Investigating the Apoptotic Induction Potential of Various Chemical Food Preservatives on Caenorhabditis elegans

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Despite the ubiquity of food preservatives in modern-day cuisine, the holistic range of their effects has yet to be adequately explored. The purpose of this experiment is to examine whether these different food preservatives can induce caspase-based apoptosis in animal tissue specifically due to caspase 3-related protein expression in Caenorhabditis elegans (chosen because of the homologous conserved pathways that it shares with humans). The methods involved a unique protocol: C.elegans were incubated with preservatives of concentrations from 6.25-50 mM (similar to physiological concentrations found in regulated packaged foods) and a negative control of distilled water for 6 hours, and subsequently fixed with ethanol, permeabilized using antibody wash with detergent, and imaged with anti-tubulin and caspase-3 antibodies applied. Protein expression was measured using confocal microscopy and the ImageJ imaging program to calculate the fluorescence of the imaging assay, representing the level of caspase expression. Citric Acid had significantly more caspase 3-related protein expression than Sodium Benzoate and Sodium Nitrate. However, most of the preservatives induced more expression than the control, except for some Sodium Nitrate treatment groups. Statistical analysis was done using an Unbalanced Two-way ANOVA and Tukey Multiple Comparison tests. The results insinuate that the common food preservatives Citric Acid, Sodium Benzoate, and (to a lesser extent) Sodium Nitrate induce caspase 3-related protein expression leading to apoptosis. This has implications for not only the safety and regulation of overconsumption of food preservatives, but also the field of oncology, as inducing apoptosis in cancerous cells is a novel potential treatment for fighting cancer.

Awards Won:
University of Arizona: Renewal Tuition Scholarship