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Review Article

SARS CoV-2 GREATEST CHALLENGE OF CENTURY

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ABSTRACT

In late 2019 when the final reports of an unknown respiratory infection emerged from Wuhan, China, nobody knew it will be greatest challenge to humans of this century. Corona virus is related to those viruses that had caused outbreaks of severe acute respiratory syndrome (SARS) from 2002-2004 and Middle East respiratory syndrome (MERS) in 2012.

KEYWORDS: Sars CoV-2, Wuhan, China, Covid-19

WHO declared the illness resulting from the new virus COVID-19 a public health emergency of international concern. By early March 2020 the novel Corona virus named SARS CoV-2 had infected more than 90000 people worldwide and killed at least 31000. At this time total Corona virus cases are 8lakhs and deaths are around 435,300. United States leads the world with 2,208,400 infected and 119,132 deaths. In India alone around 354,161 people have been infected and 11,921 died. It is the greatest threat to humanity as the second wave of infection has started in many countries including China and Iran. The latest version of this mutated strain of virus is D614G having 5-6 times more spikes portions than other strains. This change enhances viral transmission. Actually this virus is an old virus in new packet which we had faced earlier. According to a recent study around one fifth of the world has an underlying health conditions that the virus can exploit. Those individuals would go on to develop severe infections with diseases like cardiovascular, chronic kidney infections diabetes and respiratory disorders, in this way about 4 percent of the world's population would require hospitalization if infected.

Corona viruses are large roughly spherical particles with so many surface projections, the average diameter of the envelope is 85 nm and the spikes are 20 nm long. The viral envelope consists of a lipid bi layer in which the membrane envelope and spikes (structural proteins) are anchored; on average corona virus particles have 74 surface spikes. They are large enveloped positive stranded RNA virus having largest genome amongst all RNA viruses ranging from 27 to 32 Kb. The genome is packed inside a helical capsid formed by the Nucleocapsid protein (N) and further surrounded by an envelope. Viral envelope is thus associated with three types of structural proteins. The membrane protein M and envelope protein E are involved in virus assembly.

Spikes protein S mediates virus entry in to the host cell. Among the structural proteins the spikes form large protrusions from the viral surface giving it to the appearance of having crowns, hence named Corona. According to recent researches like the virus that caused the 2002 SARS outbreak SARS CoV-2 spikes bind to receptor on the human cell surface called Angiotensin converting enzyme 2(ACE2) (NIH National Institute of Allergy and Infectious Diseases).

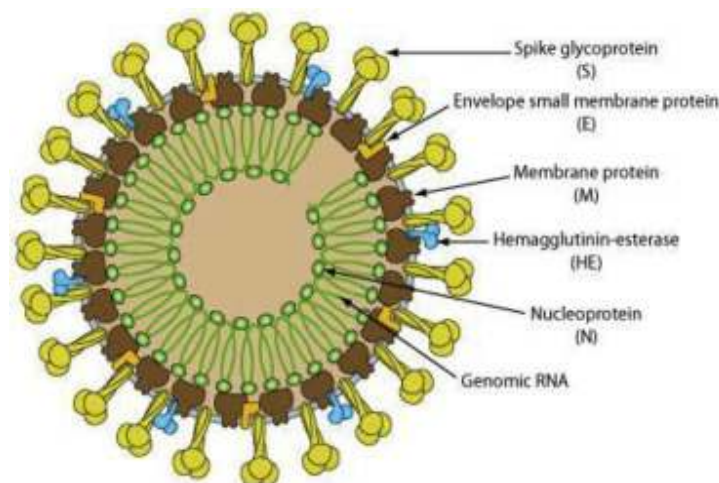


Figure 1: Structure of Envelope, That makes it Corona

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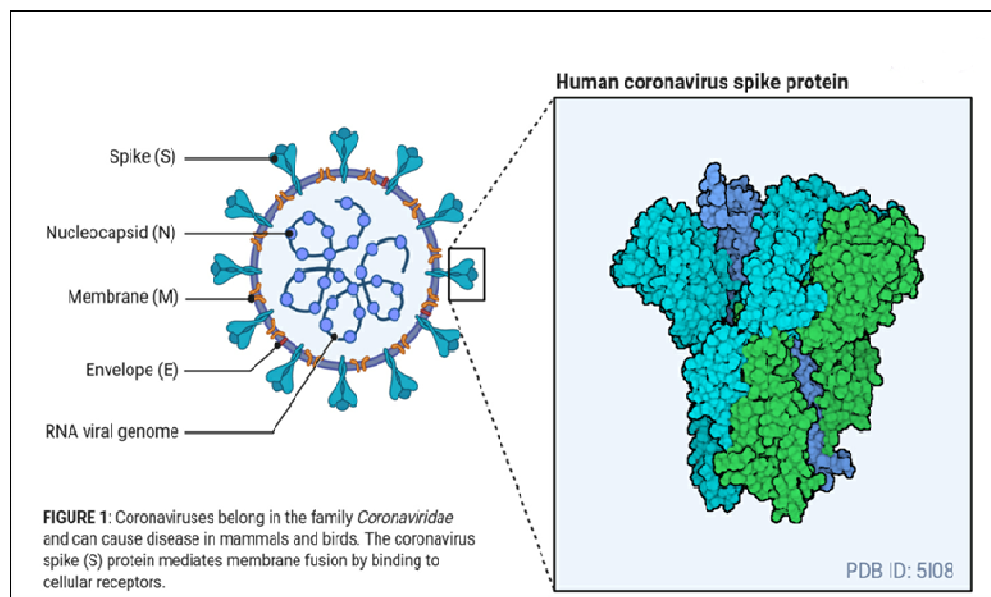


Figure 2: Coronavirus Structure and Protein Visualization

The researchers found that SARS CoV-2 spikes were 10 to 20 times more likely to bind ACE2 on human cells than the spikes from SARS virus from 2002. This enables SARS CoV-2 spread more easily from person to person than the earlier virus. Although there are similarities in sequence and structure between the spikes of two viruses, three different antibodies which acted successfully against SARS (2002) virus could not successfully bind to the SARS CoV-2 spike protein. Thus a potential vaccine and antibody based treatment tactics will be needed to this unique virus which is a big challenge. Corona virus are a very diverse family of viruses having a large host range including humans, however greatest amount of corona virus diversity is seen in Bats. Most of the time Corona virus cause mild respiratory illness like common cold. A new type can emerge when animal Corona virus develop the ability to transmit a disease to humans (zoonotic transmission). Corona virus makes a jump to human hosts.

