Global Pandemic COVID-19 (2019-nCoV)

Novel Deadliest Contagion

Mahnoor Patel

*Department of Molecular Biology and Genetic Engineering, School of Bioengineering and Biosciences,
Lovely Professional University, Phagwara-144411, Punjab, India.*

Email: patelmahnoor786@gmail.com

Abstract

Global pandemic cause by coronavirus has been reported in Wuhan, China; in late December 2019. Within time duration of few weeks, the newly identified virus designated as 2019-Novel Coronavirus (2019-nCoV) and it was declared by World Health Organization (WHO). At the time of late January 2020, WHO announced it as the international emergency outbreak because of the rapid spread and increases at the global level. There is no any preventive vaccine is present or any approved therapy/treatment for this viral emergency which is very infectious globally. Till the previous few decades, six strains of coronaviruses were found, but in Wuhan, China in December 2019, a totally new strain of coronavirus was spread across the city. Within few days, it was designated as the novel coronavirus abbreviated as 2019-nCoV by World Health Organization. The rate of virus progression is still not determined and that is why it is very difficult to find the patient zero which is very essential. Phylogenetic analysis of the virus specifies bat origin of 2019-nCoV, its transmission is airborne *i.e.* human to human, infected person can be identified having the primary symptoms which includes high fever, upper or lower respiratory tract infection. Its diagnosis at the molecular level includes Real-Time PCR for encoding genes for the internal transcribed RNA-dependent RNA polymerase and Spike protein receptor binding domain. It can be confirmed by the Sanger Sequencing including full genome analysis by Next Generation Sequencing, multiplex nucleic acid amplification and microarray based analysis. There are few mRNA vaccines which were developed by few Biotechnology companies, showing positive results against COVID-19 and it is there in 4th phase clinical trial which possibly be the first vaccine available in the market in between mid-2021.

Corona Viruses

Coronaviruses are enveloped, positive-sense, single-stranded RNA viruses belong to the family Coronaviridae, subfamily Coronavirinae, order Nidovirales. The virion has nucleocapsid composed of genomic RNA & phosphorylated nucleocapsid protein, which is buried inside phospholipid bilayers and covered by spike proteins. The membrane protein which is type III transmembrane glycoprotein and the envelop protein are located among the spike protein in virus envelope. Coronavirus was given based upon the crown like appearance. There are four genera of coronaviruses, Alpha coronavirus, Beta coronavirus, Delta coronavirus, and Gamma coronavirus. Evolutionary analysis have shown that bats and rodents are the gene sources of most α CoV and β CoV, while avian species are the gene sources of most δ CoV and γ CoV. CoV have repetitively crossed the species barriers and some have emerged as human pathogens. The genomic RNA is used as template for directly translating polyprotein. SARS-CoV-2 is a beta coronavirus. On January 3rd 2020, the first complete genome of the novel β genus coronaviruses (2019-nCoV, subsequently named as SARS-CoV-2) was identified in samples of bronchoalveolar lavage fluid from a patient from Wuhan. A viral genome sequence was released via the community online resource virological.org on 10th January (Wuhan-Hu-1, GenBank accession number MN908947). Additional sequences were rapidly obtained by other groups and complete genomes were submitted to GISAID. It was first reported in Wuhan, China & designated as 2019-nCoV which cases ranged from no symptoms to severe pneumonia and death also in most of the cases. Symptoms includes fever, cough and shortness of breath.

2019-nCoV Virion & Genome

Diagnosis of Corona Infection

mRNA Vaccine - An Inexpensive Biopharmaceutical

Moderna, Inc. announced a new class of vaccine for SARS-CoV-2 is RNA vaccine. Moderna will manufacture an mRNA vaccine. The Vaccine Research Center (VRC) of the National Institute of Allergy and Infectious Diseases (NIAID) collaborated with Moderna to design the vaccine. Moderna announced the initiation of the phase 1 trial of the mRNA-1273 vaccine on March 16. This vaccine candidate mRNA-1273 consists of lipid nanoparticles packaged with nucleoside-modified mRNA that encodes a prefusion-stabilized form of the SARS-CoV-2 S protein. Three dose levels of mRNA-1273 (25, 100, 250 μ g) are administered on a two-dose vaccination schedule, given 28 days apart. A total of 45 healthy adults will be enrolled in the study. Participants will be followed through 12 months after the second vaccination. The primary objective is to evaluate the safety and reactogenicity of a two-dose vaccination schedule of mRNA-1273. The secondary objective is to evaluate the immunogenicity of the SARS-CoV-2 S protein.

CureVac also developing vaccine against COVID-19 by using mRNA platform. Recently, CureVac announced that their mRNA platform using lipid nanoparticles in phase I study for the prevention of rabies was capable of providing protective virus-neutralizing antibody titers after two vaccination with dose of 1 μ g mRNA vaccine.

Scientific Classification of SARS-CoV-2

Taxonomy: Group IV {(+) ssRNA}

Family: Coronaviridae, Coronavirinae

Genus: Beta Coronavirus

Common Name: 2019-nCoV, Severe Acute Respiratory Syndrome Coronavirus 2

Virion: Enveloped, spherical, 60-140 nm in diameter with spikes of about 9-12 nm.

Genome: ~30 kb positive-sense, single-stranded RNA

RNA Transcript: 5' Cap, 3' Poly-A tail

Proteome: 10 Proteins

Transmission Cycle of Coronaviruses (MERS-CoV, SARS-CoV, SARS-CoV-2)