



# Influenza

## Immune responses to flu

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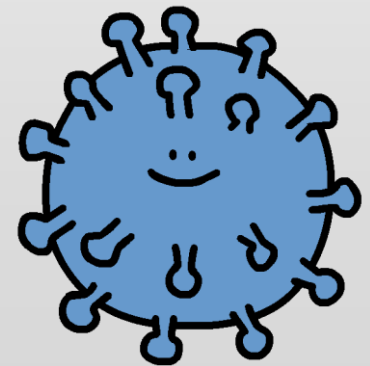
# Objectives:

- Identify influenza.
- Recognize the signs and symptoms of influenza.
- Describe the immune reaction against influenza infections.
- Mention prevention strategies and treatment of influenza.
- Know the importance of influenza vaccinations.

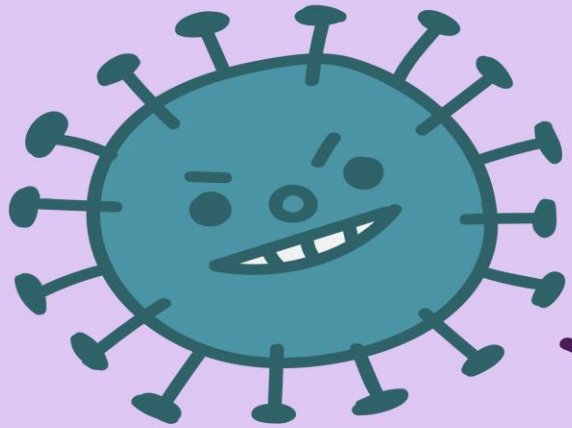


# Introduction to influenza:

- **Influenza**, sometimes known as the flu, is a highly infectious respiratory infection caused by flu viruses that infect the nose, throat, and lungs.
- **Influenza** is challenging for scientists to study because there are hundreds of strains that are classified into four main categories:
  1. Type **A**: is the most prevalent cause of human sickness and has been the source of all significant influenza pandemics in modern history.
  2. Type **B**: cause seasonal epidemics.
  3. Type **C**: cause mild respiratory illness
  4. Type **D**: not known to cause disease.

