# Coronavirus: Types, Symptoms, Transmission and Treatment

Coronavirus is a large family of viruses that cause illnesses ranging from the common cold to more severe infections such as pneumonia, Middle East Respiratory Syndrome and severe acute respiratory syndrome.

They belong to a family of enveloped, positive-sense, single-stranded RNA (+ssRNA) viruses.

The name "**coronavirus**" is derived from the Latin corona and the **Greek** ?????? (kor?n?, "garland, wreath"), meaning crown or halo. This is the characteristic of the virion when seen under an electron microscope.

Coronaviridae Members of the genus Coronavirus also contribute to respiratory illness, including severe disease.

Coronaviruses cause about 1/3 of common colds and SARS

Dozens of these coronaviruses affect animals.

Until the 20th century, only two strains of human coronaviruses were known to cause disease: 229E (HCoV-229E) and OC43 (HCoV-OC43).

An outbreak of infection with SARS-associated coronavirus (SARS-CoV) showed that animal coronaviruses have the potential to cross from other species to humans, with devastating effects.

The one major epidemic to date (November 2002 through July 2003) encompassed more than 8000 cases, with mortality rates approaching 10%.

When these viruses infect epithelial cells of the enteric tract they cause diarrhea.

## Strains of coronavirus

There exist seven strains of the virus that have been identified.

1. SARS-CoV
2. Human coronavirus OC43 (HCoV-OC43)
3. Human coronavirus 229E (HCoV-229E)
4. Human coronavirus NL63 (HCoV-NL63)-New haven coronavirus
5. Human coronavirus HKU1
6. Middle East Respiratory Syndrome (MERS-CoV)-Novel coronavirus, 2012 and HCoV-EMC
7. Novel coronavirus (COVID-19) Wuhan pneumonia or Wuhan coronavirus

Novel means newly discovered. It is used as a placeholder name to refer to a newly originated of discovered virus.

A novel **coronavirus** (nCoV) is a new strain that has not been previously identified in humans.

Out of the 7 known species of coronaviruses, only 3 are known to cause severe infections in humans:

- Severe acute respiratory disease coronavirus (SARS-CoV): emerged in 2003 in southern China from civet cats
- Middle East respiratory syndrome coronavirus (MERS-CoV): emerged in 2012 in Saudi Arabia from dromedary camels
- SARS-CoV 2: emerged in December 2019 in China possibly from bats or pangolins

## Signs and symptoms

Coronaviruses cause respiratory and enteric infections in humans.

The major site for viral replication is the epithelial cells of the respiratory tract.

The common severe symptoms are;

- High fever of 100.4 degrees F or higher
- Pneumonia
- Kidney failure and death

Infected patients also present with;

- General body aches
- Mild breathing difficulties at the onset
- Dry cough after 2-7 days
- Runny nose
- Headaches
- Gastrointestinal disturbances
- Diarrhea

These symptoms may last for about 7 days with variations in different victims. More often there are no symptoms but the patient still sheds infectious viruses

## Transmission

Cough from an infected person or touching a contaminated object.

Transfer of nasal secretions ie aerosols caused by sneezes.

The viral spread is limited by the immune response of most people but this immunity is said to be short-lived.

## Characteristics of coronavirus.

Coronaviruses belong to a family of enveloped, positive-sense, single-stranded RNA (+ssRNA) viruses.

The SARS-CoV 2 (Covid-19) virion has a diameter of approximately 1,250 nm , and its genome ranges from 26 to 32 kilobases. Coronavirus is the largest for an RNA virus.

SARS-Coronavirus 2 has 5 structural proteins which are:

1. spike (S),
2. envelope (E),
3. membrane (M),
4. nucleocapsid (N), and
5. hemagglutinin-esterase (HE).

The neucleocapsid(N) protein holds the ribonucleicacidgenome, and the spike (S), envelope (E,) and membrane (M) proteins create the viral envelope.

