The present study deals with the effects of the organophosphorous insecticide curacron on the hepatic, renal and pulmonary tissues of mice fetuses.

Materials and Methods: Fourty pregnant females were divided into four groups, 10 individuals each. The 1st group served as control group. The individuals of the 2nd and 3rd groups were given oral dose of curacron 14.4 and 28.8 mg/kg, respectively on day 7 of gestation. The 4th group was given 14.4 mg/kg for 8 successive days from day 7 to day 14 of gestation. At the 18th day of pregnancy, females from both the control and treated groups were sacrificed and samples of hepatic, renal and pulmonary tissues were taken from the fetuses.

Results: The liver of the 18-days-old fetuses of all experimental groups showed different phases of venous congestion, disorganization of the hepatic lobules, fatty degeneration and necrosis. The kidney of curacron-treated groups showed venous congestion, cloudy swelling, and necrosis of the epithelial cells lining the kidney tubules. Moreover, the lungs of the different treated groups showed dilation and congestion of the blood vessels, thickening of the interalveolar septa and scattered cell debris in the lumens of the alveoli.

Conclusion: Consequently, cumulative doses of curacon obviously affect hepatic, renal and pulmonary fetal tissues and extreme caution should be considered by pregnant women to avoid its hazardous effects on their fetuses.

Key Words: Organophosphorous, Insecticides, Curacron, Mice fetus liver, Kidney and Lung.

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INTRODUCTION

Pesticides have contributed to dramatic increases in crop yields, and in the quantity and variety of the diet. They have helped to limit the spread of certain diseases, but can cause injury to human health as well as to the environment (Mansour, 2004). The major predictors of health risk from pesticide exposure are quantity and toxicity of pesticides reaching end-users, field workers and persons with casual and indirect exposures to field and food residues, drift and contaminated groundwater (Richter and Safi, 1997). On the other hand exposure to very low doses of common pesticides, at levels currently assumed to be safe and within dose ranges that have been measured in people, caused significant injury to mice embryos tested in vitro during early stages of development (Greenlee, et al. 2004). Coulombe et al. (1986) studied the pulmonary toxicity of the organophosphorous insecticide fenitrothion following a single exposure of rats to the field formulation, at the site of an aerial spraying. Rat lungs examined under light and electron microscopy showed a few signs of toxic lung injury. The alveolar toxic reaction was limited to small and discrete foci and was entirely reversible within a period of 2 months. Enan et al. (1986) studied the effect of 1/10 LD50 of profenofos on the liver and kidney of rats and reported that, congested blood vessels, nodular cellular infiltration and dense fibrosis around the blood vessels appeared 1,2 and 3 weeks, respectively following exposure. The kidney tissue showed hyalinization affecting some glomeruli and the beginning of degeneration in the related tubules.
followed by dilation of the proximal and distal tubules. Moreover, El Nahas et al. (1988) investigated the cytogenetic effects of curacron on mice somatic cells and reported that curacron significantly increased the frequency of chromosome aberrations and also inhibited the mitotic activity. Meanwhile, El Sebae et al. (1988) investigated the cytogenetic effects of curacron on mice somatic cells and reported that curacron significantly increased the frequency of chromosome aberrations and also inhibited the mitotic activity. Moreover, El Sebae et al. (1988) declared that profenofos showed maximum effect on protein synthesis in rabbit liver and muscle tissues at a dose of 0.2 microgram/ml.

Moreover, El-Swak (1990) found that histopathological examination revealed widespread congestion and degenerative changes in the organs and tissues of hens after a single oral dose of profenofos (25mg/kg). Saeed et al. (1995) stated that profenofos caused different symptoms of toxicity and revealed some biochemical changes especially in the enzymes activity of the liver following two sublethal doses of profenofos to pregnant female Swiss mice during organogenesis. On the same line, Ibrahim and Sayed (1998) reported that there was a significant decrease in the mean number of live fetuses and the body weight of fetuses of all treated mice following the same doses of profenofos used by the former authors.

