

Histopathological Alterations in the Liver and Kidney of Toads (*Bufo Regularis*) Intoxicated With the Insecticide Dimethoate.

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ABSTRACT

The effect of the organophosphorous insecticide dimethoate on the liver and kidney of toads Bufo regularis was subjected to histological studies. Force feeding the toads with a daily dose of dimethoate (40 mg/kg body wieght) for one, two and seven days caused pathological changes in the liver and kidney. The liver cells showed vacuolation of the cytoplasm, fatty degeneration and necrosis, in addition to dilatation of the blood vessels. Degeneration of the tubular epithelia, lymphocytic infiltration and atrophy of the glomeruli were observed in the kidney of the treated toads.

INTRODUCTION

Although the importance of insecticides in controlling many harmful insects is well established, the administration of such compounds may result in dangerous effects on man and

animals. Dimethoate is an organophosphorus insecticide acaricide registered for use on a variety of field, vegetable, orchard and ornamental crops, and for fly control around livestock and poultry facilities (Martin and Worthing 1976). Yasanova and Abbasov (1972) found that ingestion of higher doses of trichlorphon, dimethoate and fenitrothin resulted in chronic lesions in the different organs of calves particularly manifested by acute damage of the liver. Dimethoate was found to induce histopathological changes in the testis of mammals (Moussa and Abdel-Hafez, 1982, Sakr and Salib, 1987) and Amphibia (El-Mofty et al., 1988). Moreover, dimethoate has been found by many authors to have a considerable effects on carbohydrates, proteins, lipids and nucleic acids in different mammalian cells (Moussa et al., 1987; El-Beih et al., 1987 a,b; Moussa and Hafez, 1983, b and Dedak et al., 1984). Datta and Pramanik (1979) reported that dimethoate administration decreased DNA and RNA content in Periplaneta americana. The greatest attention on the effect of insecticides was devoted to mammalian animals. In the present work, we used the toads Bufo regularis to investigate the effect of dimethoate on the histological structure of the liver and kidney.

MATERIAL AND METHODS

Thirty adult male toads Bufo regularis weighing 40-50 g. each were used in the present work. The animals were force-fed with a daily dose of fresh diluted suspension of the organophosphorous insecticide dimethoate in distilled water (40 mg/kg body weight). Ten animals were autopsied after 1,2

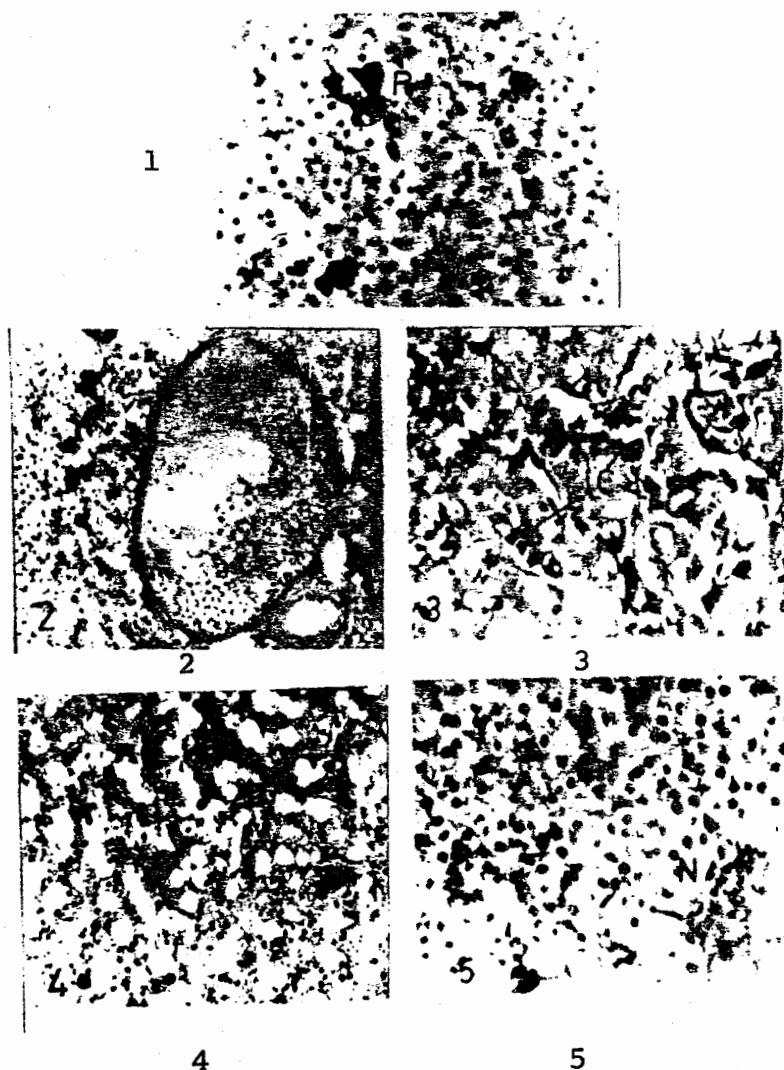
& 7 days after initiation of feeding, their livers and kidneys were removed, fixed in Bouin's fluid and processed until finally embedded in paraffin wax. Sections (5 μ m thick) were stained with haematoxlin and eosin and studied histologically. Another group of 10 toads was served as control.

