Year III: Optimizing the Bioavailability of Curcumin in Dugesia tigrina as a Model To Mitigate the Negative Effects of Radiotherapy

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Radiotherapy is a cancer treatment that causes an excess of free radicals, which can induce a variety of chronic and degenerative diseases. Curcumin and piperine, potent antioxidants, exhibit the ability to scavenge for free radicals, rendering them ineffective and increasing the likelihood of the antioxidants mitigating the negative effects of radiotherapy. Piperine is a bioavailability enhancer; potentially aiding in the absorption of curcumin by cells, thus, this study aimed to ascertain the optimal concentration of piperine in conjunction with curcumin. Planaria were utilized as a cell model due to their unique regenerative properties. The methodology for this study began with five of six groups of planaria being irradiated; then, all six, including two controls, were bisected and fed corresponding concentrations of curcumin and piperine. Three different metrics were measured during experimentation: photoreactivity, position change, and length. The percent change was calculated for each of the tests, and a t-test was performed to determine statistical significance. For the change in length of the planaria, the primary metric, Mann-Whitney U, ANOVA, and Tukey's Kramer tests were employed, which demonstrated that 50 mg was the optimal concentration of piperine administered with curcumin, as the planaria that received this concentration exhibited a statistically significant length change over time with a p-value < 0.0001, as well as in comparison to the irradiated control. This study's implications emphasize the role of curcumin and piperine as radioprotectors, as well as their capability in relieving oxidative stress linked to afflictions such as Alzheimer's and cardiovascular diseases.