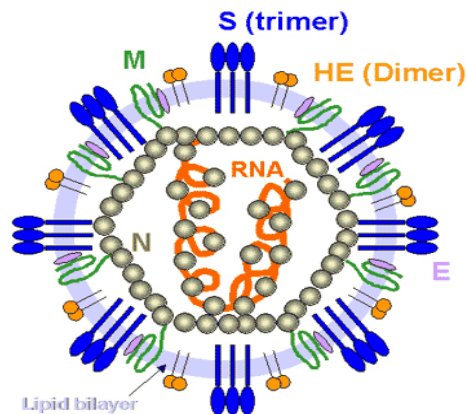


"Coronaviruses"



Coronaviruses are species belonging to Coronaviridae family. The name "coronavirus" is derived from the Latin "*corona*" meaning crown or halo and refers to the royal crown or the solar corona image appearance of virion under electron microscopy, this morphology is created by the viral spikes which are proteins that populated the surface of the virus and determine host tropism.

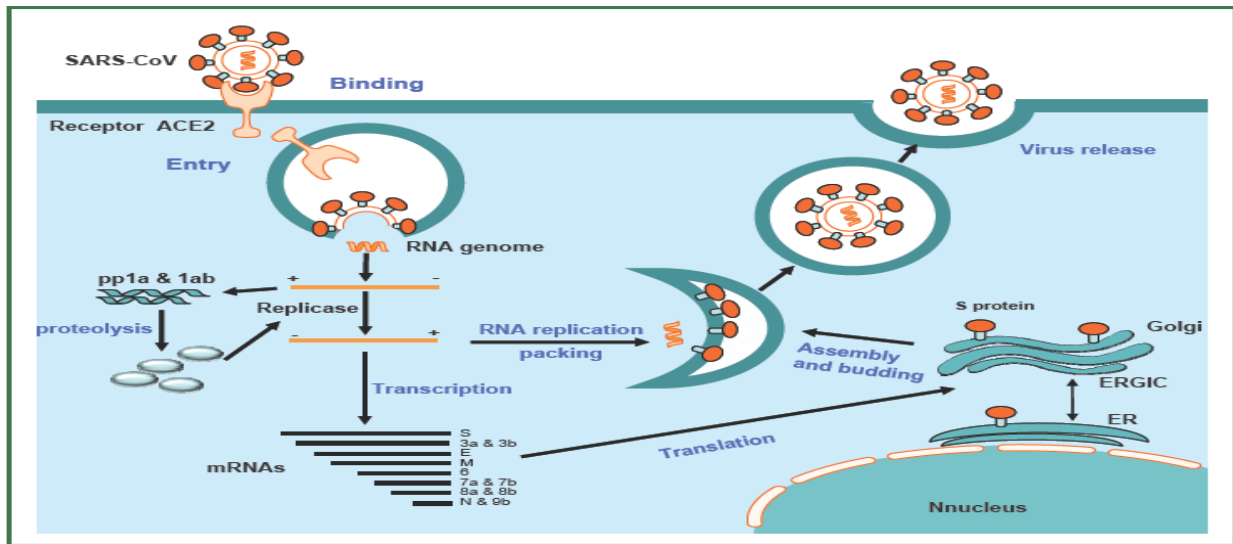
Structure:

Coronaviruses are **enveloped** viruses with spherical **virion** of (120-160 nm) particles that contain the largest **genome** among RNA viruses (unsegmented RNA genome of single stranded positive sense). **The nucleocapsid** has helical symmetry.

Proteins that contributed to the overall structure of all coronaviruses are the spike (S), envelope (E), membrane (M) and nucleocapsid (N), some of coronaviruses have hemagglutinin glycoprotein (HE). In the specific case of the SARS coronavirus a defined receptor-binding domain on (S) mediated the attachment of the virus to its cellular receptor.

Coronaviruses replication:

The entire cycle of coronavirus replication occurs in the cytoplasm. Virions bind specific receptor glycoprotein or glycan via the spike protein. Penetration and uncoating occur by S protein-mediated fusion of the viral envelope with the endosomal membrane. Gene 1 of viral genomic RNA is translated into a polyprotein, genomic RNA is used as a template to synthesize negative-stranded RNAs which are used to synthesize full-length genomic RNA and subgenomic mRNAs, each mRNA is translated to yield proteins. The N protein and newly synthesized genomic RNA assemble to form helical nucleocapsid. Other proteins including M are inserted in the endoplasmic reticulum (ER) and (M) proteins interact to trigger the budding of virions enclosing the nucleocapsid, (S) and (HE) associate with M protein and are incorporated into maturing virus particles. Virions are released by exocytosis from the host plasma membrane.



