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THE EFFECT ON TRACE ELEMENTS OF BRAIN AND LIVER OF RAT EXPOSED TO FLUORIDE

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ABSTRACT

Fluoride is a naturally occurring toxic mineral present in drinking water. Fluoride can accumulate in the body, and it has been shown that continuous exposure to it causes damaging effects on body tissues such as liver, brain and kidney. Twenty wistar albino rats were divided into four equal groups of five rats in each group. The first group of rats served as the untreated control, the second, third and fourth group was administered 0.02gm/l, 0.04gm/l, 0.06gm/l fluoride in the drinking water. After56 days, the rats were anesthetized and their brain and liver tissues were collected under ether anaesthesia for analysis of trace elements. Trace elements concentration were analysed by Atomic absorption spectrophotometer. Mn level shows significantly decreased in liver and significantly increased in brain as compared to control. And the level of Zn, Cu and Fe decreased significantly in liver and brain of rats as compared to control.

KEYWORDS: Albino rat, Sodium fluoride, trace elements.

INTRODUCTION

Fluoride is a naturally occurring toxic mineral present in drinking water. Fluorspar, Cryolite and Fluorapatite are the naturally occurring minerals, from which fluoride finds its path to ground water through infiltration (Shailaja and Johnson, 2007). The effect of fluoride on human health has long been of interest to medical researchers. Fluorosis is an important clinical and public health problem in several part of the world (Singh et al., 1970). In high concentrations fluoride compounds are toxic. It enters the human body mainly through the oral route along with food and water. It can be rapidly absorbed by passive diffusion through stomach, small intestine, mouth, lungs and skin (Khandare et al., 2001).

Due to the rapid industrialization, urbanization, and increased use of automobiles, environmental contamination has increased gradually over the past 25 years (Nriago and Pacyna, 1988; Gucer and Yaman, 1992; Yaman, 1997). It is known that, metals as one group of environmental pollutants enter the human body mainly through inhalation and ingestion (Var *et al.*, 2000; Yaman and Cokol, 2004).

Heavy metals are correlated with a number of serious health problems such as cancer, neurotoxcity, immunotoxicity and cardio toxicity leading to increased morbidity/mortality in community (Ozen *et al.*, 2002; Kumru *et al.*, 2003; Yaman *et al.*, 2007a; Yaman, 2006). Hence, it is clear that accumulation of metals in human body might have middle and long term health risks and might adversely affect the physiological functions. Because metals cannot be degraded or destroyed in human body, the assessment of health risks due to metals via ambient air and dietary intake is of great importance.

Our aim in this study was to determine the effect of fluoride on the levels of trace elements such as Zn, Cu, Mn, Fe in brain and liver of rats.

MATERIAL AND METHODS

Experimental Design

Adult albino rat, Rattus rattus (Wistar) were obtained from P. Wadhwani College of pharmacy, yavatmal. The rats were housed in polypropylene cages with stainless steel grill tops and were fed with standard pellet diet and given distilled water ad libitum. The animals were allowed to acclimatize to the laboratory conditions for seven days before experiments began. The rats were randomly divided into 4 groups, the first group served as controls and was given water ad libitum. The second group animals were given sodium fluoride (NaF) 0.02gm/l water ad libitium. The third group animals were given sodium fluoride 0.04gm/l water ad libitum. The fourth group animals were given 0.06 gm/l water ad libitum and maintained for 56 days. The body weight of each animal was noted before treatment and also on day 57 rats were sacrificed and their Brain and liver were quickly excised and used for biochemical assays.

RESULT

Table and Fig, 1: Trace elements alteration in liver of control and experimental animals.

Parameters	Control	Experiment- 1	Experiment – 2	Experiment – 3
Zinc	17.75±4.21	17.14±4.14*	17.01±4.12**	18.06±4.05**
Copper	4.26±2.06	4.06±2.01**	3.33±1.82***	2.12±1.45***
Manganese	4.75±2.18	4.64±2.15*	4.23±2.05**	3.27±1.80***
Iron	12.1±3.47	12.71±3.36*	13.16±3.31***	14.39±3.15**

