Anbar University

Science College

Biotechnology Department

Viruses

Lecturer.D.Al-Moghira Khairi Al-Qaysi

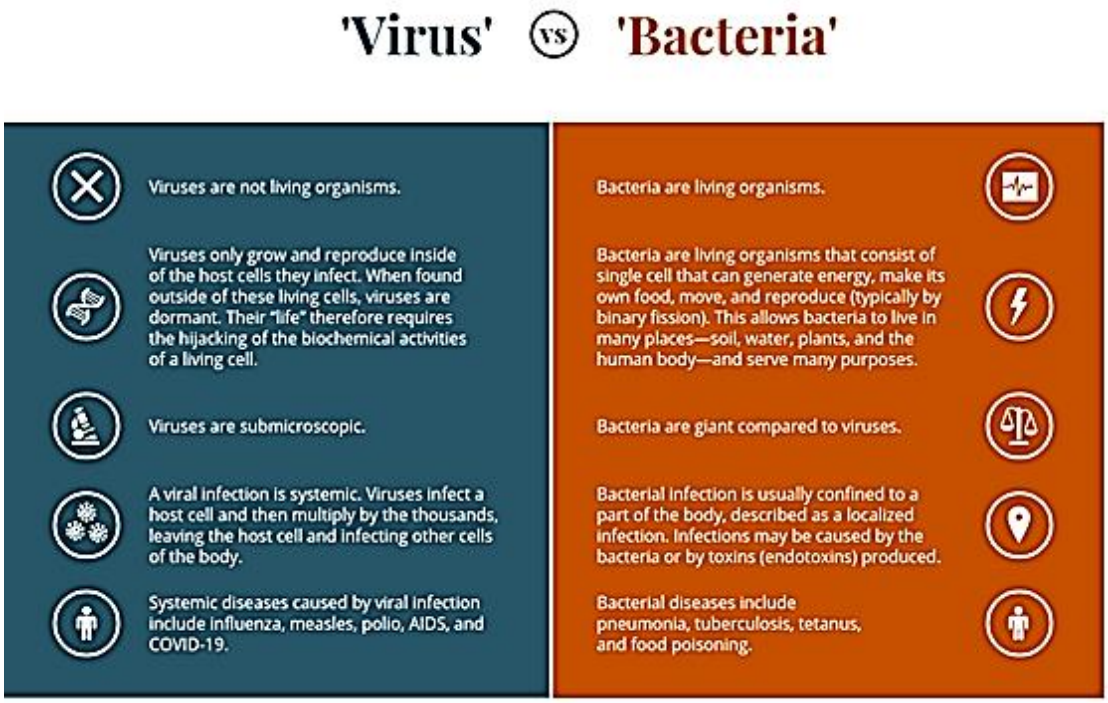
Virology, Stephen N.J. Korsman, Gert U. van Zyl, ... Wolfgang Preiser 2012

