SARS-CoV-2 Molecular Biology and Pathogenesis and Therapeutic Options

Kanwal Abbasi*
Pakistan Council of Scientific and Industrial Research (PCSIR), Karachi, Pakistan
*E-mail: kanwalabbasi@yahoo.com

ABSTRACT

The novel coronavirus disease 2019 (COVID-19) emerged in December 2019 in China caused by severe acute respiratory syndrome coronavirus 2. It (SARS-CoV-2) has been declared a pandemic by the World Health Organization (WHO) in March of 2020 (SARS-CoV-2). SARS-CoV-2 is the seventh member of the coronavirus family to affect humans. The present talk highlights the genomic, proteomic, pathogenesis, and therapeutic strategies in SARS-CoV-2 infection. The coronavirus genome is a single-stranded positive-sense RNA (+ssRNA), coronavirus genome is organized by 5′-leader-UTR-replication-ORF1a/b-Spike-envelope-protein-membrane-Nucleocapsid-3′ UTR-poly(A) tail with additional genes interspersed in structural genes at the 3′ end of the genome. SARS-CoV-2 primarily infects ciliated bronchial epithelial cells and type II pneumocytes, binds to the surface receptor, angiotensin-converting enzyme 2 (ACE2), through spike glycoprotein. Viral entry and cell infection trigger the host's immune response, and the inflammatory cascade is initiates the uncontrolled inflammatory responses characterized by marked pro-inflammatory cytokine release in patients with severe COVID-19, leading to lymphopenia, lymphocyte dysfunction, and granulocyte and monocyte abnormalities. Therapeutic approaches against COVID-19 targeting the specific COVID-19 immune profiles, such as by enhancing lymphocytes or inhibiting inflammation, are promising treatment strategies for severe cases. Enhancing lymphocytes includes NK cell-based therapy, immunomodulators, or convalescent plasma therapy. Though a considerable amount of work has enhanced our knowledge of SARS-CoV pathogenesis and therapeutic treatment design, many questions remain unanswered.

Keywords: Coronavirus, immune response, lymphopenia, RNA, therapeutic approaches.

ACKNOWLEDGEMENT

Thank you for inviting me to the Conference, the Conference was very well organized, both logistically and in terms of its contents.

REFERENCES

1. Asghari A, Naseri M, Safari H, Saboory E, Parsamanesh N. The Novel Insight of SARS-CoV-2 Molecular Biology and Pathogenesis and Therapeutic Options. DNA Cell Biol. 2020 Oct;39(10):1741-1753. doi: 10.1089/dna.2020.5703. Epub 2020 Jul 21. PMID: 32716648.
2. Hu B, Guo H, Zhou P, Shi ZL. Characteristics of SARS-CoV-2 and COVID-19. Nat Rev Microbiol. 2020 Oct 6:1–14. doi: 10.1038/s41579-020-00459-7. Epub ahead of print. PMID: 33024307; PMCID: PMC7537588.
3. Khan S, Siddique R, Shereen MA, Ali A, Liu J, Bai Q, Bashir N, Xue M. Emergence of a Novel Coronavirus, Severe Acute Respiratory Syndrome Coronavirus 2: Biology and Therapeutic Options. J Clin Microbiol. 2020 Apr 23;58(5):e00187-20. doi: 10.1128/JCM.00187-20. Erratum in: J Clin Microbiol. 2020 Jul 23;58(8): PMID: 32161092; PMCID: PMC7180238
4. Ouassou H, Kharchoufa L, Bouhrim M, Daoudi NE, Imtara H, Bencheikh N, ELbouzidi A, Bnouham M. The Pathogenesis of Coronavirus Disease 2019 (COVID-19): Evaluation and Prevention. J Immunol Res. 2020 Jul 10;2020:1357983. doi: 10.1155/2020/1357983. PMID: 32671115; PMCID: PMC7352127.

5. Yang L, Liu S, Liu J, Zhang Z, Wan X, Huang B, Chen Y, Zhang Y. COVID-19: immunopathogenesis and Immunotherapeutics. Signal Transduct Target Ther. 2020 Jul 25;5(1):128. doi: 10.1038/s41392-020-00243-2. PMID: 32712629; PMCID: PMC7381863.