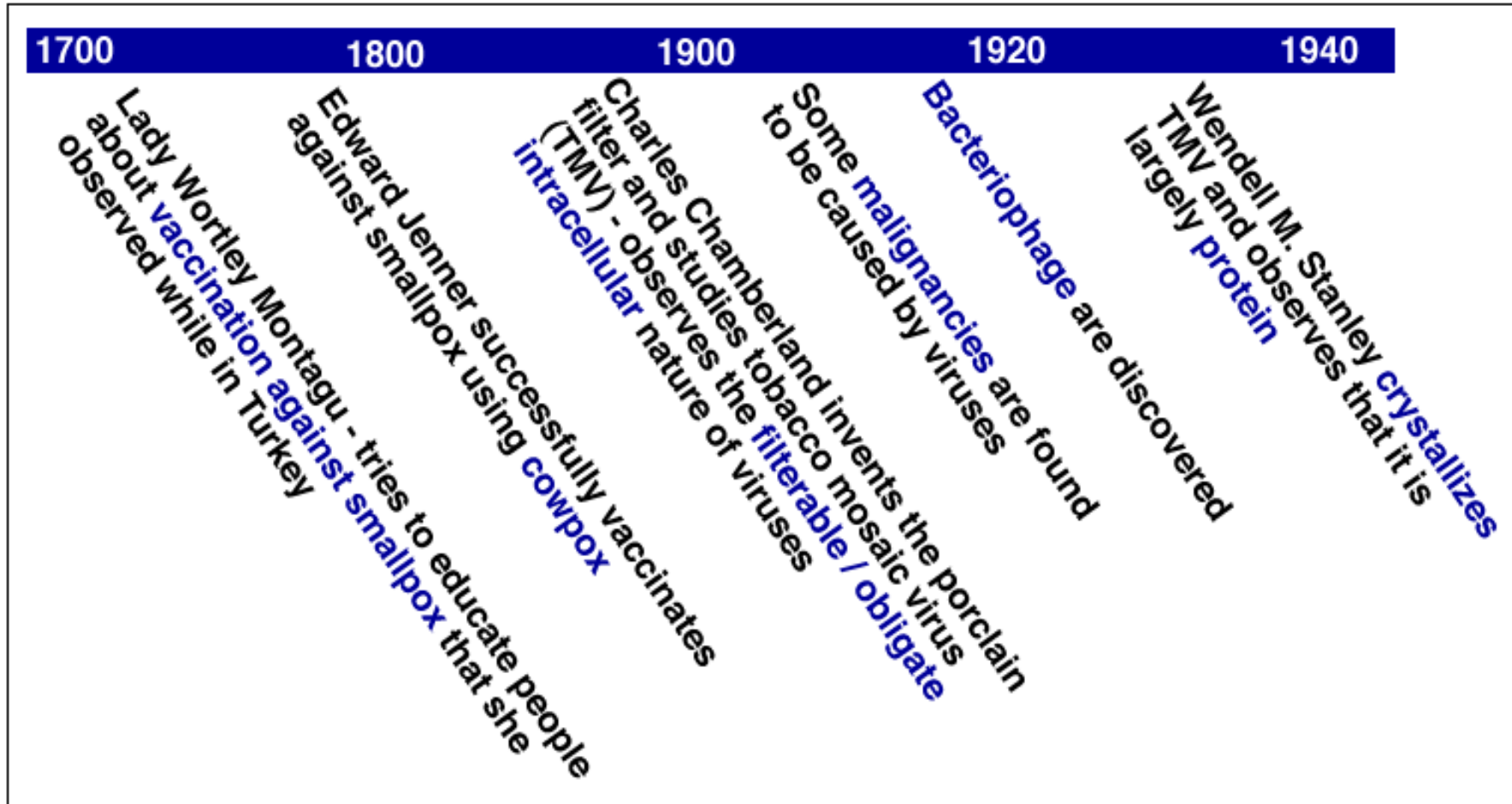


Lecture 20 (Chapter 5 and 37): Viruses

I. A brief history



I. General Characteristics of Viruses of Animals

A. Viruses are
within living cells.

that can multiply only

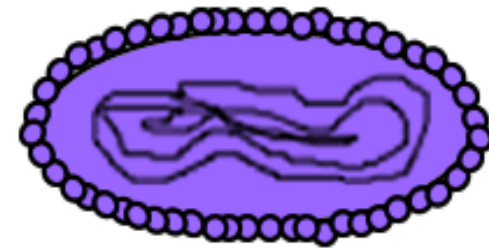
B. Virion size

Viron size ranges from

making them

and making them

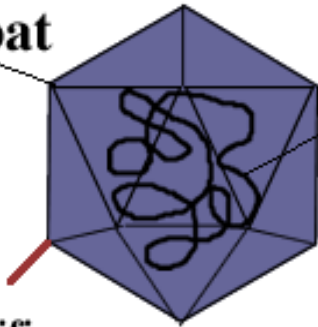
impossible to view on a regular light microscope.



