Original Research Article

Effect of Malathion Toxicity on Body Weight and Blood Profile in Male Rabbits

Abstract:

Malathion is a widely used organophosphorous pesticide that a large number of population are undesirably exposing themselves to severe health risk due to taking up the contaminated foods, water and vegetables. The present study was aims to evaluate the chronic toxicity of orally administered low doses of malathion in rabbits based on the body weight loss and blood profile. The study was conducted on sixty male rabbits, non-adult male rabbits they were divided into three equal groups, thirty rabbits of each group. The rabbits were treated orally with different dose (5 and 15 mg/ kg/day) of malathion for thirty days. After treatment; body weight were recorded and blood samples were collected for blood profile analysis to investigate the health changes. Changes in total body weight in both treatment groups were showed reduction while total body weight in control group showed significant increase ($p \leq 0.5$). The counts of WBC were showed significant increase in low and high dose respectively compared with control group. We concluded that malathion decrease body weight.

Keywords*: Malathion, body weight loss, Male rabbits.*

Introduction:

Insecticides are becoming indispensable part in our daily life. However, there has been a rapid rise in the quantity of insecticides used in agriculture over the past ten years in Sudan. Despite these enormous uses and benefits of insecticides they can cause and implicate some health and environmental problems, such as diseases like cancer, kidney, endocrine disrupting, and acute poisoning or cause environmental problems like ozone depletion, effect on terrestrial and aquatic animals, contamination on environmental media; air, water, food, and land (Abdalmagid, *et al*., 2001). There is a lack in official reports of pesticide poisoning in Sudan, but suffering from chronic toxicity was reported in more than 60% of workers involved in pesticide applications (Abdelbagi, 2006).

Malathion (O,O-dimethyl S-1,2-di(ethoxycarbonyl)ethyl phosphorodithioate) is one of the most widely used organophosphorous pesticides (OP); its relative low toxicity and short half-life contribute to its popularity. This is attributed to its rapid detoxification by carboxylesterases present in the liver and other tissues (Jianqin *et al*., 2013). This hazardous chemical is applied practically via ground and aerial sprays, aerosols, foggers, baits, paints, pet collars, animal dips, animal dust bags, and cattle feed blocks. It is exposed in our environment through diverse ways

such as inhalation, skin contact and through ingestion (Mofenson *et al*., 2019). Many reports showed that malathion, even at a low concentration, harms rats (Sial, *et al*., 2009).

Acute poisoning with organophosphorus insecticides is a global threat to human health that causes more than 100,000 deaths a year (Abdelbagi, 2006). Malathion is a topical agent and being lipophilic, gets rapidly absorbed through the skin. It can also be absorbed through nasal and oral routes. Soon after the absorption, Malathion disintegrates into a very toxic metabolite called Malaoxon. This metabolite is sixty-one times more toxic than malathion. It is also lipophilic and directly interacts with the cellular plasma membrane resulting in lipid peroxidation and membrane damage (Geng *et al*., 2015).

Materials and methods:

Experimental animals:

Sixty male rabbit's age three months and their means weight (950±1.0 gm.) were housed in metal cages under standard conditions with free access to drinking water and grass. All rabbits were handled in accordance with the typical guide for care and use of laboratory animals. They were brought from the Faculty of Veterinary Medicine, University of Al Butana. .

Ethical Consideration:

Permission to carry out the study was taken from the Ethical research committee in faculty of veterinary medicine, Al-Butana University.

Study duration:

The experiment was started in December, 2020, continued thirty days and ended in February, 2021.

Experimental protocol:

The rabbits were initially acclimatized for seven days by putting in their metal cages without malathion treatment. They were daily allowed for twice meals of grass in the morning and in the evening and free access of water. Rabbit body weights were taken every three days of the experiment period. Rabbits were controlled randomly in weight and breed, age, and environmental conditions, then the blood samples were taken from the rabbit ear vein for blood analysis. They divided into three equals groups (A,B,C) 20 rabbits in each. Group (A) low malathion dose (5mg/kg/day) rabbits and group (B) high malathion dose (15mg/kg/ day) rabbits group (C) has access to free food and water. In all groups, body weights were recorded every three days of study. The administration of rabbit's dose by oral gavages designed thirty days longer, on day 31the rabbits were sacrificed from all groups.

