BHARATHIDASAN UNIVERSITY

Tiruchirappalli-620024

Tamil Nadu, India.

Programme: M.Sc., Biomedical Science

Course Title : Medical Virology

Course Code : BM59C19MV

Unit-III

Orthomyxo Virus

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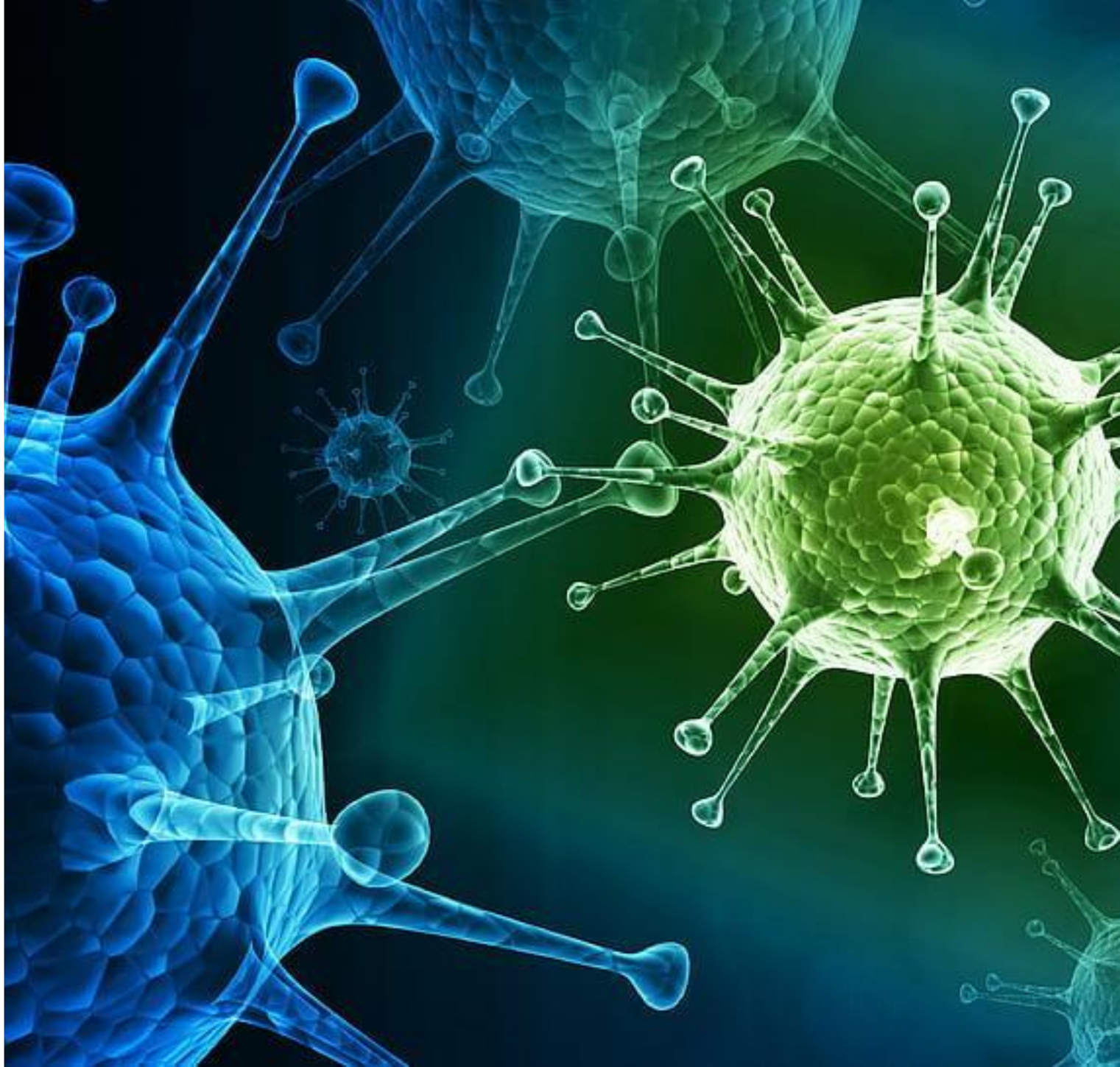
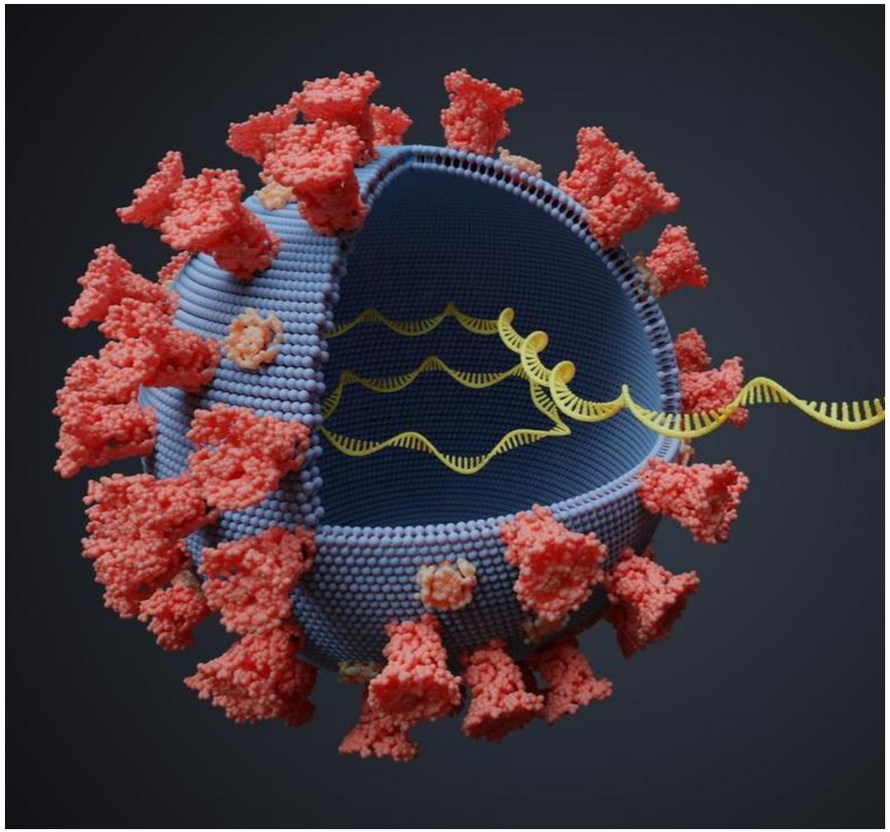
RNA VIRUS:

