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Differential Effects of Tea Extracts on Growth and Cytokine Production by Normal and Leukemic Human Leukocytes

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Abstract

Background: Tea is one of the world's most highly consumed beverages, second only to water. It is affordable and abundant and thus has great potential for improving health of those in both developed and developing areas. Green, oolong, and black teas differ in the extent of fermentation and types of bioactive polyphenols produced. Green tea and its major polyphenol decrease growth of some cancer cells and effect production of immune system cytokines. This study compares the effects of different types of tea extracts on viability and cytokine production by normal and leukemic human T lymphocytes. Generation of the toxic reactive oxygen species H_2O_2 by extracts was also examined.

Methods: The Jurkat T lymphoblastic leukemia cells and mitogen-stimulated normal human peripheral blood mononuclear cells were used in this study. Cell viability was determined by (3-4,5-dimethylthiamizol-2-yl)-diphenyltetrazolium bromide) assay and production of interleukin-2 by Enzyme-Linked ImmunoSorbent Assay. Levels of H_2O_2 generated by tea extracts were determined using the xylenol-orange method.

Results: We found that green, oolong, and black tea extracts differentially effect the growth and viability of T lymphoblastic leukemia cells and normal peripheral blood mononuclear cells, substantially decreasing both growth and viability of leukemic T lymphocytes and having much lesser effects on their normal counterparts. Tea extracts also had differential effects on the production of the T lymphocyte growth factor interleukin-2, significantly decreasing production by leukemic cells while having only minor effects on normal cells. All three extracts induced H_2O_2 generation, with green and oolong tea extracts having the greatest effect. Leukemic cells were much more susceptible to growth inhibition and killing by H_2O_2 than normal lymphocytes.

Conclusions: The three tea extracts studied altered leukemic T lymphocyte functions, decreasing cell viability, growth, and production of a major cell growth factor and the H_2O_2 generated by solutions of extracts may be partially responsible. Normal cells were affected to a far lesser degree by tea extracts and are also more resistant to killing by H_2O_2 than leukemic cells. This study has implications for using tea extracts for chemotherapeutic and immunomodulatory purposes.

Key Words: Tea extracts, interleukin-2, hydrogen peroxide, leukemia, T lymphocytes