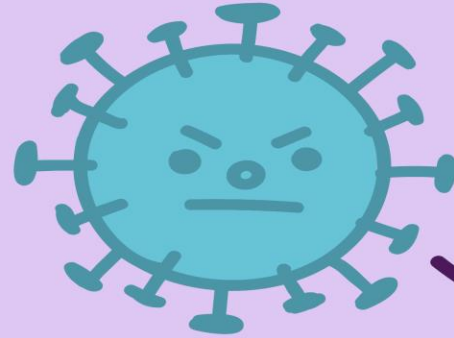


Type A



Other H#N# subtypes

Type B



Type C

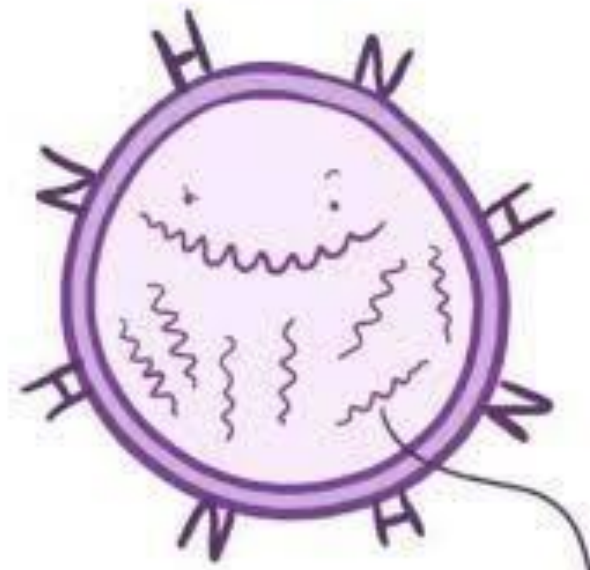


H1N1, H2N2 and H3N2



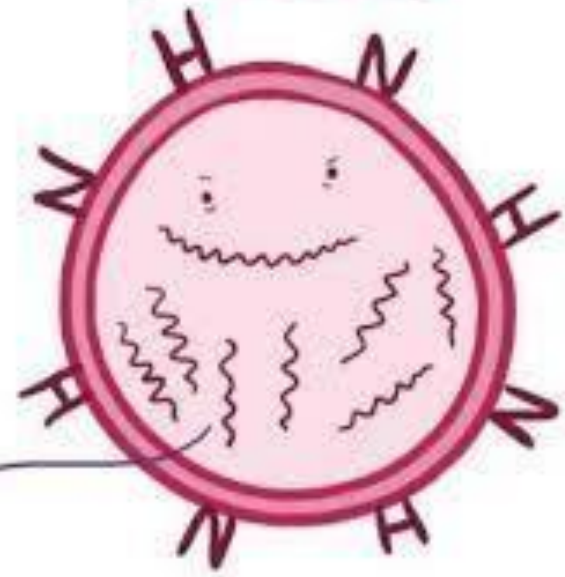
**INFLUENZA** ~ COMMON INFECTIOUS DISEASE  
"THE FLU"  
FAMILY: ORTHOMYXOVIRIDAE

