METHYL PARATHION AND PARATHION-INDUCED CYTO-GENOTOXICITY TO HUMAN LIVER CARCINOMA (HEPG2) CELLS VIA OXIDATIVE STRESS

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Abstract: Methyl parathion (C₈H₁₀NO₅PS) and parathion (C₁₀H₁₄NO₅PS) are both organophosphate insecticides (OPI) widely used for household and agricultural applications. They are known for their ability to irreversibly inhibit acetylcholinesterase which often leads to a profound effect on the nervous system of exposed organisms. Many recently published studies have indicated that human exposure to OPI may be associated with neurologic, hematopoietic, cardiovascular, and reproductive adverse effects. Studies have also linked OPI exposure to a number of degenerative diseases including Parkinson's, Alzheimer's, and amyotrophic lateral sclerosis. Also, oxidative stress (OS) has been reported as a possible mechanism of OPI toxicity in humans. Hence, the aim of the present investigation was to use human liver carcinoma HepG2 cells as a test model to evaluate the role of OS in methyl parathion- and parathion-induced toxicity. To achieve this goal, we performed the MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] assay for cell viability, lipid peroxidation assay for malondialdehyde (MDA) production, and Comet assay for DNA damage, respectively. Results from MTT assay indicated that methyl parathion and parathion gradually reduce the viability of HepG2 cells in a dose-dependent manner, showing 48 h-LD₅₀ values of 26.20 mM and 23.58 mM, respectively. Lipid peroxidation assay resulted in a significant increase (P < 0.05) of MDA level in methyl parathion- and parathion-treated HepG2 cells compared with controls, suggesting that OS plays a key role in OPI-induced toxicity. Comet assay indicated a significant increase in genotoxicity at higher concentrations of OPI exposure. Overall, we found that methyl-parathion is slightly less toxic than parathion to HepG2 cells. The cytotoxic effect of these OPI was found to be associated, at least in part, with oxidative cell/tissue damage.

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