

Immune reaction to fragment 674-685 of SARS-Cov-2 spike protein results in neuroinflammation in the brain and impairs 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. The biochemical studies demonstrated direct interaction of 674-685 spike protein fragments with the portion 179-190 of $\alpha 7$ nAChR. We immunized mice with 674-685 peptide coupled to a protein carrier and observed an impairment of episodic memory measured in novel object recognition test starting from day 14 after initial immunization and further progressing after the second immunization that coincided with the peaks 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, immunoglobulins of (674-685)-immunized mice, passively transferred to non-immunized mice, decreased their episodic memory within two days. The mechanisms of such effect, as well as its relevance to COVID-19 will be discussed.

Biography

Maryna Skok has completed her PhD at the age of 26 years and defended her Doctor of Science theses in Palladin Institute of Biochemistry, Kyiv, in 2006. She is a Head of Laboratory of Cell Receptor Immunology in Molecular Immunology Department at Palladin Institute of Biochemistry. She 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. Her scientific interests deal with the role of nicotinic acetylcholine receptors localized in both the plasma membrane and mitochondria in neuroinflammation and cell survival.

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