Orthomyxo virus

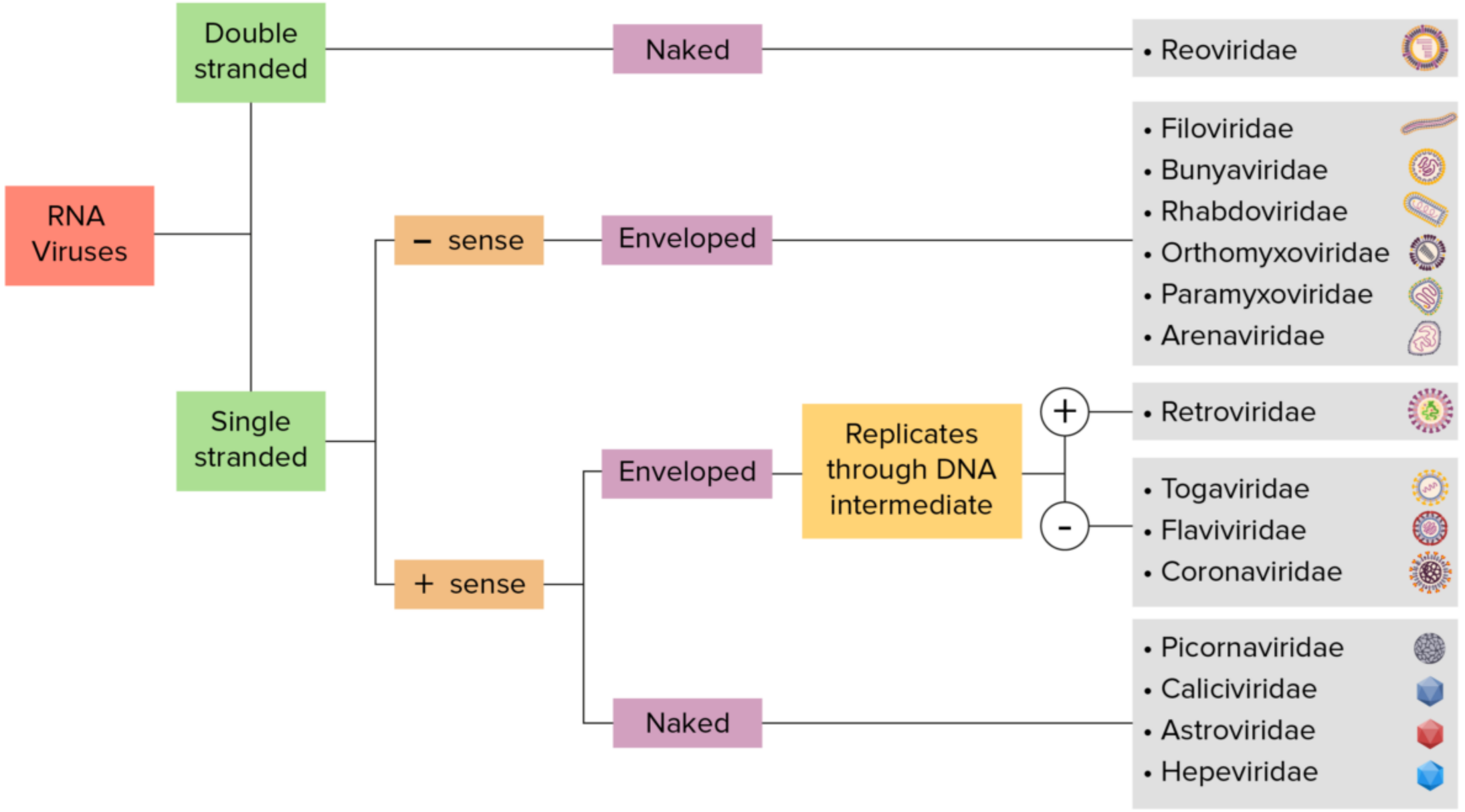


RNA VIRUS..

- An RNA virus is a virus—other than a retrovirus—that has ribonucleic acid (RNA) as its genetic material.[1] The nucleic acid is usually single-stranded RNA (ssRNA) but it may be double-stranded (dsRNA).[2] Notable human diseases caused by RNA viruses include the common cold, influenza, SARS, MERS, COVID-19, Dengue virus, hepatitis C, hepatitis E, West Nile fever, Ebola virus disease, rabies, polio, mumps, and measles.



Classification



Positive strand RNA virus

- RNA viruses can be subdivided into groups based on type of RNA that serves as the genome. Positive or plus (+)-strand RNA viruses have genomes that are functional mRNA.

- The first synthetic event in the replication cycle is protein synthesis.

- Families include: Picornaviridae, Flaviviridae, Togaviridae, Hepeviridae, Coronaviridae, Arteriviridae, Toroviridae, among many others..

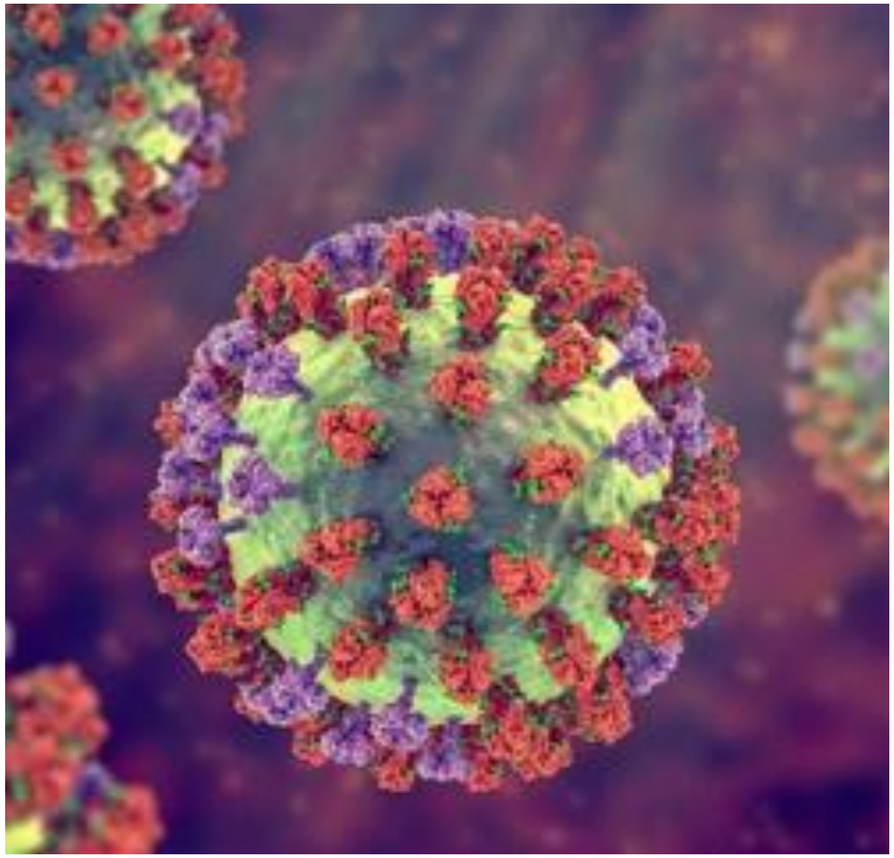
Negative strand RNA virus

- There are three additional groups of RNA viruses whose genomes are not mRNAs. They are the negative or minus (–)-strand RNA viruses, the closely related ambisense RNA viruses, and double-stranded RNA.

- Families of negative-strand RNA viruses include Orthomyxoviridae, Paramyxoviridae, Rhabdoviridae, Bornaviridae, and Filoviridae..