This can be due to several factors including lack of immunity to the new virus. Some Corona virus examples are; 1. SARS-CoV—Virus that caused SARS which was first identified in 2003 2.--MERS-CoV—Virus that caused Middle East respiratory Syndrome in 2012. 3.- SARS-CoV-2—Virus that caused COVID-19 was first identified in 2019. Surprisingly this virus continuously changes its structure. Mutation is the part of virus life and RNA virus like Flu and Measles are more prone to change and mutation as compared to DNA viruses such as Herpes, Smallpox, and Human Papilloma Virus. SARS CoV-2 is no exception and over to past few months it has been mutating. As virus is mutating at a very slow rate the new copies are not very different from original ones. Virus mutations in Italy and Newyork seem to be no more infectious or fatal than the original

strains that appeared in Wuhan China in late December. Really Virus mutate in more aggressive form. RNA Viruses generally likely to mutate into weaker version. It is relaxing that characteristic and traits of that original strain and its mutations are not largely different from one another. It is good news that mutations in COVID-19 would not interfere with the effectiveness of the COVID-19. Slow and mild nature of the mutations is good news for vaccine. For more than 45 years we have had very effective for Measles, Mumps and Rubella. All these viruses have not mutated enough to escape from protection provided by vaccines. Similar with the COVID-19 to make an effective COVID-19 vaccine that will provide long lasting immunity against this particular virus. A vaccine is the best hope for ending this pandemic all researchers are racing to create one but vaccine is still far away. Some of the earliest vaccines against COVID-19 are likely to target prevention against developing severe symptoms from catching the virus, rather than the initial infections. Corona virus have a spike like structure S protein (giving it a crown like structure) attaches to surface of human cells. Vaccine that targets this protein would prevent it from binding to human cells and stop the virus from reproducing.

The SARS Corona virus which caused an outbreak of disease in 2003 does this by binding receptors on the outside of lung and gut cells. These receptors are normally used by an enzyme called ACE2 (Angiotensin – converting enzyme 2) which helps regulate blood flow through vessels the new Corona Virus uses the same receptor but binds to it with greater strength. It captures all over surface by using one of four main structural proteins. Like SARS vaccines the spike protein is main target for vaccine development for the new corona virus. One objective of a vaccine is to increase up the human

body production of antibodies. These stick to the virus and block its ability to bind and enter human cells. In experiments on monkeys, a SARS vaccine based on the whole spike protein produced antibodies to SARS Corona virus and was able to protect the monkeys when they were later infected experimentally. Firstly a vaccine is tested in animals to see if it is safe? Next comes testing on humans for safety and efficacy of a vaccine need to be demonstrated in a large group of people.

Because of the seriousness of the COVID-19 pandemic vaccines regulators might fast track some of these steps. In future it seems very difficult that COVID-19 vaccine will become available sooner than six months after clinical trial start, and we don't know whether an effective vaccine is possible for this virus. Conditions are deteriorating day by day by the time 16th June total number of Corona cases are 8lakhs worldwide total numbers of deaths around 435000. The number of recovered cases is 4,321,495 which sare of mild relief. The total number of deaths in First World War was about 40 millions. The deadliest Second World War took the death toll around 70-85 million people. A report about the death numbers by influenza epidemics in Taiwan are around 25,500. Although number of infections decreased dramatically in early 1919, a second wave of the epidemic at the end of that year created another severe death toll. Bengal Famines in 1943 led to the death of around 3 to 4 million Indians either due to starvation or due to Famines. Although above mentioned conditions are quite scary, mankind is afraid that the conditions caused due to the COVID-19 outbreak may outrun then.

According to UN chief this is most challenging crisis since Second World War, he further added that human crisis demands coordinated, decisive, inclusive and innovative policy action from the world's leading economies and maximum financial and technical support for the poorest and most vulnerable people and countries. Scientists believe it to be 21st century's biggest blunders

by heads of governments making choices based on incomplete information sharing false information with other countries. Environmentalist believes that there is a correlation between Pandemics and environment. Whether Black Death spread in Europe, Chickenpox in America in 1610 or Spanish flu in 1918, a misbalance in environment took revenge. Out of four virus pandemics in recent years three spread from animals to human beings. According to Biologists deforestation, excess use of natural resources and abnormal intake of animals as food broke the normal chain of biodiversity. All these factors led to pandemics like Corona that is why biodiversity is need of today worldwide. Around 29 Crores hectare forests are removed between 1990 to 2015 which result in to 100 times more extinctions of animals and plants. Recently Proceedings of Academy of Sciences showed that around 500 species of wild animals will be extinct in 20 years. If man does not interfere with ecosystem these survive for about 10,000 more years. We are now living in world where wearing a mask is no more usual than carrying a cell phone. A time has come when poor countries are engaged in fighting with corona virus and they are unintentionally contributing to fresh explosions of illness and deaths from other diseases.

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