Increasing virion size

C. General morphological types

Protein coat
()



nucleic acid

Spikes
(have specific adsorption proteins)

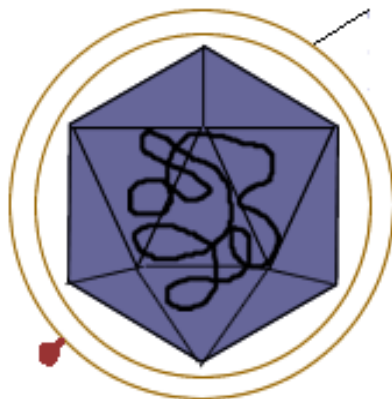
capsid + nucleic acid =

Example:



Capsid is a hollow protein cylinder

Example:



Internal nucleocapsid may be icosahedral or helical

Example:

Capsid is

(may possess tail fibers and other structures - bacteriophage)

Example

II. Nucleic acids

A. May be

DNA or RNA. May

be linear or circular.

1. Most DNA viruses use

2. Most RNA viruses use ssRNA

a. may be identical to the mRNA and thus called the

b. may be complementary to the mRNA and thus called the

B. viruses (e.g. the influenza virus) have several molecules
of RNA carrying different genetic information.





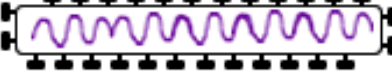
C. Viral genes must encode for three things:

1. The _____ (early genes).
2. The synthesis of the viral _____ (late genes).
3. The _____ of the virus into and out of the host cell.
 - a. When the virus is outside the host cell, it is in a _____ called a _____.
 - b. When the virus is inside the host cell, it is actively using the host cell's replication and expression machinery. At this point the virus is in the _____.




III. Classification / Groupings of Animal Viruses

A. Based on genome structure, virus particle structure and presence or absence of an envelope, animal viruses can be classified into families. We will look at examples of a few of these families.




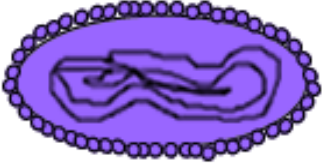
Some animal viruses containing a single molecule of ssRNA:

Family	Cartoon of virion (description of structure)	Example
<i>Picornaviridae</i>	 Icosahedral Naked	Poliovirus Rhinovirus (common cold)
<i>Togaviridae</i>	 Icosahedral Enveloped	Yellow fever virus Dengue virus West Nile virus (all in genus <i>Flavivirus</i>)
<i>Coronaviridae</i>	 Helical Enveloped	Respiratory viruses SARS virus
<i>Rhabdoviridae</i>	 Helical Enveloped	Rabies virus
<i>Filoviridae</i>	 Helical Enveloped	Ebola virus


Some animal viruses containing a segmented RNA genome:

Family	Cartoon of virion (description of structure)	Example
<i>Orthomyxoviridae</i>	 <p>Helical (pleomorphic) Enveloped</p>	Influenza virus
<i>Bunyaviridae</i>	 <p>Helical Enveloped</p>	Hantavirus
<i>Retroviridae</i>	 <p>Icosahedral Enveloped</p>	HIV

Some animal viruses containing a dsDNA genome:

Family	Cartoon of virion (description of structure)	Example
<i>Hepadnaviridae</i>	 Icosahedral	Hepatitis B
<i>Papovaviridae</i>	 Icosahedral	Papillomavirus (HPV)
<i>Herpesviridae</i>	 Icosahedral Enveloped	Herpes simplex virus (fever blisters) Varicella-zoster (chickenpox) Epstein-Barr (mononucleosis)
<i>Poxviridae</i>	 Complex Enveloped	Smallpox virus

An animal virus containing a ssDNA genome:

Family	Cartoon of virion (description of structure)	Example
<i>Parvoviridae</i>	 Icosahedral	Parvovirus

*Note: viruses are commonly referred to by only their **species name** which is the name of the **disease they cause**. The family and genus names are **italicized** but the **species** name is not.

