

Haematological alteration in European rabbit, *Oryctolagus cuniculus* (Linn.) exposed to ethereal

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ABSTRACT

Different hematological parameters and its indices were evaluated in the study. After exposure hemoglobin (Hb), total RBC, Erythrocyte Sedimentation Rate (ESR), Packed Cell Volume (PCV), Mean Corpuscle Haemoglobin Concentration (MCHC), Mean Corpuscle Volume (MCH) and platelets values exhibited significantly decreased whereas increased in total WBC count, Reticulocytes, Mean Corpuscle Haemoglobin (MCV), neutrophils (N) and lymphocytes (L) were recorded. While eosinophils (E), monocytes (M) and basophiles (B) were not elevated or depleted. The present study indicated the toxic effect of ethephon on hematological parameters of rabbit.

Key words: Haematology, alteration, rabbit, ethereal.

INTRODUCTION

Hematological studies are an important diagnostic tool in health science and indicators of diseases and toxicant stress in living organisms. In animal chemical poisoning lead interference with hematological, biochemical, cardiological, neurological, etc processes. The toxicant compound and its constituents are varied and variables over time and space around the world. Research on haematology and toxicology has grown considerably over recent decades, not in the more traditional field but also with other disciplines and environment.

Ethephon is inorganic substance widely used in various processes. It is known as to persist and might become a health hazard when used indiscriminately and with mode of action on human causes diarrhea, nausea, vomiting, cramps, slow heart beat, accelerate breathing, muscle weakness, and in severe cases paralysis. Ethephon [2-Chloroethyle phosphonic acid ($C_2H_6ClO_3P$)] is available in market as a common name ethereal is being used as pre-harvest ripener on mango, pineapple, coffee, tomato, cucumber, groundnut and rubber [1]. Eye may causes mild irritation, irritation to nose and throat, coughing and choking and even skin dermatitis. In the present piece of work it has been assigned that the effects of acute ethereal administration to rabbit as assess the possible modulations in haematology.

MATERIALS AND METHODS

Experimental specimen

An healthy mature European rabbit, *Oryctolagus cuniculus* (Lin.) (1400±20 gm wt) was used. They were maintained in well ventilated and sterilized animal cage (55 cm L x 45 cm W x 30 cm H) with a constant 12 hours light and dark schedules. They were brought from animal farming house, Ajay Rabbitary, Rahata. They were feed regularly with fresh vegetables (200 gm) three times per day. They were grouped in to three groups and acclimatized at room

temperature ($26 \pm 2^{\circ}\text{C}$). To the control group gives only water and food, while treatment rabbit were treated with ethephon dose at 4 mg/kg body weight [2]. The ethephon was regularly provided up to 28 days.

Experimental treatment

A chemical ethephon was perched from Vijay Trading Co., Shrirampur. All chemicals used were of analytical grade. For the experiment 2 ml chemical dissolved in 2 ml distilled water. A regular treatment provided up to 28 days. The acute oral dose was performed according to the Office of Prevention, Pesticide and Toxic Substance guideline following the limits test procedure. The animals were fasted over night prior to scarify.

Haematological analysis

All the animals were sacrificed at control, 7, 14, 21 and 28th day for the experimentation. The blood was collected from ear artery with the help of micro syringe in to the sterilized vial containing anticoagulant EDTA (Ethylene Diamine Tetra Acetic Acid) at concentration of 1mg:5ml of blood. The following blood parameters were studied in treated and controlled animals. The peripheral count of red blood corpuscles (RBC), total white blood corpuscles (WBC) and differential count of WBCs, ESR, Platelets and Reticulocytes were carried out. The percentage of Hb content was determined with the help of Sahli's haemoglobinometer. The absolute values of blood indices such as packed cell volume (PCV), mean cell volume (MCV), MCH, and MCHC were evaluated (Table 1).

RESULTS AND DISCUSSION

The result of hematological studies under ethephon stress was depicted in table 1. The rabbit exposed to ethephon resulted in a significant decrease in haemoglobin (Hb) concentration, total red blood corpuscles (RBC), packed cell volume (PCV), MCH, MCHC, erythrocyte sedimentation ratio (ESR) and platelets were noticed. While white blood corpuscles (WBC), MCV, eosinophils (E) monocytes (M), basophiles (B) and reticulocytes were increased as compared to control rabbit.

