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# Effect of Quinalphos on Urea and Creatinine in Blood Plasma of Albino Rats in Multigeneration Exposure

KEYWORDS: Male, Female, Quinalphos, Urea, Creatinine, blood Plasma

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**ABSTRACT** *Male and female albino rats were orally fed with quinalphos at dose concentration of 1mg/kg b.wt for three generations. Rats were divided into two groups i.e. control fed with peanut oil and treated fed with quinalphos for a period of six weeks in each generation to assess the alterations in the level of urea and creatinine in blood plasma. Urea concentration was significantly increased in treated male and female albino rats of F0 and F1 generation as compared to control rats however there was non-significant change in the concentration of creatinine in the rats of treated group of three generations.*

**Introduction**
Pesticides are widely used throughout the world in agriculture to protect crops and their residues have affected the environment adversely. Their poisoning is an important cause of morbidity and mortality in developing countries. The uses of such biologically active compounds possess potential problems of toxicity among those who manufacture, formulate or use these compounds (Saxena and Saxena, 2010). Organophosphates are one of the most preferred pesticides as compared to organochlorine due to their high effectiveness and low persistence in the environment (Pandey et a.,l 2009). Organophosphates have broad spectrum of activity against a number of pests. Organophosphorus compounds are liquids at room temperature and produce a vapor capable of penetrating the skin, respiratory epithelium and cornea. The liquid can be absorbed through intact skin and through the gut after ingestion of contaminated food (Beseler et al., 2008). Quinalphos [O, O-diethyl-O-quinoxalinyl-phosphorothidate] is an organophosphate insecticide developed with tremendous utility in mixed pest control due to its insecticidal and acaricidal properties. The present report aims at studying the effects of quinalphos on changes in blood urea and creatinine in albino rats for three generations.

**Material and methods**
The multigeneration study was conducted on albino rats weighing 100-110g obtained from Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana. The rats were maintained in laboratory under standard conditions of temperature (25±2°C) providing them laboratory pelleted feed and water ad libitum. The rats were acclimatized to new quarters for one week before starting the treatment. The experimental protocol met the National guidelines on the proper care and use of animals in the laboratory research. This experimental protocol was approved by the Institutional Animal Ethics Committee (IAEC).

Technical grade (active ingredient) of Quinalphos procured from Sigma-Aldrich Laborchemikalien GmbH, West Germany; having 95 percent purity was used for the present studies. Adequate dilutions were made with peanut oil to achieve the test concentrations of 1 mg/kg corresponding to 1/100 of the $LD_{50}$. Rats were divided into two groups. One group was intubated orally with dose of quinalphos (1 mg/kg b.wt) dissolved in peanut oil, daily for six weeks, simultaneously same amount of peanut oil was also administered orally to other group of rats called control. In each generation rats were paired to obtain the subsequent generation and similarly the parental rats were sacrificed after weaning of the pups. The animals were mildly anaesthetized using chloroform and the blood was collected directly from heart in heparinized vials. Plasma was separated from blood by centrifuging the blood at 2000 rpm (rotations per minute) for 15 minutes at 4°C. The supernatant was used for estimation of biomolecules viz. urea and creatinine. Urea and Creatinine in plasma were estimated by method of Hawk et al (1954).

**Result and discussion**
To evaluate the effects of treatment at cellular level, estimation of urea and creatinine were carried out in blood plasma and was expressed as mg/dL. It was observed that in F0 generation of male rats no significant difference was present in the concentration of urea in control and treated group. However, the concentration of urea in treated male rats of F1 (12.07±0.54 mg/dL) and F2 (9.66±0.31 mg/dL) generation was significantly increased when compared with the concentration of urea in control rats in F1 (10.08±0.18 mg/dL) and F2 (8.94±0.17 mg/dL) generation. The estimation of creatinine resulted in non-significant change in the concentration of control and treated male rats of F0, F1 and F2 generation (Table 1).

