

Immunomodulatory effects of *Chlorella* aqueous extract on IL-12 and IL-10 production in macrophage and LPS-induced sepsis in mice

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Objectives: Immunity balance is regulated between immune activation and immune inhibition. 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. In addition, IL-12 is critical to an efficient host defense in polymicrobial sepsis. On the other hand, in response to inflammatory activation 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* aqueous 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* aqueous extract (doses between 2 and 0.25 mg/ml) were unknown. **Methods:** Effects of *Chlorella* aqueous extract on NO, TNF- α , 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 in *Chlorella*-treated cells was less than that obtained in LPS-stimulated cells, the production of TNF- α was comparable to LPS-stimulated group. The induction of IL-10 by *Chlorella* aqueous extract was greater than that seen in LPS-stimulated group. In addition, *Chlorella* aqueous extract (2 and 1 mg/ml) also enhanced IL-12p40 gene expression. LPS-induced significant mortality in mice, *Chlorella* aqueous extract (20 mg/kg) application improved the survival rate in the LPS-induced sepsis mice. Taken together, protective effects of *Chlorella* aqueous extract from LPS-induced sepsis may be mediated through counterbalance of anti-inflammatory cytokine IL-10 and proinflammatory cytokine IL-12 and TNF- α production.