AMELIORATIVE EFFECT OF ALUMINIUM SULPHATE ON THE MILK FLUORIDE LEVELS IN GOATS*

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ABSTRACT
Sodium fluoride (NaF) alone or together with aluminium sulphate was administered to goats to determine the fluoride levels of milk and the effect of aluminium sulphate on the excretion of fluoride in goat milk. The increase in milk fluoride levels at various time intervals was reduced when aluminium sulphate was administered. On the basis of these results, it is concluded that aluminium sulphate can be used to decrease the excretion of fluoride via milk in endemic areas of fluoride toxicity

Keywords: Sodium fluoride, Aluminium sulphate, Milk, Ameliorative agent.

INTRODUCTION

Fluoride toxicity is one of the emerging environmental challenges in animal and man. It is also one of the major public health problems in some parts of the globe. Man and animals are exposed to fluoride in a number of ways mainly by ingesting fluoride in various foods, drinking water and fluoride-containing products comprising dentifrices, mouth rinses, tablets, drops, (1-3) Orally ingested fluorides are absorbed from the gastrointestinal tract by a process of simple diffusion (4), and the absorbed fluoride is rapidly distributed throughout body. Urine and faeces are the primary routes of fluoride excretion. Other routes of fluoride excretion are sweat, saliva and milk of lactating mothers or animals (2,3,5).

Milk is a main constituent of the diet of humans and animals in the early stages of life.. Milk fluoride is a vital supplement in humans and animals. Some boron, calcium, and aluminium. salts have an ameliorative action on the plasma fluoride levels by decreasing their gastrointestinal absorption in different species. The present study was aimed to determine the fluoride levels of milk and effect of aluminium sulphate on the excretion of fluoride in goat milk.

MATERIALS AND METHODS

Healthy cross=bred lactating goats aged 1.5-2 years and 25-30 kg body weight were acclimatized for two weeks before the commencing the experiment. The animals were maintained on feed and water. The experimental protocol was approved by institutional ethics committee. The animals were divided into two groups of 4. In group 1, sodium fluoride (NaF) alone was administered orally at the dose rate of 20 mg/kbw. (providing 9 mg/kbw), and in group 2, the same dose of sodium fluoride along with aluminium sulphate at a dose rate of 150 mg/kbw was administered orally after dissolving separately in 100 ml distilled water. Aluminium sulphate was administered 30 minutes prior to the sodium fluoride. The milk samples were collected manually prior to dosing and at 0.5, 1, 2, 4, 6, 8, 10 12 and 24 hours post dose in polyethylene plastic vials and stored at - 20^{O}C until analysis. The milk fluoride estimation was carried out according to Sener *et al*. (6).

RESULTS AND DISCUSSION

The milk levels of fluoride at different time interval in goats of groups 1 and 2 are given in Table 1 and the graphical presentation of milk levels against time is shown in Figure 1. The milk fluoride levels increased at various time intervals in both groups after administration

of sodium fluoride.The increase of fluoride levels in milk demonstrated that it is one of the routes of excretion. On comparing the milk fluoride levels of the two , it was observed that fluoride concentrations were lower in milk of group 2. This indicated that aluminium decreased the absorption of fluoride from the gastrointestinal tract by forming the insoluble complexes and increased the excretion of fluoride in the faeces. This decreased absorption of fluoride from the gastrointestinal tract may lead to decreased plasma fluoride levels and this further leads to the decreased excretion of fluoride in milk. Allcroft *et al*. (7) reported that efficacy of aluminium sulphate, calcium carbonate and sodium acid phosphate for alleviation of fluorosis in cows was due to reduced absorption of fluorine from the intestinal tract. Also, the prophylactic activity of aluminium and calcium salts was studied by Flatla (8) who reported that these salts prevented chronic fluorosis by binding fluorine in the intestinal tract to make it less absorbable. Said *et al*. (9) reported higher fluoride excretion in the faeces of sheep when aluminium chloride was added to the diet but no alleviation of the symptoms was noted. Kessabi *et al*. (10) reported that aluminium sulfate decreased the digestive absorption by about 33 - 45 % for fluoride and reduced the level of fluoride in serum, urine, bones and teeth.

To our knowledge, this is the first report of fluoride levels in milk samples.. However, reports on increased milk fluoride levels in lactating animals of different species suffering from fluoride toxicity have been published. Samal and Naik (11) reported that fluoride levels in milk of cattle consuming fluoride-contaminated forage around an aluminium factory were enhanced and ranged from 0.19 to 1.15 ppm in cows and 0.31 to 1.21 ppm in buffaloes. Also, Murray (12), Jones (13) and Sobocinski *et al*. (14) reported that fluoride decreased the milk yield of the affected animals. It is concluded that aluminium sulphate can be used to decrease the excretion of fluoride via milk in endemic areas of fluoride toxicity.

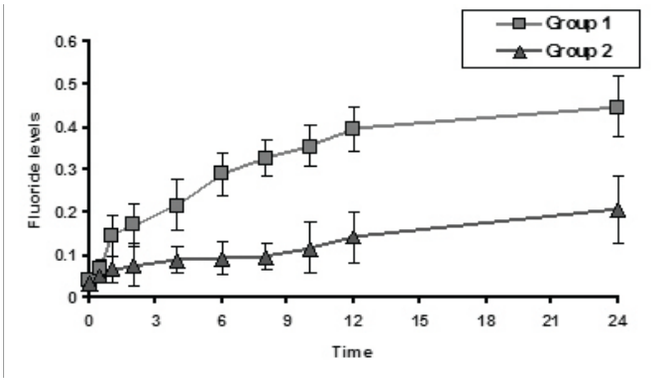

Fig. 1.
Graphical presentation of milk fluoride levels ($mg.L^{-1}$) at different time intervals in groups 1 and 2.

Table1:
Milk fluoride levels ($mg.L^{-1}$) at different time intervals after oral administration of sodium fluoride alone (group 1) and with aluminium sulphate (group 2).

Time (hours)	Milk fluoride levels (mean ± SE)	
	Group-1	Group-2
0	0.040±0.01	0.034±0.01
0.5	0.069±0.02	0.051±0.01
1	0.146±0.05	0.067±0.03
2	0.171±0.05	0.076±0.05
4	0.216±0.06	0.089±0.03
6	0.289±0.05	0.093±0.04
8	0.327±0.04	0.097±0.03
10	0.356±0.05	0.117±0.06
12	0.396±0.05	0.142±0.06
24	0.447±0.07	0.207±0.08

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