

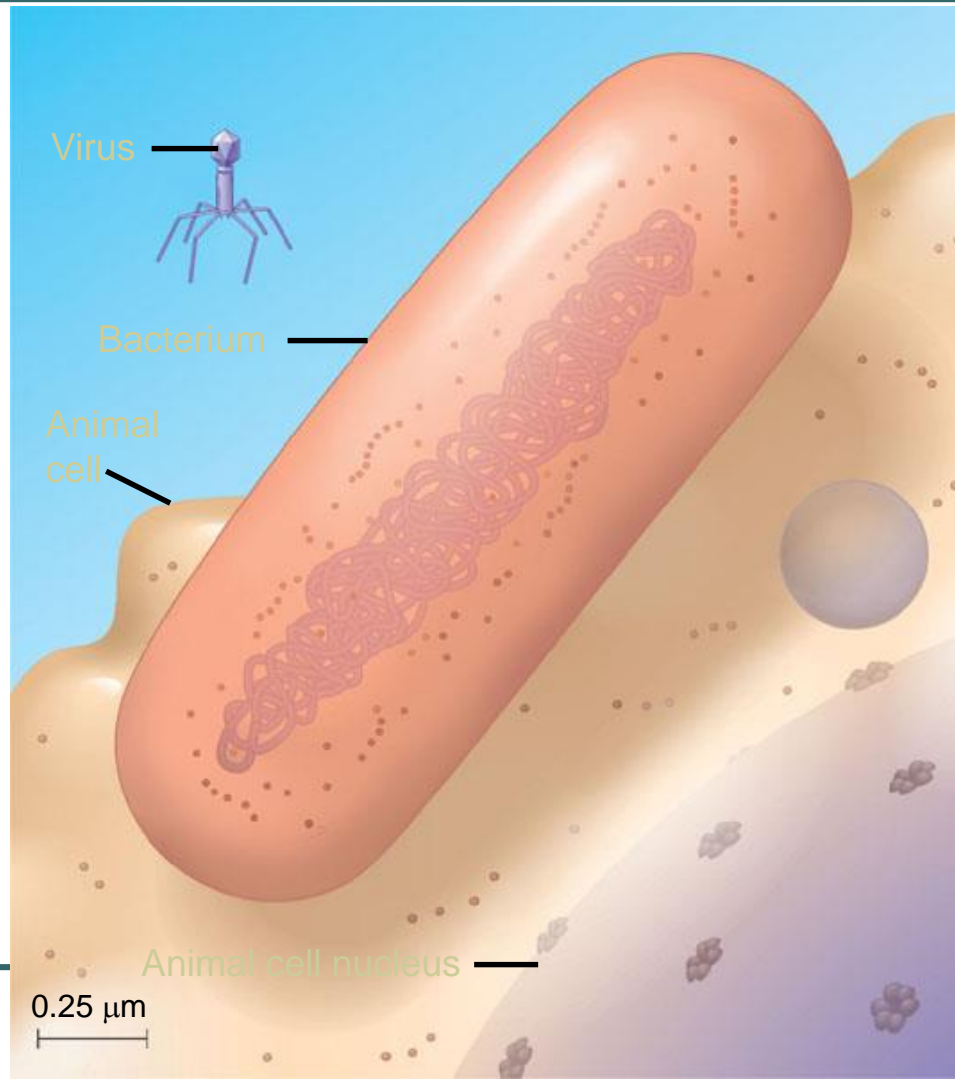
# ***Virus***

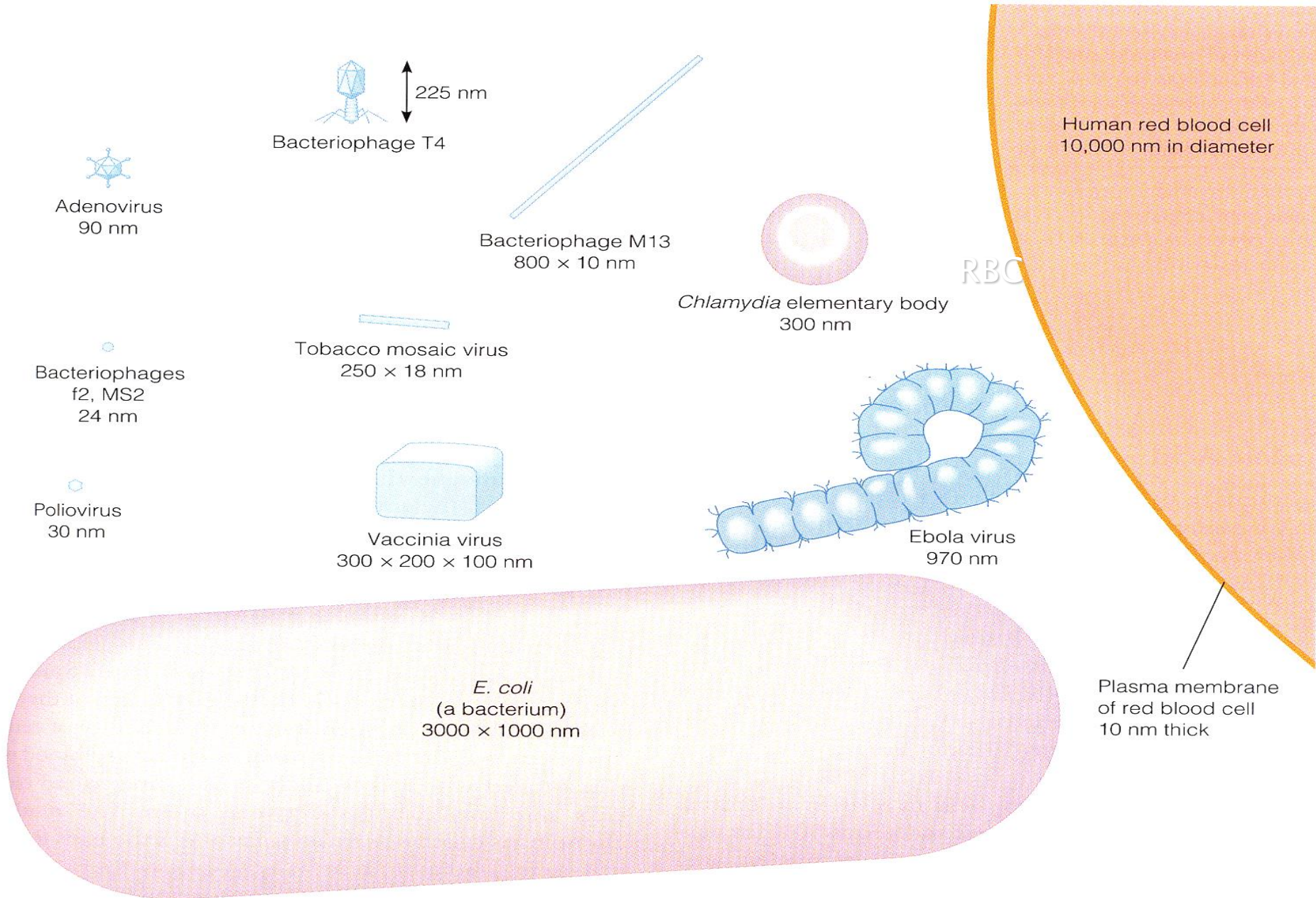
dr\_irma\_s@yahoo.co.id

# T4 bacteriophage infecting an *E. coli* cell



# Comparing the size of a virus, a bacterium, and an animal cell





**FIGURE 13.1 Virus sizes.** The sizes of several viruses (teal) and bacteria (tan) are compared with a human red blood cell, shown to the right of the microbes. Dimensions are given in nanometers (nm) and are either diameters or length by width.

