

The background is a light blue gradient with several white butterfly silhouettes of various sizes scattered across it, primarily concentrated along the left and right edges.

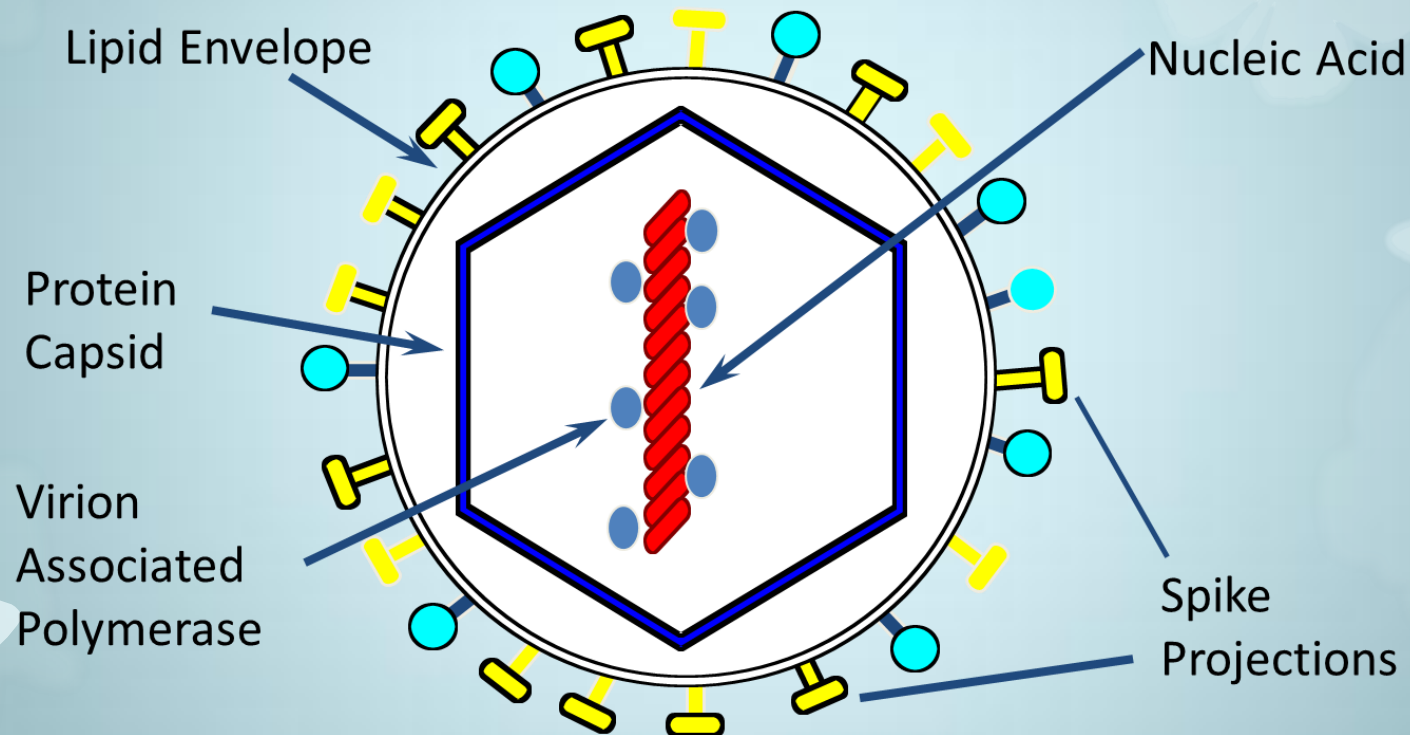
Medical Virology

