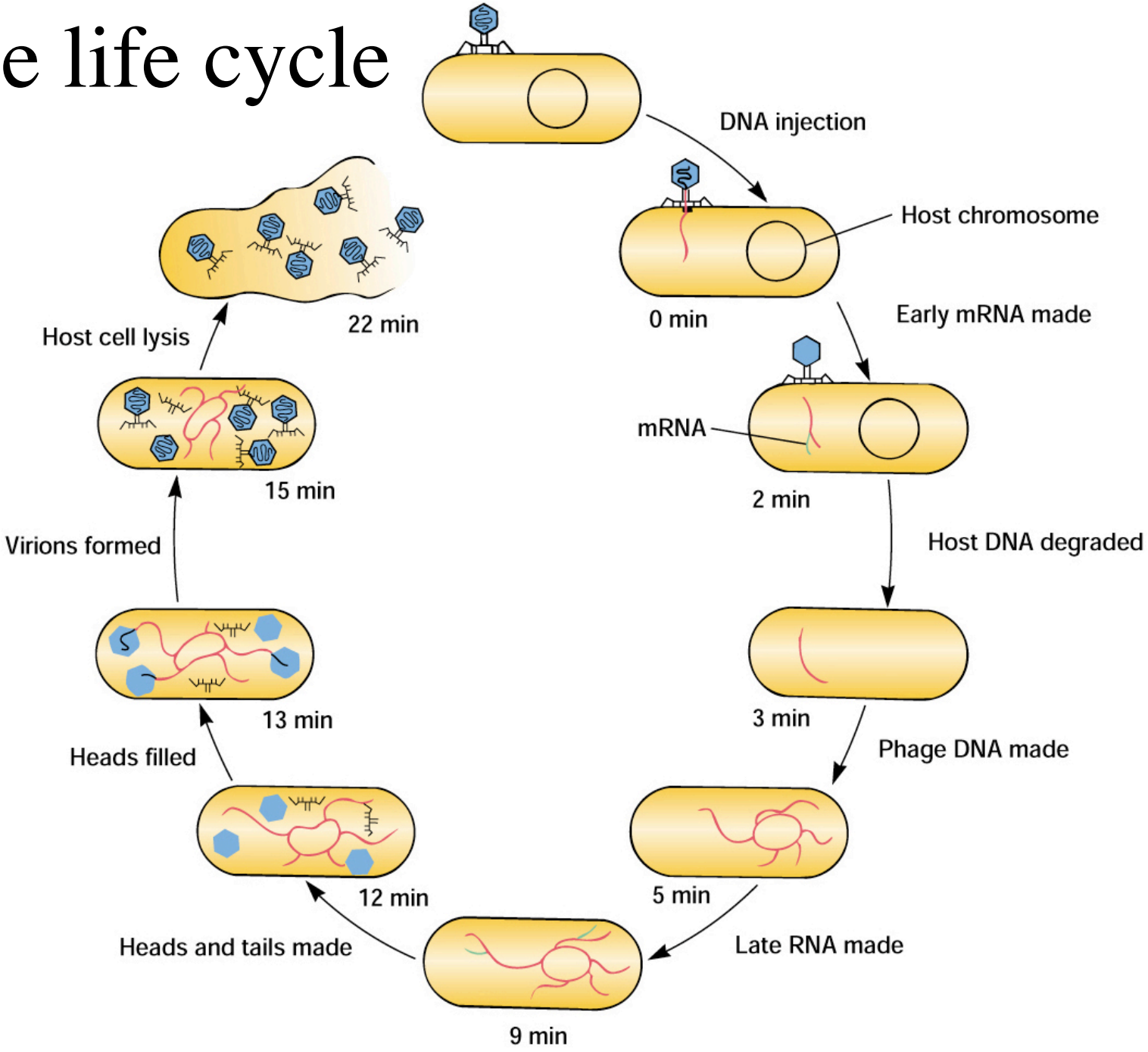


Bacteriophages

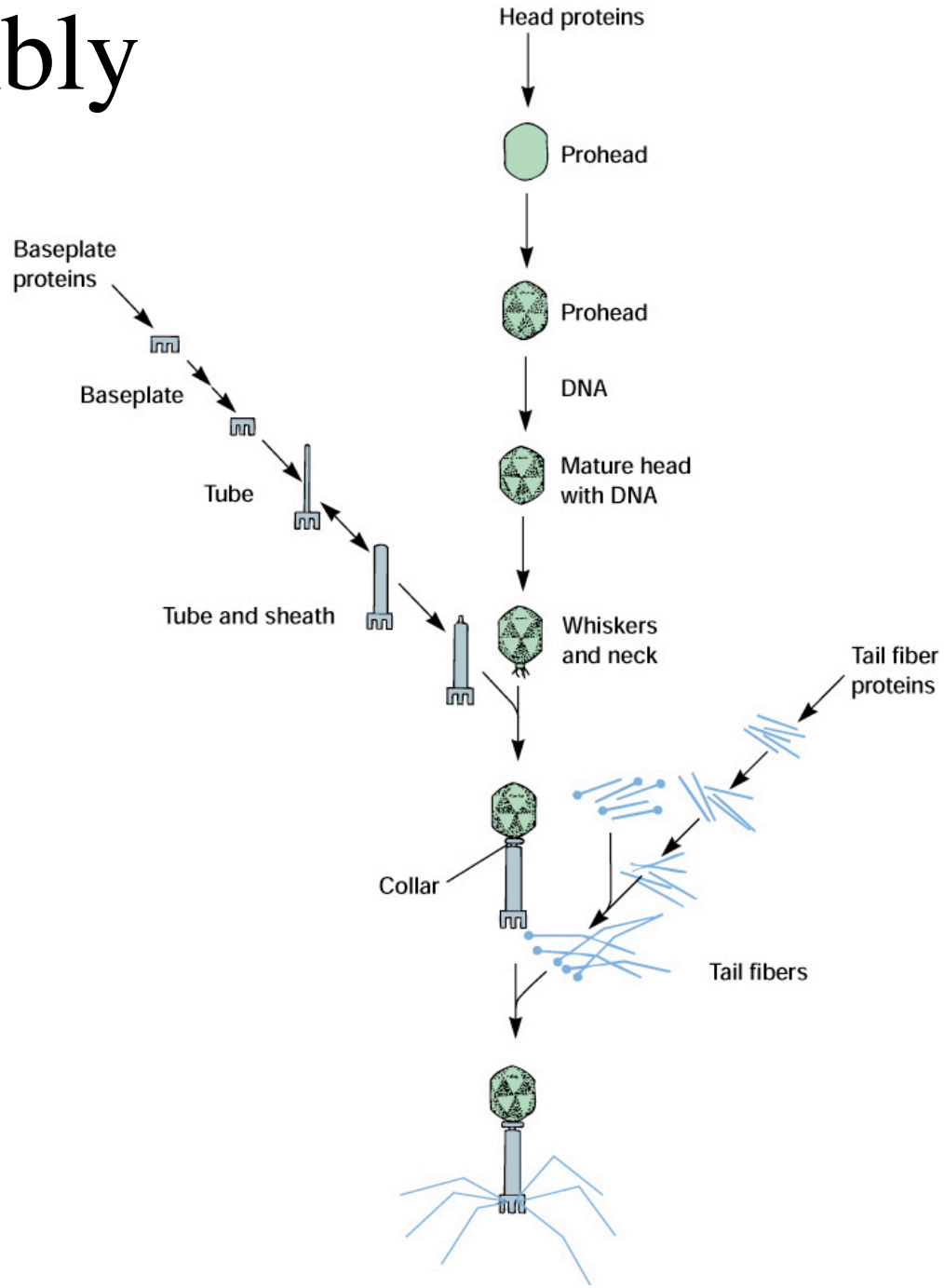
- Viruses that infect bacteria
- Extremely small
- Predominantly DNA for nucleic acid
- Model system