RESULTS

A. Liver:

Histological structure of the liver of control toads showed that it is composed of numerous acini which are formed of polygonal or rounded hepatocytes. The nuclei of the hepatocytes are relatively large with eosinophilic cytoplasm. The acini are separated from each other by a poor connective tissue, Among the acini there are pigment granules (Fig. 1, p). As regards the effects of dimethoate, liver of toads examined after one day of treatment showed various degree of changes. Most of the blood vessels were widely dilated and filled with blood elements (Fig. 2). The hepatic cells shwed vacuolization of their cytoplasm and cellular infiltrations of lymphocytes, few polymorphonuclear leucocytes are noticed in the connective tissue (Fig. 3). Liver examined after two days of treatment showed clear fatty degeneration of the hepatocytes, pyknotic nuclei were frequently observed. The dark pigment granules were found increased than normal (Fig. 4). After seven days of treatment degenerative and regenerative processes were observed in the liver tissue. Degenerative process was characterized by the presence of necrotic areas and few cells showed vacuolated cytoplasm with pyknotic nuclei (Fig. 5). The

Plate 1



- Fig.1: Section of liver of a control toad, P. pigment granules, x400.
 Fig.2: Section of liver of a toad fed with dimethoate for one day showing a dilated blood vessel filled with blood elements, x200.
 Fig.3: Section of liver of a toad fed with dimethoate showing inflammatory infiltrative cells (I.C.), x 600.
 Fig.4: Liver of a toad treated with dimethoate for two days showing clear fatty vacuolations. Pyknotic nuclei are abundant, x400.
 Fig.5: Section of liver of a toad examined after 7 days of dimethoate treatment showing necrotic area (N), x400.

Fig. 6: Section of kidney of a control toad, x 100.
 Fig. 7: Section of kidney of a toad treated with dimethoate for one day showing renal tubules with tubular epithelia (T.E.) separated from their basement membrane, x 400.
 Fig. 8: Section of kidney of a toad fed with dimethoate for 7 days showing marked degeneration of renal tubules. x400.
 Fig. 9: Section of kidney of toad fed with dimethoate showing focal lymphocytic infiltration (L.I.). x400.
 Fig. 10: Section of kidney of an experimental toad showing atrophied glomeruli (AG). x 400.