Introduction

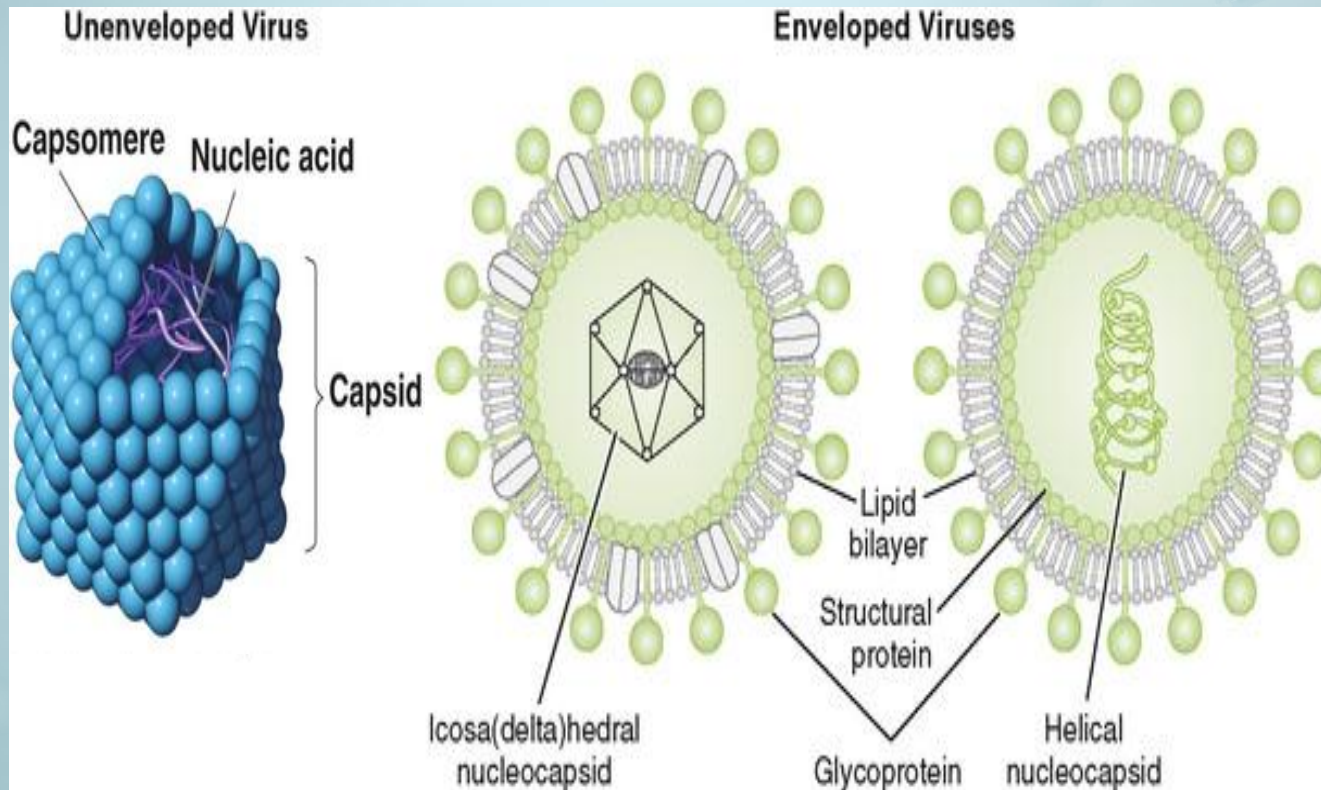
General Characteristics

- **Viral structure**
- **Virus taxonomy**
- **Viral replication**
- **Viral Pathogenesis**
- **Viruses in human diseases**
- **Laboratory diagnosis**

Viral structure

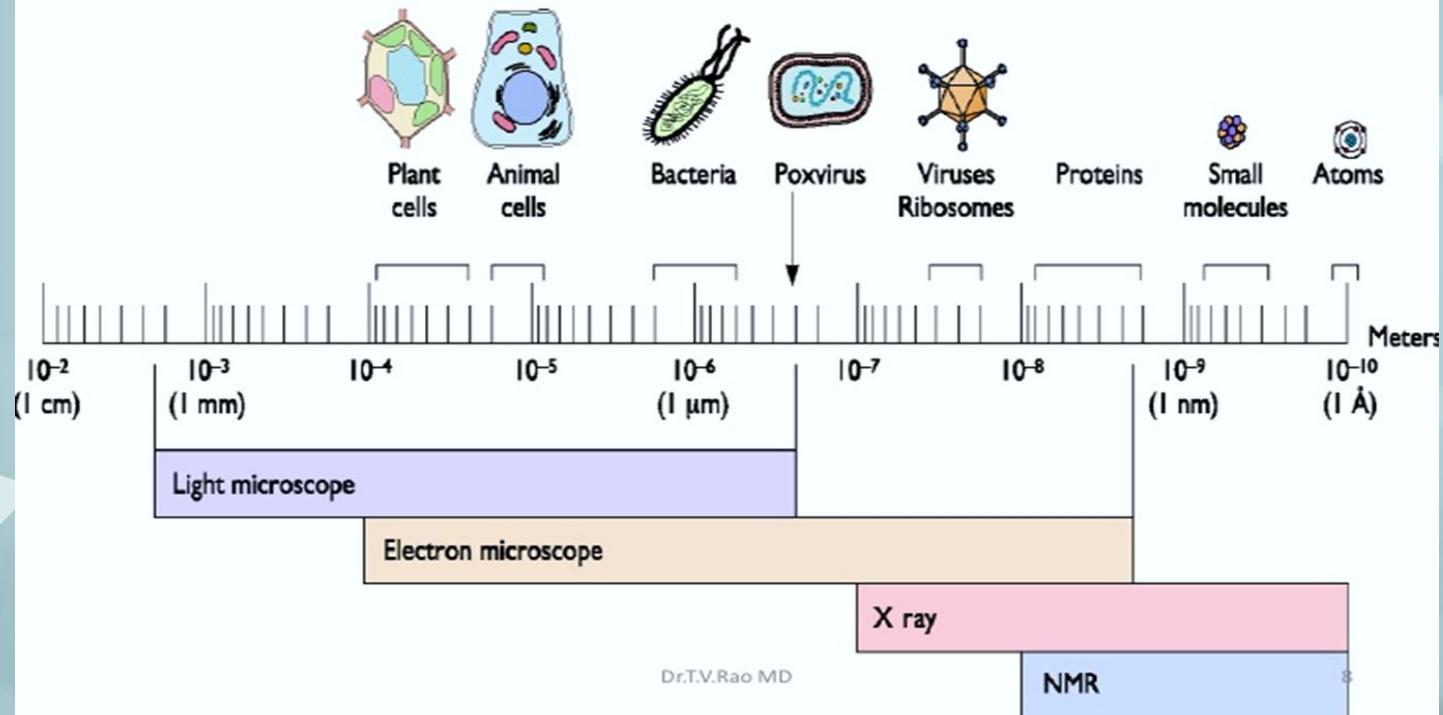


Viral structure



Viral structure

The size of viruses



Virus taxonomy

- 6 Orders (-virales)
 - 87 Families (-viridae)
 - 19 subfamilies (-virinae)
