The anti-tumor effect of Ganoderma lucidum is mediated by cytokines released from activated macrophages and T lymphocytes.

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Source
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Abstract

The present study was to ascertain the immunomodulating and anti-tumor effects of Ganoderma (G.) lucidum. Polysaccharides (PS) from fresh fruiting bodies of G. lucidum (PS-G) were isolated and used to potentiate cytokine production by human monocytes-macrophages and T lymphocytes. Our results had shown that the levels of interleukin (IL)-1 beta, tumor necrosis factor (TNF)- alpha, and IL-6 in macrophage cultures treated with PS-G (100 micrograms/ml) were 5.1-, 9.8- and 29-fold higher, respectively, than those of untreated controls. In addition, the release of interferon (IFN)- gamma from T lymphocytes was also greatly promoted in the presence of PS-G (25-100 micrograms/ml). Furthermore, these cytokine-containing mononuclear cell-conditioned media (PSG-MNC-CM) were found to suppress the proliferation and clonogenicity of both the HL-60 and the U937 leukemic cell lines. DNA labeling and gel electrophoresis showed that treatment with PSG-MNC-CM markedly induced leukemic-cell apoptosis. Flow-cytometric analysis revealed that few (2.3 +/- 0.8%) apoptotic cells were seen in the control cultures, while PSG-MNC-CM treatment resulted in a significant increase in the apoptotic population both in the HL-60 (38.3 +/- 4.5%) and in the U937 (44.5 +/- 3.8%) cells. In addition, 40 to 45% of the treated leukemic cells were triggered to differentiate into mature monocytic cells expressing CD14 and CD68 surface antigens. However, PS-G alone had no such effects even at a higher dose of 400 micrograms/ml. Since untreated macrophages and T lymphocytes produced little or no cytokine, and normal MNC-CM did not suppress leukemic cell growth, it was suggestive that the anti-tumor activity of PSG-MNC-CM was derived from the elevated levels of cytokines. Antibody-neutralization studies further revealed that the anti-tumor cytokines...
in the PSG-MNC-CM were mainly of TNF-alpha and IFN-gamma, and these 2 cytokines acted synergistically on the inhibition of leukemic-cell growth.

PMID:

9096652