RS-Viral Infections

- Major viri responsible for ARDs are :

(1)Influenza Virus
(2)Parainfluenza Virus
(3)Rhinovirus
(4)Adenovirus
(5)RSV
(6)Respiratory Coronavirus

⭐ All of these agents are associated w/ an increased risk of bacterial superinfection of the damaged tissue of the respiratory tract.

- *ROT*:

✔Direct ▸ Infective droplet nuclei
✔Indirect ▸ Hand transfer of contaminated secretions to nasal or conjunctival epithelium

Influenza Virus

- Enveloped , ssRNA viri , pleomorphic
- Based on ribonucleoprotein they are classified into 3 major serotypes :

Type A The most imp one	Naturally infect a wide variety of species, including mammals and birds Have a great tendency to undergo significant antigenic changes
Type B	more antigenically stable Only known to naturally infect humans
Type C	minor causes of dz Affecting humans and pigs.

Influenza A

- A unique aspect of influenza A viri is their ability to develop awide variety of subtypes through the processes of mutation and genetic reassortment

- 2imp Ags of this serotype are :HA & NA

Hemagglutinin Subtypes : 15	mediates binding of the virus to target cells and entry of the viral genome into the target cell H1, H2 ,H3 ; appear to be imp in human infections
Neuraminidase Subtypes :9	involved in the release of progeny virus from infected cells N1 , N2 ; appear to be imp in human infections

- Most imp subtypes based on H, N combs are :

(1) H1N1 : swine flu
(2) H3N2 : Hong Kong flu
(3) H5N1 : Birds flu (most severe)

Cx findings / dz presentation
(1) Chracterstics of *typical illness* :
⭐ Fever
⭐ Diffuse muscle aches
⭐ Chills
⭐ Resp signs ⏩ Rhinitis , cough , resp distress
✔Some acute manifistations :
-CNS dysfunction
-Myositis
-Myocarditis
✔The most common and imp compl of influenza virus infection is : Bacterial superinfection
Bacteria that most commonly involved are :
S.pneumonia , H.influenza , S.aureus
⭐ IMP ⭐
In infants and children, a serious complication known as *Reye's syndrome* may develop 2 to 12 days after onset of the infection. It is characterized by severe fatty infiltration of the liver and cerebral edema.
This syndrome is associated not only w/ influenza viruses but w/ a wide variety of systemic viral illnesses. The risk is enhanced by exposure to some drugs such as aspirin.

Pathogenesis :
(1)Multiplication of virus in ciliated resp epithelial cells ➡ functional and structural ciliary abnormalities ➡ desquamation of both ciliated and mucus-producing epithelial cells
⏩ interference w/ the mechanical clearance mechanism of the RT
(2)Viremia IS RARELY detected (y3ni el virus affinity is almost only for Resp tract)
(3)During the acute phase of infection
▸ impaired chemotactic ,phagocytes and intracellular killing functions of PMN and alveolar macrophage activity ➡ renders the host susceptible to invasive bacterial superinfections

Recovery and immunity :
(1) IFN production ➡ limits furthur viral replication
(2) Rapid generation of NK cells
(3) Anti-HA Ab ➡ most protective as it has ability to neutralize virus on re-exposure
(4) Anti-NA Ab ➡ not as protective as Anti-HA Ab , plays a role in limiting virus spread w/n the host

Dx :
✔Isolates ➡ respiratory tract specimens, such as nasopharyngeal and throat swabs.
✔Culture ➡Kidney cell culture or other types of cell culture & Detected by
➡Hemadsorption (ability of the virus to adhere and clump RBC due to expression of HA on the cell surface) / hemagglutination
If Hads test was +ve , identification is usually done by HAI test(addition of Ab).
✔Rapid dx by ➡direct IF or EIA of viral ag in epithelial cells or secretions from RT .
✔Other way : [Ab] titer ➡ 4x or greater inc in acute phase cosidered to be significant .

Vaccine :
Prevent infection. It is redeveloped each year to contain specific strains of inactivated (killed) flu virus that are recommended by public health officials for that year.

RSV

- RNA virus , Paramoxyvirus .
- Almost all children are infected by age of 4 y
- Name :derived from its ability to produce cell fusion in tissue culture (syncytium formation). Unlike influenza or parainfluenza viruses, it possesses no hemagglutinin or neuraminidase. - The genome encoded 10 proteins.
  Protein G ➡ mediate attachment
  Protein F ➡ syncytium formation
- At least two antigenic subgroups (A and B) of RSV are known to exist. This dimorphismis due primarily to differences in the G glycoprotein.

Epidemiologic studies have suggested that group A infections tend to be more severe.

Pathogenesis :
(1)RSV is the single most important etiologic agent in respiratory dz's of infancy, and it is the major cause of bronchitis, bronchiolitis and pneumonia among infants under 1 year of age.
(2)Pathological effects :
⭐ Necrosis of epithelial cells; interstitial mononuclear cell inflammatory infiltrates,
⭐ Plugging of smaller airways w/ material containing mucus, necrotic cells, and fibrin
⭐ Multinucleated syncytial cells w/ intracytoplasmic inclusions
(Viral inclusion bodies are unique structures generated by viral proteins together w/ some cellular proteins for efficient viral replication) are occasionally seen in the affected tracheobronchial epithelium.

Sites	Bronchi Bronchioles Alveoli (infection appear to be confined to RT epithelium , w/ dz progression ⏩ middle and lower airways are involved
Sx of acute phase	Cough Wheezing Resp distress (lasts 1-3weeks)
Spread to URT	Contact w/ infective secretions

The apparent enhanced severity of dz, particularly in very young infants, may have an immunologic basis.
Factors that have been proposed to play a role include :

-Qualitative or quantitative deficiency in humoral or secretory antibody (sIgA)responses to critical virus-specified proteins
-Formation of Ag-Ab complexes w/n the respiratory tract resulting in complement activation
-Excessive damage from inflammatory cytokines.

Dx:
-Specimen : Nasal washing , swabs
-On the above , IF or EIA ▸ detection of viral Ags (allow us for rapid dx)
-Can be isolated also by inoculation of specimen into cell culture (longer duration)
-Can also be diagnosed by detection of multinucleated giant cells (synsitium)

Prevention :
No vaccine is currently available