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Organophosphate Induced Neurotoxic and Cardiotoxic Damages in Wistar Rats

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Abstract

Introduction: *An estimated 300,000 deaths each year are as a result of organophosphate toxicity. Organophosphate pesticides (OP's) have been used in large amounts in agricultural settings and homes, allowing intoxication. This has been linked to the onset of neurotoxicity and cardiotoxicity.*

Methods: *Thirty-two adult wistar rats were grouped and exposed to dichlorvos and chlorpyrifos, two widely used OP's, for a period of 14 days. They underwent behavioural tests for anxiety-like behaviour and spatial memory. The brain tissue was excised, and the amygdala and hippocampus were sectioned out. These were put through biochemical tests for oxidative stress and Acetylcholinesterase (AChE) activity. These parameters, along with the brain and body weight changes were compared with those of a control group. Comparisons were analysed using one-way analysis of variance (ANOVA) and subjected to post-hoc Bonferroni's multiple comparison test.*

Results: *There was a significant decrease ($p \leq 0.05$) in the brain and body weights. In the behavioural tests for spatial working memory, a significant defect ($p \leq 0.05$) was seen, shown by Morris water maze test. Anxiety-like behaviours were also elevated, shown by changes ($p \leq 0.05$) in Open Field test and Elevated Plus Maze test. AChE activity was markedly decreased ($p \leq 0.05$) in the amygdaloid complex and the hippocampus. Oxidative stress markers, Nitric Oxide (NO) and Reactive Oxygen Species (ROS) were also markedly increased ($p \leq 0.05$) in both brain regions. A similar experiment, with cardiotoxicity focus showed atherogenic and atherosclerotic indices and morphological damages, including a deterioration in plasma lipid profiles and a rise in low density lipoprotein- cholesterol.*

Conclusion: *There is a significant increase in neurotoxic and cardiotoxic profiles with OP exposure which can lead to neurodegenerative and cardiovascular diseases.*

Keywords: *Organophosphates, Acetylcholinesterase, Hippocampus, Amygdala, Atherogenic, Atherosclerotic.*