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MED437  
KING SAUD UNIVERSITY



MICROBIOLOGY  
437

# Viruses Causing Respiratory Infections (II)

**Important!**  
Doctor's Notes  
Only found in females' slides  
Only found in males' slides  
Extra Notes

*"I'm not telling you it's going to be easy. I'm telling you it's going to be worth it."*



# Objectives

- ❖ Characteristics of MERS-CoV, Rhinovirus, Coxsackieviruses & other Picornaviruses, Adenovirus, Epstein – Barr virus.
- ❖ Mode of transmission
- ❖ Clinical Features
- ❖ Lab diagnosis
- ❖ Treatment and Prevention

# Coronavirus

## Family

Coronaviridae.

## Structural features

Enveloped virus with + polarity ss-RNA genome.

## transmission

Inhalation of infectious aerosol droplets.

## Symptoms

The 2nd cause of common cold.

★ Coronavirus causes zoonotic disease (the virus is capable of infecting humans & animals including birds, camels, pigs, others).

## SARS-CoV

### Severe Acute Respiratory Syndrome (SARS)

- In winter of 2002, a new respiratory disease known as (SARS) emerged in China after a new mutation of coronavirus.
- The disease spread worldwide due to travelling.
- The animal reservoir may be rats or cats.
- SARS starts with high fever followed by cough with difficulty in breathing (atypical pneumonia).
- Associated with high mortality due to respiratory failure.

# MERS-CoV

★ In September 2012, a case of novel coronavirus infection was reported involving a man in **Saudi Arabia** who was admitted to a hospital with **pneumonia and acute kidney failure**. This virus has been named as Middle East Respiratory Syndrome- CoronaVirus (MERS-CoV), virus closely related to several **bat** coronaviruses. MERS-CoV infected several human cells, including lower but not upper respiratory, kidney, intestinal, and liver cells.

★ **Middle East Respiratory Syndrome (MERS)** is viral respiratory illness first reported in KSA in 2012. It is caused by a coronavirus.

## Epidemiology

So far, all the cases have been linked to countries in and near the Arabian Peninsula.

- ❖ **Highly infectious.**
- ❖ **Incubation period 2-14 days.**

## Transmission

This virus spread from ill people to others through close contact. There is no evidence of sustained spreading in community settings. Evidence also suggested that the virus can be acquired from direct close contact with animals.

## Risk Group

- ❖ Individuals with weakened immune systems
- ❖ People with pre-existing medical conditions (or comorbidities) such as diabetes, cancer, and chronic lung, heart, and kidney disease. *Can lead to death.*

## Clinical Features

- Symptoms may include fever, cough, and shortness of breath.
- Some people also had gastrointestinal symptoms including diarrhea and nausea/vomiting.
- Some infected people had mild symptoms (such as cold-like symptoms) or no symptoms at all and they recovered completely.
- Most people with comorbidities developed severe acute respiratory illness.

## Complications

Severe complications include **pneumonia and kidney failure**. About **30%** of people infected with MERS died.

## Lab diagnosis

Detection of the viral nucleic acid (NA) by PCR.

## Other Method

Isolation of the virus from NPA by **cell culture**.

## Treatment

No specific antiviral treatment. For severe cases, current treatment includes care to support vital organ functions.

## Prevention

People are advised to protect themselves from respiratory illnesses by taking everyday preventive actions:

- Wash hands often with water and soap or use an alcohol-based hand sanitizer.
- Cover nose and mouth with a tissue when cough or sneeze.
- Avoid touching eyes, nose and mouth with unwashed hands.
- Avoid personal contact with sick people.
- Clean and disinfect frequently touched surfaces such as toys and doorknobs.

# Rhinovirus

## Family

Picornaviridae

## Structural features

Non-enveloped virus with + polarity ssRNA genome. More than 100 serotypes available

## transmission

Inhalation of infectious aerosol droplets.

## Clinical Symptoms

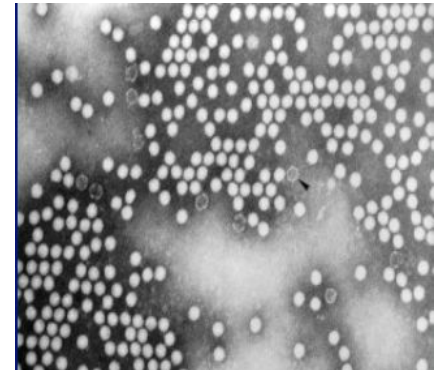
The 1st cause of common cold. The main symptoms of common cold are sneezing, clear watery nasal discharge with mild sore throat, cough

## Lab diagnosis

Detection of the viral nucleic acid (NA) by PCR.

## Treatment

Usually self-limiting disease, no specific treatment, and no vaccine available



# Coxsackieviruses & other Picornaviruses

## Family

## Structural features

## transmission

## Clinical Symptoms

Picornaviridae

Non-enveloped virus with + polarity ssRNA genome.