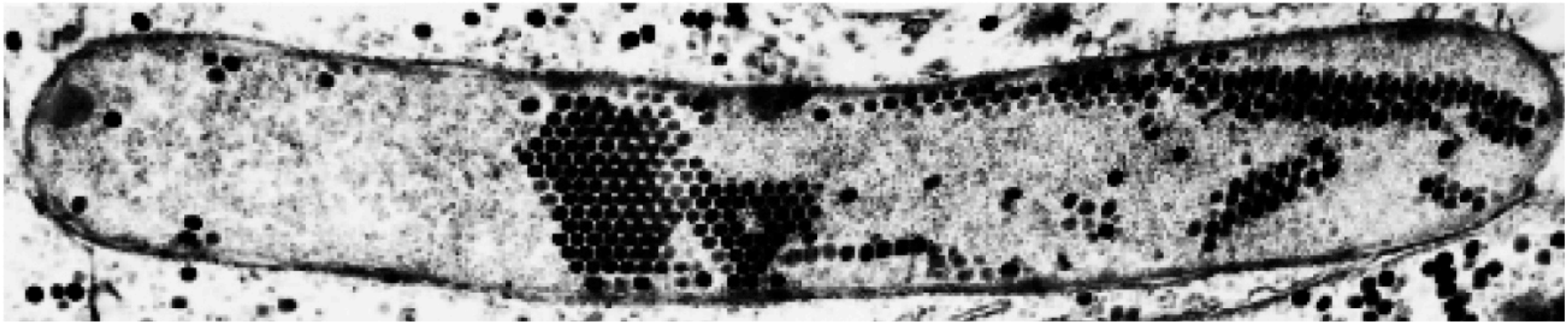


T4 phage life cycle



T4 phage assembly





Virus propagation and study

- Plaque assay
  - Bacteria
  - Cell culture
- Cytopathic effects
  - Cell culture
  - Whole organism

