



RNA viruses:

INFLUENZA VIRUS

General properties:

- Shape of virus is spherical, symmetry of nucleocapsid is helical.
- Viral genome is segmented ssRNA(7-8 segments).
- Enveloped (bilayer membrane).
- Spiked. 2 type of protein H (Hemagglutinin) and N (Nuramnidase).

Classification and nomenclature:

Influenza virus classified into three types according to group – specific antigens (nucleocapsid antigen): Influenza **A**, **B** and **C**.

Influenza type A and B contain 8 segments, while Influenza type C has 7 segments of ssRNA.

The Influenza type A (only) can be divided into subtypes (serotypes) according to specific antigen (H and N antigens).

Standard nomenclature system for Influenza virus includes; type, host, geographic strain, number and year of isolation. For example:

A/swine/Iowa/30/H1N1

Source and Transmission:

- **Host range:** Influenza A has broad host range capable of infecting human, swine, horses, chicken and birds (aquatic birds). Influenza B and C host range is limited to human only.
- Infected humans are main reservoir of infection. The virus transmitted from **person to person** by air –borne respiratory droplets and by **contact with contaminated materials** of patient.
- Avian Influenza virus (Influenza A) cause bird flu in domestic poultry birds, subtype (H5N1) can be transmitted from birds to humans, H5N1 enable to kill half of people who become infected. Fortunately Avian virus was poorly transmissible to human.

Antigenic variation:

Because viral genome is segmented, genetic reassortment can occur during viral replication. The reassrtment could lead to emergence of new

human virus (new strain), the progeny of which will contain a mixture of genome segments from human and from animal strain. Therefore antigenic variation can occur due to mutation in sequence of amino acids in proteins of H and N.

The mutation leads to change in antigenic nature of H or N or both resulting new strains that non-identified by immune system (escape from immune recognition).

Two type of variation are Known:

- **Antigenic shift (complete change in H or N or both).** This can only occur with influenza type A because it has wide host range, when two viruses co-infect the same cell (one human strain and another animal strain), during viral replication, the RNA segments can be mispackaged into another virus and release new strains. Antigenic shift is responsible for influenza epidemics.
- **Antigenic drift (partial changes).** This occur in type A and B. it involves minor changes affecting H or N not both. It is responsible for influenza epidemic.

Characteristic/ feature:

- Incubation period (1-4) dependent upon size of dose and immune status of human. Fever, headache, nose secretion, anorexia, cough and generalized myalgia (muscle pain) are most clinical features. If no complication, the disease resolves in 2-7 days.
- Complication of influenza, individuals at greater risk for complication include elderly and immunocompromised people.
- Other viruses; para influenza viruses are responsible for 10% respiratory infections in children. They are classified into 4 types.

Epidemiology:

- Influenza occurs primarily in winter months, when it and bacterial pneumonia secondary to influenza cause a significant number of deaths especially in older people.
- Influenza has been responsible for millions of infection worldwide. Most cases due to type A. it is estimated 3-5 million infected cases.
- Influenza occur worldwide distribution (epidemic). Influenza outbreak occurs in wave. The period between epidemic waves of influenza A tend to be 1-3 years, type B is longer 3-6 years.

Pandemic disease occurs every 10-40 years. Shift variants appear every 10 years, where drift variants appear every year approximately.

Global influenza infection (epidemic):

1889	H2N2
1900	H3N2

1918 H1N1 (Spanish flu)

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2009 novel strain contains mixed genome (originated from bird as well as from swine and human).

Lab. Dx:

- Virus is isolated from clinical specimen (nasal washing, gargles and throat swabs) in cell culture.
- Detection of specific antibodies level over 2 weeks by serological tests, ELISA.
- Detection of viral nucleic acid by PCR.
- Detection of viral proteins.

Control method:

A- Treatment:

- Amantadine and Rimantadine are used to prevent uncoating of influenza A.
- Children given aspirin.

B- Prevention :

- Influenza virus vaccine (killed vaccines) has been used to prevent infection primarily influenza A and B.
- Personal hygiene and avoid contact with patients.
- Avian virus was controlled by destroying poultry.