- Coxsackieviruses group A&B
- Echovirus, Entrovirsuses

Inhalation of infectious aerosol droplets.

Coxsackieviruses cause herpangina and pharyngitis Echovirus & other Enteroviruses cause respiratory

## Lab diagnosis

## Treatment

Detection of the viral nucleic acid (NA) by PCR.

Usually self-limiting disease, no specific treatment, and no vaccine available



# Adenovirus

## Family

## Structural features

## Pathogenesis

## Clinical Syndrome

Adenoviridae

Non-enveloped virus with dsDNA genome.

Adenovirus infects epithelial cell lining respiratory tract conjunctiva, urinary tract, gastrointestinal tract and genital tract.

Infect everything but not CNS!! e.g. insifilities

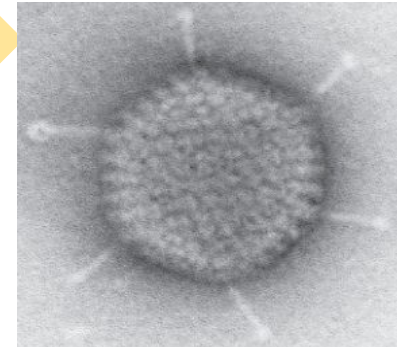
1. Pharyngitis and tonsillitis.
2. Pharyngoconjunctivitis
3. Conjunctivitis.
4. Pneumonia: in preschool children.
5. Gastroenteritis.
6. Acute hemorrhagic cystitis.
7. UTI (Cervicitis and urethritis).

## Lab diagnosis

## Treatment

Direct detection of the Ag from NPA by direct IFA.  
Other methods are tissue culture and PCR

Usually self-limiting disease, no specific treatment, and no vaccine available





# Epstein-Barr Virus

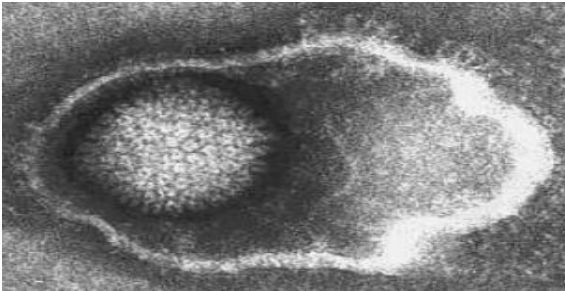
## Family

herpesviridae

Enveloped, icosahedral dsDNA virus.

- ❖ It is lymphotropic. Like living in lymphocyte
- ❖ It has **oncogenic\* properties** (causing development of tumor)
  - Burkitt's lymphoma
  - Nasopharyngeal carcinoma.

\*Can cause cancer



## Structure

## Epidemiology

- ❖ Distribution: worldwide spicely in teenagers and young adolts.
- ❖ Transmission: mainly by saliva (kissing disease) and rarely by blood.
- ❖ Age: depends on the socio-economic status (SE):
  - Low SE → Early childhood.
  - High SE → Adolescence\*

مثلا عندنا مدرستين وحده بحي فقير وملوث ووحده بحي متوسط ونظيف.  
طلاب المدرسة اللي بالحي الفقير راح يكونون أكثر عرضه بالإصابة  
بالفايروس وهما صغار والطلاب اللي بالمدرسة اللي بالحي المتوسط راح  
يكونون أكثر عرضه للإصابة بالفايروس لما يكبرون

\*(following the onset of puberty during which a young person develops from a child to an adult).

# Clinical Features

## Immunocompetent host:

- ❖ Asymptomatic
- ❖ **Infectious mononucleosis (Glandular fever)**
- ❖ Incubation period: 4-7 weeks
- ❖ **Fever, sore throat, tonsillitis, with lymph node enlargement** pharyngitis, malaise, hepatosplenomegaly & abnormal LF,



## Immunocompromised host:

- ❖ **Lymphoproliferative disease (LD)**
- ❖ Oral hairy leukoplakia (OHL)



