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### IMPACT OF DIMETHOATE ON HEMATOLOGICAL PARAMETERS AND SOME MINERALS IN ADULT MALE RABBITS

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#### ABSTRACT

Dimethoate (DM) induced pronounced hazardous effects in several physio-metabolic functions including haematological and minirels. The aim of this study was to observe the effect of DM on hematological and some minerals in adult male rabbits. The effects of DM was significantly ( $P < 0.05$ ) decrease RBC, Hb, PCV, PLT MCV, MCH and MCHC, while increase WBC compared with control group during the 12-week. Treatment with (DM) caused significant ( $P < 0.05$ ) decrease level of (P) and increase level of (Ca) compared with control group.

#### KEYWORDS

Hematological parameters, Minerals, Dimethoate and Rabbits.

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#### INTRODUCTION

Wide spread utilize and transfer of organophosphorus compounds for bug control have come about within the discharge of their buildup into common water, in this way actuating an natural issue and have been broadly recognized as a wellbeing hazard<sup>1</sup>. Pesticides are chemical substances used for the destruction of environmental organisms which are harmful to humans and plants<sup>2</sup>. According to the definition of Food and Agriculture Organization (FAO), pesticide is any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm or otherwise interfering with

the production, processing, storage, transport, or marketing of food, agricultural commodities, wood, wood products or animal feedstuffs, or which may be administered to animals for the control of insects, mites/spider mites or other pests in or on their bodies<sup>3</sup>.

The exposures to pesticides have a few antagonistic impacts, particularly on human wellbeing, such as creating leukemia, non-Hodgkin's lymphoma and skin cancer. Many neurological disorders, respiratory symptoms, hormonal disturbances and reproductive variations from the norm have too been related to pesticide exposure<sup>4</sup>. Presentation to pesticides moreover has mutagenic and carcinogenic effects<sup>5</sup>. The take-up of pesticides happens primarily through skin assimilation, eyes, inward breath and ingestion. Word related introduction to pesticides happens amid blending of pesticides, stacking of equipment's conjointly amid showering and application of pesticides. The farmer's destitute information around pesticides and pesticide utilize, less assurance against pesticides exposures, negligible understanding of the wellbeing dangers risks dangers and lacking security notices on the bundles given by the producers may impact the harmfulness of these pesticides<sup>6</sup>.

Larger part of pesticides are not effectively degradable. They stay in soil, filter to the ground water and sully the environment. They can too enter the body of organism, amass within the nourishment chains and influence the human wellbeing. Approximately 220,000 deaths are attributed to pesticides worldwide<sup>7</sup>. Exposure to pesticides can result in both acute and chronic health problems, which may range from short term effects to chronic diseases like cancer, developmental disorders and reproductive disorders<sup>8</sup>. It has been evaluated that around three fourths of passings happen due to pesticides in creating countries<sup>9</sup>. Blood transports nourishment and oxygen to all cells of the human body and evacuates their squander items. It too makes a difference to preserve body temperature, transports hormones, and battles contaminations. Two main constituents of blood are the blood cells or corpuscles (45%) and plasma (55%)<sup>10</sup>.

The pale-yellow liquid part of the blood which holds the blood cells in suspension form is known as blood plasma. The blood plasma without clotting variables is known as blood plasma. There are three fundamental sorts of blood cells, the ruddy blood cells (RBC) or erythrocytes, the white blood cells (WBC) or leukocytes and platelets (PLT) or thrombocytes<sup>10</sup>. Haematopoiesis is the method by which these cells are delivered and directed. These cells perform different capacities such as transporting oxygen, repairing harmed cells, and fighting against diseases. So, the body must cautiously regulate their production. For example, there are about  $3.5 \times 10^{11}$  WBC and  $3 \times 10^9$  RBC per kilogram (kg) of body weight which are regulated by growth factors, hormones and by several oxygen ( $O_2$ ) sensitive receptors<sup>11</sup>.

Hematological examination is exceptionally much vital in numerous areas of inquire about such as angle cultivating, toxicology and observing of natural contamination. This can be utilized as an pointer for obsessive and physiological changes in fishery administration and infection examination. Several studies have been reported on the effects of pesticides on haematology of various fish species in different parts of the world<sup>12</sup>. The pesticides and heavy metals cause the greatest threat to the health of Indian aquatic ecosystem<sup>13</sup>. Application of enormous number of pesticides served to ameliorate the crops from the ravages of pests and insects<sup>14</sup>. Maintenance of constant internal ion concentrations (e.g., sodium, potassium, chloride, calcium and magnesium) is essential for active regulation of water influx and ion efflux in aquatic organisms<sup>15</sup>. Any awkwardness within the levels of these particles in creatures will lead to disability of different physiological activities<sup>16</sup>.

