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Case Reports - Blister Beetle Poisoning (Cantharidiasis) of Dairy and Beef Cattle

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Abstract

Blister beetle poisoning (cantharidiasis) of horses has been well documented. Primary exposure to blister beetles is through consumption of contaminated alfalfa hay. Confirmed cases of bovine cantharidiasis due to natural exposure have not previously been documented in veterinary literature. This report describes blister beetle poisoning in three dairy herds and one beef herd. Cows in two large dairy herds consumed blister beetles in a total mixed ration containing green chop alfalfa. The most significant clinical signs were mass refusal to eat the freshly cut green chop alfalfa, although the cows appeared hungry, and the corresponding dramatic decrease in milk production. Cows in a smaller dairy herd and a beef herd consumed large round bales of alfalfa hay containing blister beetles. In contrast to cows exposed to the beetles in green chop, feed refusal in these cases was limited to individual cows. Other clinical signs included salivation, bruxism, frequent urination, diarrhea, reluctance to move, abdominal pain, ataxia and recumbency. Postmortem examination did not reveal significant gross or microscopic lesions. Cantharidin was detected by gas chromatography-mass spectrometry analysis of either urine or feed samples. In addition, blister beetles were found in the alfalfa green chop or hay.

Résumé

L'empoisonnement par des méloés (coléoptères qui causent des cloques) chez les chevaux est bien documenté. L'exposition primaire aux méloés se fait par la consommation de foin de luzerne contaminé. Des cas confirmés de cantharidiase chez les bovins suite à une exposition naturelle n'ont pas été rapportés dans la littérature vétérinaire. Ce rapport décrit des cas d'empoisonnement dans trois troupeaux laitiers et un troupeau de boucherie. Les vaches dans deux gros troupeaux laitiers ont ingéré des méloés dans une ration totale mélangée contenant de la luzerne hachée fraîche. Les signes cliniques les plus significatifs étaient le refus en masse de manger la luzerne hachée, même si les vaches semblaient avoir faim, et en parallèle la baisse dramatique de la production de lait. Des vaches dans un petit troupeau laitier et un troupeau de boucherie consommèrent des bottes de foin rondes de luzerne qui contenaient des méloés. Au contraire des vaches qui avaient mangé de la luzerne hachée, le refus de s'alimenter n'a été observé que chez certains individus. Les autres signes cliniques inclurent la salivation, le bruxisme, l'urination fréquente, la diarrhée, la résistance à se déplacer, la douleur abdominale, l'ataxie et le décubitus. L'examen postmortem n'a pas révélé de lésions macro- ou microscopiques. La cantharidine a été détectée à la fois dans les échantillons d'urine et d'aliments avec l'aide d'un spectrophotomètre de masse avec chromatographie au gaz. De plus, des méloés ont été trouvés dans le foin et la luzerne hachée.

Introduction

Consumption of blister beetles (*Epicauta* sp; Figure 1) in alfalfa is a common cause of severe and often fatal disease of horses.[1,8,9,14,15] Documentation of cantharidiasis in cattle naturally exposed to blister beetles is lacking. The following cases illustrate that blister beetles can cause severe economic loss in cattle.

Case Reports

Case 1. In June 1995, 2000 Holstein cows on a dairy in southeastern New Mexico were fed freshly cut green chop alfalfa during the morning feeding, and no abnormalities were noted. When fed that evening, the cows were reluctant to eat the green chop alfalfa, although they appeared hungry. Milk production was

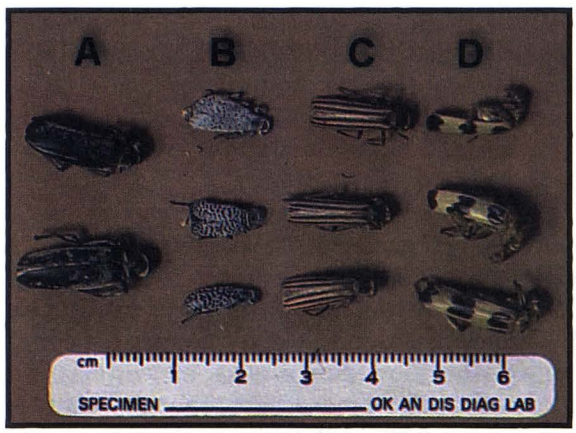

Figure 1. A. *Epicauta immaculata*
B. *Epicauta apache*
C. *Epicauta occidentalis*
D. *Pyrota sp.*

decreased, cows were reluctant to move, exhibited frequent urination and many had diarrhea. Subsequently, four cows became ataxic, had increased salivation and profuse diarrhea.