# Virus

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- DNA atau RNA ds (double stranded)/ss
- **Klassifikasi berdasarkan kandungan asam nukleat**
  - **DNA viruses: m/ Herpes simplex virus (HSV)**
  - **RNA viruses: m/ influenza virus**

# Virus

---

## Struktur

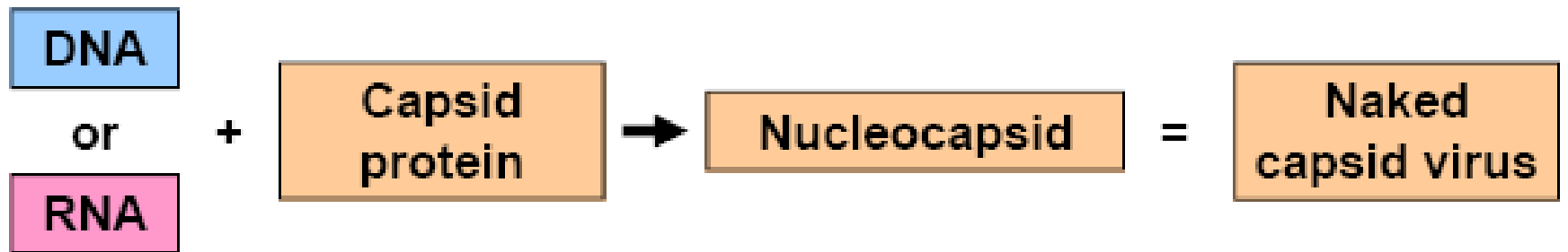
- **Kapsid : protein yang menyelubungi genom asam nukleat (inti)**
- **Nucleocapsid : kompleks protein-asam nukleat & memberi bentuk genom virus**
- **Kapsomer : unit dari nucleocapsid, terdiri dari polypeptida pada permukaan partikel icosahedral**

# **Virus**

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- **Envelope/amplop : membran yang tersusun dari lipid, yang menyelubungi partikel virus**
- **Polimer : bentukan-bentukan (spikes) pada permukaan envelope & tersusun dari glikoprotein**
- **Virion : partikel virus komplet**

# Basic virus structure





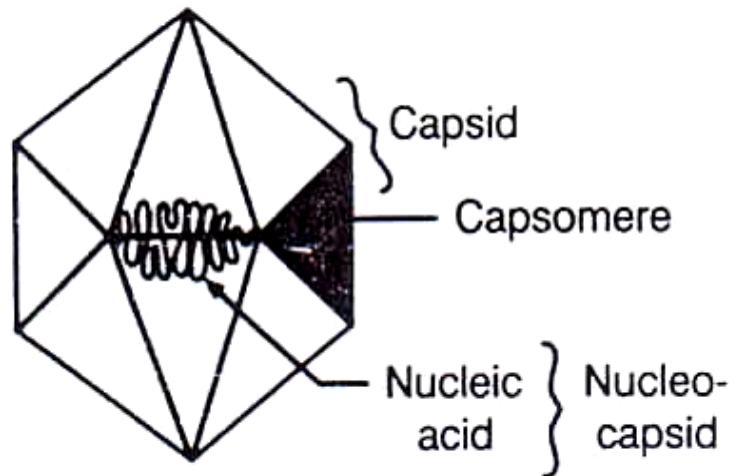
# **Virus**

---

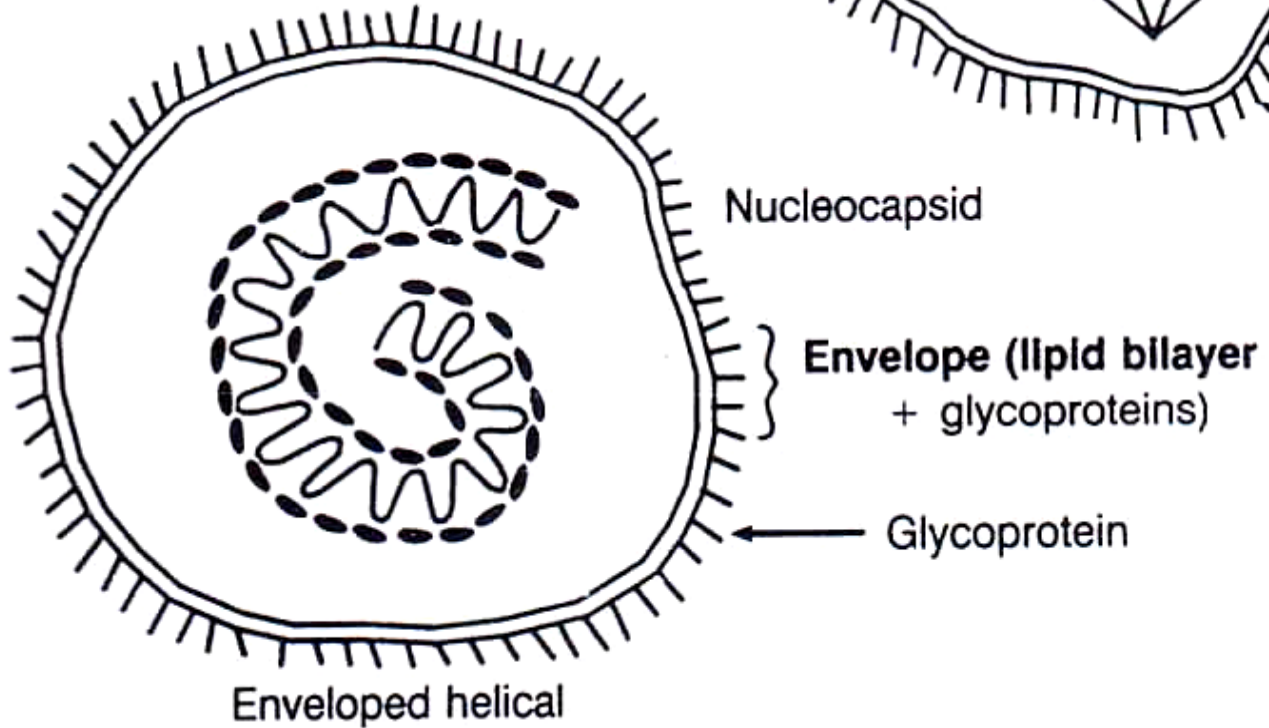
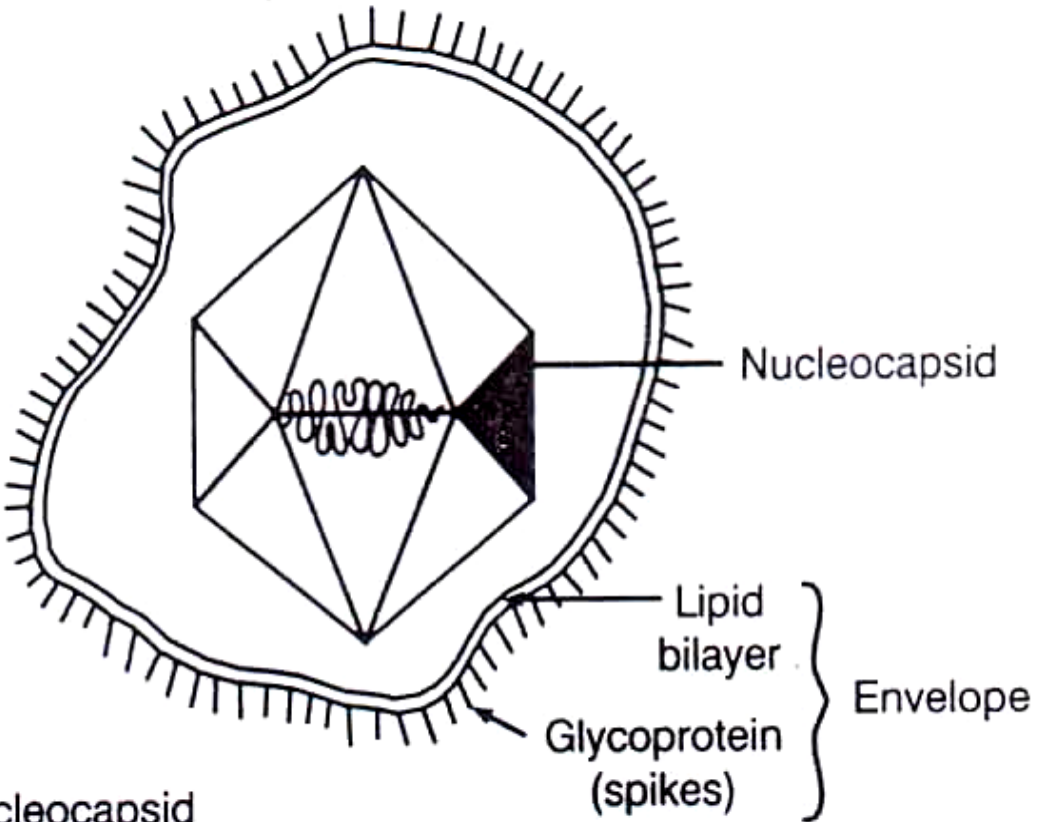
## **Bentuk virus**

