

Abstract

In 2020, the WHO declared a global pandemic due to the disease COVID-19, which is caused by the SARS-CoV-2 virus. This virus uses the binding of a surface ‘spike’ protein to the affected cell's ACE 2 receptor to enter the cell. Vaccination therefore aims at inducing the production of antibodies that inhibit the virus binding. Alternatively, antibodies can be obtained from other organism and used as a means of passive immunisation against COVID-19 disease. The aim of the work was therefore to prepare chicken antibodies, IgY, that would be able to prevent the virus from binding.

For the preparation of peptide immunogens, appropriate amino acid sequences have been selected from the RBD domain of SARS-CoV-2 S1 protein, which interacts with the ACE 2 receptor. The synthesized peptides were coupled with the KLH protein carrier, and the resulting conjugate was used to immunize hens. Subsequently, the IgY produced was isolated from the egg yolks and their ability to recognise selected peptides in different types of antigens was demonstrated using the ELISA method. After that, the protective properties of antibodies against the virus were tested *ex vivo* in cell lines and their efficiency was compared to that of Remdesivir. The antibodies were able to inhibit virus binding to cells in the assays, but the test result was affected by low initial antibody concentrations. Therefore, affinity purification of antibodies was performed to isolate specific anti-peptide antibodies. Using the ELISA method, these antibodies were shown to be many times more reactive than the original specific antibodies. Finally, antibodies were tested on commercial ELISA kits containing the whole ‘spike’ protein of SARS-CoV-2 virus and on recombinant antigens of selected parts of the surface ‘spike’ protein.

Presented data demonstrated the ability of antibodies to bind to the viral antigen and prevent it from interacting with the ACE 2 receptor. The antibodies could be applied in the form of a nasal spray to prevent COVID-19 disease.

Key words: chicken antibodies, SARS-CoV-2, S protein, passive immunization, ELISA

(in Czech)