 - 348 genera (-virus)
 - 2290 species

Virus taxonomy

- **Three basic properties for classification:**

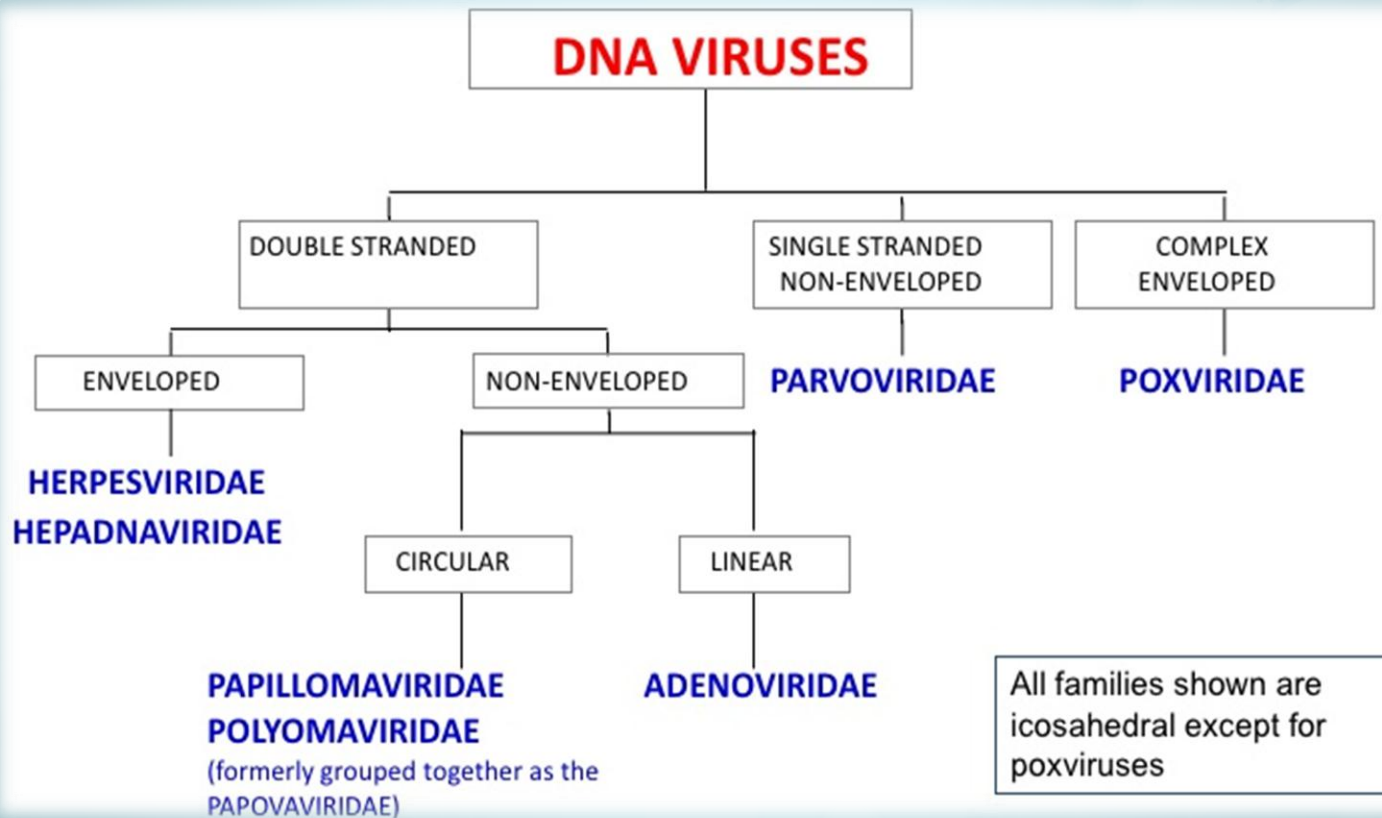
- Viral morphology
- Method of replication
- Presence or absence of lipid envelop

