MOLECULAR BASIS OF MALATHION INDUCES TOXICITY TO HUMAN LIVER CARCINOMA (HEPG2) CELLS

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Abstract: Malathion was developed during World War II, in the 1950’s, and has been known for its high insect potency, but low mammalian toxicity. Because of their low mammalian toxicity, organophosphorus insecticides have replaced chlorinated hydrocarbons, such as DDT, in many developing countries. In particular, there has been an increase in the use of organophosphate pesticides within the past few decades. But its wide and increased usage has lead to the higher likelihood of human exposure. Acting by binding to and inhibiting the normal action of acetylcholinesterase, it causes disturbance of nerve transmissions. Some of the related adverse health effects seen in malathion exposure include: headache, dizziness, nausea, vomiting, bradycardia, miosis, just to name a few. Although malathion has been widely studied in a variety of systems, the cellular and molecular mechanisms by which it induces toxicity have yet to be elucidated. In this research, we performed the MTT assay for cell viability, the Lipid peroxidation assay in order to test the levels of malondialdehyde (MDA), a byproduct of lipid peroxidation, and the Comet Assay to determine percentage of DNA damage. Human liver carcinoma (HepG2) cells were exposed to various concentrations of malathion for 48h. The results indicate that malathion is cytotoxic at elevated levels of exposure. After 48h of exposure, the average percentages of cell viability were 100±11%, 117±15%, 86±15%, 35±9%, and 27±7% for 0, 6, 12, 18, and 24mM, respectively. Following 48hr of exposure to malathion the concentrations of MDA present in exposed HepG2 cells were 12.55±0.16, 20.65±0.27, 31.1±0.40, 34.75±0.45, and 15.1±0.20μM for 0, 6, 12, 18, and 24mM respectively. Similar results from the comet assay also demonstrate a dose dependent response due to malathion exposure in human liver carcinoma cells. Our results indicate that malathion is cytotoxic to human liver carcinoma cells and induces the formation of MDA and DNA damage in exposed human liver carcinoma (HepG2) cells as measured by the MTT, Lipid peroxidation, and Comet assays.

Keywords: Malathion, cytotoxicity, lipid peroxidation, genotoxicity, DNA damage

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