Hidden Metals, Visible Consequences: The Effect of Lead Concentrations in Simulated Vape E-Liquid on C. elegans' Locomotor Behavior and Fertility

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E-cigarettes are a growing public-health concern, as new studies indicate that heavy metals, including lead, can be found in vape liquid. Despite this desperate need for research, the long-term biological effects of vaping are poorly understood. This project investigates how metal buildup from chronic vaping affects fertility and neurological health in humans via C. elegans as a translational model. Since movement is controlled by neural circuits, motility assays provide insight to neurological function. It was hypothesized that as the worms were exposed to increasing lead concentrations in the mock vape smoke, they would exhibit increased egg retention and stress behaviors (reversals, omega bends), alongside decreased forward movement. This was tested by exposing the worms to mock vape solutions (propylene glycol, nicotine) with different concentrations of lead (0μM [vehicle], 5μM, 10μM, 20μM). Motility was quantified for three days, and fertility was measured through an egg retention assay. The results indicated that the lead had significant ($p<0.05$) impacts on the worms, shown by impaired forward movement (largest drop at 20μM: -4.06 body bends/20 sec from negative control, -3.39 from vehicle), increased reversal frequency (6.5% in negative control to 24%: 20μM group), and elevated omega bending ($p<0.05$), indicating stress. Fertility had a dose-dependent relationship with lead, as the 20μM group had an average +3.36 eggs retained versus the negative control. These findings indicate that lead can disrupt neurological function and reproductive processes in C. elegans and potentially humans. Furthermore, chronic vaping and metal build-up causes more significant effects than the components of e-liquid, underscoring the need for further research in metal contamination.

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Fourth Award of $600