Methods:

Induction of low malathion dose:

The experimental model of low and high malation dose was induced by oral an administration. In group (A), the dose was prepared from ingredient malathion. One ml of formulation malathion mixed with 125 ml of distill water to make diluted solution (standard solution) which was used to treat animals orally with gavages, the dose given to each rabbit was one ml of diluted malathion which equaled 5mg/kg of body weight daily at 6:00 pm for four weeks and in group (B) the dose given to each rabbit was 3ml of diluted malathion which equaled 15mg/kg of body weight at that time in group (A), according to prof. Abd Elgabar Eltayb Babiker, National Research Council, Sudan and Gupta *et al*., (2019).

Blood samples collection:

The blood samples were collected and stored in the EDTA (ethylene diamine tetra acetic acid) tubes to prevent blood clotting. The amount of EDTA was used 2mg/ml blood, mixed with the blood by gentle rotation of the tube so that the blood cells may not be damaged. Blood samples were shifted to ice box and were transported to the laboratory for hematological analysis. The samples were stored in the refrigerator at 4C˚. Anticoagulant (EDTA) preserved blood was used for the estimation of various hematological parameters. Hematological analyzer (Model Symex kx-21) was used for analysis to hematological indices. The samples CBC were conducted at Gezira private Clinic Lab, Rufa'a, Gezira State, Sudan.

Statistical analysis:

All data was expressed as means ± standard deviation of means (SDM). The analysis will be done using Graph Pad Instat Software (version 4.00, Graph Pad Software, San Diego, USA), one-way ANOVA followed by Duncan's Multiple Range Test (DMRT) will be used for analysis of differences in experimental groups. Values $p \leq 0.05$ will be considered statistically significant.

Results and discussion:

In our study, the body weight were determined every third day for experimental period. The first two measures weight observed that the weight was increase in both malathion treatment groups while the weight was decrease at the third measuring. In low malathion dose exposure male rabbits were insignificant decrease ($p \leq 0.05$) to compare with control group, While the mean body weight in high malathion dose exposure male rabbits were significantly ($p \leq 0.05$) decrease to compare with control group Table (1). Change in total body weigh in both treatment groups were showed reduction while total body weight in control group showed significant increase ($p \leq 0.05$) figure (1). In the present study, significant decrease in body weight gain at end of the experimental period following administration of formulated malathion in rabbits has been observed. It may be attributed to the effect of malathion on gastrointestinal tract resulting in decreased appetite and absorption of nutrients from gut or might be due to direct toxicity of

malathion (Sankar *et al.*, 2012). However another study, the rabbits treated with malathion 75 mg/kg body weight also presented an increase in total leucocyte counts (Mehreen and Ali, 2017). The white blood cells count (WBCs) in low malathion dose exposure 5.65±1.33x106 mm3 was increase but not significantly compared to control group 4.12±0.58x106 mm3, while in high malathion dose exposure in male was significantly increased ($p \leq 0.05$) 12.41±2.93x106 mm3, in the present study Table (1),. Higher white blood cells count in the present study indicating that the malathion have toxic effect on the blood and in response the body immune system tried to overcome the toxicants and hence the number of WBCs were increased. Elevated WBCs count might be due to the prevalence of disease condition due to malathion and intoxication as increase in WBCs count occurred as a pathological response (Mehreen and Ali, 2017).

Fig 1: The rabbits body weights after treating with malathion at a dose of 5 and 15mg/Kg body weight during thirty days.

Table (1): Comparison of malation toxicity on WBCs counts between control group, low and high dose group

Valuables	**Control group**	**Low dose group**	**Control group**	**High dose group**	**P value**
WBCs ($x10^3$) mm^3	4.9 ± 0.58^a	8.1 ± 1.33^b	4.9 ± 0.58^c	13.7 ± 2.93^d	0.00

N= 30 male rabbits.
Low dose group= 5mg/kg/day
High dose group= 15mg/kg/day
Means±SD with row have common subscript letter were non significantly different, but with different letter were significantly different.

Conclusion:

We concluded that, significant decrease in body weight gain at end of the experimental period following administration of formulated malathion in rabbits has been observed.

Recommendation

Eventually awareness should be spread among the general public about the continuous utilization of malathion and their deleterious effect on public health.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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