Effects of Resveratrol on 5-Fluorouracil Chemotherapeutic DNA Damage and Drug Resistance in Breast and Prostate Cancer Cells

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Resveratrol is known as a powerful antioxidant present in many foods, especially in grapes and red wine. My study investigated the mutagenic effects of three increasing concentrations of Resveratrol in human prostate cancer (PC3) cells and human breast cancer (MCF-7) cells exposed to five different doses of the chemotherapeutic drug 5-Fluorouracil (5-FU), through the use of the Alkaline Comet Assay. There was a dose-dependent positive correlation between 5-FU exposure and DNA damage in both cell lines. The addition of Resveratrol, however, caused a significant unexpected decrease in DNA damage in both PC3 and MCF-7 cells ($p < 0.001$). The results indicated that Resveratrol ameliorated DNA damage caused by 5-FU in both cell lines. The ORAC Assay also showed a similar trend in antioxidant capacity when Resveratrol and 5-FU were combined. These results suggest that Resveratrol should not be used in combination treatment with 5-FU in cancer patients. After further investigation, I also found through Western Blot testing that Resveratrol was able to overcome resistance to 5-FU in a 5-FU resistant MCF-7 cancer cell line by inhibiting the NF-kB p65 protein. In other studies, NF-kB has been shown to be overexpressed in 5-FU resistant cancer cell lines and its inhibition has been shown to help overcome 5-FU chemotherapeutic resistance. However, this is the first study to show that Resveratrol can overcome resistance to 5-FU in MCF-7 breast cancer cells, as long as Resveratrol and 5-FU are not used simultaneously. These findings are highly significant as Resveratrol may be able to allow cancer patients resistant to 5-FU through prolonged exposure to the drug overcome the drug resistance, greatly increasing the effectiveness of the 5-FU chemotherapeutic drug.

Awards Won: