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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (10): 1705-1707, 2000

Sumithion Induced Hepatic Injury in the Toads *Bufo tibamicus*

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Abstract: The present work studied the effect of the organophosphate insecticide, sumithion on the liver of toads *Bufo tibamicus.* Feeding toads with a daily dose of sumithion (40 mg/kg body weight) for 10 days caused histological alterations in the liver. The normal structural organization of the hepatic acini was impaired, the hepatocytes showed cytoplasmic vacuolation and the blood vessels were congested. Moreover, elevations of transaminases (GOT, GPT) were recorded in the sera of treated animals. The obtained results collectively indicated that sumithion treatment induced liver injury in the toads.

Key words: Sumithion, liver, pollution, toads

Introduction

Insecticides are one category of the pesticides which play on important role in the environmental pollution and may result in dangerous effects on man and animals. The effect of different types of insecticides on the organs of laboratory animals was studied by many investigators. Of upmost importance in this respect, is the effect of such insecticides on the liver because of its essential role in drug metabolism and detoxication (Cohen, 1982). Liver of animals intoxicated by different insecticides showed many histopathological alterations such as cytoplasmic vacuolation (Datta and Dikishith, 1973; El-Banhawy, 1974), leucocytic infiltration (Hurket, 1978; Sakr and Gabr, 1992) and necrosis (Mikhail *et al*., 1979; Sakr and Abo-Shafey, 1989). Insecticides were also found to induce alterations in enzyme levels in different animals (Ahmed *et al*., 1992; Sakr, 1999; Saleh, 1999). Little informations (Sakr and Abo-Shafey, 1989; Sakr and Al-Sahhaf, 1996) are available on the effect of insecticides on the liver of amphibia. This stimulated us to study the effect of the organophosphate insecticide, sumithion on the liver of toads *Bufo tibamicus.*

Materials and Methods

Sexually mature male toads *Bufo tibamicus* (25 ± 5 gm} were collected from Al-Taif area, Suadi Arabia. They were transported to the laboratory and kept in large aquaria with small amounts of water which were changed twice daily, Toads were divided into 2 groups. Animals in the first group (25 toads) were enforced fed with the organophosphate insecticide sumithion dissolved in tap water at a dose level of 40 mg/kg. body weight once per day for 10 days. Toads of the second group (15 toads) served as controls and were fed with saline only. Animals were killed and dissected after 5 and 10 days of treatment and their livers were removed. For histological examination, tissues were fixed in Bouin's fluid, embedded in paraffin wax and sectioned at 5 *pm* thickness. The sections were stained with haematoxylin and counter stained with eosin. For enzyme study, sera were obtained by centrifugation of the blood samples and stored at -20°C. GOT and GPT were measured using a fully automated Hitachi 911 analyzer (Tokyo, Japan). A commercial Randox Kits (Randox Laboratories, Ltd, Ardomre, Crumlin, U.K.) were used in these analyses. The results were statistically analysed using Student's " t " test.

Results

Histological examination of the liver of control toads showed that it is formed of numerous acini. Each acinus is composed of polygonal or rounded hepatocytes surrounding a bile canalicule. The hepatic cell contains a relatively large nucleus and eosinophilic cytoplasm. The acini are separated from each other by blood sinusoids which are irregular narrow blood spaces. Among the acini there are pigment granules. The central veins have generally a circular outline and the portal veins are comparatively large in size being either empty or containing a few blood cells. The bile ductule appeared rounded and is bounded by a layer of cuboidal cells (Fig. 1).
Examination of liver sections prepared from toads, 5 days following the application of sumithion revealed apparent signs of degenerative changes. Groups of inflammatory leucocytic infiltrations were observed in different areas of the liver (Fig. 2). The hepatocytes were markedly vacuolated with discrete remnants of cytoplasmic materials. Their cell membranes were mostly unrecognized and if some of them could exist, they were ill defined and ruptured (Fig. 3) Sections examined after 10 days of treatment with sumithion showed an advanced degree of damage. The normal organization of the hepatic acini was impaired and the hepatocytes were highly damaged (Fig. 4). The blood vessels were dilated and engorged with blood elements and their lining epithelium was obviously eroded (Fig. 5). The sinusoidal spaces were filled with blood which indicated clear phenomenon of internal haemarrahge and the pigment granules were markedly in creased (Fig. 6).
Data in Table 1 show that treating toads with sumithion induced significant increase ($p<0.05$) in the serum GOT. The levels of GOT were 58.2 ± 3.2 and 79,2 ± 2.7 μ/l after 5 and 10 days of treatment, respectively, in comparison with 37.5 ± 2.7 μ/l in controls. On the other hand, a significant increase in serum GPT wtis recorded after 10 days of treatment and the mean value was 87,3 t4.2 μ/l.