TYPE A



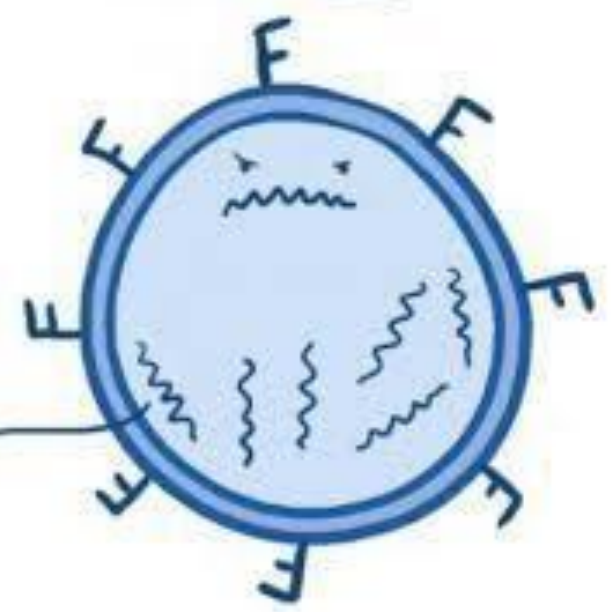
8 RNA SEGMENTS

TYPE B

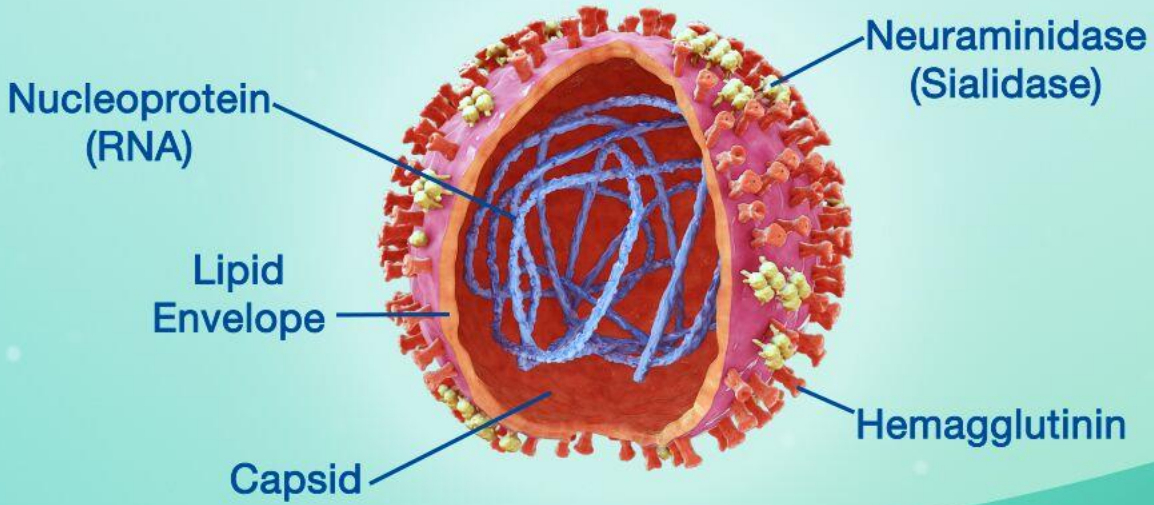


7 RNA SEGMENTS

TYPE C

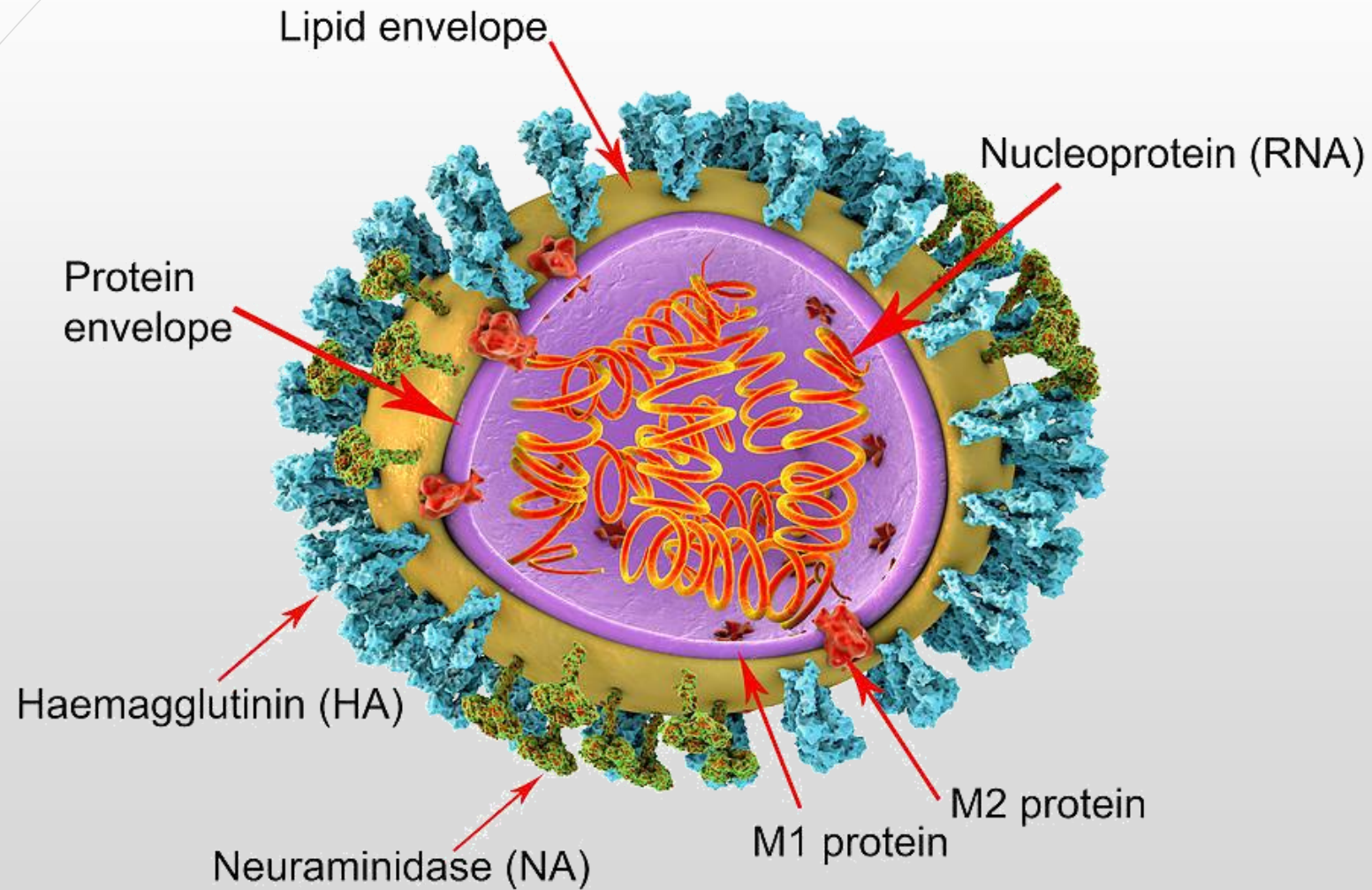


# Influenza Virus structure



Influenza Virus replication

# Basic structure of influenza virus:



# FLU

## signs and symptoms



SORE THROAT



DRY COUGH



RHINITIS



FEVER



CHILLS



HEADACHE



# When to see a doctor!

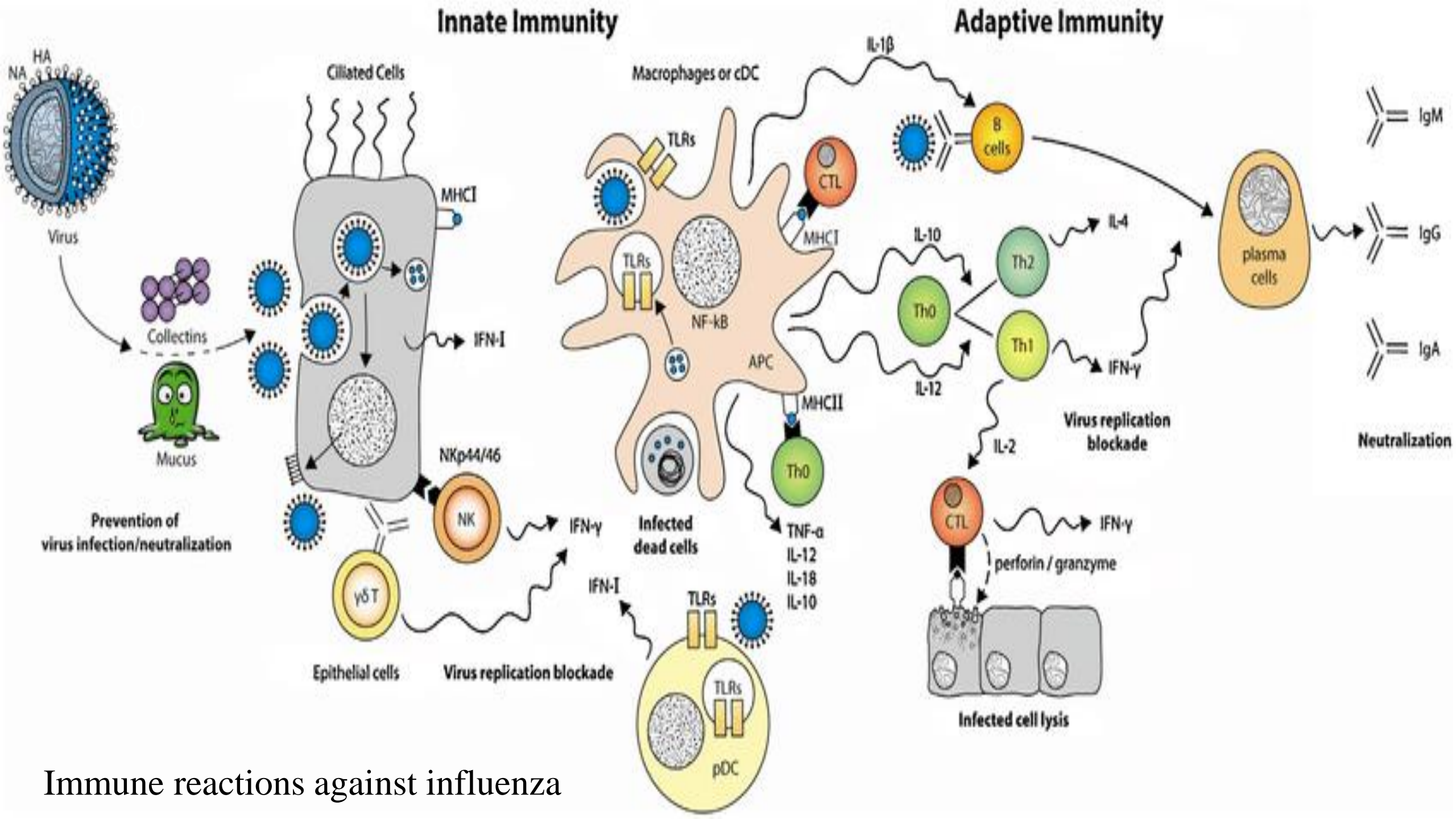


## For adults:

- Difficulty breathing or shortness of breath
- Chest pain
- Ongoing dizziness
- Seizures
- Worsening of existing medical conditions
- Severe weakness or muscle pain

## For children:

- Difficulty breathing
- Blue lips
- Chest pain
- Dehydration
- Severe muscle pain
- Seizures
- Worsening of existing medical conditions



Immune reactions against influenza

Every year, the head of the hemagglutinin **mutates**. So antibodies that worked against last year's strain won't be able to block this year's flu virus from entering our cells.