B. Classification based on routes of transmission

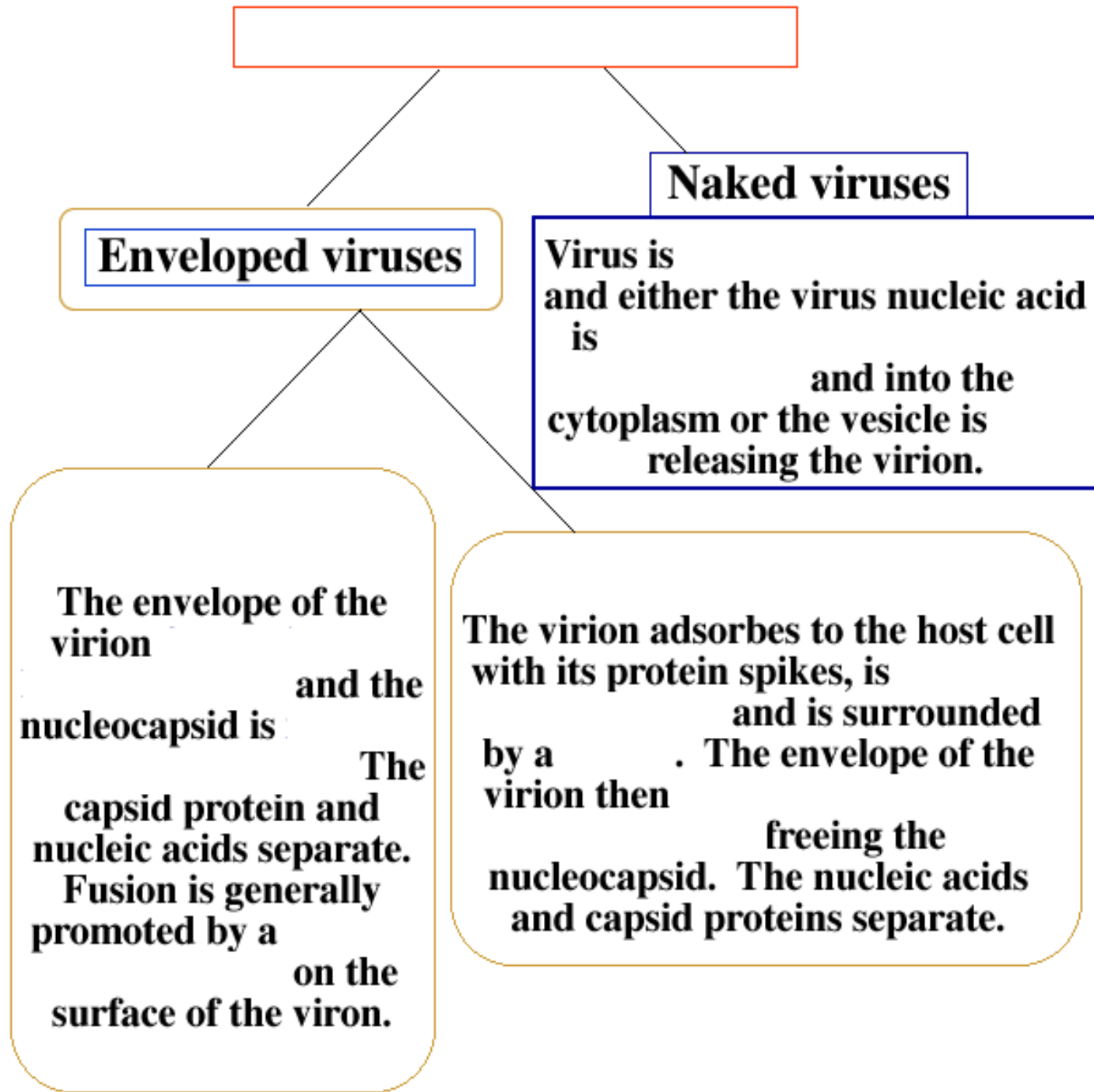
Group	Route of entry	Example
Enteric viruses	Ingested on material contaminated by feces (fecal-oral route)	Poliovirus
Respiratory viruses	Enter in inhaled droplets and replicate in the respiratory tract	Influenza virus, Rhinoviruses (colds), SARS virus
Zoonoses	Transmitted from animal to human or another animal (often from arthropods to humans / other animals)	Rabies Arboviruses (West Nile)
Sexually transmitted viruses	Transmitted during sexual contact	Herpes simplex virus-2, HIV

IV. Reproduction of Animal Viruses

A.