Discussion

The present results indicated that the organophosphate insecticide, sumithion had induced many histopathological changes in the liver of the toad *Bufo tibamicus.* The most marked symptoms of hepatic tissue impairment were destruction of liver architecture, cytoplasmic vacuolation of the hepatocytes, internal haemorrhage and leuccoytic infiltrations.

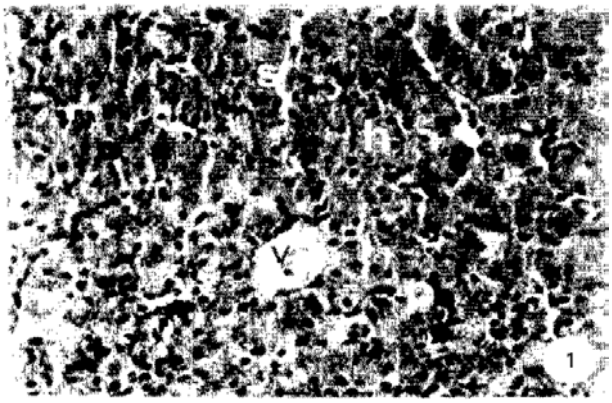

Fig. 1: Section of liver of a control toad showing, hepatic acini (H), sinusoidal space (S), Pigment granules (F) and central vein (V), X 400

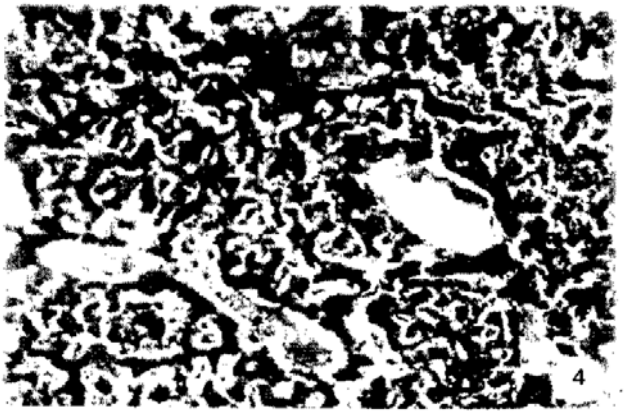

Fig. 4: Section of liver of a toad treated with sumithion for 10 days showing impaired normal organization of the hepatic acini and congested blood vessels (by) X 200

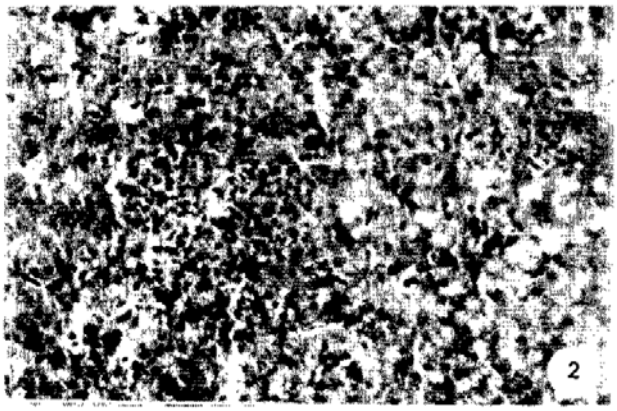

Fig. 2: Section of liver of a toad treated with sumithion for 5 days showing leucocytic infiltration IL), X 400

Fig. 5: Section of liver of a treated toad showing dilated and congested vein (V), X 400