YEAR ONE



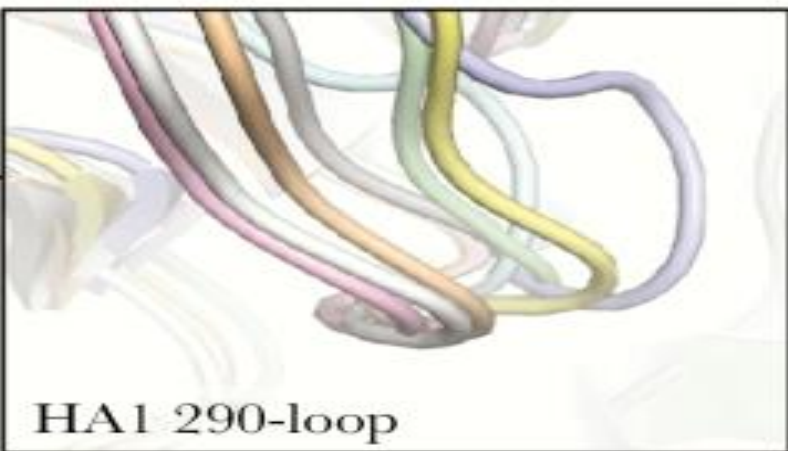
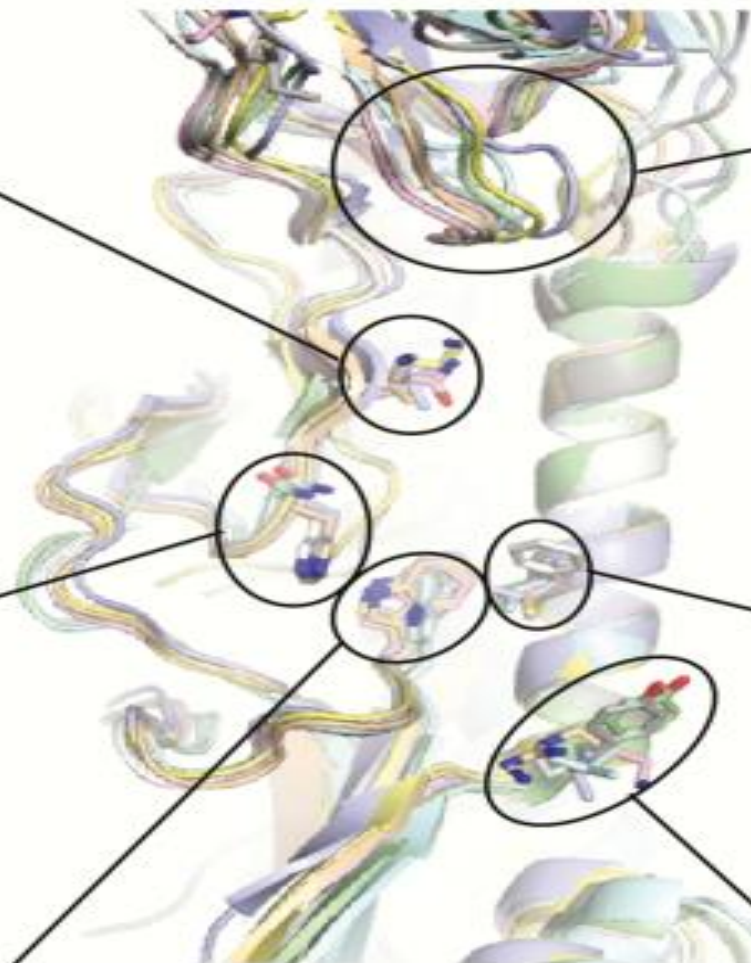
YEAR TWO



