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TOXIC EFFECT OF FLUORIDE ON TOTAL PROTEIN, HDL, LDL AND VLDL OF RAT

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ABSTRACT

Fluoride is a widespread non biodegradable and relatively persistent pollutant, which at low levels of contamination causes serious health problems difficult to cure. In the present study the effects of sodium fluoride induced toxicity in rat liver was evaluated. Twenty rats were divided into four experimental groups containing 5 rats each. 1st group was used for control and 2nd, 3rd and 4th groups were ingested with different concentration of fluoride water respectively for 56 days. The data indicate significant reduction in total protein and HDL in experimental animals while LDL and VLDL were highly elevated in the exposed rats

KEYWORD: Sodium fluoride, Liver, total protein, HDL, LDL, VLDL.

INTRODUCTION

Fluorine compounds are used in various areas of medicine particularly dentistry, agriculture and industry. Fluoride has potential to increase skeletal mass to a great extent, yet it has proven difficult to translate this into therapeutic benefit for patients with low bone mass in diseases like osteoporosis (kleerekoper, 1996). The chemical element fluorine when combines with other chemical substances, it forms fluorides. According to World Health Organization (1984), the permissible limit of fluoride in drinking water is 1.5 ppm. Fluoride depletes the energy reserves and the ability of white blood cells to properly destroy foreign agents by the process of phagocytosis. fluoride inhibits antibody formation in the blood (Takamorim,1962). Fluoride decreases the absorption of cholesterol and bile salts from plasma and intestine which could result in an increased conversion of bile acids in the liver, and bile acids are known to inhibit cholesterol synthesis. Fluorine, considered to be one of the environmental toxins (Jaśkowski, 2000) does not occur free in nature but it forms chemical compounds with sodium, magnesium calcium and tin which are more or less soluble in water (Miller, 1997) Because of good solubility in water, easy absorption from the alimentary tract as well as for economic reasons, sodium fluoride (NaF) is the most commonly used compound in collective endogenic oral caries prophylaxis. The organ that reacts rapidly to xenobiotics reaching the body from the outside is the liver.

MATERIAL AND METHODS

Experimental Animal

Albino rat, *Rattus rattus* weighting 150-200 g, were used. Animals were purchased from wadhwani pharmacy Collage Yavatmal and acclimatized for two weeks in Animal House in the Department of Zoology Govt. Vidharbha Institute of Science and Humanities Amravati.

The Institutional Animal Ethical Committee already approved this study for the use of Rat. The rat were housed in well-ventilated animal house and caged also well, at room temperature and exposed to 10-12 h of daylight.

Rats were divided into four groups having five animals each. 1st group was used for control and 2nd, 3rd and 4th groups were ingested with 0.02 gm, 0.04gm, and 0.06 gm of fluoride water respectively for 56 days. Animals from each dose group were deprived of food overnight and sacrificed at the end of 56 days. They were stunned by a blow on the head and operated. The liver was removed with adhering material by dipping in chilled normal saline and homogenized.

Biochemical Analysis

The estimation of total protein done from liver tissue by using Lowry method, 1951 And lipoproteins by measuring protein concentrations.

Statistical analysis

The results were expressed as the mean ± SEM. The data were statistically analyzed using one-way analysis of

variance (ANOVA). The level of significance was taken as $p < 0.05$.