Orthomyxovirus

- ORTHOMYXO is a family of RNA virus.
- The orthomyxoviruses (influenza viruses) constitute the genus Orthomyxovirus, which consists of three types (species): A, B, and C. These viruses cause influenza, an acute respiratory disease with prominent systemic symptoms.
- Type A viruses cause periodic worldwide epidemics (pandemics); both types A and B cause recurring regional and local epidemics.



TYPES OF INFLUENZA

INFLUENZA TYPE A

This type includes influenza A viruses of human and also widespread in animals, particularly aquatic birds, chickens, ducks, pigs, horses, and seals. Influenza type A is Responsible for pandemic and for most cases of epidemic influenza (antigenically highly variable.

INFLUENZA TYPE B

This type includes influenza B viruses which are mainly found in humans. Influenza type B may exhibit antigenic changes and sometimes causes epidemics.

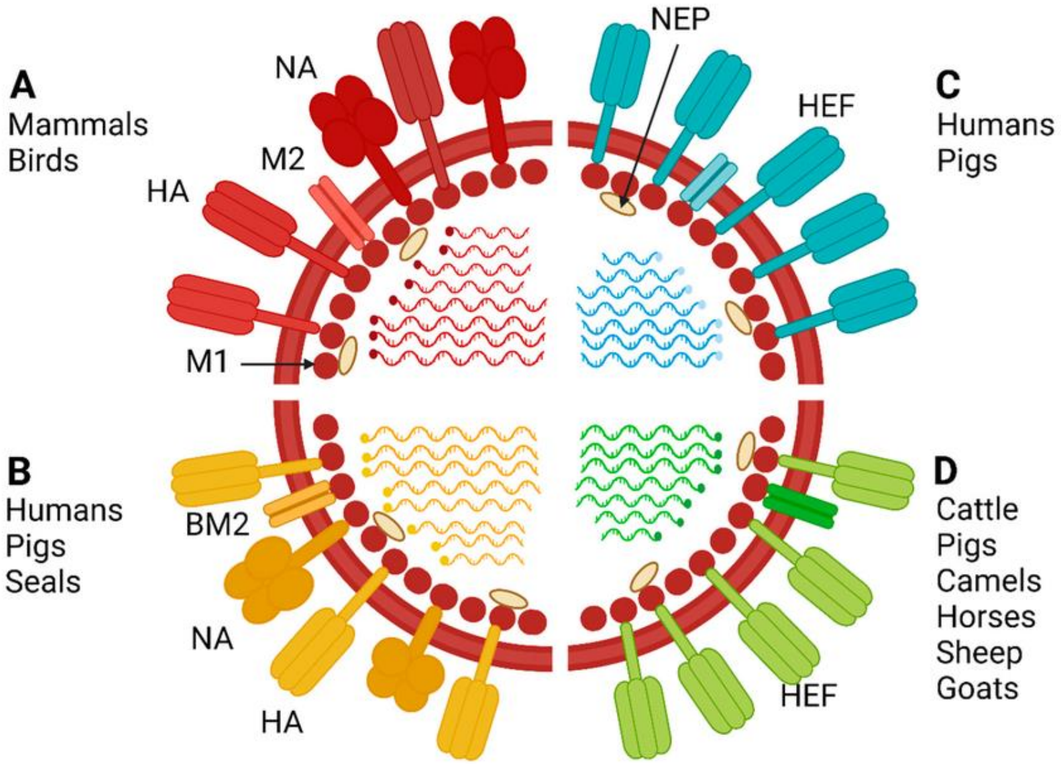
INFLUENZA TYPE C

- This type includes influenza C viruses of human and swine.

Influenza type C is antigenically stable.

INFLUENZA TYPE D

Influenza D virus (IDV) circulates in worldwide agricultural animals such as cattle and swine with little known about its impact and pathogenesis on human health .



Imp properties of orthomyxovirus

VIRION:

Spherical, pleomorphic, 80-120 nm in diameter (helical

GENOME:

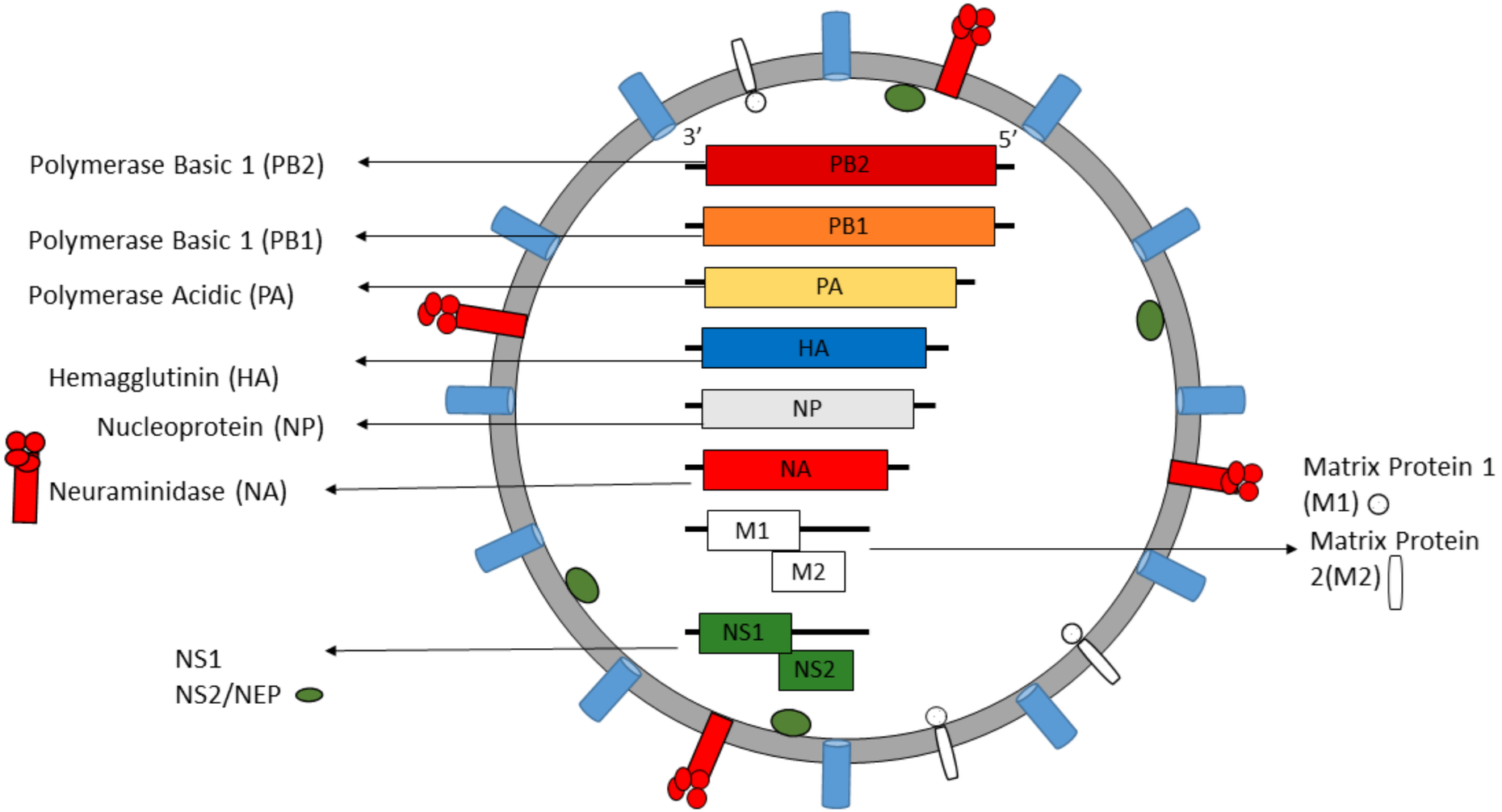
Single-stranded RNA, segmented (eight molecules), negative-Sense (polarity).