The following morning the green chop alfalfa was removed and replaced with dry hay; the cows immediately resumed eating. Total herd milk production was significantly depressed for four days. Two of the four acutely ill cows died in less than 24 hours after the onset of clinical signs, and the two remaining cows were salvaged at a local packing plant the next day. Oral ulcers were observed in the slaughtered animals.

A urine sample from one of the salvaged cows was submitted to the Oklahoma Animal Disease Diagnostic Laboratory (OADDL) and contained 36 ppb cantharidin when analyzed by gas chromatography-mass spectrometry (GC/MS). Two samples of the green chop alfalfa and one sample of the total mixed ration (corn, cottonseed meal, and green chop alfalfa) were analyzed by GC/MS and contained 680, 4450 and 550 ppb cantharidin, respectively. Blister beetles were found in the green chop alfalfa, and were identified as *Epicauta apache* by the Oklahoma State University Department of Entomology.

Case 2. This case occurred in August 1996 and involved another southeastern New Mexico dairy milking 2000 Holsteins. These cows were fed a total mixed ration (TMR) which included fresh green chop alfalfa, which was supplied to the dairy by a custom harvester. The alfalfa was harvested between 9 and 10 AM, and fed by 2 PM the same day. All of the cows offered the feed containing the recently cut alfalfa green chop appeared hungry, but refused to eat. When the green chop alfalfa was replaced with alfalfa haylage from a different source the cows immediately began to eat.

Clinical signs included increased urination, reluctance to move and significantly decreased milk production. No deaths were reported. Seven *Epicauta apache* blister beetles per kilogram were found in the sample of the TMR submitted to the OADDL. This TMR containing the green chop alfalfa was delivered to five dairies that day, but fortunately it was only fed at this particular dairy that morning. Early recognition of feed refusal in this herd prompted notification of a suspected problem, therefore the other dairies did not feed it.

Case 3. During December 1997, a northwestern Oklahoma dairyman observed five acutely ill cows in his 70-cow Jersey herd. Two of the five cows died. Cows were allowed free-choice access to round bales of alfalfa hay, and were fed a pelleted dairy concentrate while in the milking parlor. While in the milking parlor, cows would attempt to eat but would start coughing after ingesting one or two bites of pellets. After expelling the ration, cows would salivate profusely, and were reluctant to attempt any further eating.

One of the two dead cows was submitted to the OADDL for a necropsy examination; no significant gross or microscopic lesions were observed. The urine from this cow was negative for cantharidin, but urine submitted from a herdmate collected at the time of acute illness contained 5 ppb cantharidin. Striped blister beetle fragments were found in the hay but were not submitted for identification.

Case 4. Three cows in a 45-head Hereford herd in northwestern Oklahoma died in January 1999. Clinical signs observed by the owner included mild ataxia, bruxism, abdominal pain, recumbency and death within 24 hours. The cows had been grazing dormant native grass pastures, and were supplemented with natural protein cubes and large round bales of alfalfa hay.

Postmortem lesions observed by the local veterinarian included scattered areas of mucosal hemorrhage throughout the small intestine, and multiple focal pale areas on the surface of the kidneys. Urine and formalin-fixed kidney from one cow were submitted to the OADDL. Four hundred-twenty ppb cantharidin was detected in the urine by GC/MS analysis. Microscopic examination of the kidney tissue did not reveal any lesions.

The cattleman found black blister beetles in the alfalfa hay. They were not submitted for identification.