- 1. Icosahedral**
- 2. Helical**
- 3. complex**

Naked icosahedral

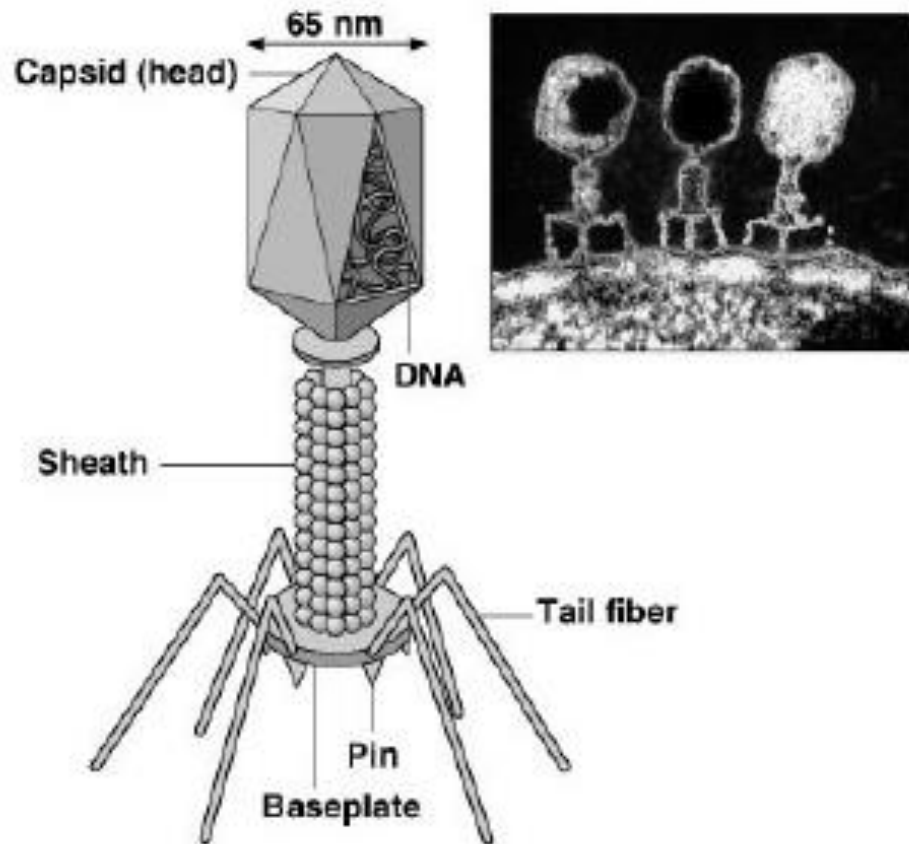


Enveloped icosahedral



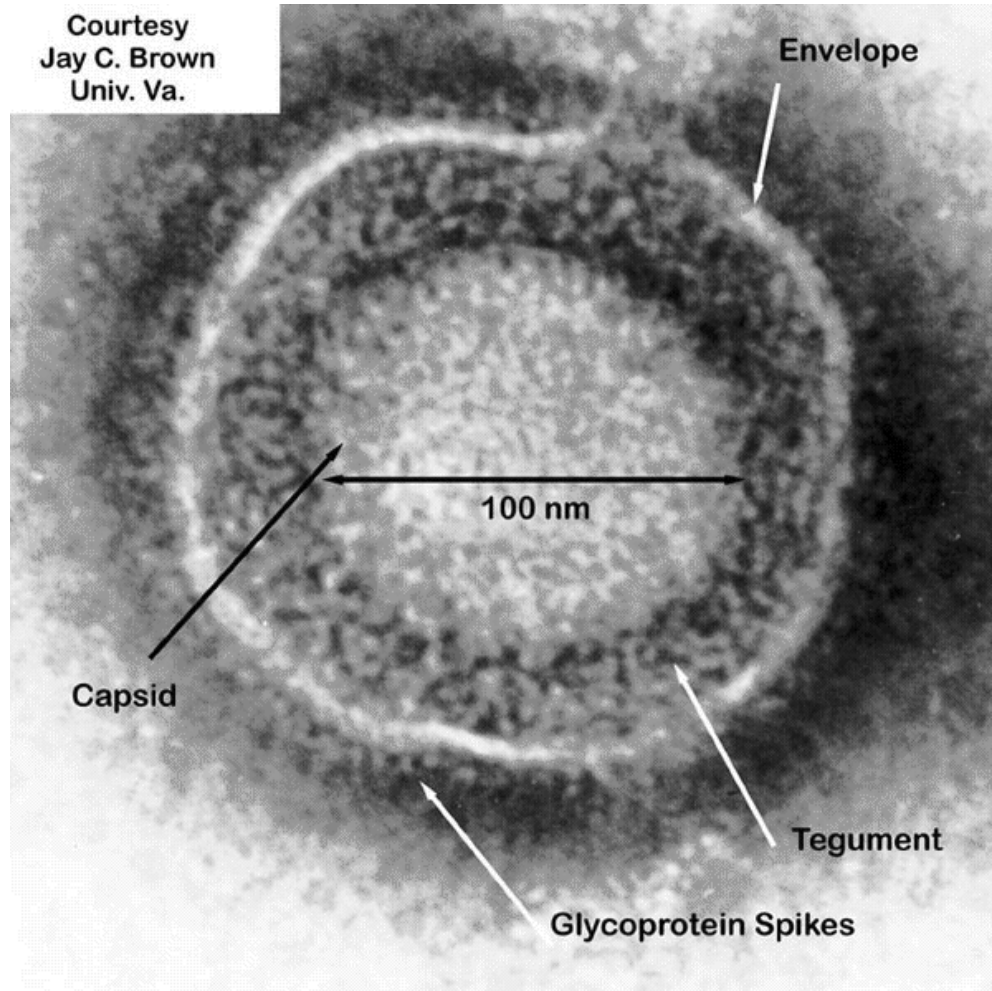
Enveloped helical

# Complex Viruses

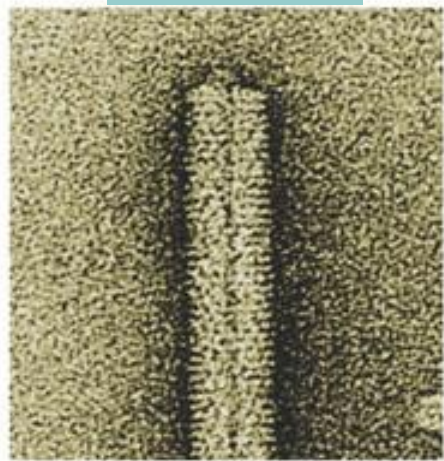
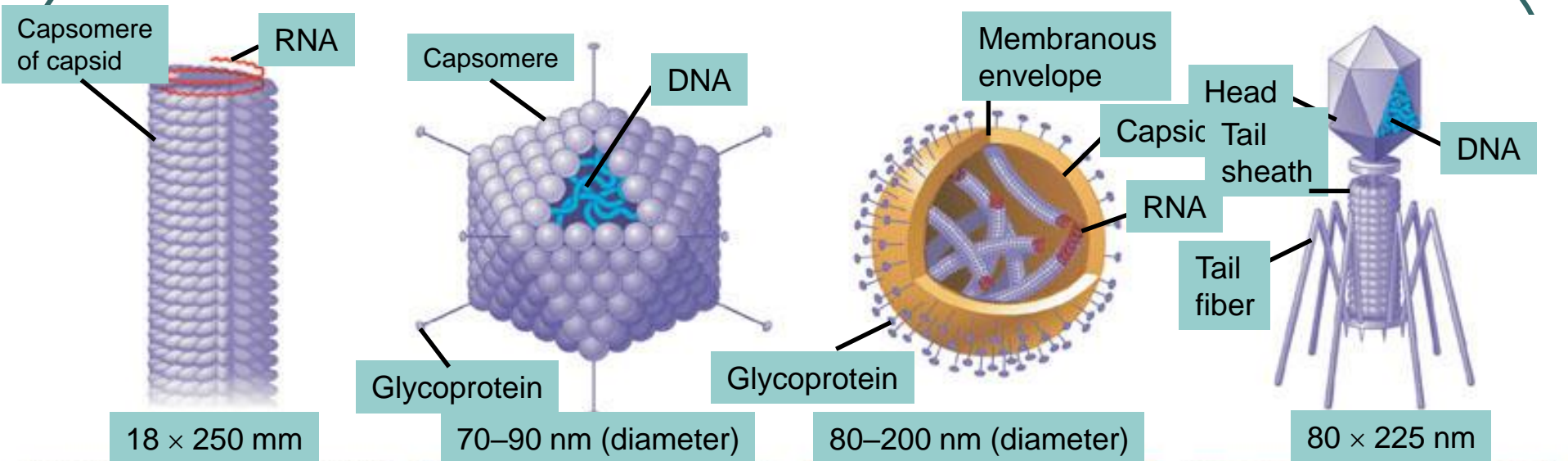


**(a) A T-even bacteriophage**

Courtesy  
Jay C. Brown  
Univ. Va.

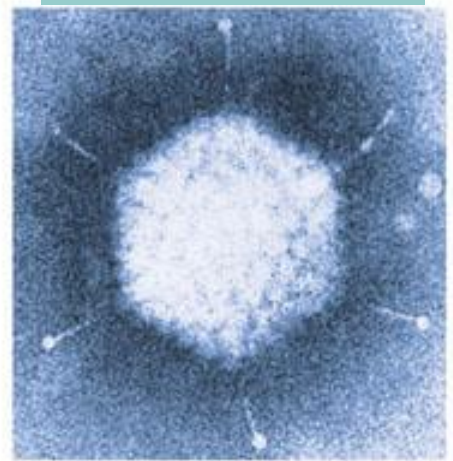






20 nm

**(a) Tobacco mosaic virus**



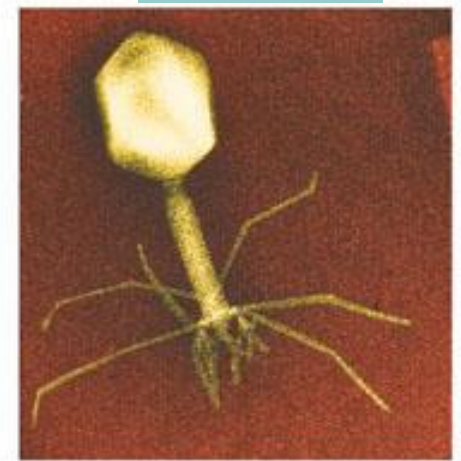
50 nm

**(b) Adenoviruses**



50 nm

**(c) Influenza viruses**



50 nm

**(d) Bacteriophage T4**

# **Virus**

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- **Obligate intracellular parasit**
- **Membutuhkan sel host untuk mensintesa asam nucleat dan protein**
- **Merusak sel : dengan memblocking vaksin antibody**
- **Replikasi secara intracellular: target dari obat antiviral**

