METHYL PARATHION-INDUCED TOXICITY, GENOTOXIC DAMAGE, AND APOPTOSIS IN HUMAN LIVER CARCINOMA CELLS

Falicia L. Edwards, Clement G. Yedjou, and Paul B. Tchounwou

Molecular Toxicology Research Laboratory, NIH-Center for Environmental Health, College of Science, Engineering and Technology, Jackson State University, 1400 Lynch Street, P.O. Box 18540, Jackson, MS, USA

Abstract: Methyl Parathion is an organophosphate insecticide that has been used in agriculture and domestic for several years. However, published studies indicated that long-term of human exposure to this compound might result in profound effects on the nervous, hematopoietic, cardiovascular, and reproductive systems. Although clinical manifestations associated with parathion exposure are well documented, its molecular mechanisms of action remain largely unknown. To investigate the mechanism of organophosphate insecticides-induced toxicity, DNA damage, and apoptosis, we exposed cultured human liver carcinoma (HepG2) cells with different concentrations of parathion. The 3-(4,5-dimethyl-thiazoyl-2-yl)-2,5diphenyl-tetrazolium bromide assay was used to evaluate cytotoxicity, comet assay to evaluate the degree of DNA damage, and flow cytometric analysis to determine apoptosis. We clearly demonstrated that methyl parathion has significant cytotoxic effect on human liver carcinoma cell lines. Comet assay indicate that parathion induced DNA damage in a dose-dependent fashion. Flow cytometry assessment using annexin/FITC revealed that organophosphate insecticides-induced apoptosis in treated HepG2 in comparison to the control. Overall, findings from the present study demonstrated that methyl parathion is highly cytotoxic to HepG2 cells. The mechanism underlying cytotoxicity and genotoxicity of parathion was shown to be apoptosis.

Keywords: Methyl Parathion, cytotoxicity, apoptosis, HepG2 cells

Acknowledgements: This research was financially supported in part by the U.S. Department of Defense Cooperative Agreement (Grant No. W912HZ-04-2-2002), and in part by the National Institutes of Health RCMI Program (Grant No. 1G12RR13459) at Jackson State University (JSU). We thank Dr. Abdul K. Mohamed, Dean of the College of Science, Engineering and Technology at JSU for his support for this research.