Abdel Hadi and Abedin (1997) studied the histopathological changes in the liver and kidney tissues of mothers and newborn rats, Rattus rattus, after treatment with Dimethoate or Nuvacron insecticides. Results showed marked degenerative changes including lymphocytic infiltrations and nuclear pleomorphism. Moreover, high doses of the insecticides induced tissue vacuolization, haemorrhage and hyperplasia of Kupffer cells in the liver. In addition, swelling of Bowman's capsules and tubular degeneration in the kidney were found. Finally, they suggested that the insecticides seem to affect newborn through the transmission of their chemicals through mother's placenta. Fahmy and Abdalla (1998) indicated that the two pest control agents buprofezin and petroleum oil are relatively much safer compounds than profenofos. Chromosomal aberration induced by profenofos in somatic and germ cells of male mice were highly significant than by the other two agents.

Recently, Mahadevaswami and Kaliwal (2003) investigated the effect of dimethoate, an organophosphorous insecticide and progesterone on implantation in virgin pregnant albino mice. They stated that treatment with dimethoate for 7 days (from days 1 to 7) or with dimethoate for 7 days followed by progesterone for 8 days (up to day 15) totally abolished implantation, with a 100% pre-implantation loss. Munidasa et al. (2004) studied the outcomes and predictors of mortality in patients with acute organophosphates (OP) poisoning requiring intensive therapy over a period of 40 months. They reported that mortality following (OP) poisoning remains high, of the 71 patients studied 36 had died, despite adequate respiratory support and intensive care. Farag et al. (2007) studied the effect of organophosphate insecticide dimethoate at three dosage levels on male reproduction in mice. Brain and skeletal muscle acetylcholinesterase activities were inhibited both in the middle and high dose groups. Dimethoate was associated with a decreased number of implantations and live fetuses and an increased number of dead and early resorptions at high dose-treated group. Sochaski et al. (2007) investigated the blood fenitrothion concentrations in the rat dam and foetus and tissue esterase activity following in-utero exposure to the organophosphate insecticide fenitrothion. They reported that fenitrothion concentrations in maternal and foetal blood were virtually identical. The authors added that esterase inhibition occurred at a fenitrothion dose of 5mg/Kg, that has not previously associated with reproductive toxicity, suggesting that such inhibition should be considered as the critical effect in risk assessment for this pesticide.

Thus, a need has sprung for an accurate and critical examination of the possible teratogenic impacts of many insecticides related to different chemical groups. The purpose of the present study is to evaluate the teratogenic effects of curacron on the hepatic, renal and pulmonary tissues of 18-days-old CD1 mice fetuses.

MATERIAL AND METHODS

Adult males and females of CD-1 Swiss albino mice with an average body weight of 25-30g were obtained from the breeding unit of
Theodor Bilharz Research Institute, Imbaba-Cairo, Egypt. Three adult females in pro-estrous stage were housed together with an adult male in the same cage for overnight. Vaginal smears were then examined in the next morning and the presence of spermatozoa was considered as an indication of pregnancy and the date was considered as 0 day of gestation.

The insecticide used in the present investigation was the organophosphorous insecticide, curacron (Profenofos), obtained from Ciba-Geigy agrochemicals division, Dokki, Cairo. Desired concentrations were prepared using distilled water as a diluent.

Forty pregnant females were used in the present study. They were divided into four groups of 10 individuals each. The first group (GI) was used as control. The pregnant females of the second group (GII) were given, each, a single oral dose of 14.4 mg/kg body weight of curacron at day 7 of gestation. The pregnant mice of the third group (GIII) were given, each, a single oral dose of 28.8 mg/kg body weight of curacron at day 7 of gestation, while the pregnant females of the forth group (GIV) were given, each, a daily oral dose of 14.4 mg/kg body weight of curacron for 8 successive days, from day 7 to day 14 of gestation.

At the 18th day of pregnancy females from both the control and the treated groups were sacrificed. The uteri were removed and fetuses were fixed in aqueous Bouin's solution for at least 24 hours and then preserved in 70% ethyl alcohol. The fetuses were dehydrated in ascending grades of ethyl alcohol, cleared in terpineol and embedded in paraffin wax. Serial transverse and sagittal sections 5 microns thick of fetuses were cut, mounted and stained with haematoxylin and eosin for general histological studies.