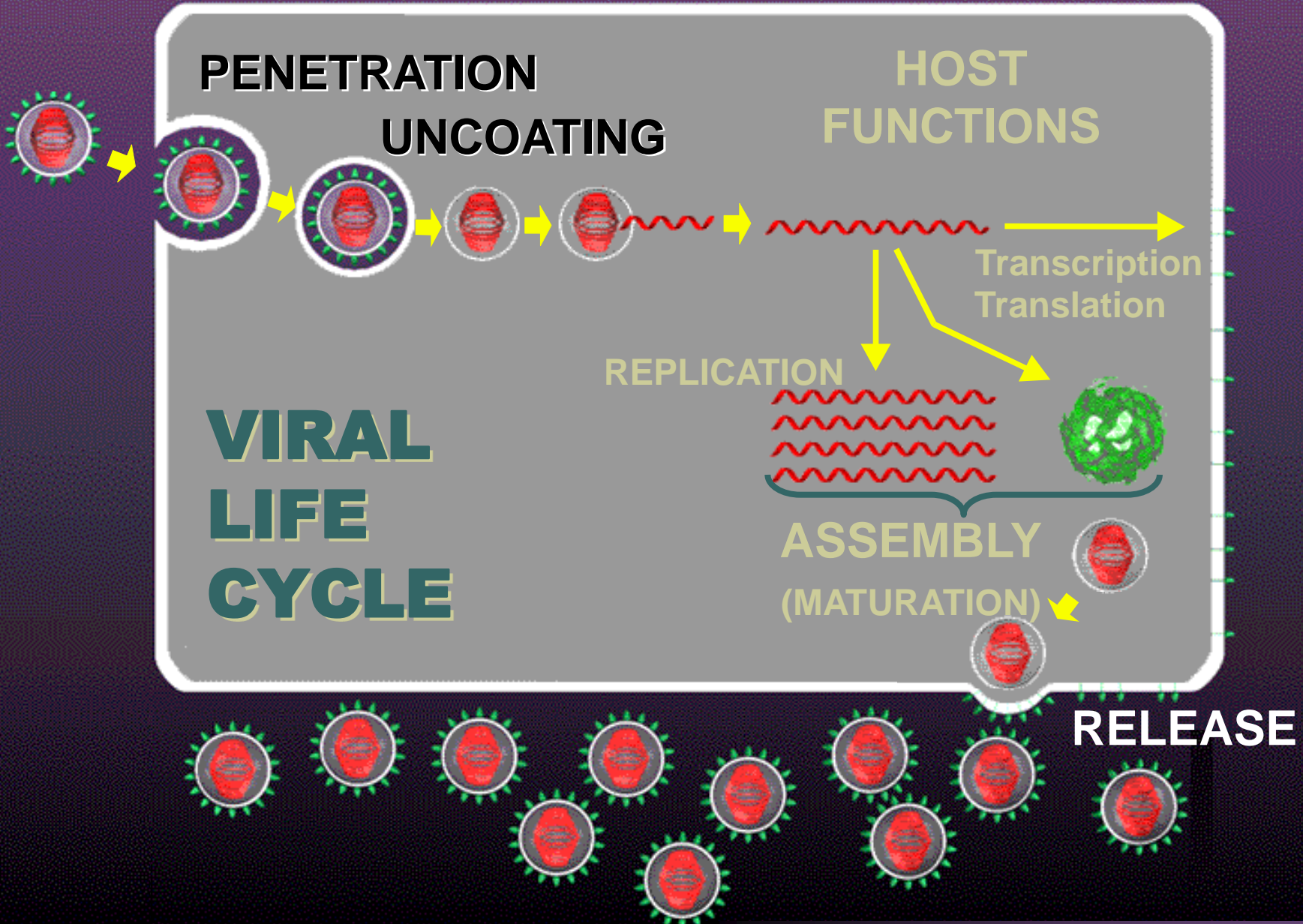
# **Efek Virus Pada Sel Host**

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- **Degeneration (cytopathic effect)**
- **Cell lysis**
- **Cell fusion, syncytia formation**
- **Cell proliferation**
