TABLE 13.1 Viruses and Bacteria Compared

	Bacteria		
	Typical Bacteria	Rickettsias/ Chlamydias	Viruses
Intracellular Parasite	No	Yes	Yes
Plasma Membrane	Yes	Yes	No
Binary Fission	Yes	Yes	No
Pass through Bacteriological Filters	No	No/Yes	Yes
Possess Both DNA and RNA	Yes	Yes	No
ATP-Generating Metabolism	Yes	Yes/No	No
Ribosomes	Yes	Yes	No
Sensitive to Antibiotics	Yes	Yes	No
Sensitive to Interferon	No	No	Yes

Figure 13.1 Virus sizes.

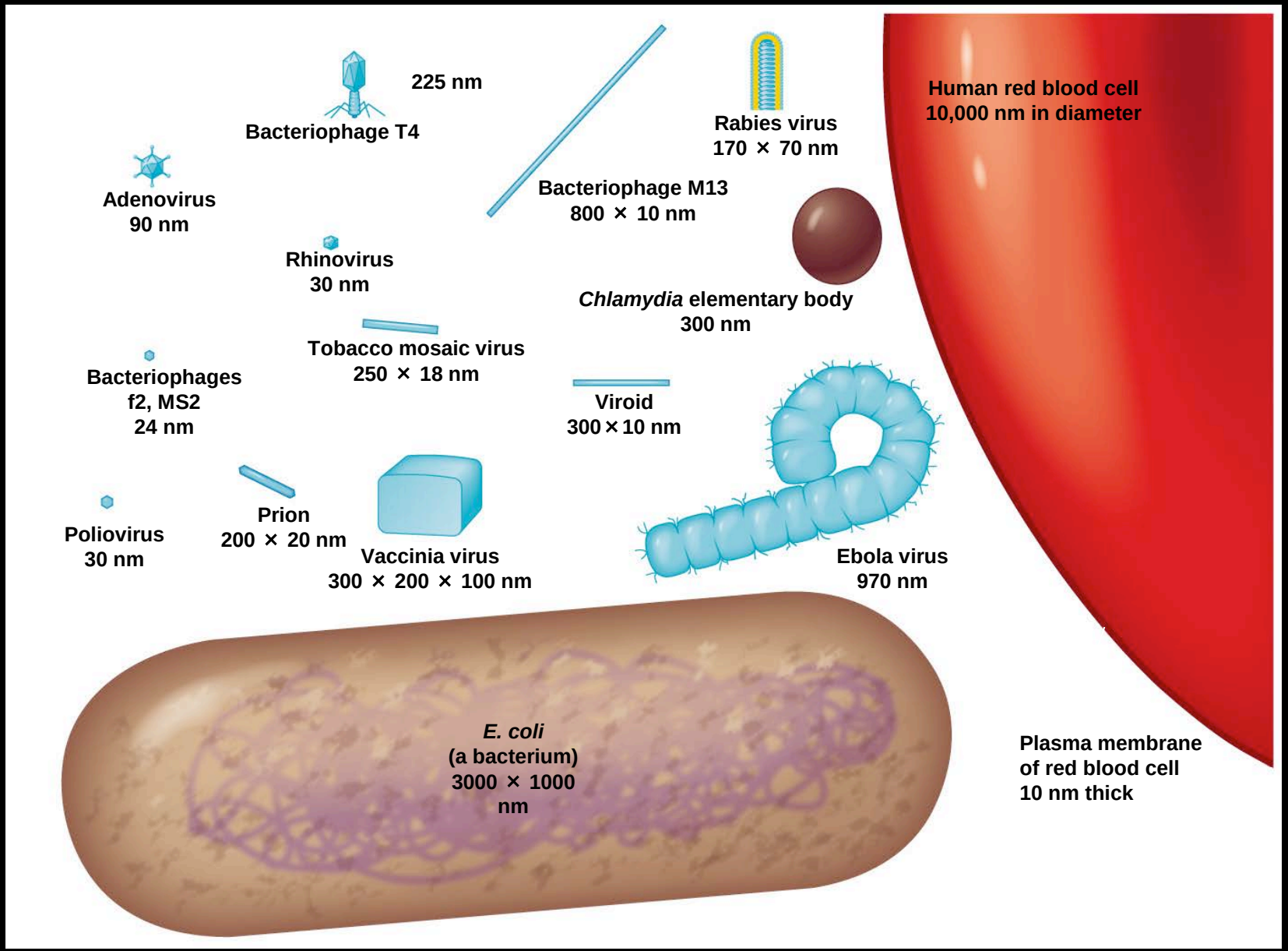
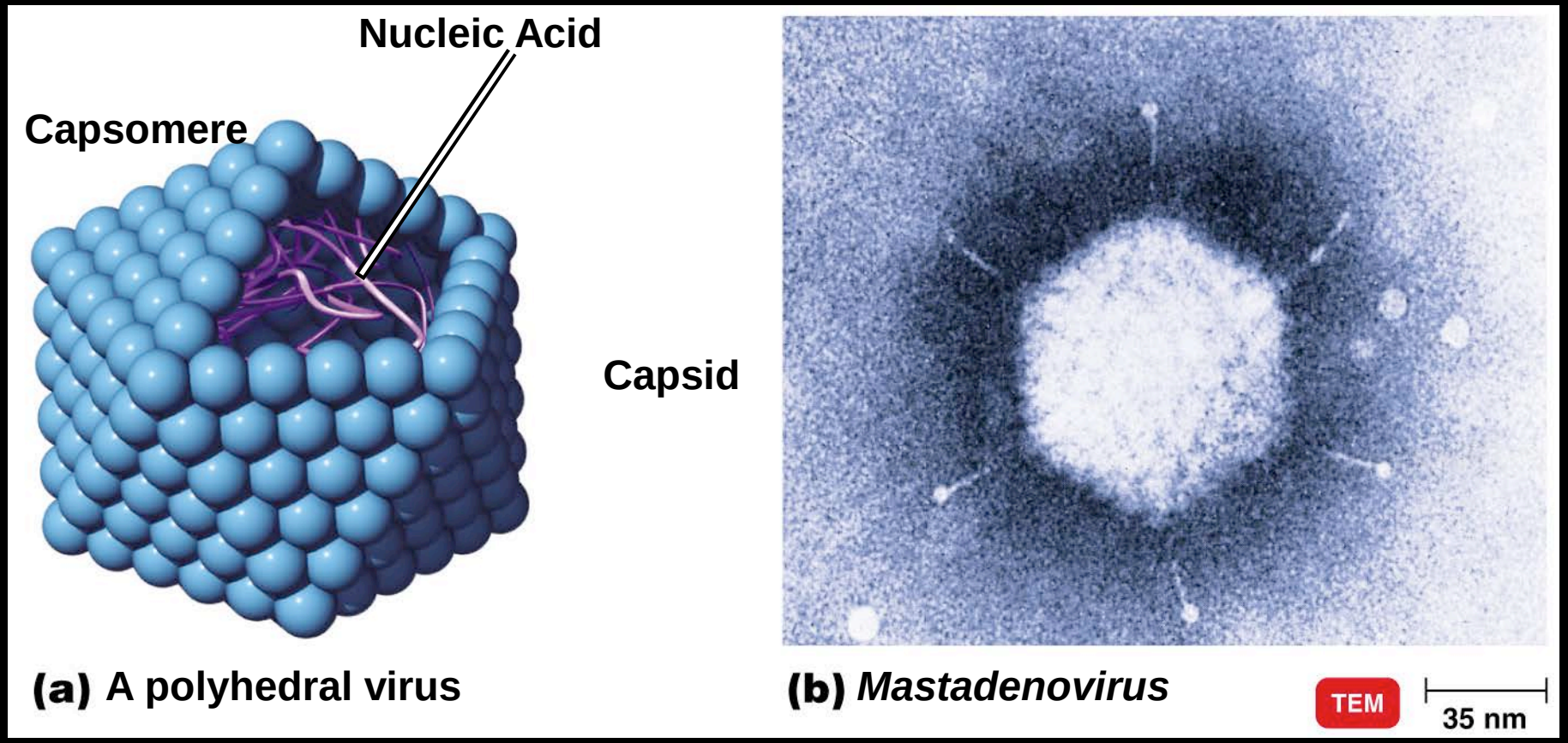


Figure 13.2 Morphology of a nonenveloped polyhedral virus.



