Lecture 1.

Viruses : Are smallest infection agents (range from about 20nm -300nm in diameter) containing only one kind of nucleic acid as their genome, surrounded by protein shell. The viral particle has ability to replicate only inside living host cell and cause infection diseases.

Note.

* The term virus , Which come from the Latin word for poison .

* Because the viruses pass through bacteria filters, therefore the viruses were known as (filterable viruses) .

General properties of viruses :

Virus are unlike any other forms of organisms . They are different from other infection organisms in the following specific properties :

1-Viruses possession of only one type of nucleic acid , ether DNA or RNA , but never both .

2- Viruses are not considered as cell because they do not have a cellular composition and inert metabolically .They lack cellular organelles such as :nucleus ,cytoplasm ,mitochondria , ribosome ,Golgi apparatuses and endoplasmic reticulum .

3- Viruses are not capable of independent replication ,but they replicate only within living host cell ,therefore they are known as obligate intracellular parasites.

4-All Viruses are pathogenic and the viruses infect all types of organisms in nature such as (animals ,plants , fungi , bacteria).

5- Viruses can not seen by light microscope (therefore the viruses termed as sub microscope agents),but they can seen by electronic microscope fig(1).

6- Viruses are unaffected by antibiotic agents but sensitive to antiviral chemotherapy agent and interferon .

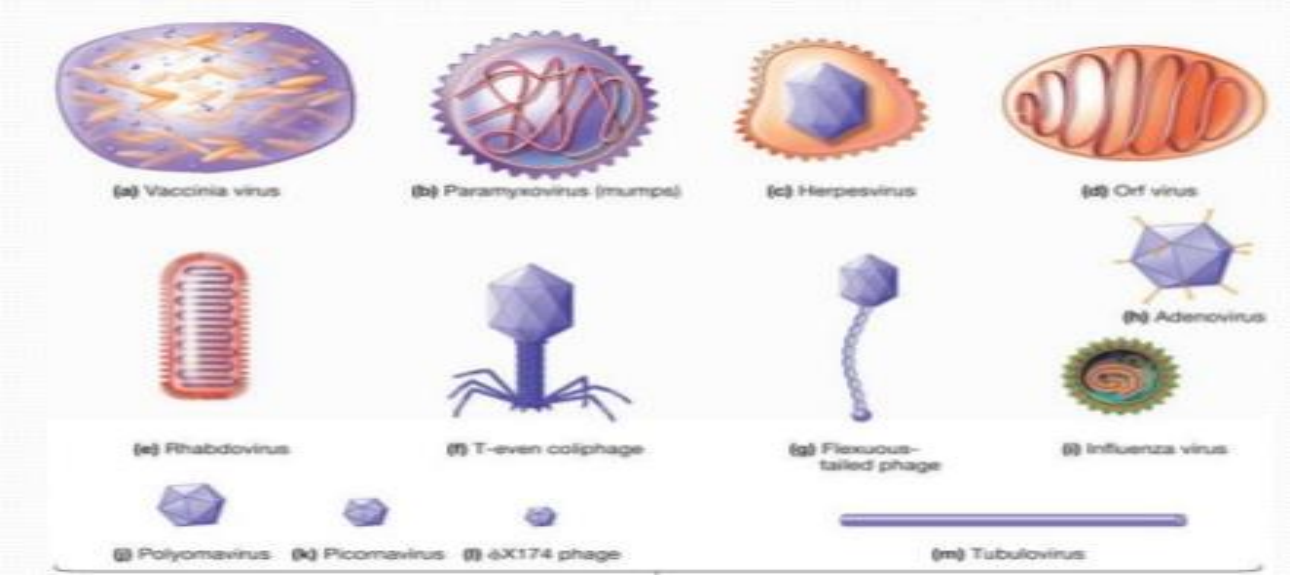


Figure (1): The size and morphology of selected virus

Structure of virus :

The main components of viral particle are nucleic and protein :

1- Nucleic acid (viral genome):

The viruses have central core of nucleic acid , which is either DNA or RNA but not both ,therefore the viruses can be divided according to type of nucleic acid into two groups :DNA viruses and RNA viruses .

The nucleic acid is important part of virus structure because it represent infective particle .

Viral nucleic acid can be either single stranded (ss) or double stranded (ds), linear or circular , segmented or non-segmented genome .

All DNA viruses have dsDNA (except parvovirus /have ssDNA),While most RNA viruses possess ssRNA (except reovirus are dsRNA).

Nucleic acid of most DNA viruses and RNA viruses is linear ,but in some DNA viruses and RNA is circular .

DNA genome always a single molecule (non segmented) , whereas RNA genome can exist either single molecule (segmented) or multiple molecules (segmented).

All viruses contain single copy of genome (haploid), except retrovirus have two copies of RNA (diploid) .

2-Capsid (protein shell):

The central core is surrounded by protein coat which called capsid . The capsid made up number of subunits called capsomeres .Each capsomeres consisting of one or several protein known as promoters .

* The capsid serves several important functions:

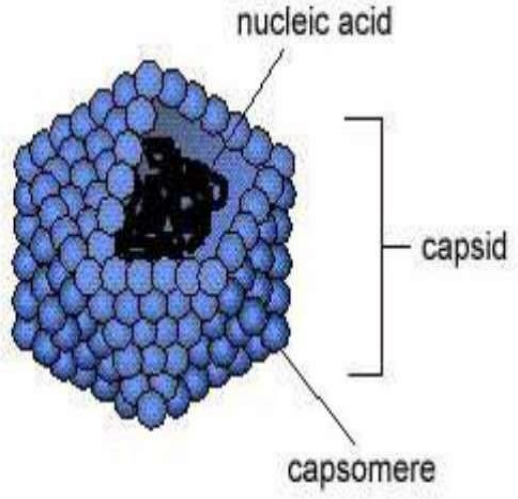
1-The capsid gives shape of virus .

2-Protect viral genetic material from external harmful effect .

3- Mediated attachment of viruses to specific receptor on surface of host cells .

4-Acts as antigen that induce neutralizing antibodies and activate cytotoxic T- cell to kill virus infected cells.

The unite composed of together (nucleic acid and capsid protein) is called **nucleocapsid or nucleoprotein (NP) .**



Other structures:

***Envelope:** Certain DNA virus and most RNA viruses are enveloped. The other viruses are non-envelope (nacked). The envelope is consist from lipoprotein which derived from cell membrane of infected cell when virus released by budding from infected cell (except herpes viruses envelope which derived from nuclear membrane of infected cell) .

***Spikes :**the envelope of certain virus may be covered with projecting spikes (glycoprotein), which called peplomeres .

