



RESPIRATORY
VIRAL
INFECTION.
VIRUS OF FLUE
(INFLUENZA)

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RESPIRATORY VIRAL INFECTION

- Respiratory infection means something that affects the lungs and airways (breathing passages)
- Myxovirus

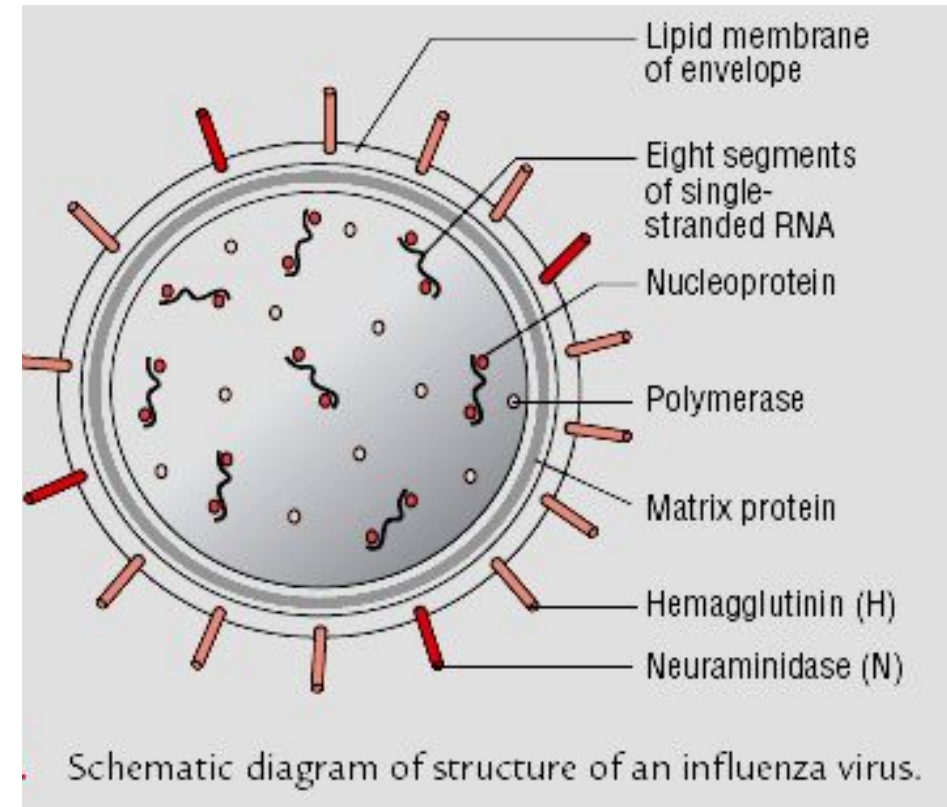
	Orthomyxovirus	Paramyxovirus
DEFINITION	Orthomyxovirus is a single-stranded RNA virus with a segmented genome	Paramyxovirus is a single-stranded RNA virus which has a non-segmented linear RNA genome
GENOME	Genome is segmented - eight RNA segments	Genome is not segmented - linear RNA
SIZE	Smaller (80-120 nm)	Larger (150 - 300 nm)
SURFACE SPIKES	H and N different spikes	H and N same spikes
GIANT CELL FORMATION	No	Yes
DISEASES	Influenza types A, B and C	Mumps, measles, parainfluenza 1-4 infections and RSV diseases

INFLUENZA

- Influenza is a highly contagious viral infection of the nose, throat, and lungs that occurs most often in the late fall, winter, and early spring.
- Incubation period is about 2 days but ranges from 1 - 4 days
- There are 4 types (on the basis of variation in this nucleoprotein antigen) –
 1. influenza A
 - a) Hemagglutinin(HA)
 - b) Neuraminidase(NA)
 2. Influenza B
 3. Influenza C
 4. Influenza D

STRUCTURE

- Shape - Spherical or filamentous
- Envelope –
- ✓ the outer layer - is a lipid membrane , Inserted with 'spikes', which are proteins – glycoproteins ,H (hemagglutinin) and N (neuraminidase). These are the proteins that determine the subtype of influenza virus, Also embedded in the lipid membrane is the M2 protein(channel)
- ✓ inner layer – made up of protein , M1(matrix protein)
- Nucleocapsid – made up of protein
- RNA – single stranded ,antisense



ANTIGEN

Two types of antigens:

- **Group-specific antigens** - The ribonucleoprotein (RNP) antigen, or the “**soluble**” antigen, or the internal antigen is the group-specific antigen.
- **Type-specific antigens** - surface antigen, or “viral” antigen, or “V antigen” is composed of two virus-encoded proteins, HA and NA, which are the type-specific antigens.

