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Full Length Research Paper

Effect of sub chronic exposure to Malathion on hematological parameters in the quail (*Coturnix coturnix*)

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The aim of the present study to investigate effects of the Malathion on hematological of quail (*Coturnix coturnix*). Quail were treated orally with $\frac{1}{4}$ LD₅₀ (25mg /kg B.W.) of Malathion for 28 days. Malathion decreased the body weight significantly at the end of experimental. There were statistically significantly decreased in hemoglobin content (Hb), red blood cells (RBC), hematocrit (Hct) and increased the number of white blood cells (WBC) in Malathion treated- quail as compared to control. These result suggest that the affects of Malathion are does dependent.

Keywords: Hematological Parameters, Quail, Malathion, Body weight.

INTRODUCTION

Organophosphate insecticides (OPI) are globally used in the control of insects around the home and in agriculture practice (Donaldson, *et al.*, 2002). There have been increasing concerns about the effects of various OPI in humans and experimental animals. These include cholinergic and no cholinergic biological disturbances (Gordon and Mack, 2003). Exposure to these insecticides can involve a large segment of the population including, agriculture workers and their families, those living in proximity to farms, and the general population who may be exposed through home application of pesticides or via residues on food (Rastogi *et al.*, 2008). OPI like Malathion (S-(1,2-BIS-(ethoxy carbonyl)-ethyle)-O,O-dimethyl phosphorodithioate) has been extensively used wildly for the control of agriculture and household pets. Some reports have been published with respect to the chronic Malathion toxicity on some hematological parameters of quail (Gordon and Mack, 2003). The

toxicity of Malathion has been studied before by Dutta *et al.* (2004), exposure to Malathion at a dose (50 mg /kg) decreased the weight of the rabbits that treated for 28 days. Yehia *et al.*, (2007) when he introduced rats to Malathion at dose (1mg/kg) for 15 days found that there were increased in the number of lymphocytes. Therefore, the present work is initiated to study the effects of this insecticide on hematological parameters.

MATERIALS AND METHODS

Birds

Male quails (*Coturnix coturnix*) were brought from commercial marketing in Jeddah K.S.A. They weight (197.6g \pm 1.817), and maintained in a laboratory environment for

Table 1. The average weight of birds after treatment the quail (*Coturnix coturnix*) with Malathion dose (25 mg / kg b.w.).

Groups	Time (days)		
	0	14	28
Control (g)	198 ± 1.41	198.8 ± 1.92	199.4 ± 1.66
Treated (g)	197.6 ± 1.81	194.6 ± 1.67 ^a	192.6 ± 1.51 ^{a,b}

Values represent as mean ± S. E (n=5, in each groups). The birds had been treated with Malathion (25 mg / kg b. w.) orally, ^aSignificant different as compared to control and ^bSignificant different as compared the birds after 14 days of treatment, $P < 0.05$.

two weeks at a temperature (24 ± 2 °C) with food, and water ad labium for adaptation on the new environmental.

Chemical

Malathion 57% was applied as commercial emulsifiable concentrate formulation containing 57 % active ingredient. It was diluted in deionized water for the final concentration.

Experimental design

Birds were divided into two main groups: Groups A is control group, in which the birds were (n= 10) received saline (25mg /kg B.w.) orally for 28 days. Groups B is treated-group, in which the birds were (n= 10) received LD₅₀ (25mg /kg B.w.) orally for 28 days according to Ahmad, *et al.*, (2000). After 14 days and at the end of treatment period, body weight and blood samples were taken for hematological analysis.

Measurement of body weight

All animal were weighed by automatic balance (AND GX-600, japans) at 0, 14 and 28 days and compared with control groups.

Hematological parameters determination

Blood sample were collected from all birds from the wing vein according to the method of Donaldson, *et al.* (2002). Blood sample were transferred to test tube containing EDTA for hematological parameters [red blood cell count (RBC), hemoglobin (Hb) content, white blood cell count (WBC) , lymphocytes counts, mean corpuscular hemoglobin (MCH), mean corpuscular volume (MCV), mean corpuscular hemoglobin volume (MCHC), hematocrit (Hct) and blood clotting time were determined] using Sysmex KX21N hematology analyzer at different time (0 , 14 and 28 days). Each sample was run in

duplicate. Blood smearing was used for studying the general shape of blood cell by using the method of Karabay and Oguz (2005) at different times.

Statistical analysis

Statistical analysis was based on comparing the value between the Malathion groups with control groups. The result was expressed as mean ± SD of 5 birds / group. The statistical significant of the date has been determined using one way Analysis of Variance (ANOVA – LSD) using SPSS statistical software package version 13. The level of significant was taken below $P < 0.05$.

RESULT

Evaluation of body weight

In the beginning of this study, the mean body weight of quail was ($197.6g \pm 1.8g$). Significant different were observed in body weight between malathion-treated group and the control birds (Table 1). A significant decline ($p < 0.05$) of the mean body weight was observed after administration Malathion for 14 days (Table 1). The food intake by quails was decrease significantly. By increase the time of treated to 28 days, most of malathion-treated quail was decreased in their body weight significantly as compared to 14 days-treatment birds.