Function :

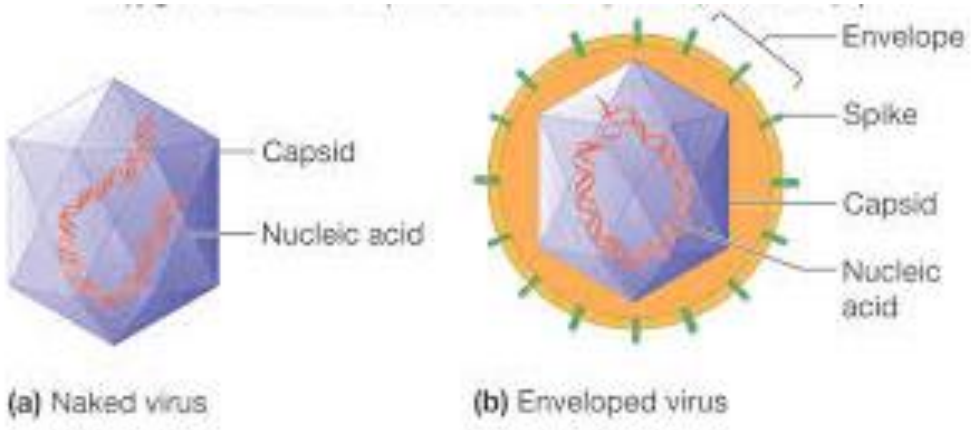
***-As the binding site ..the spike of envelope virus attach to the host cell receptor .**

*** Have antigenicity … enveloped glycoprotein are also important antigens .**

*** Confer instability on the virus … envelop virus are more sensitive to the heat and lipid solvent .**

***Non-structural protein :**most viral protein are structural , while other proteins are functional such as viral enzymes , essential for replication of viruses.

The complement structural unite of entire virus particle is called virion .The mature virion in some virus may be consist of only nucleocapsid ,whereas in other viruses the virion is more complex ,it includes nucleocapsid plus surrounding envelop with or without spikes .The virion is mature infectious particles , by which the virus invade other cells.

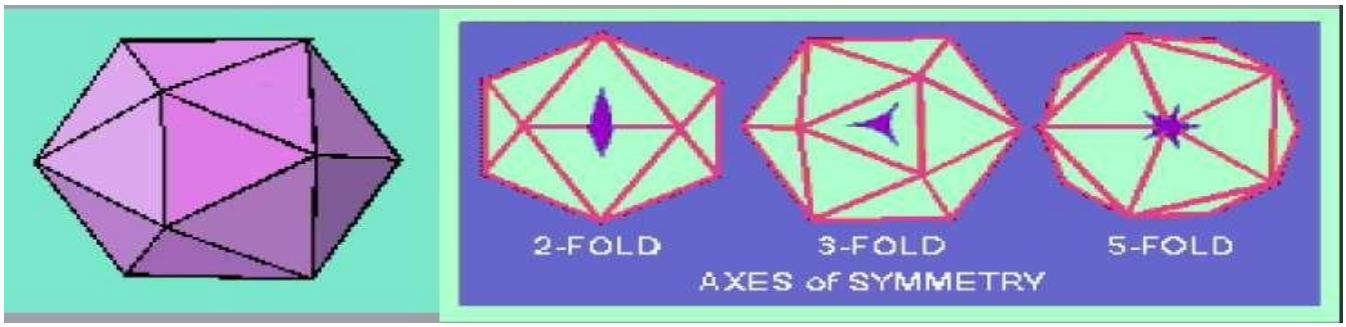


Figure(2):Generalized structure of virus

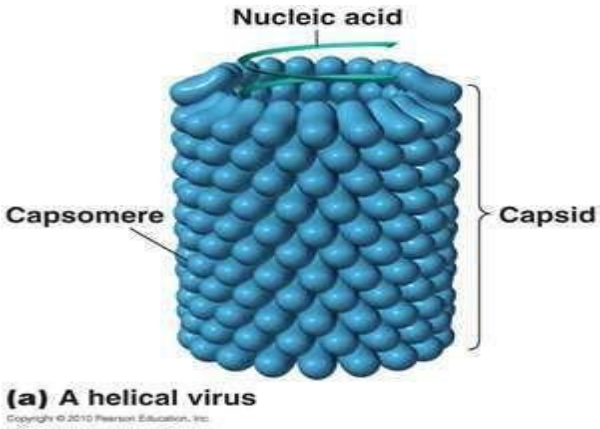
Symmetry types of virus particles:

The symmetry depending up on the ways in which the capsomeres are arrangement .

1-Icosahedral symmetry (cubical symmetry):is cubic multiple faces (polyhedral), in which the capsomeres are arranged in pattern consisting of multiple triangular faces. Most DNA virus and some RNA virus have Icosahedra symmetry . e.g .Herpes viruses ، Adenoviruses.

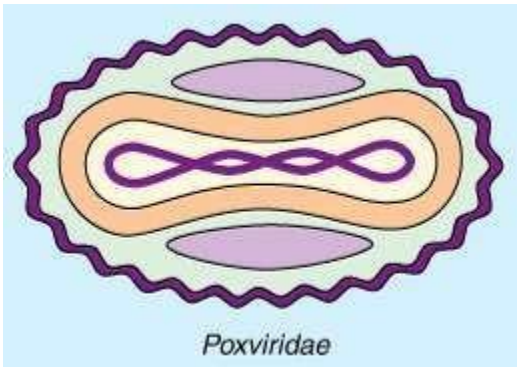


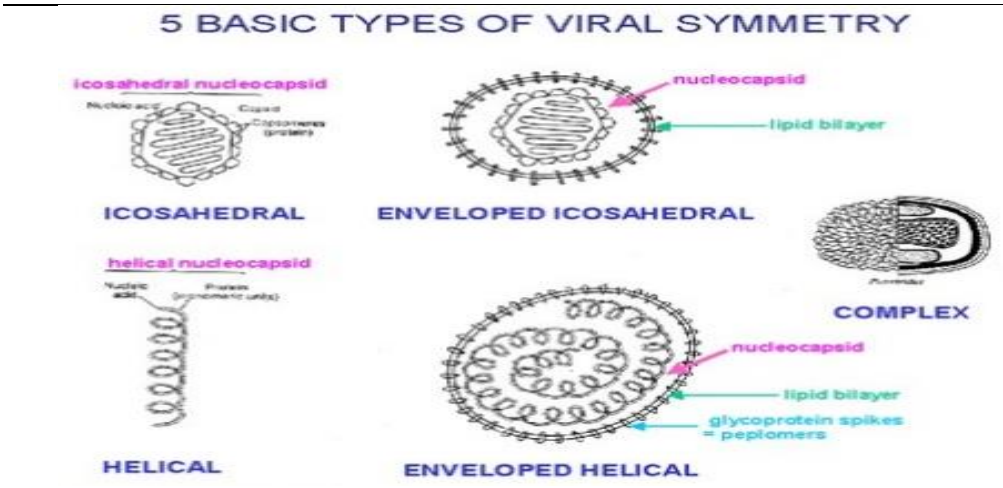
2-Helical symmetry: In which the capsomeres are arranged in spiral from around nucleic acid that appears rod-shape (tubular shape).The helical symmetry found only in RNA viruses . e.g. Influenza viruses



3-Bindal symmetry: This type of symmetry show both icosahedral (cubical) and helical symmetry . but with the same virion like bacteriophage , when the head is cubical and the tail is helical .

4-Complex symmetry: Most animal viruses show either helical or cubical symmetry but pox viruses have exceptional and either ultra structure appears to be complex .Some pox viruses are brick-shape .while other are ovoid and the DNA is contained in nucleoid , shape like a biconcave disc and surrounded by one or more membranes .





Atypical virus – like agents :

- **Defective virus:** are composed of viral nucleic acid and protein , but cannot replicate without co-virus (helper virus) because missing some functional , such as certain adenovirus and hepatitis –D virus are Defective virus.
- **Pseudoviruses :** the virus particle contains host cell DNA instead of viral DNA within capsid .They are formed during infection of host cell. peudovirus can infect cells but they don't replicate .
- **Viriod :** consist of only single molecule of circular ssRNA without protein coat or envelope. They replicate and cause several diseases in plant but not in human .
- **Prion :** is infectious particle that is composed only protein .this protein has ability to cause disease . this prion disease are called spongiform encephalopathies because it is responsible for the transmissible of spongiform encephalopathies, include creutzfeld-jacob disease and bovine spongiform encephalopathy (mad cow disease) and kuru disease in human.

