ABSTRACT

Due predominantly to the persistent characteristic of the organochlorine (OC) and organophosphorus (OP) pesticides, a survey was conducted to assess the extent of exposure of schoolchildren to pesticides from the environment and through dietary intake. A total of 577 whole blood samples from schoolchildren in Peninsular Malaysia were analysed for the residues of eleven OC and two OP pesticides. The results of the survey revealed the following range of levels in blood (nanogram per gram): aldrin, nd - 47.6; dieldrin, nd; endrin, nd; alpha-endosulfan, nd-0.6; beta-endosulfan, nd; endosulfan sulfate, nd; heptachlor, nd - 3.8; lindane, nd - 5.7; p,p'-DDT, nd - 3.4; o,p'-DDE, nd - 1.4; p,p'-DDE, nd; chlorpyrifos, nd -10.3; diazinon, nd - 103.0. An attempt was also made to correlate exposed individuals with potential sources of the chemicals.

In the acute exposure study where rats were fed with technical grade endosulfan orally at a dose level of 10 mg/kg, blood was sampled at selected interval and analysed for α-endosulfan, β-endosulfan, endosulfan sulfate and endosulfan diol. The change in body weight of dosed animals and the weights of the selected organs as well as the sera testosterone level were measured daily. The concentrations of the parent compound and metabolites were also determined in the kidneys and livers seven days after administration.

The plasma concentration of α-endosulfan as a function of time was found to best fit a one-compartment model, with estimated biological half-life of 55 minutes and not detected after four hours following administration. Only residues of the α- and β-endosulfan were detected in the kidneys of rats. The body weight and the weights of the selected organs in treated animals were statistically insignificant compared to control rats

($p > 0.05$). However, the sera testosterone levels in treated animals were found to be significantly lower than the control animals ($p < 0.05$).

In the subacute exposure study, rats were fed with technical grade endosulfan orally at a dose level of 5 and 10 mg/kg bw/day for 15 days. Half of the animals in the two groups were decapitated on the 16th day and the remaining half on the 30th day (15 days after the last treatment). Following administration, the distribution of endosulfan and its metabolite, endosulfan sulfate was determined in plasma, kidneys and liver. In addition, animals were also observed for signs of toxicity. Upon termination of treatment, body weight and the weights of selected organs were determined. In addition, histological examination of the testes was carried out and sera testosterone, T3 and insulin levels determined.

The mortality rate of 36% with obvious signs of intoxication was observed in the higher-dosed group. Significant reduction in body weights was noted in both treated groups during the treatment period. However, animals regained their initial body weights and by the end of the study. On the 16th day, only α- and β-endosulfan were detected in the kidneys whereas endosulfan sulfate was detected in the liver of rats receiving 5 mg/kg/day of endosulfan. On the 30th day, none of the α- and β-isomers was detected in the kidneys but endosulfan sulfate was still detected in the liver, with its mean concentration lower compared to the mean of the 16th day. The distribution of α-, β- endosulfan and endosulfan sulfate at the higher-dosed group followed similar trends with higher mean concentrations compared to the lower dosage.

Significant histological changes of the testes in the forms of reduction of tubules diameter and the formation of clumped cells in the treated groups were observed. In addition, damage to the membrane of the tubules as well as the reduction in testes weight was also noted.

Significant changes were also observed in the levels of sera testosterone and T3 of both treated groups compared to the control animals. Animals treated with 5 mg/kg bw/day of endosulfan exhibited significantly lower levels of testosterone and T3 on the 16^{th} day compared to control animals. However, the animals regained their hormonal levels on the 30^{th} day, which were noted to be lower than control animals.

As with the higher-dosed group, animals treated with 10 mg/kg endosulfan exhibited statistically lower testosterone and T3 levels compared to control animals and animals fed with 5 mg/kg endosulfan on the 16^{th} day. The hormone levels also showed similar trends as observed with the lower-dosed group. The change in insulin levels in treated animals was statistically insignificant compared to control animals for both the treated groups.