Virus taxonomy

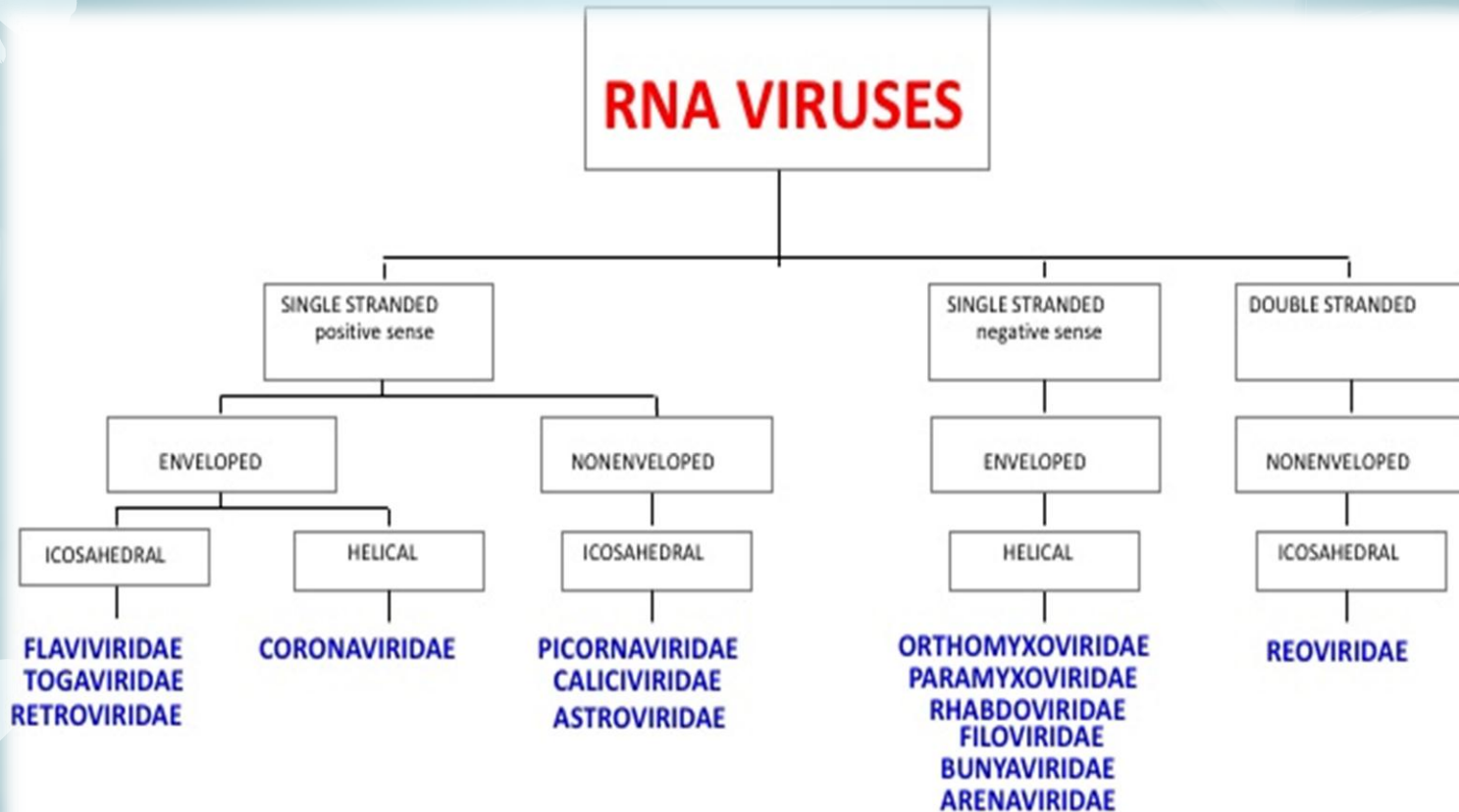
- The Baltimore classification system Based on:
 - Genetic contents
 - Replication strategies of viruses
- Seven classes:
 1. dsDNA viruses
 2. ssDNA viruses
 3. dsRNA viruses
 4. (+) sense ssRNA viruses (codes directly for protein)
 5. (-) sense ssRNA viruses
 6. RNA reverse transcribing viruses
 7. DNA reverse transcribing viruses