Influenza Vaccine: Northern Hemisphere recommended strains

NH winter season	H1N1	H3N2	B-strain	additional B-strain for QIV
2013-2014	A/California/7/2009 (H1N1)pdm09-like virus	A(H3N2) virus antigenically like the cell-propagated prototype virus A/Victoria/361/2011	B/Massachusetts/2/2012-like virus	B/Brisbane/60/2008-like virus
2014-2015	A/California/7/2009 (H1N1)pdm09-like virus	A/Texas/50/2012 (H3N2)-like virus	B/Massachusetts/2/2012-like virus	B/Brisbane/60/2008-like virus

World Health Organization

Recommended composition of influenza virus vaccines for use in the 2014-2015 northern hemisphere influenza season

Annex 1

Declarations of interest

The WHO recommendation on the composition of influenza virus vaccines for the northern hemisphere 2014-2015 was made through a technical consultation with relevant WHO Collaborating Centres on Influenza (CCs) and WHO Essential Regulatory Laboratories (ERLs).

In accordance with WHO policy, all Directors of the WHO CCs and ERLs, in their capacity as representatives of their respective institutions ("Advisers") completed the WHO form for Declaration of Interests for WHO experts before being invited to the consultation. At the start of the consultation, the interests declared by the Advisers were disclosed to all consultation participants.

The Advisers declared the following personal current or recent (past 4 years) financial or other interests relevant to the subject of work:

Institution	Representative	Personal interest
WHO CC Atlanta	Dr Nancy Cox	None
WHO CC Beijing	Dr Yuelong Shu	None
WHO CC London	Dr John McCauley	None
WHO CC Melbourne	Dr Anne Kelso	Shareholdings (significant) in the company CSL Limited
WHO CC Memphis	Dr Richard Webby	None
WHO CC and ERL Tokyo	Dr Masato Tashiro	None
WHO ERL Canberra	Dr Gary Grohmann	None
WHO ERL London	Dr Othmar Engelhardt	Travel cost (flights and hotel) to a conference related to influenza vaccine development under GAP[8] program as invited speaker by the vaccine manufacturer BIRMEX
WHO ERL Rockville	Dr Zhiping Ye	None

Based on the WHO assessment of the interest declared by Dr Kelso, it was concluded that Dr Kelso should continue to serve as an Adviser, considering that the interest was disclosed at the beginning of the consultation, and that, in accordance with the conditions required of all WHO CC Melbourne staff, Dr Kelso has agreed to refrain from acquiring additional shares in influenza vaccine manufactures.

The interest declared by Dr Engelhardt was reviewed by WHO and determined not to present a conflict of interest with the objectives of the technical consultation.

In view of the foregoing, Dr Kelso and Dr Engelhardt participated in the consultation as Advisers.

TABLE 13.2 Families of Viruses That Affect Humans

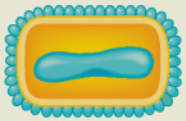
Characteristics/ Dimensions	Viral Family	Important Genera	Clinical or Special Features
Single-Stranded DNA Nonenveloped			
18–25 nm	Parvoviridae 	Human parvovirus B19	Fifth disease; anemia in immunocompromised patients. Refer to Chapter 21.
Double-Stranded DNA Nonenveloped			
70–90 nm	Adenoviridae 	*Mastadenovirus*	Medium-sized viruses that cause various respiratory infections in humans; some cause tumors in animals.
40–57 nm	Papovaviridae 	*Papillomavirus* (human wart virus) *Polyomavirus*	Small viruses that cause warts and cervical and anal cancer in humans belong to this family. Refer to Chapters 21 and 26.
Double-Stranded DNA Enveloped			
200–350 nm	Poxviridae 	*Orthopoxvirus* (vaccinia and smallpox viruses) *Molluscipoxvirus*	Very large, complex, brick-shaped viruses that cause smallpox (variola), molluscum contagiosum (wartlike skin lesion), and cowpox. Refer to Chapter 21.
150–200 nm	Herpesviridae 	*Simplexvirus* (HHV-1 and -2) *Varicellovirus* (HHV-3) *Lymphocryptovirus* (HHV-4) *Cytomegalovirus* (HHV-5) *Roseolovirus* (HHV-6 and HHV-7) *Rhadinovirus* (HHV-8)	Medium-sized viruses that cause various human diseases: fever blisters, chickenpox, shingles, and infectious mononucleosis; cause a type of human cancer called Burkitt's lymphoma. Refer to Chapters 21, 23, and 26.
42 nm	Hepadnaviridae 	*Hepadnavirus* (hepatitis B virus)	After protein synthesis, hepatitis B virus uses reverse transcriptase to produce its DNA from mRNA; causes hepatitis B and liver tumors. Refer to Chapter 25.

TABLE 13.2 Families of Viruses That Affect Humans

Characteristics/ Dimensions	Viral Family	Important Genera	Clinical or Special Features
Single-Stranded RNA, + Strand Nonenveloped			
28–30 nm	Picornaviridae 	*Enterovirus* *Rhinovirus* (common cold virus) Hepatitis A virus	At least 70 human enteroviruses are known, including the polio-, coxsackie-, and echoviruses; more than 100 rhinoviruses exist and are the most common cause of colds. Refer to Chapters 22, 24, and 25.
35–40 nm	Caliciviridae 	Hepatitis E virus *Norovirus*	Includes causes of gastroenteritis and one cause of human hepatitis. Refer to Chapter 25.
Single-Stranded RNA, + Strand Enveloped			
60–70 nm	Togaviridae 	*Alphavirus* *Rubivirus* (rubella virus)	Included are many viruses transmitted by arthropods (*Alphavirus*); diseases include eastern equine encephalitis (EEE), western equine encephalitis (WEE), and chikungunya. Rubella virus is transmitted by the respiratory route. Refer to Chapters 21, 22, and 23.
40–50 nm	Flaviviridae 	*Flavivirus* *Pestivirus* Hepatitis C virus	Can replicate in arthropods that transmit them; diseases include yellow fever, dengue and St. Louis and West Nile encephalitis. Refer to Chapters 22, 23, and 25.

TABLE 13.2 Families of Viruses That Affect Humans *(continued)*

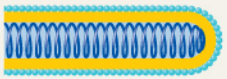
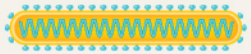
Characteristics/ Dimensions	Viral Family	Important Genera	Clinical or Special Features
80–160 nm	Coronaviridae 	*Coronavirus*	Associated with upper respiratory tract infections and the common cold; SARS virus. Refer to Chapter 24.
– Strand, One Strand of RNA			
70–180 nm	Rhabdoviridae 	*Vesiculovirus* (vesicular stomatatis virus) *Lyssavirus* (rabies virus)	Bullet-shaped viruses with a spiked envelope; cause rabies and numerous animal diseases. Refer to Chapter 22.
80–14,000 nm	Filoviridae 	*Filovirus*	Enveloped, helical viruses; Ebola and Marburg viruses are filoviruses. Refer to Chapter 23.
150–300 nm	Paramyxoviridae 	*Paramyxovirus* *Morbillivirus* (measles virus)	Paramyxoviruses cause parainfluenza, mumps, and Newcastle disease in chickens. Refer to Chapters 21, 24, and 25.
32 nm	Deltaviridae 	Hepatitis D	Depend on coinfection with hepadnavirus. Refer to Chapter 25.