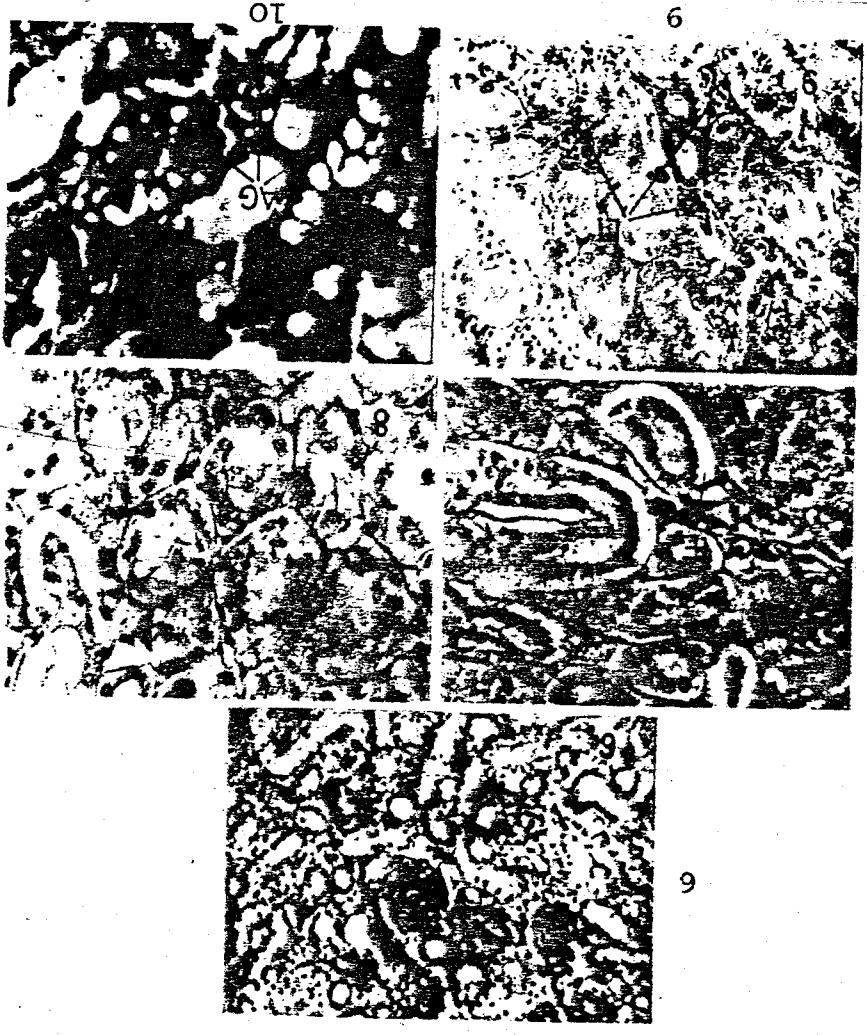


Plate 2

regenerative cells showed deeply stained nuclei. The dark pigments were still increased.

B. Kidney:

Fig. 6 shows the structure of the kidney of a control toad. The kidney of toads treated with dimethoate for one and two days showed a slight vacuolar degeneration of the tubular epithelia and in some cases there were separation of the tubular epithelia from their basement membrane (Fig. 7). The most apparent effect of dimethoate on the kidney was noticed after 7 days and was represented by the cloudy swelling and degeneration of the tubular epithelia. The cells lining the affected tubules showed either a loss of the nuclei or their complete disintegration (Fig. 8). Focal lymphocytic infiltration was seen in between the tubules (Fig. 9). In addition, some of the glomeruli were atrophied and appear as empty spaces (Fig. 10).

DISCUSSION

The present study revealed that dimethoate induced histopathological changes in the liver and kidney of the toads (Bufo regularis). The effects on the liver include vacuolation of the cytoplasm, fatty degeneration, necrosis and dilatation of blood vessels. In the kidney, dimethoate caused degeneration of the renal tubules, lymphocytic infiltration and atrophied glomeruli.