RESULTS

THE LIVER

Control group

Examination of the liver of 18-days-old control fetus (group I) revealed that it is formed of homogenous mass of parenchyma cells arranged in hepatic lobules separated by interlobular connective tissue septa which are poorly developed. The hepatic lobules are composed of irregular branched and interconnected hepatic strands of 1-3 cells thick radiating from the central vein to the lobule periphery (Figures 1 and 2).

The hepatocytes are more or less polygonal in shape with distinct boundaries possessing spherical nuclei (Figure 2). The blood sinusoids are irregularly dilated vessels, lined with a discontinuous layer of endothelial cells intervened by large phagocytic Kupffer's cells (Figure 2). As the liver in the late embryonic stages acts as a hemopoietic organ, a considerable number of different stages of erythroblasts and few megakaryocytes are found in between the hepatic cells (Figure 2).

Fig. 1: Showing the hepatic lobules that can be only distinguished by their central veins, hepatocytes and blood sinusoids. X 100

Fig. 2: Showing the central vein with its intact endothelial lining (arrow head), the blood sinusoid and Kupffer's cells (arrows) protruding into the cavity of the blood sinusoid. X 400

Figs. 1 and 2: Photomicrographs of sections of the liver of 18-days-old control fetus (Group I).
**Treated Groups**

Examination of the liver of 18-days-old fetus maternally treated with 14.4 mg/kg body weight of curacron at day 7 of gestation, G (II) revealed no remarkable changes as compared with that of the control (Figures 3 and 4). Erythroblasts have normal appearance, however, some are aggregated inside the blood sinusoids (Figures 3 and 4). In addition, a marked increase in the number of megakaryocytes with their characteristic, lobulated, voluminous nuclei are more frequently encountered (Figure 4).

Examination of the liver of 18-days-old fetus maternally treated with 28.8 mg/kg body weight of curacron at day 7 of gestation, G (III) showed that, the majority of the liver cells have no remarkable changes and their vesicular prominent nuclei appear normal. However some hepatocytes showed histopathological alterations including both fatty degeneration and necrotic hepatocytes (Figure 5). Degeneration was reported by the presence of numerous vacuoles in the cytoplasm of these cells. Moreover, the nuclei of these cells are either pyknotized or karyolyzed (Figure 5). Sinusoids are dilated and some of them are congested. These sinusoids contain stagnant blood with intact and hemolysed blood cells (Figure 5).

Examination of the liver of 18-days-old fetuses maternally treated with repeated oral doses (14.4 mg/kg) of curacron for 8 successive days starting from day 7 to day 14 of gestation, G (IV) revealed severe histopathological alterations (Figures 6 and 7). The most striking effects of the repeated doses of curacron were the congestion of blood vessels and sinusoids as well as the appearance of scattered focal areas of inflammatory lymphatic and eosinophilic cell infiltration in the hepatic tissue (Figure 6). Most of the central veins were congested and contained stagnant intact and hemolysed blood cells (Figure 6).

The liver of this group showed marked loss of the lobular architecture and disorganization of the hepatic strands. Histopathological alterations including both fatty degeneration and necrosis were observed (Figure 6). These degenerated hepatocytes possessed pyknotized, karyorrhexed or karyolyzed nuclei.

Blood sinusoids were markedly dilated with marked aggregation of erythroblasts and increase in the number of the megakaryocytes (Figure 7) was encountered. Hence the repeat-
ed doses of curacron seemed to accelerate the formation of erythroblasts and megakaryocytes. Most of the endothelial cells lining the sinusoids were markedly eroded and ruptured. Kupffer’s cells became hypertrophied with enlarged and faintly stained nuclei (Figure 7).