"A schematic diagram of Coronaviruses replication"

Listing of human coronaviruses:

- Human coronavirus 229E
- Human coronavirus OC43
- Human coronavirus NL63
- Human coronavirus HKU1
- Sever Acute Respiratory Syndrome, SARS-CoV
- Middle East Respiratory Syndrome Coronaviruses

Coronavirus infection in human

Epidemiology:

They are a major cause of respiratory illness in adults during winter months when the incidence of colds is high. It is estimated that coronaviruses cause 15-30% of all colds. Antibodies to respiratory coronaviruses appear in childhood and increase with age.

Pathogenesis and Clinical Findings:

A coronavirus is a kind of common virus that cause an infection of nose, sinuses or upper throat, infection in humans usually remain limited to the upper respiratory tract display a tropism for epithelial cells of respiratory tract causes **common cold** symptoms and some gastroenteritis in human.

The human coronaviruses produce "colds" usually symptoms typified by runny nose, coughing, sore throat, malaise and sometimes fever. The I.P is from 2-5 days and symptoms usually last about 1 week, but if a coronavirus infection spreads to the lower respiratory tract it can cause pneumonia, asthmatic children and chronic pulmonary disease in adults.

Laboratory Diagnosis:

- **Antigen and Nucleic acid detection:**

Coronavirus antigens may be detected using ELISA test if a high-quality antiserum is available. Polymerase chain reaction (PCR) assays are useful with viremia most readily detectable between days 4 and 8 of infection.

- **Virus Isolation:**

Isolation of human coronaviruses has been difficult. However, the SARS virus was recovered from oropharyngeal specimens using monkey kidney cells.

- **Serology:**

Serodiagnosis using acute and convalescent sera is the practical means of confirming coronavirus infection. ELISA and HA tests may be used with strain 229E.

Treatment:

There is no proven treatment for coronavirus infections and no vaccine. Control measures that were effective in stopping the spread of disease include isolation of patients, quarantine of those had been exposed and travel restrictions as well as use of gloves, gowns, goggles and respirators by health care workers.

Sever Acute Respiratory Syndrome Coronavirus (SARS)

SARS is a viral respiratory disease of zoonotic origin caused by the SARS coronavirus. Between November 2002 and July 2003 an outbreak of SARS in southern China caused an eventual 8,098 cases resulting in 774 deaths reported in 37 countries with the majority of cases in Hong Kong (9.6% fatality rate).

The Virus Similar to:

- Influenza virus found in birds from outbreak in Hong Kong in 1997
- Chlamydia like organisms from atypical pneumonia patients in Guangdong outbreak
- Paramyxovirus – similar particles

Transmission:

- SARS-CoV is predominantly spread in droplets shed from respiratory secretions of patients direct or indirect contacts
- Less likely by oral-fecal transmission fecal or airborne transmission
- SARS natural hosts: wild horseshoe bats in China and masked palm civets (*Paguma larvata*)

Clinical course:

- short incubation period (6 days)
- time period from exposure to onset of symptoms ranging from 2 to 16 days
- intensive care usually required about 10 days after onset of symptoms

There are generally 3 phases:

- week 1: cold like symptoms, fever, myalgia, chill and a sore throat
- week 2, recurrence of fever. Onset of diarrhea, and oxygen desaturation
- only 20% of patients reach this phase, requires ventilatory support

The fatality rate is about 10% upon infection.

Diagnosis:

SARS may be suspected in patient who has:

- Any of the symptoms including a fever of 38°C or higher
- History of casual contact with someone with a diagnosis of SARS within the last of 10 days
- Travel to any regions identified by the (WHO) as areas with recent local transmission of SARS

Antiviral drugs/Vaccines:

- Currently, no specific antiviral drugs available for SARS-CoV
- Vaccines are under development.

Control measures:

1. Close contacts of a probable or suspect case of SARS are at high risk of becoming a case, it should be isolated in the community during their potential incubation period
2. Travelers from areas with recent local transmission of SARS should be given advice about whom to contact
3. Health departments should assign staff to undertake contact tracing and daily review of contacts in the community. This should be in conjunction with a 24-hour SARS hotline
4. The recovered patients will be quarantined at home for at least 14 days after discharged from hospital