

Antibodies against fragment 674-685 of SARS-Cov-2 spike protein induce neuroinflammation in the brain and impair memory

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COVID-19 caused by SARS-Cov-2 infection affects multiple organs and tissues including the brain. Post-COVID patients often suffer from cognitive disorders like depression, intellectual weakness and memory loss. The fragment 674-685 of SARS-Cov-2 spike protein is homologous to the fragment 27-37 of α -cobratoxin underlying its interaction with $\alpha 7$ nicotinic acetylcholine receptors (nAChRs) known to be involved in memory and cognition. Both in silico and biochemical studies demonstrated direct interaction of 674-685 spike protein fragment with the portion 179-190 of $\alpha 7$ nAChR. We immunized mice with 674-685 peptide coupled to a protein carrier and observed a decrease of episodic memory measured in novel object recognition test starting from day 14 after initial immunization that coincided with the first peak of (674-685)-specific antibodies in the blood. The antibodies of such specificity were also found in the brain of mice sacrificed on day 14 after the second immunization. The antibody presence was accompanied with the decrease of $\alpha 7$ nAChRs and increased levels of pro-inflammatory cytokines IL-1 β and TNF α in the brain. Choline prevented (674-685)-specific antibody binding to BSA-coupled (674-685) peptide indicating that the antibody could bind choline. When injected regularly in (674-685)-immunized mice choline prevented memory loss and the decrease of $\alpha 7$ nAChRs in the brain. Finally, the antibodies specific to (674-685) spike protein fragment were detected in the blood of COVID-19 patients 2 to 3 months after recovery and their level depended on the severity of the disease. The data obtained allow suggesting that post-COVID memory impairment is caused by the antibodies directed to (674-685) fragment of SARS-Cov-2 spike protein. Choline treatment/consumption may be helpful to overcome neurological post-COVID complications.

Biography

Maryna Skok has completed her PhD at the age of 26 years and defended her Doctor of Science theses from Palladin Institute of Biochemistry, Kyiv, in 2006. She is the Head of Laboratory of Cell Receptor Immunology in Molecular Immunology Department at Palladin Institute of Biochemistry. He has published about 100 papers in reputed journals and has been serving as an editorial board member in Frontiers of Immunology (Inflammation). She is a Member of National Academy of Sciences of Ukraine since 2018.

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