

## **In vitro Modulation of Cytokine Expression by an Aqueous Licorice Extract in Canine**

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**Abstract :** Objective: We investigated the immunomodulatory ability of licorice (*Glycyrrhiza glabra*). Such activities could have value for the management of common immunological diseases in dogs, such as environmental allergy. This study investigated the potential of a Licorice root extract (LRE) to influence the relative expression of Th-1, Th-2, and Th-17 cytokines in canine peripheral blood mononuclear cells (PBMC). Methods: A LRE was prepared using an alcoholic-aqueous-based solvent method. The extract was tested in three in vitro assays using canine leukocytes to determine its toxicity and immunoregulatory profile. Extract toxicity was assessed using the human T-lymphocyte cell line, Jurkat E6.1. The impact of the extract on the proliferation of concanavalin-activated canine PBMC was also determined. Finally, the extract was assessed for its ability to influence cytokine release in activated PBMC, measuring culture medium concentrations of interleukin-17, interferon gamma, and interleukin-4. One-way ANOVA followed by Dunnett's post-test was used for statistics using concanavalin positive control as reference ( $p \leq 0.05$ ). Results: There was evidence that the LRE had specific immunomodulatory properties, causing significant inhibition of IL4 expression over a non-toxic/non-cytostatic concentration range ( $p < 0.001$ ). In the same cell incubations, there was no significant impact on IL17 nor IFN $\gamma$  over the same non-toxic/non-cytostatic concentration range. Conclusion: The study provides in vitro evidence that LRE preferentially reduces the expression of a Th-2-type cytokine, IL4. The dog population, as with humans, is prone to conditions associated with a Th-2 bias of the immune system, such as environmental allergy. Based on these results, licorice merits further evaluation as a useful immune modulator for such allergic diseases.

**Keywords :** cytokine, *Glycyrrhiza glabra*, peripheral blood mononuclear cells, T-cell activation

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