An Investigation of the Consequences of Aquatic Single-Walled Carbon Nanotube Exposure Concerning Daphnia magna at Varying Concentrations

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The widespread use of CNTs in aquatic devices has led to an alarming amount of CNTs entering aquatic ecosystems. Due to their relatively new introduction, researchers have only been working on determining the hazardous effects of these nanoparticles since late 2007, and little data has been published pertaining to aquatic organisms or ecosystems. Therefore, this experiment is designed to observe the effects of carbon nanotubes at varying concentrations (0-3%) concerning the planktonic filter-feeding crustacean Daphnia magna regarding key biological factors such as population/population growth, mortality, average length, parthenogenic reproduction, ephippial reproduction, heart rate, and dissolved oxygen consumption/metabolism. The researcher hypothesized that the presence of CNTs would result in a population decrease coupled with increased mortality, shorter length, a decrease in parthenogenic reproduction paired with an increase in ephippial reproduction, an increased heart rate, and lower dissolved consumption/metabolism; varying concentrations will provide arithmetic differences. Daphnia were exposed to the CNTs for a period of 10 days in 2.75 liters of 25 °C pH 7 natural spring water. The data received fully supported the hypothesis with a large differential between groups, following a general linear progression. This may be attributed to a buildup of CNTs in the intestinal tract of the Daphnia, restricting feeding in an environment of abundant food sources. Additionally, CNT/tissue fusion occurred in the instar stage of development, leading to an abnormally high mortality rate. Based on these results, it can be concluded that CNTs pose a significant threat to aquatic environments and CNT restrictions should be pursued.

Awards Won:
First Award of $5,000