

A general review of Corona Virus - Covid-19

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ABSTRACT

Corona virus causes respiratory infection including pneumonia, cold, sneezing and coughing while in animal it causes diarrhea and upper respiratory diseases. Corona virus transmitted human to human or human to animal via airborne droplets. Corona virus enters in human cell through membrane ace-2 exopeptidase receptor. Firstly, corona virus (2019-ncov) was isolated from Wuhan market, China.

Key words : Corona Virus, Covid-19, MERS-CoV, SARS-CoV, Isolation

Introduction

Coronaviruses (covid-19) belong to the coronaviridae family in the nidovirales order. Corona represents crown-like spikes on the outer surface of the virus; thus, it was named as a coronavirus. Coronaviruses are minute in size (65–

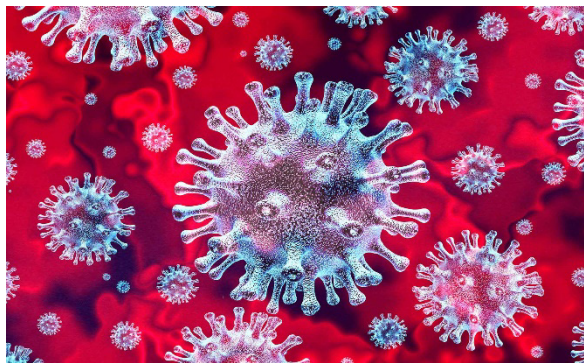


Fig. 1. Corona virus

125 nm in diameter) and contain a single-stranded RNA as a nucleic material, size ranging from 26 to 32kbs in length (Fig. 2.) The subgroups of coronaviruses family are alpha (α), beta (β), gamma (γ) and delta (δ) coronavirus (Zhong *et al.*, 2003)

Coronaviruses were first identified by a group of virologists who relayed their findings in 1968 to the journal Nature. There were 6 known human coronaviruses, of which 4 cause only minor cold-like symptoms, but 2 cause more serious illnesses: severe acute respiratory syndrome coronavirus (SARS-CoV) (Fig. 2) and middle east respiratory syndrome coronavirus. (MERS-CoV) (Zhu *et al.*, 2020). Coronaviruses are important human and animal pathogens. At the end of 2019, a novel coronavirus (covid-19) was identified as the cause of a cluster of pneumonia cases in Wuhan, a city in the Hubei province of china. It rapidly spread, resulting in an epidemic throughout china, followed by an increas-

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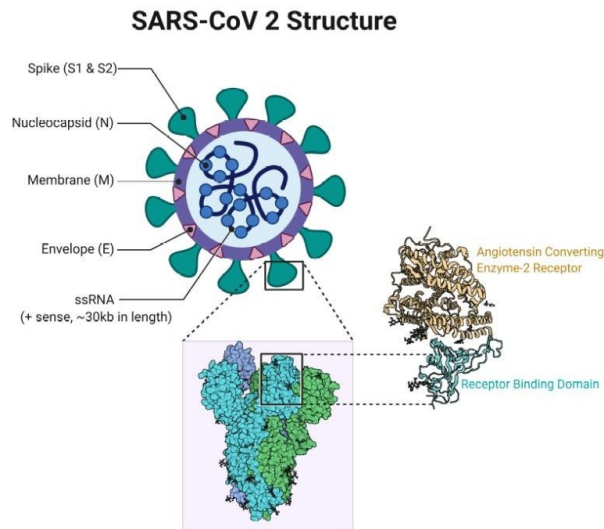


Fig. 2. SARS-CoV 2 structure

ing number of cases in other countries throughout the world (Peiris *et al.*, 2004)

History, evolution and origin

Corona viruses are a big family of different viruses. Some of them cause the common cold in people. Others infect animals, including bats, camels, and cattle. But how did sars-cov-2, the new coronavirus that causes covid-19, come into being? The virus was first detected in Wuhan, china, in late 2019 and has set off a global pandemic. The novel coronavirus (2019-ncov) outbreak has been traced in china late 2019 and then was transmitted into more than 25 countries (Cho *et al.*, 2016). Throughout history, nothing has killed more human beings than the viruses, bacteria and parasites that cause disease. Not natural disasters like earthquakes or volcanoes. Not war – not even close (Bin Saeed *et al.*, 2016). SARS-CoV (2003) infected 8098 individuals with mortality rate of 9%, across 26 countries in the world, on the other hand, novel corona virus (2019) infected 120,000 individuals with mortality rate of 2.9%, across 109 countries, till date of this writing. It shows that the transmission rate of sars-cov-2 is higher than SARS-CoV and the reason could be genetic recombination event at s protein in the rbd region of sars-cov-2 may have enhanced its transmission ability. The covid-19 is very similar in symptomatology to other viral respiratory infections. Cases vary from mild forms to severe ones that can lead to serious medical conditions or even death. (Peiris *et al.*, 2003)

On the morning of December 26, Wuhan-based respiratory expert, Zhang Jixian. Zhang had become the first doctor in the world to diagnose and then track the novel coronavirus, which in the next five weeks would kill over 300 and affected more than 14,000 globally. Zhang said that the experience in protection against infectious diseases is rooted in SARS. A 57-year-old female shrimp seller in china's Wuhan city, the originating point of the coronavirus pandemic, has been identified as one of the first victims of coronavirus. Wei guixian, as identified by the wall street journal, was selling shrimps at the Huanan seafood market on December 10 when she developed a cold. At the end of December, Wei was quarantined when doctors related the emergence of the coronavirus with the seafood market (Holshue, *et al.*, 2020).

Corona virus Evolution

Scientists first identified a human coronavirus in 1965. It caused a common cold. Later that decade, researchers found a group of similar human and animal viruses and named them after their crown-like appearance. Seven coronaviruses can infect humans. More than 8,000 people were infected by July 2003, and 774 died. A small outbreak in 2004 involved only four more cases. MERS started in Saudi Arabia in 2012.

Almost all the nearly 2,500 cases have been in people who live in or travel to the Middle East. This coronavirus is less contagious than its SARS cousin but more deadly, killing 858 people. It has the same respiratory symptoms but can also cause kidney failure (Fig. 3.) (Xu *et al.*, 2020).

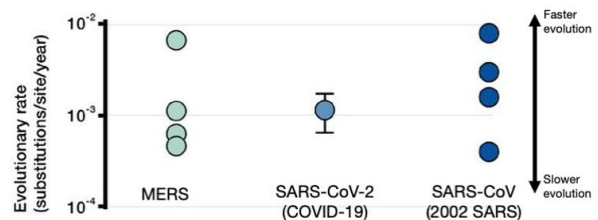


Fig. 3. Evolutionary rate

In 2016, a 45-year-old School Teacher in Athens, Greece, arrived at the emergency room. Thinking this a case of bacterial pneumonia, doctors treated her with antibiotics. She was also tested for a broad variety of possible culprits. All came back negative. Only one test turned up positive, the patient was

suffering from a familiar but inscrutable infection known as 229e—the human corona virus.

Life cycle

The new coronavirus is a respiratory illness, which means it typically spread via airborne droplets. When an infected person cough or sneeze, droplets carrying viral particles can land on someone else’s nose or mouth or get inhaled (Fig. 4) (Zhou *et al.*, 2020). The virus (with red spikes) reproduces inside a host cell (green). It binds to the cell surface with its protein spikes before entering the cell and releasing

its RNA (ribonucleic acid) genetic material (yellow strands). This is copied by the cell’s own genetic machinery. The new viral genetic material produces its own surface and spike proteins (lower center), and eventually new virions burst from the cell (lower left) (Fig. 5.)(Al-Qahtani *et al.*, 2017).

