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Assessment of acetylcholinesterase activity, oxidative stress responses, and primary DNA damage in blood and brain tissue of chlorpyrifos-exposed rats

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Organophosphate compounds are among the most frequently used pesticides worldwide. In this study, we evaluated the in vivo effects of the insecticide chlorpyrifos, which was orally administered to male Wistar rats at 0.160 mg/kg, 0.015 mg/kg, and 0.010 mg/kg for 28 days. Following treatment, the level of lipid peroxidation and acetylcholinesterase (AChE) activity was estimated in plasma and brain. To establish the potential DNA damaging effects of the exposure, we applied an alkaline comet assay on the white blood cells and brain tissue of the exposed and control animals. We found that 28-day exposure resulted in dose-dependent changes in AChE activity, which was significantly more depressed in the brain. Lipid peroxidation, presented as TBARS concentration, was elevated both in plasma and in the brain. All of the tested doses of chlorpyrifos were slightly genotoxic, both to the white blood cells and brain tissue. Taken together, our findings confirmed the AChE-inhibiting potency of chlorpyrifos and indicated that its toxicity was mediated through free radicals, which contributed to DNA instability. Considering that our study focused on very low doses of chlorpyrifos within toxicology reference values our results call for further research using other sensitive biomarkers of effect, along with different exposure scenarios.

Biography

Ana Lucić Vrdoljak has completed her PhD from University of Zagreb, Faculty of Pharmacy and Biochemistry. She is appointed as a Scientific Advisor at the Institute for Medical Research and Occupational Health, Zagreb, Croatia, and as a Lecturer at the Department of Biotechnology, University of Rijeka. Her research interest is focused on experiments dealing with acetylcholinesterase poisoning and search for more effective therapy. She also possesses extensive experience in human biomonitoring using the acetylcholinesterase assay and cytogenetic techniques to assess and control the risk of long-term outcomes associated with exposure to organophosphate and carbamate pesticides. Her work has been presented through 60 scientific papers.

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