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Enhancing effect of *Paeonia japonica, Houttuynia cordata,* and *Aster scaber* extracts on the immunoreactivity *in vivo* in mice

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Natural products are increasingly appreciated as a lead for drug discovery and development. A number of investigators have studied various activities of natural products and have found that they have not only nutritional effects but also beneficial properties to cure various diseases and maintain good health. Recently, many investigators have initiated searches for immunomodulating substances from natural food sources. This study was performed to investigate the immunomodulative effects of *Paeonia japonica* (*Pj*), *Houttuynia cordata* THUNB (*Hc*), and *Aster scaber* THUNB (*As*) in mice, using *ex vivo* experiments.

The water extracts of each plant and their mixture were administrated every other day for two or four weeks and peritoneal macrophages were collected to examine the reactivity of macrophages against LPS. Peritoneal macrophages of plants-treated mice were incubated for 4, 8, 16, and 24 h in the presence or absence of LPS to compare the levels of iNOS and COX-2 expression. The accumulation of NO metabolite (nitrite) and PGE_2 were measured by Griess reaction assay and ELISA kit. The expression levels of iNOS mRNA and protein were determined by RT-PCR and Western-blot analyses, respectively. Treatment of LPS increased significantly nitrite production in macrophages isolated from the group treated with *As* for 2 weeks, and also in *Pj*, *Hc*, *As* and mixture-treated groups for 4 weeks. Furthermore, inducibility of iNOS mRNA and protein was different in each group. These results suggest that each extract of plants administrated may modulate the inducibility of iNOS, leading to the differential immune functions in response to the infections. However, there was not any significant differences in COX-2 expression and PGE_2 production between control and plants-treated groups.

These results suggest that *Pj*, *Hc*, *As* and their mixture may enhance the immune function by regulating the reactivity against stimulus such as LPS and antibody production against antigen in mice. Further investigations are needed to identify the stimulative components, the mechanism by which the imunomodulating activity may exert, and the clinical effects of *Pj*, *Hc*, *As* and their mixture supplementation.