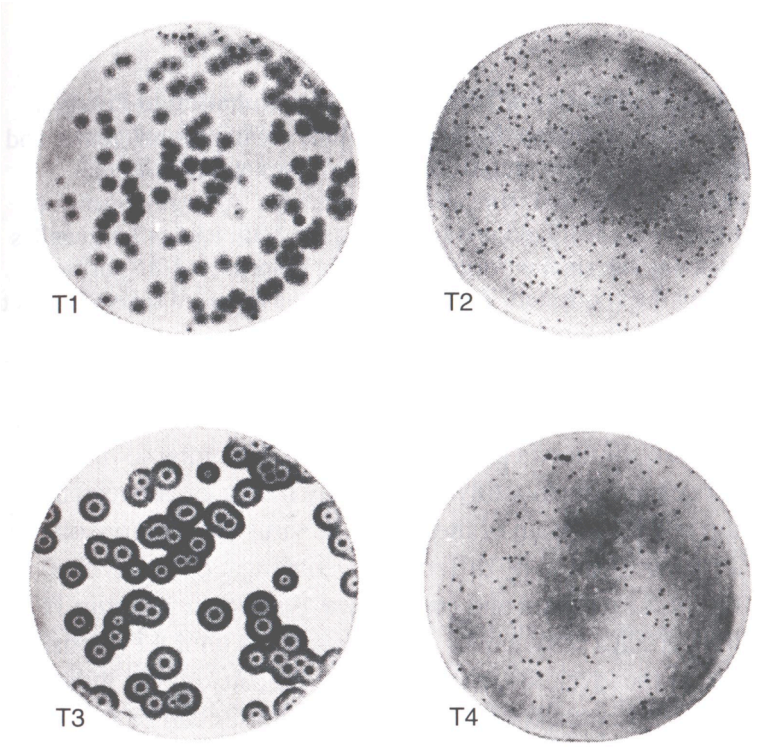


Fig. 16.4

Animal viruses

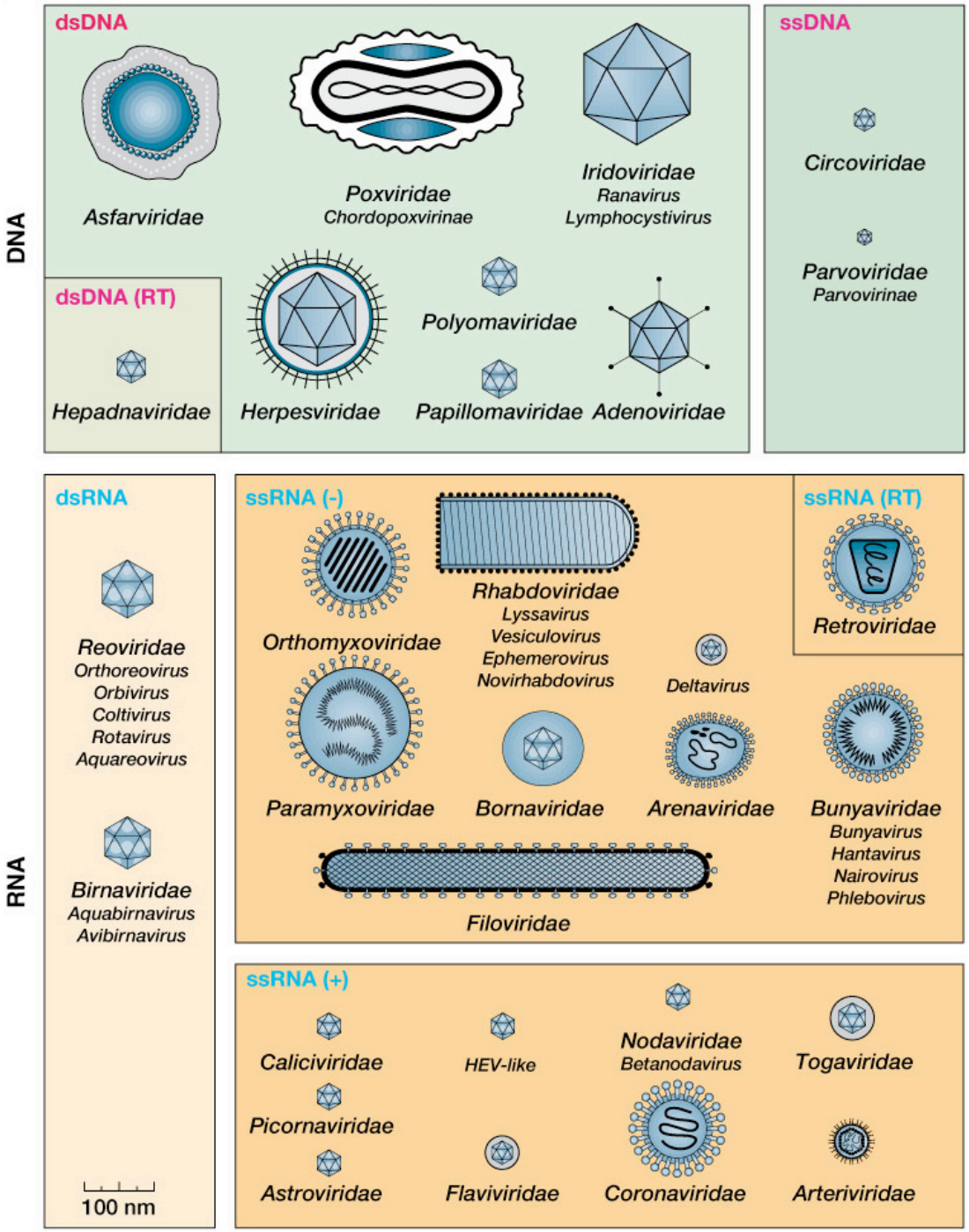


Fig. 18.3

Specificity for host receptor

Table 18.1 Examples of Host Cell Surface Proteins That Serve as Virus Receptors

Virus	Cell Surface Protein
Adenoviru	Coxsackie adenovirus receptor (CAR) protein
Epstein-Barr virus	Receptor for the C3d complement protein on human B lymphocytes
Hepatitis A viru	Alpha 2-macroglobulin
Herpes simplex virus, type 1	Fibroblast growth factor receptor; a member of the tumor necrosis factor/nerve growth factor receptor family
Human immunodeficiency virus	CD4 protein on T-helper cells, macrophages, and monocytes; CXCR-4 or the CCR5 receptor
Influenza A virus	Sialic acid–containing glycoprotein
Measles viru	CD46 complement regulator protein
Polioviru	Immunoglobulin superfamily
Rabies virus	Acetylcholine receptor on neurons
Rhinovirus	Intercellular adhesion molecules (ICAMs) on the surface of respiratory epithelial cells
Reovirus, type 3	β-adrenergic receptor
Rotavirus	Acetylated sialic acid on glycoprotein
Vaccinia virus	Epidermal growth factor receptor

