

### Common Features of a Virus

#### 1. Genome

- Could be ssDNA, dsDNA, dsRNA, ssRNA
- Viruses are particles and there is a question about if they are living or non-living (*need a host cell for reproduction*)
- Our genome is DNA, viruses can harm different types
- > Always a nucleic acid

What does the genome do?

- Codes for proteins to run the virus
- > genome is the smallest

#### 2. Capsid

- a virally coded protein coat, shell, or sheath that surrounds the nucleic acid

Capsid= protein coat surrounding genome

Protects genome from breakdown and facilitates entry

Some viruses have membrane

### Virus Diversity

#### Rod

- RNA
- Capsomere of capsid
- ex: *Tobacco mosaic virus*

Simplest virus

#### Adenoviruses

- Capsomere
- DNA
- Glycoprotein
- Cause us to get sick

#### Circle Virus

- Membranous envelope
- RNA
- Glycoprotein
- Capsid
- ex: *Influenza Viruses*

- Affect animals= have membrane around capsid

#### Moon Landing Shaped One

- DNA
- Tail sheath
- Head
- Tail fiber
- ex: *Bacteriophage T4*

- Phages are viruses that collect bacteria
- > bacteriophages

### Genome of HIV Virus

#### gag

- Components of capsid
- Matrix
  - Capsid
  - Nucleocapsid
  - Vpr-binding protein

#### pol

- Proteins required for reverse transcription and integration into host DNA
- Protease
  - Reverse transcriptase
  - Integrase

#### env

- Surface Proteins
- Surface glycoprotein
  - Transmembrane glycoprotein

### Infection Cycle

- Infects human white blood cells
- Immune System deficiency

### Viral Genome Classification

#### Virus Classes

- Class 1
- > Double-Stranded DNA (+)

- Class 4
- > Single-Stranded RNA (+)

- Class 5
- > Single-Stranded RNA (-)

- Class 6
- > Single-Stranded RNA (+)
  - > SPECIAL "retro virus"

#### Use genome (DNA and RNA) of virus to classify the bacteria

Must ask:

- How is genome made? Poly. used?
- How is the mRNA made? Poly. used?
- Are the poly derived from the host or virus genome?

#### D.S. DNA Viruses

- Genome: D.S. DNA (what comes into host)
- > DdDp needed for virus (host has this)
- mRNA: D.S. DNA --> mRNA
- > DdRp (already has this in host)



### Viral Genome Classification (cont)

#### RNA

- ss(+) RNA virus=> many bacteria phages
- Genome:ss(+) RNA=>template(-)RNA=>(+)RNA
- > RdRp: has to be virally encoded. Does not have to be carried in by virus since (+) RNA can be read by mRNA

#### ss(-)RNA=>(+)ssRNA=>(-)ssRNA

- RdRp: has to be brought in by virus

#### Retrovirus

- even though they are (+) RNA they dont follow pattern.
- Be integrated into host genome and replicate the provirus with it
- (+)ssRNA=>DNA=>Protein
- > Reverse transcriptase carried by virus (after +ssRNA)
- > DNA integrated intermediate host genome

### Influenza Virus

#### H and N

- > glycoproteins on the surface of the glycoprotein
- > HA- 16 common variants of the protein
- > NA- 9 common variants of the protein

(-) ssRNA virus with a genome with 8 segments

- > Newly released influenza viruses will be genetically heterogenous enabling a high rate of evolution

> HA and NA may not be detectable by our immune system due to **antigenic drift**

- > Enters via fusion
- > Carries own polymerase
- > doesnt have proofreading mechanism

*high mutation rate*

Viral reassortment may lead to **antigenic shift** (a new influenza subtype)

- different strains for humans and animals

### Basic Viral Infection Cycle

1. Entry and uncoating
2. Replication
3. Transcription and manufacture of capsid proteins
4. Self-assembly of new virus particles and their exit from the cell

*Phages are the best understood of all viruses*

Entry: Mechanism to the virus that attaches to the host cell and into the cytoplasm

- Viruses that have membranes can be receptor mediated (\*endocytosis)

- Bacteria phage injection genome

--> can be replicated, always ends up in cell bursting

Flu Virus= membrane fusion membranes fuse together and go into cell

*Receptor-Mediated Mechanism*

*Replication=* DNA replication. Every time a cell divides

*Central Dogma*

-DNA

--Transcription (*DdRP RNA Polymerase*)

-RNA

--Translation(*Ribosomes, tRNA...Always sue ribosomes from the host*)

-Protein

*DdDp ==>* DNA dependent DNA polymerase



By **Morghay123**

[cheatography.com/morghay123/](https://cheatography.com/morghay123/)

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