Discussion

Cantharidin, the toxic component found in blister beetles, has been classified as a drug for over 25 centuries. Hippocrates prescribed the drug for dropsy, and as late as the early 1900s it was still used to treat pleurisy and pericarditis.[4] Its centuries-old reputation

as an aphroidisiac and abortifacient, know as "Spanish Fly," is well known even though unfounded, and its use as an abortifacient has caused the death of women that have used it.[4]

Cantharidin's effect on the horse, and association with blister beetles in alfalfa, was first documented in the 1970s.[14] Although three calves experimentally poisoned with blister beetles died within 56 hours, clinical signs of cantharidiasis in cattle naturally exposed to blister beetles have not been previously documented.[2]

Hypocalcemia and hypomagnesemia are constant findings in horses with cantharidiasis.[2,10,15] Clinical observation of synchronous diaphragmatic flutter is thought to result from the hypocalcemia.[15] Further investigation of bovine cantharidiasis is needed to determine if hypocalcemia also occurs in cattle, and if decreased serum calcium levels cause the ataxia and recumbency seen with bovine cantharidiasis.

Many cases of bovine cantharidiasis probably go undiagnosed or are attributed to non-specific gastrointestinal or urinary tract disease. The increased awareness of the potential for blister beetle poisoning of cattle will hopefully lead to increased submission of urine, stomach, and feed samples for cantharidin analysis.[11,12] Blood samples from suspected cases allow evaluation of the clinical pathology changes that occur in cattle. The length of time cantharidin is detectable in urine is dose-dependent.[13] Urine samples taken from cows more than 72 hours after ingesting blister beetles may not contain detectable levels of cantharidin.[5] There are no consistent gross or microscopic changes that are diagnostic for cantharidiasis in equine.[3] Whether this is true for cattle is still unknown.

There are over 200 species of blister beetles in the United States, and the amount of cantharidin in the beetles ranges from less than 1% to almost 6%.[15] Cantharidin is found in the hemolymph and gonads, and is exuded by blister beetles as a defense mechanism. Adult male blister beetles contain significantly more cantharidin than the female, whose cantharidin level decreases from the pupa to the adult stage.[3,6] During mating, the female obtains cantharidin from the male.[5]

Although the striped blister beetles (*Epicauta occidentalis* and *E. temexia*) are most commonly associated with equine poisoning in the southwestern United States, spotted and black blister beetles (*Epicauta apache* and *E. pennsylvanica*, respectively), along with beetles in the *Pyrota* sp also cause illness.[2,6] The species of blister beetles that produced illness in both dairy and beef cattle in northwestern Oklahoma was not determined. *Epicauta apache,* found in the alfalfa in the large dairy outbreaks, is found in the higher elevations of New Mexico and Arizona.

Although appropriate therapy for cantharidin toxicity of cattle has not been established, symptomatic treatment, including the administration of activated charcoal and saline cathartics, should be considered. The administration of calcium, intravenous fluids and analgesics may be warranted.

Adult blister beetles travel in swarms, and generally travel less than 50 yards from where they were hatched.[16] Adults prefer the blossom of flowering plants but do eat leaves when blossoms are unavailable. The beetles feed on goldenrod, pigweed, peanuts, soybeans, and many other flowering plants, as well as alfalfa.[16] Blister beetle pupa feed on grasshopper eggs before over-wintering in the soil; therefore habitat surrounding alfalfa fields that is favorable for grasshoppers increases the probability that blister beetles may be present.[16] The referring New Mexico veterinarian was told by the area "old timers" that "beetles are found in greater numbers in alfalfa fields bordered by range land". The green chop alfalfa was harvested from a field bordered on three sides by range land. When spraying alfalfa fields to control blister beetles, it is important to examine the forage surrounding the field for blister beetles, and include the outer boundary of the field and adjacent fence rows and ditches in the area to be sprayed.

Haying equipment that crimps the plant at the time of mowing improves the quality of the hay but kills entrapped beetles and potentiates the possibility of poisoning. When using harvesting equipment that does not crimp the forage, live beetles can migrate out of the mowed alfalfa, decreasing the likelihood of their presence in the baled hay.

Conclusions

Cantharidiasis is routinely included in the differential diagnosis when horses are experiencing abdominal or urinary tract discomfort and have been fed alfalfa.

