COVID-19 lung imprinting and consequences for disease development

J. Brösamlen[1], L. Pimenov[1], A. Fokina[1], M. Radhouani[1], A. Farhat[1], A. Hladik[1], K. Lakovits[1], F. Meng[1], R. Gawish[1], N. Fortelny[2], T. Krausgruber[3,4], E. Ponweiser[5], A. Haschemi[5], S. Knapp[1], P. Starkl[1]

[1]Medical University Vienna, Dept. of Medicine 1, Research Division Infection Biology, Vienna, Austria, [2]University of Salzburg, Department of Biosciences and Medical Biology, Salzburg, Austria, [3]CeMM, Research Center for Molecular Medicine of the Austrian Academy of Sciences, Vienna, Austria, [4]Institute of Artificial Intelligence, Center for Medical Data Science, Vienna, Austria, [5]Medical University Vienna, Department of Laboratory Medicine, Vienna, Austria

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Abstract text

Text: The coronavirus disease (COVID)-19 pandemic caused by SARS-CoV-2 represented the first global infectious disease crisis of the millennium. Despite widespread vaccination efforts, the virus continues to circulate globally with regular emergence of novel variants. This observation suggests that SARS-CoV-2 has become a controllable, but persistent part of the human pathogen landscape. Recent research indicates that SARS-CoV-2 infection may have lasting effects on the immune system in the lungs, potentially influencing responses to subsequent respiratory infections. The emerging concepts of *inflammatory memory* and *trained immunity* describe long-lasting immunological imprinting in structural and immune cells beyond adaptive lymphocytes. Such infection-mediated changes occur in the affected organ by shaping the transcriptional, epigenetic and/or metabolic programs of resident immune and structural cells. Such modifications may significantly alter the organ's response to secondary (independent) inflammatory triggers, thereby affecting host defense and disease development.

In our project, we investigate the long-term consequences of COVID-19 for the configuration and function of lung immune and structural cells. We hypothesize that such SARS-CoV-2-infection mediated pulmonary imprinting can influence subsequent independent inflammatory and anti-microbial responses.

To explore these ideas, we apply a mouse model of COVID-19 (mCOVID-19) which recapitulates key parameters of human COVID-19. We thoroughly characterized the inflammatory processes and their kinetics to identify the time point of complete disease recovery. Using this mCOVID-19 setup, we perform a deep characterization of SARS-Cov-2-mediated pulmonary imprinting and aim to characterize its consequences on subsequent respiratory immune responses against viruses, allergens, bacteria and fungi. As such, our pilot experiments revealed profound effects of prior SARS-CoV-2 infection on development and manifestations of secondary airway inflammation.

Our experimental studies will break new grounds in hitherto unexplored areas of pulmonary imprinting associated with COVID-19 and determine its consequences for lung physiology and development of the most prevalent respiratory diseases.

Conflict of Interest statement

Do you have any conflict of interest to declare?: No

Affirmation

1. Consent to participate and present onsite: Yes

2. Consent to publication publication: Yes

3. Consent on treatment of contact details saved in this system: Yes