Change in hematological parameters

Hematological changes were shown in Table (2). A significant decrease was observed in Hb, RBC and Hct at the end of experimental in malathion- treated group compared to control group ($p < 0.05$). WBC counts, percentage of lymphocytes and thrombocytes counts were increased significantly at the end of experiment ($p < 0.05$). No statically significant changes were found in MCH, MCV and MCHC values at the end of study (Table 2). In Malathion – treated group, WBC counts and

Table 2. Hematological parameters and blood clotting time of quail (*Coturnix coturnix*) that treated with Malathion (25 mg / kg b.w.).

Groups	Time (days)					
	0		14		28	
	Control	Treated	Control	Treated	Control	Treated
Hb (g/L blood)	13.48 ± 1.21	14.56 ± 0.55	13.96 ± 1.29	12.8 ± 1.09	13.4 ± 0.91	11.2 ± 0.92 ^a
RBC (10 ⁶ mm ⁻³)	8.6 ± 0.5	8.0 ± 0.5	9.3 ± 0.5	7.6 ± 0.5	9.3 ± 0.5	7.5 ± 0.5
Hematocrit (%)	48.4 ± 2.0	43.2 ± 1.7	48.0 ± 2.0 ^a	40.2 ± 1.6	47.5 ± 2.0 ^a	35.4 ± 2.0 ^{a,b}
WBC (10 ³ mm ⁻³)	3.7 ± 0.2	5.4 ± 0.2	3.7 ± 1.7	5.0 ± 0.1	3.6 ± 0.2	5.4 ± 0.2
Lymphocytes (%)	55.3 ± 0.7	83.1 ± 2.0	56.5 ± 0.2	74.3 ± 2.0	55.0 ± 1.7 ^a	85.2 ± 0.1
MCH (pg)	15.1 ± 0.2	16.2 ± 0.2	15.1 ± 0.2 ^a	16.1 ± 1.7	15.1 ± 0.2	16.2 ± 1.0
MCV (fl)	51.3 ± 1.9	53.3 ± 0.3	51.3 ± 1.9	52.2 ± 0.2	51.3 ± 1.9	50.2 ± 1.9
MCHC (g/dl)	31.2 ± 1.6	29.3 ± 0.5	31.2 ± 1.6	30.4 ± 0.6	31.2 ± 1.6	30.3 ± 0.8
Thrombocytes (10 ³ mm ⁻³)	915.1 ± 1.6	839.3 ± 20.6	915.1 ± 1.6	1306.1 ± 15.9 ^{a,b}	915.1 ± 1.6	807.3 ± 72.9
Blood clotting	9.1 ± 0.54	8.6 ± 0.54	9.6 ± 0.54	11.2 ± 0.83 ^a	9.6 ± 0.54	13 ± 1.22 ^{a,b}

Values represent as mean ± SD (n=5, in each groups). The birds had been treated with Malathion (25 mg / kg b. w.) orally, ^aSignificant difference as compared to control $P < 0.05$. ^bSignificant difference as compared to 14-days treated- group, $P < 0.01$.