Direct penetration

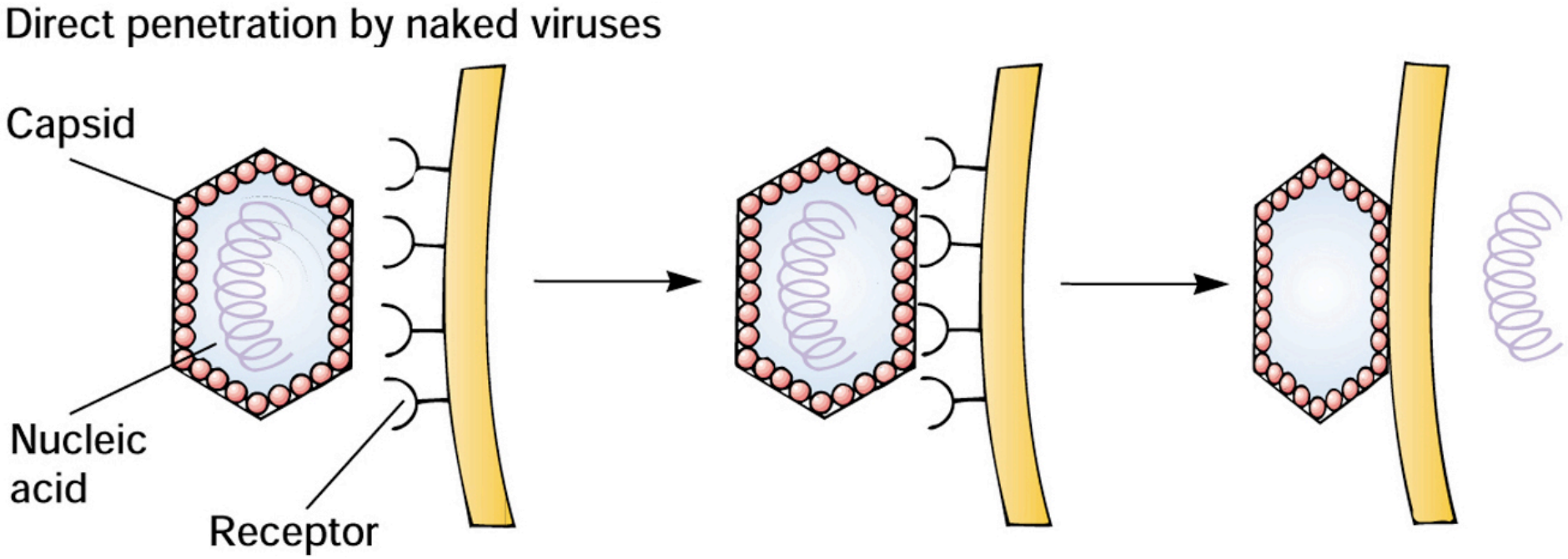


Fig.18.4

Penetration by membrane fusion

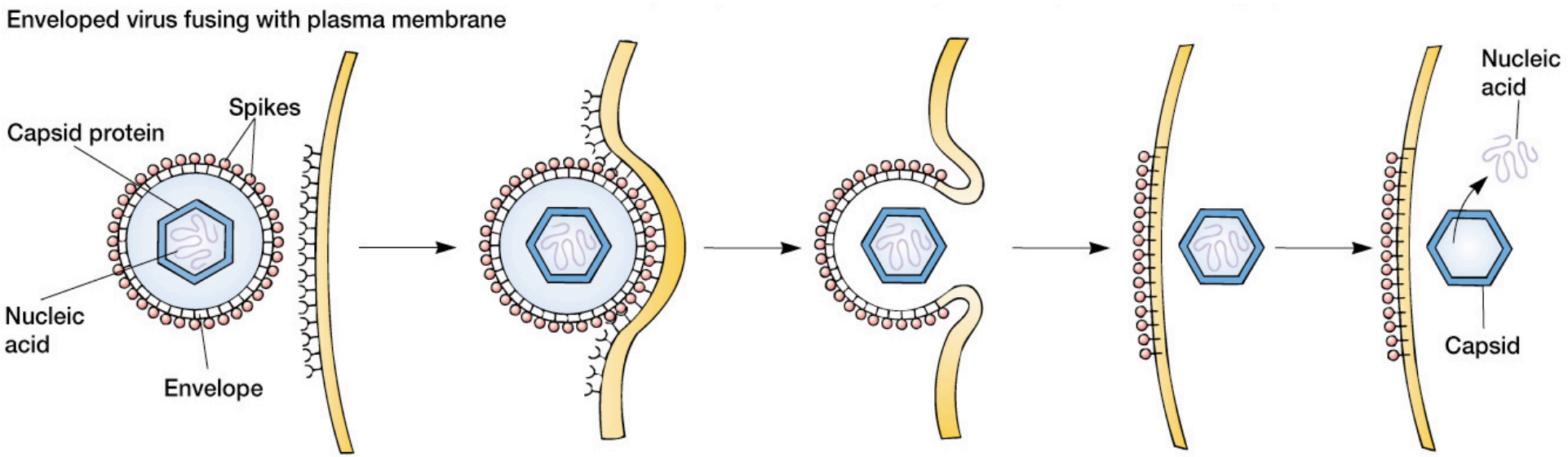