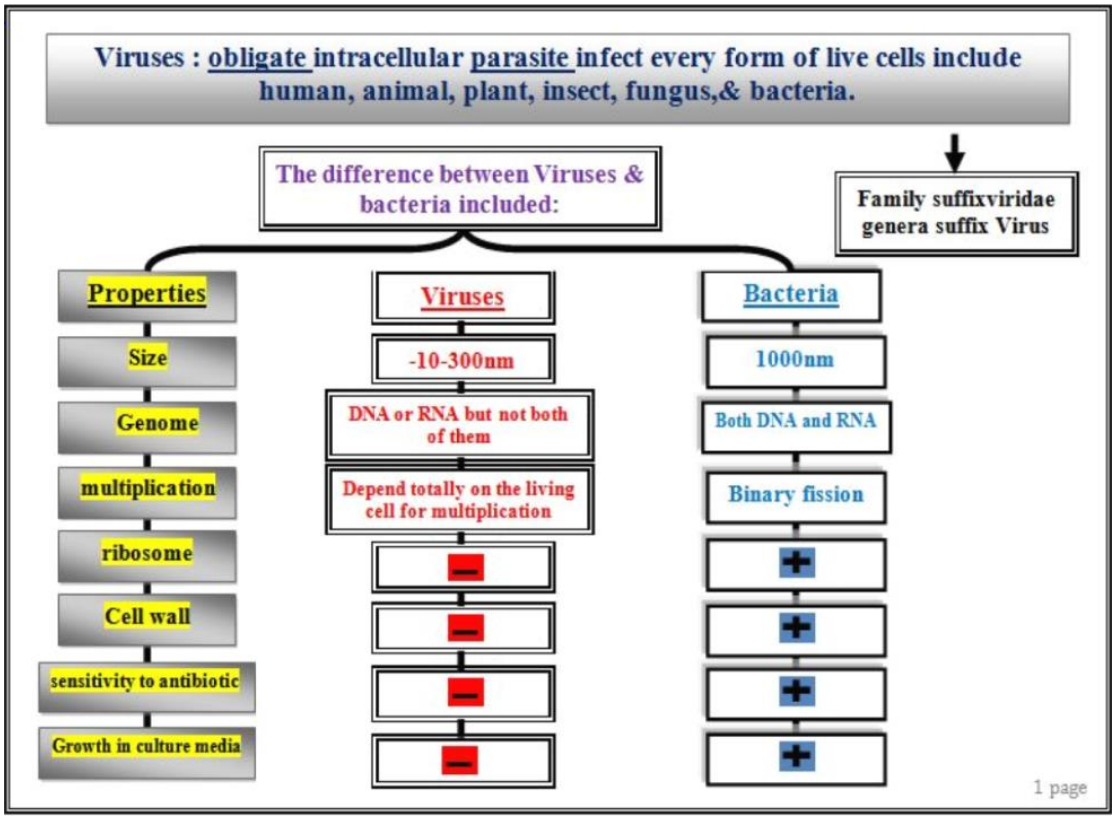
Jawetz Melnick & Adelbergs Medical Microbiology, Stefan Riedel (Author), Stephen Morse (Author), Timothy Mietzner (Author), Steve Miller.

Viruses, Pandemics, and Immunity, By Arup K. Chakraborty and Andrey S. Shaw

Viruses

The name is from a Latin word meaning “slimy liquid” or “poison.” Infectious agent of small size that can multiply only in living cells of animals, plants, or bacteria. In another way, they are obligate intracellular agents.

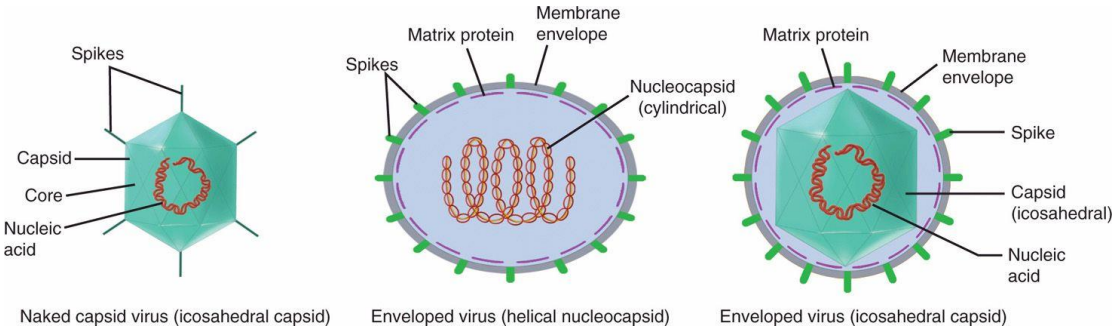




Basically all the viruses have the same structure which consists of:

1- Core

2- Capside



Naked capsid virus (icosahedral capsid) Enveloped virus (helical nucleocapsid) Enveloped virus (icosahedral capsid)

