INCIDENCE OF DENTAL FLUOROSIS IN DOMESTIC ANIMALS OF SHIVPUR, MADHYA PRADESH, INDIA

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ABSTRACT
Fluoride is a chemical element that has been shown to cause significant effects on human and animal health through drinking water and food. It has been main cause of dental and skeletal fluorosis in man and cattle. Fluoride exposure is of great significance and has been shown to affect the body’s fluoride content and thus increasing the risks of fluoride-prone diseases. Karera block of Shivpur district is facing the problem of ground water fluoride contamination. In the present investigation, fluoride in drinking water was determined in the water sources of 10 villages and incidence of dental fluorosis in domestic animals were studied. The fluoride concentration ranged from 1.65±0.0047 mg l⁻¹ in Hazinagar to 3.91±0.0072 mg l⁻¹ in Dumduma village. 41.34% adult buffaloes, 40.0% adult cows and 36.12% immature buffaloes and 36.72% cows were found to have dental fluorosis with light to deep yellowish brown teeth, striated and horizontal lines starting from the base of teeth.

Key Words : Fluoride content in water, Dental fluorosis, Domestic animals, Karera block, Shivpur

INTRODUCTION
Environmental pollution is a major global problem which poses real threats to human and animal health besides causing imbalance in the ecosystem. It has been general experience that most of the problems of pollution emanating from livestock have remained confined to the developed nations. Fluoride is an electronegative element, distributed ubiquitously as fluoride in nature. Water is the major medium of fluoride intake by humans and animals. One of these, dental fluorosis, characterized by enamel mottling appears clinically at the level of 1.5 ppm fluoride in drinking water. Animals normally ingest small amounts of various fluorides in their diets with no harmful effects, but excessive ingestion can be damaging. The domestic animals any consume naturally occurring high-fluoride components of the diet or from the ingestion of forage that has been contaminated by industrial fluoride emissions. Domestic animal viz., buffaloes and cows and goats are affected by fluorosis. Chronic fluoride intoxication of man and animals is a health problem world wide and is endemic in areas where fluoride is quite high in drinking water and aggravates in the form of fluorosis. The primary manifestations of fluorosis are mottling of teeth and osteosclerosis of the skeleton. Secondary effects include damage to the nervous system in human and domestic animals. In India fluorosis is endemic in many states. Present investigations, deal with fluorosis among cattle’s of ten villages in Karera block of Shivpur district.

MATERIAL AND METHODS
For the present investigation, ten villages viz., Dumduma, Bangama, Hazinagar, Silarpur, Sirsod, Nichrol, Zuzai, Toda Karera, Toda Rampur and Kalipahad made in Karera block of Shivpur district, Madhya Pradesh, India were selected.

Fluoride estimation
Fluoride ion concentration was measured in hand pump and well water with Orion (fluoride meter model 720 A), manufactured by Orion Research, Incorporation, by using ion selected electrode method.

Examination of dental fluorosis in animals
The present investigation was under taken to
observe different stage of enamel mottling in mature and immature domestic animals consuming water containing high level of fluoride. House to house surveys were made in the early morning and late evening when the animals are generally remain available and in herds during daytime during November 2007 to December 2009.

RESULTS AND DISCUSSION

It is observed in all ten villages of Karera block that the drinking water sources like hand pumps and wells has a contribution of fluoride ranging form 1.65±0.0047 mg $l^{-1}$ in Hazinagar village to 3.91±0.0072 mg $l^{-1}$ in Dumduma village (Table 1). Some hand pumps and wells had high concentration of fluoride in their water. Among mature domestic animals 41.34% bufaloes and 40.0% cows were found affected with dental fluorosis and among immature domestic animals 36.12% bufaloes and 36.72% cows were having dental fluorosis evident by light to deep yellowish, striated horizontal lines starting from the base of teeth (Fig. 1(a) to Fig. 1(d)). However, in mature animals, dental fluorosis appeared as deep yellow, striations on enamel of the anterior teeth were observed in Udaipur district Rajasthan, India. It has been that calves (<1 year of age), adult cattle and adult buffaloes of either sex, were suffering from fluorosis estimated up to 42.66%, 30.81% and 34.48% respectively, even when fluoride concentration in water was blow 1.0 ppm. General effects of excessive fluoride ingestion on animals have been should reviewed. Table 2 shows the prevalence of fluorosis in mature and immature cattle. Excessive abrasion of the teeth in older animals was probably due to long exposure to fluoride. A close association between chronic fluoride intoxication and increased oxidative stress has been reported in experimental animals. In general, the effect of fluoride on developing teeth and bones were enhanced by the short-terms exposure to the high levels of fluoride intake. A pasture having >40 ppm fluoride can be detrimental to the health of grazing animals. Impact of fluoride on cornwall island cattle industry was so immense that the majority of farmers switched from dairy to beef cattle.
Table 2: Prevalence of dental fluorosis in domestic animal fluoride endemic area of Shivpuri district

<table>
<thead>
<tr>
<th>Animals</th>
<th>No. of animals examined</th>
<th>Dental fluorosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mature animals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffalo (&lt;1year)</td>
<td>75</td>
<td>31 (41.34%)</td>
</tr>
<tr>
<td>Cow (Bovines) (&lt;1year)</td>
<td>25</td>
<td>10 (40.0%)</td>
</tr>
<tr>
<td><strong>Immature animals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffalo (&gt;1year)</td>
<td>36</td>
<td>12 (36.12%)</td>
</tr>
<tr>
<td>Cow (Bovines) (&gt;year)</td>
<td>14</td>
<td>05 (36.72%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>150</td>
<td>58 (38.67%)</td>
</tr>
</tbody>
</table>

Fig. 1 : Different grades of dental fluorosis in domestic animals (a,b) immature and (c,d) mature animals

(a)                                      (b)                                      (c)                                      (d)
Fluoride from industrial air bone particulates containing fluoride are settled over leafy surface of plants which in turn consumed by grazing cattle. Since, fluoride not readily transported through plant tissues, leafy portions tend to concentrate fluoride, thus the herbivores are expected to consume more fluoride than grainivores in industrial areas. In India severe fluorosis has been noticed in bovines due to contamination of herbage due aluminum smelter, brick work and super phosphate manufacturing unit. However, in the present study, the dental fluorosis among animals was due to fluoride contaminated water as well as fodder.

CONCLUSION

Observed in all ten villages of Karera block drinking water sources like hand pumps and wells had high concentration of fluoride in their water. Among mature domestic animals 41.34% buffaloes and 40.0% cows were found affected with dental fluorosis and among immature domestic animals 36.12% buffaloes and 36.72% cows. However, in the present study, the dental fluorosis among animals was due to causing fluoride contaminated water as well as fodder.

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*If all mankind were to disappear, the world would regenerate back to the rich state of equilibrium that existed ten thousand years ago. If insects were to vanish, the environment would collapse into chaos.*

Edward O. Wilson