Fig.18.4

Penetration by endocytosis

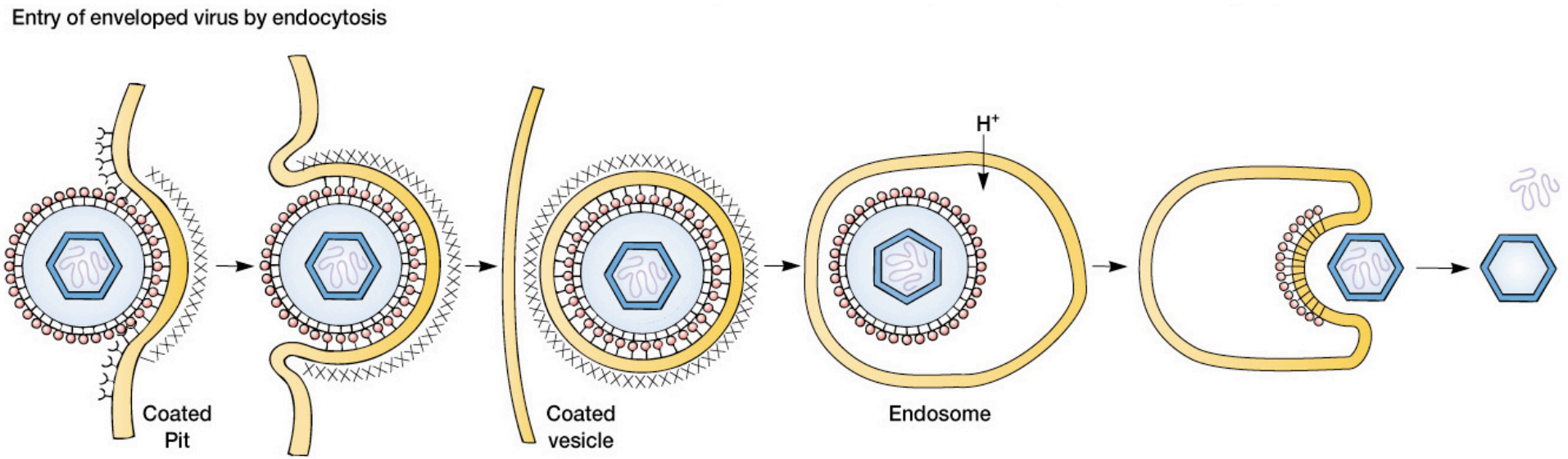
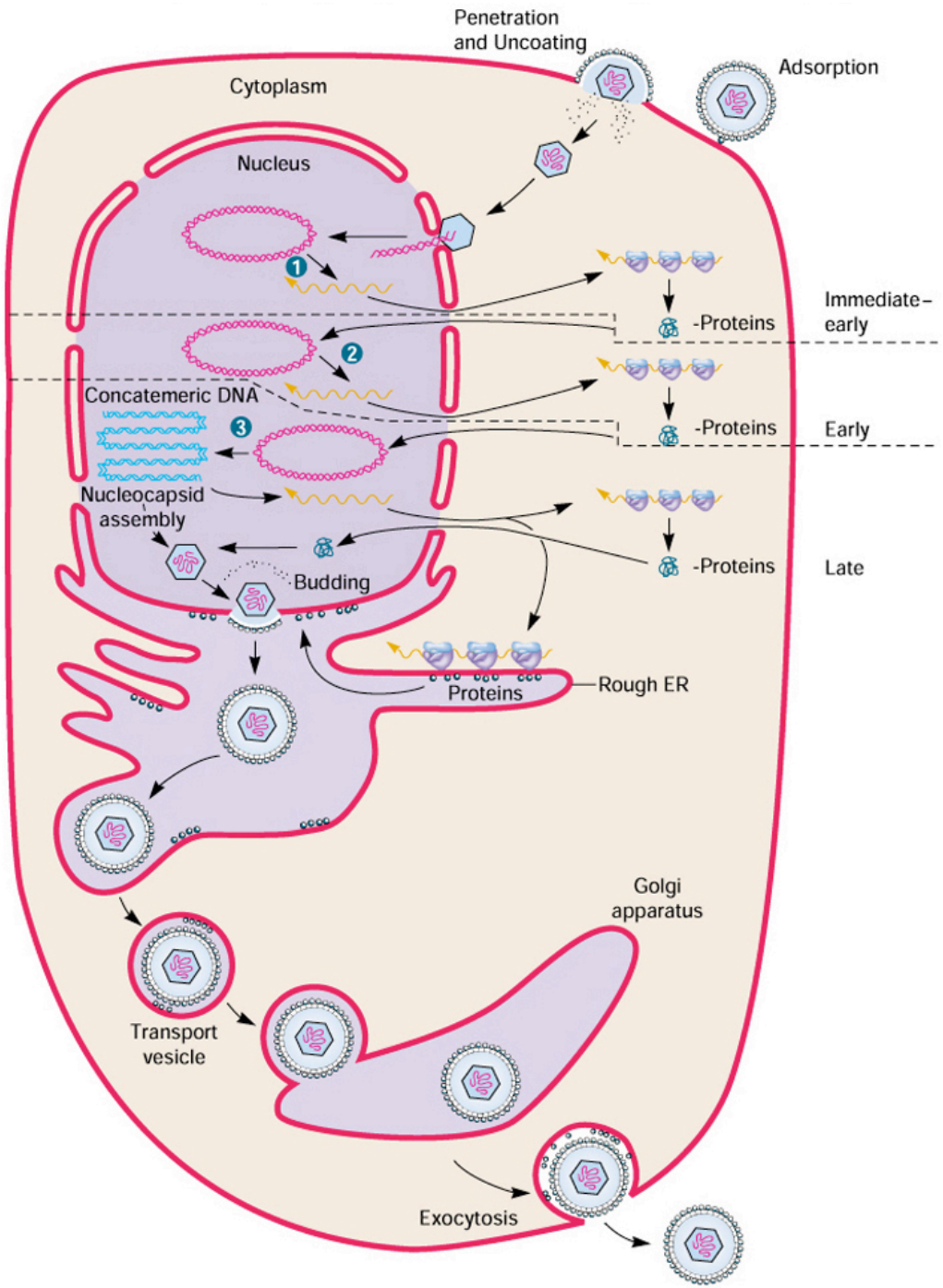


