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# In vitro Evaluation of Immunogenic Properties of Oral Application of Rabies Virus Surface Glycoprotein Antigen Conjugated to Beta-Glucan Nanoparticles in a Mouse Model

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**Abstract :** Rabies is caused by several species of the genus Lyssavirus in the Rhabdoviridae family. The disease is deadly encephalitis transmitted from warm-blooded animals to humans, and domestic and wild carnivores play the most crucial role in its transmission. The prevalence of rabies in poor areas of developing salinities is constantly posed as a global threat to public health. According to the World Health Organization, approximately 60,000 people die yearly from rabies. Of these, 60% of deaths are related to the Middle East. Although rabies encephalitis is incurable to date, awareness of the disease and the use of vaccines is the best way to combat the disease. Although effective vaccines are available, there is a high cost involved in vaccine production and management to combat rabies. Increasing the prevalence and discovery of new strains of rabies virus requires the need for safe, effective, and as inexpensive vaccines as possible. One of the approaches considered to achieve the quality and quantity expressed through the manufacture of recombinant types of rabies vaccine. Currently, livestock rabies vaccines are used only in inactivated or live attenuated vaccines, the process of inactivation of which pays attention to considerations. The rabies virus contains a negatively polarized single-stranded RNA genome that encodes the five major structural genes (N, P, M, G, L) from '3 to '5 . Rabies virus glycoprotein G, the major antigen, can produce the virus-neutralizing antibody. N-antigen is another candidate for developing recombinant vaccines. However, because it is within the RNP complex of the virus, the possibility of genetic diversity based on different geographical locations is very high. Glycoprotein G is structurally and antigenically more protected than other genes. Protection at the level of its nucleotide sequence is about 90% and at the amino acid level is 96%. Recombinant vaccines, consisting of a pathogenic subunit, contain fragments of the protein or polysaccharide of the pathogen that have been carefully studied to determine which of these molecules elicits a stronger and more effective immune response. These vaccines minimize the risk of side effects by limiting the immune system's access to the pathogen. Such vaccines are relatively inexpensive, easy to produce, and more stable than vaccines containing viruses or whole bacteria. The problem with these vaccines is that the pathogenic subunits may elicit a weak immune response in the body or may be destroyed before they reach the immune cells, which requires nanoparticles to overcome. Suitable for use as an adjuvant. Among these, biodegradable nanoparticles with functional levels are good candidates as adjuvants for the vaccine. In this study, we intend to use beta-glucan nanoparticles as adjuvants. The surface glycoprotein of the rabies virus (G) is responsible for identifying and binding the virus to the target cell. This glycoprotein is the major protein in the structure of the virus and induces an antibody response in the host. In this study, we intend to use rabies virus surface glycoprotein conjugated with beta-glucan nanoparticles to produce vaccines.

**Keywords :** rabies, vaccines, beta glucan, nanoprticles, adjuvant, recombinant protein
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