TABLE 13.2 Families of Viruses That Affect Humans *(continued)*

Characteristics/ Dimensions	Viral Family	Important Genera	Clinical or Special Features
– Strand, Multiple Strands of RNA			
80–200 nm	Orthomyxoviridae 	Influenza virus A, B, and C	Envelope spikes can agglutinate red blood cells. Refer to Chapter 24.
90–120 nm	Bunyaviridae 	*Bunyavirus* (California encephalitis virus) *Hantavirus*	Hantaviruses cause hemorrhagic fevers such as Korean hemorrhagic fever and *Hantavirus* pulmonary syndrome; associated with rodents. Refer to Chapters 22, 23.
110–130 nm	Arenaviridae 	*Arenavirus*	Helical capsids contain RNA-containing granules; cause lymphocytic choriomeningitis, Venezuelan hemorrhagic fever, and Lassa fever. Refer to Chapter 23.
Produce DNA			
100–120 nm	Retroviridae 	Oncoviruses *Lentivirus* (HIV)	Includes all RNA tumor viruses. Oncoviruses cause leukemia and tumors in animals; the *Lentivirus* HIV causes AIDS. Refer to Chapter 19.
Double-Stranded RNA Nonenveloped			
60–80 nm	Reoviridae 	*Reovirus* *Rotavirus*	Generally mild respiratory infections transmitted by arthropods; Colorado tick fever is the best-known. Refer to Chapter 25.

Figure 13.3 Morphology of an enveloped helical virus.

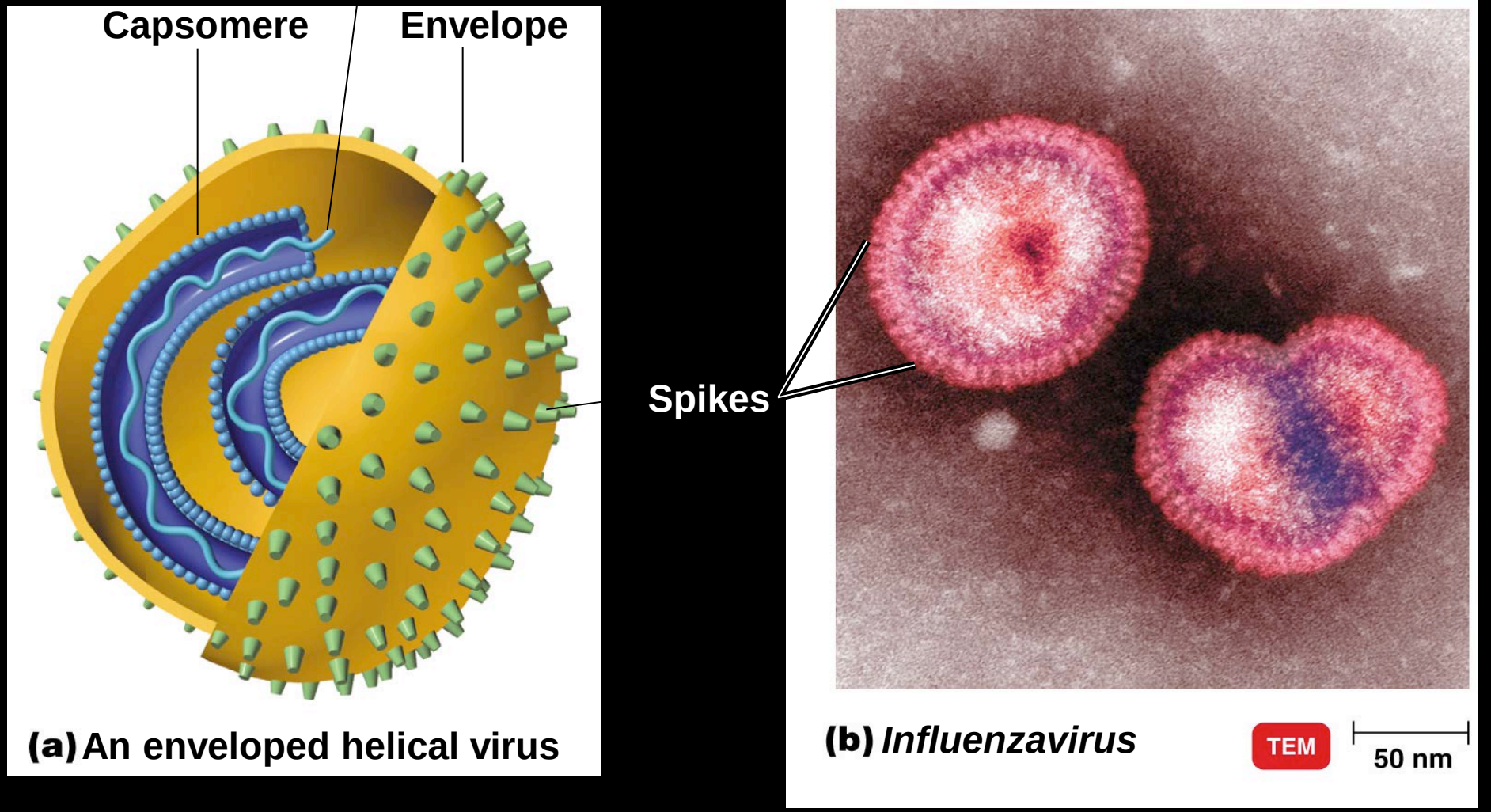


Figure 13.4 Morphology of a helical virus.

