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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan  
Mob: +92 300 3008585, Fax: +92 41 8815544  
E-mail: editorijps@gmail.com

## Clinicopathological Investigation on Thiram Toxicosis in Broiler Chicken

S. Subapriya, S. Vairamuthu, B. Murali Manohar and C. Balachandran  
Department of Veterinary Pathology, Madras Veterinary College, Chennai 600 007, India

**Abstract:** Thiram a fungicide used for treating corn and storing food grains were incorporated at 15, 30 and 60 ppm into the toxin free diet of broiler chicken for four weeks from the day of hatch. The clinical signs of tibial dyschondroplasia like reduced weight gain, lameness, abnormal bending of the tibial bones, enlarged hock joints and sternal recumbency were observed. The birds were sacrificed at the end of second and fourth week. Blood samples were collected for estimation of hematological parameters and sera separated for biochemical analysis. The packed cell volume and hemoglobin values were unaltered. Serum total proteins, albumin, globulin, albumin:globulin ratio, aspartate amino transferase, alanine amino transferase, alkaline phosphatase, gamma glutamyl transferase were unaltered. Hypercholesterolemia was observed in all the thiram fed birds and hypocalcemia and hypophosphatemia in the 60 ppm thiram fed birds.

**Key words:** Broiler chicken, tibial dyschondroplasia, hematology, serum biochemistry, thiram

### Introduction

Pesticide is any substance or a mixture of substances intended for preventing, destroying, repelling or mitigating any pest (Helferich and Winter, 2001). It is a generic name for a variety of agents encompassing insecticides, herbicides, fungicides, acaricides, larvacides, miticides, molluscides, pediculicides, rodenticides, scabicides, defoliants, desiccants, plant growth regulators and repellants. The efficacy of pesticides in controlling a wide range of pests has been established beyond doubt, providing us with abundant, inexpensive, wholesome and attractive fruits and vegetables. But the widespread use and misuse of pesticides in feed and grain crop, cultivation and preservation makes it almost inevitable that certain of these products find their way into the feeding channels (Vargas *et al.*, 1983). One such compound is thiram which causes tibial dyschondroplasia in birds.

Avian tibial dyschondroplasia is reported in thiram toxicosis in meat strain birds such as chickens, ducks and turkeys in which the delicate balance between the extracellular matrix deposition and resorption has been upset in the growth plate of the tibiotarsus and other fast growing bones. It is characterized by an abnormal mass of cartilage, representing persistent prehypertrophic cartilage that has not been calcified and has not been invaded by blood vessels from the metaphysis (Leach and Nesheim, 1965). The incidence of the lesion could be affected by a number of other factors including diet, surgical interference, environmental factors, selective breeding (Lawler *et al.*, 1988) and a mycotoxin produced by *Fusarium equiseti* (Walser *et al.*, 1982).

Rath *et al.* (1994) reported no effect of thiram toxicosis on calcium and phosphorus values in turkeys. Although the tibial dyschondroplastic condition due to thiram

toxicity in broiler chicken has been studied in the past, literature on the serum biochemical alterations are very meagre. Hence the present work was undertaken to study in detail the hematological and biochemical alterations.

### Materials and Methods

Forty eight newly hatched unsexed broiler chicks were obtained, wingbanded, weighed and housed in battery brooders with *ad libitum* supply of feed and water. They were randomly distributed into four groups of twelve chicks each. The control and toxin mixed diets were fed to the different groups at the concentration of 0, 15, 30 and 60 ppm thiram for 28 days from the day of hatch. The birds were sacrificed at second and fourth week. Blood samples were collected by intra cardiac puncture in Heller and Paul anticoagulant mixture. The PCV and Hb were determined as per the standard methods (Coles, 1986). For sera collection samples of blood collected in test tubes were allowed to clot and centrifuged at 1500 rpm for 20 min to separate the sera. The sera samples were immediately used for biochemical analysis.

The serum total protein and albumin were estimated by modified Biuret and Dumas method, glucose by glucose oxidase method (GOD), cholesterol by CHOD/POD (Cholesterol dehydrogenase/peroxidase) method, aspartate amino transferase (AST), alanine amino transferase (ALT), Gamma Glutamate Transferase (GGT) and alkaline phosphatase (ALP) by IFCC (International Federation of Clinical Chemistry) method, phosphorus by modified Metol method, calcium by OCPC (o-cresophthalein complexone) method and magnesium by Calmagite method by using commercial reagent kits in semi auto analyzer (Biosystem, 320).

## Results and Discussion

**Haematology:** The over all mean±SE PCV values were 28.00±1.08, 29.83±1.35, 28.33±1.48 and 27.08±1.50 per cent and Hb values were 7.54±0.24, 7.45±0.11, 7.37±0.11 and 7.37±0.31 g/dL respectively. Thus no significant differences were observed for PCV and Hb between the control and thiram treated groups.