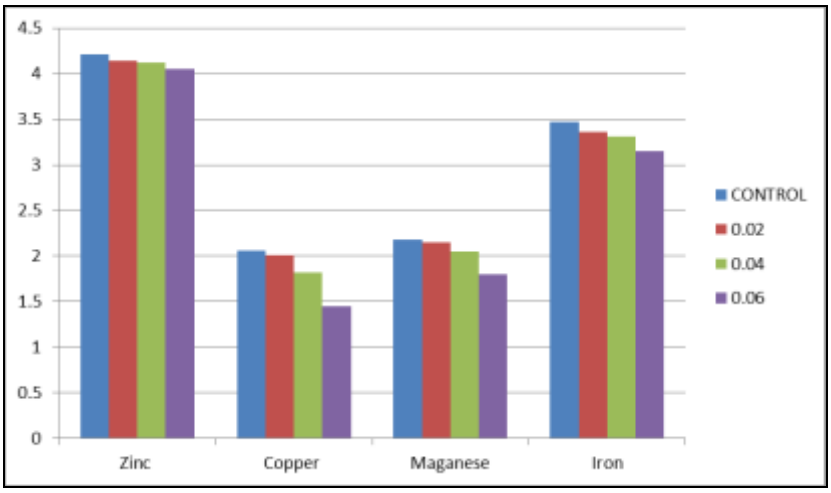
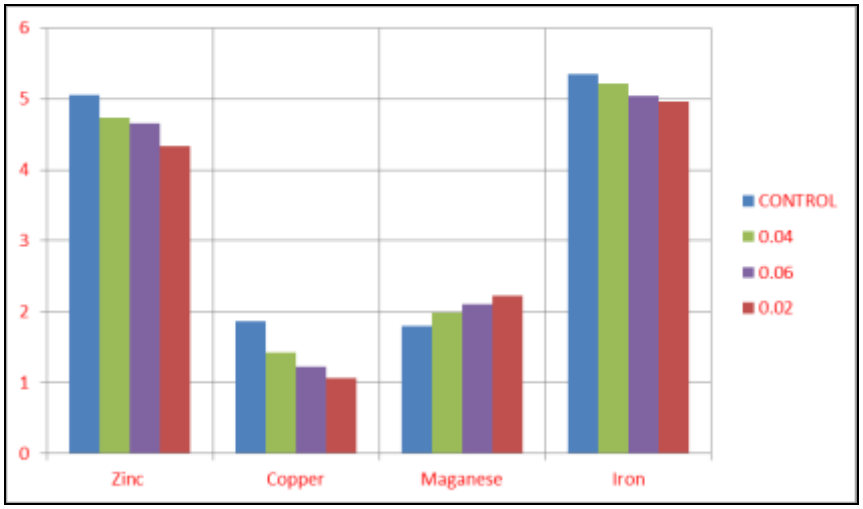


Table and Fig, 2: Trace Elements alteration in brain of control and experimental animals.

Parameters	Control	Experiment- 1	Experiment – 2	Experiment – 3
Zinc	25.65±5.06	22.93±4.78*	22.50±4.74*	21.72±4.66**
Copper	3.47±1.86	2.25±1.50**	2.05±1.43**	1.51±1.23**
Manganese	3.36±1.8	3.77±1.94**	3.93±1.98**	4.43±2.10***
Iron	28.69±5.35	27.78±5.27*	27.22±5.21**	25.40±5.04***



DISCUSSION

Fluoride toxicity is characterized by a variety of signs and symptoms poisoning most commonly occurs following ingestion (accidental or intentional) of fluoride-containing products (Barbier et al, 2010; Whitford, 1996).

Heavy metals are some of the most-active polluting substances as they can cause serious impairment to circulatory, metabolic, physiological and even structural systems when high concentrations are present in aquatic ecosystems (Shugart, 1992).

Essential trace minerals such as zinc, copper and manganese play a wide variety of biological and physiological roles in animal development and health.). Trace elements such as Fe, Cu, Mn, I, F, etc. though occur in low concentration in the body serve some useful

functions and their imbalance may affect important biological functions Copper plays a very important role in our metabolism largely because it allows many critical enzymes to function properly. Iron is absorbed from food when there is a need and the transport form of iron is known as ferritin. Zinc plays an important role in cell proliferation, differentiation and metabolic activity of the cell. The result of the present study corroborate the above data as a significant decline in the level of zn cu fe in brain and liver and mn level falls significantly in liver and rise in brain after 56 days of treatment. The present study supports by (Bhatnagar *et al.*, 2003)., (Sauberlich 1999).

CONCLUSION

In the present study was observed that the level of zn, cu, mn and fe in tissue such as brain and liver at different level of fluoride intoxication in rat, from the result it demonstrated that there is a alteration in the concentration of trace elements, these trace metals are considered essential because the body cannot synthesize them, and yet the body depends on them for health, growth and tissue repair; hence, they have also been categorized as micronutrients and these metals readily bioaccumulate in the different body organs, they are chemical constituents used by the body in many ways. Although they yield no energy, they have important roles to play in many activities in the body.

The trace elements are essential components of enzyme systems. Simple or conditioned deficiencies of mineral elements therefore have profound effects on metabolism and tissue structure, Deficiencies or disturbances in the nutrition of an animal cause a variety of diseases and can arise in several ways.

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