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Effect of Cytotoxic Chemicals on Apoptosis in Caenorhabditis elegans

Apoptosis is a mechanism of programmed cell death often dysregulated in neurological diseases and cancer. Betulinic acid (BetA), derived from white birch (Betula pubescens), induces apoptosis in sixteen cancer cell lines, including drug resistant lines. BetA is hypothesized to induce apoptosis by antagonizing anti-apoptotic Bcl-2 family proteins in a context-dependent manner. I used ced-1 C. elegans, which have a genetically sensitive background to apoptosis, to determine BetA′s effect on apoptosis. To determine if BetA targets CED-9, I used ced-1; ced-9(ts) worms, which have an inactive Bcl-2 homologue CED-9. I used this information to investigate how BetA selectively induces cancer cell death. I quantified apoptotic cells in the germline of C. elegans treated with BetA or a DMSO control. My prediction was that BetA would increase the number of apoptotic cells relative to the control in ced-1 worms, but that it would have no effect in ced-1; ced-9(ts) worms. BetA was found to increase apoptosis by 10% in the ced-1 background, though this trend was not found to be significant. BetA had no effect in the ced-1; ced-9(ts) background. These results indicate that BetA has a slight effect on apoptosis, probably in a ced-9-dependent manner. Further experimentation is warranted to determine BetA effects in a highly sensitized system in C. elegans and to determine which protein BetA effects. Further experimentation determining effects on apoptosis in C. elegans by other cytotoxic chemicals including crocin and allicin is suggested.