

Catalytic antibodies after COVID-19 and vaccination hydrolyze SARS-CoV-2 S-protein and corresponding oligopeptides

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The most important part of the humoral response to SARS-CoV-2 are antibodies against the S-protein and RBD. The presence of anti-S-IgG and anti-RBD-IgG has been correlated with SARS-CoV-2 neutralizing activity. Antibodies to the N-protein indicate the past disease. In addition, the S-protein is the primary immunogen for the development of vaccines such as Sputnik V, Moderna, Pfizer-BioNTech and AstraZeneca. Therefore, the study of antibodies to the S-protein and RBD is essential for understanding the immune processes during SARS-CoV-2 infection and vaccination. The donors' blood plasma was screened for antibodies to S- and N-proteins of the SARS-CoV-2 virus. Using affinity chromatography on protein-G-Sepharose we isolated IgG preparations from the blood plasma of donors, and show their electrophoretic homogeneity. After affinity chromatography on sorbents with immobilized recombinant SARS-CoV-2 S-protein and its RBD fragment, we obtained antibody subfractions with an affinity for these antigens (named S-IgG and RBD-IgG respectively).

The content of RBD-IgG in the blood plasma of COVID-19 convalescents and patients vaccinated against SARS-CoV-2 was about 1 %. Antibodies not bound to the sorbent after chromatography on RBD-Sepharose, were applied to Sepharose with immobilized S-protein. The amount of this subfraction of antibodies was less than 1 %.

The S-IgG and RBD-IgG subfractions were analyzed in hydrolysis of RBD and corresponding fluorescent 18-mer oligopeptides. All RBD-IgG and S-IgG subfractions we analyzed were inactive in RBD hydrolysis, but RBD-IgG were more active in the hydrolysis of oligopeptides compared to S-IgG. It has been shown that some oligopeptides were hydrolyzed in a wide pH range or within a pH optimum 6.5–7.5. The data we obtained indicate the differences in the spectrum of antibodies generated during the immune response against the S-protein in COVID-19 convalescents and patients vaccinated with Sputnik V.

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