Outer protein shell called a capsid and an inner core of nucleic acid

1-core

Consist of nucleic acid

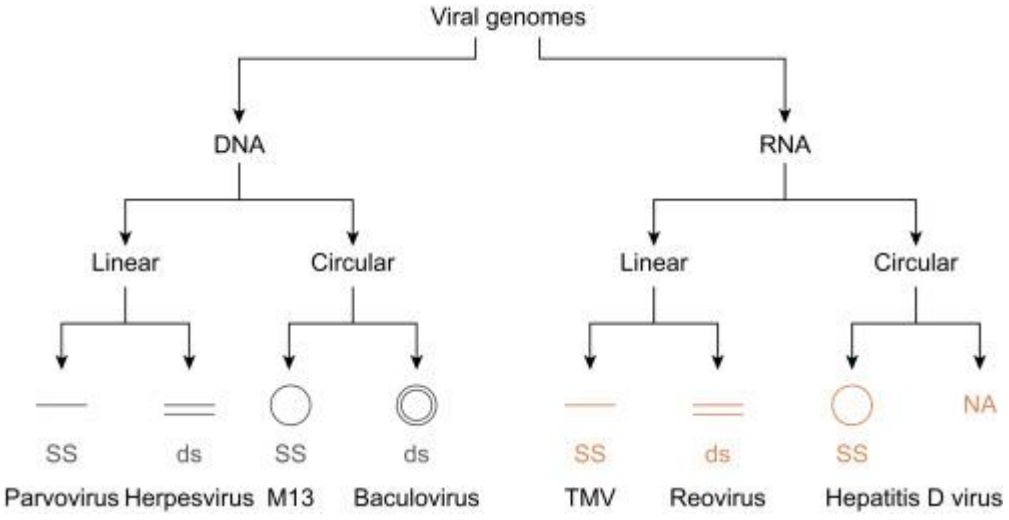
A-DNA

a- Circular
b- Liner
c- Single strand (SS)
d- Double strand (DS)

B-RNA

RNA viruses either positive polarity or negative polarity, the first one means that the sequence of virus and mRNA are the same, so act as mRNA. The second one means the virus is apposite of mRNA, so it needs to transcript to mRNA

a- Segmented
b- Non-segmented
c- SS
d- DS



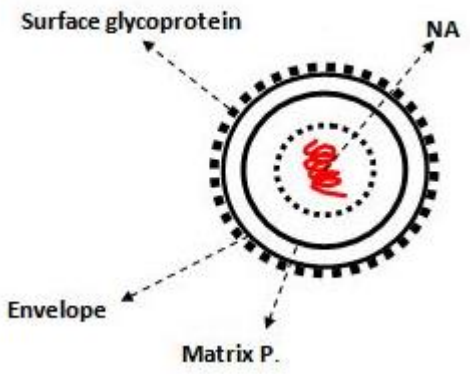
2-capside

The capside protects the genome of virus from external factors that affect the virus, such as nucleases of the host cell. It also interacts with receptor binding protein on the surface of the host cell.

The capside consist of just protein coat or shells which in mainly composed of morphological unit name as capsomeres and they consist of either single protein or several protein.

According to capside, the viruses can classify in to two groups envelope and non-envelope (naked) viruses.

A-**envelope virus**: it consists of in addition to nucleocapside, there is a layer of phospholipase surrounding the nucleocapside and this envelope derived from plasma membrane of the host cell during release of the virus after replication of the virus. Some of the envelope viruses consist of matrix proteins or surface glycoprotein which projected as a spike on lipid bilayer.



B-**naked virus**: it consist of nucleocapside only, which means nucleic acid and capside.

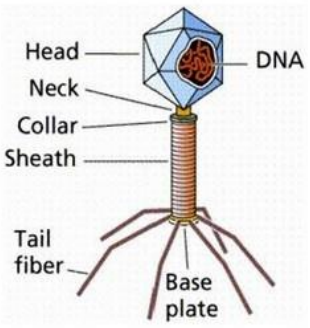
Some non-envelope viruses have internal proteins which are: structural protein act as matrix and non-structural protein as polymerase enzyme which are responsible for replication of the viral nucleic acid.

Symmetric types of viruses

1- Icosahedral (isometric) symmetry

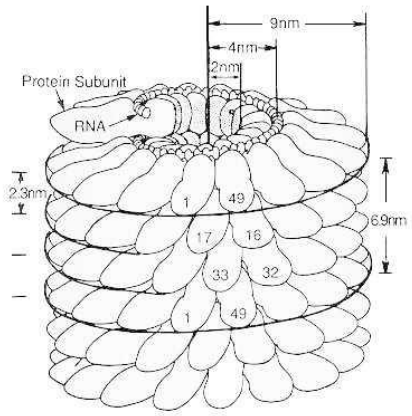
They Contain 12 vertices and 20 triangular faces, ex. Herpes virus and Adeno Virus.

