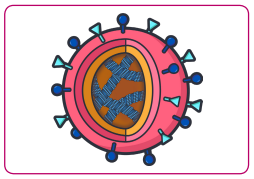
TOPIC: MICROBIAL INFECTIONS – RESPIRATORY SYSTEM

Influenza

Influenza

Viral

TYPE: _____ Virus



CAUSE

Orthomyxoviridae family of singe stranded RNA viruses.

- Glycoproteins on the surface influence _____ → create "spikes".
  - **Hemagglutinin** (___): help virus get _____ the cell.
  - **Neuraminidase** (___): help virus get _____ of the cell.
- 3 main types: __ & __ cause seasonal epidemics; __ is mild.
  - **Influenza** __: identified by variants in the spikes → H1N1, H2N2, H3N2.

SPREAD

Direct and indirect transmission → respiratory & _____ droplets.

SYMPTOMS

- Fever.
- Chills.
- Headache.
- Muscle ache.

DIAGNOSIS

New _____ tests; _____ for monitoring seasonal variants.

TREATMENT

____; antivirals (zanamivir & oseltamivir) for ___ _____ individuals.

IMMUNITY

Annual _____ vaccine.

- Most likely strains to circulate are identified _____ in advance.

PRACTICE

Which of the following types of influenza are the most common and cause seasonal epidemics?

i. Influenza A.
ii. Influenza B.
iii. Influenza C.

a) I & II. b) I & III. c) II & III. d) I, II, & III.

PRACTICE

Which of the following is most directly responsible for the entry of the influenza virus into the cell?

a) The hemagglutinin protein.
b) The NA spike protein.
c) Influenza C.
d) The neuraminidase antigen.

PRACTICE

Immunity to influenza is acquired through:

a) Childhood vaccination schedule.
b) An annual multivalent vaccine.
c) Community exposure since no vaccine currently exists.
d) mRNA vaccines each flu season.

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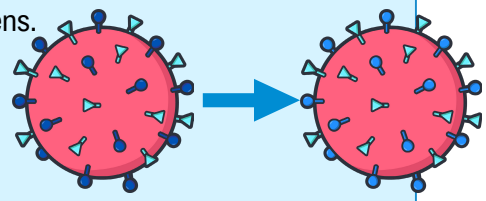
Flu Naming, Antigenic Drift & Shift

- Influenza __ is named for it's ___ spike proteins (i.e., H1N1, H2N2, H3N2).
  - There are _____ HA & NA subtypes: most do _____ infect humans.
- To spread, flu must _____ previous immunity.

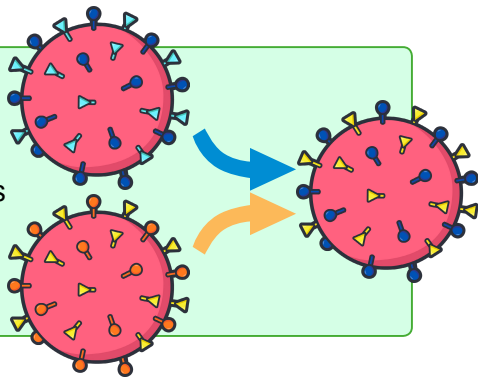
Antigenic Drift: mutations cause _____ changes to antigens.

- Responsible for most _____ flu variants.
- Reason why flu _____ updated yearly.
- Does _____ change antigen numbering.



Antigenic Drift: sudden introduction of _____ changes.

- Often responsible for _____.
- Often involves _____ of flu variants from birds or swine with _____ variants.
- May lead to _____ antigen numbering.



EXAMPLE

The 1968 influenza pandemic introduced the H3N2 flu strain for the first time. Prior to 1968, the most common flu strain in humans was the H2N2 strain. The 1968 flu is thought to have developed in pigs that had been infected by both avian and human flu strains. Using this information and your knowledge of influenza, answer the following questions.

a) Which spike protein variant do you think was most likely novel to humans in the 1968 flu pandemic?

_____

b) What is the role of the spike protein that was your answer for the previous question?

_____

c) Was this a case of antigenic shift or antigenic drift?

_____

PRACTICE

Most years, a new version of the seasonal flu vaccine is required because of:

a) Antigenic drift.
b) Antigenic shift.
c) Hemagglutinin reshuffling.
d) Neuraminidase reshuffling.

PRACTICE

The flu pandemics of 1957, 1968, 2009, and likely 1918 all involved the introduction of either HA or NA protein variants from either birds, swine, or both. Which of the following is a reasonable explanation as to why such an introduction could be associated with a pandemic?

a) Antigenic shift introduced novel antigens for which humans had no immune defenses.
b) These pandemics represent zoonoses, which are inherently more dangerous than other infections.
c) Avian and swine variants of influenza more closely resemble human influenza type C, meaning they are significantly more virulent.
d) Introduction of a novel NA protein would allow the flu virus to enter new types of cells, significantly increasing its virulence.