**"ds= "double strand" and "ss" = "single strand"

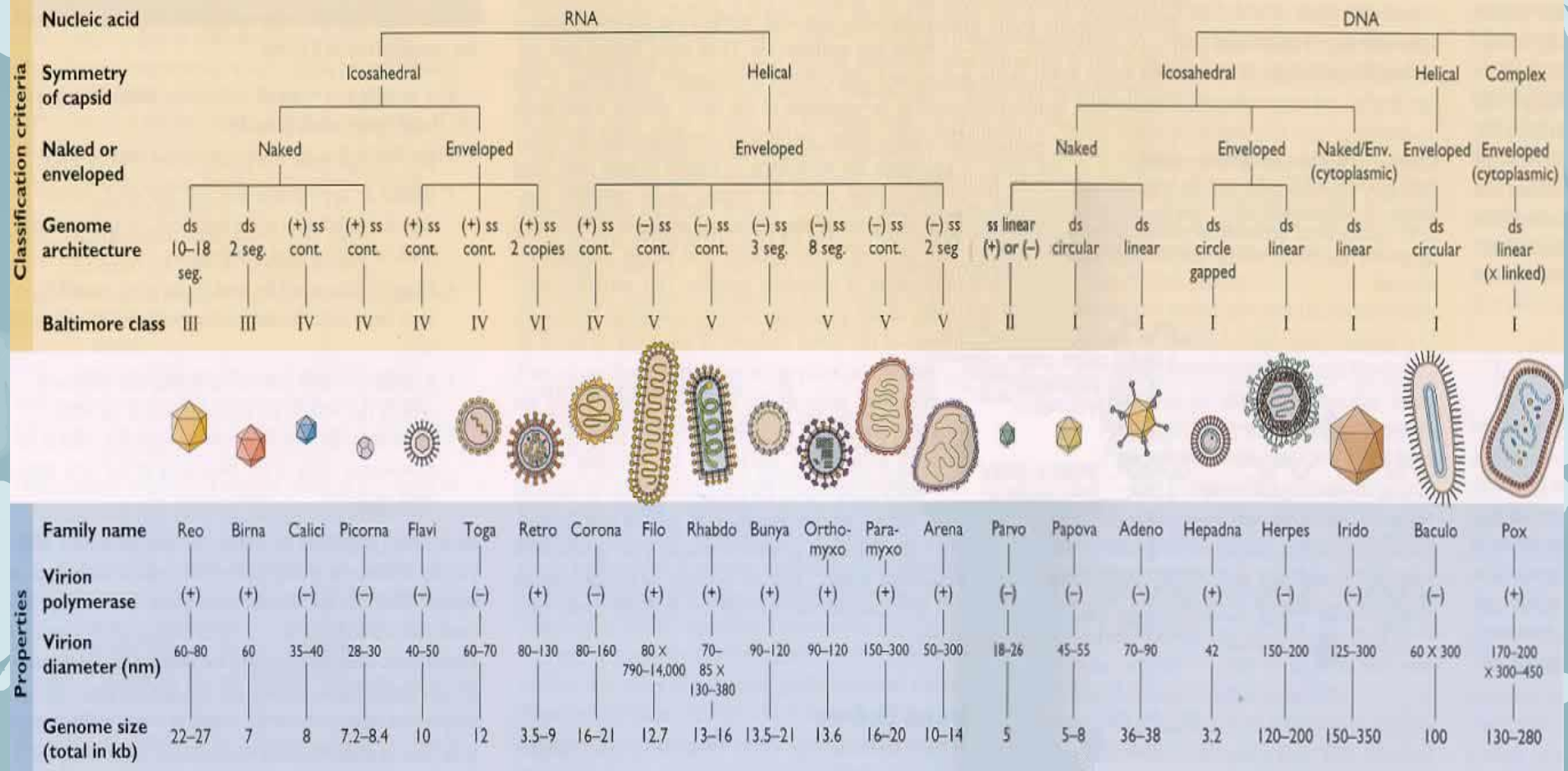
Virus taxonomy



Virus taxonomy



Virus taxonomy



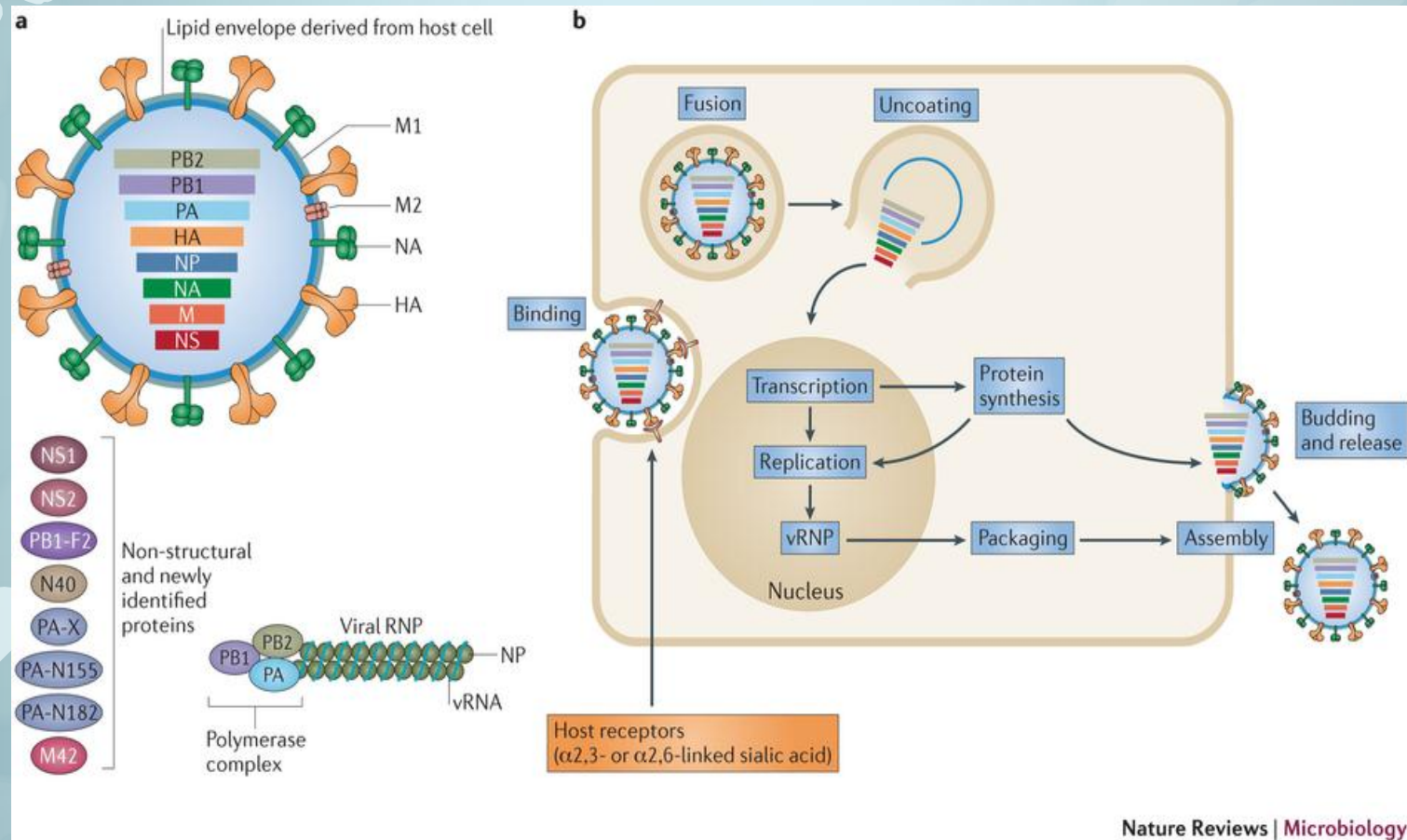
Viral replication

○ Infectious cycle:

1. Attachment
2. Penetration
3. Uncoating
4. Macromolecular synthesis
5. Viral assembly
6. Release

<https://www.youtube.com/watch?v=7aEL0EQtyGA>

Viral replication



Viral Pathogenesis

- **The main viral clinical presentations:**

1. Acute viral infection
2. Latent infection
3. Chronic (persistent) infection

- Primary viremia
- Secondary viremia
- Autoimmune pathogenesis
- Oncogenic viruses

Viruses in human diseases

TABLE 66-1 DNA and RNA Viruses That Cause Serious Disease in Humans

Family	Viral Members
DNA Viruses	
Adenoviridae	Human adenoviruses
Hepadnaviridae	Hepatitis B virus
Herpesviridae	HSV types I and II, VZV, CMV, EBV, human herpes viruses 6, 7, and 8
Papillomaviridae	Human papilloma viruses
Parvoviridae	Parvovirus B-19
Polyomaviridae	BK and JC polyomaviruses
Poxviridae	Variola, vaccinia, orf, molluscum contagiosum, monkeypox viruses
RNA Viruses	
Arenaviridae	Lymphocytic choriomeningitis virus, Lassa fever virus
Astroviridae	Gastroenteritis-causing astroviruses