**THE KIDNEY**

**Control group**
Examination of the kidney of 18-days-old control fetus G(I) revealed that it is differentiated into an outer cortex and an inner medulla, which is formed of conical pyramids. The cortex shows radial striations, the medullary rays are extending from the base of the pyramids without reaching the renal capsule. Each medullary pyramid with the corresponding part of the cortex represents a renal lobe which consists of the uriniferous tubules and stromal tissue. The latter is formed of a network of connective tissue (Figure 8).

The uriniferous tubule is composed of the nephron which is formed of the Malpighian corpuscle, the proximal convoluted tubule, the descending and the ascending limbs of Henle’s loop and the distal convoluted tubule. Each corpuscle consists mainly of a tuft of blood capillaries, or glomerulus and a Bowman’s capsule which is a double walled cup formed of two layers, an outer parietal layer and an inner visceral layer separated by a clear, distinct capsular space (urinary space) (Figure 9).

The proximal convoluted tubules appear rounded, and is lined by a single layer of short columnar cells with indistinct cell boundaries, and spherical nuclei. The free ends of these cells have well-developed brush borders that almost fill most of the lumen (Figure 9). The distal convoluted tubules are lined with simple cuboidal epithelial cells that possess distinct cell boundaries and a granular cytoplasm, and conspicuous spherical centrally located nuclei (Figure 9).

**Treated groups**
Examination of the cortical region of the kidney of 18-days-old fetus maternally treated with 14.4 mg/kg body weight of curacron at day 7 of G (II) gestation, revealed various histopathological changes. Most of the renal corpuscles appeared more or less normal. However, some glomeruli have lost their normal circular shape and converted into shrunken, abnormally cellular and relatively vascular structures having few red blood cells and leaving rather wide urinary space (Figures

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**Fig. 6** Showing congestion of the central vein, the surrounding tissue is infiltrated with many inflammatory cells. The hepatocytes exhibit severe fatty degeneration. X 250

**Fig. 7** Showing the increased number of encountered megakaryocytes and erythroblasts. Necrotic areas (asterisk) are scattered all over the tissue. X 400

**Figs. 6 and 7** Photomicrographs of sections of the liver of 18-days-old fetus maternally treated with 14.4 mg/kg of curacron (Group IV).

**Fig. 8** Showing the renal capsule (arrow), outer cortical and inner medullary regions and the medullary rays. X 40
The lining cells of the proximal and distal convoluted tubules exhibited cloudy swelling. They became swollen and projected inwards attaining a conical shape. The lumina of these tubules became relatively small. Some cells showed advanced degenerative changes and their nuclei were pyknotized or karyolysed (Figures 10 and 11).

Examination of the cortical region of the kidney of 18-days-old fetus maternally treated with 28.8 mg/kg body weight of curacron at day 7 of G (III) gestation, revealed distinct pathological lesions in the urineferous tubules. The changes which occurred in the glomeruli were manifested by their hypertrophy probably due to their congestion and the mild proliferation of their constituent cells. In addition some other glomeruli appeared shrunken with wide urinary spaces (Figure 12). The lining cells of the convoluted tubules exhibited cloudy swelling, hydropic degeneration and cellular necrosis. The outer borders of the cells lining the convoluted tubules were deteriorated, their lumina contained faintly stained casts and the brush borders of the proximal convoluted tubules were destructed (Figure 12).

Examination of the cortical region of the kidney of 18-days-old fetuses maternally treated with repeated oral doses (14.4 mg/kg) of curacron for 8 successive days starting from day 7 to day 14 of gestation G (IV), revealed severe histopathological alterations. The glomeruli exhibited clear features of damage represented by congestion of their capillaries which were packed with red blood corpuscles (Figure 13). Vacuolation of the cytoplasm of the cells lining the convoluted tubules was obvious and the nuclei of some deteriorated cells showed obvious signs of pyknosis (Figures 13 and 14). Some of the lining cells of the convoluted tubules and collecting tubules showed features of necrosis. These cells were detached in the lumina of the tubules and their nuclei were either pyknotized or completely disappeared (Figures 13 and 14). Intertubular extensive hemorrhagic areas were obviously noticed among the tubules (Figures 13 and 14).