Hb content

After exposure of ethephon to rabbit showed significant reduction in haemoglobin content. A toxicant showed effect on Hb. It is an agreement with other workers [3,4,5]. The depletion of Hb may lead a number of pathological conditions such as lyses of erythrocyte, increased sedimentation of erythrocytes [6]. Previous workers reported that the anemic state may be due to inhibition of erythropoietin coupled with enhanced rate of erythrocyte distribution, disturbed haemoglobin synthesis and haemodilution [7,8].

RBC count

A depletion in total RBC count was observed after exposure to ethephon. It revealed maximum reduction (-11.3%) at 14th day. Previous workers had emphasized different view regarding reduction in RBC count after exposure to different toxicant. It may be due to an inhibited production of RBC caused by increased erythrocyte destruction. However decrease in RBC could be due to lower level of erythropoietin after depression of oxygen consumption, a condition conducive for erythropoietin and erythrocyte production [9]. Some workers reported that reduction in RBC count may be due to microlytic or normocytic anemia [3,4,5]. In the previous study erythropenia seem to be due to reduced haemoglobin content with haemopoiesis [8].

WBC count

An increased WBC value was observed in rabbit due to exposed of ethephon. It is revealed that linear increased on 7th to 28th day's exposure. WBC plays a major role in the defense mechanism in animals. An immediate activation of the rabbit immune system is showed by increase in leucocytes [10]. Similar findings was also observed in fish after exposure to toxicant [8,11]. A leucocytosis, which may be directly proportional to the severity of the causative stress condition, may be attributed to an increase in leucocytes mobilization [12]. An increase in WBC seems to be associated with malfunctioning of haemopoiesis system caused by given toxicant.

Total WBC count (DLC)

In the present investigation the DLC count showed changed due to defense against invading toxicant. WBC plays a major role in the defense mechanism of rabbit. It was found that neutrophils and lymphocytes, eosinophils, monocytes and basophils were raised in exposed animal. Similar finding are also reported by Kar [13]. An immediate activation of rabbit immune system is proved by increase in leucocytes [10]. Neutrophils act in acute infection and digest them. The lysozyme present in neutrophils carry number of enzymes that acts on invading

organisms. It may be a one cause of rise of neutrophils in the present study. An increase in L% value was noticed in the exposed rabbit. It is revealed that maximum 11.3% increase on 21th day's exposure. Leucocytes are released from the infested and inflamed area. They appear in the infested spots. It may be a cause of rise of leucocytes in the study. While eosinophils, monocytes and basophils were found to be increased. Chandra [10] reported that the leucolysis was also observed in teleost fish after exposure to other toxicant. An initial leucocytosis which may be directly propositional to the severity of the causative stress conditions may be attributed to an increase in leucocytes mobilization [12]. Due to administration of toxicant eosinophil, monocytes and basophils were found to be increased [14].

ESR

In the present study, ESR ratio was decreased in treated rabbit. It showed -16.7% maximum reductions on exposure. It seems that decrease in haematocrit might have occurred due to a slight hypoxia post-exposure to ethephon. Depletion in ESR values have also been reported in vertebrate (fish) exposed to different chemicals [5,8]. Similarly reduced hemoglobin and haematocrit as well as rapid sedimentation of erythrocyte had also been noticed [15]. Changes in ESR values has been associated with stress, impaired osmoregulation and increased sensitivity of hypoxia [8].

Platelet

Depletion in platelets value was noticed in the rabbit after exposed to ethephon. It had showed that -10.5% and -15.8% reduction on 7^h and 14th days respectively. Platelet can retract and caused clot retraction due to their thrombostain in contains which help in coagulation it act as assist to homeostasis. In may be a one cause of reduction in platelets.

Reticulotocytes

An increase in reticulotocytes value was observed in the study. It was revealed that 2.2% and 4.4% increased on 14^h and 28th day's exposure respectively. Reticulotocytes is a one stage of RBC genesis. Since a direct count is not possible. Relative count is taken against the number of red blood cell. However depletion in RBC is not correlated with reticulotocytes. The reticulotocytes showed increased trend in the study.

Haematocrit [PCV]

In the study, the rabbit shows significant decreased in PCV after exposed to ethephon. It seems that depletion in haematocrit might have occurred due to a slight hypoxia post-exposure to ethephon chemical. Change in PCV value had also reported in fish exposed to different chemicals [5,11]. Similarly reduced hemoglobin content and haematocrit as well as rapid sedimentation of erythrocyte have also been noticed [5]. Changes in PCV values have been associated with stress [16], impaired osmoregulation [17], electrolyte loss, impairment of gas exchange by gill [18] and increased sensitivity to hypoxia [19]. It seems that decreased in haematocrit value might have occurred due to slight hypoxia post-exposure to ethephon. Further, increased erythrocyte sedimentation rate in the present study might be attributed to erythropenia that is caused by reduced hemoglobin content and interference with hemopoiesis.

