

Spontaneous Fluorosis in Indian Buffaloes

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Abstract

The present study envisaged the appraisal of occurrence of spontaneous fluorosis in buffaloes in 15 villages of Kunkavav, Lathi and Liliya talukas of Amreli district of Gujarat, India. A total of 731 buffaloes were examined in three talukas of Amreli districts. A total of 45 fodder samples, three from each selected villages were collected. Fluoride content of fodder in Kunkavav, Lathi and Liliya taluka was 6.10, 19.28 and 19.74 ppm, respectively. These values were significantly ($P < 0.05$) higher as compared to control (2.32 ppm). The overall prevalence of dental lesions in buffaloes was 31.4, 48.6 and 55.4 percent in Kunkavav, Lathi and Liliya taluka, respectively. A direct correlation between prevalence of dental lesions and fluoride content in fodder was noted. Sex-wise analyses revealed that 33.3% males and 46.6% females had dental lesions. Animals above three years of age were comparatively more susceptible. It might be concluded that fluoride level of 4.76 ppm in fodder samples could produce characteristic dental lesions in animals.

Keywords: Buffaloes, Fodder, Fluorosis, Saurashtra region, Gujarat

Introduction

In India, over 25 million people from 15 states namely Rajasthan, Tamil Nadu, Maharashtra, Bihar, Delhi, Jammu and Kashmir, Uttar Pradesh, Madhya Pradesh, Gujarat, Punjab, Haryana, Karnataka, Andhra Pradesh, Kerala and Orissa are under the threat of fluorosis due to high fluoride content varying from 2-20 ppm in potable water sources. As per WHO guidelines (1994) and Rajiv Gandhi National Drinking Water Mission (RGNDWM), Government of India (1994), the permissible limit for fluoride in potable drinking water is 1.5 mg/l. When its concentration is higher than 1.5 ppm, it is known to cause dental and skeletal fluorosis in human beings.

Available reports revealed the prevalence of hydro-fluorosis in bovines in Andhra Pradesh and Uttar Pradesh (Dwivedi *et al.*, 1997), Punjab

(Sharma *et al.*, 1997), Rajasthan (Choubisa, 1999), Karnataka (Muralidhara *et al.*, 2000) and Orissa (Maiti *et al.*, 2002). However, no report is available on clinical status of fluorosis in buffaloes from Saurashtra region of Gujarat state. Therefore, the survey was conducted in buffaloes to study the correlation between prevalence of dental lesions and fluoride level in fodder samples.

Materials and methods

Selection of area

A survey was conducted to determine the prevalence of fluorosis in buffaloes. Based on the available data on fluoride levels in water (RGNDWM, 1994), three talukas of Amreli district viz., Kunkavav, Lathi and Liliya were selected.

Fodder samples

From each taluka, five villages were selected at random. A total of 45 fodder samples were collected to determine the level of fluoride. For com-

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parison, five fodder samples from unaffected areas of Amreli district where the water fluoride level was 1.12 ppm and was below WHO recommended limit of 1.5 ppm. The fodder samples were dried for 24-48 hours at 80°C and then grinded. The grinded samples were stored in clean, dry, tightly closed plastic bottles until further analysis.

Animals

A total of 731 buffaloes of different age and sex were examined in 15 villages under study for characteristic dental lesions (mottling, staining, pitting, erosion and excessive wearing) of fluoride intoxication. For comparison, fifty buffaloes were examined from unaffected areas of Amreli district where the water fluoride level was 1.12 ppm and was below WHO recommended limit of 1.5 ppm.

Estimation of fluoride from fodder samples

Inorganic fluoride in fodder samples was estimated by Fluoride ion Selective Electrode Meter (Orion – 920 A2, USA) as described by AOAC (1990). In brief, meter was calibrated as per method described in the Users’ Manual. Grinded fodder sample

(0.09g) was taken in 100 ml polyethylene beakers and 15 ml of 5 M hydrochloric acid was added. Beakers were covered with aluminum foil and kept overnight. Subsequently, solution was filtered through Whatman filter paper (40 No.) and the volume was made up to 100 ml by double distilled water. Aliquots of 25 ml were taken and 25 ml of Total Ionic Strength Adjusting Buffer-II (TISAB-II) was added to each sample. Readings of the samples were measured and fluoride content were calculated by using the following formula: Fluorine in fodder (ppm)= Meter reading (ppm) x 100/ Weight of samples (g).