**Table 1:-Effect of quinalphos on concentration (mg/dL) of urea and creatinine in plasma of male rats of F0, F1 and F2 generation as compared to control group of rats.**

| Generation male | Group | Biomolecules (mg/dL) | |
|---|---|---|---|
| | | Urea | Creatinine |
| F0 | Control | 10.79±0.51 | 0.32±0.02 |
| | Treated | 10.43±0.28 | 0.35±0.01 |
| F1 | Control | 10.08±0.18 | 0.43±0.03 |
| | Treated | 12.07±0.54* | 0.35±0.02 |
| F2 | Control | 8.94±0.17 | 0.51±0.03 |
| | Treated | 9.66±0.31* | 0.42±0.02 |

**All the values are mean ±SE values of 6 animals in each group**
***Significant difference at (p≤0.05) as compared to control**

In females it was observed that in F0 generation no significant difference was present in the concentration of urea in control and treated group. However, the concentration of urea in treated female rats of F1 (11.73±0.24 mg/dL) and F2 (10.11±0.42 mg/dL) generation was significantly increased

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when compared with the concentration of urea in control rats in F1 (10.80±1.71 mg/dL) and F2 (8.51±0.14 mg/dL) generation. The estimation of creatinine resulted in non-significant change in the concentration of control and treated female rats of F0, F1 and F2 generation (Table 2).

**Table 2:- Effect of quinalphos on concentration (mg/dL) of urea and creatinine in plasma of female rats of F0, F1 and F2 generation as compared to control group of rats.**

| Generation female | Group | Biomolecules (mg/dL) | |
|---|---|---|---|
| | | Urea | Creatinine |
| F0 | Control | 11.32±0.09 | 0.31±0.02 |
| | Treated | 11.28±0.26 | 0.32±0.01 |
| F1 | Control | 10.80±1.71 | 0.38±0.01 |
| | Treated | 11.73±0.24* | 0.35±0.03 |
| F2 | Control | 8.51±0.14 | 0.44±0.02 |
| | Treated | 10.11±0.42* | 0.59±0.05 |

**All the values are mean ±SE values of 6 animals in each group**
***Significant difference at ($p \leq 0.05$) as compared to control**

Little information was available on the role of quinalphos on renal toxicity. Earlier studies of Bansal et al (2007) have demonstrated general loss of oxidoreductases in the kidneys of cypermethrin treated rabbits. Quinalphos treatment (250 micrograms/kg) for 26 days to Wistar strain rats showed increase in blood urea level of rats (Ray et al 1987). Deltamethrin administered to mice at repeated doses of 7.5mg/kg/b.wt/day ($3/20LD_{50}$) and 30mg/kg/b.wt/day ($12/20LD_{50}$) for a period of 60 days resulted in significant increase in level of urea in plasma of treated rats as compared to their level in control. Similar increase in urea was noticed in male rats given dimethoate at dose of 75 mg/kg/day ($1/4\ LD_{50}$) for 21 days (Attia and Nasr 2009). Increase in level of urea was index of impairment in kidney functions and was related to either the increase in protein catabolism or increase in the synthesis of the enzyme that leads to synthesis of urea from ammonium or increase in protein catabolism as a result of liver dysfunction (El-Demerdash et al., 2003). Deltamethrin administered at the doses of 7.5 and 30 mg/kg/body weight/day to white male mice showed increase in urea and cholesterol (Eraslan et al., 2007).

Creatinine is excreted by filtration through the glomerulus and by tubular secretion. Creatinine level in blood is a measure of glomerular filtration rate (Murray et al., 1990). In the present study no significant difference was observed in the concentration of creatinine among control and treated groups however, quinalphos at the dose of 1.0 mg and 1.5 mg/kg body weight to male cross breed calves showed increase in serum levels of creatinine by 12-178 percent within three days of its administration (Srivastava et a.,l 1988). Administration of $1/4\ LD_{50}$ of dimethoate and diazinon for 20 days to male rabbits resulted in increased levels of uric acid, creatinin and blood glucose in the serum of treated rabbits as compared to control animals (Salih, 2010). Cypermethrin mixed diet when fed uninterrupted to male albino resulted in elevation of blood serum creatinine phosphokinase (CPK) activities (Shakoori et al., 2006) and thus increase the creatinine level in plasma. Similar increase in plasma creatinine was noticed in male rats given dimethoate at dose of 75 mg/kg/day ($1/4\ LD_{50}$) for 21 days (Attia and Nasr, 2009). Increased creatinine level as a result of pesticidal toxicity indicated increased protein metabolism.

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