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Dichlorovos induced changes in enzyme activities in testis and adrenal glands of male *mus musculus* P.

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15 sexually mature male mice *Mus musculus* weighing 30 ± 5 grams were exposed with dichlorovos (1ppm) for 15 and 30 days and their enzyme activities i.e. ACP and ALP were estimated in testis and adrenal glands. Dichlorovos increased the ACP and ALP activities in testis and adrenal glands after 15 and 30 days when compared with control group.The significant values were noticed only in adrenal gland as compared to testis. These observations suggests that dichlorovos alters the functional activities of testis and adrenal glands of *Mus musculus,* by interfering metabolic activities and protein synthesis.

Key words: Dichlorvos, Enzyme activities (ACP and ALP), Testis, Adrenal, *Mus musculus*

INTRODUCTION

PESTICIDES are toxic substances; these chemicals may affect our health and other smaller animals and plants. Dichlorvos is an insecticide used on crops, animals and in pest strips. Exposure to dichlorvos can occur through inhalation, ingestion, eye or skin contact and absorption through the skin (Casida, et al., 1962). Dichlorvos exerts its toxic effects in human and animals by inhibiting the enzyme acetylcholinestarase (Xiong and Zeng, 2003). It effects the nervous system where it may cause nausea and vomiting, restlessness, sweating and muscle tremors at high levels (Hathway et al., 1991). The neurotoxic effect of dichlorvos on the central and peripheral nervous system was investigated in acute and sub chronic experiments using male rats (ACGIH, 1991). Sperm abnormalities were also observed in mice injected with dichlorvos (Okamura et al.,2005) and it induced developmental abnormalities in fetuses of rats given intraperitonially (NIOSH, 1995). Dichlorvos is rapidly absorbed by gastrointestinal tract and promptly broken down primarily by the liver through hydrolysis in dichloroacetaldehyde and dimethyl phosphoric acid without accumulating in to tissue (Hughes, 1963).

The present study is undertaken to evaluate the toxic effects of diclorovos on testicular and adrenal enzyme activity in male *Mus musculus* after 15 and 30 days exposures.

MATERIALS AND METHODS

15 sexually mature male mice, *Mus musculus* weighing about 30 $\pm$ 5 g were used in this investigation. The animals were acclimatized to laboratory condition at least for 7 days in the animal room maintaining at 23-25^{0}C temperature with a light and dark cycle (14 h light : 10h dark) prior to initiation of the experiments.The animals were fed with mice feed and water *ad-libitum*. The animals were divided into three groups of five each. Group Ist served as control, which received normal diet and water *ad-libitum*, while group IInd and IIIrd received 1ppm of dichorovos through drinking water for 15 and 30 days respectively. Animals were sacrificed by cervical dislocation on the 16th and 31st day and their testis and adrenal were dissected out quickly and processed for enzymological activities by adopting the spectrophotometeric methodology of Bergmeyer and Bernt (1974). The statistical significance of the data was assessed by using the student 't' test.

Table 1 : Acid phosphatase concentration in testis & adrenal glands of male mice Mus musculus after dichlorvos exposures up to 15 and 30 days

TREATMENT	TESTIS (mg/ml)	ADRENAL (mg/ml)
CONTROL	0.0010±0.0002	0.0035±0.0002
15 DAYS	0.0040 ±0.0001	0.0072 *± 0.0005
30 DAYS	0.0047 ± 0.0011	0.0121 *± 0.0007

± SEM values of five animals
* Significantly different (p<0.001) from the control by the students 't' test.

Table 2 : Alkaline phosphatase concentration in testis & adrenal glands of male mice Mus musculus after dichlorvos exposure up to 15 and 30 days

TREATMENT	TESTIS (mg/ml)	ADRENAL (mg/ml)
CONTROL	0.0276±0.0049	0.0137±0.002
15 DAYS	0.0245 ±0.0002	0.0453 *± 0.0037
30 DAYS	0.0288 ± 0.0031	0.0525 *± 0.005

± SEM values of five animals
* Significantly different (p<0.001) from the control by the students 't' test.