## MATERIAL AND METHODS

In this consider, the impact of DM on hematological parameters and a few minerals of male rabbits were explored. DM (immaculateness 400g/L) was obtained from B and W Agro Chemicals (China). All other chemicals utilized within the try were of expository review. Develop male Modern Zealand White rabbits (age of 6 months and starting weight

of  $(1.641 \pm 27.2\text{Kg})$  were utilized. Ten develop male rabbits were arbitrarily partitioned into couple break even with bunches (each five rabbits): Gather I: Rabbits were utilized as control progressive weeks. Gather II: Rabbits were treated day by day with DM (DM) by gavage at a dose of  $43.2\text{mg/kg B.W/day}$  ( $1/50$  of DM) dangerous dose<sup>17</sup>.

### Methods

At the conclusion of the exploratory period, all rabbits were weighed at that point yielded beneath ether anesthesia. Blood tests were collected in clean dry centrifuge tubes. Plasma was isolated by centrifugation at 3000rpm for 10 minutes and after that rapidly solidified at  $-20^{\circ}\text{C}$  for antioxidant chemicals and free radical examination.

### Blood Specimens

The blood tests were collected in two tubes: one containing EDTA (anti-coagulant) and the other containing Heparin (anti-coagulant). Noncoagulated blood by EDTA was tried in no time after collection by Molecule counter (from ERMA INC.-Tokyo. Model PCE-210) for measuring total leukocyte counts (TLC), total erythrocyte count (TEC), haemoglobin (Hb), and packed cells volume (PCV). Serum calcium was determined by photometric test with cresolphthalein complexone<sup>18</sup> using Dia Sys reagent kit. Serum phosphorus was determined by phosphomolybdate UV end point<sup>19</sup> using Amonium Molybdate Diagnostic kit.

### Statistical analysis

Data were analyzed as a completely randomized design<sup>20</sup> using the General Linear Model procedure of<sup>21</sup> SAS (1986). Means were statistically compared using Least Significant Difference (LSD) test at 0.05 significant levels<sup>20</sup>. The following model was used:  $Y_{ijk} = \mu + a_i + b_j + ab_{ij} + e_{ijk}$

Where:  $Y_{ijk}$  = experimental observation;  $\mu$  = Overall mean;  $a_i$  = treatment effect;  $b_j$  = week effect;  $ab_{ij}$  = interaction effect of treatment and week;  $e_{ijk}$  = random error.

## RESULTS AND DISCUSSION

As shown in Table No.1 the data recorded the effects of DM on total erythrocyte counts (TEC), hemoglobin (Hb), packed cell volume (PCV), total leukocyte counts (TLC), platelets (PLT), mean cell

volume (MCV), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), calcium (Ca) and phosphor (P) in plasma of male rabbits. Treatment with DM caused significant ( $P < 0.05$ ) decrease RBC, Hb, PCV, PLT, MCV, MCH, and MCHC, while increase WBC. Treatment with (DM) caused significant ( $P < 0.05$ ) decrease level of (P) and increase level of (Ca).

### Discussion

The results indicated that treatment with DM decrease RBC, Hb, PCV and PLT, while increase WBC. Pesticides exposure poses a serious risk to all domestic animals, to the environment and the public health<sup>22</sup>. The results of this study showed that, the hematological parameters RBC and Hb were significantly decreased in DM treated rabbits when the erythrocytes sedimentation rate was highly significant increased as compared to control. The effect of organophosphorus pesticides on the Hb of other workers has been studied by<sup>23,24</sup>. The decrease in the Hb along with the decrease in the RBC might be due to the effect of pesticides on blood forming organ (bone marrow and liver) and inhibition of many steps of heme biosynthesis in rabbits, as the result of pesticides exposure<sup>24</sup>.

The poisoning by pesticide residues leads to the development of anemia due to interference of Hb biosynthesis and shortening of the life span of circulating erythrocytes<sup>25</sup>. The increase of ESR indicates to inflammation caused by organophosphorus pesticides<sup>26</sup>. Our finding is in agreement showed that pesticides decrease RBC and Hb levels and<sup>26</sup>, who noticed the reduce of RBC, Hb and increase in erythrocytes sedimentation rate in rabbits exposure to orally dose of  $10\text{mg/kg}$  of the organophosphorus pesticide Methidathion.