Fig.18.4

Herpes simplex 1 life cycle

- Linear, dsDNA virus
- Encodes 50-100 genes
- Uses host polymerase for RNA synthesis
- Viral DNA replication enzymes



Positive (+) sense RNA

- Poliovirus
- Rhinovirus
- Hepatitis A
- Dengue virus
- Rubella virus (German measles)

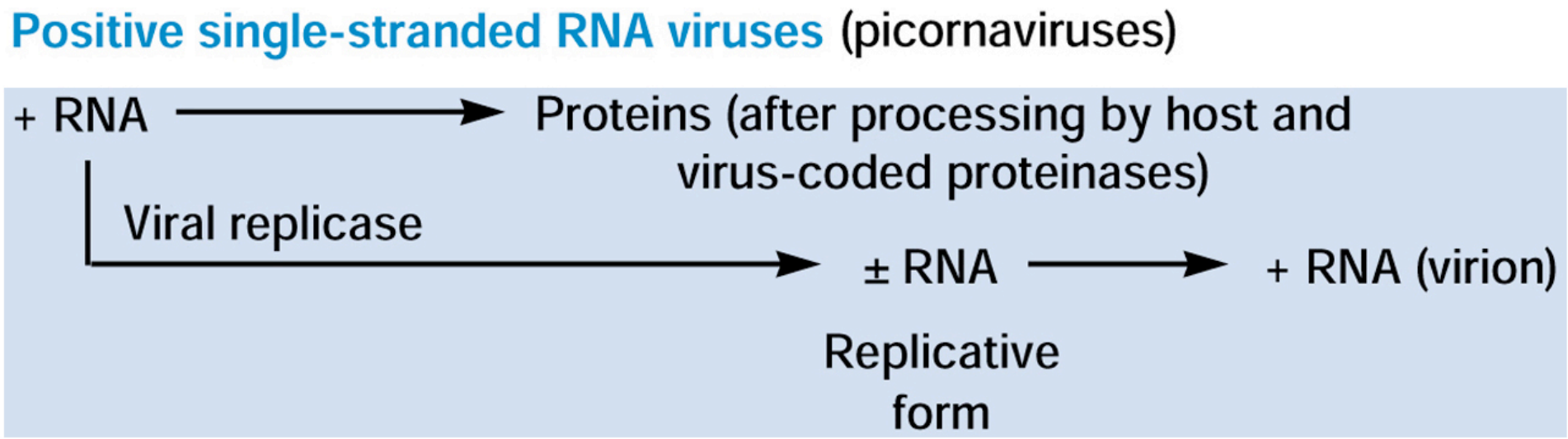


Fig. 18.6

Negative (-) sense RNA viruses

- Influenza
- Rabies
- Ebola and Marburg
- Sin Nombre (Hantavirus)

Negative single-stranded RNA viruses (paramyxoviruses—mumps and measles; orthomyxoviruses—influenza)