ENVELOPE:

Contains viral hemagglutinin (HA) and neuraminidase (NA) proteins.

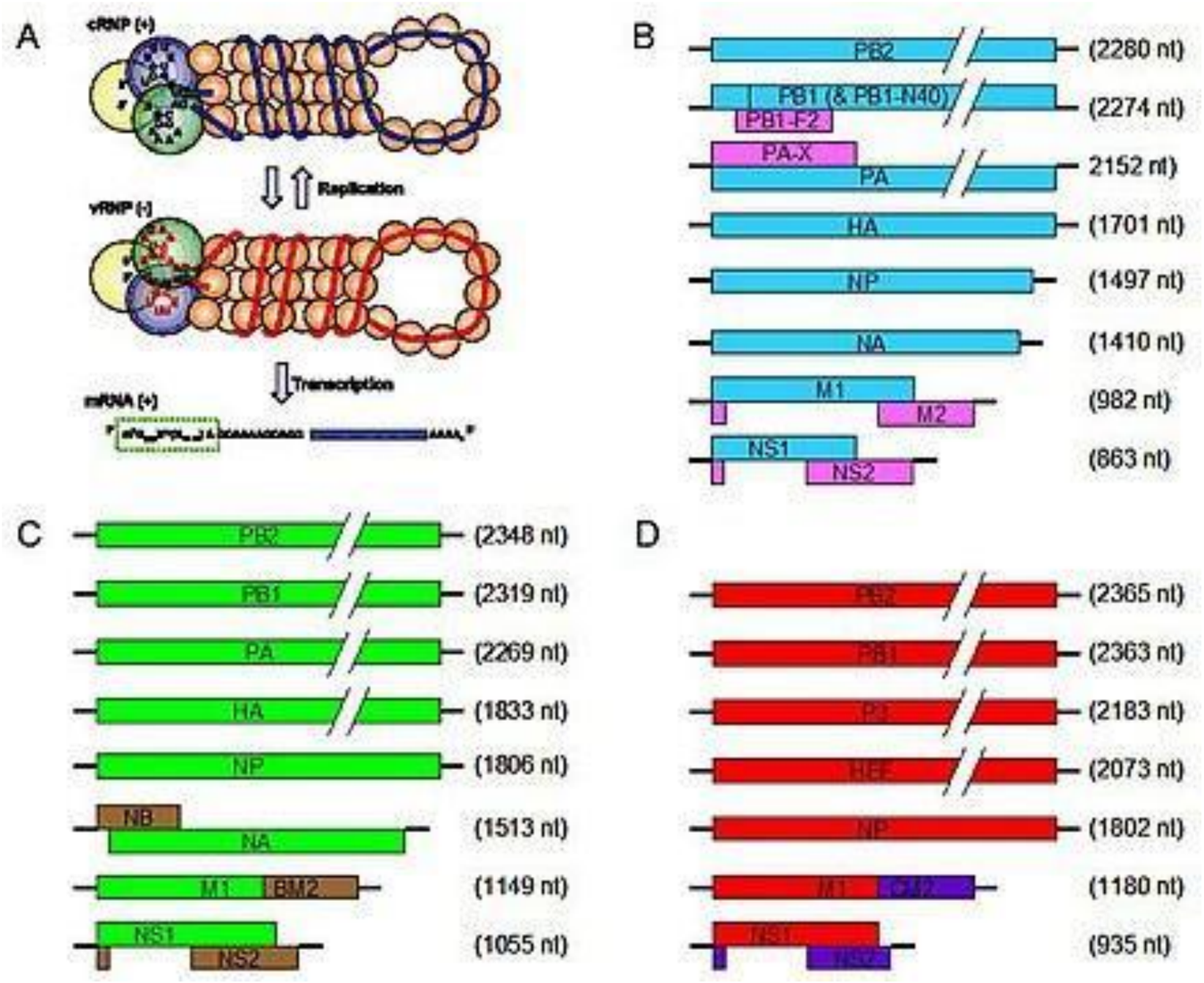
The single-stranded, negative-sense RNA genomes of Influenza A and B viruses occur as eight separate segments; influenza C viruses contain seven segments of RNA, lacking a neuraminidase gene.

STRUCTURE


3’
5’
PB2
PB1
PA
HA
NP
NA
M1
M2
NS1
NS2
Polymerase Basic 1 (PB2)
Polymerase Basic 1 (PB1)
Polymerase Acidic (PA)
Hemagglutinin (HA)
Nucleoprotein (NP)
Neuraminidase (NA)
NS1
NS2/NEP
Matrix Protein 1 (M1)
Matrix Protein 2(M2)

H5N1 genetic structure

Influenzavirus genomes. Segments translate to polymerase (PB1, PB2, and PA), hemagglutinin (HA), neuramindase (NA), nucleoprotein (NP), membrane protein (M), and non-structural protein (NS).



