

Summary of the Ph.D thesis No., **231-1402 D** Faculty of Veterinary Medicine, Urmia University.

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**Title:** Immune Response Profile Induced by Combined Alum and Glycyrrhizin Liposomes in Balb/c Mice Immunized with Ovalbumin

**Summary:**

Glycyrrhizic acid (Glycyrrhizin) is a triterpenoid saponin and one of the effective compounds in licorice root. Different studies have confirmed the anti oxidant, anti inflammatory, anti virus and anti tumor effects of glycyrrhizin. Responses of immune system can be modulated by glycyrrhizin effects on cells and regulatory mechanisms of immune system. This compound, such as other saponins, have the ability to enhance immune responses and create adjuvant effects. The present study was conducted to investigate the effects of alum and Glycyrrhizin liposomes (GL) as an adjuvant on the induction of cellular and humoral immune responses in mice immunized with ovalbumin. The statistical population consisted of 50 Balb/c mice that were randomly divided into five groups (n=10 per group). Male Balb/c mice were immunized with Ovalbumin adjuvant with alum, GL, or alum-GL combination twice with two weeks intervals. Two weeks after the last immunization, the specific immune responses against Ovalbumin were assessed. Results suggested that the adjuvant formulated with alum and GL induced a Th1 cytokine pattern against ovalbumin, while alum alone induced a Th2 cytokine pattern. Also formulation of alum and GL as an adjuvant, induced a Th17 cytokine pattern against Ovalbumin. In comparing the ratio of cytokines, it was found that the most important factor for higher production of IFN- $\gamma$  and creation of type 1 immune responses is GL while the combined adjuvant of alum and GL was the most important factor in directing immune responses from the second type to the third type. The combined adjuvant increased the potential of Ovalbumin to induce a delayed type hypersensitivity reaction and IgG2a antibody titer. There was no significant difference between the three adjuvants used in terms of inducing specific responses of lymphocyte proliferation against ovalbumin. Unlike alum, the combination of alum and GL synergistically increased the cellular and humoral immune responses after immunization with an antigen and therefore has the ability to be used as an adjuvant to induce cellular immune responses.

**Keywords:** Adjuvant, Alum, Glycyrrhizin Liposome, Ovalbumin.