Bunyaviridae	Arboviruses, including California encephalitis and Lacrosse viruses; nonarboviruses, including sin nombre and related hantaviruses
Caliciviridae	Noroviruses and hepatitis E virus
Coronaviridae	Coronaviruses, including SARS coronavirus
Filoviridae	Ebola and Marburg hemorrhagic fever viruses
Flaviviridae	Arboviruses, including yellow fever, dengue, West Nile, Japanese encephalitis, and St. Louis encephalitis viruses; nonarboviruses, including hepatitis C virus
Orthomyxoviridae	Influenza A, B, and C viruses
Paramyxoviridae	Parainfluenza viruses, mumps virus, measles virus, RSV, metapneumovirus, Nipah virus
Picornaviridae	Polio viruses, coxsackie A viruses, coxsackie B viruses, echoviruses, enteroviruses 68-71, enterovirus 72 (hepatitis A virus), rhinoviruses
Reoviridae	<i>Rotavirus</i> spp., Colorado tick fever virus
Retroviridae	HIV types 1 and 2, HTLV types 1 and 2
Rhabdoviridae	Rabies virus
Togaviridae	Eastern, Western, and Venezuela equine encephalitis viruses, rubella virus

CMV, Cytomegalovirus; EBV, Epstein-Barr virus; HIV, human immunodeficiency virus; HSV, herpes simplex virus; HTLV, human T-lymphotropic viruses; RSV, respiratory syncytial virus; SARS, severe acute respiratory syndrome; VZV, varicella-zoster virus.