## Complications:

- ❖ Acute airway obstruction
- ❖ Splenic rupture
- ❖ CNS infection

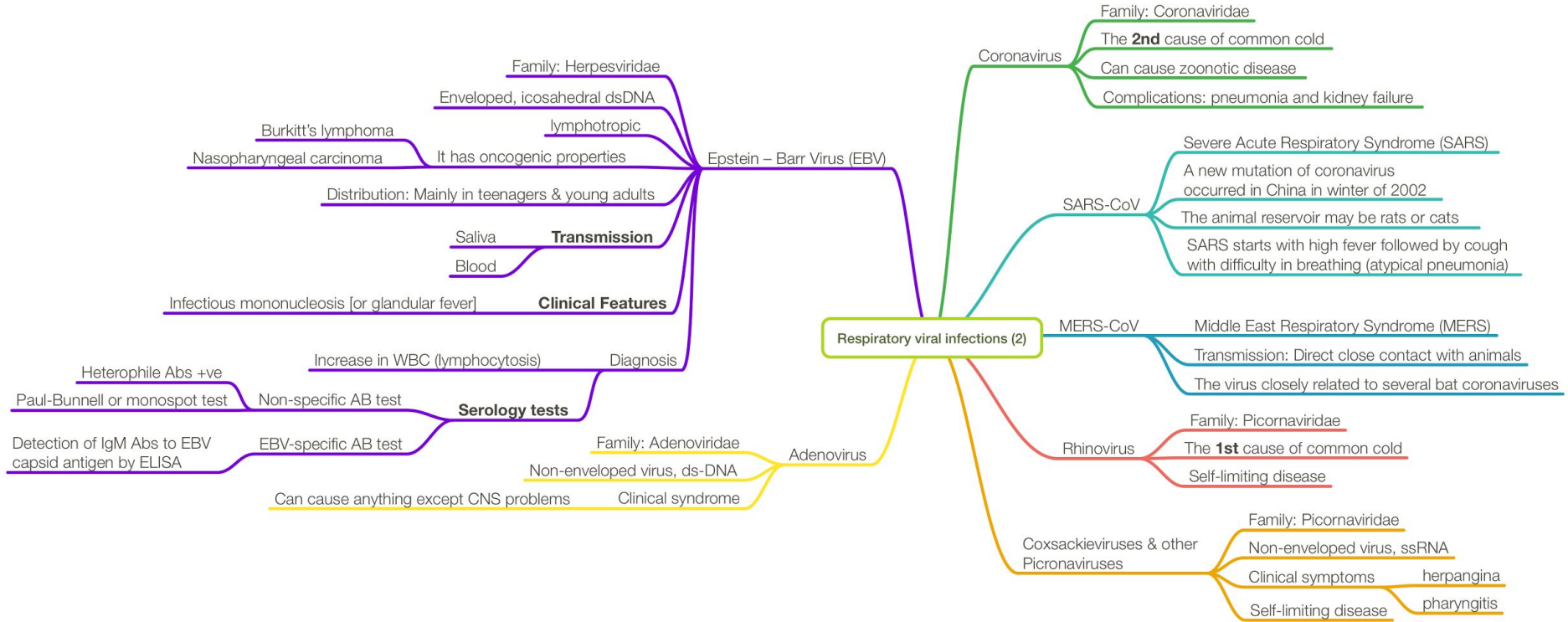
# Diagnosis

- 1) **Hematology**
  - High WBC
  - Lymphocytosis (Atypical lymphocytes)

- 2) **Serology Test**
  - Non-specific AB test:
    - Heterophile Abs +ve
    - **Paul-Bunnell** or monospot test
  - EBV-specific AB test:
    - Detection of IgM Abs to EBV capsid antigen by ELISA

# Management

There is **NO treatment** for infectious mononucleosis, and **NO vaccine** to prevent it from happening.



# MCQs

1- Which one is the 1<sup>st</sup> cause of common cold?

- A. Coronavirus
- B. SARS-coV
- C. Rhinovirus
- D. MERS-coV

2- Which one is the 2<sup>nd</sup> cause of common cold?

- A. Coronavirus
- B. Adenovirus
- C. Rhinovirus
- D. SARS-coV

3- Adenovirus genome is a ...

- A. ssRNA
- B. dsRNA
- C. ssDNA
- D. dsDNA

4- A virus transmitted by saliva and blood

- A. Epstein-Barr virus EBV
- B. Adenovirus
- C. Coronavirus
- D. Coxsackievirus

5- A virus which usually self-limiting disease

- A. SARS-coV
- B. MERS-coV
- C. Coronavirus
- D. Coxsackievirus

6- A virus start with high fever followed by cough with difficulty in breathing

- A. SARS-coV
- B. MERS-coV
- C. Coronavirus
- D. Coxsackievirus

# SAQs

1. How can coronavirus transmit?
2. List two clinical symptoms of coxsackievirus and other picornaviruses.
3. What is the main clinical feature of Epstein-Barr virus EBV?
4. Describe the EBV genome.
5. What are the two oncogenic properties of EBV?
6. How can we diagnose EBV?

Answers:  
1. C  
2. A  
3. D  
4. A  
5. D  
6. A

1. By direct close contact with animals.
2. Herpangina and pharyngitis.
3. Infectious mononucleosis (or glandular fever).
4. Enveloped, icosahedral dsDNA virus.
5. Burkitt's lymphoma, Nasopharyngeal carcinoma.
6. By two ways:
  - a. Hematology: there will be an increase in WBC (atypical lymphocytes)
  - b. Serology test :
    - i. Non-specific AB test : heterophile Abs+ve, Paul-Bunnell or monospot test.
    - ii. EBV-specific AB test : detection of IgM Abs to EBV capsid antigen by ELISA.

# Team Leaders

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