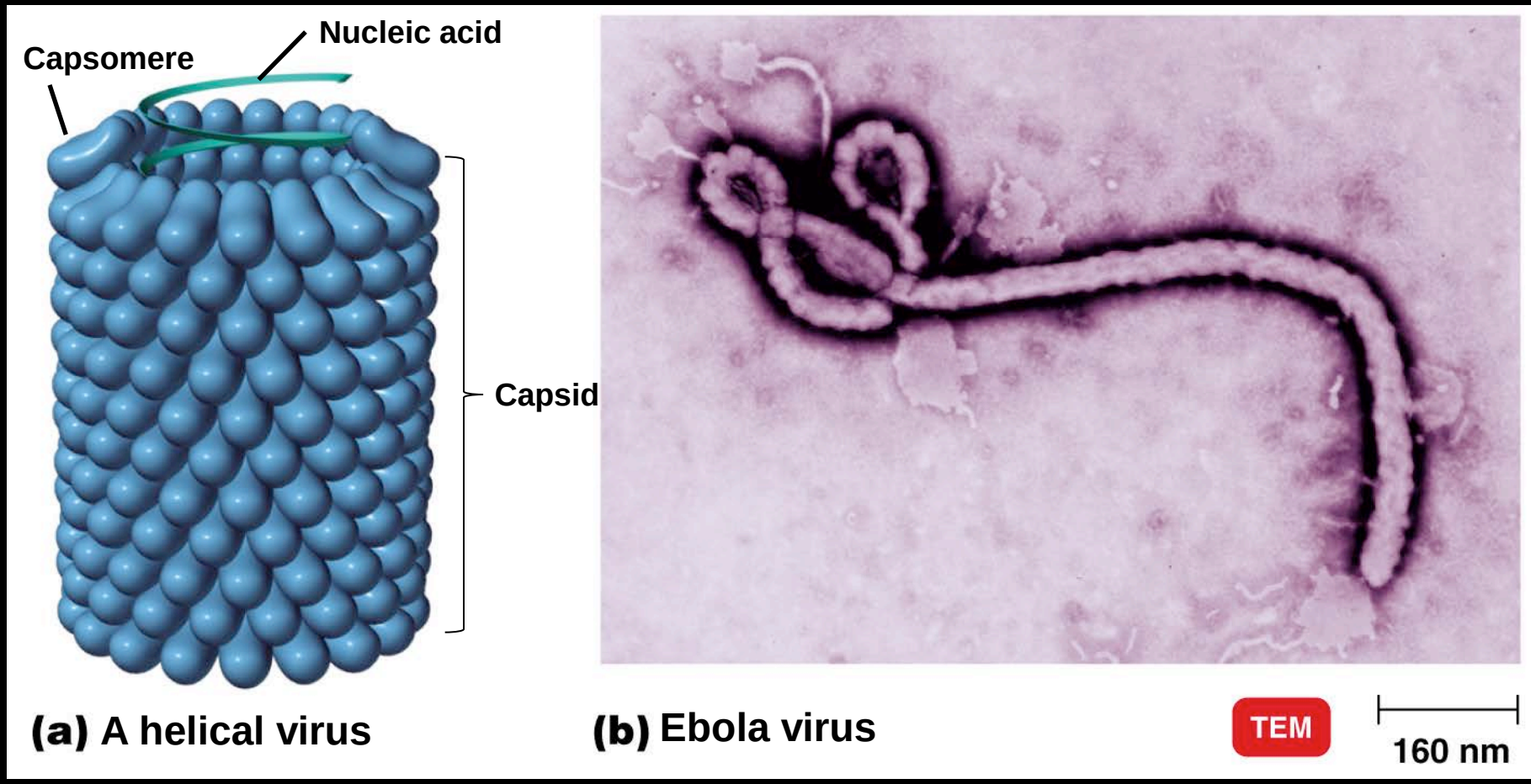
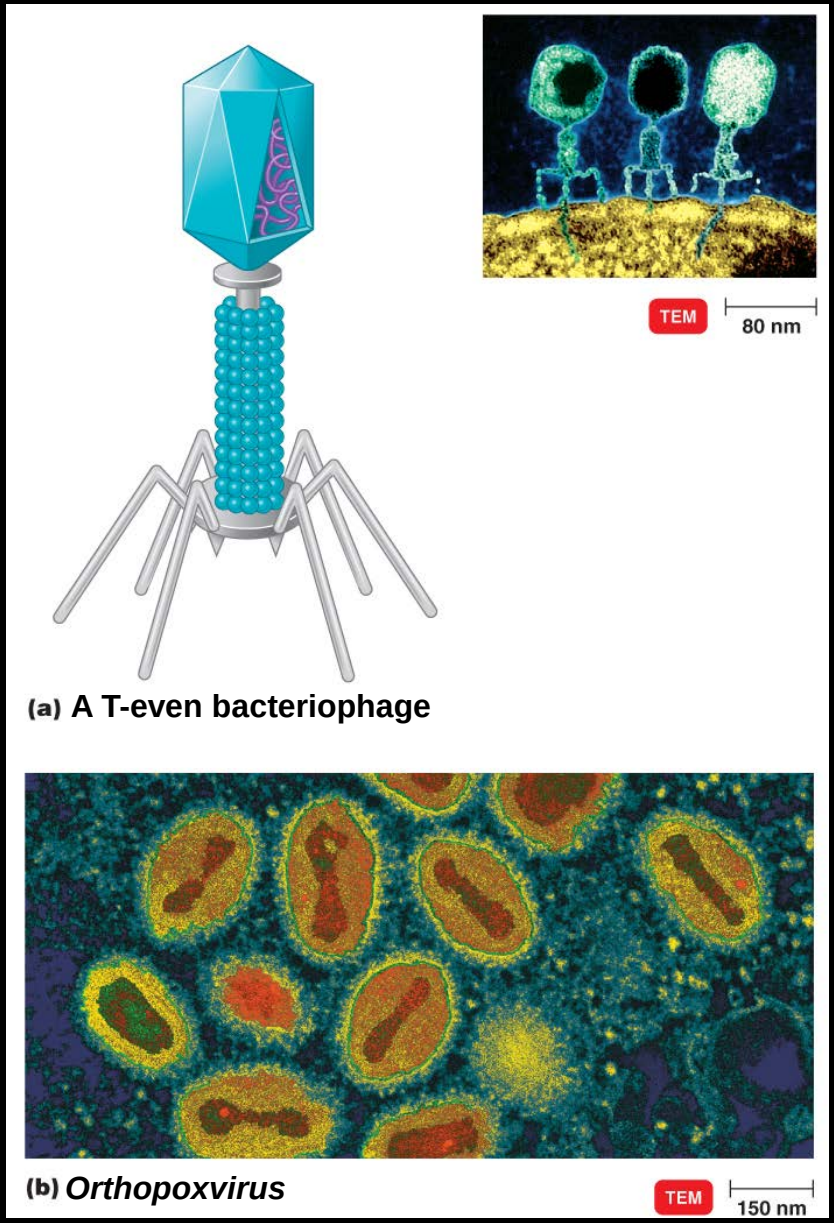


Figure 13.5 Morphology of complex viruses.

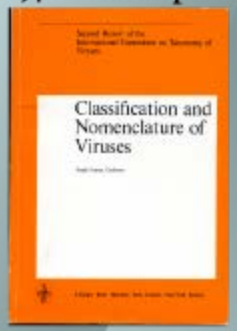


Forty Years of Virus Taxonomy

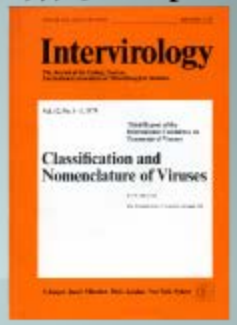
ICTV

1971: 1st Report

1976: 2nd Report



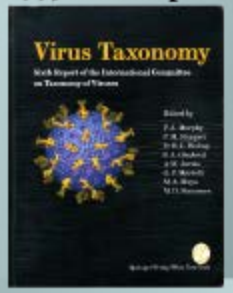
1979: 3rd Report



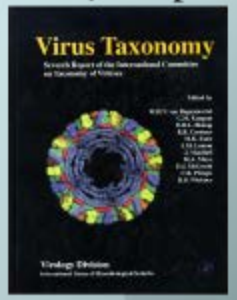
1982: 4th Report

1991: 5th Report

1995: 6th Report



2000: 7th Report

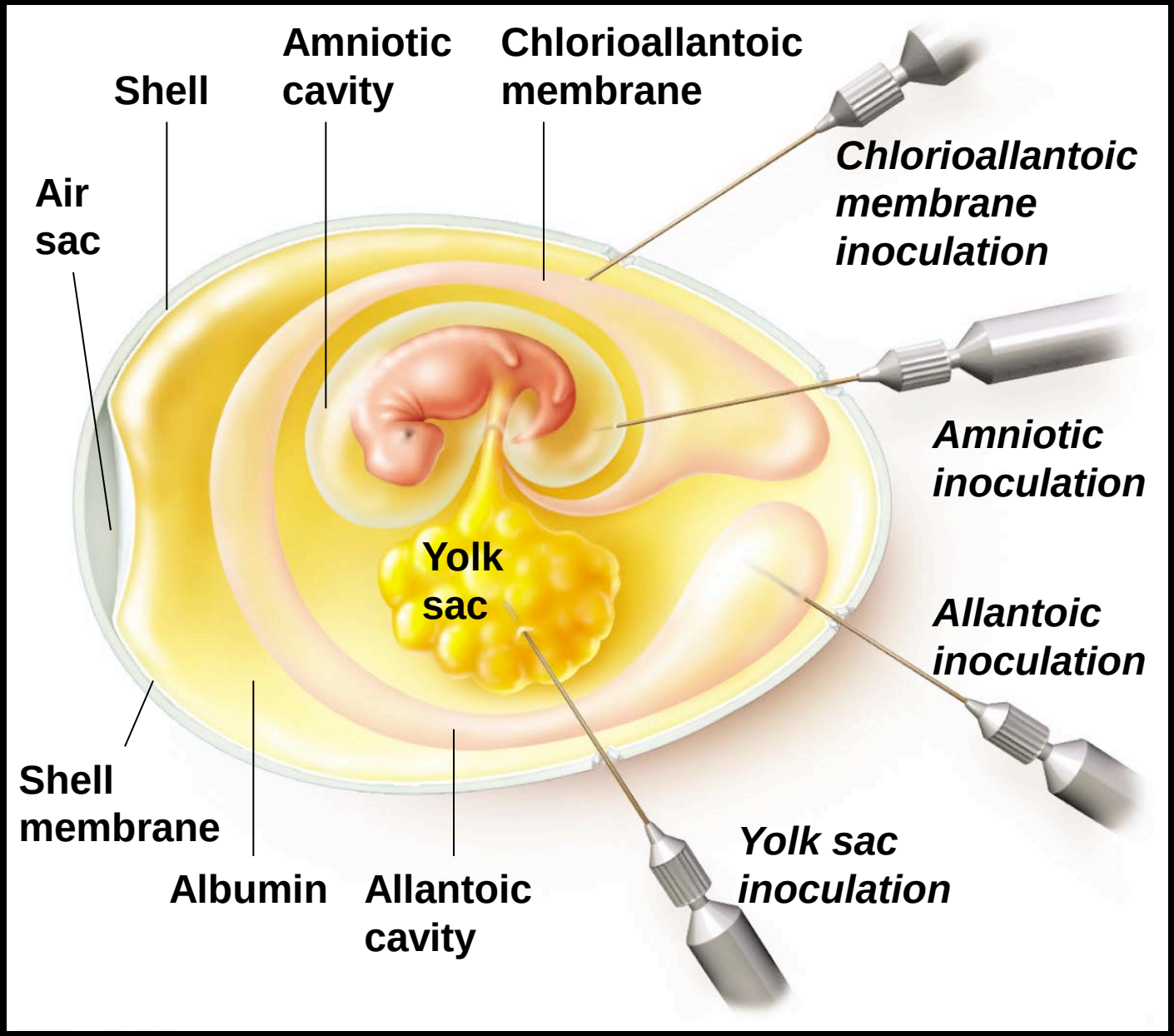


2005: 8th Report

2011: 9th Report

Figure 13.6 Viral plaques formed by bacteriophages.