Classification of viruses :

Classical virus classification schemes have been based on the consideration of four major properties of virus:

1-The type nucleic acid which found in the virion (RNA OR DNA)

2-The symmetry and shape of the capsid .

3-The presence or absence of an envelope.

4-The size of the virus particle .

Nomenclature of viruses:

The viruses are classified into groupings which called families ,the family names have the suffix-viridae .Each family ,subdivide into genera .The genus names carry the suffix –virus .

The names of viruses are derived from :

1-The name of disease caused by virus (eg: Influenza virus, Hepatitis virus).

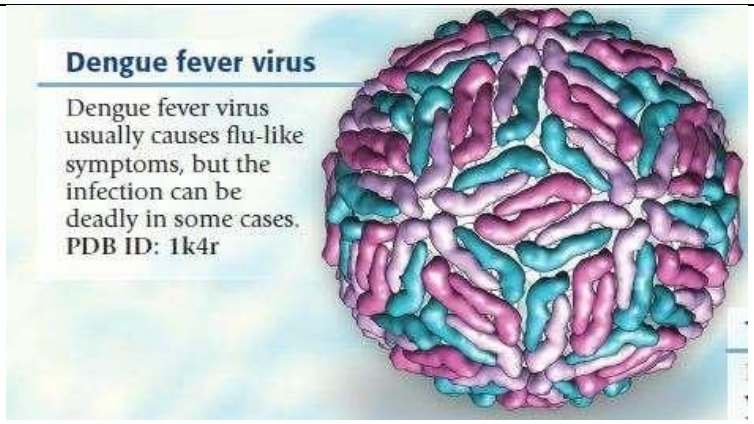
2-The locality where the virus was first isolating (such as :West Nile virus).

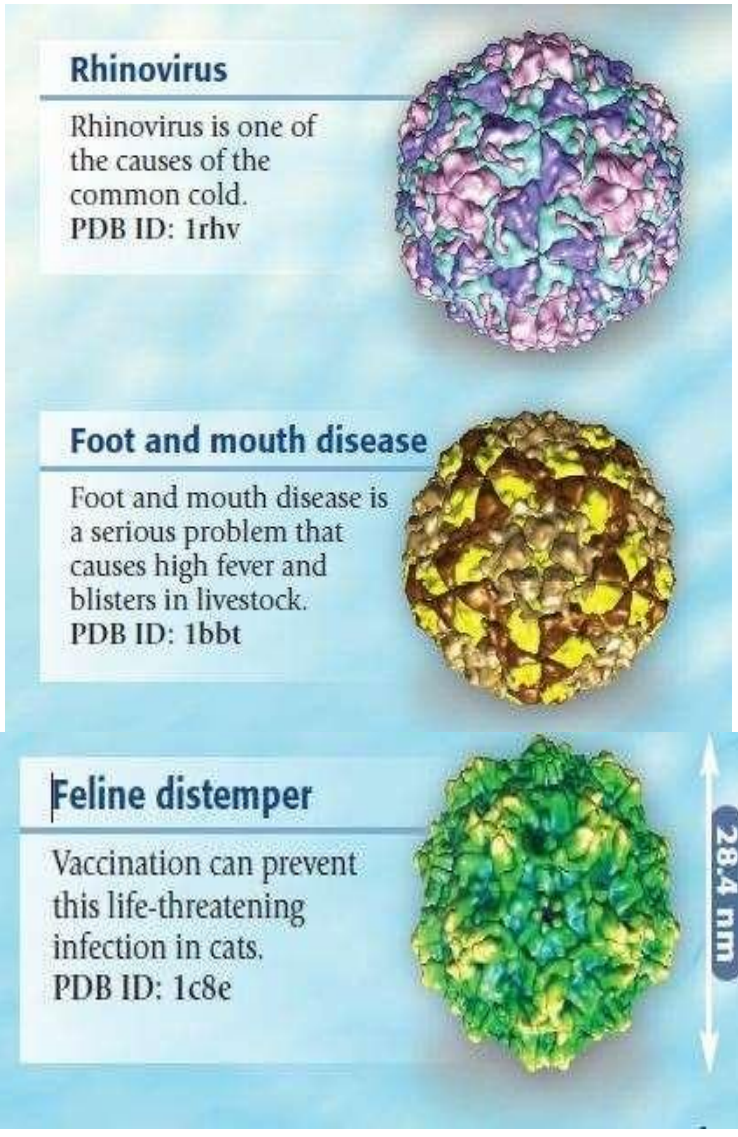
3-The name of scientists responsible for isolating (such as: Epstein-Barr virus).

4-Unique epidemiological characteristics of virus (such as :Arboviruses , these are arthropod –borna viruses).

Virus sizes

Most viruses are much smaller than cells–the ones shown here are all drawn at approximately 900,000x magnification ،ranging from less than 30 nanometers to over 500 nanometers in diameter ١) nanometer = 1 billionth of a meter.


Dengue fever virus
Dengue fever virus usually causes flu-like symptoms, but the infection can be deadly in some cases.
PDB ID: 1k4r


Rhinovirus
Rhinovirus is one of the causes of the common cold.
PDB ID: 1rhv
Foot and mouth disease
Foot and mouth disease is a serious problem that causes high fever and blisters in livestock.
PDB ID: 1bbt
Feline distemper
Vaccination can prevent this life-threatening infection in cats.
PDB ID: 1c8e
28.4 nm

Lecture 2.

Virus Replication

Viruses are obligatory intracellular parasites. They do not possess any machinery which may be of help to them in synthesizing their nucleic acids or proteins the genetic information for which is present in the genome of the virus. The viruses make use of the metabolic machinery of the host cell to undertake these processes.

Genome of RNA or DNA virus exist in a considerable variety of sizes and shapes, from small molecules of single-stranded RNA or DNA to large double – stranded molecules that may be linear or circular . Whatever their physical nature, viral RNA or DNA molecules must be replicated efficiently within an infected cell to provide genome for assembly into progeny virions Steps in the replicative Cycle of viruses are still composed of steps fig (1):

Attachment/Adsorption - penetration - Uncoating - Biosynthesis - Assembly - Release – Maturation

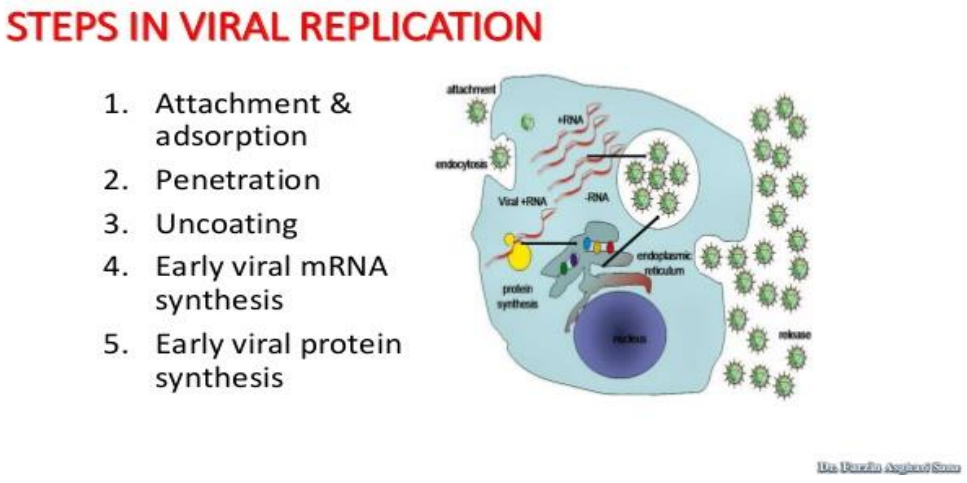


Figure (1):Virus Replication steps

1)Attachment /Adsorption

The virus attaches to the cell membrane of the host cell. It then inject DNA or RNA into the host to initiate infection. Virus attachment consist of specific binding of a viral attachment protein (VAP) to a cellular receptor . Many examples of virus receptor are known. Receptor molecules may be proteins (usually glycoprotein – specific molecules), or the sugar residues present on glycoprotein or glycolipids (less specific). Some complex viruses (e.g Poxviruses, Herpesviruses) may have more than one receptor/receptor – binding protein .

