Catastrophic Cattle Loss from Urea Poisoning

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Introduction

On the morning of July 9, 1975, two Holstein heifers were presented for necropsy. These heifers were only two of nineteen found dead the previous evening.

Catastrophic losses such as this confront most large animal practitioners sooner or later and present a stressful emotion-laden situation requiring clear thinking and intelligent questioning to elucidate the nature of the disease process.

History

At 10:00 a.m., July 8, 1975, water was hauled to 31 Holstein replacement heifers maintained at a barn with an attached lot isolated from other buildings and dwellings. There were 16 heifers in one group averaging 6 months of age and 15 heifers in the second group averaging 10 months. The heifers were fed grain and hay daily. Both groups had access to small permanent bluegrass pastures. The water tanks were empty upon arrival. All heifers ate and appeared normal when fed and watered. When rechecked at 7:00 p.m., fourteen of sixteen in the younger age group and five of fifteen in the older age group were dead.

The local veterinary practitioner was called and found the remaining 12 animals to be clinically normal. Two of the dead, all of which were bloated, were selected for submission to the diagnostic laboratory for necropsy.

Necropsy Observations

Both heifers presented to the Ohio Veterinary Diagnostic Laboratory 15 hours after they were found dead were extremely bloated. Bruising in the shoulder and inguinal regions of one heifer was noted. Echymotic hemorrhages were in skeletal muscles of the other heifer. Fat depots were adequate in both. The rumens contained a larger proportion of liquid than would be observed in the usual ruminant necropsy. Rumen and abomasum contents were not grain rich. There was hemorrhage in the jejunum of both animals. Colonic contents were normal. The urinary bladders were empty.

Further communication with the owner after necropsy indicated the following:

1. A thunderstorm passed through the area the afternoon the cattle were lost. Fourteen of sixteen were found in the barn, which showed no evidence of lightning strike, thus precluding lightning as the cause of death.
2. Electrocution had been ruled out by careful examination of the barn electrical system.
3. The barn was open on one side, eliminating noxious fumes from consideration.
4. Known toxic plants were not in the hay or in the pasture.
5. The grain was from a batch that had been used out of for several days.
6. A 250-gallon tank used to transport liquid fertilizer had been used to haul the water of which 100 gallons were consumed. The tank had been most recently used in the field and was not rinsed before the water was added. This procedure had been followed several times before with no problems resulting.

Toxicologic Findings

The liquid fertilizer manufacturer indicated that the undiluted product hauled in the tanks consisted of 17.5% nitrogen from urea out of 18% total nitrogen, 5% phosphoric acid, 5% potassium, and 1% sulfur from ammonium thiosulfate. The pH of the undiluted fertilizer was 7.2. The water given to the heifers contained 2.5% urea but no free ammonia.[1] Spot tests for nitrite in rumen contents and water sample were negative. Rumen ammonium levels were determined to be less than 10 mg/100 ml. Tests for cyanide, chlorinated and organo-phosphate pesticides, nitrates, and heavy metals in rumen contents were negative.[1]

Discussion

Fatal urea poisoning in ruminants occurs following rapid ingestion of 1.0 to 1.5 gram/kg body weight (2). Urea is hydrolyzed by ruminal micro-organisms with production of carbon dioxide and ammonia. Release of ammonia, the actual toxic principle, is a rapid process with only 7.6% of radio-labeled urea remaining in sheep rumens six hours after administration (1). Rumen ammonia levels in urea poisoning are over 80 mg./100 ml Ammonia odor is evident in rumen contents if at levels over 10.0 mg/100 ml (3).

Onset of signs with progression to death or recovery occurs within 30 minutes to 4 hours. Clinical signs, when observed, include colic, hypersalivation, and grinding of the teeth, progressing to tremors, ataxia, hyperpnea, bloat, and bellowing with terminal tetanic spasms (2).