Figure 13.7 Inoculation of an embryonated egg.



http://videos.howstuffworks.com/tlc/29847-understanding-growing-viruses-in-chicken-eggs-video.htm
https://www.youtube.com/watch?v=766QH_qaYN8

HeLa cells dividing (video)

wikipedia.org

Figure 13.11 The lytic cycle of a T-even bacteriophage.

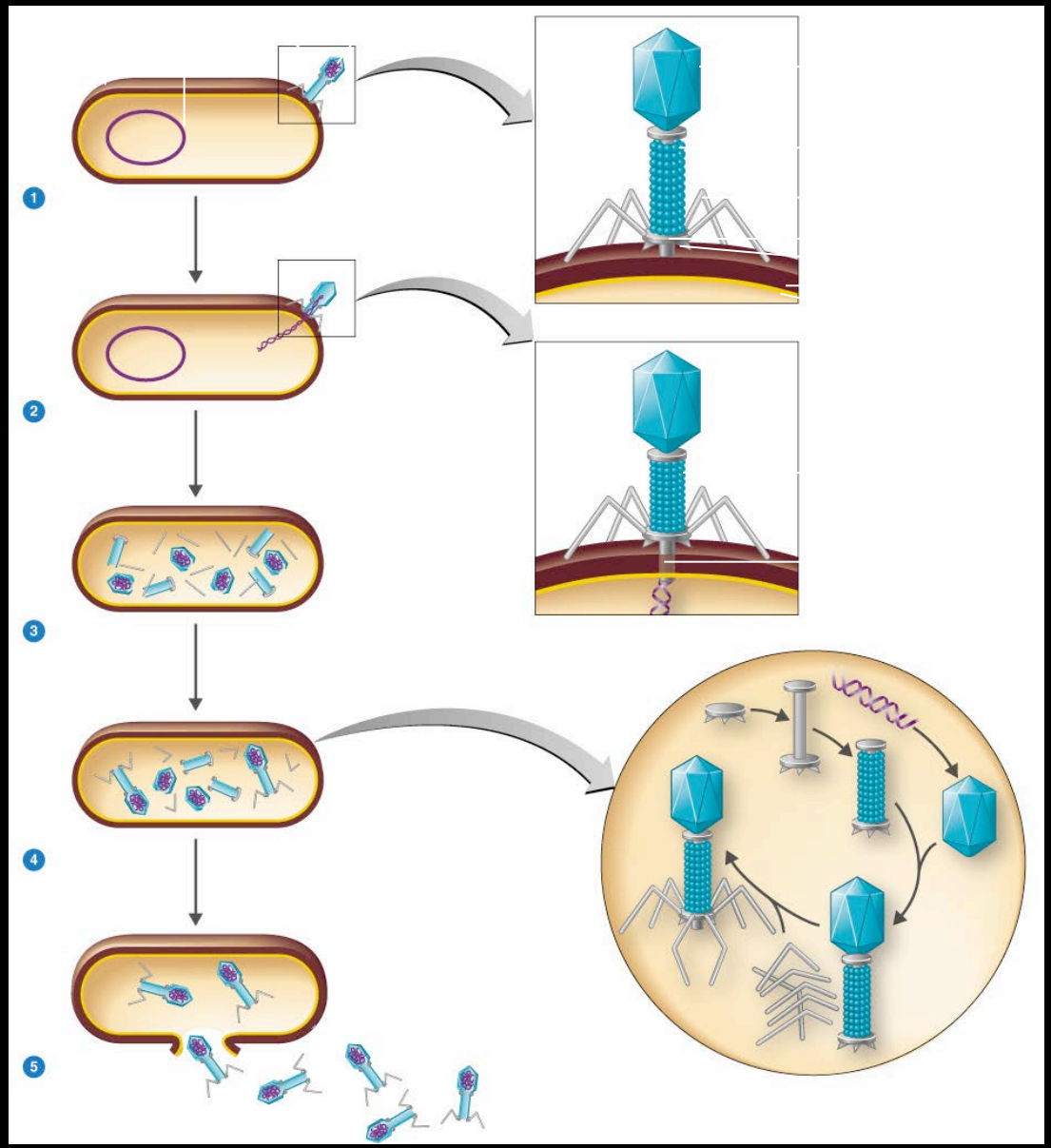


Figure 13.12 The lysogenic cycle of bacteriophage λ in *E. coli*.

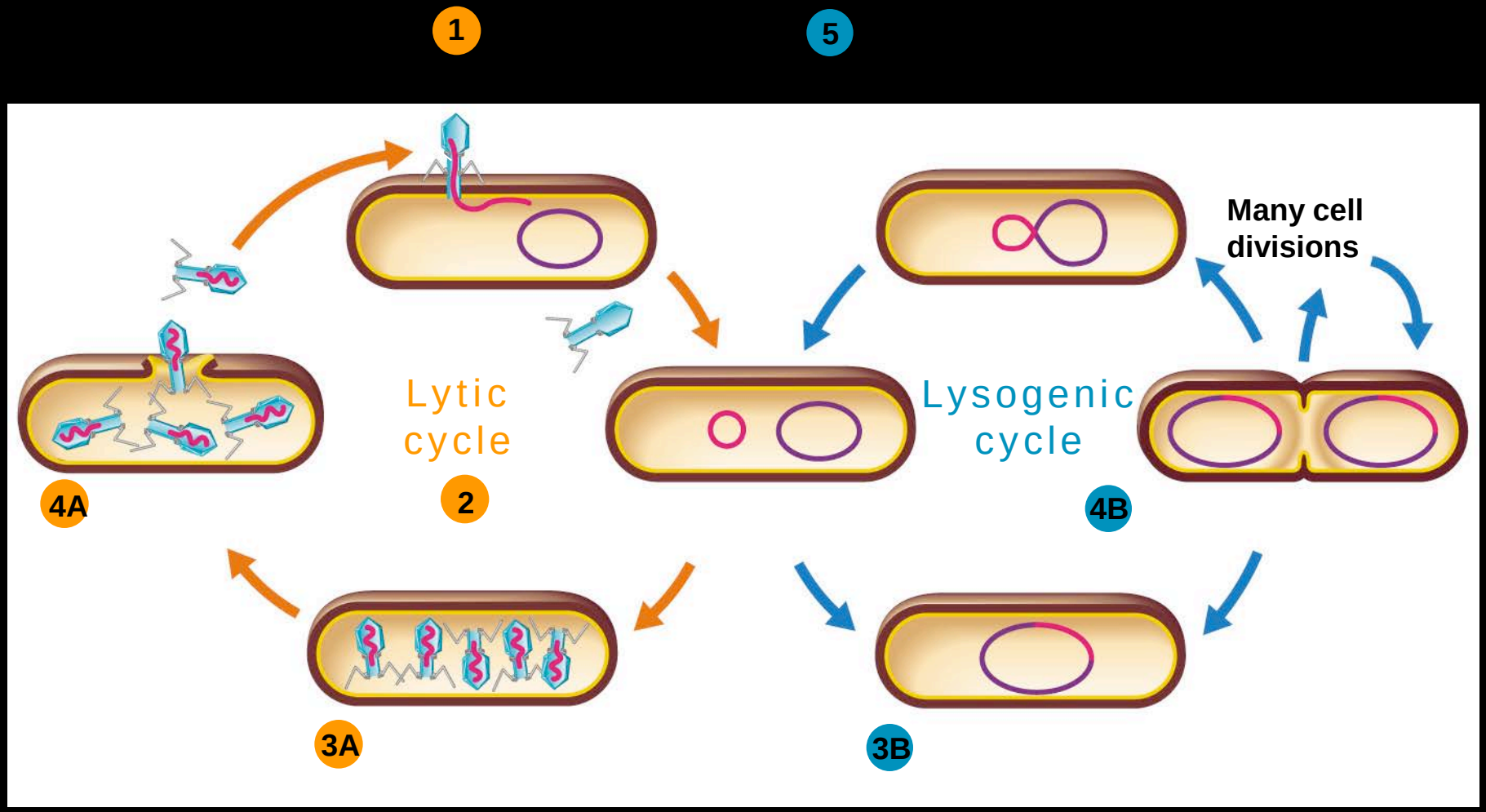


Figure 13.13 Specialized transduction.