The medullary region of the kidney of this group showed, marked degenerative changes in the descending and ascending
limbs of Henle's loop as well as the collecting tubules. Such changes included cloudy swelling, hydropic degeneration and cellular necrosis. The lumina of the collecting tubules contained faintly stained casts. The intertubular connective tissue contained small hemorrhagic areas (Figure 15).

THE LUNG Control group
Examination of the lungs of 18-days-old control fetus (G I) revealed that the pulmonary tissue consists of the bronchial tubes, respiratory bronchioles and alveolar ducts which lead into many blind alveolar sacs. The pulmonary alveoli are lined with simple squamous epithelium and are surrounded by a network of pulmonary capillaries (Figure 16). The alveoli are separated from each other by interalveolar septa which consist of three main types of cells, the endothelial cells of the blood capillaries, the squamous alveolar epithelial cells and the connective tissue cells or septal cells (Figure 17). The endothelial cells lining the blood capillaries are elongated with intensely stained elongated nuclei. The squamous alveolar epithelial cells are characterized by their intensely stained cytoplasm and elongated faintly stained nuclei. The connective tissue cells are irregular, oval or cuboidal in shape and possess faintly stained cytoplasm and large oval or rounded nuclei (Figure 17).

Treated groups
Examination of the lung of 18-days-old fetuses maternally treated with 14.4 mg/kg

Fig. 12: Photomicrograph of a section through the cortical region of the kidney of 18-days-old fetus maternally treated with 28.8 mg/kg of curacron (Group. III) showing, cloudy swelling of the epithelial lining of the proximal and distal convoluted tubules (arrows), casts inside the lumina of most of the tubules (arrow heads) and hypertrophied congested glomerular tufts (asterisk). X 250

Fig. 13: Showing, degeneration of the cytoplasm and deterioration of the nuclei of the lining cells of the proximal and distal convoluted tubules (arrows), intertubular hemorrhagic areas (asterisks), faintly stained casts inside the lumina of most tubules (arrow head). X 250

Fig. 14: Showing, lobulated and congested glomerular tufts (arrow heads), intertubular hemorrhagic area (asterisk), faintly stained casts in the lumina of some tubules (arrow) and vacuolation of the cytoplasm of the cells lining the convoluted tubules (thick arrow). X 250

Fig. 15: Showing degenerative changes in the descending and ascending limbs of Henle's loop as well as the collecting tubules. Many of these cells show necrosis and pyknotized nuclei (thick arrows). Notice the presence of small intertubular hemorrhagic areas (arrow heads). The lumina of the tubules contain few faintly stained casts (long arrows). X 250

Figs.13-15: Photomicrographs of sections through the cortical region of the kidney of 18-days-old fetus maternally treated with 14.4 mg/kg of curacron (Group. IV).
body weight of curacron at day 7 of gestation G(II), revealed variable histopathological changes including congestion of pulmonary blood vessels and capillaries (Figures 18 and 19), thickening of the interalveolar septa separating the pulmonary alveoli with infiltrating lymphocytic or inflammatory cells (Figures 19 and 20). The cells lining the respiratory bronchioles possessed vacuolated cytoplasm (Figure 19). In addition, the epithelial lining of the respiratory bronchioles and pulmonary alveoli was partly shed and few cells were detached in their lumina (Figure 20).

Examination of the lung of 18-days-old fetus maternally treated with 28.8 mg/kg body weight of curacron at day 7 of gestation G(III), revealed remarkable histopathological changes as compared with the control group. Marked pathological lesions were observed in the pulmonary tissues which included dilation and congestion of the pulmonary blood vessels and capillaries (Figures 21 and 22). The lining epithelium of the terminal bronchioles and respiratory bronchioles was severely destructed and many cells could be seen detached in their lumina (Figure 21). In addition, the cells lining the respiratory bronchioles possessed vacuolated cytoplasm and pyknotic nuclei. The alveolar walls were slightly thickened and the interalveolar septa contained large number of infiltrated lymphocytes as well as red blood cells.

