

Toxic effects of copper sulphate on enzymological parameters in liver and kidney of male rat (*Rattus rattus*)

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ABSTRACT

Experimental investigation was made to study the effect of copper sulphate on certain enzymatic activities viz., ACP and ALP in the liver and kidney of male rat, *Rattus rattus*. Copper sulphate was administered intraperitoneally (i.p) @ 2.5 mg/kg b.w. for 15 and 30 days. It showed significant decrease in the ACP and ALP activities in the liver and kidney of male, rat, when compared with the control.

Key words: Copper sulphate, enzymatic activities, liver, kidney and *Rattus rattus*.

INTRODUCTION

Copper occurs naturally within the environment. At low concentrations, it is an essential element both for plants and animals, however, large doses can be harmful. Essentiality of copper arises from its specific incorporation into a variety of enzymes which play important roles in physiological processes, as well as, into some structural proteins (WHO 1998). Although the crucial role of copper in several enzymatic processes (Baber 1969). This heavy metal can exert adverse to enzymatic toxicological effects, when present in high concentrations. Effects of copper sulphate on ACP and ALP are not well documented. Therefore, the present experimental investigation is an attempt to evaluate the toxic effects of copper sulphate on enzymological parameters viz. ACP and ALP in liver and kidney of *Rattus rattus*.

MATERIAL AND METHODS

Male mature rats, *Rattus rattus*, weighing 90±5 gms were used which were fed by standard rat feed. Animals were divided equally (n=5) into 3

groups. Group I was considered as control while the other two groups II and III received an intraperitoneal injection of copper sulphate (2.5mg / Kg b.w.) for 15 and 30 days, respectively. After the above treatment, animals were scarified and their organs viz., liver and kidneys were dissected out and processed for enzymological studies by adopting the spectrophotometric methodology of Bergmeyer and Bernt (1974). The statistical significance of the data was assessed by using the student 't' test.

RESULTS AND DISCUSSION

Acid phosphatases belongs to a class enzymes called hydrolases and they are characterised by their ability to hydrolyse a large variety of organic phosphate esters with the formation of an alcohol and a phosphate ion (Guraya and Sindhu, 1975). Alkaline phosphate is a brush border enzyme that mediates membrane transport (Gold Fisher *et al.*, 1964).

The effect of copper sulphate (2.5 mg/kg b.w.) administered intraperitoneally was studied on

Table 1: Acid phosphatase (ACP) and Alkaline (ALP) concentration in liver and Kidney of *Rattus rattus* after 15 and 30 days of copper supphate (2.5 mg/kg b.w.) exposure

| Duration | Liver | | Kidney | |
|----------|----------------------------|-----------------------------|------------------------------|------------------------------|
| | ACP (mg/ml) | ALP (mg/ml) | ACP (mg/ml) | ALP (mg/ml) |
| Control | 112.59±1.7892 | 201.93±0.9642 | 337.815±10.7103 | 879.85±10.5317 |
| 15 days | 60.29 ^a ±4.0812 | 173.56 ^a ±1.1912 | 318.05 ^{NS} ±8.8951 | 703.02 ^a ±15.3969 |
| 30 days | 51.37 ^a ±2.0513 | 170.50 ^a ±2.0854 | 204.99 ^a ±11.5696 | 354.31 ^a ±10.7345 |

± SEM Values of 5 animals

^a= Highly significant (P>0.001) from control by studnet 't' test

^{NS}= Not significant from control by student 't' test

the enzymological activities in the liver and kidney of *Rattus rattus* after 15 and 30 days treatment which is presented in table 1. There was a significant decrease in the acid phosphatase (ACP) and alkaline phosphatase (ALP) levels in liver and kidney of treated groups as compared to control. Ram and Satyanesan 1985, Jana *et al.*, 1985 stated that the activities of these enzymes get altered to adverse effects of heavy metals on the cell and its organelles.

A number of workers have reported biochemical alterations in different tissues/organs

of experimental animals after various heavy metal exposures (Jana and Bandhopadhaya 1987, Sen *et al.*, 1992). Copper has been reported to alter some biochemical and enzymological parameter in fishes and other animals (Dethloff and Marier, 2004, Mudaser *et al.*, 2007).

The present investigation confirms that copper effects the enzymological activities viz. acid and alkaline phosphatases in liver and kidney of male *Rattus rattus*, there by interfering the normal metabolic activities.

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