- **Transformation: malignancy**
- **Latent infection**

# ATTACHMENT

Click after each step to view process





# Multiplication of DNA Virus

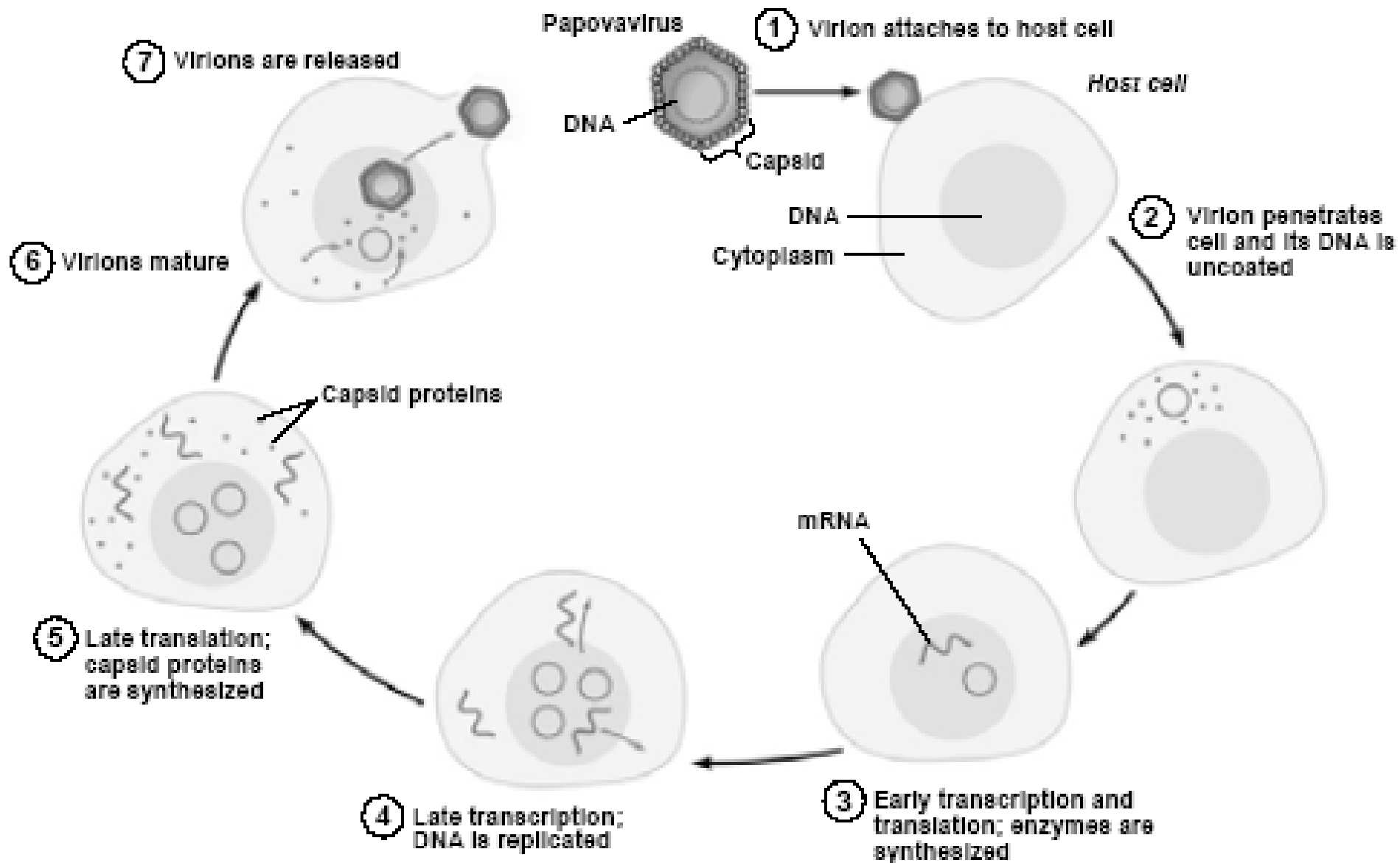
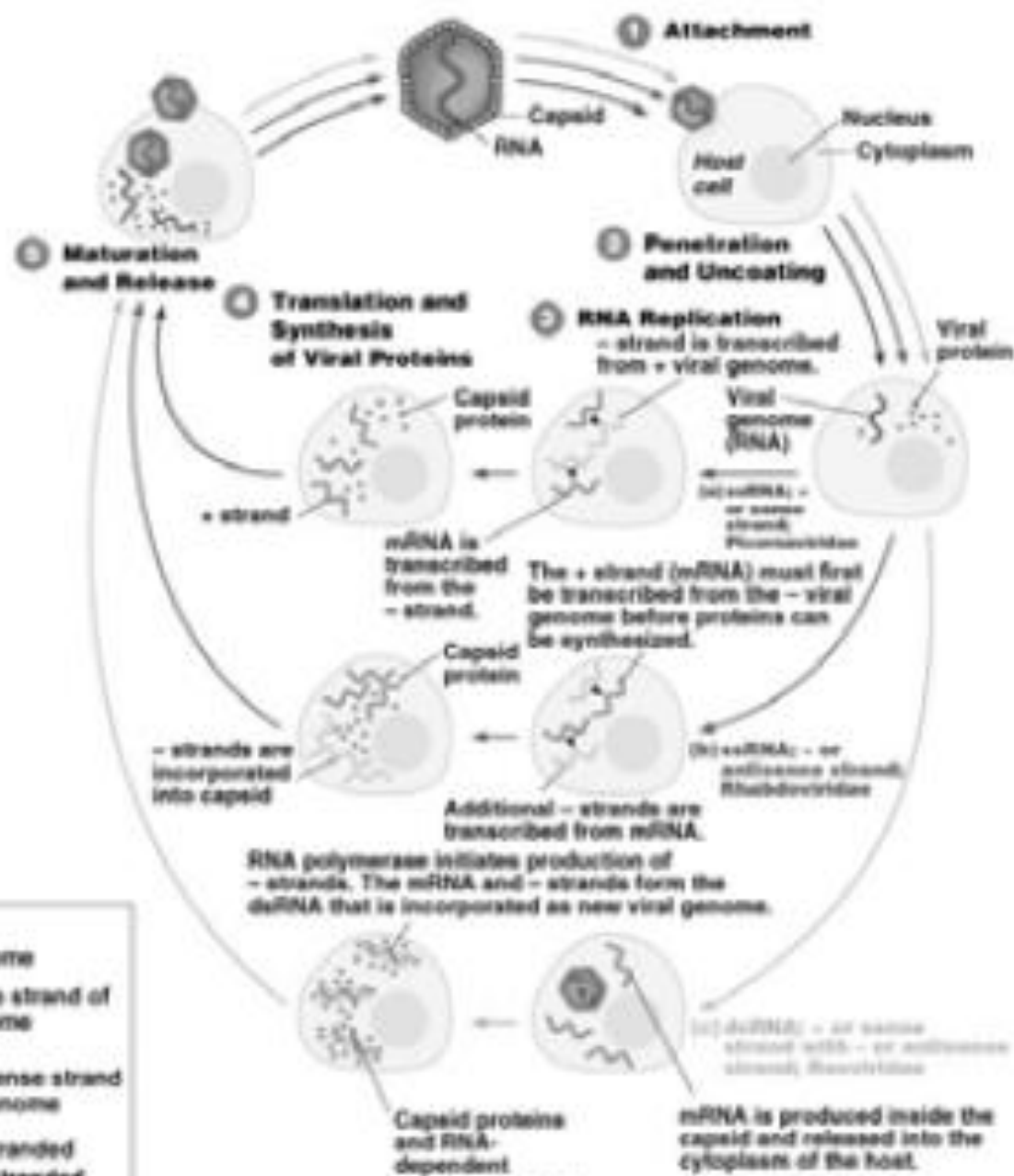
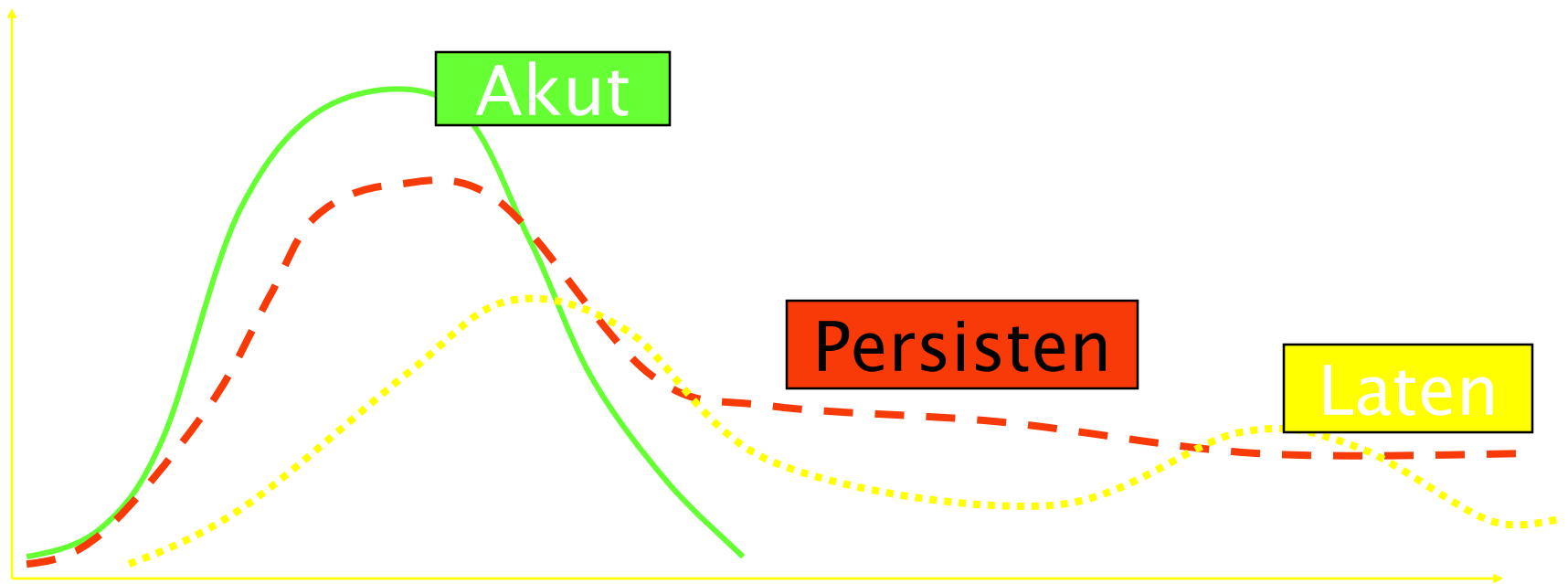