Examination of the lung of 18-days-old fetuses maternally treated with repeated oral doses (14.4 mg/kg) of curacron for 8 successive days starting from day 7 to day 14 of gestation G(IV), revealed severe histopathological alterations. The blood vessels and capillaries were highly congested and their lumina were filled with blood cells (Figures 23 and 24). The mucosal layer of the respiratory bronchiole was thickened, folded...
and contained darkly stained cells with pyknotized nuclei. In addition, the lining epithelium of some bronchioles and alveolar ducts was destructed and numerous cells were detached in their lumina. The interalveolar walls were abnormally thickened due to the extensive development of the epithelial cells (hyperplasia). These interalveolar walls contained large number of lymphocytic inflammatory cells and red blood cells (Figures 24 and 25). The cells of the interalveolar septa possessed highly vacuolated eosinophilic cytoplasm and pyknotised nuclei (Figure 25).
THE EFFECT OF AN ORGANOPHOSPHOROUS INSECTICIDE ...

LIST OF ABBREVIATIONS

AL : Alveoli
AL.D : Alveolar duct
AL.S : Alveolar Sac
AS.L : Ascending limb of Henle’s loop
BL.S : Blood sinusoid
BL.V : Blood Vessel
BO.CP : Bowman’s capsule
CO.T : Collecting tubule
CV : Central vein
CX : Cortex
DS.L : Descending limb of Henle’s loop
DT.T : Distal convoluted tubule
EB : Erythroblast
GL : Glomerulus
HC : Hepatocyte
IAL.SP : Interalveolar Septum
IPR : Interparietal
MD : Medulla
MD.R : Medullary ray
MG : Megakaryocyte
N : Nucleus
PX.T : Proximal convoluted tubule
R.B : Respiratory bronchiole
UR.S : Urinary space

DISCUSSION

Organophosphates (OPs) are some of the most useful and diverse classes of insecticides in use for almost five decades. Although they continue to be extremely useful in agricultural pest control throughout the world, yet, their extensive use has led to numerous poisonings of non-target species. OPs ability to poison insects is the result of their anticholinesterase activity (El-Masry et al. 1985; Goh et al. 1990; Seno et al. 1998; Gomes et al. 1999; Farag et al. 2003). There is, however, a growing body of literature indicating that organophosphorous compounds may induce oxidative stress leading to generation of free radicals and alterations in antioxidants and scavengers of oxygen free radicals (OFRs) (Akhgari et al. 2003).

Meanwhile, organophosphates have been shown to cross the placental barrier (Villeneuve et al. 1972) and thus could potentially affect the developing fetus as investigated by many authors (Abdel Hadi and Abedin, 1997; Farag, et al. 2000; Bonfanti et al. 2004; Sochaski, et al. 2007).

Saad et al. (1992) studied the effect of drift-ed profenofos residues on clover, on the New Zealand white male rabbits, where profenofos residues in dorsal muscles and liver were determined after heating. In the present study, the liver tissues of 18-days-old fetuses maternally treated with different doses of curacron revealed some histopathological changes. The results were dose-dependant which agrees with Abdel Hadi and Abedin (1997). Single low dose administration (group II) of the present study revealed only slight histopathological changes including aggregation of non-nucleated red blood cells inside the blood sinusoids and an increase in the number of the megakaryocytes. This contradicts with the results that have been observed in rats by Chung et al. (2002) who reported that at lower doses of flupyrazofos there were no signs of either maternal toxicity or embryotoxicity.

The hepatic tissues of fetuses of Group III and Group IV showed various histopathological alterations including loss of the lobular architecture and disorganization of the hepatic strands, fatty degeneration and necrosis of the hepatocytes that possessed many pyknotized, karyolyzed or karyorhexed nuclei. Blood sinusoids were dilated and congested and their endothelial lining was markedly eroded and ruptured. Congestion of the central veins, invasion of many inflammatory cells and hypertrophy of kupffer cells were recorded besides the marked increase in the number of the encountered megakaryocytes.
and erythroblasts generally. These results are in agreement with those obtained by Bayoumi et al. (1979) who reported that diazinon, an organophosphorous insecticide, caused fatty degeneration and pyknosis or karyorrhexis of the hepatocytes after long term administration. In addition, Mikhail et al. (1979) observed liver necrosis of mid-zonal type and fatty changes after two repeated intraperitoneal injections of 1/2 the LD50 of dursban to albino rats. In this respect, fatty degeneration, necrosis and vacuolation of hepatocytes in fishes were reported by Desai et al. (1984).

