



## CORONAVIRUS : INSIGHT ON COVID 19 AND IT'S IMPACT ON HUMAN LIFE

## Chemistry

**Dr Shweta Chand\*** Associate Professor, Department of Chemistry, Christ Church College, Kanpur.  
\*Corresponding Author

## KEYWORDS

## INTRODUCTION

This article is about the on- going disease involved in the COVID19 pandemic resulting due to the corona virus. The name coronavirus is derived from Latin corona meaning crown or wreath<sup>1,2</sup>. The name was coined by June Almeida and David Tyrell who first observed and studied human coronaviruses. Coronaviruses were first discovered in the 1930s when an acute respiratory infection of domesticated chickens was shown to be caused by infectious bronchitis virus (IBV)<sup>3</sup>. The infection of new born chicks was characterized by gasping and listlessness. In the 1940s two more animal coronaviruses mouse hepatitis virus (MHV) and transmissible gastroenteritis virus (TGEV) were discovered<sup>4</sup>. Human corona viruses were discovered in 1960s<sup>5,6</sup> in the United Kingdom and United States<sup>7</sup>. Corona viruses are a group of related RNA viruses which infects mammals and birds in humans, these viruses cause respiratory tract infection that can range from mild to lethal. Mild illness includes the common cold while more lethal varieties can cause SARS, MERS and COVID19.

## STRUCTURE

Coronaviruses are large mostly spherical sometimes pleomorphic means changeable in shape. The average diameter of the virus particle is around 125 nm. The diameter of the envelope is 85 nm and the spikes are 20 nm long. The viral envelope consists of lipid bilayer in which the membrane (M) envelope (E) and spike (S) structural proteins are anchored<sup>8</sup>. The ratio of ESM in the lipid bilayer is approximately 1:20:300<sup>9</sup> on an average a corona virus particle has 74 surface spikes<sup>10</sup>. The corona virus spikes are homotrimers of the S protein which is composed of S1 and S2 subunit. The homotrimers S protein is a class I fusion protein which mediates the receptor binding and membrane fusion between the virus and host cell. The S1 subunit forms the head of the spike and has the receptor binding domain (RBD). The S2 subunit forms the stem which anchors the spike in the viral envelope and on protease activation enables fusion. The E and M protein are important in forming the viral envelope and maintaining its structural shape<sup>11</sup>. Inside the envelope there is the nucleocapsid which is formed from multiple copies of the nucleocapsid N protein which are bound to the positive sense single standard RNA genome in a continuous beads -on - a - string type confirmation<sup>11,12</sup>. The lipid bilayer envelope, membranes proteins, nucleocapsid protect the virus when it is outside the host cell.

## TRANSMISSION

Infected carriers are able to shed viruses into the environment. The interaction of the coronavirus spike protein with its complimentary cell receptor is central in determining the tissue tropism infectivity and species range of the released virus<sup>13,14</sup>. Coronavirus mainly target epithelial cells<sup>15</sup>. They are transmitted from one host to another host depending upon the coronavirus species by either an aerosol, fomite or fecal- oral route<sup>16</sup>. Human coronavirus infect the epithelial cells of the respiratory tract while animal coronavirus generally infect the epithelial cells of the digestive tract<sup>17</sup>. SARS coronavirus for example infects via an aerosol route<sup>17</sup>, the human epithelial cells of the lungs by binding to the angiotensin converting enzyme 2 (ACE2) receptor<sup>18</sup>. Transmissible gastroenteritis coronavirus (TGEV) infects via a fecal- oral route<sup>16</sup>, the pig epithelial cells of the digestive tract by binding to the alanine aminopeptidase (APN) receptor<sup>11</sup>.