### Serum Biochemistry

**Serum proteins:** The overall mean±SE of serum total protein were 3.76±0.02, 3.76±0.02, 3.78±0.02 and 3.83±0.02, albumin 2.45±0.03, 2.41±0.05, 2.41±0.05 and 2.37±0.06, globulin 1.30±0.04, 1.35±0.06, 1.36±0.21 and 1.45±0.06 g/dL and albumin globulin ratio 1.91±0.07, 1.84±0.10, 1.82±0.10 and 1.67±0.09 for 0, 15, 30 and 60 ppm thiram treated groups respectively. No significant differences were observed between the control and thiram fed birds.

**Glucose:** The respective overall treatment mean±SE for 0, 15, 30 and 60 ppm of thiram were 113.53±2.44, 118.15±2.38, 120.65±2.56 and 120.60±1.81 mg/dL. Comparison of means revealed no significant differences between the control and thiram treated groups.

**Cholesterol:** The respective overall mean±SE serum cholesterol values for 0, 15, 30 and 60 ppm of thiram were 152.52±8.31, 171.25±2.67, 177±4.26, 172.35±17.30 mg/dL. Comparison of means revealed significant ( $p<0.05$ ) differences between the control and thiram treated groups. There was a significant increase in the serum cholesterol in toxin treated groups when compared to the control but no significant difference was observed among the toxin treated groups. Hypercholesterolemia has been reported earlier (Mishra *et al.*, 1998) in rats exposed to 5, 10 and 25 ppm thiram for 180 and 360 days. The increased serum cholesterol level might be due to starvation due to lameness, pancreatic damage (Coles, 1986), altered lipid and carbohydrate metabolism and enhanced glycogenolysis due to the hepatic damage seen histopathologically.

### Serum Enzymes

**Aspartate amino transferase:** The respective overall mean±SE for 0, 15, 30 and 60 ppm thiram were 21.12±1.29, 21.44±2.31, 22.21±2.90 and 20.02±2.92 U/L. Comparison of means revealed no significant differences between the control and thiram treated groups.

**Alanine amino transferase:** The respective overall mean±SE for 0, 15, 30 and 60 ppm thiram were 12.31±2.01, 12.44±1.93, 13.38±2.72 and 13.30±2.16 U/L. Comparison of means revealed no significant difference between the control and thiram treated groups.

**Alkaline phosphatase:** The respective overall mean±SE for 0, 15, 30 and 60 ppm thiram were 599.41±45.97, 508.35±54.87, 587.2±43.76 and 659.52±28.52 U/L. Comparison of means revealed no significant difference between the control and thiram treated groups.

**Gamma glutamyl transferase:** The respective overall mean±SE for 0, 15, 30 and 60 ppm thiram were 5.50±0.51, 5.66±0.73, 5.66±0.58 and 5.83±0.46 U/L. Comparison of means revealed no significant difference between the control and thiram treated groups. Thus no significant changes were observed in the serum total proteins, albumin, globulin, albumin: globulin ratio, aspartate amino transferase, alanine amino transferase, alkaline phosphatase and gamma glutamyl transferase. Perusal of literature showed no such study in broiler chicken in thiram toxicity.

**Serum Electrolytes:** The respective overall mean±SE of serum magnesium values for control 15, 30 and 60 ppm thiram were 1.42±0.04, 1.35±0.04, 1.37±0.04 and 1.37±0.07 mg/dL respectively. Comparison of means did not reveal any significant difference between the control and toxin treated groups.

The respective overall mean±SE serum calcium values for 0, 15, 30 and 60 ppm thiram were 10.53±1.03, 9.45±0.51, 9.01±0.45 and 8.11±0.58 mg/dL. Comparison of means revealed significant difference between the control and 60 ppm thiram fed group. There was a significant ( $p<0.05$ ) decrease in the serum calcium level in the 60 ppm thiram fed group when compared to the control group. No significant difference was observed among the control and 15 or 30 ppm thiram treated groups.

The overall mean±SE serum phosphorus were 4.54±0.33, 4.82±0.56, 3.56±0.63 and 3.10±0.33 mg/dL for 0, 15, 30 and 60 ppm thiram respectively. Comparison of means revealed significant difference between the control and 60 ppm thiram fed group. There was a significant ( $p<0.05$ ) decrease in the serum phosphorus in 60 ppm thiram fed group when compared to the control group and 15 and 30 ppm thiram treated groups. The 60 ppm thiram fed birds showed significant ( $p<0.01$ ) reduction in the serum calcium and phosphorus values. This could be attributed to the fact that thiram inhibits the absorption of calcium in the intestine as reported earlier (Edwards, 1987) and the overall damage to the alimentary tract including the crop, proventriculus, gizzard, intestine and pancreas hampering the digestive and absorptive processes.

The present investigation thus revealed the effect of thiram on the serum calcium, phosphorus and cholesterol value.

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