Figure 13.15

# Pathways of Multiplication for RNA-Containing Viruses



Jumlah virus  
di jaringan



Akut

Persisten

Laten

Waktu (bulan atau tahun)

## **Diagnosa laboratorium**

---

### **Mikroskopis**

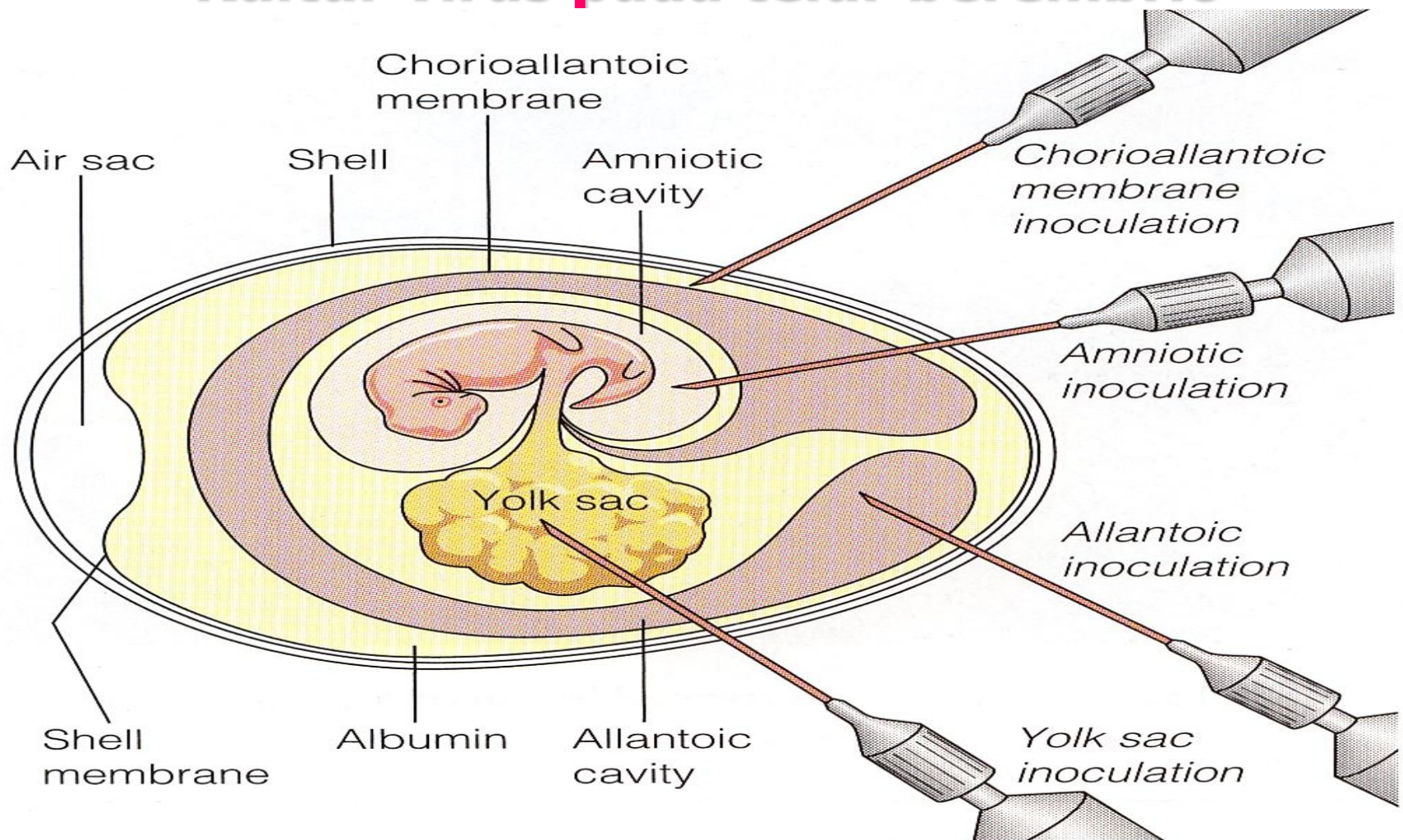
- **Inclusion bodies**
- **ME**

### **Kultur virus**

**Pada telur berembrio**

- **Pada membran korioalantois**
- **Pada rongga amnion**
- **Pada rongga allantois**
- **Pada yolk sac**

# Kultur virus pada telur berembrio



**FIGURE 13.7** Inoculation of an embryonated egg. The injection site determines the membrane on which the viruses will grow.

■ Viruses must be grown in living host cells.

# **Diagnosa laboratorium**

---

- **Kultur jaringan/sel**
  - **Primary cells culture**
  - **Secondary cells culture**
  - **Continuous cells line**

## **Diagnosa laboratorium**

---

- **Deteksi pertumbuhan virus**
  - **CPE (cytopathic effects) = perubahan morfologi sel (kultur jar/sel/telur)**
  - **Hemaglutinasi → hemaglutinin**
  - **Hemadsorpsi**
  - **Fenomena interferensi (non-CPE virus)**
  - **Transformasi sel**

## **Diagnosa laboratorium**

---

### **Deteksi antigen**

**Tgt penyakit :**

- Hepatitis B : serum**
- Rotavirus : feses**
- Varicella : cairan vesikel/kerokan kulit**
- dll**

### **Deteksi asam nukleat**

### **Deteksi antibodi**



## **Virus-virus DNA**

**1. Adenovirus**

**2. Herpesvirus**

- **Herpes Simplex Type-1 & HSV-2**
- **Varicella & Zoster virus**
- **Cytomegalovirus**
- **Epstein Barr Virus**

**3. Parvovirus**

**4. Poxvirus**

**5. Hepadnavirus**

**6. Papovavirus**

- **Papillomavirus**
- **Polyomavirus**

## **Virus-virus RNA**

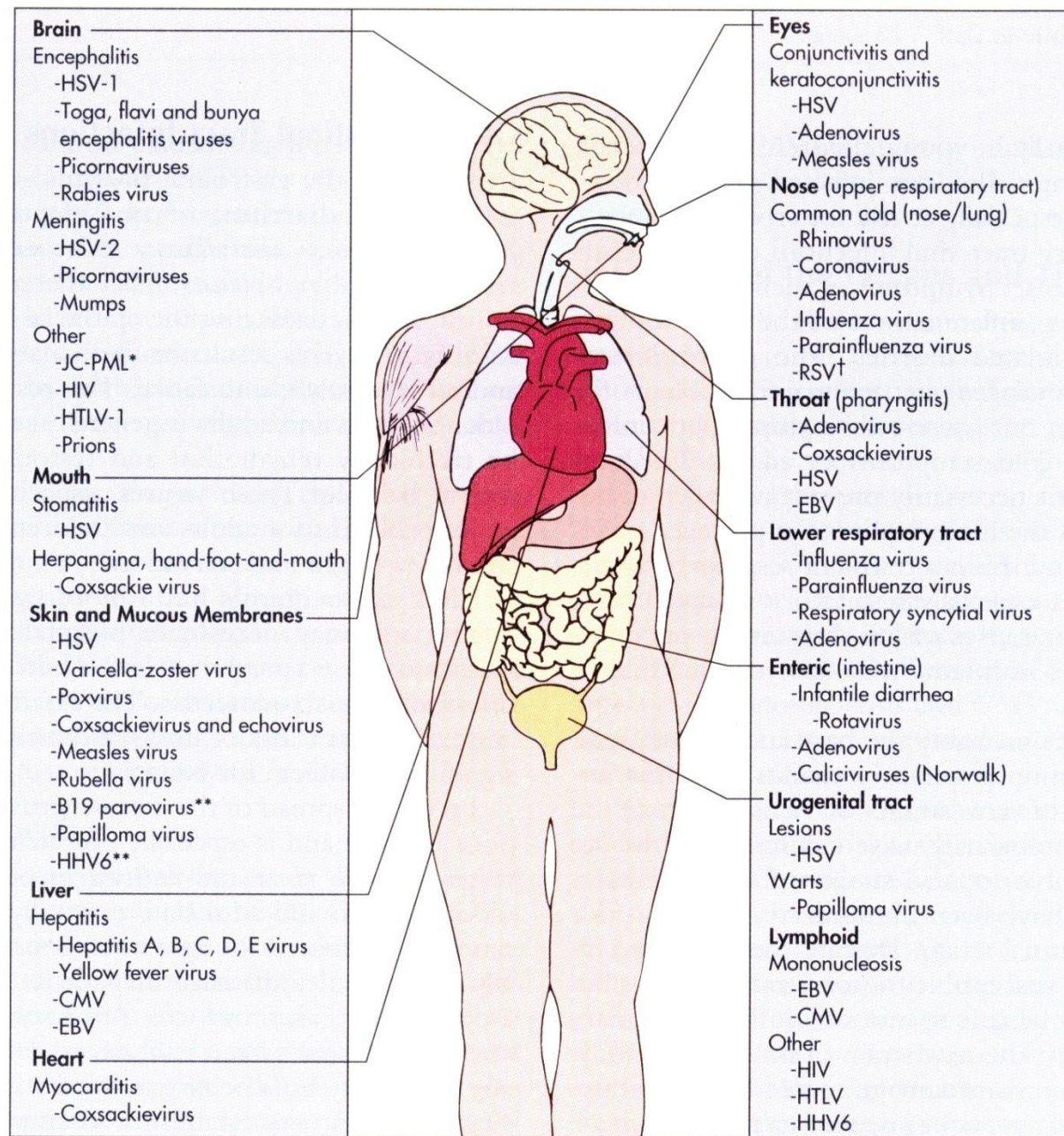
- |                        |                           |
|------------------------|---------------------------|
| <b>1. Picornavirus</b> | <b>10. Bunyavirus</b>     |
| <b>2. Astrovirus</b>   | <b>11. Rhabdovirus</b>    |
| <b>3. Calicivirus</b>  | <b>12. Filovirus</b>      |
| <b>4. Reovirus</b>     | <b>13. Orthomyxovirus</b> |
| <b>5. Arbovirus</b>    | <b>14. Paramyxovirus</b>  |
| <b>6. Togavirus</b>    | <b>15. Viroid</b>         |
| <b>7. Flavivirus</b>   | <b>16. Coronavirus</b>    |
| <b>8. Arenavirus</b>   | <b>dll.</b>               |
| <b>9. Rotavirus</b>    |                           |

