

Immunomodulatory effects of fresh water grown green algae on IL-12 and IL-10 production in macrophage and LPS-induced sepsis in mice

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**Objectives:** Interleukin-12 (IL-12) has an essential role in the interaction between the innate and adaptive arms of immunity by regulating inflammatory responses, innate resistance to infection, and adaptive immunity. IL-12 is critical to an efficient host defense in polymicrobial sepsis. On the other hand, in response to inflammatory response during LPS challenge, host cells also produce anti-inflammatory cytokines like interleukin-10 (IL-10). Imbalance between pro-inflammatory and anti-inflammatory response can result in circulatory failure, organ dysfunction, the immunosuppressive state and even death. Chlorella extract has been demonstrated to augment resistance against challenge with tumor cells in mice, which may be mediated through the participation of T cells and macrophages. However, immunomodulatory effects of Chlorella extract (doses between 2 and 0.25 mg/ml) were unknown. **Methods:** Effects of Chlorella extract on NO, TNF- $\alpha$ , and IL-10 productions and IL-12 gene expression in RAW264.7 macrophages were compared to LPS. Sepsis was induced by LPS (i.p.). **Results and Conclusion:** Although the level of NO production was less than that obtained in LPS-stimulated cells, the production of TNF- $\alpha$  was comparable to LPS-stimulated group. The induction of IL-10 by Chlorella extract was greater than that seen in LPS-stimulated group. In addition, Chlorella extract (2 and 1 mg/ml) also enhanced IL-12p40 gene expression. LPS-induced significant mortality in mice, Chlorella extract (20mg/kg) application improved the survival rate of LPS-induced sepsis. Taken together, protective effects of Chlorella extract from LPS-induced sepsis may be mediated through counterbalance of anti-inflammatory cytokine IL-10 and proinflammatory cytokine IL-12 and TNF- $\alpha$  production.