STUDY OF NEUROTOXICITY, HEPATOTOXICITY, AND RENAL TOXICITY BIOMARKERS IN SPRAGUE-DAWLEY RATS TREATED WITH MALATHION

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Abstract: Malathion is one of the most common and widely used organophosphate insecticides. It is often used in the United States in numerous agricultural, residential, and in public health settings. As a result of its widespread use, there has been concern for its potential to cause toxicity and poisoning in human populations. Malathion acts by effecting nerve enzymes; it combines chemically with acetylcholinesterase (AchE) and inactivates it. The decrease of AchE causes the accumulation of acetylcholine (Ach) to occur. The adverse health effects that are associated with accumulation of Ach are headache, nausea, dizziness, blurred vision, chest tightness, difficulty breathing, muscle weakness or twitching, along with many other symptoms. The main objective of this study was to further elucidate the mechanisms involved in malathion toxicity in Sprague-Dawley rats using enzyme analysis. Four groups of 4 male rats each weighing an average of 60±2g were used in this study. Malathion was intraperitoneally administered to the rats at the doses 2.5, 5, 10 and 20mg/kg body weight (BW), and one dose per 24 hours given for 5 days. A control group was also made of 4 animals injected with 1%DMSO without chemical. Following anesthesia, blood specimens were immediately collected using heparinized syringes; cholinesterase (ChE), aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), and acid phosphatase (AcP) were detected and quantified in serum samples by spectrophotometry. Exposure to malathion was found to increase the activity of the enzymes in a statistically significant manner. There was a dose dependent response in all enzyme activities. Enzyme activities of 1376±119, 1286±159, 792±460, 747±506, and 628±97 (ChE); 970±61, 913±62, 1010±21, 2269±381, and 2225±300 (AST); 1240±143, 1966±85, 3205±186, 3615±418, and 3655±154 (ALT); 6939±0.02, 7026±0.04, 8883±0.09, 9556±0.05, and 9396±0.25 (ALP); 52±0.005, 202±0.069, 253±0.072, 268±0.086, and 281±0.094 (AcP) were recorded for 0, 2.5, 5, 10, and 20mg/kg BW of malathion, respectively. Our findings demonstrated that malathion exposure induced a significant increase in enzyme activity in treated groups of Sprague-Dawley rats. Taken together, we can conclude that malathion exposure has the potential to induce neurotoxic, hepatic, and renal damage as assessed by the enzyme analysis.

Keywords: Malathion, enzyme analysis, cholinesterase, aminotransferase, phosphatase, Sprague-Dawley rats

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