EPDIOMIOLOGY

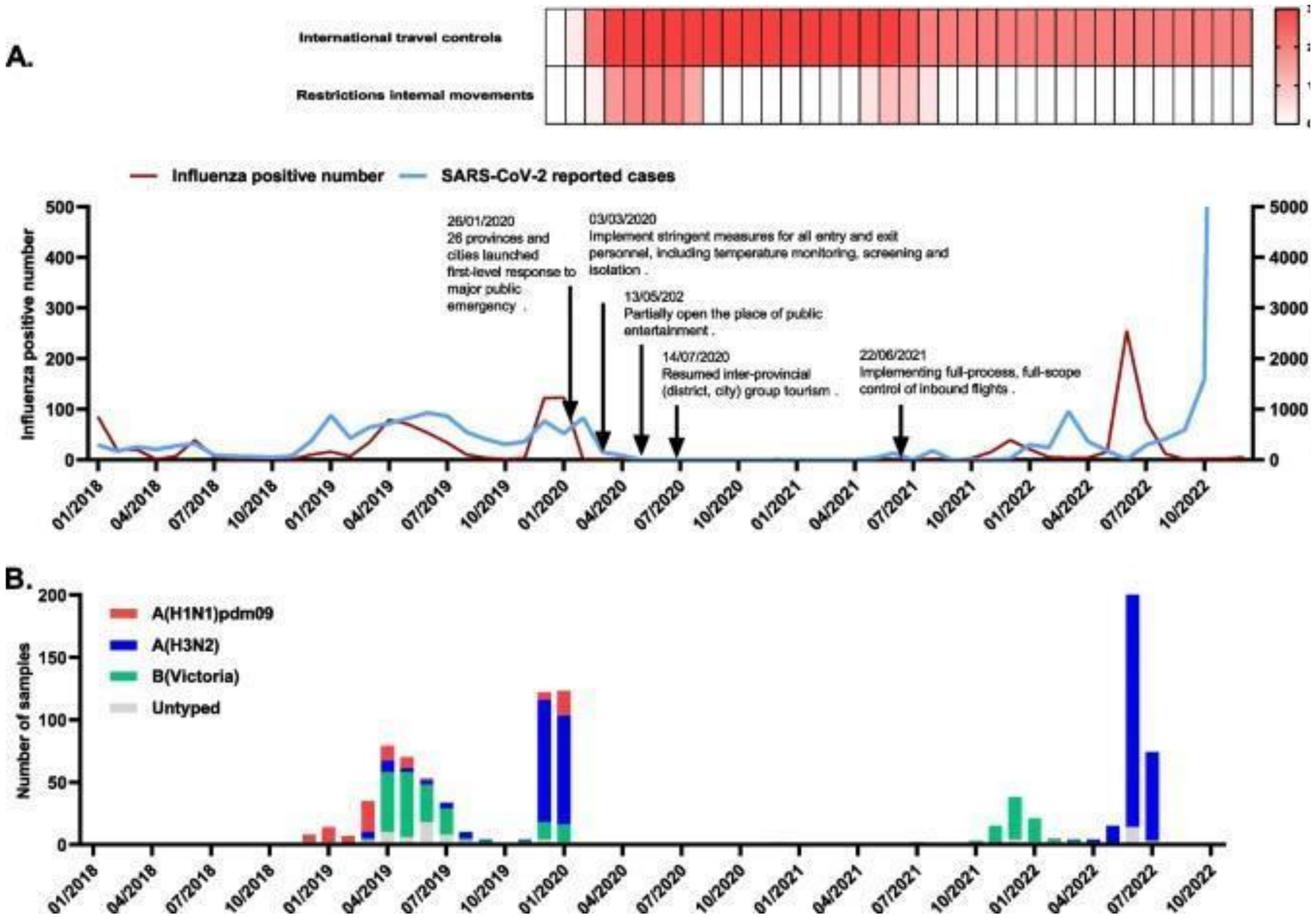
- Influenza typeA - epidemic and pandemic.
- Influenza type B - Sporadic epidemic.
- Influenza type C - inappropriate infection.

pandemic originates from reservoir animals or avians due to ANTIGENIC SHIFT.

MAJOR PANDEMIC

- 1918-19:20 millions death.
- 1957:H2N2 : from china.
- 1968:H3N2 : From Hongkong.
- 1977: China and Russia: Red Flu.

Epdiomiology



TRANSMISSION

- Influenza virus spreads from person to person by airborne droplets

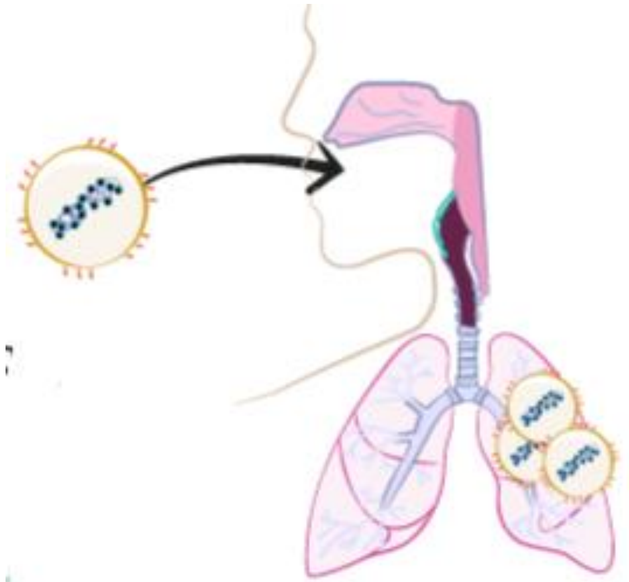
or by contact with contaminated hands or surfaces.

- Close contact

& close environments favor transmission.

- Typically, influenza is transmitted from infected mammals through the air by coughs or sneezes, creating aerosols containing the virus, and from infected birds through their droppings. Influenza can also be transmitted by saliva, nasal secretions, feces and blood.

PATHOGENESIS



- Mode of spread: airbone.
- Incubation time :1-4 days.
- Entry : respiratory tract.

Attached with respiratory epithelium

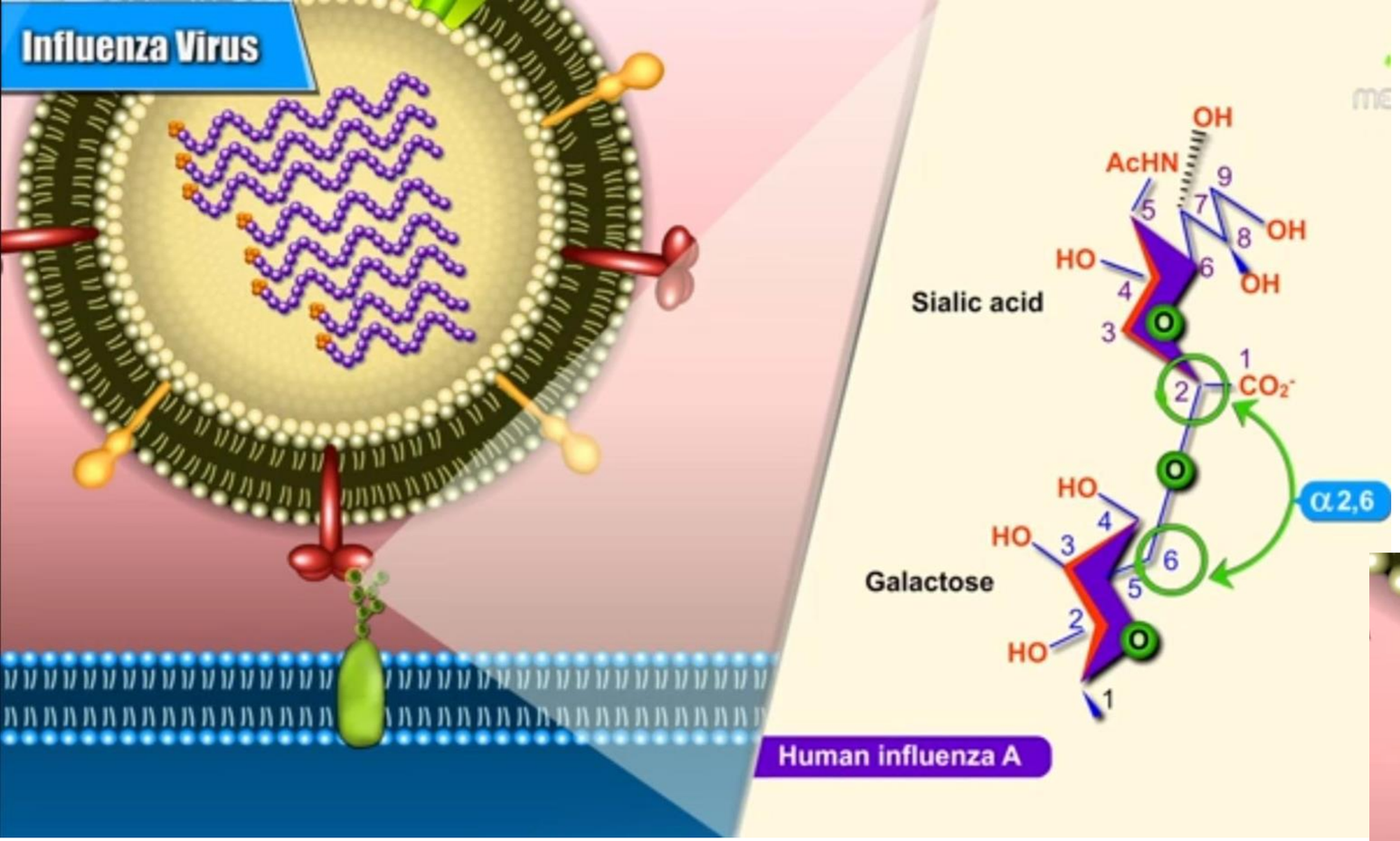
- Neuraminidase lyse mucous membrane leads to sloughing off epithelium .

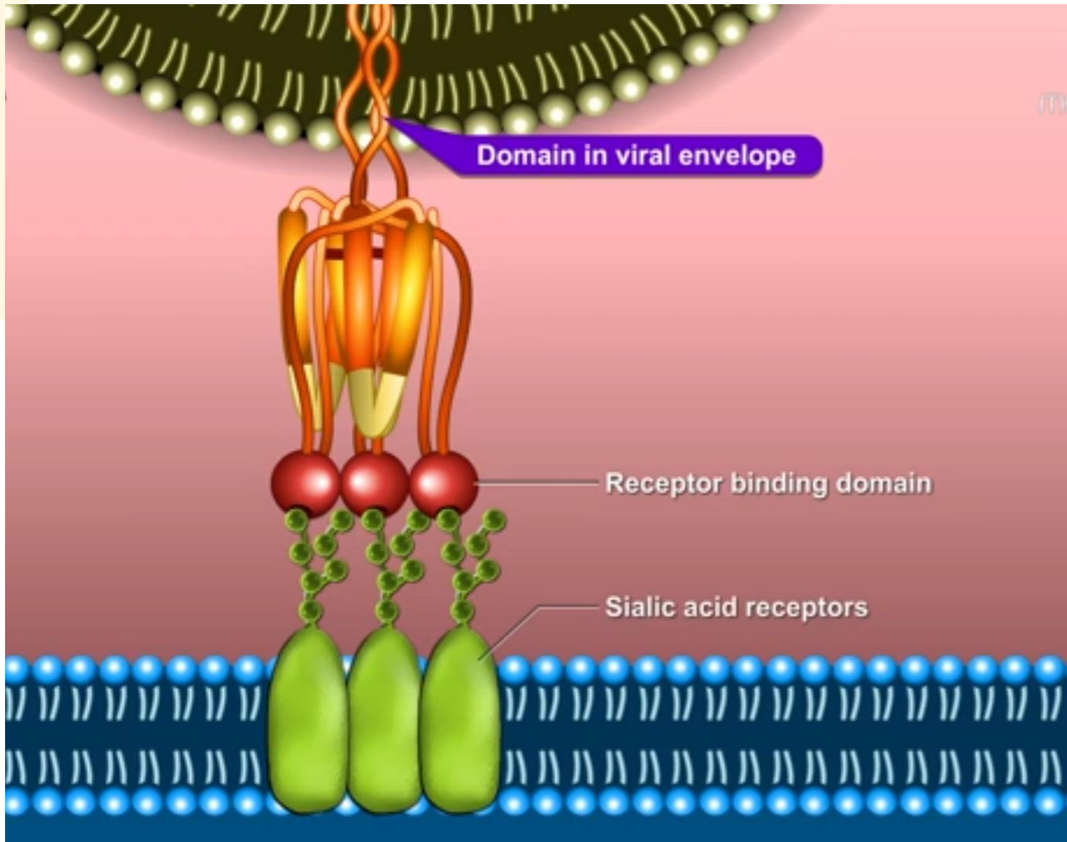
SYMPTOMS: Common cold to fulmiate pneumonia (fever,chills,sore throat,cought , respiratory distress).

Uncomplicated pneumonia resolve in 7 days.

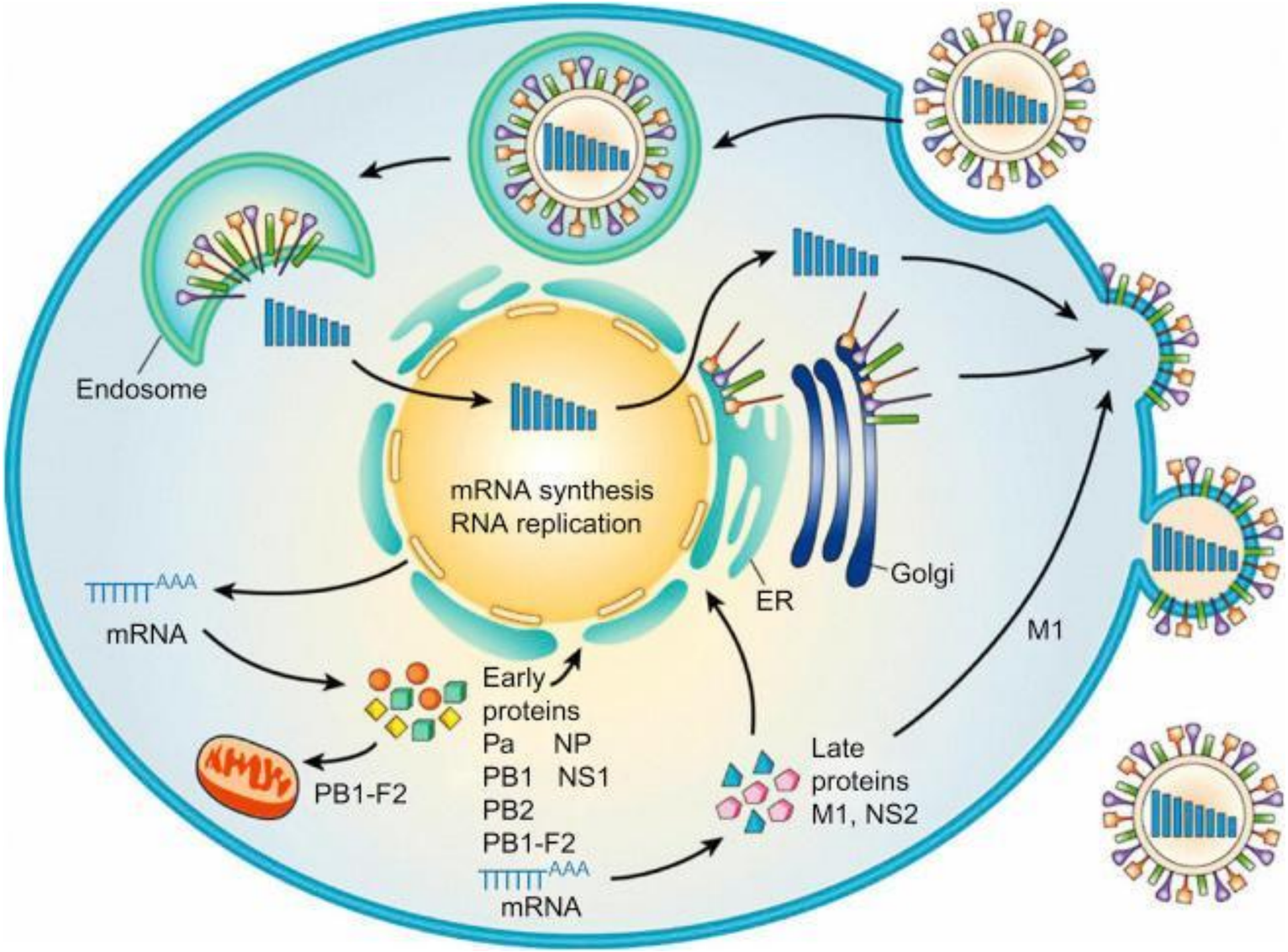
- EXTRA PULMONARY COMPLICATIONS (rare):