Necropsy findings, though characteristic, are not specific. Thus, elucidation of the cause of death requires a detailed history and chemical analysis of suspect nutrient source in addition to clinical and

[1]A.O.A.C. Method

necropsy findings. Rumen and blood ammonia levels are of diagnostic value if obtained from the live animal or one dead less than a few hours. Rumen ammonia levels in this case were noncontributory because of the prolonged post-mortem interval prior to collection of samples.

Consumption of approximately 100 gallons of water indicates each of the 31 heifers could have received 300 grams of urea or potentially enough to kill a 660 pound animal if each drank equal quantities. (The estimated average weight of the smaller group was 500 pounds and 800 pounds in the large.) The heifers necropsied apparently were quite thirsty as evidenced by the empty urinary bladders and drank excessively as evidence by the "tanked up" rumens. Differing quantities consumed obviously accounted for the deaths in some and not in others.

Acknowledgments

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Examination and Surgery of Prolapsed Cervical Rings

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The purpose of this presentation is to focus attention on the value of the vaginal speculum as a diagnostic aid and secondly to emphasize abnormalities of the cervix as a cause of infertility. The use of a vaginal speculum should be routine in the examination of repeat breeder cows.

As veterinarians, often we overlook or ignore cervical problems in our examination of the reproductive tract. With the use of a vaginal speculum, especially one with the light at the distal end, it is possible to thoroughly examine the vagina and the cervix. With this instrument we can diagnose vaginitis, pneumovagina and urovagina, abnormal discharge from the cervix, scar tissue involving the cervix and prolapsed (everted) cervical annular rings. The above listed conditions may go undetected if only a rectal examination is made.

If we detect injury to the cervix as evidenced by the presence of scar tissue in a repeat breeder cow, we may not be able to correct the situation, but we can advise the owner that it may be responsible for the cow's failure to conceive and/or maintain pregnancy.

Cervicitis as evidenced by swelling, redness and enlargement of the external os and muco-purulent discharge can be recognized and treated with antibiotic or disinfectant (2% Lugol's solution) infusion plus sexual rest until the inflammation subsides.

Prolapsed Cervical Annular Rings

Eversion of annular rings through the external os of the cervix is evidence of injury to the cervical canal, which may have occurred during parturition or manual dilatation of the cervix for removal of retained fetal membranes. Amputation of the prolapsed tissue has proven beneficial in repeat breeder cows.

The everted tissue varies in size from a small protrusion to a cauliflower-like structure, of 1" to 2" diameter which is actually the free border of the annular fold which tapers to its attachment in the cervical canal. On rectal palpation the posterior end of the cervix feels 2-3 times normal size.

This condition may interfere with conception by providing a site for chronic infection which may invade the uterus and prevent implantation. Another possibility is that the prolapsed rings prevent the external os of the cervix from closing and maintaining a cervical plug. This may allow early fetal death or premature termination of pregnancy.

Surgical Procedure

1. Epidural 4-5 cc. Xylocaine, 2% prevents straining and defecation during surgery.
2. Surgical scrub of vulva and perineal area.
3. Secure the prolapsed tissue in the jaws of a uterine forceps with the aid of the left hand in the vagina.
4. Expose the cervix at the vulvar lips by gradual traction with left hand holding the cervix and right hand holding the uterine forceps.
5. Have assistant retract the lips of the vulva to expose the cervix.
6. Amputate the prolapsed tissue as close as possible to its attachment in the cervical canal with a scissors or scalpel.
7. The cervix retracts to the normal position and the vagina may be irrigated with 2% Lugol's.

Following are the results of surgery in 12 cases which we have detected in the past 2-1/2 years.

Results of Surgery

No. of Cases	12
No. of Pregnancies Resulting	11 (1 abortion)
Avg. Age of Cows	10 years
Avg. Interval Calving to Surgery	7.6 months
Avg. No. of Services Before Surgery	3.5
Avg. Interval Surgery to Conception	1.5 months
Avg. No. of Services After Surgery	1.58

In conclusion, may I remind you that the use of a vaginal speculum opens up a whole new world in the diagnosis of infertility in repeat breeder animals.

References

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