2)Penetration

Unlike attachment, viral penetration is an energy – dependent process, i.e the cell must be metabolically – active for this to occur . Three mechanism may be involved:

- **Translocation** of the entire virion across the cell membrane. Is the process by which the whole non-enveloped virus enters the host cell by moving across the cell membrane.

-**Endocytosis** of the virus into intracellular vacuoles ;eventually into the cytoplasm . is the engulfment of the virus by the invagination of a section of plasma membrane (common in non-enveloped viruses).

-**Fusion** of the viral envelope with the cell. Is the endocytosis of enveloped in which the envelopes of the viruses fuse with the membrane of the endosome. Requires the presence of a viral fusion protein in the

virus envelope e.g influenza hemagglutinin, retrovirus envelope glycoprotein .

3)Uncoating

A general term for the events which occur after penetration, in which the capsid is removed and the virus genome exposed, usually in the form of a nucleoprotein complex.

4)Biosynthesis : Genome replication & Gene expression

The replication strategy of the virus depends on the nature of its genome . Virus can be classified into seven groups :

Genome	Information	Example
1- ds DNA	dsDNA → mRNA	Adenovirus ; Herpesvirus ; poxvirus
2- ss DNA	ssDNA ⇄ dsDNA → mRNA	Parvovirus
3- ds RNA	dsRNA → mRNA	Reovirus ;Birnavirus
4- + ss RNA Serves as mRNA	dsRNA ⇄ +ssRNA (mRNA)	Picornavirus ;Togavirus
5- - ss RNA mRNA template	-ssRNA → +ssRNA → mRNA	Orthomyxovirus ; Rhabdovirus
6-ssRNA with DNA intermediate	ssRNA ⇄ dsDNA → mRNA	Retrovirus
7- dsDNA with RNA intermediate	dsDNA → mRNA ↖ ↘ -DNA ← +RNA	Hepadnavirus

5)Assembly

Involves the assembly of all the components necessary for the formation of the mature virion at a particular site in the cell. During this process, the basic structure of the virus is formed

The site of assembly varies for different viruses e.g:Picornaviruses , Poxviruses ,Reoviruses – In the **cytoplasm** Adenovirus , papovavirus , parvovirus – In the **nucleus** Retrovirus –On **the inner surface of the cell membrane**

6)Release

There are three mechanism by which mature virions can escape from the host cell and start their cycle once again in new host cells. These are:

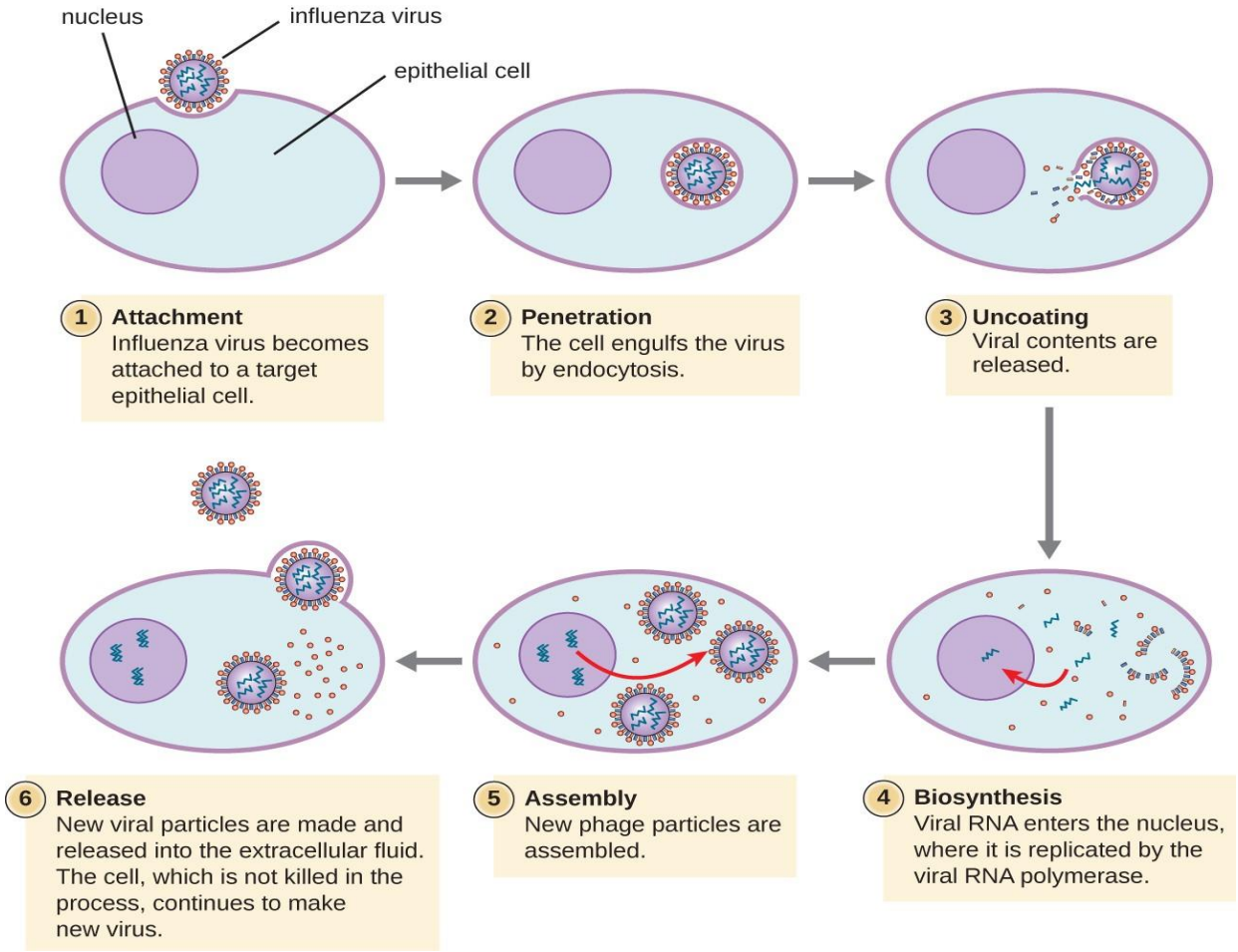
1- Cell lysis : this occurs with most of the non- enveloped viruses when the cell lysis occurs after the completion of the replication of the viruses. This cell lysis is not the result of natural death of the cell but is because of the large number viruses in the host.

2- Cell degeneration : many viruses such as parvoviruses accumulate within the nucleus of the host and are released only after the death of the cell which follows the degradation of the cell.

