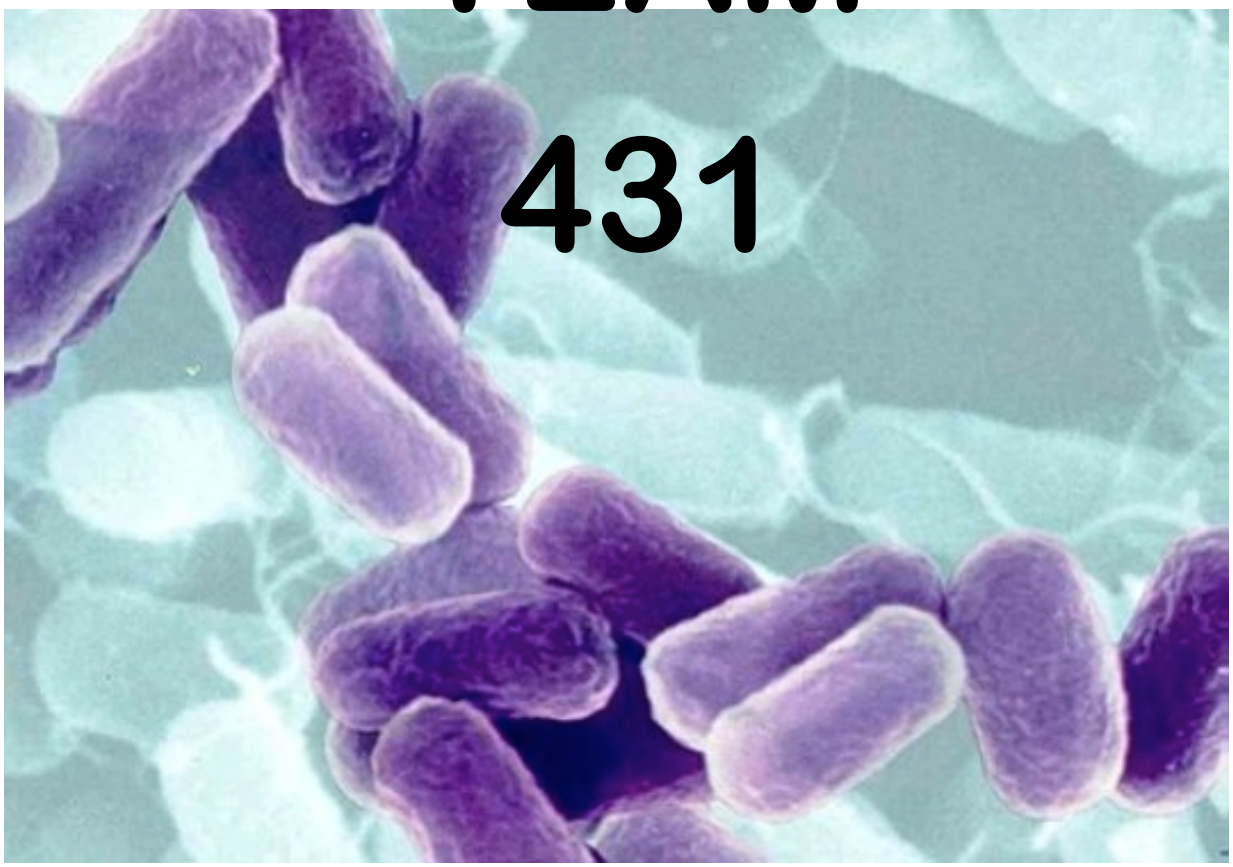
MICROBIOLOGY TEAM 431



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<VIROLOGY>

- **Respiratory tract infections are mostly common human infections , cause a lot of morbidity and loss of time at work (you can't go to work or does complications & affect your work)**
- **Respiratory tract infections are mostly caused by viruses (if the infection is bacterial or viral, viral is most common, bacteria can come secondary to the virus)**
- **Affect both children and adult**
- **Viral infections mostly mild and confined to upper respiratory tract(URT)**
- **Most are self-limiting disease**
- **URT infection may spread to other organs and cause more severe infection or death**

Viral Infections of Respiratory Tract

1- **Influenza Virus**
2- **Rhinovirus: responsible for 60% of the common causes all year e.g.: runny nose, conjunctivitis , cough)**
3- **Corona virus**
4- **Para influenza virus (important in children)**
5- **Respiratory Synctial viruses (important in children especially infants< 6 months**
6- **Adenovirus (causes respiratory tract infection and other things)**