## Route of Transmission Viruses

Route of Transmission	Virus
Respiratory	Rhino, Adeno, Paramyxo, Orthomyxo
Fecal-oral	Picorna, Hepatitis A, Hepatitis E, Adeno, Reo
Close contact: Injection Transplants	Herpes, Retro (HIV), Hepatitis B, Hep C
Arthropod or Animal bite	Flavi (Dengue), Rhabdo (Rabies)

## **Selected Viral Infections by Age of Major Impact**

<b>Before birth</b>	<b>CMV, Rubella</b>
<b>At birth</b>	<b>Herpes 1 &amp; 2, hepatitis B, C, HIV</b>
<b>Infants</b>	<b>RSV, Parainfluenza, Influenza, Polio, Entero, Rota, Adeno</b>
<b>Children</b>	<b>Rhino, Corona, Measles, Mumps, Rubella, Norwalk, Varicella, Hepatitis A</b>
<b>Adolescents and Young adults</b>	<b>Herpes, Hep B, EBV, Mumps, Rubella</b>



**FIGURE 65-1** Major target tissues of viral disease. Asterisk indicates progressive multifocal leukoencephalopathy, and dagger indicates respiratory syncytial virus. Infection by viruses indicated by two asterisks results in an immune-mediated rash.

# KLASIFIKASI VIRUS ATAS DASAR TROPISME

- Virus Enterik : penularan fekal oral, replikasi saluran cerna, tidak menimbulkan infeksi sistemik
- Virus Hepatotropik : penularan fekal oral, seksual dll. Gejala utama : kelainan fungsi hati.

# KLASIFIKASI VIRUS ATAS DASAR TROPISME

- Virus Respiratorik : penularan perinhalasi, replikasi saluran napas, tdk menimbulkan infeksi sistemik
- Virus Onkogenik : penularan perinjectionum, kontak yang erat, dll. Virus menyerang sel-sel tertentu, infeksi persisten → transformasi → Ca

# KLASIFIKASI VIRUS ATAS DASAR TROPISME

- Virus neurotropik : penularan berbagai cara, replikasi tidak hanya pada syaraf, manifestasi klinik utama pada fungsi susunan saraf
- Virus dermatotropik : penularan kontak atau cara lain, replikasi pada berbagai tempat, manifestasi utama pada jaringan mukokutan



# Oral and Respiratory Disease

**TABLE 65-1** Oral and Respiratory Diseases

<b>DISEASE</b>	<b>ETIOLOGICAL AGENT</b>	<b>DISEASE</b>	<b>ETIOLOGICAL AGENT</b>
Common cold (including pharyngitis)	Rhinovirus* Coronavirus* Influenza viruses Parainfluenza viruses Respiratory syncytial virus Adenovirus Enteroviruses	Bronchiolitis	Respiratory syncytial virus* (infants) Parainfluenza virus 3* (infants and children) Parainfluenza viruses 1 and 2
Pharyngitis	Herpes simplex virus Epstein-Barr virus Adenovirus* Coxsackie A virus* (herpangina, hand-foot-and-mouth disease) and other enteroviruses	Pneumonia	Respiratory syncytial virus* (infants) Parainfluenza virus* (infants) Influenza virus* Adenovirus Varicella-zoster virus (primary infection of adults or immunocompromised hosts) Cytomegalovirus (infection of immunocompromised host) Measles
Croup, tonsillitis, laryngitis, and bronchitis (children younger than 2 years)	Parainfluenza virus 1* Parainfluenza virus 2 Influenza virus Adenovirus Epstein-Barr virus		

\*Most common causal agents.

# Gastrointestinal Tract Infections

**BOX 65-1**

## Gastrointestinal Viruses

### **INFANTS**

Rotavirus A\*

Adenovirus 40, 41

Coxsackie A24 virus

### **INFANTS, CHILDREN, AND ADULTS**

Norwalk virus

Calicivirus

Astrovirus

Rotavirus B (outbreaks in China)

Reovirus

\*Most common cause.



# Exanthems and Hemorrhagic Fevers

---

## CONDITION

## ETIOLOGICAL AGENT

### RASH

Rubeola

Measles virus

German measles

Rubella virus

Roseola infantum

HHV6

Erythema infectiosum

Human parvovirus B19

Boston exanthem

Echovirus 16

Infectious mononucleosis

EBV, CMV

# Exanthems and Hemorrhagic Fevers

---

## **VESICLES**

Oral or genital herpes  
Chickenpox/shingles  
Hand-foot-and-mouth  
disease, herpangina

HSV\*

VZV\*

Coxsackie A virus\*

## **PAPILLOMAS**

Warts  
Molluscum

Papilloma virus\*

Molluscum contagiosum

\*Most common cause.



# Infections of the Organs and Tissues

---

## **LIVER**

Hepatitis A,\* B,\* C, D,  
and E viruses

Yellow fever virus

EBV

Hepatitis in the neonate or  
immunocompromised person:

CMV

HSV

VZV

Rubella virus (congenital  
rubella syndrome)

## **MUSCLE**

Coxsackie B virus  
(pleurodynia)

## **GLANDS**

CMV

Mumps virus

# Infections of the Organs and Tissues

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## **EYE**

HSV

Adenovirus\*

Measles virus

Rubella virus

Enterovirus 70

Coxsackie A24 virus

## **HEART**

Coxsackie B virus

## **KIDNEY**

CMV



# Infections of the Central Nervous System

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## **MENINGITIS**

Enteroviruses

Echoviruses

Coxsackievirus\*

Poliovirus

HSV-2

Adenovirus

Mumps virus

Lymphocytic choriomen-  
ingitis virus

EBV

Arboencephalitis viruses

## **PARALYSIS**

Poliovirus

Enteroviruses 70 and 71

Coxsackie A7 virus

## **ENCEPHALITIS**

HSV-1\*

VZV

Arboencephalitis viruses\*

Rabies virus

Coxsackie A and B  
viruses

Polioviruses

# Infections of the Central Nervous System

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## POSTINFECTIOUS ENCEPHALITIS (IMMUNE MEDIATED)

Measles virus	VZV
Mumps virus	Influenza viruses
Rubella virus	

## OTHER

JC virus (progressive multifocal leukoencephalopathy [in immunosuppressed people])  
Measles variant (subacute sclerosing panencephalitis)  
Prion (encephalopathy)  
HIV (AIDS dementia)



# Sexual Transmitted Viral Disease

**BOX 65-4**

## Sexually Transmitted Viruses

Human papillomavirus 6, 11, 42

Human papillomavirus 16 and 18 (associated with human cervical carcinoma)

HSV (predominantly HSV-2)

CMV

HBV, HCV, HDV

HIV

HTLV-1

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**Wassalam**