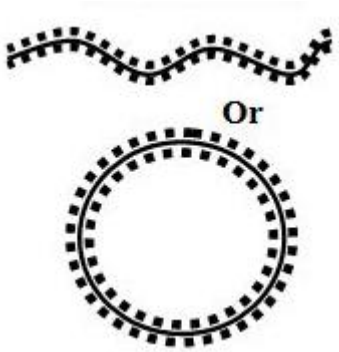
2- Complex symmetry: Some virus are more complex, being composed of several separate capsomere with separate shape and symmetry, may possess extra structures such as protein tails or a complex outer walls Ex. Pox virus.



3- Helical symmetry

The capsomeres arranged around the coiled nucleic acid, ex. Influenza and parainfluenza virus.





Effect of physical and chemical agents

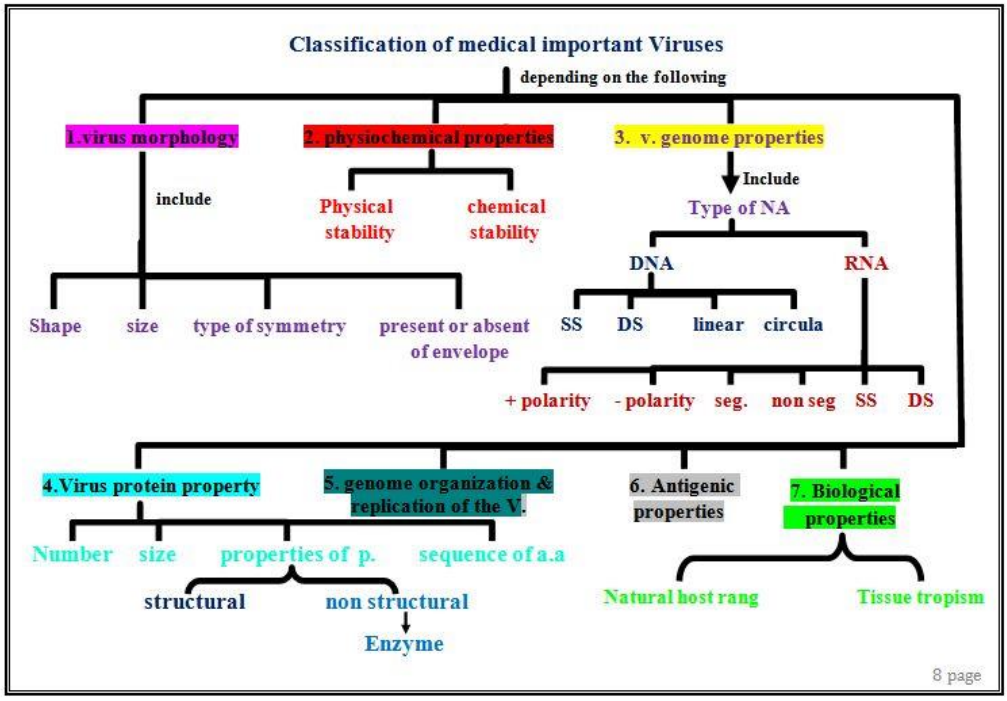
1- **Temperature: envelope viruses are heat labile more than non-envelope virus, the viruses can destroy or survive as follow:**

