

Introduction to Virology

Introduction to Virology – Study Notes

1. What Is Virology?

- **Definition:** Branch of microbiology that deals with viruses – their structure, classification, replication, evolution, and the diseases they cause.
 - **Scope:**
 - Basic virology (virus biology, life cycle)
 - Clinical virology (diagnosis, treatment, prevention)
 - Molecular virology (genome manipulation, vaccine design)
 - Environmental/animal virology (zoonoses, viral ecology)
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2. Fundamental Concepts

Concept	Key Points
Virus	Submicroscopic infectious particle consisting of nucleic acid (DNA or RNA) surrounded by a protein coat (capsid); some have a lipid envelope.
Obligate intracellular parasite	Cannot replicate outside a host cell; relies on host machinery for transcription, translation, and energy.
Virion vs. Virus	<i>Virion</i> : complete, extracellular infectious particle. <i>Virus</i> : the replicative form inside the host cell (genome + associated proteins).
Host range	Spectrum of species/cell types a virus can infect; determined by receptor binding and intracellular factors.
Tropism	Preference for specific tissues or cell types (e.g., neurotropism, hepatotropism).

3. Virus Structure

1. Genomic Nucleic Acid

- **DNA viruses:** dsDNA (e.g., Herpesviridae), ssDNA (e.g., Parvoviridae)

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- **RNA viruses:** +ssRNA (e.g., Picornaviridae), –ssRNA (e.g., Orthomyxoviridae), dsRNA (e.g., Reoviridae), ssRNA?RT (retroviruses), dsDNA?RT (hepadnaviruses)

2. Capsid

- **Protein subunits (capsomeres)** assemble into icosahedral, helical, or complex symmetry.
- Provides protection and determines antigenicity.

3. Envelope (optional)

- Lipid bilayer derived from host membranes, embedded with viral glycoproteins (spikes) that mediate attachment and entry.
- Enveloped viruses are generally more sensitive to detergents, heat, and desiccation.

4. Accessory Structures

- **Matrix proteins:** scaffold between capsid and envelope.
- **Tegument (herpesviruses):** layer of proteins that modulate host response.
- **Enzymes packaged in virion:** polymerases (e.g., RNA?dependent RNA polymerase), integrase, reverse transcriptase.

4. Virus Classification (ICTV System)

Level	Example	Basis of Classification
Realm	<i>Riboviria</i>	Replication strategy (RNA viruses)
Kingdom	<i>Orthornavirae</i>	Genome type & replication
Phylum	<i>Pisuviricota</i>	Polyprotein processing
Class	<i>Alphaherpesviridae</i>	Morphology, genome organization
Order	<i>Mononegavirales</i>	Non?segmented, negative?sense RNA
Family	<i>Flaviviridae</i>	Genome size, envelope, replication
Genus	<i>Flavivirus</i>	Sequence similarity, vector
Species	<i>Dengue virus</i>	Host range, pathogenicity

Key point: Classification reflects both evolutionary relationships and practical features (e.g., genome type, replication mechanism).

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5. Viral Replication Cycle (General Steps)

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