In this study significant decrease alterations were observed in Hb concentration in rabbits which were intoxicated. However, one study has observed decrease in Hb concentration due to a direct effect on bone marrow as reported in rabbits<sup>27</sup>. The discrepancy might be attributed to short period of study with intact compensatory mechanisms. Significantly decreased PCV might be due to malabsorption of nutrients or the hyperactivity of the animal<sup>28</sup>. The present observation was in accordance

with previous workers<sup>28</sup>, who observed no effect on the basophil values following DM administration in mice. However, decrease in TLC and lymphocyte values following DM administration has been reported in *Oncorhynchus mykiss* and mice<sup>29</sup>.

The above mentioned effects of organophosphorus pesticides could be due to their ability to form free radicals<sup>30,31</sup>. That fact may ensure the hypothesis of the ability of organophosphorus pesticides to form free radicals, which have been implicated as playing a role in the etiology of many alterations<sup>32</sup>.

The mean plasma concentration of calcium showed significant increase in dimethoate-intoxicated rabbits. In contrast, plasma phosphorus concentration was significantly decreased in response to dimethoate treatment (Tables No.1). Similar results were documented by<sup>33-34</sup>. This indicates that the organophosphorus insecticide dimethoate interferes with calcium and phosphorus homeostasis. Hypercalcemia and hypophosphatemia were recorded by<sup>35</sup> in rats exposed to 40mg/kg body weight dimethoate. They suggested that exposure to dimethoate altered bone mineral composition especially calcium and phosphorus levels of bone.

The mean plasma concentration of calcium showed significant increase in dimethoate-intoxicated rabbits. In contrast, plasma phosphorus concentration was significantly decreased in response to dimethoate treatment (Table No.22 and Table No.23, Figure No.20). Similar results were documented by (Logaswamy *et al*, 2007 and Khan *et al*, 2013). This indicates that the organophosphorus insecticide dimethoate interferes with calcium and phosphorus homeostasis. Hypercalcemia and hypophosphatemia were recorded by (Mahjoubi-Samet *et al*, 2005) in rats exposed to 40mg/kg body weight dimethoate. They suggested that exposure to dimethoate altered bone mineral composition especially calcium and phosphorus levels of bone. Shown that pretreatment with Vitamin C and E showed a protective role on the toxic effects of cadmium on hematological value. Similar results were obtained by Fox *et al*. (1971) which showed the protective effect of Vitamin C on anemia induced by heavy metals in rats.

**Table No.1: The overall means (±SEM) of different parameters during treatment of male rabbits with dimethoate**

S.No	Parameters	Animal Groups	
		Control	DM
1	Total erythrocyte count (TEC; X 10 <sup>6</sup> / mm <sup>3</sup> )	6.20 ± 0.06 <sup>a</sup>	4.92 ± 0.09 <sup>b</sup>
2	Hemoglobin (Hb; g/dl)	12.7 ± 0.18 <sup>a</sup>	10.51 ± 0.58 <sup>b</sup>
3	Packed cell volume (PCV; %)	40.16 ± 0.46 <sup>a</sup>	32.35 ± 0.35 <sup>b</sup>
4	Total leukocyte count (TLC; x 10 <sup>3</sup> /mm <sup>3</sup> )	8.46 ± 0.27 <sup>b</sup>	11.56 ± 0.18 <sup>a</sup>
5	platelets (PLT; g/dl)	293.6 ± 15.9 <sup>b</sup>	217.8 ± 20.62 <sup>bc</sup>
6	Mean cell volume (MCV; fl)	68.42 ± 1.10 <sup>ab</sup>	69.81 ± 1.82 <sup>a</sup>
7	Mean cell hemoglobin (MCH; pg )	22.55 ± 0.366 <sup>a</sup>	22.67 ± 0.88 <sup>a</sup>
8	Mean cell hemoglobin concentration (MCHC; dl)	33.10 ± 0.522 <sup>a</sup>	31.81 ± 0.70 <sup>b</sup>
9	Calcium (Ca; mg/dl)	14.32 ± 0.077 <sup>b</sup>	14.71 ± 0.098 <sup>a</sup>
10	Phosphor (P; mg/dl)	6.67 ± 0.040 <sup>b</sup>	6.49 ± 0.051 <sup>c</sup>

Values are means ± SE of 5 rabbits in each group

Mean with different letters (a- d) are significantly difference ( $p \leq 0.05$ ).

Mean with the same letters (a-d) are non significantly difference ( $p \geq 0.05$ ).

## CONCLUSION

It is clear from the obtained results that dimethoate induced pronounced hazardous effects in several physio-metabolic functions including hematological parameters and minerals.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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