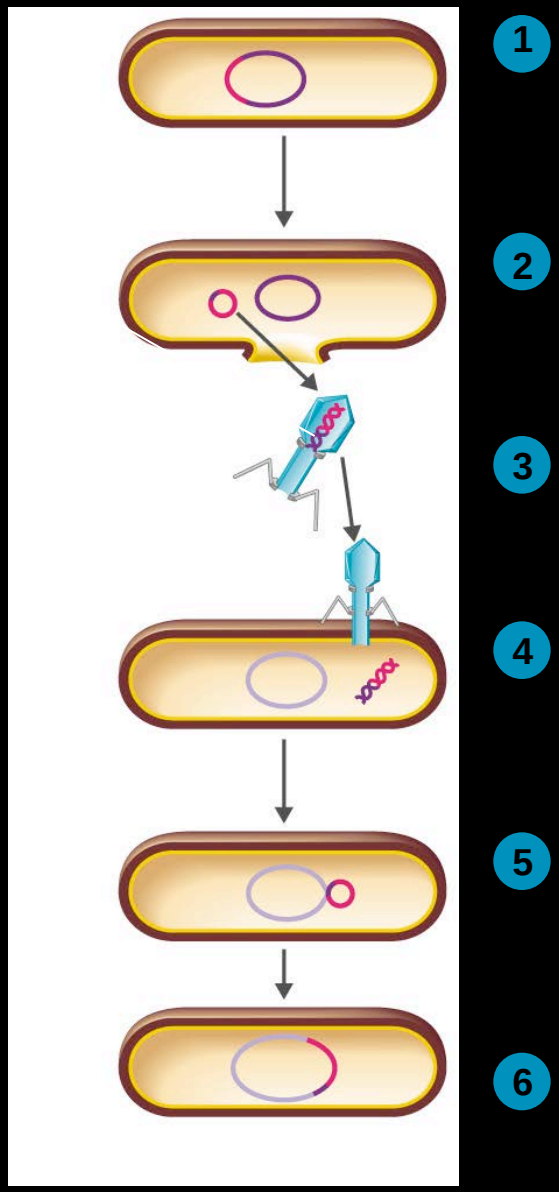


TABLE 13.4 The Biosynthesis of DNA and RNA Viruses Compared

Viral Nucleic Acid	Virus Family	Special Features of Biosynthesis
DNA, single-stranded	Parvoviridae	Cellular enzyme transcribes viral DNA in nucleus.
DNA, double-stranded	Herpesviridae Papovaviridae	Cellular enzyme transcribes viral DNA in nucleus.
	Poxviridae	Viral enzyme transcribes viral DNA in virion, in cytoplasm.
DNA, reverse transcriptase	Hepadnaviridae	Cellular enzyme transcribes viral DNA in nucleus; reverse transcriptase copies mRNA to make viral DNA.
RNA, + strand	Picornaviridae Togaviridae	Viral RNA functions as a template for synthesis of RNA polymerase, which copies – strand RNA to make mRNA in cytoplasm.
RNA, – strand	Rhabdoviridae	Viral enzyme copies viral RNA to make mRNA in cytoplasm.
RNA, double-stranded	Reoviridae	Viral enzyme copies – strand RNA to make mRNA in cytoplasm.
RNA, reverse transcriptase	Retroviridae	Viral enzyme copies viral RNA to make DNA in cytoplasm; DNA moves to nucleus.

Figure 13.20a Budding of an enveloped virus.

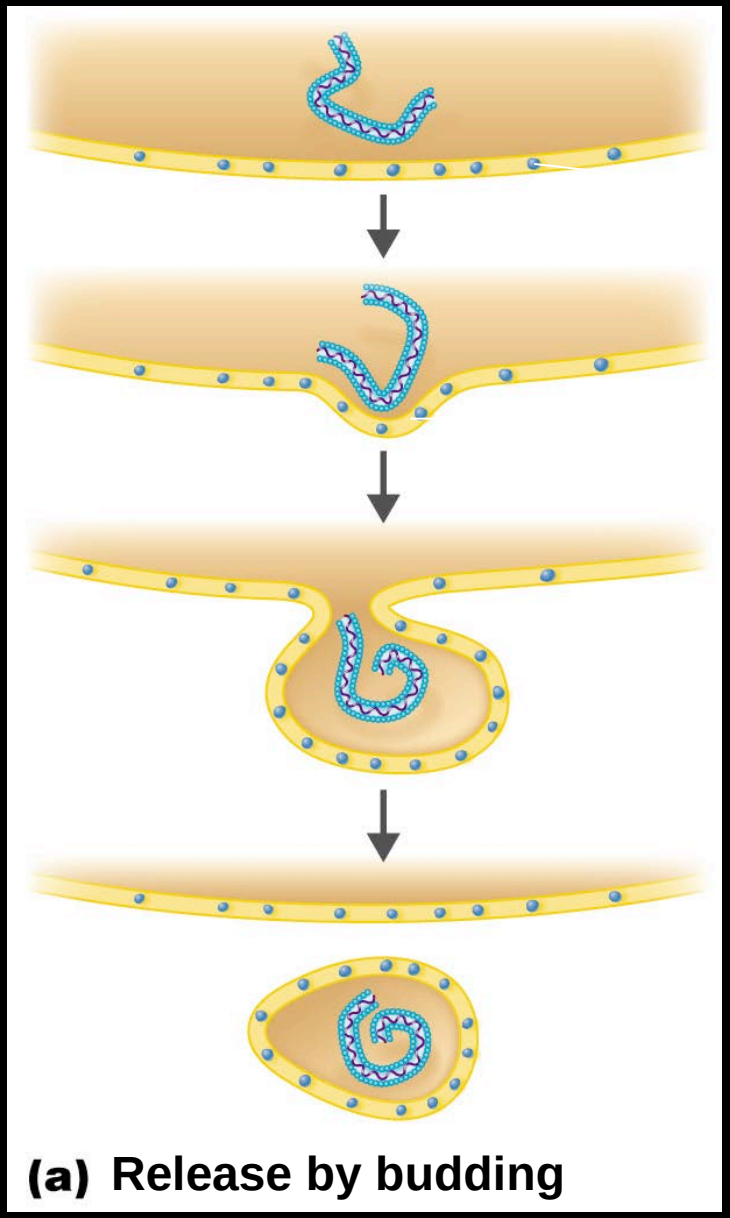


Figure 13.20b Budding of an enveloped virus.