HA1 residue 40

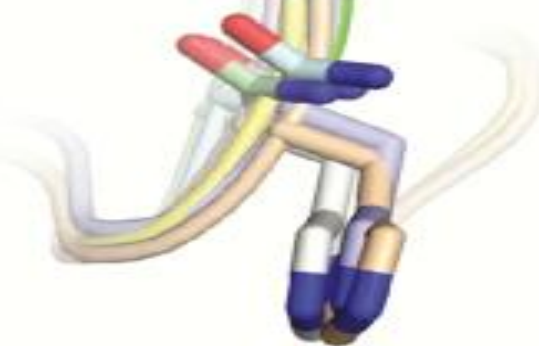


HA stem

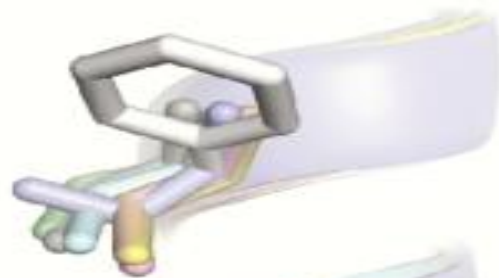


HA1 290-loop

HA1 residue 38



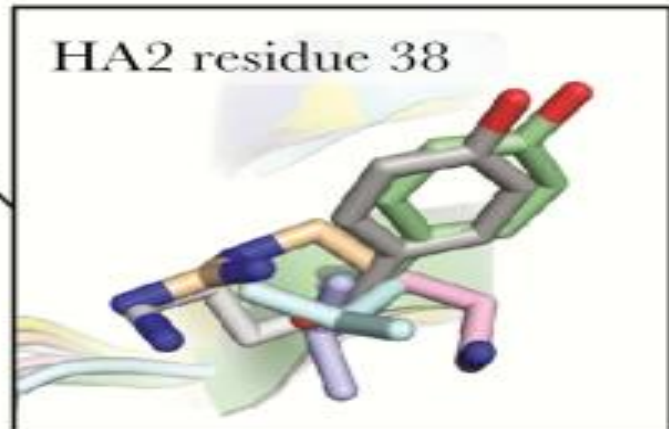
HA2 residue 45



HA2 residue 21



HA2 residue 38



- H1 (A/California/04/2009)
- H2 (A/Japan/305/1957)
- H3 (A/Hong Kong/1/1968)
- H5 (A/Vietnam/1194/2004)
- H6 (A/Taiwan/2/2013)
- H7 (A/Shanghai/2/2013)
- H9 (A/Swine/Hong Kong/9/98)
- H10 (A/Jiangxi-Donghu/346/2013)

# Prevention and treatment of influenza:

- Hand washing is an important prevention method of influenza.
- Treatment recommendations for non-complicated cases include:
  - Analgesic such as acetaminophen and ibuprofen.
  - Fluids such as water, juice and warm soups.
  - rest.
  - time.



# FLU SEASON TIPS



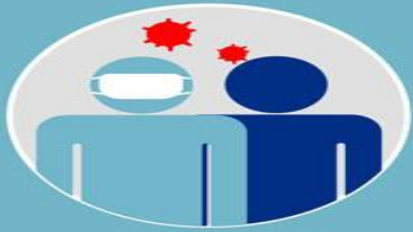
**GET A FLU  
VACCINATION**



**CLEAN AND DISINFECT  
SURFACES**



**ALWAYS WASH  
YOUR HANDS**



**COVER UP  
WHEN YOU  
COUGH OR  
SNEEZE**



**STAY HEALTHY  
STAY HYDRATED**

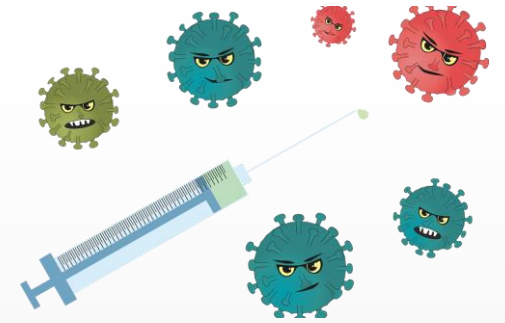


**IF YOU'RE SICK,  
STAY HOME  
AND REST**



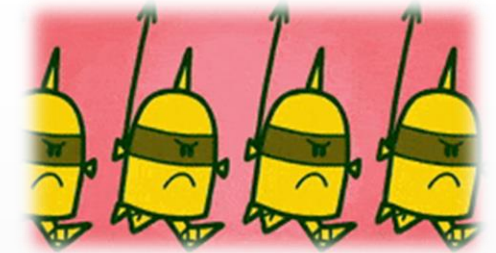
**SEE A DOCTOR**

# Influenza vaccine:



- With few exceptions, everyone 6 months and older should obtain an influenza (flu) vaccination every season.
- Vaccination against influenza and its potentially fatal consequences is especially crucial for persons who are at a higher risk of serious flu complications.
- Influenza A and B strains are included in each year's influenza vaccine.
- Influenza C viruses are not immunized by the vaccination.

## Conclusion:



- Influenza viruses have a single-stranded segmented RNA genome and are members of the Orthomyxoviridae family. On the basis of their core proteins, influenza viruses are divided into four types: A, B, C, and d.
- The influenza virus has a high rate of mutation and genetic reassortment.
- The influenza virus is spread mostly through infected people's droplets or - respiratory secretions.
- Serum antibodies provide the majority of protection against clinical illness, whereas mucosal IgA antibodies aid in infection resistance.



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Thank you for your time