Replication in human being

Coronavirus replication entails ribosome frameshifting during genome translation, the synthesis of both genomic and multiple sub genomic RNA species and the assembly of progeny

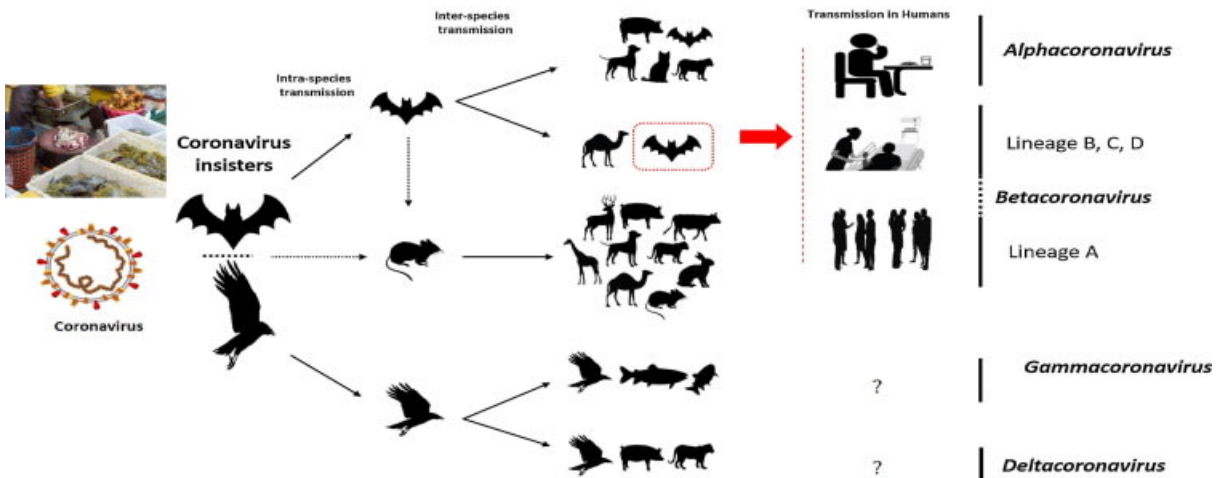


Fig. 4. Life cycle of corona virus from animal to human being

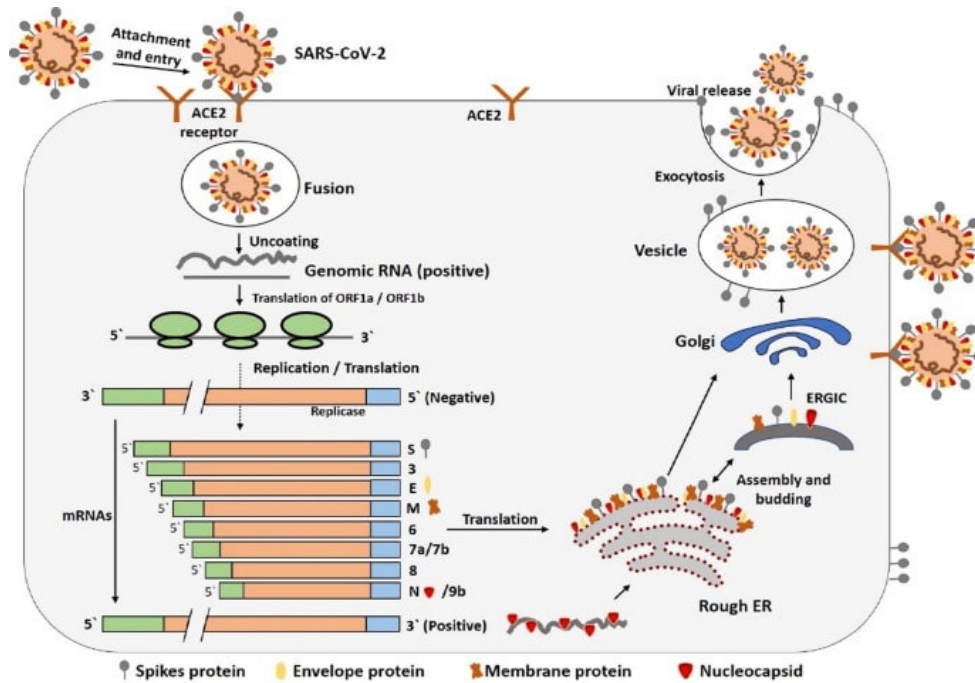


Fig. 5. Life cycle of corona virus in human being

virions by a pathway that is unique among enveloped RNA viruses. Progress in the investigation of these processes has been enhanced by the development of reverse genetic systems, an advance that was heretofore obstructed by the enormous size of the coronavirus genome. Replication is the process whereby genome-sized RNA, which also functions as mRNA, is produced (Isabel Sola, 2011).

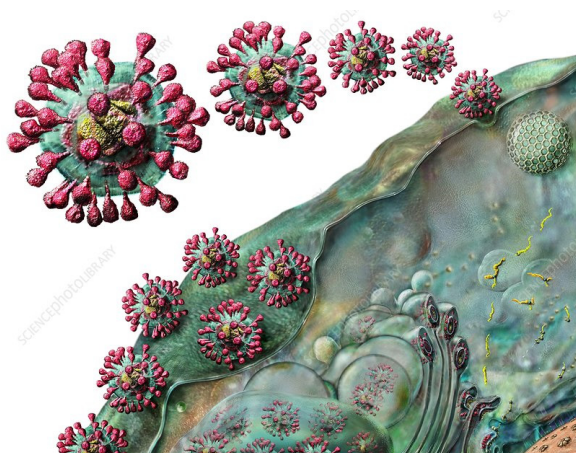


Fig. 6. Replication

Temperature

Corona viruses (covid-19) generally don't live as long in higher temperatures (41-52° fahrenheit) and humidity levels(50-80%) than in cooler, dryer conditions. Researchers are studying whether exposure to heat, cold, or sunlight affects how long the new virus lives on surfaces. (Fehr AR, 2015)

Prevalence of covid-19

In December 2019, a 57-year-old female shrimp seller in china's Wuhan city, the originating point of the corona virus pandemic, has been identified as one of the first victims of coronavirus (covid-19).

Many of the initial cases had a common exposure to the Huanan wholesale seafood market that also traded live animals. The surveillance system was activated, and respiratory samples of patients were sent to reference labs for etiologic investigations. On December 31st, 2019, china notified the outbreak to the world health organization and on 1st January the Huanan sea food market was closed. On 7th January the virus was identified as a coronavirus that had similarity with the SARS- CoV. Environmental samples from the Huanan sea food market also tested positive, signifying that the virus originated from there (Huang *et al.*, 2019).

Cases in other provinces of china, other countries (Thailand, Japan and South Korea in quick succession) were reported in people who were returning from Wuhan. By 23rd January, the 11 million population of Wuhan was placed under lock down with restrictions of entry and exit from the region. Soon this lock down was extended to other cities of Hubei province (Hui *et al.*, 2020)

Incubation period

The median incubation period was estimated to be 5.1 days (95% ci, 4.5 to 5.8 days), and 97.5% of those who develop symptoms will do so within 11.5 days (ci, 8.2 to 15.6 days) of infection. These estimates imply that, under conservative assumptions, 101 out of every 10 000 cases (99th percentile, 482) will develop symptoms after 14 days of active monitoring or quarantine (J. Lessler *et al.*, 2009).

