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4(5)

Hammond, P.B. and Aronson, A.L. (Univ. of Minnesota, St. Paul): LEAD POISONING IN CATTLE AND HORSES IN THE VICINITY OF A SMELTER. Annals of the New York Academy of Sciences 111, Art. 2:595-611 (Apr. 24), 1964.

An outbreak of lead (Pb) poisoning in 1962 in horses and cattle from 3 different farms in the vicinity of a Pb smelter near St. Paul, Minn., where old battery plates were melted down, is reported. After 4 cows had died at Farm A, the veterinarian serving the area requested assistance. Pb poisoning was confirmed on the basis of characteristic clinical signs exhibited by one of the surviving cows and the presence of approximately 18 ppm Pb in the liver of a dead cow. In total, 9 cows, 2 horses and 6 ponies died and 3 additional horses showed signs of illness while 4 cows from Farm C never exhibited signs of poisoning. The Pb concentration in the blood of 12 cows which had survived the episode, ranged from 0.30 to 1.26 mg. per liter, compared to an average normal of 0.10 to 0.129. The range of Pb concentrations in the blood of 6 horses tested in the vicinity of the smelter was 0.23 to 0.47 mg. per liter compared to a normal of 0.04. The Pb contact of alfalfa-clover hay and corn silage grown immediately across the road from the smelter and fed to the animals, was 26 to 284 ppm (analyzed without further drying): In order to get a better picture of the extent of contamination, samples of wintered-over vegetation were analyzed. Contamination with Pb decreased with the distance from the smelter and was appreciably greater when the samples were taken close to busy highways. It was estimated that the minimum cumulative fatal dose of Pb for cows was 6 to 7 mg. per kg. per day while

(cont. on card 2)

231 Kettering Laboratory, University of Cincinnati

4(5)

Hammond, P.B. et al. 1964 - card 2

horses appeared to be more susceptible, calculating that they had ingested 2.4 mg. Pb per kg. per day. Even under conditions of prolonged intake the syndrome in cattle was acute or peracute. Analysis of the Pb content of the milk from 8 normal cows (0.006 to 0.013 ppm) and from the affected showed a rather constant relationship between Pb excretion in milk and Pb concentration in the blood cells, the ratio of Pb in blood to Pb in milk being approximately 23. The high level of Pb in the colostrum of a Pb-exposed cow about to freshen suggested that the blood-milk barrier acquires different permeability characteristics for metals at the time of parturition. Also, Pb excretion in milk was not enhanced during therapy with ethylenediaminetetraacetate (EDTA). The conclusion was drawn that the mammary gland and the kidney apparently behave differently with regard to excretion of the Pb EDTA complex.

Evidence was presented that excessive mobilization of Pb by means of EDTA, at least under conditions of long-term accumulation in cattle, is a hazardous procedure. The authors point out that although this observation was made only on 1 animal, it is of sufficient importance to warrant study. No adverse reactions were seen in chronically poisoned horses, given 110 mg. EDTA per kg. intravenously on 3 successive days. There was no effect whatever on the Pb concentration in blood, leading to speculation on the mobility of Pb deposited in the erythrocytes and in soft tissue

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generally under conditions of chronic intake as compared to the acute.

Since public reaction to the Pb poisonings on the farms was vigorous, the state health department was requested to analyze well water, home-grown vegetables, milk and to test blood and urine of residents. In no case was any evidence of abnormal Pb accumulation found. The problem was clearly one of hazard to herbivorous animals in the vicinity of the plant.