- **All nucleic acid viruses are RNA except for Adenovirus has DNA NA**

Influenza Virus

- **Family: <u>Orthomyxoviridae</u>**

- **Nucleic acid: single, stranded negative sense RNA with 8 helical segments (separated from each other)**
- **Capsid: helical symmetry**
- **Enveloped virus : contains 2 projecting glycoprotein spikes**
  1- **Heamagglutinin HA (antibodys to HA is important for immunity)**
  2- **Neuroamindase NA(an enzyme help in releasing progeny virus formation from infected cell)**

- **Heamagglutinin: is the one important for attachment, in order for the virus to get inside our body, we should have receptors for this Heamagglutinin**
- **Neuroamindase: After the virus is inside the cell and multiplies, it goes to infect other cells, Neuroamindase helps the virus to infect other cells.**

Epidemiology: Winter months mostly

There are 3 types of influenza (very important)

Influenza A	Influenza B	Influenza C
Causes most of the problems every year Infect Human & Animals (swine flu) Can cause infection epidemic (restricted area) or pandemic (whole continent, large area) Epizootic (infect all animals in a whole area e.g. swine flu, bird flu .It can cause all those problems because it can do antigenic shift, also antigenic drift	Infect Humans only Cause infection outbreaks & epidemic (No pandemic, can't infect a whole country) E.g. outbreaks (can affect schools, colleges), epidemic can infect a village Has Antigenic drift only	Infect Human only Cause Mild illness

Antigenic Shift: (Character of Influenza A only) important

When 2 types of influenza e.g. Human H2N2(protein is rounded) in humans and Avian H3N8(protein is arrow shape) in birds, depends on the nucleic acid and there is a pig (has receptors can catch any type of influenza A) living in the same place , the pig takes and catches the 2 types of influenza & inside its body mixes the 2 types and opens their nucleic acids to produce a new virus (rounded & arrow shape proteins) which has the character of the human virus and the avian so the problem here is that this new virus can infect humans (as in Swine flu) <genetic re assortment>, change in the genetics to produce a new virus(Human H3N2) called shift because it changed the RNA & the organization , when double infections in animals happen at the same time

- **Influenza B & C can't change and do antigenic shift so can't infect animals only humans**

Antigenic Drift:

Every year I can get infected with an influenza and a small change happens, arrangement changes, slight mutation occurs (in A & B influenza)

Immunity

Influenza establishes an Upper respiratory tract infection BUT according to immunity of the host, it can be a localized infection or spread to lower respiratory tract

Viremia occurs (fever)

Influenza infection is a self limiting condition

Clinical Syndrome

Transmission :
inhalation of respiratory secretions

Incubation period:

4 days

Usually in winter

Symptoms : Malaise – Headache sneezing – sore throat It takes 3 days. Non-productive cough

Complications of Influenza:

Primary Influenza

Pneumonia.

2nd bacteriapneuomonia *Strep. pneumoniae, H.influenzae*

Myositis (inflammation of the muscle).

Post influenza encephalitis.

Bronchial Asthma.

Sinusitis

Laboratory Diagnosis

Specimen: Nasopharyngeal aspirate, nasal washing (in children)

Rapid and direct detection of influenza A or B from nasopharyngeal aspirate by immunofluorescence &ELISA. This is the most common laboratory diagnosis.

PCR (Nucleic acid testing)

Treatment of Influenza

Amantadine

: Is only effective against **influenza A** virus.

Inhibiting the UN coating step of influenza A virus. It has both **therapeutic** and **prophylactic** . It significantly reduced the duration of fever and illness is given to **high risk group of patients** who are **not vaccinated because they have allergy from egg.**

Tamiflu (Oseltamivir)

- **It is Neuraminidase inhibitor that acts by blocking the viral enzyme neuraminidase which help the influenza virus invade respiratory tract cells is effective against Influenza A&B.**
- **It has to be given within the first 48 hours after the exposure of cases or appearance of symptoms.**
- **Recommended dose is 75 mg twice daily for 5 days.**

INFLUANZA VACCINE

- **Two types of vaccine, both contain the current influenza A & B.**
- **Vaccine should be given in October or November, before the influenza season begins.**
- **Yearly booster dose recommended.**
- **1-The Flu shot vaccine(Inactivated (Killed vaccine),**
- **Given to people older than 6 months, including healthy people as well as high risk groups (elderly, patients wit**
- **h chronic pulmonary or cardiac diseases).**
- **2-The Nasal spray flue vaccine(Flu mist) This is a live attenuated vaccine.**
- **Approved for use in healthy people only between 5- 49 years age.**

2- Rhinovirus

Family: ***Picornaviridae.***

Non-enveloped virus with + RNA genome, more than 100 serotypes available.(That's why rhinovirus can come 100 times common cause a year cuz it has more than 100 types)

Transmission:(the same aerosol) , inhalation

The First common cause of Cold (important) 60% common cases every year is Rhinovirus

The main symptoms of common cold are sneezing, clear watery nasal discharge with mild sore throat and cough

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Lab diagnosis: (the same as influenza) Direct detection of the Ag from NPA by direct I.F.

