Lead Poisoning In The Bovine Animal

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Lead continues to be the most commonly diagnosed cause of poisoning in cattle. During 1979 the Oklahoma Animal Disease Diagnostic Laboratory investigated 299 cases of suspected heavy metal poisoning. Fifty-five cases were confirmed as lead poisoning in cattle.

The seasonal distribution involved 31 cases during the spring, 13 cases during the summer, 4 during the fall and 7 during the winter months.

While the source of lead often remains unknown the most common causes encountered by our laboratory include lead-based paint, used crankcase oil, machinery grease, pipe joint compound and lead storage batteries. Unusual sources have included feed sacks containing 20,000 ppm lead in the colored printing ink, garden hose, pelleted feed and lead contaminated soil. Our laboratory has also investigated cases involving forage contaminated by industrial emissions[1].

Clinical signs of lead poisoning are varied and may involve both the CNS and gastro-intestinal systems[2].

Common CNS signs include blindness, head bobbing, hyperirritability or depression and convulsions. Anorexia, diarrhea and excessive salivation are frequent gastrointestinal signs[3].

Gross and microscopic pathological changes associated with lead poisoning are minimal and diagnosis is most often made on the basis of lead analysis of blood or tissues. The differential diagnosis must include polioencephalomalacia, nervous coccidiosis, insecticide poisoning, rabies, pseudorabies, listeriosis, cerebral edema, brain abscesses and sodium ion toxicity.

Recommended treatment for lead poisoning includes parenteral administration of calcium disodium edetate. Oral administration of mineral oil, magnesium sulfate and calcium carbonate have also been recommended.

The toxicology section of the OADDL performed 2601 analytical procedures during 1979 of which 299 were heavy metal analyses. Blood lead levels on 27 confirmed cases ranged from 0.290-2.10 ppm (Table 1). Most laboratories generally consider blood lead levels greater than 0.30 ppm to be clinically significant [3]

Table I
Lead Levels Associated With Clinical Lead Toxicosis in Cattle (ppm wet weight basis)

TISSUE	No. Of CASES	MEAN	RANGE
Blood	27	0.849	0.39-2.10
Kidney	27	72.84	6.20-195
Liver	19	37.5	3.99-490
Rumen Contents	3	233	80-490

The average non-significant blood lead value from 51 cases where lead poisoning was not confirmed was 0.066 ppm (Table 2).

The average kidney lead level from 27 cases where lead poisoning was confirmed was 72.84 ppm with a range of 6.20 to 195 ppm.

The average non-significant lead level on 41 bovine kidneys where lead poisoning was not diagnosed was 0.318 ppm with a range of 0.02 ppm to 1.210 ppm.

Case History I

Approximately 80 head of 15 month old registered Holstein heifers had been exposed to "pipe dope" left on the premises by an oil well service company. There was evidence that four discarded buckets originally containing 25 pounds of "pipe dope" had been licked clean by an unknown number of heifers.

The composition of the material was 36% grease, 30.5% lead and various percentages of copper and zinc.

Exposure had occured over the last two days. Forty-three heifers with evidence of the material on their face and muzzles were treated with 1½ gallons of mineral oil and placed under observation. Blood samples were collected from 15 of the animals for lead analysis. Several of the animals were passing black tarry stools. The animals were placed on grass and hay. The next day they were again treated with mineral oil and given one pound of calcium carbonate. The blood levels ranged from 0.006 to 0.420 ppm. Five of the 15 animals with high levels were treated intravenously with 200 ml calcium disodium edetate (Havidote).

Several of the animals were showing signs of mild depression, incoordination and drooping eyelids. The next day 3 additional heifers were showing signs of incoordination and impaired vision. These animals were treated three times during the day with calcium disodium edetate and placed under observation. The blood lead levels on these three heifers were 0.03, 0.048 and 0.558 ppm.

The 15 heifers in the original treatment group were sent home one week after their initial treatment with complete remission of clinical signs.

Blood lead levels on the 3 additional heifers was determined to be 0.09, 0.30 and 0.15 ppm one week after their initial treatment and they were sent home with complete remission of clinical signs.

Case History II

Six calves had died and 10 were sick in a herd of 60 cows and calves. The clinical signs included bawling, circling and pica. A 3 month old heifer was submitted to the laboratory for necropsy. Water from a salt water storage tank and sludge pit material were also submitted for analysis. The cattle had access to an unfenced oil production site where the salt water tank had been recently spray painted with "red lead paint". Paint chips and wet paint samples were also submitted.

The kidney lead level from the necropsied calf was 51.6 ppm, the sludge pit material contained 0.4 ppm lead and the paint samples contained 650,000 ppm lead. Paint flecks were noted in the rumen contents.

Both of these cases emphasize that several sources of lead exist around oil production sites. The availability of lead containing compounds such as pipe joint compound, grease and paint and the extreme toxicity of lead to cattle constitutes a hazard that could perhaps be minimized by fencing oil production and drilling sites.

References

1. Edwards, W. C. and Clay, B. R., Reclamation of Range Land Following a Lead Poisoning Incident in Livestock from Industrial Airborne Contamination of Forage. Veterinary and Human Toxicology 19: 4, 247-249 (1977) - 2. Buck, W. B., Toxic Materials and Neurologic Disease in Cattle JAVMA 166: 3, 222-226 (1975) - 3. Leary, S. L., Buck, W. B., Lloyd, W. E., and Osweiler, G. D., Epidemiology of Lead Poisoning in Cattle. Iowa State University Veterinarian, 3: 112-117 (1970)

Table II
Lead Levels From Cases Not Confirmed as Lead Poisoning (ppm wet weight basis)

TISSUE	NO. OF CASES	MEAN	RANGE
Blood	51	0.066	0.02-0.28
Kidney	41	0.318	0.02-1.21
Liver	9	0.314	0.02-2.57
Rumen Contents	6	3.31	0.60-33.0