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# Study of Haemato-Biochemical Changes in Male Albino Rats by Thiram Induced Toxicity

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# Abstract

The present study was done with objective to study the haematological and biochemical changes due to Thiram induced toxicity in male albino rats. A total of 24 rats were selected for the study and divided into 4 groups, each group having six rats. The control was 1<sup>st</sup> group and did not

receive any thiram, whereas group 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> received the thiram at different dose rate. The hematological and biochemical parameters were evaluated on 0<sup>th</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup> and 28<sup>th</sup> day of experiment as per the procedure.

# Keywords: Thiram, Rats, Haematology, Biochemical

#### Introduction

Thiram is a broad-spectrum fungicide which is dimethyl dithiocarbamate compound. Thiram involves intracellular action of metabolites of carbon disulfide, causing microsome injury, cytochrome P-450 injury accompanied by increased heme-oxygenase activity. A wide variety of factors including monoamine-oxidase inhibition, abnormal vitamin B6, tryptophan metabolisms and cellular deprivation of zinc and copper have been cited as causes of the subcellular injuries.

Haas (1983) <sup>[3]</sup> observed decrease hemoglobin, packed cell volume, total erythrocyte count and sudden inactivation of cholinesterase due to carbamate subacute toxicity in rats

Van Leeuwen *et al.* (1986) reported interference of thiram with some haematological indices, it induced leucopenia, a fall in haemoglobin content and an increase in the osmolarity of the blood in the rainbow trout.

#### **Materials and Methods**

The present study was carried out in the Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Mhow M.P. The study was carried out on twenty-four male albino rats and approved by Institutional Animal Ethical Committee (IAEC). The study was conducted in four groups, each group having six (n=6) healthy adult male albino rats.

Rats were anesthetized by using diethyl ether during blood collection and blood was collected for haematological and biochemical estimations on 0<sup>th</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup> and 28<sup>th</sup> days of experiment as per the procedure described by Jain (1986). 1 ml blood was collected from each rat from retro-orbital plexus with the help of capillary tube in EDTA vials for haematological and 1 ml in non EDTA vials to separate serum for biochemical estimations. Prior to each collection rats were fasted for 12 hours.

### **Result & Discussion**

The rats were divided into 4 groups. The control was  $1^{st}$  group and did not receive any thiram, whereas group  $2^{nd}$ ,  $3^{rd}$  and  $4^{th}$  received the thiram at different dose rate which is showed in the Table 1.

Group-I. (Control)	Six animals for control group and administration of water orally with the help of gavage needle.
Group-II	
280mg/kg/day	Thiram will be administered orally with the help of gavage needle in Six animals.
(50% of LD50)	
Group-III.	
140mg/kg/day	Thiram will be administered orally with the help of gavage needle in Six animals.
(25% of LD50)	
Group-IV.	
84mg/kg/day	Thiram will be administered orally with the help of gavage needle in Six animals.
(15% of LD50)	

### Table 1

#### Hematological observations: PCV, Hb AND TEC

The analysis of variance indicated no significant changes in the Hb, PCV and TEC in groups II, III and IV as compared to the group I (control). This finding could be correlated to the similar results reported earlier.0 (Haas 1983)<sup>[3]</sup> observed decrease hemoglobin, packed cell volume, total erythrocyte count and sudden inactivation of cholinesterase due to carbamate subacute toxicity in rats.

# **Total Leucocyte Counts:**

# Lymphocytes

The analysis of variance indicated significant (P<0.01) decreased in level of lymphocytes in groups II, III and nonsignificant change in group IV as compared to group I (control). Similar results reported earlier (Khurana *et al.*, 1998) observed a significant decrease in total leucocyte count, lymphocyte count and lymphocyte stimulation tests in lambs fed with thiram.

# Neutrophils

The General mean of neutrophils of groups I, II, III and IV were  $31.90\pm0.97$ ,  $32.47\pm0.92$ ,  $30.20\pm0.97$  and  $28.53\pm0.70$  % respectively. The analysis of variance indicated significant (P<0.01) increase in level of neutrophils in groups II, III and IV as compare to group I (control). Similar results reported earlier California Environmental Protection Agency (2005) <sup>[1]</sup> there was increase in white blood cell counts in both sexes at more than 500 ppm and absolute increase in neutrophil, lymphocyte and monocyte counts in both sexes at 1000 ppm of thiram in feed for 13 days.