MCV

A significant increased in MCV value was noticed in ethephon exposed rabbit. A rise in MCV value have been reported [20]. An increase in MCV value may be due to swelling of RBC and/or production of large number of lymphocytes, disturbance of osmoregulation and reduction in erythrocytes. However, decrease in MCV values have also been noticed [19]. Rise in MCV values seems to be correlated with decline in RBC count.

MCHC

A significant decreased in MCHC values were observed in the rabbit after exposed. Similar observation also have been made in fish too [8]. However, increase in MCHC values have been noticed after malachite green exposure [19]. It has been suggested that decreased in MCHC values due to greater loss in hemoglobin [5]. The decreased in MCHC values reveals greater loss of hemoglobin content and thus, supports the above view.

MCH

A significantly declined was noticed in MCH values in ethephon exposed rabbit. Such type of findings was notice in fish [7]. The decline in MCH value indicates hypochronic microcytic anemia in the exposed fish as also suggested by other workers [7].

The toxicant showed hematological alterations in the blood. Hence, there is needed to take percussion. However, the study suggested that do not eat artificially ripened fruits. Use naturally ripened fruits. The concerned health authorities and law agencies should look out these illegal practices.

Table 1: Showing alterations in blood parameters and its indices

Sr. No.	Parameters	Exposed days				
		0	7	14	21	28
1	Hb (gm/dl)	6.2±0.4 (100)	5.9±0.3 (-4.3)	5.8±0.5 (-6.5)	5.7±0.4 (-8.1)	5.7±0.5 (-8.1)
2	RBC (cumm ⁻⁶)	4.4±0.4 (100)	4.2±0.3 (-4.5)	3.9±0.6 (-11.3)	4.0±0.7 (-9.1)	4.1±0.5 (-6.8)
3	WBC (cumm ⁻³)	3.5±0.5 (100)	3.7±0.3 (5.7)	3.8±0.8 (8.6)	3.9±0.8 (11.4)	4.1±0.6 (17.1)
4	Differential WBC count					
	a. Neutrophils (%)	54±0.5 (100)	56±0.4 (3.7)	58±0.8 (7.4)	60±0.7 (11.1)	59±0.9 (9.3)
	b. Lymphocytes (%)	44±0.8 (100)	45±0.7 (2.3)	47±0.4 (6.8)	49±0.6 (11.3)	46±0.7 (4.5)
	c. Eosinophils (%)	01±0.7 (100)	02±0.5 (100)	01±0.9 (00.0)	01±0.7 (00.0)	02±0.6 (100)
	d. Monocytes (%)	01±0.5 (100)	02±0.6 (100)	01±0.7 (0.0)	02±0.8 (100)	02±0.9 (100)
	f. Basophiles (%)	00±0.0 (100)	00±0.0 (100)	00±0.0 (100.0)	00±0.0 (100)	00±0.0 (100)
5	ESR (mm/h)	1.2±0.4 (-100)	1.0±0.3 (-16.7)	1.0±0.5 (-16.7)	1.0±0.6 (-16.7)	1.0±0.4 (-16.7)
6	Platelets (cumm)	1.9±0.2 (100)	1.7±0.4 (-10.5)	1.6±0.3 (-15.8)	1.6±0.2 (-15.8)	1.8±0.4 (-5.3)
7	Reticulocytes (%)	4.5±0.4 (100)	4.5±0.5 (00)	4.6±0.6 (2.2)	4.6±0.07 (2.2)	4.7±0.4 (4.4)
8	Blood indices					
	a. PCV (%)	20.2±0.5 (100)	18.3±0.4 (-9.4)	17.2±0.3 (-14.9)	17.9±0.2 (-11.4)	19.7±0.7 (-2.5)
	b. MCV(μm ³)	19.5±0.5 (100)	19.8±0.6 (1.5)	19.9±0.5 (2.1)	20.2±0.8 (3.6)	19.7±0.6 (1.1)
	c. MCH (pico.gm)	18.3±0.5 (100)	17.5±0.4 (-4.37)	17.1±0.3 (-6.6)	16.5±0.7 (-9.8)	16.9±0.8 (-7.7)
	d. MCHC (%)	27.1±0.5 (100)	26.7±0.3 (-1.5)	26.1±0.5 (-3.7)	25.9±0.4 (-4.4)	26.1±0.9 (-3.7)

Figures in parenthesis are percent variation over control

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