3- Budding : this is the mechanism by which most of the enveloped viruses exit from the host cell without damaging the cell. This process take a long time and does not kill the host cell.

7)Maturation

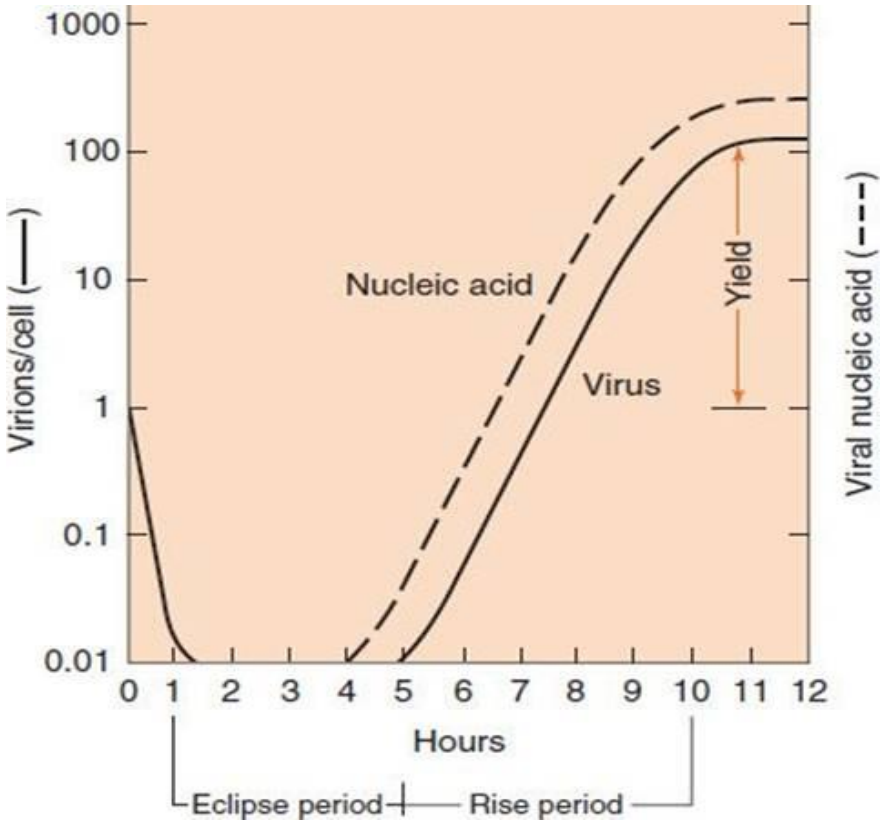
The stage of the life –cycle at which the virus becomes infectious. Usually involved structure changes in the particle , often resulting from specific cleavage of capsid protein to form the mature products, which frequently leads to a conformational change in the capsid, or the condensation of nucleoprotein with the genome . For some viruse, may occur after the virus particles has left the cell.

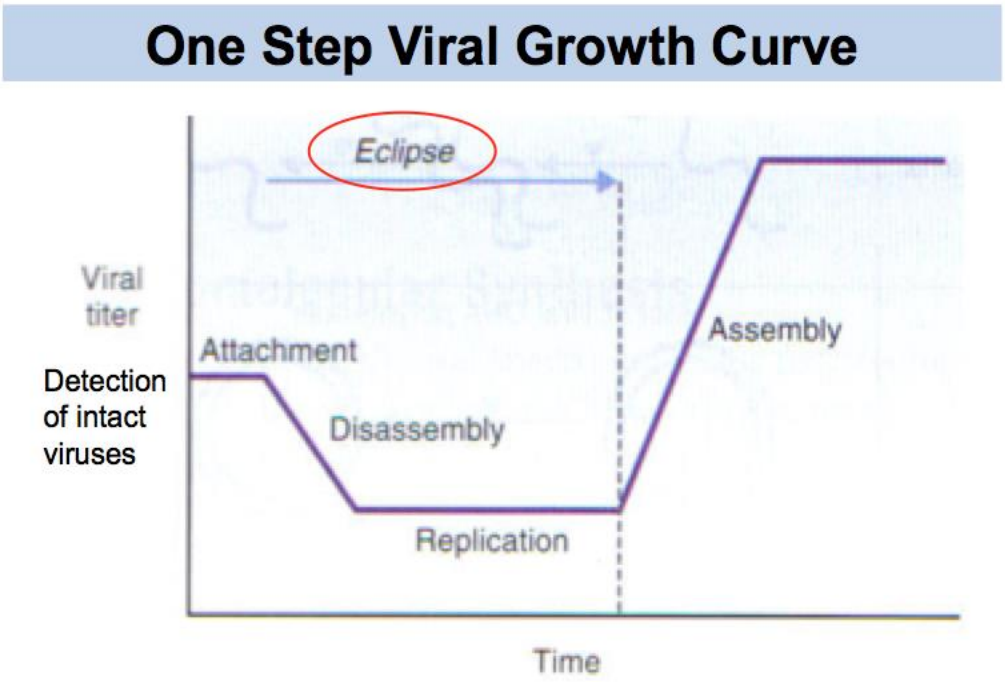


Viral growth curve

The curve shows the amount of virus produced at different times of infection . it was plot the amount of versus the time there will be no virus detected after 3-4 hours from entry to cell (eclipse

period) , mean while there is accumulation of nucleus acid inside the cells , then virus are produced exit from the cell (Rise period). The time required for these periods varies according to the type of virus from 1minute (bateriophage) to 12hours (human virus) .





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Lecture 3.

Pathogenicity of viral infection

Viral pathogenesis : The study of the capability & manner of viruses to infect and cause disease .

Virulence : The degree to which a virus causes disease . strains of virus differ greatly in their ability to cause disease .

Steps of viral pathogenicity

To produce disease, viruses must enter a host, come in contact with susceptible cells (target host), replicate, and produce cellular injury .

Specific steps involved in viral pathogenesis are the following:

- Entry and Primary viral replication.
- Viral spread.
- Virulence and cytopathic effect.

- Host immune response.
- Viral clearance or establishment of persistent infection.
- Viral shedding.

A. Entry and Primary Replication

Most viral infections are initiated when viruses attach and enter cells of one of the body surfaces:

Person to person (direct contact)

- **Skin,**
- **Respiratory tract,**
- **Gastrointestinal tract**
- **Saliva**
- **food and water**
- **Urogenital tract or conjunctiv**.

Mother to offspring :

- Uterus – Across placenta .
- At time of delivery .
- Breast feeding .

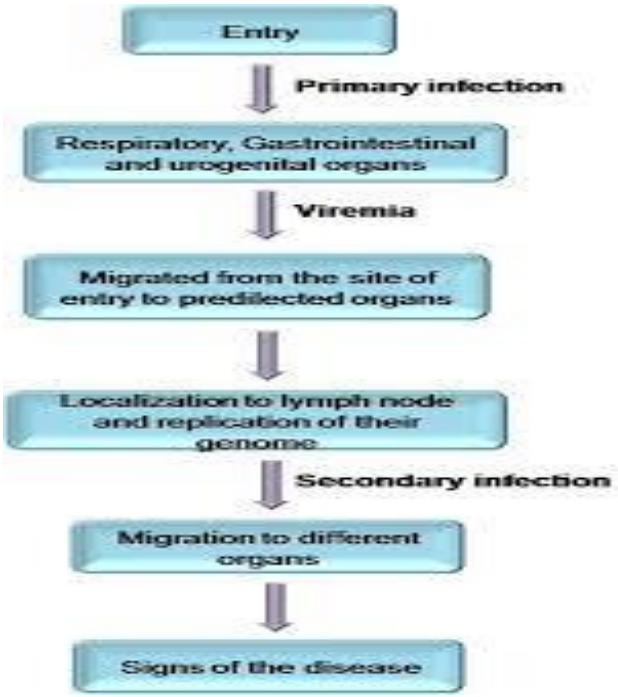
Other viruses can be introduced directly into tissues or the bloodstream through

- **Skin wounds**,
- **Needles** (hepatitis B and C, human immunodeficiency virus [HIV]),
- **Blood transfusions, or insect vectors** (mosquitoes) (arboviruses) .