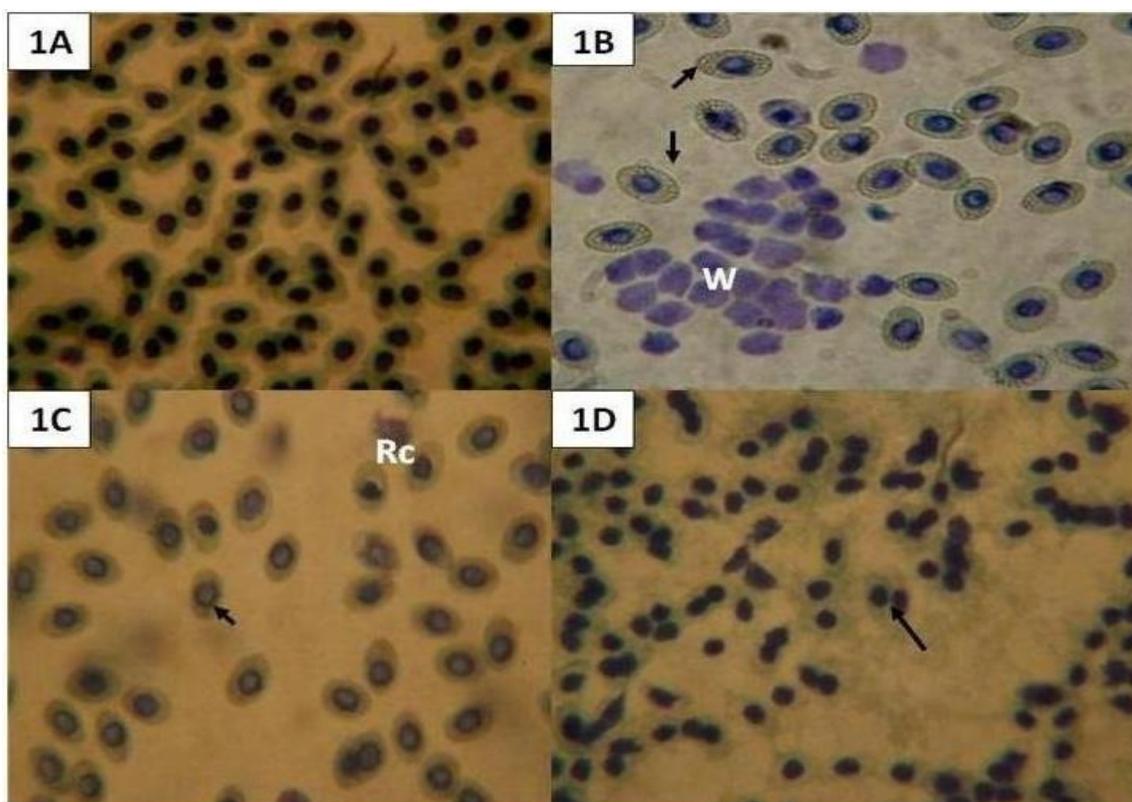


Figure 1. Photomicrograph of Gemsa staining smear of blood (1000X). A, blood from control quail (R: RWCs, 1000×); B, blood from quail that treated with 25 mg/kg B.W. of Malathion for 14 days where WBCs (W) increased , cytoplasmic vaculation (black arrow); C; blood from quail 25 mg/kg B.W. Malathion -treated group for 21 days where there are chromatin granulars (Black arrow) and reticular cell (RC). D, blood from quail that treated with 25 mg/kg B.W. Malathion for 28 days cell membrane break down (Black arrow).

percentage of lymphocytes was increased significantly. Blood clotting time change were shown in Table (2). A

significant decrease was observed in blood clotting time after 14 days treatment. The blood clotting time was 11.2

min for Malathion treated group as compared to 8.6 min for control group ($p < 0.05$). At the end of experimental in Malathion treated group has the high significant of blood clotting time as compared to control group ($p < 0.01$).

Morphological characters of blood cell

Red oval blood cells with central nuclei and the presence of the spread of simple white blood cells were observed in control birds (Figure 1A). After 14 days of treatment, smear of blood Malathion – treated groups, showed that changes in blood cell indicated by increasing the number of WBCs, irregular circular shape and cytoplasmic vaculation on RBCs (Figure 1B). After 21 days of treatment quail there were differences in distribution of chromatin granules inside the nucleus of RBCs and increase secretion the reticular cell (Figure 1C). The most apparent change after 28 days of treatment by Malathion have been observed many changes in RBCs that indicated by break down cell membranes (Figure 1D).

DISCUSSION

Use the pesticide Malathion on a commercial scale and widely as a pesticide for more than 58 years as used in the fight against scale insects and some types of flies. It had also been used to fight many diseases by eliminating the insect vectors of disease such as malaria the mosquito-borne, and was used to control animal parasites. (Mason and Epple, 1999). OPI cause reduction of body weight in experimental animals (Saleh, 1999). In the present study, Malathion was given $\frac{1}{4}$ LD₅₀ does (25 mg / kg B.W.) and no death was observed during experiments. A decrease in body weight was observed after 14 days of Malathion treated. That could due to the reduced food intake. The same observation has been reported in rabbit exposure to Malathion at a dose 50 mg/kg for 28 days (Dutta *et al.*, 2004). In the present study, we observed changes of some hematological parameters in quail, the Hb content was decreased leading to anemia after 14 days of treatment (Rastogi *et al.*, 2008; Rezg *et al.*, 2007, Chakrarty and Banerje, 1988). Reduction in RBC count and Hb concentration could be attributed to internal hemorrhage. One of the most factors to be considered in reduction of RBC count is the production of the hormone erythropoietin (Chakrarty and Banerje, 1988). A similar trend has been observed in rabbit treated with dizonon (Yehia *et al.*, 2007), they found that Hb content decreased with dizonon. The same observation was reported by Rezg *et al.* (2007) they found that increase in the blood clotting time. There was increase blood clotting in this reference guide that there is damage to the liver cells and followed by an

imbalance in the liver and the production of blood proteins help the blood clotting process and is a clear indication of the damage made in the liver tissue. Ahmad *et al.* (2000) noticed that the Malathion caused damage to various physiological blood cells and increasing the number of WBCs. Moreover, the numbers of lymphocytes were increased in mice treated with 1 mg/kg of Malathion for 15 days (El-Shenawy *et al.*, 2010). MCV has been reported to provide information on the size and status of erythrocytes while, MCH shows hemoglobin counts in erythrocytes Karabay and Oguz (2005). In the present study, no significant changes of MCH, MCV and MCHC counts were observed 14 days after treatment with two different doses that indicate there is no swollen erythrocytes and therefore, the Malathion does not cause macrocytic anemia.

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