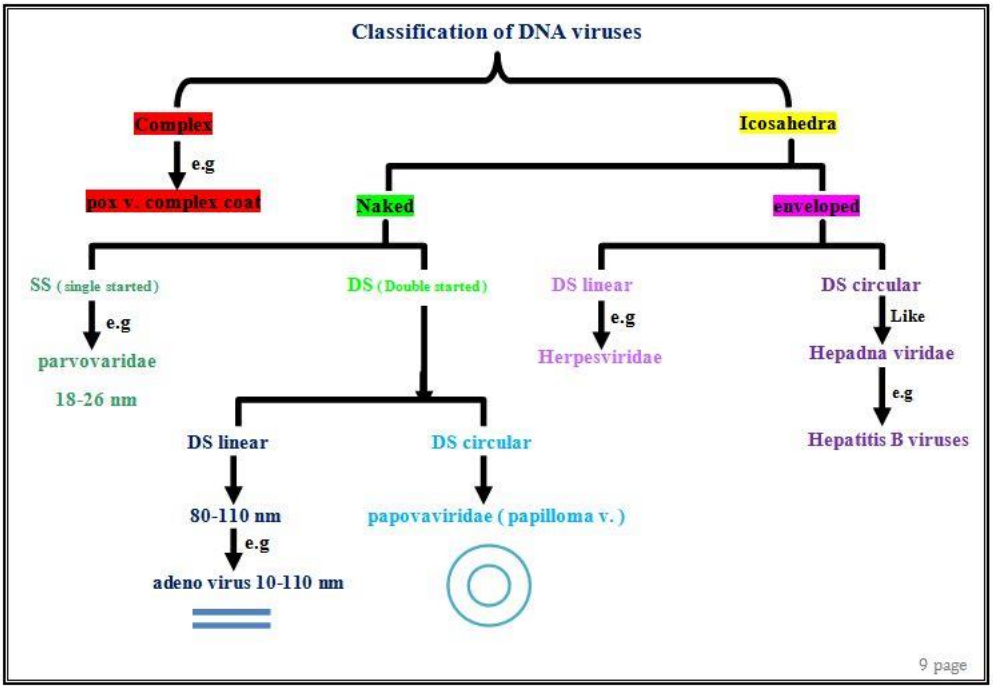
Time	Temperature (C^o)
1 s	60
2 m	37
1 h	20
1 d	4
1 y	-70

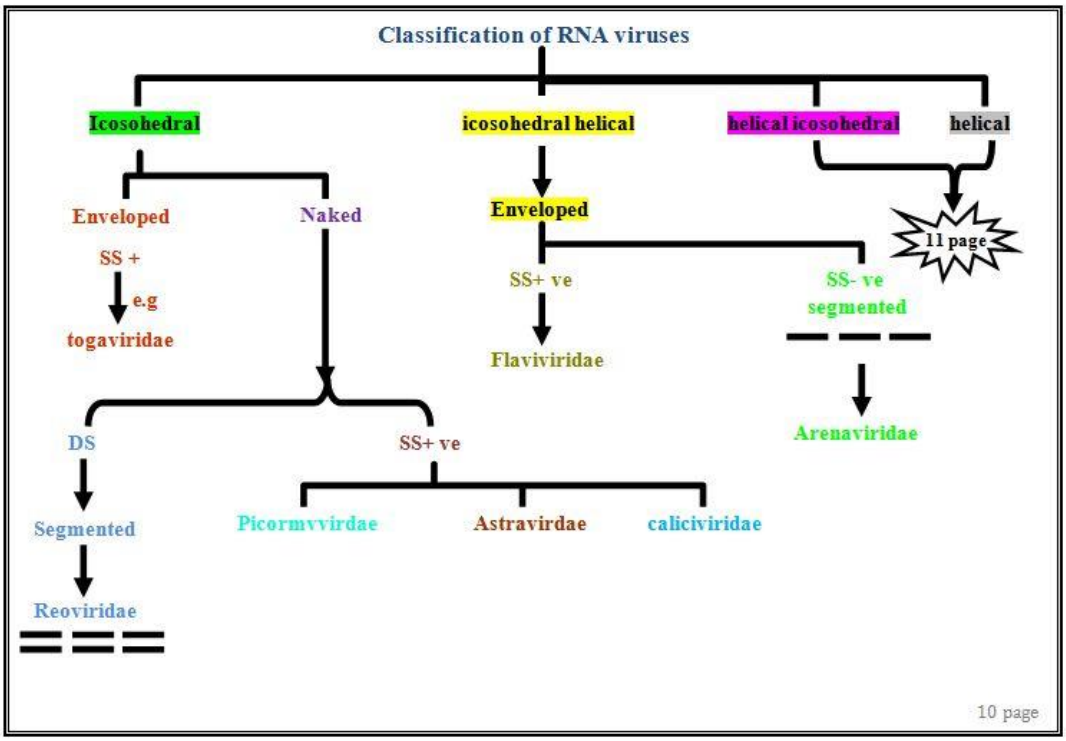
2- **pH: neutralized pH is needed but they were destroyed or killed by change pH.**
3- **Lipid solvent: ether, chlorophorm, and detergent can destroy the viruses.**
4- **Salt: the salt is used as virus stabilizer as preservative material added to vaccine. Ex. $MgCl_2$ and $MgSo_4$**
5- **Radiation: causes inactivation of viruses. Ex. UV. X Ray**

