Preface: Immune Response against Coronaviruses Including SARS-CoV-2

The SARS-CoV-2 virus respiratory infection quickly crossed the geographical barriers of its place of emergence in Asia. Beginning as an epidemic, it quickly became a pandemic. This clearly shows us that, despite knowledge accumulated over the last century, we are still highly vulnerable to attack by microorganisms, mainly viruses. This vulnerability is aggravated when the virus in question spreads among humans through the respiratory system, as is the case of SARS-CoV-2, the causative agent of COVID-19. Chemotherapy drugs used in other viral infections were tested for COVID-19 with no positive effects and leaving sequelae in users.

Researchers from different areas of the biomedical sciences, including virology, immunology, molecular biology, epidemiology, and many others, began researching the SARS-CoV-2 virus in emergency mode with the goal of developing a vaccine. However, we know that a vaccine against an infectious agent takes years to be developed, tested in all its aspects, and finally released to the general population without risk. Therefore, we were faced with significant challenges as soon as the year 2020 began.

This special issue investigates the immune response against coronaviruses and SARS-CoV-2 in particular. The seven contributions from researchers from different countries are briefly outlined below.

Maciorowski et al.’s article, “Molecular Insights into SARS-CoV-2 Pathobiology: Dissecting the Interplay between Cellular-Innate Immunity and Immune Evasion,” discusses the SARS-CoV-2 replication cycle and the immunological responses against its viral infection, mainly the increase in inflammation-inducing cytokines during the so-called cytokine storm. Also, they discuss the typical symptoms of the disease that can lead to death.

Lei and Mohan, in “Immunological Biomarkers of COVID-19,” discuss hematological changes observed in SARS-CoV-2 patients. These changes suggest potential biomarkers that define COVID-19, including specific cell-type counts in blood as well as quantification of soluble mediators in serum. The authors provide a comprehensive review of the blood/serum biomarker abnormalities associated with different levels of COVID-19 severity.

In “COVID-19 and Strategies for Its Therapeutics,” Ma et al. discuss research on the mechanisms by which SARS-CoV-2 enters the human body, and that on clinical symptoms and immunopathological responses found in severe COVID-19. They comprehensively review research on safe therapeutics and a vaccine against SARS-CoV-2.

The article by Andrade and Marzocchi-Machado, “Neutrophils and COVID-19: What Is Going On?” discusses the hypothesis that, in severe cases of COVID-19, immune response overactivation, inflammation, participates in the pathogenesis of SARS-CoV-2 infection, and that neutrophils are essential in this process. Confirming this hypothesis, the authors posit that neutrophils might represent a target of pharmacological intervention against COVID-19.

In “Viral Proteins under 70 Kilodaltons in Size Prevent the Development of Long-Lasting B-Cell Immune Memory and IgG2a Prevention in COVID-19 Vaccines,” Oncina discusses a hypothesis that, in COVID-19 patients, the wrong host immune response can be explained based on the molecular size of viral antigens. He suggests that, during COVID-19 sepsis, antigens with of a molecular size more than 70 kDa activate B-cell receptors (BCRs), thus modulating the shift from Th1- to Th2-pattern cytokines and altering other immunological features that may favor cytokine storms, apoptosis, and immune paralysis. Based on these assumptions, Oncina proposes a new COVID-19 vaccine design that polymerizes viral antigens to promote long-lasting B cell immune memory and IgG2a production.

Wang et al.’s article, “Immunology of Transplant Patients with SARS-CoV-2 Infection: Transmission, Immune Response, and Therapeutic
Strategy,” discusses the impact of SARS-CoV-2 infection on the world population considering the risk factors of age, gender, and the presence of comorbidities such as diabetes, hypertension, and cancer. The authors discuss whether transplant patients subjected to immunosuppressive therapy may be considered more susceptible to SARS-CoV-2 infection.

Finally, Peron et al., in “COVID-19 Pandemic and Dysbiosis: Can the Ivermectin Hysteria Lead to an Increase of Autoimmune Neuroinflammatory Diseases?” critically discuss whether the treatment of COVID-19 by ivermectin is of benefit to SARS-CoV-2 infected patients or may result in dysbiosis, considering that this therapy alters the gut microbiota.

This special issue offers a critical reading of the present COVID-19 situation given the current knowledge of the virology and immunology of SARS-CoV-2.

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