Treatment and prevention: Usually self-limiting disease, no specific treatment, and no vaccine available.

3-Coronaviruses

ssRNA enveloped

Coronavirus are 2nd cause of common cold (important)

Clinical presentation of common cold:

Symptoms :(the same) runny nose, sneezing and nasal obstruction, mild sore throat, headache and malaise that last for one week.

Complication: Usually due to secondary bacterial infection

1. **Acute sinusitis 2) Acute otitismedia.**

3) chronic bronchitis ,bronchial asthma

Laboratory Diagnosis:

- **Usually no need. Treatment and Prevention: No specific treatment.(no vaccines)**

- **Coronavirus: <SARS> Mutation in coronavirus inside the cat made a new strain which caused severe acute respiratory syndrome**

4- Parainfluenza Virus

Family: *Paramyxoviridae.*

Structural features: Enveloped virus with ssRNA genome, with 5 serotypes.

Transmission: Inhalation of infectious aerosol droplets mainly in winter.

Clinical syndrome: <The main problem it causes in Children & Infants> very severe disease

Croup or acute laryngotracheobronchitis (infection in vocal folds and pharingitis) . P.I. Type I, II mainly in infants and young children. Fever, harsh cough, difficult inspiration can lead to airway obstruction need hospitalization to do tracheostomy. Bacterial cause of croup: hemophilous influenza

Bronchiolitis and Pneumonia: P.I. Type III in young children.

In adults just causes URT infection but the problem is in children

Lab diagnosis: Direct detection from N.P.A by direct I.F. Treatment: supportive treatment(no specific)

5-Respiratory Syncytial Virus (RSV) important

One of the paramyxoviridae family.

Enveloped, ss **RNA .** **The virus transmitted by respiratory droplets, virus is very contagious with (I.P. 3-6 days) infection mainly in winter.**

The importance of RSV lies in its tendency to invade the lower respiratory tract of infant <6 months

Bronchiolitis & pneumonia (can kill baby) < here is the importance>
ClinicalSyndromes: RSV can cause any respiratory tract illness from common cold, in children pneumonia, In old children and adult can cause common cold.

Bronchiolitis an important and life –threatening disease in infant especially under 6 months of life, started with fever, nasal discharge, rapid breathing, respiratory distress and cyanosis, it may be fatal in premature infant or infant with underlying disease or immunocompromised infant, also can lead to chronic lung disease in later life. <Needs treatment>

Pneumonia: also an important and life threatening disease in infant with case fatality rate of 2-5% .

Infant will be hypoxic and need hospitalization <very important>

1- (oxygen inhalation).
2- 2- Ribavirin given by inhalation to treat severe Bronchiolitis and pneumonia.

- Passive immunization with anti-RSV immunoglobulin is

available for premature infant.

Hospital staffs caring for these isolated infants have to follow control measure as hand washing, wearing of gowns, goggles and mask.

No vaccine is available.

Laboratory diagnosis:

Isolation of the virus from nasopharyngeal aspirate OR mouth wash in cell culture will appear as multinucleated giant cell (syncitia).

ELISA and immunofluorescent for direct detection from

nasopharyngeal aspirate.

6-Adenovirus

Structural features: Non-enveloped virus with ds-DNA genome.

This virus is considered respiratory virus, GIT virus, sexually transmitted disease virus) cuz it can infect any epithelial cell lining the body

Pathogenesis: Adenovirus has the ability to infect epithelial cell lining respiratory tract, conjunctiva, urinary tract, gastrointestinal tract and genital tract, Adenovirus has the tendency to be Latent in lymphoid tissue (hides there). <adenovirus can cause everything except the brain, meningitis & encephalitis (infection of the brain tissue)

Clinical syndrome: Causes a lot of things

1. Phrayngitis and tonsilitis.
2- Pharyngioconjunctivitis
3- Keratoconjunctivitis.
4-Pneumonia: in preschool children.
5-Gastroenteritis.
6-Acute hemorrhagic cystitis.

Cervicitis and urethritis.

Q1: Which of the Following is a DNA virus?

A. **Parainfluenza virus**
B. **Adenovirus**
C. **Coronaviruses**
D. **Rhino Virus**

B

Q2: Which one of the following is the most common cause of cold?

A. **Adenovirus**
B. **Coronaviruses**
C. **Rhino virus**
D. **Parainfluenza virus**

C