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# Autoimmune effect of antibodies against the SARS-Cov-2 nucleoprotein

Matyushkina D.[1]*, Shokina V.[1], Tikhonova P.[2], Manuvera V.[2], Kharlampieva D.[2], Lazarev V.[2, 3], Varizhuk A.[2], Vedekhina T.[2], Pavlenko A.[1], Arapidi G.[2, 3], Govorun V.[1, 3]

[1] *Scientific Research Institute for Systems Biology and Medicine, Moscow, Russia*

[2] *Federal Research and Clinical Center of Physical-Chemical Medicine, Moscow, Russia*

[3] *Moscow Institute of Physics and Technology (National Research University), Dolgoprudny, Moscow Region, Moscow, Russia*

** d.matyushkina@gmail.com*

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*Motivation and Aim*: New pandemic caused by the SARS-Cov-2 forced the scientific community to throw all capabilities to fight against this disease. Also, it is important not only to eliminate the pathogen from the body, but also to analyze the mechanisms of the occurrence of long-term post-COVID complications. *Methods and Algorithms*: We performed analysis of antibody response of patients with COVID-19 to linear and conformational epitopes of viral proteins by several methods: ELISA, chemiluminescent microparticle immunoassay (CMIA), chip array and western blot. We used downloaded standalone version of NetMHCpan 4.1 and NetMHCIIpan 4.0 [1] to predict protein fragments likely binding the most common alleles of HLA class I and pan-specific binding of peptides to HLA class II alleles of all known sequences respectively. All comparisons of continuous values distributions were performed using ANOVA tests. *Results*: The most intriguing and interesting results were obtained for the nucleocapsid protein. The titer of antibodies to conformational epitopes to nucleoprotein was 2.5 fold higher in the group of severe patients and correlated with the patient's oxygen demand. No less important is the presence of IgG to linear epitopes of the nucleoprotein, which can indicate a risk of development of an autoimmune process. We analyzed cross reactivity of this antibodies with own human proteins. Using competitive western blot analysis, we revealed that the autoimmune manifestation is caused by antibodies against the nucleocapsid protein. According with the possibility of HLA presentation main possible targets were identified by bioinformatic and mass-spectrometry approach. *Conclusion*: As a result of the study, we found out that in monitoring the COVID-19 disease progression it is essential to measure not only the level of antibodies to Spike protein, but especially to NP (both linear and conformational epitopes) because main autoreactive antibodies are associated with nucleoprotein. People with HLA alleles A01:01; A26:01; B39:01; B15:01 are most susceptible to the development of autoimmune processes after COVID-19. So the obtained results can be used for optimizing categorization of patients in terms of disease severity degree and for understanding the possible development of autoimmune complications and post-COVID consequences, for creating protocols for the management and prognosis of patients with COVID-19 as well as for further development of vaccines against coronavirus infection.

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