

Abstract

Effects of Natural and Cultured *Cordyceps* Aqueous Extracts on RAW 264.7 Macrophage Function

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Cordyceps sinensis, a traditional medicinal fungus, has been widely used in China for its various biological activities. However, its usage has been limited during the past decades due to high price and rarity, so isolation of mycelial strains from *Cordyceps* to achieve a large-scale production by fermentation has become a trend. The aim of this study is to investigate the effects of water extracts of two natural *Cordyceps*, *C. sinensis* (DCXC) and *C. gunnii* (GNCC) and fifteen cultured *Cordyceps* mycelia, which the fungus strains from natural *C. sinensis* (LZST4, QH11JC, BNQ, BNZK, QHJ, 50542, 50562, 50677, HS-1, HS-2, WJM, FHJM, BMB and CNB) and *C. militaris* (BCC), on macrophage function *in vitro*. The assays included proliferation, production of NO, iNOS protein levels, phagocytosis, pro-inflammatory cytokines, and translocation of NF- κ B and protein expression of NF- κ B p65 on RAW 264.7 mouse macrophage cells. Cell viability, NO production, phagocytic activity, pro-inflammatory cytokines, NF- κ B activation and expressions of iNOS and NF- κ B p65 were investigated by MTT assay, colorimetric method, flow cytometry, ELISA, immunostaining and Western Blot, respectively. The results showed that two natural *Cordyceps* (DCXC and GNCC) and three cultured *Cordyceps* mycelia (LZST4, QH11JC and BNQ) significantly increased cell viability and production of NO, induced expression of iNOS and enhanced

phagocytosis of RAW 264.7 macrophage cells. DCXC, GNCC, LZST4, QH11JC and BNQ significantly increased the secretion of TNF- α . High concentration of LZST4 and QH11JC, moreover, promoted the production of IL-1 α , IL-1 β and IL-10. DCXC at high concentration also increased the secretion of IL-1 β and IL-10, and GNCC increased the production of IL-10. In addition, LZST4 markedly induced the translocation of NF- κ B in macrophages and increased p-NF- κ B p65 expression on RAW 264.7 macrophages. Therefore, natural *C. gunnii* (GNCC) and cultured *Cordyceps* mycelia, LZST4, QH11JC and BNQ, have similar effects with natural *C. sinensis* (DCXC) on RAW 264.7 macrophages.

Key words: *Cordyceps sinensis*; *Cordyceps gunnii*; Cultured *Cordyceps* mycelia; RAW 264.7 macrophage; Immunomodulatory activity.