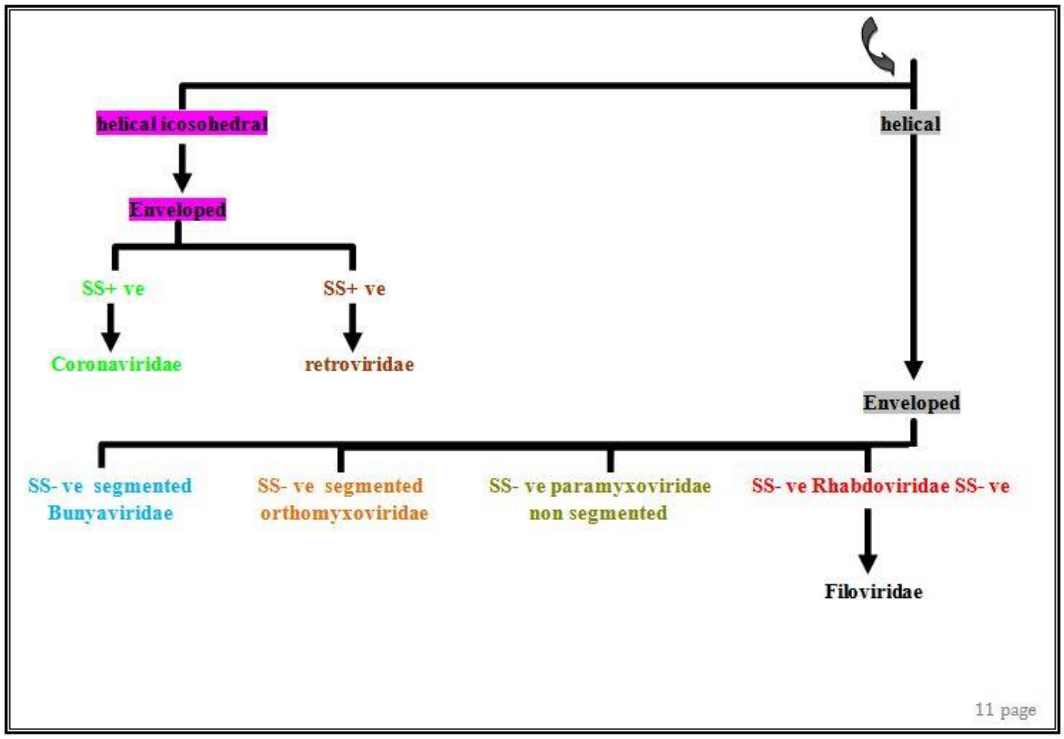
6- Formaldehyde: the viruses killed by destroying nucleic acid (preparation of killed vaccine).

Note: the antibiotics are not effect on viruses






Classification of RNA viruses
Icosohedral
icosohedral helical
helical icosohedral
helical
Enveloped
Naked
SS +
e.g
togaviridae
Enveloped
SS+ ve
Flaviviridae
11 page
SS- ve
segmented
Arenaviridae
DS
SS+ ve
Segmented
Reoviridae
Picornvvirdae
Astravirdae
caliciviridae
10 page


helical icosohedral
helical
Enveloped
SS+ ve
SS+ ve
Coronaviridae
retroviridae
Enveloped
SS- ve segmented
Bunyaviridae
SS- ve segmented
orthomyxoviridae
SS- ve paramyxoviridae
non segmented
SS- ve Rhabdoviridae SS- ve
Filoviridae
11 page