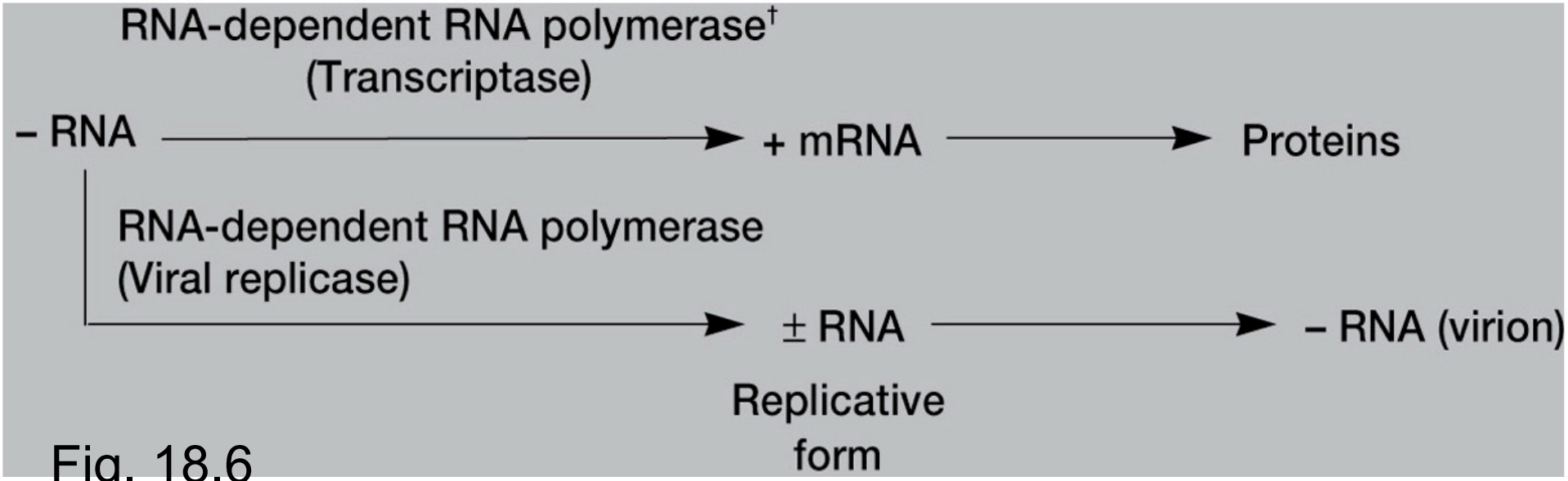
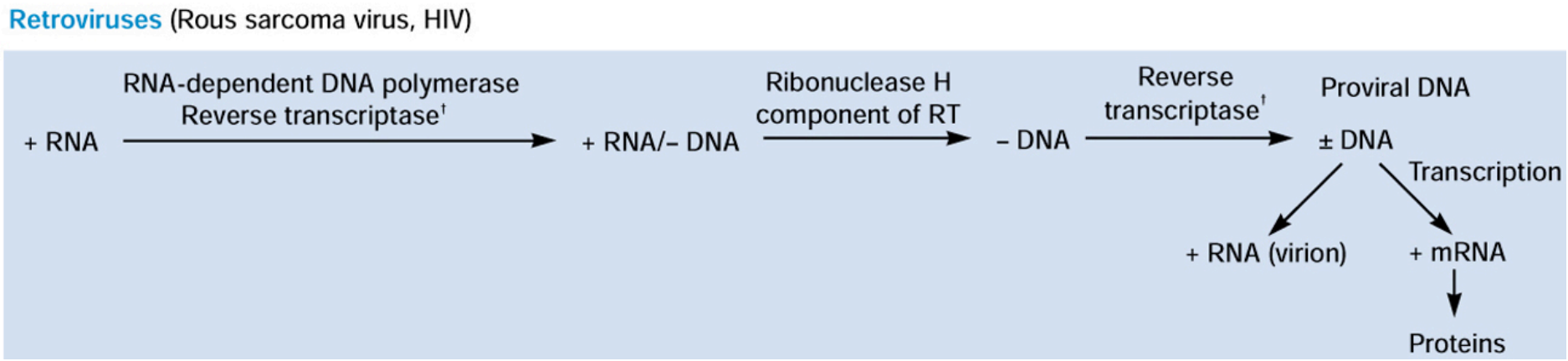


Fig. 18.6

Retroviruses

- HIV
- HTLV



Viral budding