The S protein, together with hemagglutin-esterase (HE), is responsible for the entry of the virion into the cell. S protein is a club-shaped surface projection, giving the virus its characteristic crown-like appearance when seenuner an electron microscopy.

The S protein in this SARS-CoV 2 binds to the host cell through an enzyme known as angiotensin-converting enzyme 2 (ACE2) and basigin (BSG). Angiotensin-converting enzyme 2 (ACE2) is expressed by epithelial cells of the intestine, kidney, blood vessels, and most abundantly in type II alveolar cells of the lungs.

This viral spike protein induces a drop in the levels of ACE2 in human cells, which might be the cause of lung damage.

Cause respiratory and enteric disease

Coronaviruses are the largest RNA virus

They have a positive single-stranded RNA genome

Nested mRNA with a common 3’ terminal

The spike protein attaches to sialic acid

M glycoprotein helps in the attachment of the nucleocapsid to the membranes of internal structures such as the Golgi Body.

## Epidemiology

Most human harbor anti-coronavirus antibodies but reinfection is common indicating that there may be many existing circulating serotypes of the virus in humans.

Major outbreaks occur every few years with a cycle that depends on the type of coronavirus involved.

## Diagnosis

Most coronavirus infections are self-limiting.

The diagnosis is made by;

Immunoelectron microscopy

Serology- Polymerase chain reaction (PCR) and Sequencing

## Prevention

Handwashing with soap and water or sanitizers

Keep hands away from the eyes

Avoid close contact with infected people

Drink a lot of fluids

Get enough rest

## Severe Acute Respiratory Syndrome

Severe acute respiratory syndrome (SARS) was identified in 2002 in China but has been diagnosed in several countries, primarily in Asia.

Possible animal reservoirs include bats and civets.

Once discovered, the SARS coronavirus was rapidly sequenced: the full genome was assembled in April 2003, <6 months after the recognition of the first case.

SARS is caused by a coronavirus and is characterized by efficient human transmission but relatively low mortality. It spreads from person to person via droplets; “super-spreader” airborne events have occurred.

The potential pandemic with SARS was controlled through the identification and isolation of infected patients.

## Signs and symptoms

Typically, patients present with a nonspecific illness.

The incubation period is about 6- 10 days

A 3- to 7-day prodrome characterized by;

- Fever,
- Malaise,
- Sore throat,
- Headache, and
- Myalgia

It can progress to nonproductive cough, dyspnea, and respiratory failure.

Many patients have abnormal chest radiographs.

The risk of contagion is low during the prodrome.

Older patients and those with immunosuppressive states ie diabetes mellitus, chronic hepatitis B, and other comorbidities can have less favorable outcomes.

It is a unique form of viral pneumonia which when compared with most other viral pneumonia, SARS lacks upper respiratory symptoms, although cough and dyspnea occur in most patients.

Investigators have reported the identification of a fourth human coronavirus, HCoV-NL63.

*NOV 2002: highly contagious, severe atypical pneumonia observed in China*

*FEB 2003: Spread to Hong Kong - a doctor who later died*

*Similar outbreaks occurred in different local communities*

*The virus was identified in March 2003 (A coronavirus)*

## SARS: Transmission

The worldwide spread of severe acute respiratory syndrome (SARS) began as a species cross-over, most likely involving transmission of a previously unknown coronavirus of horseshoe bats to Himalayan palm civets that were subsequently captured and transported to live-animal markets in Guangzhou, China, for human consumption.

The SARS coronavirus was then transmitted to humans most likely by restaurant workers and from them to medical personnel and eventually to individuals around the world.

This spread was a consequence of human travel.

Transmission is through droplet.

## Diagnosis

Polymerase chain reaction assays are used in the detection of the coronavirus nucleic acid in the respiratory secretions and in stool samples between 4-8 days of infection.

Antigen and nucleic acid detection techniques are also used. This detects the antigens in the cells in respiratory secretions from infected persons using the ELISA test if there is a high-quality antiserum.

Isolation of these viruses in cell culture has been a difficult process though the virus was recovered from oropharyngeal specimens using Vero monke