

### 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*

### Virus Diversity (cont)

- 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?



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### Viral Genome Classification (cont)

#### 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)

#### 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 don't 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 heterogeneous 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

----> doesn't have proofreading mechanism

### Influenza Virus (cont)

*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



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