2) Viral spread & cell tropism

Stages of viral infection Primary infection occurs when virus enters the body through different portals such as epithelial surface of respiratory tract or gastrointestinal tract , migration to the regional lymph nodes the viruses then

enter into the blood streams , the stage is known as **viremia (**Fever & malaise**)**. After entry into the predilected site they start their replication and transmitted to different organ system (liver , spleen , bone marrow) and may shed outside through body secretions, the condition is referred as secondary infection known as **secondary viremia**

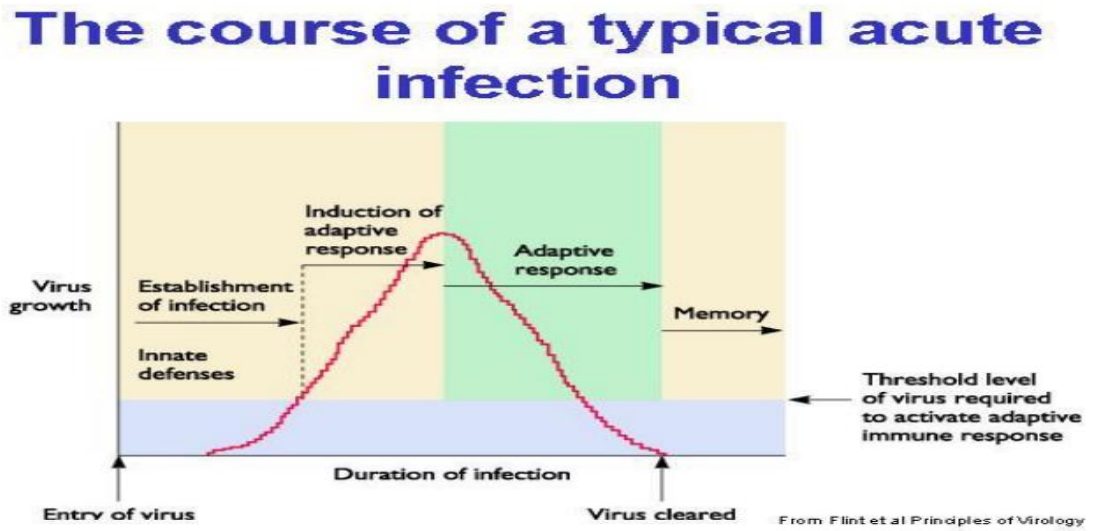


Schematic representation of viral infection from entry to the signs of the disease

3) Patterns of diseases :

1-Acute non persistent disease

- Some viruses, such as influenza viruses (respiratory infections) Produce disease at the portal of entry and typically do not spread systematically.



2-Chronic persistent viral disease :

involves complex interplay between viral and host immune factors, and the virus may enter a life-long latent state, then reactivate and cause disease months to years later.

- Others can spread to distant sites (eg, cytomegalovirus [CMV], HIV, rabies virus) and cause additional disease manifestations
- Some viruses travel along neuronal axons to spread within the host
- Rabies migrates to the brain,
- Herpes simplex virus [HSV] travels to ganglia to produce latent infection).

Virus shedding:

The last stage in pathogenesis is the shedding of infectious virus into environment . The shedding usually occurs from the body surface involved in viral entry. The shedding occurs at different stages of disease dependent on particular agent involved . In some infections such as rabies, human represent dead-end infection,

and shedding does not occur.

Virus Family	Envelope Present	Capsid Symmetry	Particle Size (nm)	RNA MW ($\times 10^6$)	RNA Structure[1]	Medically Important Viruses
Picornavirus	No	Icosahedral	28	2.5	SS linear, nonsegmented, positive polarity	Poliovirus, rhinovirus, hepatitis A virus
Hepevirus	No	Icosahedral	30	2.5	SS, linear, nonsegmented, positive polarity	Hepatitis E virus
Calicivirus	No	Icosahedral	38	2.7	SS linear, nonsegmented, positive polarity	Norovirus
Reovirus	No	Icosahedral	75	15	DS linear, 10 or 11 segments	Rotavirus
Flavivirus	Yes	Icosahedral	45	4	SS linear, nonsegmented, positive polarity	Yellow fever virus, dengue virus, West Nile virus, hepatitis C virus
Togavirus	Yes	Icosahedral	60	4	SS linear, nonsegmented, positive polarity	Rubella virus
Retrovirus	Yes	Icosahedral	100	7[2]	SS linear, 2 identical strands (diploid), positive polarity	HIV, human T-cell leukemia virus
Orthomyxovirus	Yes	Helical	80–120	4	SS linear, 8 segments, negative polarity	Influenza virus
Paramyxovirus	Yes	Helical	150	6	SS linear, nonsegmented, negative polarity	Measles virus, mumps virus, respiratory syncytial virus
Rhabdovirus	Yes	Helical	75 × 180	4	SS linear, nonsegmented, negative polarity	Rabies virus
Filovirus	Yes	Helical	80[3]	4	SS linear, nonsegmented, negative polarity	Ebola virus, Marburg virus
Coronavirus	Yes	Helical	100	10	SS linear, nonsegmented, positive polarity	Coronavirus
Arenavirus	Yes	Helical	80–130	5	SS circular, 2 segments with cohesive ends, negative polarity	Lymphocytic choriomeningitis virus
Bunyavirus	Yes	Helical	100	5	SS circular, 3 segments with cohesive ends, negative polarity	California encephalitis virus, hantavirus
Deltavirus	Yes	Uncertain[4]	37	0.5	SS circular, closed circle, negative polarity	Hepatitis delta virus

[1]SS = single-stranded; DS = double-stranded.
[2]Retrovirus genome RNA contains two identical molecules, each with a molecular weight (MW) of 3.5×10^6.
[3]Particles are 80 nm wide but can be thousands of nanometers long.
[4]The nucleocapsid appears spherical but its symmetry is unknown.

Classification of medically important viruses

Virus	Genome	Polarity	Segments	Morphology	Enveloped	Diseases
Picorna	RNA	+ss	1	Icosahedral	No	Polio, Hepatitis A, Colds
Toga	RNA	+ss	1	Icosahedral	Yes	Encephalitis, Rubella
Retro	RNA	+ss	1+1	Icosahedral	Yes	AIDS
Orthomyxo	RNA	-ss	6-8	Helical	Yes	Influenza
Paramyxo	RNA	-ss	1	Helical	Yes	Parainfluenza, Mumps, Measles
Rhabdo	RNA	-ss	1	Helical	Yes	Rabies
Papova	DNA	ds	1	Icosahedral	No	Warts
Adeno	DNA	ds	1	Icosahedral	No	Respiratory Infections
Herpes	DNA	ds	1	Icosahedral	Yes	HS, VZ, Cancer Mononucleosis,
Pox	DNA	ds	1	Complex	Yes	Smallpox
Hepatitis B	DNA	ds	1	Icosahedral	Yes	Serum Hepatitis

Lecture 4.

