

IN-VITRO TECHNOLOGIES FOR RISK ASSESSMENT OF ORGANOPHOSPHORUS PESTICIDES

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The risk of exposure of humans to various environmental chemicals, contaminants especially pesticides and heavy metals has been a serious issue, and forms an important area of research. Various in-vivo methods are available to evaluate the hazards of the xenobiotics, but to evaluate these chemicals by the in-vitro methods is a recent development. In this decade a number of alternative toxicological (in-vitro) technologies have been developed and validated as alternatives for regulatory toxicity studies. These new testing procedures have become important in view of ethical concerns of using animal models for testing, and provide improved toxicological information. The toxicological effects of the pesticides like monochrotophos, chloropyrephos and Dimethoate described herein characterize its effects on lymphocytes from peripheral blood from healthy donors. In these experiments, various aliquots of pesticides were incubated with lymphocytes cultures in-vitro. At the end of the experiment the dose response relationship in each case was calculated by applying log tables as LC_{50} values. Cytotoxicity of these pesticides on lymphocytes was measured using the trypan blue dye exclusion technique. Based on LC_{50} value, all the pesticides were found to be highly toxic to lymphocyte culture, among them, monocrotophos was the most toxic and dimethoate was the least toxic. The genotoxicity of the pesticides was also determined by comet assay (single cell gel electrophoresis). The results revealed that the pesticides caused increase in the tail length significantly indicating single

strand breaks and DNA damage. This study suggests that these pesticides have the capacity to effect the genetic material particularly chromosomes in mammalian cultures. The Comet assay used in this study was found to be a sensitive and rapid method to detect genotoxicity of pesticide compounds. Chromosomal aberration frequency was determined by Karyotyping assay using lymphocyte cultures from peripheral blood. This investigation established these methods for assessing the toxicity of pesticides by in-vitro methods. Cytotoxicity studies determine the viability of cells incubated with various doses of soluble pesticides. Single cell gel electrophoresis (SCGE or Comet assay) determines the adduct formation of DNA after interaction with various doses of the pesticides. Based on our results and those in literature, practical and theoretical advantage of using the in-vitro technologies in genetic toxicology is discussed.

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