- a. Virus has surface attachment proteins (sometimes more than one) that
- b. Host cell receptors are always _____ and are usually _____ (hormone receptors or surface immunoglobulins). Often the virus must bind to _____ before it can enter the host cell.
- c. Because a virion must bind to certain receptors, often a particular virus can only infect a _____ and most can only infect a _____

2.



3. Replication of viral nucleic acids and proteins- This from virus

to virus. Viruses with large genomes require the use of

as they encode for most of

In contrast, the very small parvoviruses depend completely upon the

Generally viruses are

before replication begins.

4. - similar to the maturation step in the life cycle of lytic

bacteriophages.

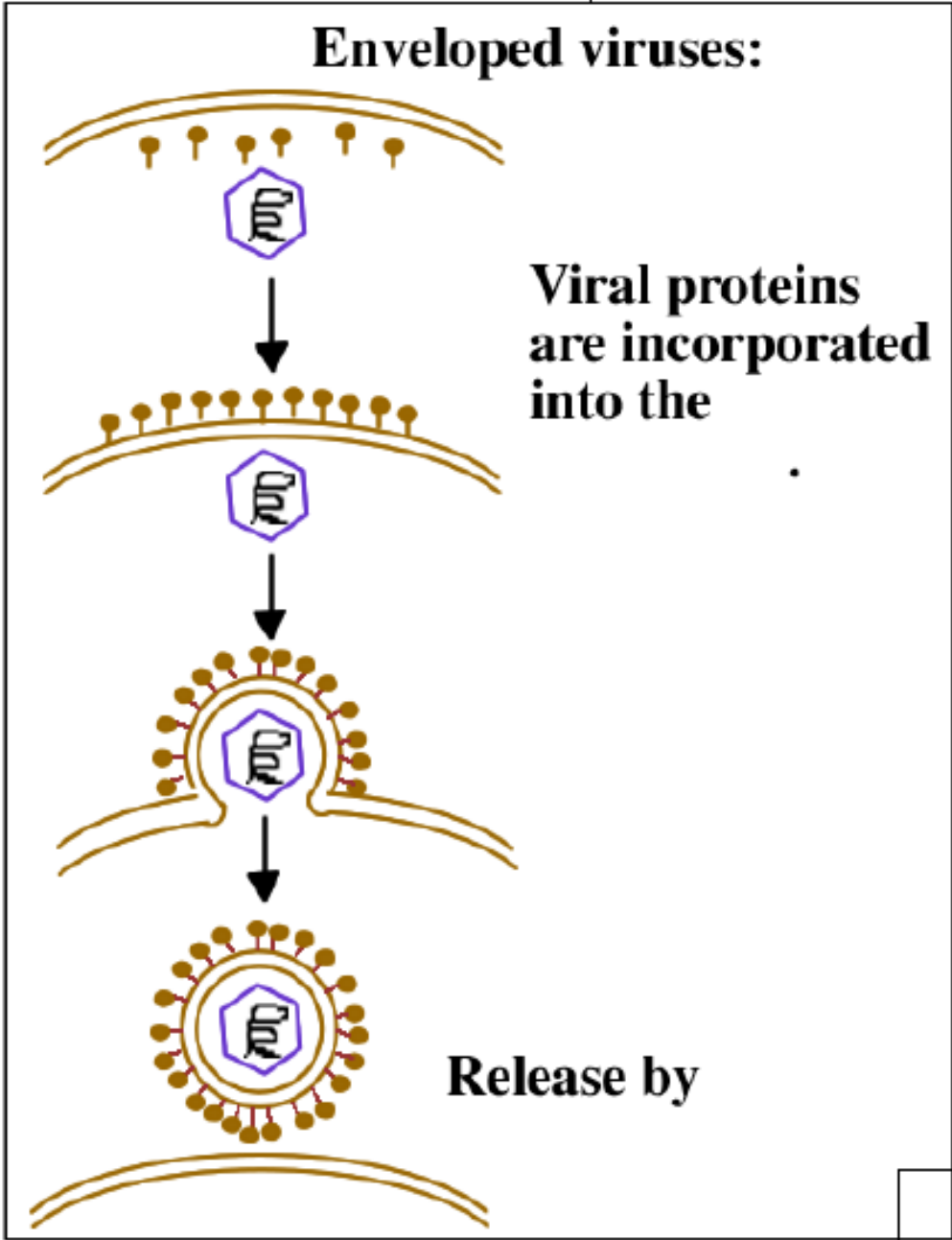
6.

Release

Naked viruses:
Often host cells are to such a point that they die. After death, degradation of the host cell allows

Degredation by these enzymes allows

Alternatively the introduced viral proteins by the immune system after which virions escape.



III.