## Infection In Humans

Coronaviruses very significantly in risk factor. Some can kill more than 30 percent of those infected such MERS-COV and some are relatively harmless such as the common cold<sup>11</sup>. Coronaviruses can cause cold with major symptoms such as fever and sore throat from swollen adenoids. Coronaviruses can cause pneumonia, the human

coronavirus discovered in 2003 SARS-COV which causes severe acute respiratory syndrome SARS has a unique pathogenesis because it causes both upper and lower respiratory tract infections. Six species of human coronavirus are known with one species sub divided into two different strains making seven strains of human coronavirus altogether four of these coronaviruses continually circulate in human population and produce the mild symptoms of the common cold in adults and children worldwide.

Four human coronaviruses produce symptoms that are generally mild

- 1.Human coronavirus OC43 (HCOV-OC43)  $\beta$ -COV
- 2.Human coronavirus HKU1 (HCOV-HKU1)  $\beta$ -COV
- 3.Human coronavirus 229 E (HCOV 229E)  $\alpha$ -COV
- 4.Human coronavirus NL63 (HCOV- NL63)  $\alpha$ -COV

Three human coronaviruses produce symptoms that are potentially severe

- 1-Middle East respiratory syndrome-related coronavirus (MERS-COV),  $\beta$  - COV
- 2-Severe acute respiratory syndrome coronavirus (SARS-COV)  $\beta$ -COV
- 3-Severe acute respiratory syndrome coronavirus 2 (SARS-COV-2)  $\beta$ -COV

	MERS-COV	SARS-COV	SARS-COV-2
Disease	MERS	SARS	COVID19
Outbreaks	2012,2015,2018	2002-2004	2019-2020 Pandemic

## COVID-19

In December 2019 a pneumonia outbreak was reported in Wuhan China. On 31st December 2019 the outbreak was traced to a novel strain of coronavirus which was given the interim name 2019-nCoV by World Health Organization later renamed SARS-CoV-2 by the international committee on taxonomy of viruses.

## Medical Research for COVID 19-

There are no drugs or therapeutics presently to prevent or treat COVID 19. Current clinical management includes infection prevention and control measures and supportive care including supplemental oxygen and mechanical ventilatory support as and when needed. COVID19 has been associated with inflammation and a prothrombotic state, with increase in fibrin. Based on different studies the recommendations given by the medical expert panel includes the following-

Remdesivir-On the basis of preliminary clinical trial data, the panel recommends the investigational antiviral agent remdesivir for the treatment of COVID 19 in hospitalized patients with severe disease defined as SpO<sub>2</sub>  $\leq$  94% on ambient air requiring supplemental oxygen, mechanical ventilation or extracorporeal membrane oxygenation. Remdesivir is not approved by Food and Drug Administration however it is available through an FDA emergency use authorization for the treatment of hospitalized adults and children with COVID 19. The panel does not recommend remdesivir for the treatment of mild or moderate COVID19. The panel recommends against using high dose of chloroquine due to the risk of high degree of toxicities being carried through it.

Immune based therapy under evaluation for treatment of Covid19- There have been efforts towards convalescent plasma and SARS-Cov-2 specific immune globulins. A new section for non-SARS-Cov-2 intravenous immune globulin was created in which the panel recommends against the use of NON-SARS-Cov-2 specific IVIG for

the treatment of COVID 19 except in the contest of clinical trial.

## CONCLUSION-

With more than sixty one lac cases reported from 196 countries of the world including deaths crossing three lacs and fifty thousand and the graph still on the rise with maximum cases being reported from the developed nations of the world this pandemic continues to remain as a deep cause of concern for one and all with no authentic and proven medicine or vaccine available till now. Although the research is going on in different parts of the world with the hope that the world should get the vaccine by the end of this year but the present threat is the spread of the disease exponentially. The only way out as of now is imposed restrictions and selfprotection for which the World Health Organization has already issued the advisory followed by the guidelines given by the governments of different countries of the world. Out of all the uncertainties with no reliable data to tell that when this pandemic is going to end, one of the certainty is that the world is going to observe the new normal of social distancing, masks, gloves and washing of hands etc.

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