VACCINE

The term vaccine was derived from "vaccine" meaning cow , which Edward Jenner demonstrated in 1798 could prevent smallpox in humans, **the term "vaccine :all biological preparations, produced from living organisms, that enhance immunity against disease or in some cases treat disease (therapeutic vaccines)** .Vaccines are administered in liquid from , either by injection, by oral or by intranasal routes . When the immune system recognizes a foreign antigen for the first time, an immune response is produced .

Type of vaccines:

A.KILLED VACCINES:

When it is unsafe to use live microorganisms to prepare vaccines. They are killed or inactivated .These are preparations of the normal infectious, Pathogenic microorganisms that have been rendered nonpathogenic usually by treatment with using **heat** , **formaldehyde or gamma irradiation** so that they cannot replicate at all such killed vaccines vary greatly in their efficacy .

Advantage :

1-Safe to use and can be given to immunodeficient and pregnant individuals .

2-Cheaper than live attenuated vaccines .

3-Storage not as critical as live vaccine .

Disadvantage :

1-Since the microorganisms cannot multiply, a large number are required to stimulates immunity.

2-Periodie boosters must be given to maintain immunity .

3-Only humeral immunity can be induced .

4-Most killed vaccines have to be injected.

B.LIVE ATTENUATED VACCINE:

These vaccines are composed of live, attenuated microorganism that cause a limited infection in their hosts sufficient to induce an immune response, but insufficient to cause disease. To make an attenuated vaccine, the pathogen is grown in foreign host such as animals, embryonated eggs or tissue culture, under condition that make it less virulent . These vaccine may be given by injection or by the oral route . A major advantage of live virus vaccines the nature stimulus to the immune system .

Advantage :

1-Infectious microbes can stimulate generation of memory cellular as well as humeral immune response .

2-Since these can multiply in the host, fewer quantities must be injected to induce protection .

3-A single administrated of vaccine often has a high efficacy in producing long –lived immunity –multiply booster doses may not be required.

4-Whole microbes stimulate response to antigens in their natural conformation. They raise immune response to all protective antigens.

5-Some live vaccines can be given orally : such vaccines induce mucosal immunity and IgA synthesis, which gives more protection at the normal site of entry .

6-Oral preparation are less expensive than giving injection .

7-They can lead to elimination wild type virus from the community.

Disadvantage :

1-May very rarely revert to its virulent from and cause disease.

2-Live vaccine cannot be given safely to immunosuppressed individual .

Administrated of live attenuated vaccines to people with impaired immune function can cause serious illness or death in the vaccine recipient

3-Since they are live and because their activity depends on their viability , proper storage is critical.

C. SUBUNIT VACCINES :

Subunit vaccines contain purified antigens instead of whole organisms .Such a preparation consist of only those antigens that elicit protective immunity .

subunit vaccines are composed of toxoids, sub cellular fragments, or surface antigens . Administration of whole organisms as in case of pertussis was found unfavorable immune reaction in several side effects . The effectiveness of subunit vaccine in increased by giving them in adjuvant

.Adjuvants slow antigen released for a more sustained immune stimulation .

F. DNA VACCINES

These vaccines are still in experimental stage . like recombinant vaccines, genes for the desired antigen are located and cloned . The DNA is injected into the muscle of the animals being vaccinated . It is also possible to introduce DNA into nasal tissue in nose dopes .Some muscle cells express the pathogen DNA to stimulate the immune system.DNA vaccines have indused both humoral and cellular immunity.

Advantage :

1-DNA is very stable, it resists extreme temperature and hence storage and transport are easy

2-A DNA sequence can be changed easily in the laboratory .

3-The inserted DNA does not replicate and encodes only the protein of interest .

4-There is no protein component and so there will be no immune response against the vector itself

Disadvantage :

1-Protein integration of DNA into host genome leading to insertion mutagenesis.

2-Induction of autoimmune responses: anti-DNA antibodies may be produced against introduced DNA .

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Lecture 5.

ORTHOMYXOVIRUSES (INFLUENZA VIRUSES)

Are major determinant of morbidity and mortality caused by respiratory disease and outbreaks of infection sometimes occurs in worldwide epidemics , three immunological types of Influenza viruses are known designated A , B , (contains human and animal) and C (contains human and swine).

Characterize :

1 - Influenza virus particles are usually spherical and about 100 nm in diameter .

2 - Orthomyxoviruses is a family of RNA

3 –Include five genera A , B , C , Tagoto virus and Isa virus.

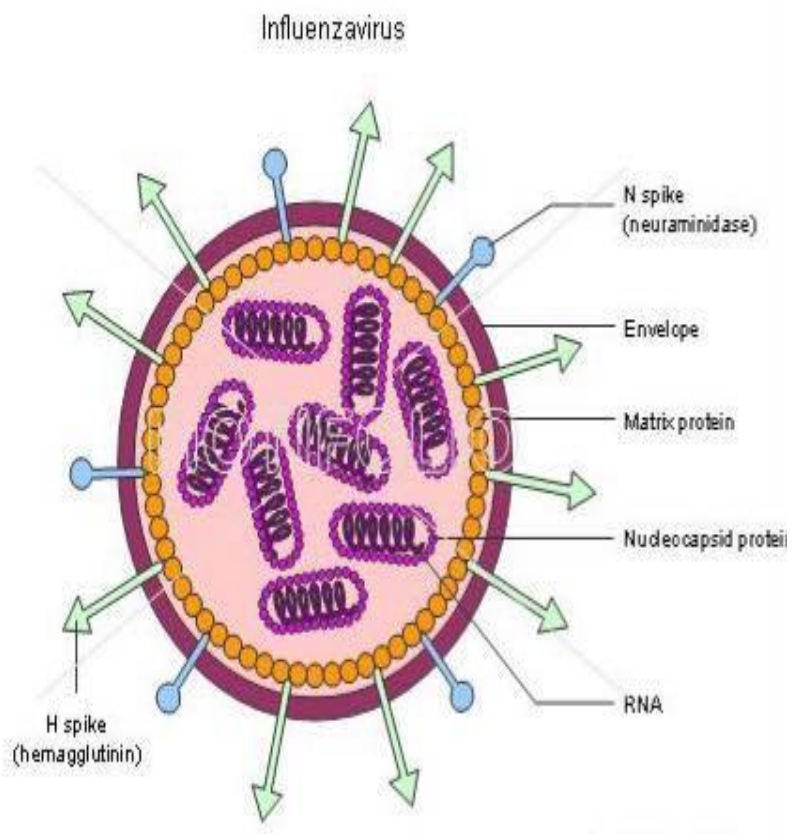
4 - Influenza virus particle contain 9 different structural proteins

