The Effect of Intralipid on Bupivacaine-Induced Cardiac Activity in Daphnia magna

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Local anesthetics are widely used in a variety of medical procedures. Although they are relatively safe and efficient in managing pain, complications can arise in what is known as local anesthetic systemic toxicity (LAST). LAST occurs when unintended large doses of local anesthetics are administered or when accidentally injected intra-arterially, resulting in seizures and cardiovascular collapse. LAST is also caused by excessive systemic absorption of anesthetics. To counter the effect of LAST, lipid emulsion therapy has been used in several animal studies and in various clinical settings. The purpose of my experiment is to apply this rationale by studying the effect of Intralipid on bupivacaine-induced cardiac activity in Daphnia. It was hypothesized that if then the concentration of Intralipid increases, then effectiveness of bupivacaine on cardiac activity will decrease. Cardiac activity was measured by comparing the heart rate in Daphnia to the control heart rate. Increasing concentrations of Intralipid combined with a set concentration of bupivacaine (lethal enough to dramatically lower heart rate) were exposed to the Daphnia and heart rate was counted under a microscope. The results showed that the heart rate of Daphnia Magna dramatically decreases upon exposure of the Daphnia to bupivacaine, a potent, and long-acting local anesthetic. Intralipid, a plant-based lipid emulsion, markedly reversed the effect of the bupivacaine and increased the heart rate of the Daphnia to a normal level. In conclusion, the data strongly supports the hypothesis that Intralipid effectively countered the effect of bupivacaine in Daphnia Magna.

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