

Influenza

Common viral disease of lower respiratory system caused by an **orthomyxovirus**, pervasive worldwide, characterized by **fever chills and body aches** last a week or more.

Sign/Symptom	Common Cold	Influenza
Fever	Low (37.2 °C [99 °F])	High (39 °C [102.2 °F])
Headache	Common	Common
Aches and pains	Mild	Severe
Fatigue	Slight	Severe
Nasal congestion	Common	Rare
Sneezing	Common	Rare

Cough and sore throat

Myalgias, arthralgias and loose stool

In general, influenza is **self-limiting**. serious cases can lead to **pneumonia, bronchitis, bronchiolitis** and other complications that can be fatal. Such cases are more common in the very young and the elderly

The influenza virus is primarily transmitted by **direct contact and inhalation of aerosols**

Reye syndrome

A complication of influenza that occurs primarily in **children and teenagers** **Swelling in the liver and brain**, and may progress to **neurological damage, coma, seizures, hallucinations or death.**

Reye syndrome may **follow other viral infections, like chickenpox, and has been associated with the use of aspirin.**

It is often misdiagnosed. Symptoms may include:

- ☐ Persistent or recurrent vomiting, Lethargy, Personality changes such as irritability or combativeness, Disorientation or confusion, Delirium, Convulsions, Loss of consciousness, Liver abnormalities

Influenza virus

The RNA genome(segmented) Seven or eight segments, each coated with ribonucleoprotein and encoding one or two specific viral proteins.

The influenza virus is surrounded by a lipid membrane envelope, and two of the main antigens of the influenza virus are The spike proteins hemagglutinin (H) and neuraminidase (N)

The hemagglutinin protein to bind to sialic acid receptors on host,when reaching respiratory tract.,Neuraminidase, which cleaves sialic-acid receptors to allow progeny viruses to make clean exit

The influenza viruses

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The influenza A viruses

Have different subtypes

18 known subtypes of hemagglutinin(H) and 11 known subtypes of neuraminidase(N).

That's why H1N1 differs from H2N2 (different antigen).

□ Influenza viruses are serologically characterized by the type of H and N proteins that they possess.

□ Of the nearly 200 different combinations of H and N, only a few , such as the H1N1 strain ,are associated with human disease

Influenza virus infections

Elicit a **strong immune response**(unlike rhinovirus), particularly to the hemagglutinin protein

Unfortunately, the antigenic properties of the virus change relatively rapidly, so new strains are evolving.

When an influenza virus gains a new hemagglutinin or neuraminidase type, it is able to evade the host's immune response and be successfully transmitted, often leading to an epidemic

Evolutionary changes

-Antigenic Variation in influenza viruses

□ Antigenic **drift** is the result of point mutations causing slight changes in the spike proteins hemagglutinin (H) and neuraminidase (N).

□ Antigenic **shift** is a major change in spike proteins due to gene reassortment(whole segment is changed).

-Influenza viruses swap gene segments. This genetic exchange is possible due to the segmented nature of the viral genome

-Occurs when two differing influenza viruses co-infect a cell.

•The rate of antigenic variation in influenza viruses is very high, making it difficult for the immune system to recognize the many different strains of Influenza virus.

•Although the body may develop immunity to one strain through natural exposure or vaccination, antigenic variation results in the continual emergence of new strains that the immune system will not recognize.

•This is the main reason that vaccines against Influenza virus must be given annually.

•Each year's influenza vaccine provides protection against the most prevalent strains for that year, but new or different strains may be more prevalent the following year.

Spanish flu

The most lethal pandemic , antigenic **shift** , new H1N1 virus (first appearance)

Bird flu

H5N1 , antigenic **shift** cause sever respiratory symptoms , people who work with poultry , water fowl , spread from animals body fluid

H1N1 swine flu

Antigenic **shift**
H1N1 flu to be pandemic in 2009
leads to a lung disease in pigs