Types of Viral Infection

Infections

- **and localized**
- **Disease symptoms result and infected cells but the host generally develops long-lasting immunity**
Example:

Infections

- **Example: can produce a slow infection called subacute sclerosing panencephalitis**

Infections

- **May not cause disease but the infected person is called a**

Infections

- **Virus but symptoms for long periods**
Example:

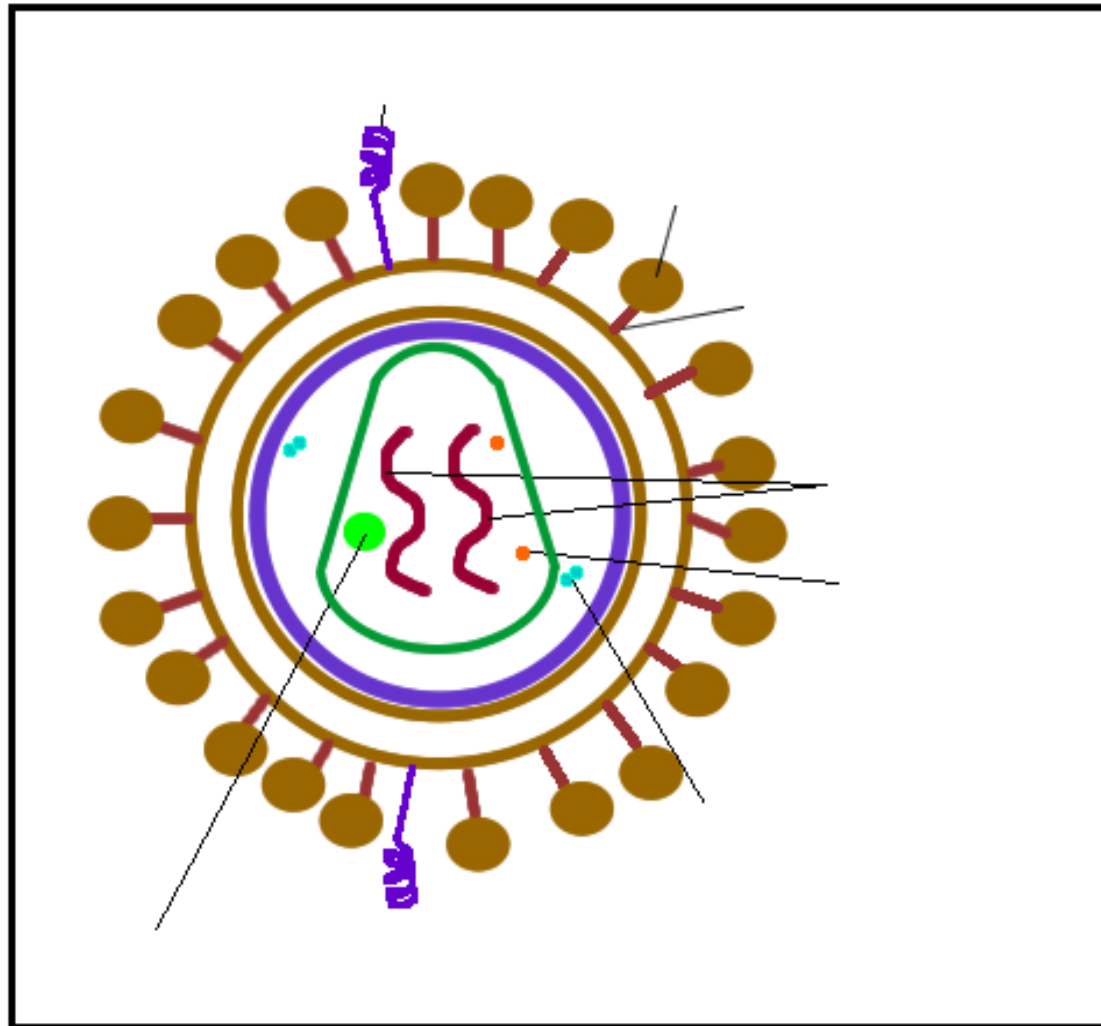
Infections

- **Virus stops reproducing and is and not detectable**
Example: simplex, varicella-zoster, Epstein-Barr

IV. HIV, the virus that causes AIDS

A. HIV is a member of the _____ family (Retro =

It has a cylindrical core inside its capsid that contains



<http://news.bbc.co.uk/2/hi/health/4642940.stm>
The structure of HIV is variable

B. HIV attacks _____ and dendritic cells that line mucousal surfaces. It enters these white blood cells by attaching to _____

C. HIV replication:

