

Coronaviruses

Co Vs.

○ Learning Outcomes

- 4th Example of Human Specific Disease:
 - Coronaviruses
 - Classification
 - morphology and structure.
 - Laboratory diagnosis.
 - Treatment and Prevention

What are Coronaviruses?

- Human coronaviruses (HCoVs) are known respiratory pathogens associated with a range of respiratory outcomes.
- A Coronavirus is a kind of common virus that causes an infection in your nose, sinuses, or upper throat. Most Co Vs are not dangerous.
- In the past 14 years, the onset of severe acute respiratory syndrome Co Vs (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) have thrust HCoVs into spotlight of the research community due to their high pathogenicity in humans.
- Most coronaviruses first replicate in epithelial cells of the respiratory or enteric tracts.
-

The Classification

Order

Nidovirales

Family

*Coronaviridae**

Subfamily

Coronavirinae

Torovirinae

Genus

Alpha
coronavirus

**Beta
coronavirus**

Gamma
coronavirus

Delta
coronavirus

Torovirus

Bafinivirus

Lineage

a

b

c

d

SARS-CoV

MERS-CoV

- SARS-Cov

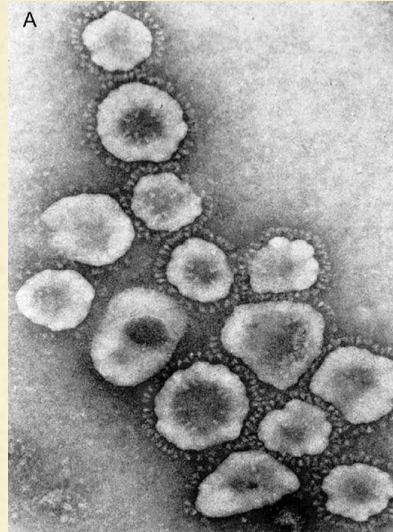
- Appeared in 2002 in China. Emerged from animal reservoir. Incubation period 2-14 days, droplet infection. Affected 8000 patients in 29 countries of the world . no vaccine.

- MERS-Cov

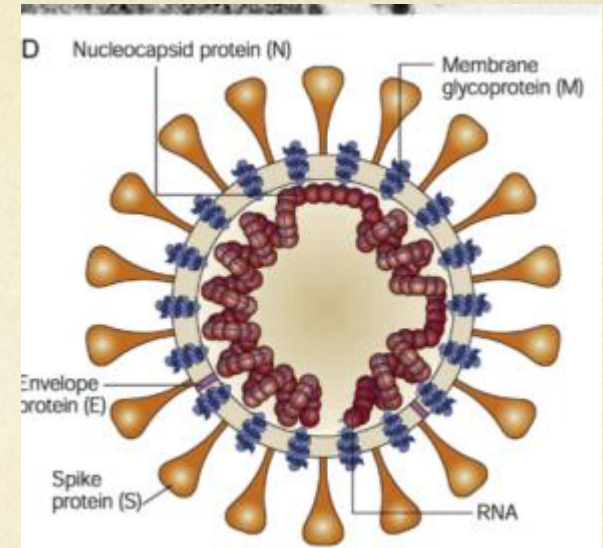
- Appeared in 2012. Human -to-human transmission confirmed. Reservoir of infection not yet determined. (from Bats to Camels to Humans?) .Incubation period (2-14 days) not yet confirmed.

Structure and genome:

- ❖ Co Vs are enveloped viruses with a positive-sense single-stranded RNA genome and with a nucleocapsid of helical symmetry.
- ❖ The genomic size of Co Vs ranges from approximately 26 to 32 kilobases, the largest for an RNA virus.
- ❖ four genes of structural proteins are S(spike) -E(envelope) -M (membrane) -N (nucleocapsid)



Negative contrast electron microscopy of SARS coronavirus (SARS-CoV), showing the large petal-shaped surface projections (spikes, peplomers).



Model of coronavirus virion structure, showing the supercoiling of the viral nucleocapsid under the envelope.

Specimens

- Blood
- Stool
- Nasopharyngeal swab
- Tracheal aspirate

Laboratory diagnosis:

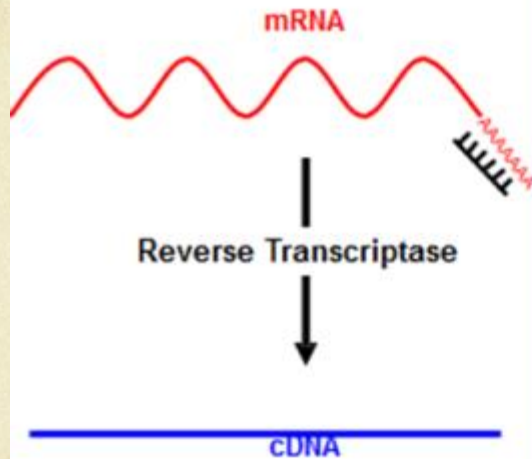
- 1- Direct Detection by ELISA
- showed the presence of SARS-CoV antibodies against the N protein in 50% to more than 80% of sera collected during the first week of illness, and in more than 50% of respiratory and stool specimens collected during the second and third weeks of illness.

- 2-detection in respiratory secretions by RT-PCR assay systems.
- MERS-CoV RNA can be detected in blood, urine, and stool
- as well as in respiratory aspirates by RT-PCR.
- Technique used in molecular biology to detect RNA expression by generation of complementary DNA (cDNA) transcripts from single stranded RNA
- mRNA is the message sent for translation – gene expression
- DNA polymerase cannot read RNA
- RT-PCR reverse transcribes mRNA to cDNA and then amplifies this using traditional PCR.

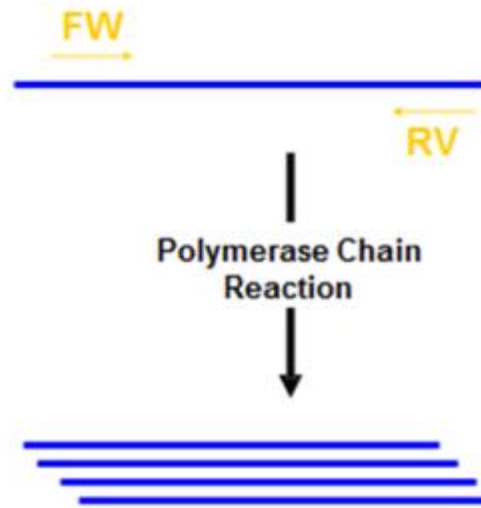
RT-PCR

STEPS OF RT-PCR

1. Synthesize cDNA by RT



2. Amplify cDNA by DNA Polymerase



- 3- Isolation: CoV are difficult to grow in cell culture. Reliable isolation of the virus is accomplished using human embryonic tracheal organ cultures.

Treatments:

- No specific treatments.
- Most people with illness will recover on their own.
- Some things can be done to relieve symptoms such as :
 - ◆ Taking pain and fever medications(caution: aspirin should not be given to children).
 - ◆ Using a room humidifier or taking a hot shower to help ease a sore throat and cough.
 - ◆ During sick, drink plenty of liquids, stay home and rest.
 - ◆ Contact health care provider.

Who can we prevent Co Vs?

- ✧ Keep away from someone with a heavy cough.
- ✧ Use a tissue to cover the nose/mouth when coughing, sneezing, wiping and blowing noses.
- ✧ If a tissue isn't available, cough or sneeze into the inner elbow rather than the hand.

1 ORIGINS
The origins of the corona virus are currently undiscovered by scientists, however it is believed that the disease originally targeted bats. Then the virus may have made the leap from bats to humans after evolving within their population. Likewise, the Corona virus's range also extended to camels, making the same jump to the human species.

2 TRANSMISSION AND EFFECTIVITY
The corona virus is transmitted through contact with someone who is infected with the disease. It is also transmitted through a patient's coughing and sneezing. This places a greater emphasis on using tissues and prevention in that region of transmission.

3 SYMPTOMS-SEVERITY/LETHALITY
We can diagnose and identify the severity of the Corona Virus thru the manifestation of the following symptoms:

- Fever/38 degrees or higher temperature
- Pneumonia
- Coughing
- Asthma or trouble breathing

4 IDENTIFICATION OF SEVERITY

LOW	MILD	MEDIUM	SEVERE
Very few or no symptoms.	Cold like symptoms appear.	Symptoms such as fever, coughing and troubled breathing appear.	Symptoms such as pneumonia and difficulty to breathe appear.

5 AFFECTED COUNTRIES
Source: 2

A world map showing affected countries with callouts for: America, Mexico, India, Pakistan, Turkey, Iran, Saudi Arabia, Qatar, Oman, United Arab Emirates, Bahrain, Yemen, and South Korea.

Poster 1: Corona Virus Prevention

corona
VIRUS PREVENTION

3
ISSUE

PREVENTION METHODS

Currently, there is no vaccine for the corona virus, so prevention is extremely important. There are many prevention methods that are important to practice so as not to spread the disease. Listed below are some of these methods:

1. **Wash your hands** for at least 20 seconds with soap and water.
 - Follow the steps stated for minimizing the chance of infection. Keep in mind that patients with asthma who are infected with the Corona Virus will suffer from more severe symptoms.
 - However, if you have had no previous health issues but breathing is becoming more difficult than usual, seek medical attention anyway.
 - One of the most effective methods for prevention against the corona-virus is washing your hands regularly and occasionally using alcohol rubs.
2. **Refrain from touching your eyes, nose and mouth with unclean hands.**
3. **Avoid personal contact** with an infected person like sharing saliva and coughs.
4. **Disinfect frequently touched surfaces.**

ADDITIONAL INFO

The mortality rate for the corona-virus is currently believed to be 50%. This is subject to the evolution of the disease which might change certain attributes about it.

As this disease is a virus it will constantly mutate and cannot fully be eradicated as every year a new strain will appear, similar to the flu. The virus will become smarter every year, though our bodies will become smarter as well.

Currently, there is no vaccine for the corona virus, though scientists are working on getting to the roots of the virus and how it initially evolved.

- ✧ Wash hands with hot water and soap at least six or seven times a day
- ✧ Disinfect common surfaces as frequently as possible.
- ✧ Wash hands or use a sanitiser when in contact with common surfaces like door handles.

Thank
you

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