Statistical analysis

The data generated on various parameters were analysed for significance by using t-test as per methods of Snedecor and Cochran (1980).

Results

Fluoride concentration of fodder samples and prevalence of dental lesions in different villages of three talukas of Amreli district is depicted in Table 1. Fluoride content of fodder in Kunkavav, Lathi

Table 1. Prevalence of dental lesions and fluoride level in fodder samples collected from different villages of Amreli district.

Name of Taluka	Name of Villages	No. of animals examined	Animals showing dental lesions (%)	Fodder fluoride level (ppm)
Kunkavav	Moti Kunkavav	35	34.3	7.27
	Amrapur	28	32.1	5.11
	Nava Ujada	48	29.1	4.76
	Jangar	52	30.8	5.56
	Barwada (Bavisi)	44	31.8	7.84
		207 ¹	31.4 ²	6.10 ± 0.61* ³ (n=15)
Lathi	Havtad	65	41.5	12.31
	Ingorada	64	37.5	20.41
	Eklara	43	48.8	24.96
	Asodar	62	62.9	21.48
	Padarsinga	52	53.9	17.28
		286 ¹	48.6 ²	19.28 ± 2.13* ³ (n=15)
Liliya	Panch Talavada	52	53.9	19.88
	Nana Kankot	29	41.4	20.34
	Kalyanpur	64	56.2	20.91
	Khara	32	56.2	17.25
	Gundaran	61	62.3	20.31
		238 ¹	55.4 ²	19.74 ± 0.64* ³ (n=15)
Control		50	—	2.32 ± 0.21 ³ (n=5)

¹Sub-total, ²mean, ³mean ± S.E.

* Significant at 5 % level of significance, ppm= parts per millions

and Liliya taluka were 6.10, 19.28 and 19.74 ppm, respectively. These values were significantly ($P<0.05$) higher as compared to control value (2.32 ppm). It is observed that a low fluoride level of 4.76 ppm in Nava Ujada village of Kunkavav taluka may cause the characteristic dental lesions (Fig. 1).

The overall prevalence of dental lesions was found to be 31.4, 48.6 and 55.4 percent in

Kunkavav, Lathi and Liliya taluka, respectively.

Age and sex wise incidence of fluorosis in buffaloes of all three talukas is presented in Table 2. A total of 731 buffaloes comprising of 36 males and 695 females were examined and out of these 12 males and 324 females showed characteristic dental lesions. Higher percentages (57.4 %) of dental lesions were observed in buffaloes above three years of age.



Fig. 1 Mottling consisting of diffuse yellow brownish discolouration in streaks and spots with appearance of chipped incisor teeth.

Table 2. Age and sex-wise incidence of fluorosis in buffaloes of Amreli district

Age range (year)	No. of examined Animals			Percentage of affected animals		
	M	F	T	M	F	T
0-1	12	35	47	41.8	34.3	36.1
1-3	10	268	278	30.0	30.9	30.9
>3	14	392	406	28.6	58.4	57.4
Total	36	695	731	33.3	46.6	45.9

M: Male; F: Female; T: Total

Discussion

The present research work was undertaken to throw light on the impact of fluoride intoxication on buffaloes of Amreli district with a hope to alleviate the suffering of animals due to this condition. The fluoride content of pastures is influenced by the plant species, and its stage of growth, and by fluoride concentration of soil (Less *et al.*, 1975). Present findings supported earlier observations of

Mascola *et al.* (1974) at 13–145 ppm fluoride in pasture and Dwivedi *et al.* (1997) at 22.50 ppm in Unnao district of Uttar Pradesh, India. Boddie (1955) also observed dental lesions in sheep grazing on pasture having eight ppm fluoride content. In the study, 33.3% and 46.6% dental lesion was found in males and females respectively. Singh (1994) reported the intoxication of fluoride in either sex of sheep and goat. Among the affected animals, 57% animals were of above three years of

age and this might be due to ingestion of excessive amounts of fluoride over a prolonged duration. Our findings supported the observations of Patra *et al.* (2000) who recorded fluorosis in 63.3% cattle above three years, by 37.2% in cattle between 1 and three years and 17.4% in calves below one year.

A direct correlation between prevalence of dental lesions and fluoride content in fodder samples was observed. Based on results obtained in the present study, it is observed that fluoride level of 4.76 ppm in fodder samples could produce characteristic dental lesions in animals.

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