

## Prevention of fluorosis in domestic animals

Fluorine (F) ranks seventeenth in the order of abundance in the earth's crust<sup>1</sup> and is variably distributed in sea water, freshwater, soil and mineral deposits. Biologically, fluoride is regarded both beneficial and harmful to humans and animals, but its significance is mainly due to it being in excess rather than deficient. Intake or ingestion of high amounts of fluoride by animals and humans over a prolonged period is known to cause dental and skeletal fluorosis<sup>2</sup>. Domestic animals as cattle (*Bos taurus*), buffaloes (*Bubalus bubalis*), camels (*Camelus dromedarius*), sheep (*Ovis aries*) and goats (*Capra hircus*) are also susceptible to fluorosis, but recently an article reported on the differences in the expression, prevalence and severity of fluorotoxicosis among ruminants in Rajasthan<sup>3</sup>. In this study, cattle and buffaloes had higher prevalence and severity of skeletal and dental fluorosis compared to camels, sheep and goats. The differential expression of fluorosis among these animals was found to be due to their food habits<sup>4</sup>, i.e. natural amelioration of fluoride toxicity.

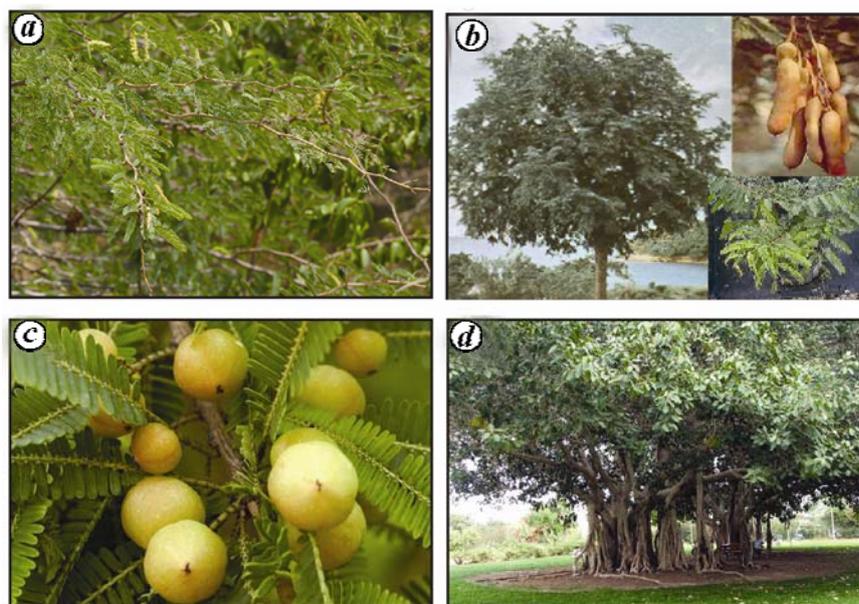
Sheep, goats and camels are basically plant-eaters and consume almost all edible parts of the arid and humid-zone plants, viz. fresh leaves, berries, pods, fruits, etc. The most common trees and shrubs found in Rajasthan are (Figure 1): *Prosopis juliflora*, *Ziziphus mauritiana*, *Tamarindus indica*, *Cyamopsis tetragonolobus*, *Pithecellobium dulce* and *Emblia officinalis* and are also found in other states of India. These plants are a rich source of calcium and ascorbic acid (vitamin C)<sup>3,4</sup>, which are effective against fluoride toxicity. These two nutrients are known to counteract fluorotoxicosis<sup>5-7</sup>, thereby decreasing the severity of osteo-dental fluorosis.

Buffaloes and cattle are generally restricted to farms and houses, and therefore consume fluoridated groundwater and dry fodder that is insufficient in nutritional composition. This regular exposure to fluoride through groundwater and inadequate nourishment makes these animals more prone to the debilitating conditions of fluorosis such as gastrointestinal discomfort, reproductive dysfunctions, neurological disorders, teratogenic effects, etc.<sup>8,9</sup>.

The observations made in this study on domestic animals are quite relevant in the current scenario of Rajasthan, where annual rainfall is scarce and groundwater is excessively exploited for all basic needs. The fluoridated groundwater, especially in the fluoride endemic areas is the main cause of osteo-dental deformities (Figure 2). Recently, the State Government of Rajasthan announced a defluoridation scheme in fluoride endemic areas (Udaipur, Banswara, Rajsamand, Dungarpur, Pratapgarh and Chittorgarh), where 1582 hand pumps would be attached to the defluoridation units to ensure fluoride-free water supply. This is a welcome step in the control of fluorosis, though the Government will

have to spend Rs 15 crores on this scheme. However, this alone would also not be able to combat fluorosis completely. These defluoridation units need regular maintenance and monitoring; otherwise after some time they would become non-functional. Also, the water from these units would be mainly consumed by humans and not animals. So, the fluorosis problem still persists for animals.

