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A Novel Approach to Breast Cancer Therapy: Modified Arabinoxylan Rice Bran (MGN-3/Biobran) Enhances Apoptosis of Human Breast Cancer Cells Following Phagocytosis of Sacchromyces Cerevisiae, the Baker's Yeast, in vitro

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The study was designed to evaluate the effect of treatment with MGN-3/BioBran on phagocytosis-induced apoptosis of human metastatic breast cancer cell line (MCF-7) and non-metastatic cancer cells (HCC70). MGN-3 is an arabinoxylan from rice bran that has been modified by carbohydrate hydrolyzing enzymes from shiitake mushrooms. METHODS: Heat-killed yeast was cocultured with cancer cells at a ratio of 10:1 in the absence or presence of MGN-3. Phagocytosis of yeast was determined by morphological examination of Giemsa stained cytopin preparations and flow cytometry. Apoptosis was determined by propidium iodide technique using FACScan. Activation of caspases was examined by flow cytometry using carboxyfluorescein labeled substrates of caspase 8 (FAM-LETD-FMK) and caspase 9 (FAM-LEHD-FMK). RESULTS: MCF-7 cells showed a 28% attachment to yeast, and MGN-3 treatment resulted in about 200% increase in the percentage of attachment of yeast to tumor cells. MCF-7 cells also phagocytosed yeast (16% phagocytic cells) and MGN-3 treatment caused over a 300% increase in phagocytosis. In addition, MGN-3 enhanced the apoptosis of cancer cells induced by yeast; the percentages of increase were 187% for MCF-7 cells and 164% for HCC70 cells. Enhancement of apoptosis by MGN-3 was dose dependent and the maximum effect was noticed at 500 g/ml. Moreover, the data indicated that apoptosis of MCF-7 cells was associated with activation of caspase 8 and caspase 9; MGN-3 increased the level of activation of caspase 8 (154% increase) and caspase 9 (122.5% increase). Similar enhancement of caspases by MGN-3 was observed in HCC70 cells. CONCLUSION: The data demonstrate the important role of MGN-3 in yeast induced cancer cell apoptosis and may represent a novel therapeutic strategy for the treatment of breast cancer. MGN-3/BioBran was provided by Daiwa Pharmaceutical Co. Ltd., Tokyo, Japan.