Features	<i>Hemagglutinin</i> (HA)	<i>Neuraminidase</i> (NA)
structure	Trimer	Tetramer
Polypeptide	HA 1 and HA 2	
Arrangement	triangular-shaped HA is inserted into the virus membrane by its tail end	mushroomshaped NA is inserted into the virus membrane by its hydrophobic tail end
Binding	neuraminic acid (sialic acid) cell receptor, the cell surface glycoprotein receptor	<i>N</i> -acetyl neuraminic acid or sialic acid residues present on the glycoprotein receptors on red cells
Function	Provide protective immunity	Limit viral spread

Difference between Antigenic Shift & Drift

	Antigenic Shift	Antigenic Drift
1	Major Antigenic Change	Minor Antigenic Change
2	Forming new sub-type	Forming new strain of virus
3	Large change in nucleotides of RNA	Small mutation of RNA
4	Occurs as a results of genome reassortment between difference subtypes.	Occurs as a result of the accumulation of point mutations in the gene.
5	An antigenic change which results in severe alternation in HA (hemagglutinin) or NA (neuraminidase) subtypes.	An antigenic change can alter antigenic sites on the molecule such that a virion can escape recognition by the host's immune system.
6	Large and sudden mutation	Random and Spontaneous Mutation

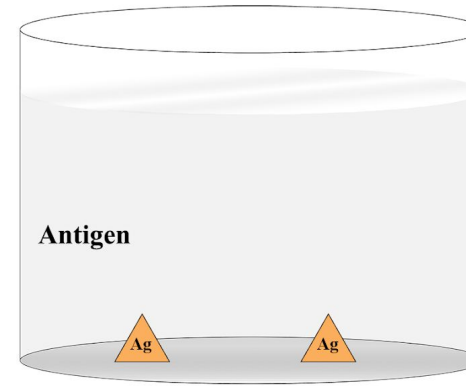


LABORATORY DIAGNOSIS

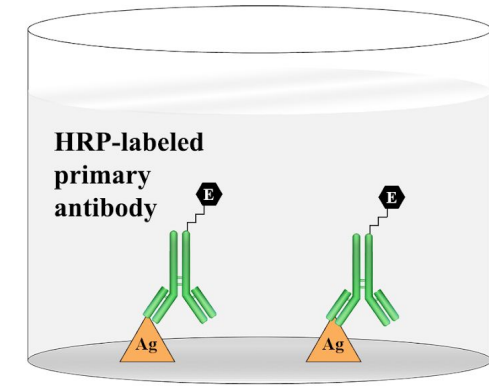
- Direct antigen detection
- Virus isolation
- Detection of influenza-specific RNA by reverse transcriptase-polymerase chain reaction (RT-PCR).Laboratory confirmation of influenza virus

DIRECT ANTIGEN DETECTION

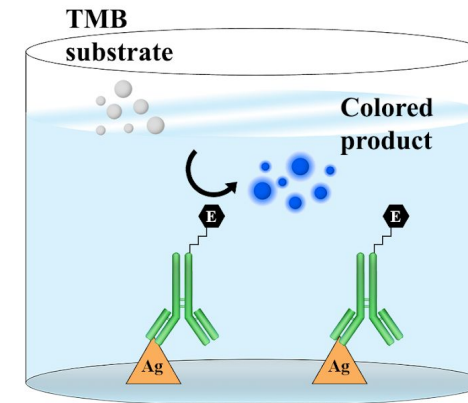
- It works on the principle of immunofluorescent
- In this antigen are placed at the base and then an antibody with enzyme attached at its base is added
- At last substrate is added and if there is antigen – antibody reaction then there will be color change (i.e positive test)