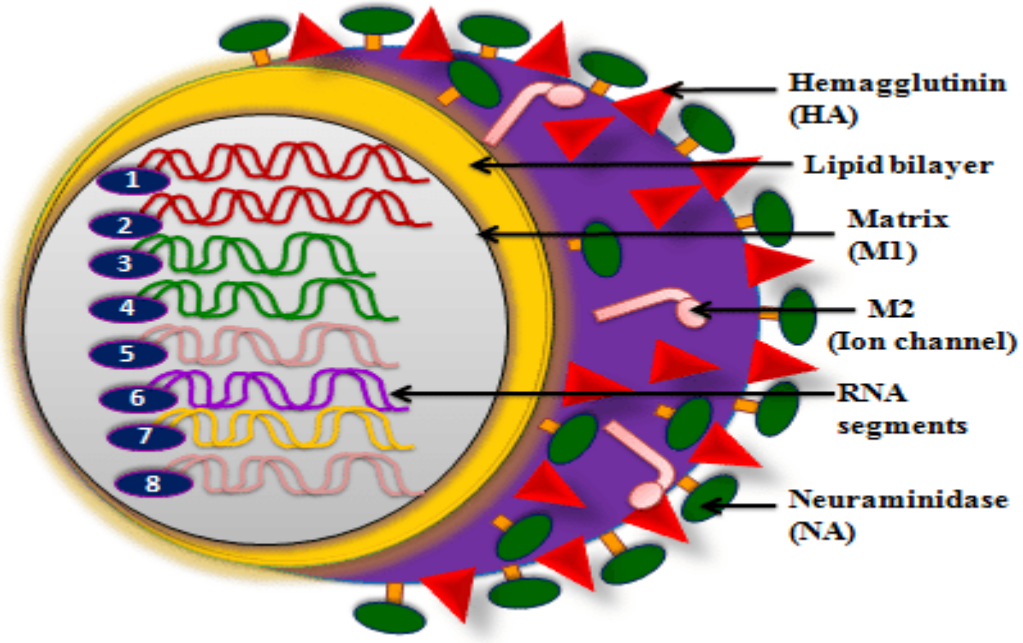
5 - It has a lipid envelope derived from the cell surrounds .

6- Influenza virus particle have 2 virus-encoded glycoproteins, the hemagglutinin (HA) and neuraminidase (NA) are inserted into the envelope these 2 surface glycoproteins are the important antigens that determine antigenic variation of influenza viruses & host immunity .

Table 1: Morphological and genetic features of Influenza viruses

Character	Influenza A	Influenza B	Influenza C
Genetic structure	8 segments	8 segments	7 segments
Viral proteins	11 total	11 total	9 total
Unique viral protein	M2	NB	HEF
Antigenic determinants	HA and NA	HA and NA	HA and NA
Genetic change	Antigenic shift and drift	Antigenic drift	Antigentic drift
Host range	Avians, Humans, Swine,Mammals Marine, Horses	Humans	Humans, Swine
Human epidemiology	Pandemics and seasonal epidemics	Seasonal epidemics	No seasonality





Structure of Influenza virus

Clinical Finding

Influenza attacks mainly the upper respiratory tract it poses a serious risk for the elderly , the very young , and people with underlying medical conditions such as lung , kidney , or heart problems , diabetes and cancer.

Lab. Diagnosis

A- Isolation and identification of virus :

Nasal washings , gargles , and throat swabs are the best specimens for viral isolation and should be obtained within 3 days after the onset of symptoms. Classically embryonated eggs and primary monkey kidney cells have been the isolation methods of choice for influenza viruses.

B- Serology :

Antibodies to several viral proteins (HA , NA) are produced during infection with Influenza virus , the immune response against the HA glycoprotein is associated with resistance to infection. Routine

serodiagnostic test in use are based on hemagglutination inhibition (HI) and ELISA (Enzyme Linked ImmunoSorbent Assay). Neutralization test are the most specific and the best predictor of susceptibility to infection but are more unwieldy and more time-consuming to perform than other tests. ELISA test is more sensitive than other assays.

PARAMYXOVIRUSES & RUBELLA VIRUS

The paramyxoviruses include the most important agents of respiratory infectious of infants and young children (parainfluenza virus). The WHO estimates that acute respiratory infections and pneumonia are responsible every year worldwide for the death of 4 million children under 5 years of age , all members of Paramyxoviridae family initiate infection via the respiratory tract , replication of
the respiratory pathogens is limited to the respiratory epithelia.

Characterizes :

1-The morphology of the paramyxoviridae is pleomorphic with particles 50 nm or more in diameter occasionally ranging up to 700 nm .

2- The envelope seems to be fragile making virus particles labile to storage conditions .

3-The viral genome is linear , negative-sense single stranded RNA , non-segmented , about 15 kb in size.

4-Most paramyxoviruses contain six structural proteins , three proteins are complex with viral RNA and three proteins participate in the formation of the viral envelope .

5-The envelope contains viral hemagglutinin (HN) glycoprotein which sometimes carries neuraminidase activity and fusion (F) glycoprotein.

Lab. Diagnosis

A- Antigen detection :

Direct identification of viral antigens in specimens is commonly done , antigens may be detected in exfoliated nasopharyngeal cells by direct or indirect immuno fluorescences tests , these methods are rapid but less sensitivity than viral isolation and must be carefully controlled.

B- Isolation and identification of virus :

Nasal washes are good specimens for viral isolation. Bronchoalvelor fluid and lung tissue have also been used. Primary monkey kidney cells are the most sensitive for isolation of parainfluenza viruses.

C- Serology :

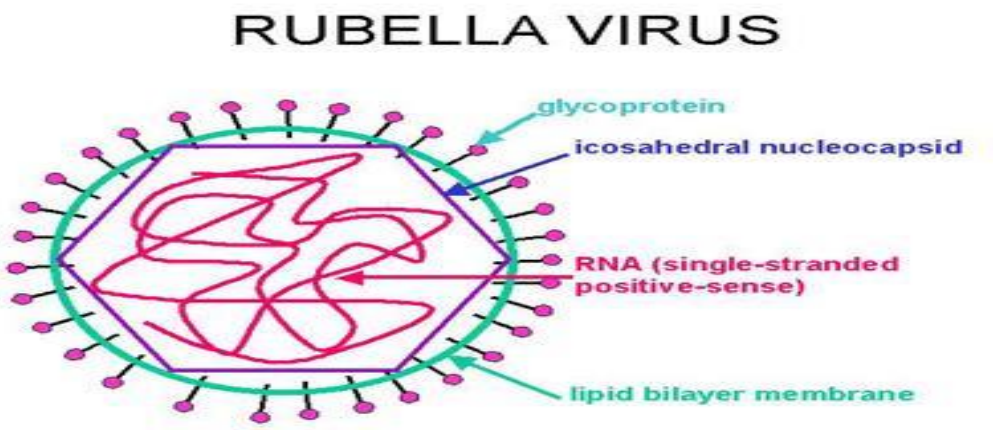
Antibody can be measures using Neutralization test (Nt) , Haemagglutination inhibition (HI) , or ELISA test.

RUBELLA (GERMAN MEASLES)

Is an acute febrile illness characterized by a rash and lymphadenopathy that effects children and young adults. It is the mildest of common viral exanthems however , infection during early pregnancy may result in serious abnormalities of the fetus including congenital malformations and mental retardation the consequences of rubella in utero are referred to as the congenital rubella syndrome.

Characterizes

Rubella a member of the Togaviridae family is the sole member of the genus Rubivirus , Rubella is Positive-sense, single strand RNA, non-segmented, not enveloped virus



Lab. Diagnosis

Clinical diagnosis of rubella is unreliable because many viral infections produce symptoms similar to those of rubella.

A- Isolation and identification of virus :

Nasopharyngeal or throat swabs taken 6 day before and after onset of rash are a good source of rubella virus.

B- Serology:-

The HI test is a standard serologic test for rubella however, serum must be pretreated to remove non-specific inhibitors before testing. ELISA tests are preferred because serum pretreated is not required and they can be adapted to detect specific IgM detection of IgG is evidence of immunity.

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