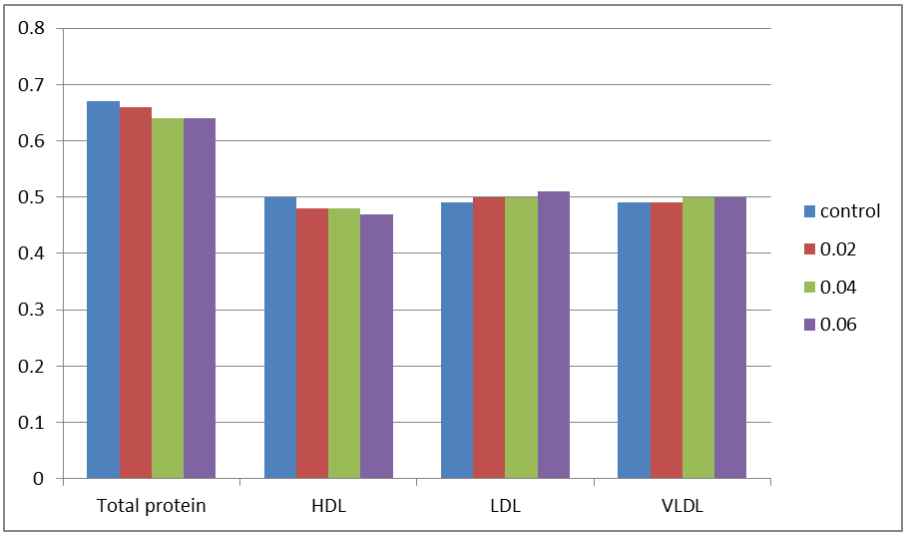
RESULT

Present data showed the effect of sodium fluoride treatment on Total protein and HDL in rat. Results showed that NaF treatment caused significant ($P<0.05$) decrease in Total protein and HDL in rat compared to the control group of rats.

Biochemical parameters are shown in Table 1 After 56 days of treatment, LDL and VLDL showed significant ($P<0.001$) increase compared to control group.

Table and fig 1: Effect of fluoride on total protein and lipoproteins contents in rat liver.

Parameter	Control	0.02 gm/lit	0.04 gm/lit	0.06 gm/lit
Total protein	0.46±0.67	0.44±0.66	0.41±0.64*	0.41±0.64**
HDL	0.25±0.50	0.23±0.48**	0.23±0.48*	0.22±0.47*
LDL	0.24±0.49	0.25±0.50**	0.25±0.50**	0.26±0.51***
VLDL	0.24±0.49	0.24±0.49*	0.25±0.50**	0.25±0.50**



Values are expressed as Mean ± SE *=p<0.05; **=p<0.01;***=p<0.001;where nothing is shown =Non Significant.

DISSCUSSION

The fluoride intoxication in rabbits resulted in decreased contents of the total protein in the brain (Shashi,*et. al*,1994). The present study also indicated that decrease in total protein in rat. Fluoride inhibits protein synthesis in vitro and in vivo (Shashi, 2003). Fluoride inhibits key enzymes of the glycolytic pathway and thus reduces energy metabolism and protein synthetis (Holland and Hongslo 1978). Earlier studies revealed a dose dependent decline in protein levels in skeletal muscle (Shashi *et al.*, 1992) and brain (Shashi *et al.*, 1994) in experimental fluorosis in rabbits.

The treatment with NaF caused changes in lipid profile and this is in accordance with the obtained results by Bouaziz *et al.* and Eraslan *et al.* They suggested that the abnormal activities of lipases enzymes seem to be one of the chief factors responsible for the rise in serum triglycerides and cholesterol. It appears that enzymes inhibited by fluoride, such as triglyceride lipase, unspecific esterase and pyrophosphates. The obtained results of hyperlipidemia may be attributed to an increase in the synthesis of fatty acids in the liver or possibility due to incidence of liver cholestosis (Owings and Georgeson, 2000). The observed abnormalities in lipoprotein profile may be due to over-production of very low density lipoprotein (VLDL) by the liver or to the decrease in removal of VLDL and LDL from the circulation (Tsutsumi *et al.*, 1995). The present study also indicated that increase in LDL and VLDL with decrease in HDL. HDL is a lipoprotein which picks cholesterol from extrahepatic tissues to the liver for degradation (Murray *et al.*, 2003).

CONCLUSION

From the results, it is clearly indicated that 56 days of sodium fluoride exposure to rats caused a significant decrease in total protein and HDL with increase in LDL and VLDL.

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