REYE's syndrome (Due to Aspirin use)


Influenza Virus
Sialic acid
Galactose
α 2,6
Human influenza A


Domain in viral envelope
Receptor binding domain
Sialic acid receptors

Replication cycle



Laboratory Diagnosis

Specimens:

- Nasal washings, gargles, and throat swabs.

ISOLATION:

1. Embryonated eggs

2. Primary monkey kidney cells

- Cell cultures can be tested for the presence of virus by

Heamadsorption 3-5 days after inoculation.

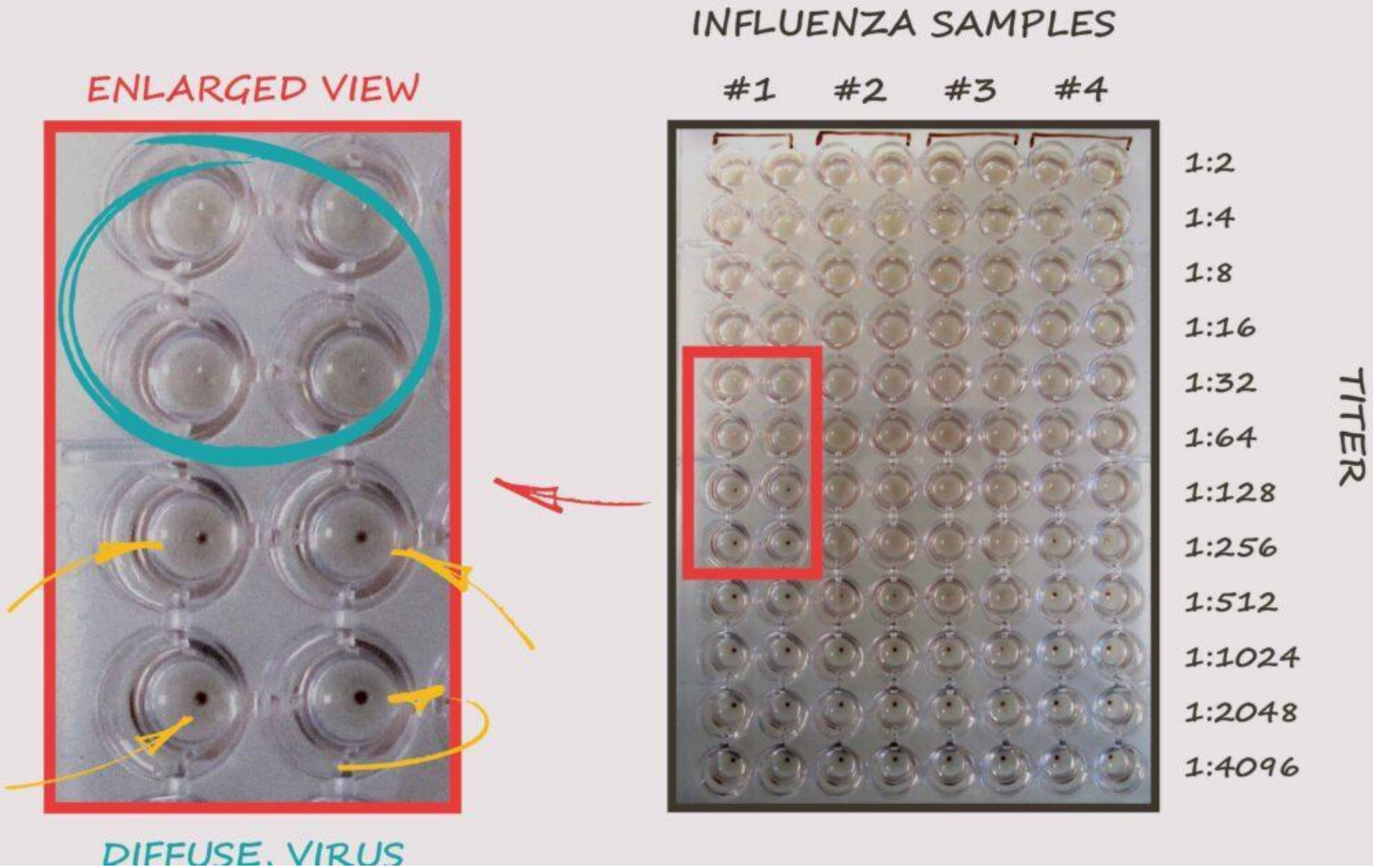
IDENTIFICATION:

- Viral isolates can be identified by hemagglutination inhibition test (HI)