Preventive measures therefore need to be suggested to the inhabitants of fluoride endemic regions. A general awareness regarding prevention of fluorotoxicosis needs to be generated via campaigns that educate people, especially the rural population. The farmers



**Figure 1.** a, *Prosopis juliflora*; b, *Tamarindus indica*; c, *Emblia officinalis*, and d, *Ficus bengalensis*.



**Figure 2.** Severe form of dental fluorosis in buffalo (source: Choubisa *et al.*<sup>3</sup>).

and livestock owners need to be educated about the plants that are easily available in the surroundings and which contain large amounts of calcium and vitamin C. They should be made aware of the fact that these plant parts and their products when given as supplements to domestic animals would help mitigate fluoride toxicity. This supplement food is economically cheaper and easily available compared to the commercial supplements sold in the market. Also, these plants can be cultivated easily without any large investment on any type of land as their water demand is less. These plants fruit and flower throughout the year and thus would be always available to the animals.

If the State Government can spend billions of rupees on Jatropa (ratanjot) plantation in the state for the production of biological fuel, fluorosis is a much big-

ger problem affecting both humans and domestic animals, and needs to be controlled. Thus the plantation of these trees and shrubs would not be a financial burden, but would surely provide a fluoride-free animal population without any adverse effects on animal health.

1. Fleischer, M., *Crust Geological Survey Circular No. 285*, Washington DC, USA, 1953.
2. World Health Organization, *Fluoride and Human Health*, Monograph Series No. 59, WHO, Geneva, 1970.
3. Choubisa, S. L. *et al.*, *Fluoride*, 2011, **44**(2), 70–76.
4. Choubisa, S. L., *Curr. Sci.*, 2010, **99**, 1331–1332.
5. Chinoy, N. J., *Proc. Zool. Soc. (Calcutta)*, 1991, **144**, 11–15.
6. Chinoy, N. J., Reddy, V. V. P. C. and Michael, M., *Fluoride*, 1994, **27**, 167–175.

7. Chinoy, N. J., Sorathia, H. P. and Jhala, D. D., *Fluoride*, 2005, **38**, 106–114.
8. Choubisa, S. L., *Fluoride*, 2010, **43**, 5–12.
9. Choubisa, S. L., Mishra, G. V., Sheikh, Z., Bhardwaj, B., Mali, P. and Jaroli, V. J., *Adv. Pharmacol. Toxicol.*, 2011, **12**(2), 29–37.

ACKNOWLEDGEMENTS. I thank Dr S. L. Choubisa, Head, Parasitology and Toxicology Research Laboratory, Department of Zoology, Government Meera Girls College, Udaipur for support.

ZULFIYA SHEIKH

*P.G. Department of Zoology,  
Government Meera Girls College,  
Udaipur 313 001, India  
e mail: zulfiyasheikh@gmail.com*

## A malnourished nation is deprived on many fronts besides gold medals in sports

Bamji<sup>1</sup> has elegantly brought out the harsh reality that a malnourished nation cannot be a sporting nation. I wish to add that besides sports, where the end results are highly visible and can be quantitative, malnutrition also deprives a large section of the Indian population from reaching its genetic potential for cognitive, emotional and behavioural traits, limiting the growth of the nation's mental capital. Malnourished individuals, both in the rural and urban areas, are predominantly from the low-income families. Malnutrition perpetuates the vicious cycle<sup>2</sup> of poverty – poor nutrition of mothers – low birth weight of new born babies – impaired health and development of children – their low capacity for education and learning of skills required for higher income. Thus, the poverty

perpetuates generation after generation. Improved nutrition of the family provides an opportunity to come out of the vicious cycle and enter the virtuous cycle<sup>2</sup> of improved maternal health and nutrition leading to normal birth weight for the children, enhancement of their physical and cognitive abilities required for education and learning skills necessary for higher income jobs. A Government of UK sponsored international study involving more than 450 experts and stakeholders from 16 countries had concluded that, 'To prosper and flourish in a rapidly changing world, we must make the most of all our resources – both mental and material'<sup>3</sup>. Further, 'Countries must learn how to capitalize on their citizens' cognitive resources if they are to prosper, both economically and

socially'. Early nutritional interventions and nutritional security as suggested by Bamji<sup>1</sup> could be the right solution.

1. Bamji, M. S., *Curr. Sci.*, 2011, **101**(5), 602–604.
2. Bhatia, C. R., In *Science Technology for Achieving Food Economic and Health Security* (ed. Rao, U. R.), Prism Books, Bangalore, pp. 264–277.
3. Beddington, J. *et al.*, *Nature*, 2008, **455**, 1057–1060.

C. R. BHATIA

*17, Rohini,  
Plot 29–30, Sector 9-A, Vashi,  
New Mumbai 400 703, India  
e-mail: chitranjan.bhatia@yahoo.com*