Viruses in human diseases

TABLE 65-1 Viral Syndromes and Common Viral Pathogens

Viral Syndrome	Viral Pathogens
Infants and Children	
Upper respiratory tract infection	Rhinovirus, coronavirus, parainfluenza, adenovirus, respiratory syncytial virus, influenza
Pharyngitis	Adenovirus, coxsackie A, herpes simplex virus, Epstein-Barr virus, rhinovirus, parainfluenza, influenza
Croup	Parainfluenza, respiratory syncytial virus, metapneumovirus
Bronchitis	Parainfluenza, respiratory syncytial virus, metapneumovirus
Bronchiolitis	Respiratory syncytial virus, parainfluenza, metapneumovirus
Pneumonia	Respiratory syncytial virus, adenovirus, influenza, parainfluenza
Gastroenteritis	Rotavirus, adenovirus 40-41, calicivirus, astrovirus
Congenital and neonatal disease	HSV-2, echovirus, and other enteroviruses, CMV, parvovirus B19, VZV, HIV, hepatitis viruses
Adults	
Upper respiratory tract infection	Rhinovirus, coronavirus, adenovirus, influenza, parainfluenza, Epstein-Barr virus
Pneumonia	Influenza, adenovirus, sin nombre virus (hantavirus), severe acute respiratory syndrome (SARS) coronavirus
Pleurodynia	Coxsackie B
Gastroenteritis	Noroviruses
Cervical cancer	Human papillomavirus
All Patients	
Parotitis	Mumps, parainfluenza
Myocarditis/pericarditis	Coxsackie B and echoviruses
Keratitis/conjunctivitis	Herpes simplex virus, VZV, adenovirus, enterovirus 70
Pleurodynia	Coxsackie B
Herpangina	Coxsackie A
Febrile illness with rash	Echoviruses and coxsackie viruses
Infectious mononucleosis	Epstein-Barr virus and CMV
Meningitis	Echoviruses and coxsackie viruses, mumps, lymphocytic choriomeningitis, HSV-2
Encephalitis	HSV-1, togaviruses, bunyaviruses, flaviviruses, rabies, enteroviruses, measles, HIV, JCV
Hepatitis	Hepatitis A, B, C, D (delta agent), E, and non-A, B, C, D, E
Hemorrhagic cystitis	Adenovirus, BK virus
Cutaneous infection with or without rash	HSV-1 and HSV-2; VZV; enteroviruses; measles; rubella; parvovirus B-19; human herpes virus 6 and 7; HPV; poxviruses, including smallpox, monkeypox, molluscum contagiosum; and orf
Hemorrhagic fever	Ebola, Marburg, Lassa, yellow fever, dengue, and other viruses
Generalized, no specific target organ	HIV-1, HIV-2, HTLV-1

CMV, cytomegalovirus; HIV, human immunodeficiency virus; HPV, human papillomavirus; HSV-1, herpes simplex virus type 1; HSV-2, herpes simplex virus type 2; HTLV-1, human T-lymphotropic virus type 1; JCV, JC virus; SARS, severe acute respiratory syndrome; VZV, varicella-zoster virus.

Laboratory diagnosis

- Specimen selection and collection
- Specimen transport and storage
- Specimen processing
- Virus detection methods
- Viral serology
- Preservation and storage of viruses

Specimen selection and collection

- **Selection** depends on
 - The specific disease syndrome
 - Suspected viral etiologies
 - Time of year
 - Type of specimen
- **Collection methods:**
 - number of specimens
 - Validated container

Specimen selection and collection

- Throat, Nasopharyngeal swab, or Aspirate
- Rectal swab and Stool specimens
- Urine
- Skin and mucous membrane lesions
- Blood
- Genital specimens

Specimen transport and storage

- ◉ **Specimen transport:**

- ◉ Swab types
- ◉ Transport media
- ◉ Blood container

- ◉ **Storage:**

- ◉ General
- ◉ Serum

Specimen processing

A. Specimen type

1. Lip and genital specimens
2. Urine
3. Stool
4. Respiratory tract
5. Neonatal specimens
6. CSF
7. Blood

B. Requests for specific viruses

Specimen processing

B. Requests for specific viruses

1. Arboviruses
2. Cytomegalovirus
3. Enteroviruses
4. Epstein-Barr virus
5. Hepatitis viruses
6. Herpes Simplex Virus
7. HIV and other Retroviruses
8. Influenza A and B Viruses
9. Pediatric Respiratory Viruses
10. Gastroenteritis Viruses
11. TORCH
12. Varicella-Zoster Virus

Virus detection methods

- Cytology and Histology
- Electron Microscopy
- Immunodiagnosis
- Enzyme-linked Virus-Inducible System
- Molecular detection
- Cell culture
 - Conventional cell culture
 - Shell vial cell culture
 - Identification of viruses

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Viral serology

Preservation and storage of viruses