These cases suggest that blister beetle poisoning can also cause significant economic losses in cattle because of lost milk production, animal illness and death. When there is a history of exposure to alfalfa hay or green chop alfalfa and hungry cattle refuse to eat, and experience salivation, abdominal discomfort, polyuria, ataxia, acute downers, and unexplained death, cantharidiasis should be included in the differential diagnosis. When bovine cantharidiasis is suspected, urine, rumen content, and feed samples should be analyzed for cantharidin, and the suspected feed should be thoroughly examined for the presence of blister beetles.

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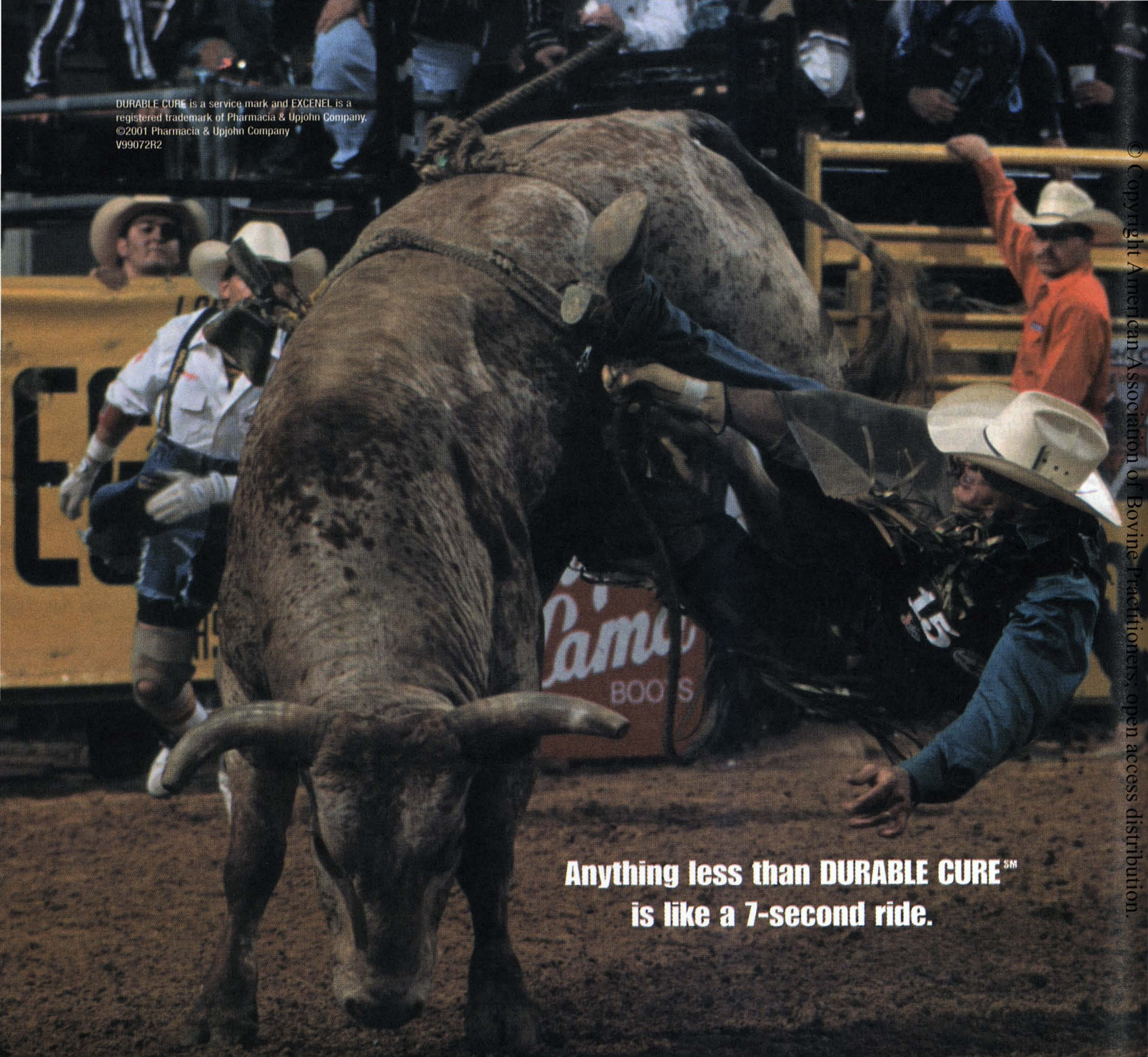

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