

Effect of Fluoride Concentration on Cattle of Nagaur District (Rajasthan)

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Abstract- Fluoride is highly toxic and corrosive gas, light yellow-green in colour and with a pungent smell. The excess fluoride intake is responsible for dental and skeletal fluorosis in cattle. The symptoms of excessive fluoride ingestion include lesions in the developing dentition, skeletal lesion and lameness. The immature animals are reported to be most susceptible to dental fluorosis. The milk production is indirectly affected by fluoride toxicosis. The excessive fluoride reduces the conception rates of cattles.

Index Terms- Fluoride, cattle, dentition, toxicosis.

I. INTRODUCTION

Nagaur district is one of the 33 districts of the state of Rajasthan in western India. It falls almost in the central part of Rajasthan covering an area of 17,718 sq.km. High fluoride concentration in the ground water of different parts of the Nagaur district is responsible for widespread fluorosis. When fluoride intake is more than the permissible limit it becomes toxic and wants cause various metabolic disturbances in cattles including dental and skeletal fluorosis. The surface water has low fluoride content while ground water passes a huge concentration of fluoride. Groundwater is the single biggest contributing factor for the spread of fluoride and fluorosis. High concentration of fluoride causes adverse effect on the central nervous system and joints. The survey indicates that the degree of fluoride problem is very serious in Nagaur district.

II. METHODOLOGY

The fluoride concentration in water was determined electrochemically using fluoride in selective electrode. This method is applicable to the measurement of fluoride in drinking water in the concentration range of 0.02-1000mg/l. The electrode was used as an Orion fluoride electrode, coupled to an Orion electrometer. House to house survey was done in the early morning and late evening when the animals were available at home. The herds in the field were also examined during the day time.

OBSERVATIONS

Normal cattle have blood levels of up to 0.2 mg fluorine per deciliter of blood and 2-6 ppm in urine. The detoxification process takes place if intake is very high in the form of deposition of fluorine in association with phosphate before irruption of teeth. The deposition is greatest in long bones on periosteal surface and exostosis occurs due to excessive

mobilization of calcium and phosphorus at any age in life. The bone lesions like osteomalacia, osteoporosis, osteofluorosis, hip lameness and stiffness of limbs, painful gait, un-thriftiness are the characteristic clinical symptoms. Palpably and visibly enlarged bones particularly the mandible, sternum, metacarpal, and phalanges become short thicker, broader, porous, brittle, hence are prone to fracture.

Immature animals have relatively greater sensitivity and susceptibility and less tolerance to fluoride. A few of the immature camel (calves), goats (kids) and sheep (lambs) were found to be afflicted with either dental or skeletal fluorosis. The excessive intake of fluoride is usually observed as skeletal, abnormalities or damage. Many detailed medical investigations have confirmed that there is no adverse effect on the body from continuous long term consumption of 1 mg/l in drinking water. Ingestion of 20/30mg /day or more through water over all long period result in crippling fluorosis and severe osteosclerosis. Calcification of certain ligaments, rendering movement of joints difficult, is usually associated with at least 10 mg/l of fluoride in drinking water.

The bone structure was found to be burred and it becomes a diffuse structure less shadow with uneven contours. These changes were marked in the spine and ribs. The actual lethal dose in between 2.5 and 5.0 gm depending upon the solubility of the compound and susceptibility. Cattle have been the species most commonly affected, and the symptoms of excessive fluoride ingestion in the species include lesions in the developing dentition, skeletal lesions, lameness, chemical evidence of tissue fluoride ingestion in that species include: lesions in the developing teeth and decrease in production. Dental lesions occur when excessive amounts of fluoride are ingested during the period of tooth formation and calcification. Bone effects the incisor teeth of a 6 year and 8 month old cow drinking fluoridated water from birth. All teeth have severe brown discoloration, and the enamel of these areas is thinner and has receded from the surrounding less-disturbed enamel. The maxillary gingiva is recessed, and the exposed distal enamel exhibits extensive defects. The mandibular gingival has receded and is bulging. The entire masticatory surface of the mandibular teeth has a severe brown coloration.

The teeth of a camel that has been consuming fluoridated water from 21year has brown discoloration of the enamel and extensive defects of the distal enamel of the maxillary teeth are present. A severe loss and recession of apical alveolar bone resulted in exposure of the distal clinical crown and the upper part of the roots of the maxillary teeth along with recession and bulging of the gingiva of the mandibular teeth. In milk producing animals like cow, buffalo and goats etc., the milk production is indirectly affected by fluoride toxicosis. Due to poor mastication

of roughages by unevenly worn teeth results in poor digestion and utilization of feed. Lameness associated with fluoride toxicosis may limit feeding time. Prolonged ingestion of excessive fluoride reduces the conception rates of cattles. Some secondary factors like poor body condition etc. has also seen to decrease the rate of reproduction. Decline in fertility is observed in cows and buffaloes receiving 8-12 ppm. fluorine continuously.

III. CONCLUSION

Nagaur district was observed to have 27.8% of villages with concentration range between 3.1 to 5.0 mg/l, 26.96% villages have between 1.6 to 3.0 mg/l, 15.64% have more than 5.0 mg/l, 14.56% between 1.0 to 1.5 mg/l. But only 14.64% villages have less than 1.0 mg/l fluoride concentration in their ground water. Skeletal fluorosis, skeletal deformities, bony exostosis, muscle wasting, poor body condition, reductions move stiffness were observed.

IV. RECOMMENDATIONS

Prior to providing safe water, it is necessary to carry out a benchmark health survey of the community. The timing of the initial survey should be closer to the date of commissioning of the safe water source. It is equally important to carry out a second health survey among the same population, 2 or 3 weeks after providing safe or defluoridated water for impact assessment. When health complaints-especially early warning signs of fluoride poisoning-disappear, the community needs to be informed about it. The rainwater harvesting is the best possible option to make fluoride-free water available to both the human beings and domestic animals.

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