The Effects of Cobalt on Daphnia magna

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Groundwater surrounding the nation’s largest coal fired power plant, Plant Scherer, has been reported to contain heavy metals and other contaminants exceeding the EPA’s Groundwater Protection Standards. The largest and most frequent of these exceedances is cobalt with concentrations up to thirteen times the federal limit having been recorded in monitoring wells surrounding the plant’s unlined ash pond. These exceedances are concerning due to the plant’s close proximity to the freshwater ecosystems of Lake Juliette and the Ocmulgee River. To test the effect of chronic exposure to cobalt on freshwater invertebrates native to aquatic Georgia ecosystems, D. magna, a model organism commonly used for water toxicity tests were exposed to the following levels of cobalt: 0.0 mg/L (control), 0.01 mg/L (half the EPA limit), 0.02 mg/L (established EPA limit), and 0.26mg/L (concentration present in one of Plant Scherer’s wells) over a twelve day period. Brood size, heart rate, population size, and population death rates were examined. Analysis revealed that D. magna exposed to cobalt levels at and above the EPA limit of 0.02mg/L had a significant decrease in population. Additional analysis revealed no difference in heart rate or brood size among varying levels of cobalt exposure. Our results indicate that, if there is leaching of cobalt into freshwater ecosystems, there could be a negative effect on the population size of invertebrate organisms and thus a negative effect on the diversity within Georgia freshwater food webs.

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