Diagnostics

Polymerase chain reaction (PCR) testing remains the primary covid19 diagnostic testing method in the United States. Thus, is the same type of test that was used to detect severe acute respiratory syndromes

No.	Symptoms	Complications	References
1	Dry cough	Pneumonia	Lui, K., Fung, Chin. <i>Med Jan</i> 2020
2	Fever	Kidney failure	Chaolin, H; Yeming; <i>Lancet</i> 2020
3	Sore throat	Sepsis	Weijie, G; Zhengyi, <i>Medrxiv</i> 2020
4	Headache	Acute respiratory distress Syndrome (ards)	Lui, K., Fang, Y. Y., Deng, Y, chin. <i>Med J.</i> 2020
5	Body ache and pain	Weakness	Lui, K., Fang, Y. Y, Deng, Y; <i>Chin. Med J.</i> 2020
6	Shortness of breath	Acute respiratory Distress syndrome (ards)	Chaolin, H., Yeming, <i>Lancet.</i> 2020
7	Runny or stuffy nose	Acute respiratory distress Syndrome (ards)	Weijie, G; Zhengyi, <i>Medrxiv.</i> 2020



Fig. 7. PCR method

(SARS) (Fig. 7.).

To collect a sample

- Swab your nose or the back of your throat
- Aspirate fluid from your lower respiratory tract
- Take a saliva or stool sample (Chen *et al.*, 2020).

Epidemiology of covid-19

The epidemic of 2019 novel coronavirus (now called sars-cov-2, causing the disease covid-19) has expanded from Wuhan throughout china and is being exported to a growing number of countries, some of which have seen onward transmission. The first four cases of an acute respiratory syndrome of unknown etiology were identified among people linked to a local seafood market (wet market in Wuhan city china on 29 December 2019). The research is under progress to learn more about covid-19-related transmissibility. The full spectrum of disease severity ranges from asymptomatic, to symptomatic-but-mild, to severe, to requiring hospitalization, to fatal, second, how transmissible is the virus? third, who are the infectors — how do the infected person's age, the severity of illness, and other characteristics of a case affect the risk of transmitting (Chen *et al.*, 2020).

Geographic distribution

Globally, more than four million confirmed cases of

covid-19 have been reported. Updated case counts in English can be found on the world health organization and European centre for disease prevention and control the cumulative incidence varies by state and likely depends on a number of factors, including population density and demographics, extent of testing and reporting, and timing of mitigation strategies. In the United States, outbreaks in long-term care facilities and homeless shelters have emphasized the risk of exposure and infection in congregate settings (Wang *et al.*, 2020).

Transmission

Epidemiologic investigation in Wuhan at the beginning of the outbreak identified an initial association with a seafood market that sold live animals, where most patients had worked or visited, and which was subsequently closed for disinfection. However, as the outbreak progressed, person-to-person spread became the main mode of transmission (Lipsitch *et al.*, 2009).

Route of person-to-person transmission

The exact mode of person-to-person spread of severe acute respiratory syndrome coronavirus 2 (sars-cov-2) is unclear. It is thought to occur mainly via respiratory droplets, resembling the spread of influenza. With droplet transmission, virus released in the respiratory secretions when a person with infection coughs, sneezes, or talks can infect another person if it makes direct contact with the mucous membranes; infection (Burke *et al.*, 2020).

Viral shedding and Period of Infectivity

The interval during which an individual with covid-19 is infectious is uncertain. It appears that sars-cov-2 can be transmitted prior to the development of symptoms and throughout the course of illness. In a study of nine patients with mild covid-19, infectious virus was isolated from nasopharyngeal/oropharyngeal and sputum specimens during the first eight days of illness, but not after this interval, despite continued high viral RNA (Claire *et al.*, 2020).

Risk of Transmission

The risk of transmission from an individual with sars-cov-2 infection varies by the type and duration of exposure, use of preventive measures, and likely individual factors (e.g., the amount of virus in respiratory secretions). Secondary infections have been described among household contacts, congregate or

health care settings when personal protective equipment was not used (including hospitals and long-term care facilities), and in closed settings (e.g., cruise ship. However, reported clusters of cases after social or work gatherings). The risk of transmission with more indirect contact (e.g., passing someone with infection on the street, handling items that were previously handled by someone with infection) virus present on contaminated surfaces may be another source of infection if susceptible individuals touch these surfaces and then transfer infectious virus to mucous membranes in the mouth, eyes, or nose (Martina *et al.*, 2003).

Uncertain risk of Animal Contact

Sars-cov-2 infection is thought to have originally been transmitted to humans from an animal host, but the ongoing risk of transmission through animal contact is uncertain. There is no evidence suggesting animals (including domesticated animals) are a major source of infection in humans (Guan *et al.*, 2019).

Immunity and Risk of Reinfection

Antibodies to the virus are induced in those who

have become infected. Preliminary evidence suggests that some of these antibodies are protective, but this remains to be definitively established. Who recovered from covid-19, antibodies to the receptor-binding domain of the spike protein and the nucleocapsid protein were detected by enzyme-linked immunosorbent assay (Elisa) in most patients by 14 days following the onset of symptoms; Elisa antibody titers correlated with neutralizing activity? (Hui *et al.*, 2019).

Technical focus: early epidemiologic and clinical investigation

The recent emergence of covid-19 means that understanding of transmission patterns, severity, clinical features and risk factors for infection remains limited, whether about the general population, health workers or in household and other "closed" settings. Studies to assess the epidemiology and clinical characteristics of cases in different settings are therefore critical to furthering our understanding of this virus and associated disease. They will also provide the robust information needed to feed forecasting models in china (Barreto *et al.*, 2006).

Table 1. Epidemiological indicators of covid-19 Infection

Indicators	Description
Patient age	Cases ranged between 25 - 89 years, with most patients aged between 35 - 55 years and fewer cases among children and infants Median age of patients is 59 years, ranging from 51- 89 Average age of patients was 55.5 years; age distribution: d" 39: 10%; 40-49: 22%, 50-59: 30%; 60-69: 22%, e"70: 15%
Patients sex	Cases range from 2 - 72 years More cases were males 68% males 59% males
Age of the deaths	Median age of death was 75 (with a range between 48 and 89 years)
History of exposure	Huanan seafood market in Wuhan Wuhan residents or people who visited Wuhan
Incubation time	4.8 ± 2.6 days (2-11 days) 5.2 days (4.1-7 days) Average of 7 days (2-14 days) Average of 10 days
Basic reproduction (r0)	2.6 (uncertainty range: 1.5-3.5) 3.8 (95% ci: 3.6-4.0) 2.2 (1.4-3.8) 2.68 (95% ci: 2.47-2.86)
Susceptible populations	Elderly people People with poor immune function People with chronic co-morbidities Surgery history before admission

Several early investigation master protocols or master forms are available for countries

1. Ffx (first few x numbers of cases and their close contacts) transmission protocol. Tracing in the general population. Ffx is the primary investigation protocol to be initiated upon identification of the initial laboratory-confirmed cases of covid-19 in a country. For a more targeted approach on specific groups and more precise estimation of epidemiological parameters, three other investigation protocols are available.
2. Household (hh) transmission study protocol.
3. Risk factors assessment for health workers (hwc) protocol.
4. Environmental sampling protocol (in development)
5. Global covid-19 clinical characterization case record form: a standard approach to collect clinical data of hospitalized patients is necessary to better understand clinical characteristics of the disease and treatment interventions. Anonymized clinical data and information related to patients with suspected or confirmed infections can be shared. Data field electronic tool for case and contacts data collection and management (Su *et al.*, 2006).

Conclusion

Corona virus was spreading human to human to transmission by close contact via airborne droplets generating by coughing, sneezing, kissing and smooching. So, avoid these activities with infected partners and family members. Corona virus may transmit through pet animals such As dog, cat, pig, cow, turkeys. So, avoid contact and separate them if observed any infection activities like diarrhea, cold, fever. As per who and ecdc guideline avoid the contact with sick person and avoid the market or public place as per possible. There is no anti corona virus vaccine to prevent or treatment but some supporting therapy work. Future research needed to fight with corona virus. Till only 'distance is rescue'.

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