1



2



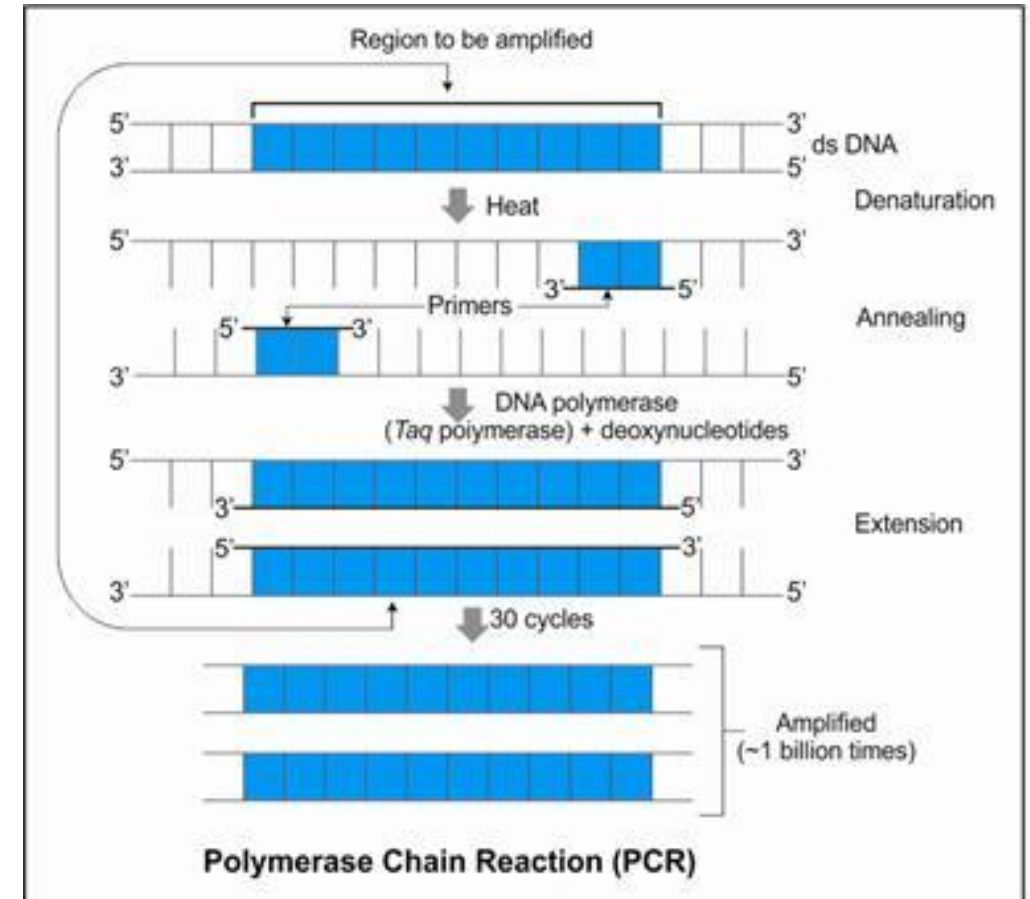
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VIRUS ISOLATION AND ANIMAL SUSCEPTIBILITY

- **Chick embryos.** The influenza viruses grow in the allantoic and amniotic cavity of the chick embryos. After an incubation period of 3 days, the fluid is tested for hemagglutination activities of the viruses.
- **Cell culture.** Cell lines are widely used for culture of influenza viruses. They can grow in several primary and continuous cell lines. Rhesus Monkey kidney cell lines (LLC-MK2) and Madin–Darby canine kidney (MDCK) are the continuous cell lines frequently used to isolate influenza viruses.
- **Laboratory animals.** Human influenza virus causes experimental infections in a variety of animals. Intracerebral inoculation of mice by neurotrophic strains produces fatal encephalitis. It causes an acute respiratory disease on intranasal inoculation in ferrets.
- **Pathogenesis and Immunity.** Influenza virus is transmitted from person to person primarily in droplets released by sneezing and coughing.

RT - PCR

- It is same as PCR but it has an added step of reverse transcription of RNA to DNA
- RT-PCR is used for those containing RNA that needs to be transcribed to DNA for amplification
- It is performed in 'real time', which means results are visible almost immediately



TREATMENT

Old drugs

- Amantadine and rimantadine are the specific antiviral agents available for treatment of influenza.
- These drugs are effective against influenza A virus but not against influenza B virus.
- These drugs when given within 1–2 days of the onset of illness, reduce severity of the disease and also hasten the disappearance of fever and other symptoms.

Latest drugs

- Zanamivir (*Relenza*) and oseltamivir (*Tamiflu*) are newer drugs for treatment of influenza and are effective against both influenza A and B viruses.
- These are the NA inhibitors, which act by inhibiting the release of viruses from infected cells.
- These drugs also prevent the spread of virus from one cell to another.
- Relenza is used in the form of nasal spray, whereas Tamiflu is given orally.



PREVENTION AND CONTROL

1. Immunoprophylaxis by vaccines
2. Chemoprophylaxis



THANK YOU