Chernyukh O.G.

QUALITATIVE DETECTION OF Ig G ANTIBODIES TO SARS-CoV-2 CORONAVIRUS NUCLEOCAPSID ANTIGEN IN THE BLOOD SERUM OF PATIENTS WHO HAD VIRAL RESPIRATORY INFECTION, CAUSED BY SARS-CoV-2

Department of Bioorganic and Biological Chemistry and Clinical Biochemistry
Bukovinian State Medical University

Interest in the diagnostics and study of SARS-CoV-2 and the development of numerous complications lead to the study and research of the level of humoral immunity, which results in the production of specific antibodies and the formation of immunological memory.

Immunoglobulin G (IgG) molecules consist of two light chains (kappa or lambda) and two heavy gamma chains. IgG is approximately 80% of all immunoglobulins; its main task is protection against microorganisms, direct neutralization of toxins and initiation of the complement binding assay. IgG is the only immunoglobulin that can penetrate the placental barrier and provide passive immune protection to the fetus and newborn. IgG plays a main role in the formation of long-term humoral immunity after going through infectious diseases, including SARS-CoV-19.

The purpose and objectives of the study were to conduct a qualitative analysis of IgG levels in patients who suffered from mild to moderate SARS-CoV-19 (without hospitalization) within 2-6 months after recovery.

Blood serum of 41 patients was studied to determine the presence of Ig G antibodies to SARS-CoV-2 by solid-phase indirect ELISA (enzyme-linked immunosorbent assay) with a two-stage procedure:

- while depositing the test sample into the wells, it bounded to the recombinant nucleocapsid antigen SARS-CoV-2 on a solid basis with the formation of the antigen-antibody complex;
- with subsequent detection under the assistance of peroxidase conjugate of monoclonal antibodies to human Ig G. The wells are filled in with the TMB (3,3',5,5'-tetramethylbenzidine) substrate, after washing off of the unbound components is carried out. The reaction is stopped with a stop reagent and the optical density is measured at a wave length of 450/620 nm, which is proportional to the concentration of Ig G to SARS-CoV-2 in them. The test of the DiaProphMed system (Kyiv, Ukraine) was used in the work.

Statistical data processing was performed using the parametric Student's t test (t-test).

The result of the analysis was calculated by the positivity coefficient (PC):

$$\mathbf{PC = OD_{sample} / BV}$$

The limit (*boundary value*) BV was calculated:

$$\mathbf{BV = Average\ Value + 0.2}$$

where *Average Value* – the average value of optical density of negative control (at least two, while examining more than 24 samples at the same time, the number of controls reaches four, etc.).

OD_{sample} - optical density of the test sample.

The result of the analysis was considered negative if PC<1 and positive if PC⩾1,1.

The result of PC of 12 people was definitely negative, its average value was 0.26 (from 0.09-0.37) (M ± m = 0.26 ± 0.03). For 29 people the PC varied from 1.22 to 10.2 (M ± m = 4.713 ± 0.72). The other 21 of them had PC moderately and severely affected (PC⩾3.0).

Thus, 70.7% of patients examined for the level of Ig G antibodies to the nucleocapsid antigen of coronavirus in the blood serum had an expressing immunity ($p < 0.001$ in comparison to the group with negative PC). At the same time 72.4% of patients with positive immunity, the level of IgG antibodies was characterized as high. To sum up, Ig G level of most patients, who had mild or moderate SARS-CoV-2 disease, was present in the blood for a long period of time.