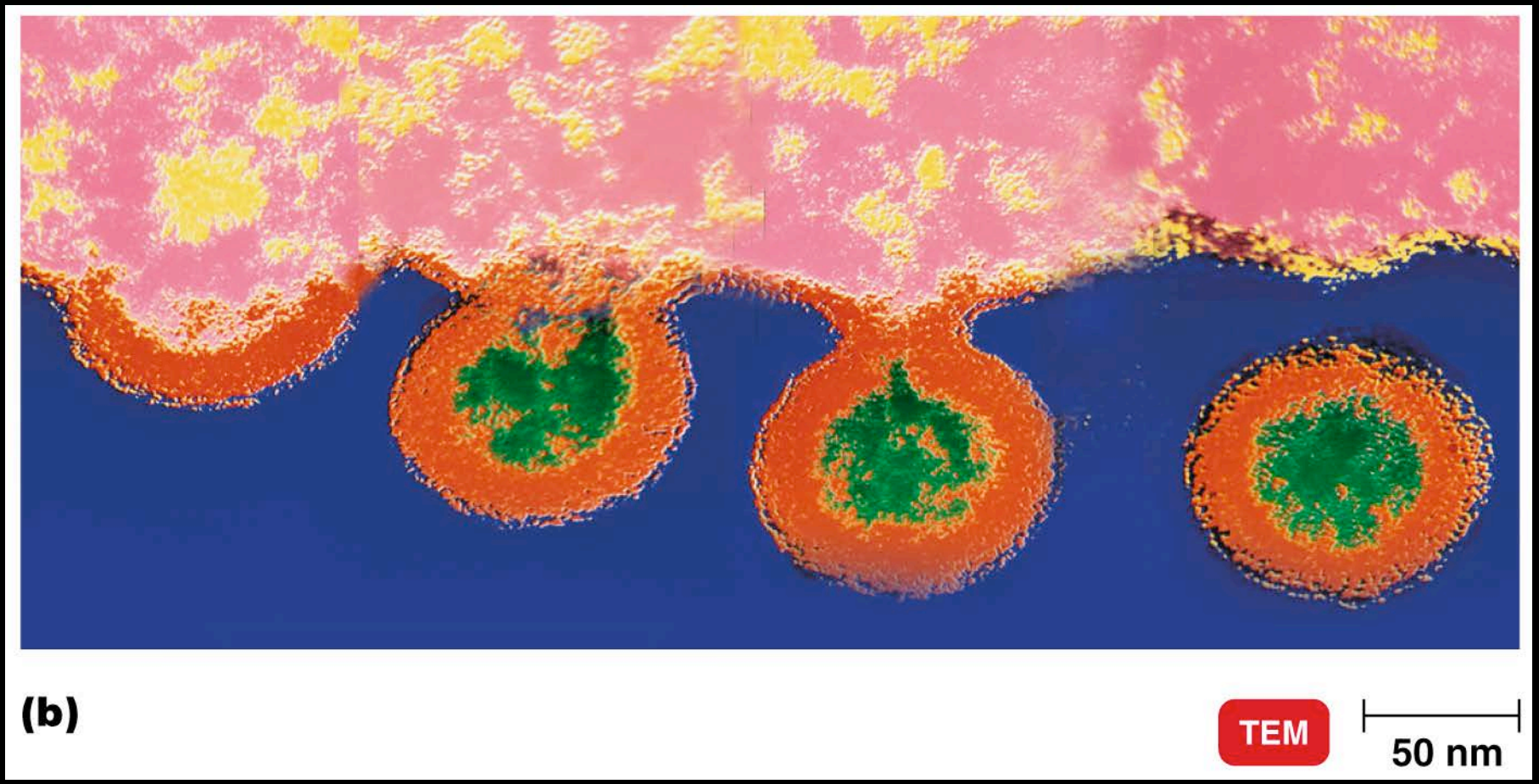


Figure 13.21 Latent and persistent viral infections.

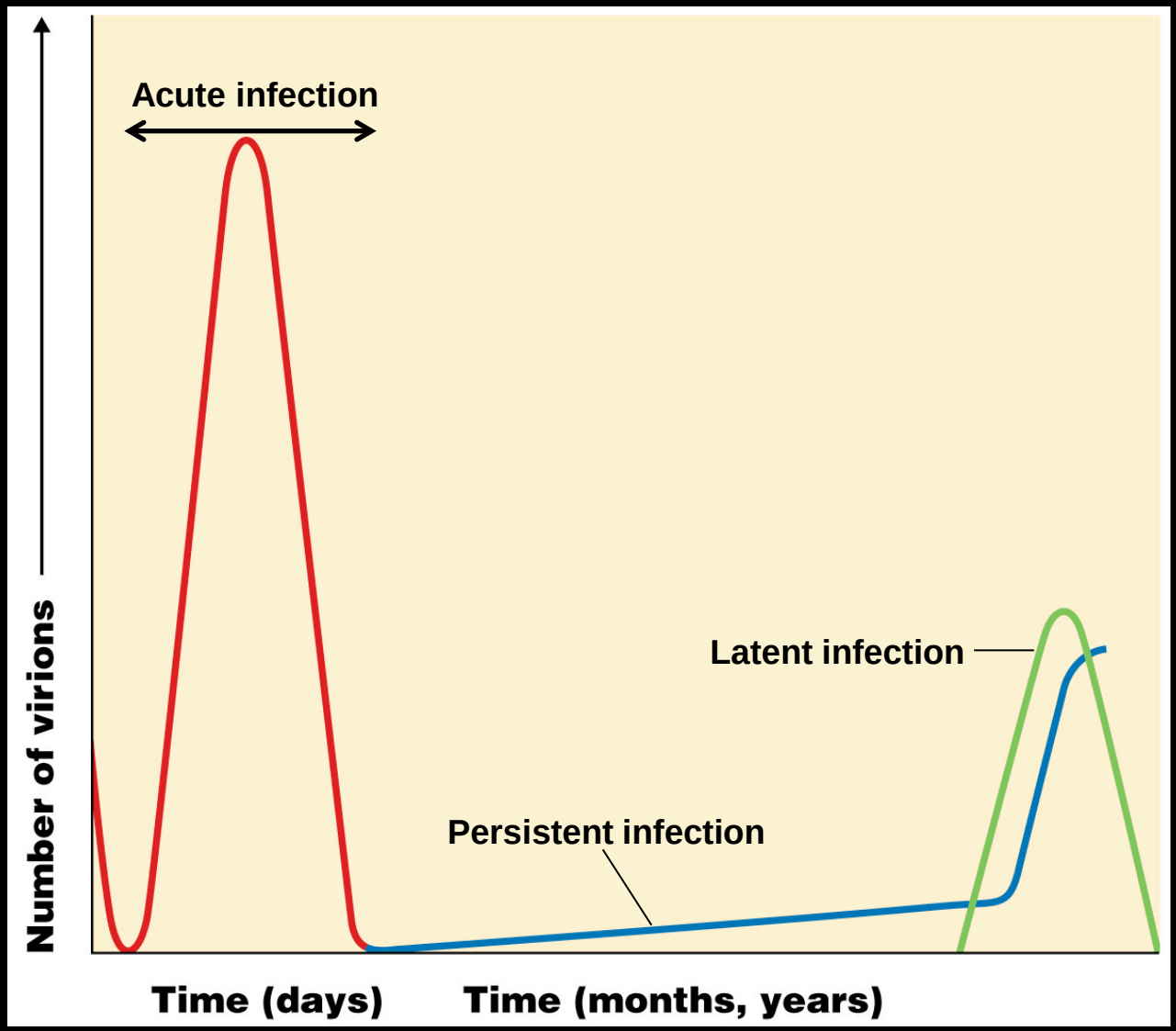
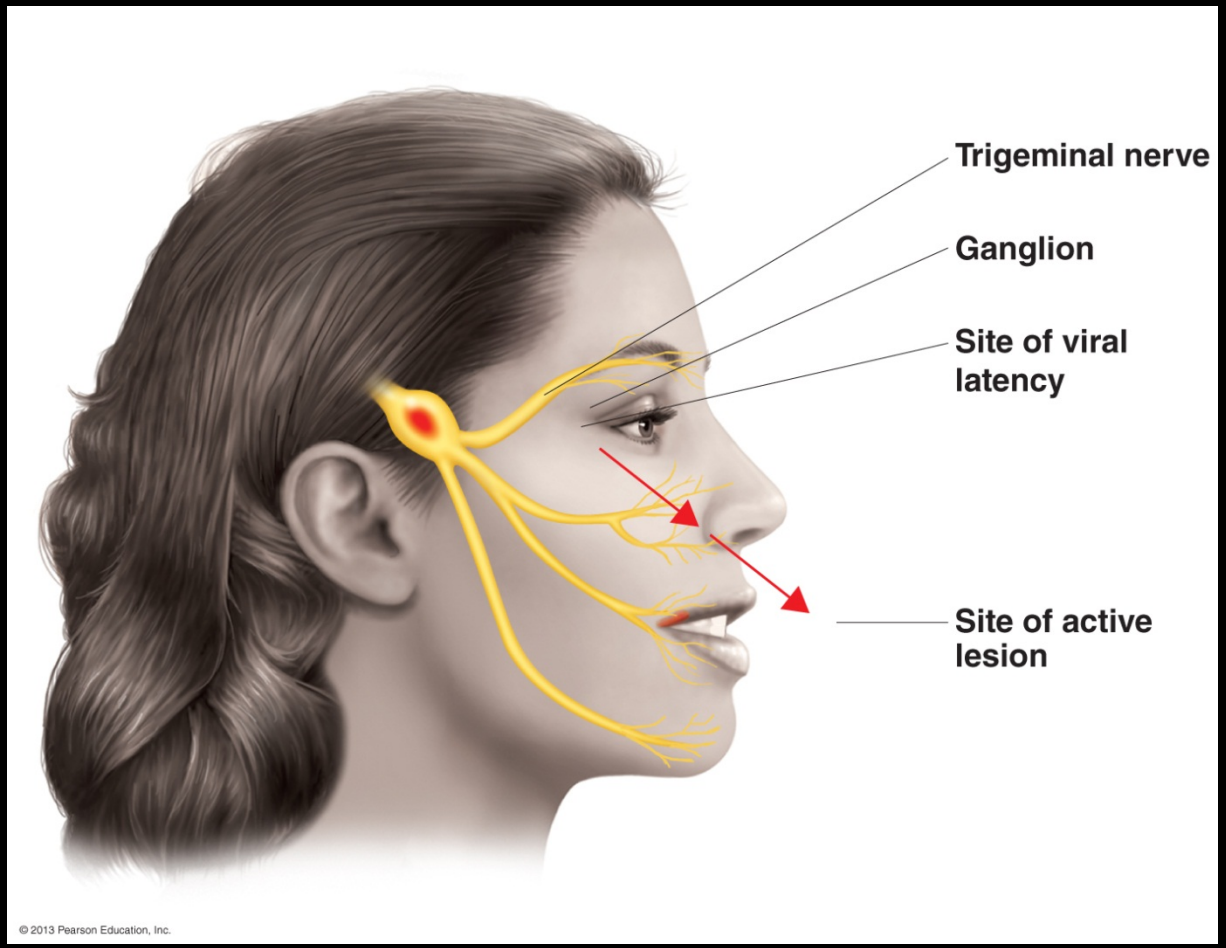
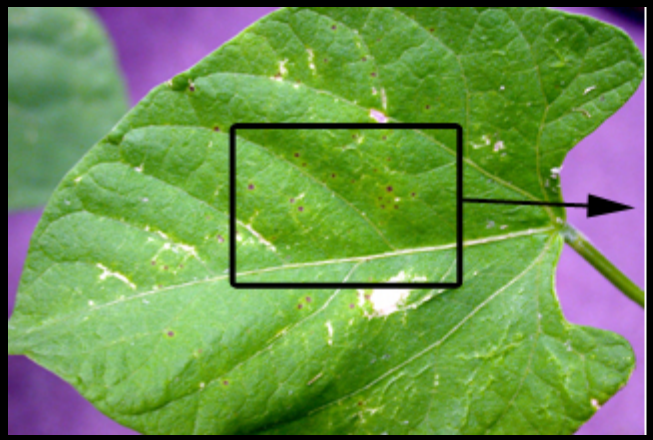
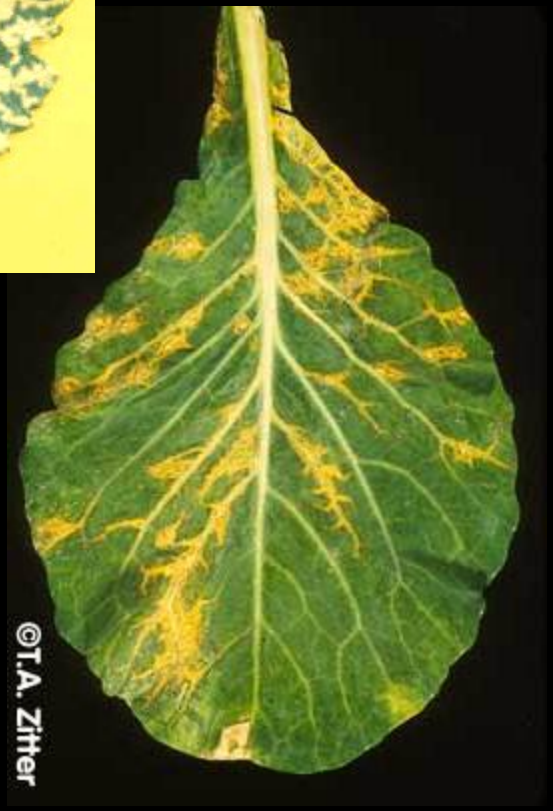


