Reversing the Effects of Lead Toxicity on Selected Biological Models Using EDTA Chelation Therapy

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For parts of Oklahoma, Kansas, and Missouri, lead mining was a prominent industry. This has created medical and ecological concerns in Picher, OK, which the EPA calls “the most toxic place in America.” Burdened by negative health implications, citizens in and around Picher have experienced higher cancer rates, stunted cognitive function and development, and damaged cells and organ systems. The effects of lead are long-lasting, as lead from the local Tar Creek affects several waterways, presenting a continued medical issue. Thus, in an effort to both study and combat the effects of lead, the purpose of this investigation is to examine the effects of solutions containing 0.3125 to 10 ppm lead on the cellular regeneration, pulse rate, and mortality of Lumbriculus variegatus, the integrity of cell membranes, and the function of the enzyme polyphenol oxidase. This project also evaluated the ability of ethylenediaminetetraaceticacid, or EDTA, to remove lead ions and reverse the effects of lead on the selected biological models. The data suggests that lead inhibited regeneration rate at all concentrations as compared to the control group ($p<=.036$ for all groups tested), decreased heart rate, increased mortality, increased damage to the cell membrane, and denatured PPO enzyme function. EDTA showed limited ability to recover the biological models from lead exposure. EDTA showed the best results for the PPO enzyme recovery and mixed results with cellular regeneration, pulse rate, and mortality. EDTA restored the reaction rate of PPO denatured by 10 ppm lead to only .0074 AU/min below the spring water control. Overall, EDTA assisted in maintaining cell membrane integrity as compared to the lead only treatment.

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