# Eosinophils

The General mean of eosinophils of groups I, II, III and IV were  $1.43\pm0.21$ ,  $1.33\pm0.21$ ,  $1.27\pm0.19$  and  $1.22\pm0.15$  % respectively. The analysis of variance indicated non-significant changes in level of eosinophils in groups II, III and IV as compare to group I (control).

#### Monocytes

The General mean of monocytes of groups I, II, III and IV were  $1.50\pm0.21$ ,  $1.47\pm0.37$ ,  $1.33\pm0.20$  and  $1.30\pm0.23$  % respectively. The analysis of variance indicated non-significant changes in level of eosinophils in groups II, III and IV as compare to group I (control).

# **Basophils**

The General mean of basophils of groups I, II, III and IV were  $0.40\pm0.21$ ,  $0.37\pm0.20$ ,  $0.33\pm0.21$  and  $0.23\pm0.18\%$  respectively. The analysis of variance indicated non-significant changes in level of basophils in groups II, III and

IV as compare to group I (control).

#### **Biochemical changes:** Serum Creatinine

The General mean of creatinine of groups I, II, III and IV were  $0.74\pm0.061$ ,  $1.18\pm0.066$ ,  $0.92\pm0.066$  and  $0.79\pm0.057$  mg/dl respectively. The analysis of variance indicated significant (P<0.01) increase in level of creatinine in groups II and III.And (P<0.05) increase in level of creatinine in groups IV as compare to group I (control). Similar result was reported earlier (Radostitis *et al.*, 2009) <sup>[5]</sup> in ruminants due to carbamate toxicity.

# Alkaline Phosphatase

The General mean of alkaline phosphatase of groups I, II, III and IV were93.10 $\pm$ 1.25, 49.75 $\pm$ 1.26, 41.19 $\pm$ 1.36 and 40.51 $\pm$ 1.03 IU/L respectively. The analysis of variance indicated significant (P<0.01) increase in level of alkaline phosphatase in groups II, III and IV group as compare to group I (control). This finding could be correlated to the similar results reported earlier (Mishra *et al.*, 1998)<sup>[4]</sup> in rats when fed with thiram at doses 5, 10 and 25 mg/kg/day for 180 and 360 days.

#### Serum alanine transaminase (ALT)

The General mean of ALT of groups I, II, III and IV were  $59.74\pm2.32$ ,  $78.72\pm1.97$ ,  $74.48\pm1.98$  and  $64.82\pm1.49$  IU/L respectively. The analysis of variance indicated significant (P<0.01) increase in level of ALT in groups II, III and IV group as compare to group I (control). This finding could be correlated to the similar results reported earlier (Dalvi *et al.*, 2002) in the rats fed with thiram at the two equimolar doses 0.1 and 0.5 mmol/kg and same results were reported (Kurata *et al.*, 1981) in rats when ten male and 10 in ten male and 10 female rats were fed a commercial diet containing 0.015, 0.03 or 0.06% thiram for 13 weeks. Female rats in highest dose group showed increased levels of ALT.

# Serum aspartate transaminase (AST)

The General mean of AST of groups I, II, III and IV were 176.67 $\pm$ 3.31, 187.28 $\pm$ 1.65, 181.00 $\pm$ 1.63 and177.67 $\pm$ 2.31 IU/dl respectively. The analysis of variance indicated significant (P<0.01) increase in level of AST in groups II III and IV group as compare to group I (control). This finding could be correlated to the similar results reported earlier (Kurata *et al.* 1981) investigated sub chronic toxicity of thiram induced biochemical changes in ten male and ten female rats fed with a commercial diet containing 0.015, 0.03 or 0.06% thiram for 13 weeks. Female rats in highest dose group showed higher levels of aspartate transaminase AST.

#### Conclusion

The present study indicates that the Thiram induced toxicity is responsible for changes in haematobiochemical values in Albino rats.

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