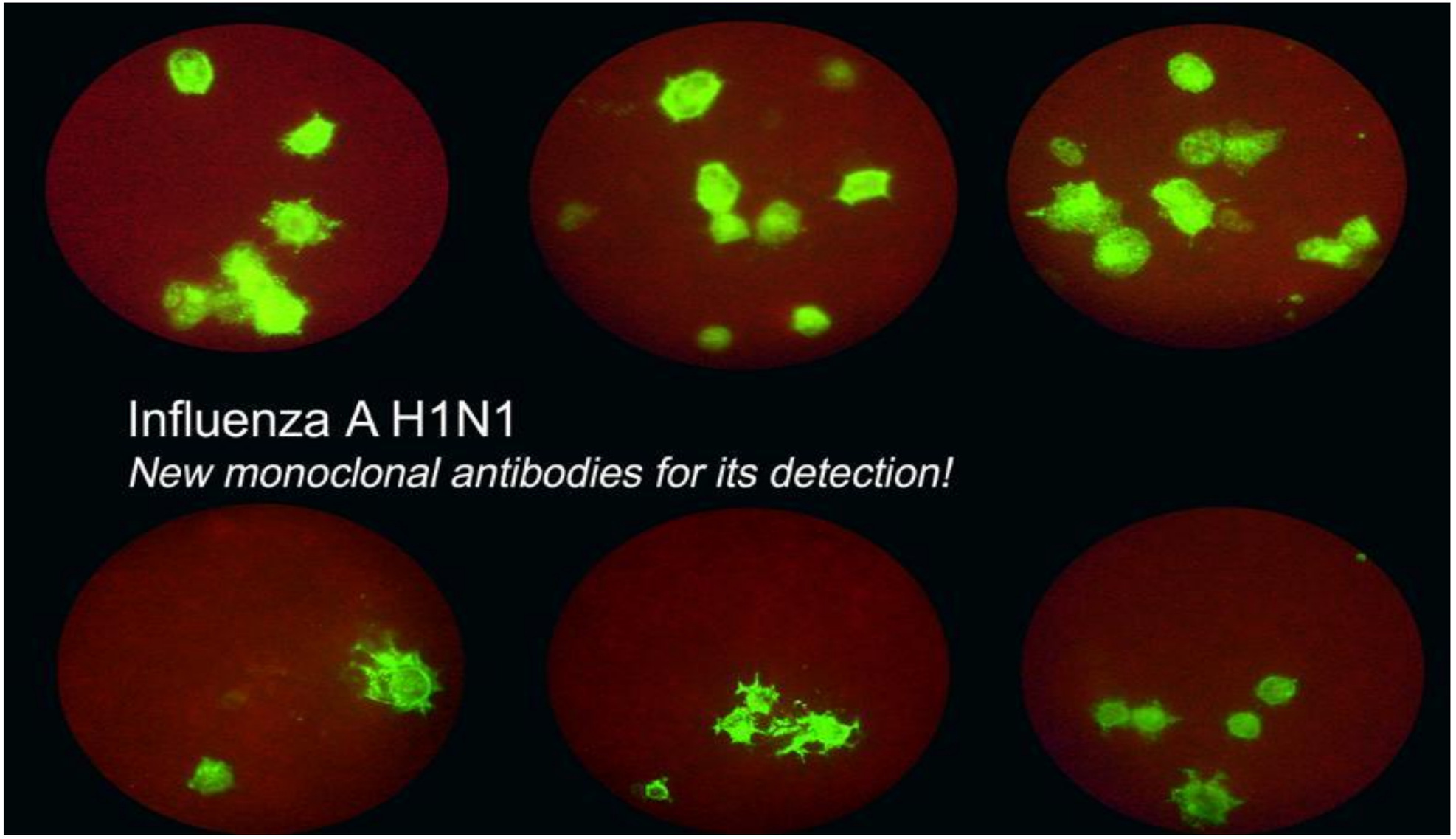
SEROLOGY:

- Routine serodiagnostic tests in use are based on (HI) and ELISA.
- Polymerase chain reaction (PCR).

HEMAGGULITINATION ASSAY



Indirect immunofluorescence Antibody test (IIFA)



PREVENTION(vaccines)

The different types of vaccines in use today for influenza included an annual vaccine available for influenza A and B, typically two A strains and one B strain.

A) Inactivated-virus vaccines, are either whole virus, split or subunit (surface Ag preparations purified HA & NA) vaccines. These vaccines are administered intramuscularly.

B). Live-virus vaccines

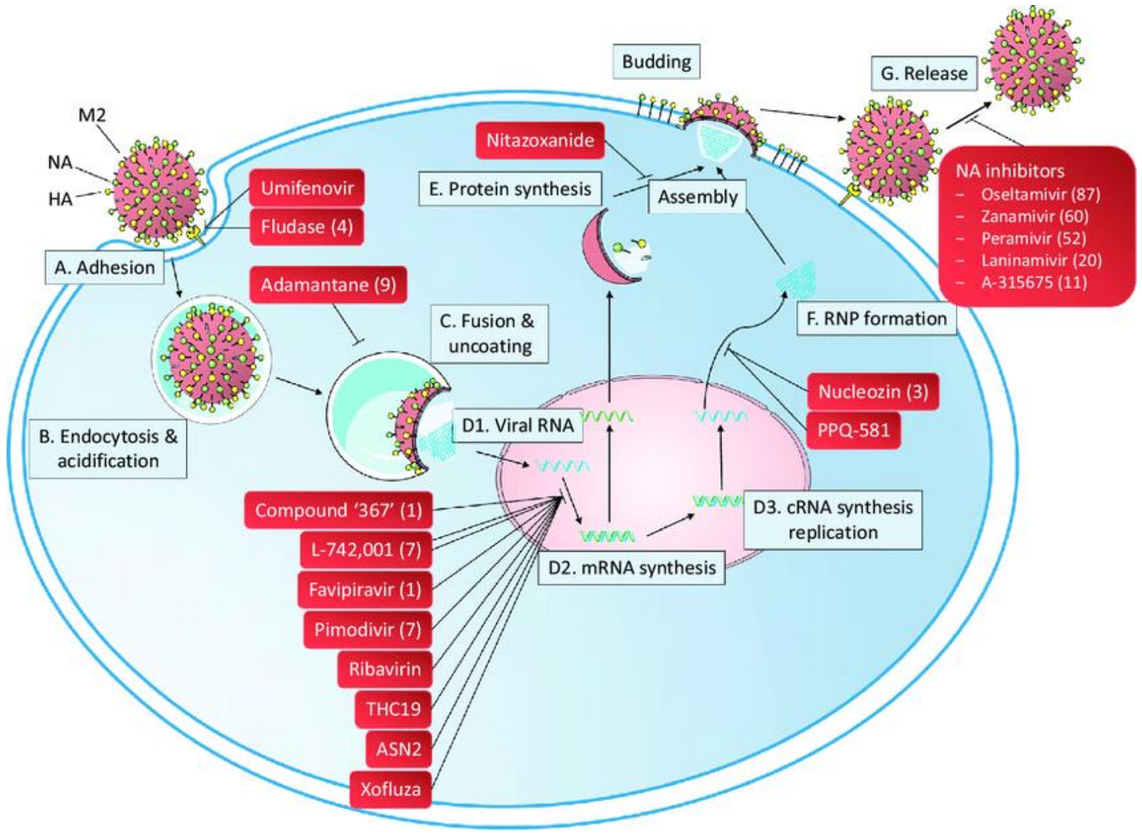
A live attenuated, cold-adapted, temperature sensitive, trivalent influenza virus vaccine administered by nasal spray(2003).

TREATMENT

- Amantadine and rimantadine for systemic use in treatment and prophylaxis of influenza A (blocks viral uncoating).

Resistant viruses emerge during therapy.

- Zanamivir (Relenza) and Oseltamivir (Tamiflu) NA inhibitors.
- These drugs are effective against both influenza A and B viruses.



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THANK YOU!