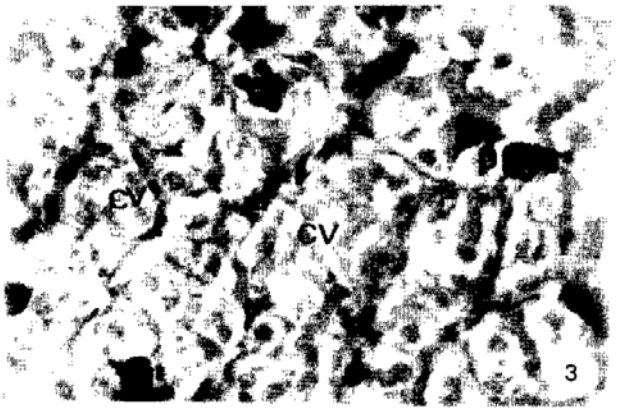

Fig. 3: Section of liver of a toad treated with sumithion for 5 days showing cytoplasmic vaculation (cv) of the hepatic cells and snusoidla space (S) filled with blodd, X600

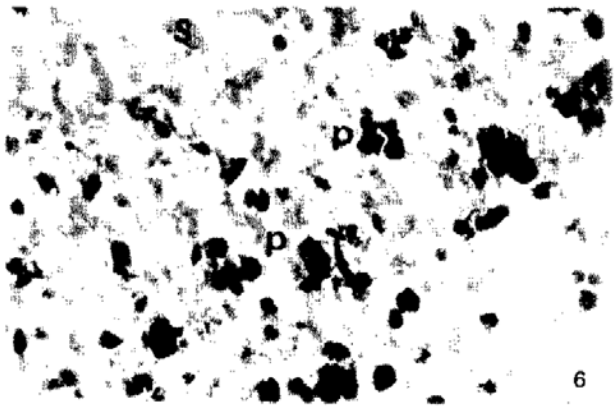

Fig. 6: Section of liver of a treated toad showing marked increase of pigment granules (p) and sinusoidal spaces (S) filled with blood, X 400

Table 1: Effect of Sumithion on serum transaminases (GOT, GPT) of the experimental toads

Transaminases values (μ/l)	Days after treatment –z–		
	Control	5	10
Glutamic oxaloacetic transaminase (GOT)	37.8 ± 2.4	58.2 ± 3.2*	79.2 ± 2.7*
Glutamic Pyruvic transaminase (OPT)	44.7 ± 3.1	54.6 ± 1.1	87.3 ± 4.2*

- Each value represents mean ± standard deviation of 5 animals.
- (*) Significant at $p < 0.05$

The magnitude of these changes appeared to be time-dependent being more prominent after 10 days of treatment. These results are in agreement with those of Sakr and Abo-Shafey (1989) who found that treating the toads *Bufo regularis* with the insecticide dimethoate produced histopathological alterations in the liver and kidney of these animals. Sakr and Al-Sahhaf (1996) reported that feeding toads *Bufo tibamicus* with the carbamate insecticide, lannate induced cytoplasmic vacuolation of the hepatocytes and increase of inflammatory infiltration by leucocytes.

Numerous studies on the effect of different insecticides on mammalian liver are available. Datta and Dikishith (1973) found that i.p. injection of rats with a 0.5% solvent of ethyl parathion or methyl parathion-DDT mixtures produced hepatic damages which include sinusoidal congestion, cytoplasmic vacuolation and necrosis. Moreover, cytoplasmic vacuolation and liver necrosis were induced in the rats by Dursban (Mikhail *et al*., 1979) and in the rabbits by dieldrin (Hurket, 1978). El-Banhawy (1974) described many histological changes in the hepatic cells of rats under the effect of a variety of insecticides.

Sakr and Gabr (1992) reported that oral administration of chlordane exert serious effects on the hepatic cells of rabbits. Recently. Saleh (1999) found that sumithion had induced cytoplasmic vacuolation, ieucocytic infiltrations and necrosis of the hepatocytes of rats.

The results reveal that sumithion included significant increase in the transaminases GOT and GPT. These results further confirmed those observed by many investigators working on different insecticides including sumithion (Dikshith *et al*., 1978; Enan, 1983; Asztalos *et al*., 1990; Ahmed *et al*., 1992; Al-Sahhaf and Sakr, 1995; Sakr, 1999; Saleh, 1999). It was suggested that the hepatocelluiar damage could be correlated with the disturbed enzyme activities. In this concern, Martin *et al.* (1983) announced that liver tissues which are famous for their rich contents of transaminases (GPT and GOT), suffer markedly from their loss under many pathological conditions. This causes their raised levels in the sera of those animals. The authors suggested that increased values of these enzymes in the sera should be taken as an indicator of hepatic damage. The present results lend a good support to this suggestion. Sumathion induced hepatic damage in the toads and as a result, the levels of GOT and GPT increased in their sera.

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