The degenerative changes of the hepatic tissues observed in the present study, including lymphocytic infiltrations, nuclear pleomorphism, vacuolization, hemorrhage and hyperplasia of Kupffer cells, confirm the results of El Elaimy et al. (1995) and Abdel Hadi and Abedin (1997). Moreover, Karim (1998) observed that liver of rats fetuses maternally treated with flufenoxuron showed vacuolation of hepatocytes and dense focal cellular infiltration with lymphocytes and polymorph cells.

On the other hand, it is worth mentioning that the congestion of the central veins and other blood sinusoids may be attributed to heart failure as a result of the administration of organophosphorous insecticides as reported by Yen et al. (2000) who suggested that patients with acute respiratory failure, induced by severe organophosphorous poisoning, showed symptoms of heart failure. In addition, Haschek and Rousseaux (1991) explained that heart failure produces changes in different organs due to the excessive blood in venous system which increases the blood pressure in the veins and capillaries, thus exerting a pressure on the neighboring structures. Meanwhile, arterial blood pressure is reduced and the organs receive a diminished blood supply leading to malnutrition, hypoxia and the accumulation of excretory and metabolic products.

In the present study the kidney of 18-days-old fetuses maternally treated with curacron (groups II, III and IV) showed several histopathological changes. The cortical region showed shrinkage of the glomerular tufts and widening of the urinary space. Dramatical changes were noticed in groups III and IV respectively, including hypertrophied and congested glomerular tufts, degeneration and vacuolation of the cytoplasm of the cells lining the convoluted tubules. Moreover, the nuclei of some deteriorated cells showed clear signs of pyknosis and intertubular extensive hemorrhagic areas were also observed.

The damaging effects of the organophosphorous insecticides on the kidney were noticed by many investigators. In this respect, Mikhail et al. (1979) reported that the acute poisoning with dursban caused cloudy swelling of the convoluted tubules of the treated mice. Zaleska Freiljan et al. (1983) noticed vacuolar degeneration of the lining of the proximal convoluted tubules in mice given bromfenvinphos alone and in combination with methoxychlor once a day for 6 weeks. Curacron caused degeneration followed by dilation of the proximal and distal convoluted tubules which contained hyaline casts as revealed by Enan et al. (1986) who studied the effect of 1/10 LD50 of curacron on 60 white male rats.

In the present study the glomerular tufts showed marked alterations including shrinkage, hypertrophy, lobulation and/or congestion. Also areas of intertubular hemorrhage were obvious in high and accumulative doses. Similar results were reported by Abdel Rahman and Zaki (1992) who noticed deformation of the structure of the glomeruli of the cortical region in mice treated with malathion or sevin. Abdel Hadi and Abedin (1997) stated that mothers and newborn rats after treatment with dimethoate showed swelling of Bowman’s capsules and tubular degeneration. Moreover, the authors suggested that the insecticides seem to affect newborn through the transmission of their chemicals through the mother's placenta. On the other hand, many teratogenic effects that have been observed in the kidney of rat fetuses maternally treated with flufenoxuron during organogenesis by Karim (1998) included massive degeneration and necrosis of the epithelial cells lining the renal tubules. Moreover, congested glomeruli and intertubular capillaries and atrophied lobulated glomeruli were also observed.

In the present investigation, the examination of the lung of 18-days-old fetuses group II showed congestion of pulmonary
blood vessels and capillaries and thickening of the interalveolar septa with infiltrated lymphocytic or inflammatory cells. Marked pathological lesions were observed in group III which included vacuolated cytoplasm, pyknotic nuclei as well as destructed epithelium of the respiratory bronchioles with detached cells in their lumina were observed. In group IV the lung of 18-days-old fetuses exhibited highly congested blood vessels and capillaries, hyperplasia of the interalveolar walls with large number of lymphatic inflammatory cells.