RESULTS AND DISCUSSION

Male *Mus musculus* exposed with 1ppm of dichlorvos for 15 and 30 days showed alternation in acid phosphatase (ACP) and alkaline phosphatase (ALP) enzyme activities in testis and adrenal gland. Dichlorvos significantly increased the ACP and ALP activities levels in testis and adrenal gland after 15 and 30 days. These activities were more significant in later part of experiment when compared with control group (Table 1 and 2). Acidphosphatases belongs to class of enzymes called hydrolases and they are characterized by their ability to hydrolyse a large variety of organic phosphates esters with the formation of an alcohol and a phosphate ion (Guraya and Sindhu, 1975). Alteration in the enzyme activity is due to adverse effect of xenobiotics on the cell and its organelles (Ram and Satyanesan, 1985; Jana et al.,1985). Alkaline phosphatase a brush border enzyme having of organic phosphatase esters and having a pH optimum between 9 and 10 and mediate membrane transport (Gold Fisher et al.,1964). They are zinc metallo enzymes that are

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composed of two identical subunits arranged around an active center. It is known to be involved in a variety of metabolic activities such as permeability, growth and cell differentiation (Lobel and Levy, 1968, Shaffi et al., 1974). In the present investigations it has observed that dichlorvos increases significantly the ACP & ALP levels after 15 and 30 days exposures. Increase in ACP and ALP levels in testis and adrenal suggested that dichlorvos modulate functional changes in testis and adrenal glands of male *Mus musculus* by interfering metabolic activities pathway and protein synthesis.

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REFERENCES

ACGIH. (1991). Documentation of the threshold unit values and biological exposure indices. 6th Ed. Cincinanati, OH: American conference of Governmental Industrial Hygiensits.

Bergmeyer H.U. and Bernt E. (1974). In : Methods of enzymatic analysis Ed. H.U. Bergmeuyer Acad. Press. Weinheim, N.Y. and London 837.

Casida J.E. and Hodgson E. (1962). Mammalian enzymes involved in the degradation of 2,2-dichlorovinyl dimethyl phosphate. J.Agr. Fd. Chem., **10:** 208-214.

Gold Fisher S. Esser E. and Novikoft, A.B. (1964). The localization of phosphatase activities at the level of Ultastructure. J. Histochem. Cytochem., **12:** 72-95.

Guraya S.S. and Sindhu K.S. (1975). Histochemical localization of hydrolytic enzymes in the buffalo spermatozoa, Acta. Histochem. B**. 54**. 307-312.

Hathaway G.J. Proctor H.H. Hughes J.R. and Fischaman, M.L. (1991). Proctor and Hughes, chemical hazards of the workplace. 3rd Ed. New York, NY: Van Nostrand Reinhold.

Hughes G.T. (1963). Colorimetric determination of low concentrations of 2,2-dichlorovinyl dimethyl phosphate in the atmosphere. Analyst **88** : 318-319.

Jana S. Shahana S.S. Choudhuri M.A. and Choudhuri D.K. (1985). Effect of mercury on inorganic phosphorus and activities of acid and alkaline pyrophosphatases in fresh water fish *Clarius batrachus.* Environ. and Ecol. 3.2.

Lobel B.L. and Levy, E. (1968). Enzymic correlates of development, secretary function and regression of follicle and copora lutea in the bovin ovary. Acta Endocrinol Suppl. **59 :** 1

NIOSH, (1995). Registry of toxic effects of chemical substances : Dichlorovos. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centres for Disease Control. National Institute for occupational Safety and Health, Division of standards. Development and Technology Transfer, Technical Information Branch.

Okamura A Kamijima M Shibata E, Ohtani K, Takagi K Ueyama J Watanabe Y, Omura M, Wang H, Ichihara G, Kondo T, Nakajima T. (2005). A comprehensive evaluation of the testicular toxiciy of diclorvos in wistar rats. Toxicology. 22

Ram R.N. and Satyanesan A.G. (1985). Mercuric chloride, cythion and ammonium sulfate induced in the brain, liver and ovarian alkaline phosphatase content in the fish *Channa punctatus. Environ and Ecol **3** :* 383-268

Shaffi S.A. Jafri A.K. and Khawaja D.K. (1974). Alkaline phosphatase activity in the ovary of cat fishes *Clarius batrachus* during maturation Curr. Sci. **43 :** 51-52

Xiong YQ Zeng FD. (2003).Effect of neferine on toxicodynamics of dichlorvos for inhibiting rabbit cohlinesterase. *Acta Pharmacol Sin*. **24(4) :** 332-6