Studies on the Immunomodulatory and Antioxidant Activities of Germinated Brown Rice Ectracts

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ABSTRACT

Germinated brown rice (GBR) contains various nutrients needed by human body, such as γ-aminobutyric acid, vitamin E, food fiber, antioxidants, inositol and long-chain fatty acids. In this study, different solvents (phosphate buffer solution (PBS), aqueous alkali and ethanol) were used for extraction, so as to study the growth inhibition ability on human leukemic U937 cells, immunomodulatory activity, and antioxidative activity of the GBR extracts. As for the antioxidation, the GBR extracts (PGBR) obtained by PBS exhibited higher DPPH free radical scavenging ability, reducing power and superoxide anion scavenging ability than did those obtained by aqueous alkali (AGBR) and ethanol (EGBR). However, EGBR exhibited the highest Trolox equivalent antioxidative capacity and ferrous ion chelating ability. As for the cell growth inhibition ability and immunomodulatory activity, the growth inhibition rates of U937 cells incubated in the conditioned mediums stimulated by PGBR, AGBR and EGBR for 1 day under a concentration of 800 μg/mL were 49.83, 57.39 and 51.23 %, respectively. After stimulation for 3 days under the same concentration, the growth inhibition rates were 58.51, 62.23 and 60.77 %, respectively, where the inhibition effect of AGBR was the highest. The cytokine secretion of the conditioned medium of human mononuclear cells (MNCs) stimulated by PGBR, AGBR and EGBR for 1 and 3days was also determined in this study. The IL-1β secretion of MNC stimulated by PGBR, AGBR and EGBR (at 1000 μg/mL) for 1 day was 1293.47, 1572.93 and 2094.71 pg/mL, respectively; and for 3 days was 1797.56, 1861.63 and 2613.95 pg/mL, respectively. According to the results, IL-1β secretion increased with increasing stimulation day. EGBR was the most effective to stimulate the mononuclear cell conditioned medium (MNC-CM) for IL-1β secretion. The TNF-α secretion of MNC stimulated by PGBR, AGBR and EGBR (at 1000 μg/mL) for 1 day was 1950.38, 546.30 and 1365.02 pg/mL, respectively; and for 3 days was 2346.54, 914.82 and 1881.10 pg/mL, respectively. PGBR was the most effective for the TNF-α secretion. The IFN-γ secretion of MNC stimulated by PGBR, AGBR and EGBR (at 1000 μg/mL) for 1 day was 853.30, 911.75 and 893.46 pg/mL, respectively; and for 3 days was 1461.14, 1135.47 and 907.91 pg/mL, respectively. PGBR was also the most effective for the IFN-γ secretion. The No contents of MNC-CM stimulated by PGBR, AGBR and EGBR (at 100 μg/mL) for 1 day were 0.54 0.46 and 0.52 μM/mL, respectively; and for 3 days were 0.80, 0.68 and 0.66 μM/mL, respectively. The greatest growth index of MNC, up to 1.02~1.04, was achieved by treatment of GBR extracts at 100 μg/mL for 1 day. After treatment of GBR extracts at 100 μg/mL for 3 days, PGBR and AGBR could inhibit the proliferation of the MNC. Under a concentration of 500 μg/mL, the extracts could kill MNCs, where PGBR was the most significant.

Keywords : Germinated brown rice、Immunomodulatory activity、Antioxidative activity、Cytokines、Human leukemic U937 cells、Human nuclear cells

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