The histopathological effects of different insecticides have been investigated in various animals by many

investigators. Dogs fed with aldrin plus DDT showed hypertrophy of hepatic cells, cloudy swelling and fatty degeneration (Deichmann et al., 1969). Datta and Dikshith (1973) reported 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, cellular vacuolization and irregular necrosis. Hurket (1978) found that subchronic oral administration of dieldrin caused histological & histochemical changes in the liver of rabbits. Frings & O'Tousa (1950) reported that chlordan induced certain histological changes in the female rats expressed mainly by necrosis & destruction of the kidney & liver cells. Ingestion of higher doses of trichlorphon, dimethoate and fenitrothion resulted in chronic lesions in the body organs of calves particularly manifested by acute damage of the liver (Yasanova & Abbasov, 1972). Mikhail et al. (1979) mentioned that in albino rats treated with dursban, liver necrosis was apparent in the mid-zonal areas of the hepatic lobules. Parathion was found to induce focal necrosis of the liver and kidney in rats (Tandon et al., 1978). Assal and Kamel (1964) reported that parathion induced vacuolization in the hepatic cells and blood vessels dilatation in the liver of guinea pigs.

Hepatotoxic and carcinogenic effects were induced by chronic exposure of rats to trichlorphon and dimethoate (Gibel et al., 1971, Stieglitz et al., 1974). Liver neoplasms were induced in the toads Bufo regularis by the insecticide chlordimform (El-Mofty et al., 1982). The early histological and histochemical events during carcinogenesis have been studied following administration of a rang of carcinogens

(Friedrich-Freska et al., 1969). In the present work it is speculated that the histopathological changes induced in the toads by dimethoate may be some of the events leading to the neoplasia of the liver and kidney.

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بسم الله الرحمن الرحيم

الملخص العربي

التغيرات المرضية في نسيج الكبد والكلية في الضفادع

المعاملة بالمبيد الحشري ديموثويست

د.د / صابر عبد الرحمن صقر - د.د / أحلام السيد ابوشافعى
قسم علم الحيوان بعلم المنوفية قسم علم الحيوان بعلم طنطا

يشتمل هذا البحث على دراسة تأثير سمية المبيد الحشري الفوسفورى ديموثويست

على بناء التركيب الهستولوجى من الكبد والكلية فى الضفادع .

وقد قسمت الحيوانات الى اربع مجموعات واعتبرت احدى المجموعات كضابط
قياسى بينما أعطيت حيوانات المجموعات الثلاثة الاخرى جرعه يومية من محلول
ديموثويست (٤٠ ملجرام/كيلوجرام من وزن الجسم) لفترات يوم ،يومين وسبعه أيام
ثم فحصت بعد ذلك التحضيرات الميكروسكوبية من كل مجموعة . وقد دلت الدراسة
على مايلى :

- فى نسيج الكبد ظهرت علامات التحلل واضحه جدا حيث ظهر بالسيتوبلازم فراغات
كثيره تدل على مدى التغير المرضى للمحتوى الدهنى فى معظم الخلايا . كما تغير
شكل الخلايا العادية تقطعت اغشيتها . تنكمش بعض الانوية وتزداد كثافة
صبغتها ويشاهد تمدد جدر الاوعية الدموية بصورة ملحوظه ويزداد
تجويفها اتساعا .

- فى نسيج الكلية أيضا يشاهد علامات واضحه من التحلل فى مكونات النسيج .
يختل شكل وتركيب الانيببات الكلوية وتتمزق جدر طلايتها الانبوبية . ويلاحظ
تجمع الخلايا الليمفاويه فى مناطق كثيره نتيجة عملية الرشبع . أيضا
يحدث ضمور فى اجزاء الكيات (glomeruli) داخل محافظها ، وتزداد
هذه الاعراض المرضية بزيادة فترة تعاطى الحيوانات للمبيد فى كل من
نسيج الكبد والكلية .