Nano-Antioxidants' Effects on Oxidizing Agent Exposure

Diyakonov, Catherine (School: Lord Byng Secondary School)

Neurodegenerative diseases are among the top five causes of death worldwide, with one major cause of these diseases being high levels of oxidative stress. Nano-antioxidants are emerging nanomaterials that may slow or prevent the development of these diseases by trapping free radicals. This research investigated a novel method of employing the use of nano-antioxidants in a combinatory approach to lower oxidative stress levels. The purpose of this research was to create and monitor the effects of nano-antioxidant solutions in an in vivo study on planaria exposed to oxidative stress. Planaria were bisected to induce oxidative stress. The administration of the combination of two nano-antioxidants, MitoQ and C60 fullerene, in four various concentrations, 0.205, 0.215, 0.225, and 0.235 mg/mL, aimed to determine which solution facilitated the greatest rate of planarian regeneration. Three trials were conducted, with five planaria in each trial of the four experimental groups and the control group. Analysis conducted through a one-way ANOVA between all treatment groups ($p<0.0001$), as well as two-sample (unpaired), one-tailed, Welch's t-tests between each condition, revealed that the solution of 0.235 mg/mL achieved the highest rate of planarian regeneration ($p<0.0001$). This unique research is the first of a kind, and the solutions' efficacies can be furthered by examining various mitochondria-targeted delivery systems. Nano-antioxidant combinations have immense therapeutic potential due to their emerging ability to combat high oxidative stress levels, thereby preventing and curing neurodegenerative diseases.

Awards Won: