Effect of Oxydemeton Methyl Toxin on Hormones Testosterone and Dihydrotestosterone in Adult Male Rats

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ABSTRACT

Every year lots of different pesticides through various ways go to the environment. These pesticides are distributed to the environment and transported to the remote areas. To predict the effects of these substances on the ecosystem, in addition to information on their toxicity, how to enter, play and behavior of these compounds in nature should be well known. The purpose of this study was to determine the effect of oxydemeton methyl toxin on hormones testosterone and dihydrotestosterone in rats. For this purpose, 40 adult male Wistar rats, weighing approximately 190 ± 10 gr, were divided into 5 groups of 8. The groups include: Control group, sham and treatment with doses 2 ppm, 5 ppm, 10 ppm. Poison was fed to the animals orally daily for 14 days. At the end of the experimental period, animals were weighed, blood sampling was performed, and blood samples were centrifuged to obtain serum and until hormone measurements was performed, it was frozen at the temperature of -20 °C. Concentration of hormone testosterone by RIA method and dihydrotestosterone by ELISA method were measured. The results of this study showed that use of oxydemeton methyl toxin in maximum for 14 days, causes significant decrease in concentration of hormones testosterone and dihydrotestosterone P<0.05. Probably, this toxin with effect on thyroid hormones causes secretion decrease of hormones testosterone and dihydrotestosterone. So it causes reduction in male fertility. Thus the use of this toxin must be done in accordance with Safety Tips.

Key words: Oxydemeton methyl, Testosterone, Dihydrotestosterone, Male rat.

INTRODUCTION

Until yet more than one hundred thousands of phosphate compounds have been known that 100 species are pesticides. Among the different properties of these compounds, we can mention toxic effects to mammals, the strength of the solubility and different stability in the environment. This group of compounds have many applications in health and agriculture and it can influence through contact, ingestion and inhalation on humans and other organisms3. In the last 50 years Pesticides have been an essential component of the agricultural world. Although production and distribution of pesticides improves the quality and efficiency of agricultural but the probability of unreasonable use is very high. One of the most important concerns of the World Health Organization, is the indiscriminate use of pesticides in agriculture. Contact with insecticides have been as a major health problem in many rural areas1. Phosphorus pesticides are the most diverse toxins2. Effects of organophosphate compounds are as both acute and chronic that the most important problems of organophosphates are acute problems that it causes at least some symptoms of diseases and stimulate the parasympathetic nervous system. If the contact time with these compounds is short without the appearance of any symptoms, cholinesterase levels would decrease, and occasionally headaches and flu-like symptoms can be observed that it is due to the accumulation of
acetylcholine in the brain receivers. Generally all organophosphate pesticides are able affect structure and function of DNA (4 and 6). Organophosphate pesticides after sorption in body, have many reactions of biotransformation. Because Organophosphate compounds are lipophilic, they are easily permeable in the skin. Mainly biotransformation reactions go towards the formation of polar compounds until they can dispose through kidney. Organophosphorus compounds in biological terms, may alter to some metabolites that its toxicity is certainly changes. Oxy dimethyl toxin with brand name metasystux-R, more than 85-90% are Phosphoinositide thiol that 10-15% of it is not known yet. There are different combinations of demeton with features and various formulas. Possible side effects of using this toxin can be as follow: increased eye secretion, increased salivation, diarrhea, coughing and breathing slow (difficult breathing), vomiting, abdominal twist, anesthesia, congestion throughout the body, Bleeding in cardiac, bleeding in the stomach, intestine congestion and inflammation, pulmonary high secretion and high salivary secretion. According to the above and the widespread use of these pesticides without considering their effects on changes in sex hormones (testosterone and dihydrotestosterone) and according to this fact that in relation to the effects of this toxin on changes in sex hormones testosterone and dihydrotestosterone no study has been done, so this research project is necessary.

MATERIALS AND METHODS

This study experimentally and is completely random. All ethic about laboratory animals have been done. 40 Wistar male rats weighing 190 ± 10% gr and age of 2/5-3 month were provided from the breeding center of laboratory animals of islamic azad university of Kazeroon branch. Rats were placed in animals house in Kazeroon islamic azad university for 14 days in laboratory conditions including temperature of 20 ± 5 ° C and cycle of 12 hours light and 12 hours dark. The Rats were kept in cages with metal mesh doors and were using standard diet (pellete) water with especial glass bottles were giving to them. Cage 3 times a week was disinfected with 70% alcohol. Method of preparation and administration of the oxydemeton methyl is as follow. Main solvent is water and in this research preferably used distilled water and were prescribed orally. Therefore, each animal was considered a dark glass container. In order to reduce the error probability, poison were weighed daily and with 2 ml of distilled water was poured into a glasses. Toxin was fed to the animals with especial needle. The rats were divided randomly into 5 groups of 8 that include:

1- Control group (A), includes 8 animals that did not receive any treatment, but all conditions were similar to other groups.
2- Injection group (B), includes 8 animals that daily 2 ml of distilled water received orally.
3- Experimental group with the minimum amount of toxin (C1), including 8 animals that daily 2 ppm oxydemeton methyl toxin dissolved in distilled water with the final volume 2 ml received orally.
4- Experimental group with a moderate amount of toxin (C2), including 8 animals that daily 5 ppm oxydemeton methyl toxin dissolved in distilled water with the final volume 2 ml received orally.
5- Experimental group with a maximum amount of toxin (C3), including 8 animals that daily 10 ppm oxydemeton methyl toxin dissolved in distilled water with the final volume 2 ml received orally.

After 14 days period, rats of all groups after weighing were anesthetized by ether and from their heart by 5 cc syringe blood samples were collected and after separation of blood serum, concentration of hormones testosterone by RIA method and dihydrotestosterone by ELISA method in laboratory of medical science university of Kazeroon was performed. One-way ANOVA for comparison between treatments and followed by t-test and Duncan test was used for multiple comparisons between groups. (P<0.05) was significant level. Data analysis and statistical testing was performed using SPSS, version 17.
RESULTS

Mean testosterone concentrations with standard errors for the different groups is shown in (Table 1). Also it shows changes in hormone concentrations with standard errors in various groups. The mean concentration of hormone testosterone in the experimental groups with the average, minimum, and maximum of toxin did not show a significant increase in the level of P<0.05 compared to control group. The mean concentration of hormone testosterone in experimental group with the maximum of toxin shows significant increase in the level of P<0.05 compared to control group (Table 1). The mean concentration of hormone DHT with standard errors for different groups shows in table (1). Also it shows mean concentration of hormone DHT with standard errors in different groups. The mean concentration of hormone DHT in maximum dose shows significant increase in the level of P<0.05 compared to control group (Table 1).

DISCUSSION

According to Table 1, the mean concentration of testosterone in control and injection sham groups did not show significant difference. Probably injection of distilled water has no effect on serum concentration of hormone testosterone. Moreover, according to Table 1, the mean concentration of hormone testosterone in the experimental groups with minimum and moderate amount of toxin, did not show significant decrease compared to control group. But, with the maximum amount of toxin it shows significant decrease compared to control group. This decrease is consistent with the results of some researchers\(^{11-16}\) and Significant differences can probably be explained by the following reasons. This toxin causes damage or reduction of various liver enzymes that some function of enzymes involved in synthesis of androgens especially testosterone, with consumption of this toxin would reduce. Oxydemeton methyl can decreases level of synthesis of hormone thyroxine and it increases clearance of hormone thyroid\(^{17, 18}\). Decrease in thyroid hormones, would cause decrease basic level of testosterone. This effect is due to these reasons: decrease production of testosterone by testis tissue in response to GnRH and hCG, decrease response of “Testicula interstitial cells” to the gonadotropins, and decrease production of CAMP and calcium entry into the cells\(^{19, 20}\). Since the mechanism of peptide hormones such as LH and FSH activates adenylate cyclase and increase CAMP in target cells\(^{21}\), decrease of thyroid hormones would causes decrease of testosterone. According to Table 1, the mean concentration of hormone DHT between control and sham groups did not show significant differences, and this is because injection of distilled water did not has any effect on serum concentration of DHT compared to control group. Since DHT is the main metabolite of testosterone, it can be reduced due to decrease of testosterone that its mechanism described above.

Table 1: Mean concentrations of hormones testosterone and dihydrotestosterone in different experimental groups

<table>
<thead>
<tr>
<th>Hormone testosterone (nmol/L)</th>
<th>Hormone dihydrotestosterone (ng/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3/21±0/252</td>
</tr>
<tr>
<td>Sham</td>
<td>3/28±0/421</td>
</tr>
<tr>
<td>The minimum amount of toxin 2ppm</td>
<td>3/01±0/527</td>
</tr>
<tr>
<td>The moderate amount of toxin 5ppm</td>
<td>2/91±0/329</td>
</tr>
<tr>
<td>The maximum amount of toxin 10ppm</td>
<td>*1/56±0/127</td>
</tr>
</tbody>
</table>

Significant difference is P<0.05 level and the number of samples in each group is n=8. The sign of * indicate a significant difference with the control group.
CONCLUSION

According to the results, it can be stated that probably this toxin with effect on hormone thyroid and effect on adenylate cyclase system and increase of CAMP in target cells, it would cause decrease of testosterone and the reduction of testosterone is bound to decrease of dihydrotestosterone. This is because this hormone is precursor of testosterone.

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