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Environmental Lead Toxicity in Cattle

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Lead has been suggested as one of the common metal toxicants of cattle, the main source being paint containing lead. Other sources of lead include forages around lead mining areas and smelters, feed ingredients contaminated with lead either during transportation or storage, trough piles, grease and batteries (BUCK 1975, HAMMOND & ARONSON 1964, OSWEILER & RUHR 1978). Recently, cattle in some villages near a lead mining area in Vinukonda Taluk of Guntur District of Andhra Pradesh, India, were affected by a disease hitherto not prevalent in that area. A preliminary study showed that it was due to lead toxicity. The results of this study are presented here.

AREA SURVEYED

During the last decade, lead ore is being mined in the village Bandlamotu in Guntur District of Andhra Pradesh, India. During the last two years, the mined lead ore is being concentrated in a plant, and the effluents are released into the open space around. Large deposits of whitish soft powder as well as slaty black deposits are found at the site of discharge. The effluent then flows in the form of a canal for a distance of about one kilometer before it joins a natural stream of water. This stream serves as a source of water to the neighbouring villages for various purposes including drinking water for cattle, water for washing, for bathing and to catch fish. The stream flows rapidly, and after passing through a few villages joins a big water reservoir situated about 20 kilometers away from the mines. The water reservoir covers an area of over 1800 acres.

In some villages, the stream passes adjacent to drinking water wells, where the level of water is similar to that of the stream. With the drying up of the stream in summer, deposits of whitish soft powder and slaty black deposits are found in the bed of the stream for several miles. These deposits are reportedly utilized by people for a variety of

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purposes including cleaning of utensils, as tooth powder, for decorating the house fronts, as pesticides and also as an adulterant to fertilizers. In some villages, the water from the stream overflows into neighbouring fields where paddy and sorghum are cultivated.

THE DISEASE

In 1976, for the first time, the cattle of the village Malapadu about 2 kilometers from the lead ore concentrating factory, were found to suffer from an unidentified disease which sometimes ended fatally. Cattle which drank water from the stream, particularly during summer months, suffered from diarrhoea, abdominal colic, and passed dark coloured stools. This was seen only as long as they drank water from the stream. This was followed within a few days by anorexia, lassitude, weakness of limbs and inability to get up from the lying posture. Excessive froathy salivation was sometimes seen. In a few animals absolute constipation and retention of urine were followed by painful writhing movements of the body and death - features clearly suggestive of lead poisoning.

Examination of human residents in these areas did not reveal the presence of any unusual disease. In some residents, however, dental mottling was observed.

A few villages - situated about 5 kilometers away from the mining operations which were at a higher elevation were also studied. The population in these villages were essentially similar to those in the village Malapadu. There was not a single instance of the disease of the type seen in Malapadu cattle. These cattle grazed on hills away from the mining site and drank water from streams flowing towards the village Malapadu.

LABORATORY ANALYSIS

Samples of the following materials were collected and analysed for their lead content. Levels of copper and zinc were also determined.

1. The effluent.
2. Deposits along the flow of the effluent and the streams.
3. Well water samples.
4. Samples of cow dung from affected cattle.
5. Milk samples from affected cattle.

The samples were processed for analysis of heavy metals according to the method described by HOOVER (1972). Quantitation was carried out using atomic absorption spectrophotometer (Varian techtran AA-5).

RESULTS

The effluents at the site of discharge contained as much as 75 ppm of lead. Fairly high amounts of lead were also found in the soil deposits near the flow of the effluent. Dung of the affected cattle contained between 4.7 and 38.3 ppm of lead in contrast to around 3 ppm in the dung of unaffected cattle (Table). The level of lead in water from wells used for drinking purposes was however not high. In all three samples of milk obtained from affected cattle, lead content was much higher than the 0.02 ppm found in normal milk.

TABLE

Level of contamination of various heavy metals (ppm) in samples collected from affected areas

Material	No.of samples	Lead	Copper	Zinc
Soil	(3)	24. -183	0.25-1.2	4.0-11
Cow's milk	(3)	0.05-0.15	0.008-0.01	0.02-0.06
Dung	(7)	4.7—38	0.02-0.24	0.65-3.1
Well water	(3)	0.1— 0.5	Upto 0.01	0.02-0.06

In one of the samples of white powder collected from the dried stream bed through which the effluents flow, 280 ppm of lead was detected. This powder is often used by the villagers to clean their teeth.

DISCUSSION

These preliminary data clearly indicate that the neurological disease in cattle is due to lead poisoning and that the source of lead for the cattle is the contaminated drinking water. Cattle while grazing also ingest considerable amounts of soil and since the soil in these areas contain high amounts of lead, this could have contributed additional amounts of lead. In fact, it has been reported that cattle while grazing can ingest several folds more of lead from soil than from herbage (THORNTON 1973).

Lead poisoning in cattle has been shown to be seasonal (BUCK 1975). The present outbreak also, occurred in summer conforming to the general pattern. This could be attributed to availability of only the polluted water for drinking for the cattle during summer. It has also been claimed that exposure to sunlight increases exposure to vitamin D which in turn increases absorption of lead through the gastro-intestinal tract (BYERS 1959).

It is significant that at present there are no evidences that lead poisoning has occurred among humans in this area. Although, it has been demonstrated that children living in a high soil lead area are exposed to increased burden of lead, by itself, it is insufficient to constitute a serious hazard (BARLTROP et al. 1975). The risk of humans developing chronic lead poisoning in future in this area through drinking milk of affected cattle, or through consumption of crops raised in this area containing amounts of lead needs to be considered and preventive measures implemented.

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