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RESEARCH ARTICLE

Organophosphorus Insecticides Induced Alterations in Liver of Male Albino Rat

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Abstract: Pesticides cause ecological problems which may leads to immediate mass mortality in addition to biological magnifications. Liver plays very important role in mammalian metabolism. Liver is the primary site for any toxic substance and suffered first. The present study revealed the toxic effect of organophosphorus in albino rat through plasma and liver enzymes. Adult male rats 70 days old, weighing 150-170 g were treated orally with of monocrotophos (1/5 LD_{50}, 3.5 mg/kg bw) and methyl parathion (1/5 LD_{50}, 4.8 mg/kg bw) for 60 days. The liver weight, aminotransferase, acid phosphatase and alkaline phosphatase in homogenates and plasma were estimated. It was found that the levels of acid phosphatase, alkaline phosphatase, aspartate aminotransferases and alanine aminotransferases were significantly ($p<0.05$) increased in liver with all of two organophosphates. It has been concluded that (monocrotophos and methyl parathion) caused increasing in the levels of phosphatase and aminotransferase as well as decreased in liver weight.

Keywords: Liver, Mice, Aminotransferase, Organophosphorus

Introduction

Liver is a target organ and primary site of detoxification and is generally the major site of intense metabolism and is therefore prone to various disorders as a consequence of exposure to the toxins of extrinsic as well as intrinsic forms. Pesticides are widely used in agricultural operations to curtail pest menace. Several chemical compounds are used as pesticides most of them are unselective and toxic to many non-target including humans[1]. Exposure to these pesticides can induce pathological changes in liver, kidney, heart and lung[2-4]. Excess of any compound will be harmful to life and considered under toxicity studies. In the modern era, and because of daily exposure to the chemical compounds can accumulated and cause toxicity in many ways. These compounds have been selected because they are very commonly used for the protection of pulses, vegetables and food from various pesticides[5].

The effect of two commonly used organophosphats, monocrotophos and methyl parathion have been evaluated and their subchronic administration were followed in doses on the activities of some plasma and liver enzyme in male of albino rats.

Experimental

Adult male rats 70 days old, weighing (150-170) g, were housed into three groups (A,B,C) each group constituted at least 6 animals . For each pesticide treated group, an equal number of rats were given vehicle (water) and kept as control.

Animals in group A was given tab water and served as control. Group B were given daily oral doses of monocrotophos (1/5 LD_{50},3.5 mg/kg bw) and group C were given daily methyl parathion (1/5 LD_{50},4.8 mg/kg bw) for 60 days.

The doses value organophosphtase were taking pesticide manual and available information[2-4]. A day after the last dose, the animals were sacrificed by cervical dislocation, blood and liver was collected.

The liver homogenized in phosphate buffer saline. Aminotransferase, acid phosphataes and alkaline phosphatase in plasma and homogenates were estimated by standard prpcedures[6,7]. The values were analyzed using students *t*-test.

Results and Discussion

The signs of pesticide toxicity were observed within 60 days of administration of organophosphate pesticide to albino rats. The result of different treated groups have been compared with control. The intake of feed and water by treated rats reduced as compared with control. The decrease in liver weight was significant with treated rats (Table 1).

The present study revealed the levels of acid phosphatase (Table 2), alkaline phosphatase (Table 3), aspartate aminotransferases (Table 4) and alanine aminotransferases (Table 5), were significantly increased in plasma and significantly or marginally in liver with all of two organophosphates.

Table 1. *In vivo* effect of pesticides on liver weights of rats, [n=6 ,($p<0.05$)]

Treatment	Liver weight, g
Control	5.42±0.08
Methyl parathion	6.16±0.34
Monocrotophos	6.11±0 .37

Table 2. Effect of organophosphorus pesticide on activities of acid phosphatase in plasma and liver of male rats [n=6 ,($p<0.05$)]

Treatment	Plasma, µ mole phenol Produced/min/100 mL	Liver, µmole phenol produced/min/g
Control	3.75± 1.1	149.6 ± 4.2
Methyl parathion	14.5± 4.8	239.5±4.2
Control	9.5±4.2	172.1±11.2
Monocrotophos	9.88± 1.3	211.±8.9

Table 3. Effect of organophosphorus pesticide on activities of alkaline phosphatase in plasma and liver of male rats [n=6 ,($p<0.05$)]

Treatment	Plasma, µmole phenol Produced/min/100 mL	Liver, µmole phenol produced/min/g
Control	466.5±81.4	37.6±8.6
Methyl parathion	987.6±76.3	93.2±9.5
Control	438.8±29.2	37.8±8.9
Monocrotophos	438.8±29.2	113±13.3

Table 4. Effect of organophosphorus pesticide on activities of aspartate minotranssinferase in plasma and liver of male rats [n=6, (p<0.05)]

Treatment	Plasma, µmole pyruvate Produced/min/100 mL	Liver, µmole pyruvate produced/min/g
Control	688.5±111.4	13.6±0.6
Methyl parathion	1257.6±76.3	14.2±0.5
Control	728.8±129.2	5.8±0.9
Monocrotophos	1132.7±133.9	7.3±0.3

Table 5. Effect of organophosphorus pesticide on activities of alanine minotranssinferase in plasma and liver of male rats [n=6, (p<0.05)]

Treatment	Plasma, µmole pyruvate Produced/min/100mL	Liver, µmole pyruvate produced/min/g
Control	1189 .5±111.4	53.6±1.7
Methyl parathion	1267.6±76.3	54.2±4.5
Control	1738.8±129.2	45.8±1.9
Monocrotophos	1836.7±153.9	49.3±4.3

Liver plays an important role in metabolism to maintain energy level and structural stability of body[8]. It is also site of biotransformation by which a toxic compound has been transformed in less harmful form to reduce toxicity[9]. The present study has shown the various effects of sublethal doses of organophosphorus insecticides on enzyme activity of liver male of albino rats.

The toxic effects of organophosphorus insecticides is to conjugate with the natural complement of enzyme in the body, thereby inactivating them. Organophosphorus pesticides (Monocroptophos, methyl parathion), caused significant elevation in plasma and liver (aminotransferases, acid phosphatases and alkaline phosphatases). However, phosphate enzymes act by hydrolyzing phosphomonoester including 3 and 5 phosphoproteins, these may also be involved in the transfer of phosphate[10], phosphatases are involved in many different processes that require mobilization of phosphate ion or dephosphorylation as part of anabolic , catabolic or transfer processes. Transminases are the metabolic enzymes which collect the amino groups from many different amino acids in the form of only one *C*-glutamite. The glutamate channels amino groups either into biosynthetic pathways or into final sequences of reactions by which nitrogenous waste products are formed and then excreted[11].

It was found, that the increased level of phosphatases and aminotransferases may be indicate to metabolic activity, perhaps to meet the stress induced by prolonged exposure to the pesticides. These enzyme changes are indicative of the cellular toxicity and tissue damage induced by these pesticides in the rats probably by altering the specific molecular pathways.

Conclusion

The results of present study are mirror to reveal extent of toxicity of pesticides used by human beings to non-target organisms and for human beings too. Liver damage is first indication of toxicity as it encounters firstly by any toxic stress.

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