The results observed in the present study confirm the results of some investigators who reported that the administration of organophosphorus insecticides caused pulmonary edema, thickening and vacuolization of the alveolar cells, marked morphologic alterations in the pulmonary parenchyma, necrosis in Clara cells, hypertrophy and hyperplasia of type II alveolar epithelial cells and Collagen deposition in the interalveolar septa (Durham and Imamura, 1988; Durham and Gijbels, 1989).

In addition, Pongrac et al. (1989) stated that cytomorphological changes occurred to the bronchial epithelial cells of a patient who inhaled aerosol organophosphate insecticide "Ekalux 25". The authors added that bronchi-al epithelial cells and macrophages showed degenerative changes, squamous metaplasia and hypertrophic cells of the bronchial epithelium were detected by the examination of the patient's sputum. Moreover, congestion of pulmonary tissues and interstitial edema were reported by Lainee et al. (1991) who attributed this edema to the increase in permeability of the pulmonary capillaries.

On the other hand, the results of the present investigation contradict with those of Coulombe et al. (1986) who could not detect any permanent changes in the alveolar area of the rat lung after a single exposure to the organophosphorus insecticide fenitrothion.

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تأثير أحد المبيدات الحشرية على كبد وكلي ورنة أجهزة الفئران

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ملخص البحث

تناولت هذه الدراسة تأثيرات أحد المبيدات الحشرية وهو الكوراكون (من مجموعه المركبات العضوية الفوسفورية) على كبد وكلي ورنة أجهزة الفئران. وقد تم تقسيم الأمهات الحوامل إلى أربع مجموعات. اتخذت المجموعة الأولى كمجموعة ضابطة بينما تم معالجة أفراد المجموعتين الثانية والثالثة في اليوم السابع من الحمل عن طريق الفم بجرعات 1.4 م/كجم و 2.8 م/كجم. أما المجموعة الرابعة فقد تم معالجتها بجرعات 1.4 م/ كجم من وزن الجسم من الكوراكون لمدة ثمانية أيام متتالية من اليوم السابع وحتى اليوم الرابع عشر من الحمل.

تم قتل الأجهزة الحوامل لكل من المجموعات المعالجة والمجموعات الضابطة في اليوم الثامن عشر من الحمل وتلتقي

اجنتها وأعداد أعضاء الدراسة للفحص النسيجي.

أوضحت الدراسات النسيجية لكبد الاجنث في اليوم الثامن عشر من الحمل للمجموعات المعالجة المختلفة وجود تغيرات مرضية نسيجية مختلفة كان أشهرها فقدان الترتيب المعروف للخلايا الكبدية التي ظهرت منشقة بالإضافة إلى التحلل الدهني مع مراحل مختلفة من تحلل البوتيبها مما ظهرت الأوردة المركزية والجسيمات مشعة وممتلئة بتجمعات دموية. أما في الكبدية فقد أوضح الفحص المجهرى لنسيج الكبدية لاجنه الأمهات المعالجة بالمبيد تقلص واختفاء الكبد الكلوي مع تحلل الخلايا المبطن لللائيبيات البولية وبعض الأنبيبات المجمعة مع وجود تجمعات دموية في المناطق بين الأنبيبات. كما ظهر الفحص المجهرى لنسيج الرئة في أجنة الفئران للأمهات المعالجة بالمبيد احتقان واسع أوزانه العددية. وتغلظ في جدران الحاويات بين الحويصلات مع وجود خلايا منفصلة في تجويف الحويصلات البولية بالإضافة إلى تدمير جدران الشعيرات التنفسية.

ما سبق يوضح أن الجرعات الترکازة للكوراكون لها تأثير ضار على كبد وكلي ورنة أجهزة الفئران و يجب على الإناث الحوامل الحرص الشديد لتجنب تلك الآثار الضارة على أجنحتها.