Figure 21.13 Herpes latency in nerve ganglion.



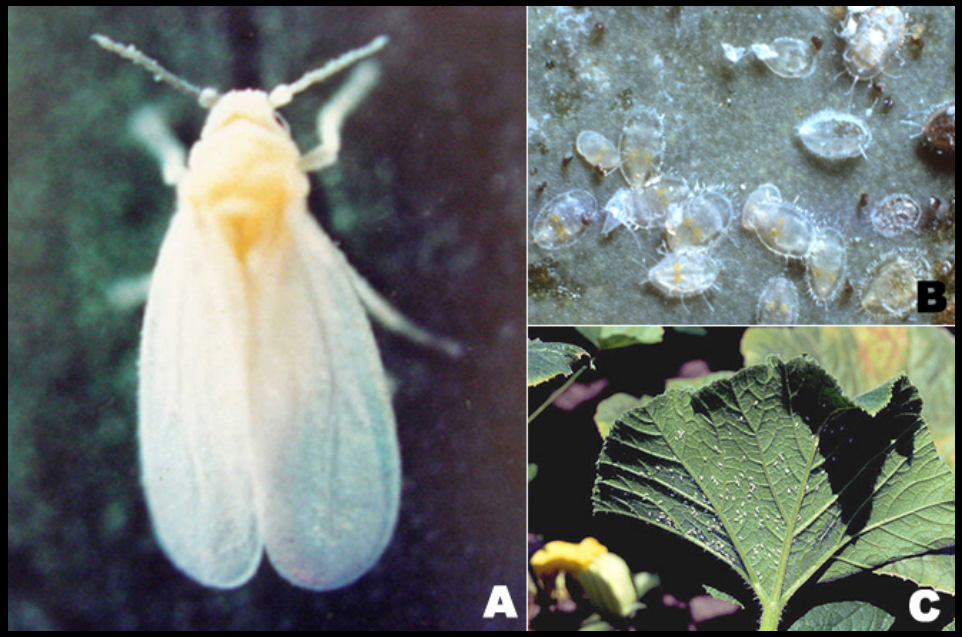
Plant Viruses

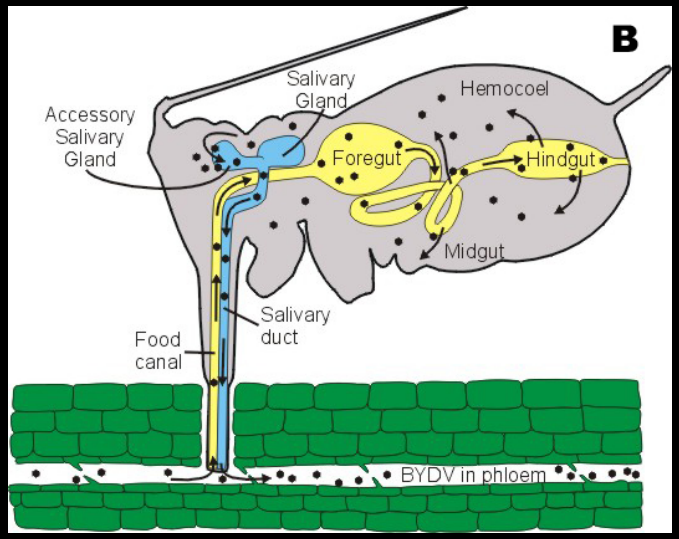




http://www.apsnet.org/

Plant Virus Vectors





http://www.apsnet.org/