Cantharidin toxicosis

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Cantharidin poisoning due to ingesting blister beetles occurs most frequently in livestock that consume alfalfa hay: cattle, goats, sheep, and horses. Horses are more commonly affected than ruminants.[1] Cantharidin poisoning has also been reported in chickens, emus, and people.[2-4] Of the many species of blister beetles, which belong to the family Meloidae, *Epicauta* species cause the greatest economic concern in the United States.[2,4-6] Beetle distribution ranges from southern Canada to Mexico and from the Atlantic coast to New Mexico, depending on the species.[6] Adult beetles have narrow, 0.5 to 1.25 in-long bodies. The various species can be striped, spotted, or a solid color such as black or gray.[1,3,6]

Larvae hatch in the fall, feed on grasshopper eggs, and overwinter in the soil. Adult beetles emerge in the late spring and early summer, feeding on the pollen or nectar of flowering plants such as alfalfa. The adults swarm and mate in summer when alfalfa is in bloom.[5]

Hay is vulnerable to contamination when harvested during this swarming period, especially if the harvesting technique involves simultaneously cutting and crimping the hay, a common practice in many areas.[3,6] Because the beetles swarm in clusters, several insects can be trapped in a few hay bales or even in a portion of a single hay bale.[3,6] Many cases of poisoning occur in the Southwest because of the prevalence of beetles during alfalfa harvesting and the common use of the cutting and crimping harvest method. However, the potential for poisoning exists throughout the United States because of the wide distribution of the beetles and the interstate marketing of hay.[5] Beetle toxicity does not decrease during hay storage.[6]

The toxin cantharidin is a vesicant found in the beetles' hemolymph and reproductive glands.[2-6] In many species, only males produce the toxin, which is transferred to females during mating.[3,5,6] Cantharidin content can range from 0.1% to 12.7% of dry weight, depending on the species and sex of beetle.[1,3,5,6] The minimum lethal dose of cantharidin in horses may be less than 1 mg/kg of body weight.[3,6] As little as 4 to 6 g of dried beetles has been fatal in horses.[3,6]

Clinical signs (colic, depression, and decreased appetite) are most often related to abdominal pain caused by the vesicant effects of cantharidin on mucosal surfaces.[2,3,6,7] Irritation of the urinary tract by the vesicant can result in frequent urination, hematuria, or straining to urinate.[3,6,7] Other signs may include oral erosions, drooling, pyrexia, diarrhea, dehydration, tachypnea, and tachycardia.[2,3,6,7] Cantharidin may also cause hypocalcemia and its associated clinical effects including muscle fasciculations, synchronous diaphragmatic flutter, abnormal gait, dysphagia, and abnormal behavior such as aggressiveness or disorientation.[3,6,7] Sudden death with no signs of struggle has been reported.[3,6,7]

Hypocalcemia and hypomagnesemia are consistent findings and can help differentiate cantharidin toxicosis from other causes of colic.[2,3,6,7] Other abnormal laboratory findings can include hypoproteinemia, azotemia, increased creatine kinase activity, hyposthenuria, and hematuria.[2,3,6] Necropsy findings may include mucosal hyperemia, hemorrhage, edema, vesication, and ulceration anywhere within the gastrointestinal or urinary tract.[3,6] Some horses have myocardial necrosis.[3,6] Diagnosis can be confirmed by testing the urine and gastrointestinal contents for cantharidin.[3,6,7] Insect parts can sometimes be identified in gastrointestinal contents or feces.[1,3,5]

No antidote is available for blister beetle poisoning. All suspect alfalfa hay, cubes or pellets should be removed from the animal's diet. Administering activated charcoal and mineral oil may reduce toxin absorption. symptomatic care, depending on the type and severity of signs, includes analgesics, gastrointestinal protectants, intravenous fluids, electrolyte replacement, and possible, antibiotics.[3,6,7] The prognosis depends on the amount of cantharidin ingested as well as the speed and aggressiveness of therapy. A poor prognosis is associated with unrelenting tachycardia, tachypnea, and increasing creatine kinase activity over one to two days.[2]

Blister beetle poisoning cannot be completely prevented; however, many management options are available, especially for horses, which appear to be more susceptible than ruminants. Each individual block or flake of alfalfa

hay should be inspected for blister beetles. Contaminated hay should be discarded rather than being fed after beetle removal because the remaining body fluids from the beetles contain cantharidin.[8]

First-cutting hay, harvested before the insects begin swarming, is less likely to be contaminated than hay harvested later in the year. Alfalfa should be harvested before it reaches full bloom when blister beetles are most attracted to the plants. Hay is less likely to be contaminated by crushed beetles when harvested with a self-propelled mower-windrower.[9] Crimping hay crushes the beetles into the hay. Tractor tires can also crush the beetles when hay is cut with a sickle bar mower.[9] Grass hay may be preferable to alfalfa in high risk situations.

References

1. Ray, A.C. *et al*.: Etiologic agents, incidence, and improved diagnostic methods of cantharidin toxicosis in horses. *AJVR 50* (2): 187-191; 1989.
2. Shawley, R.V.; Rolf, L.L.: Experimental cantharidiasis in the horse. *AJVR 45* (11): 2261-2266; 1984.
3. Guglick, M.A. *et al*.: Equine cantharidiasis. *Compend. Cont. Ed.* 18 (1): 77-83; 1996
4. Barr, A.C. *et al*.: Cantharidin poisoning of emu chicks by ingestion of Pyrota insulata. *J. Vet. Diagn. Invest.* 10 (1): 77-79; 1998
5. Edwards, W.C. *et al*.: Cantharidin contest of two species of Oklahoma blister beetles associated with toxicosis in horses. *Vet. Hum. Toxicol.* 31 (5): 442-444; 1989
6. Schmitz, D.G.: Cantharidin toxicosis in horses. *J. Vet. Intern. Med.* 3 (4): 208-215; 1989
7. Helman, R.G.; Edwards, W.C.: Clinical features of blister beetle poisoning in equids: 70 cases (1983-1996). *JAVMA 211* (8): 1018-1021; 1997.
8. Zhu, Y.C. *et al*.: Factors influencing quantity of cantharidin transferred to alfalfa from *Epicauta occidentalis Werner. J. Econ. Entomol. 90* (6): 1665-1671; 1997.
9. Blodgett, S.L.: Blister beetle mortality evaluated during alfalfa harvest. *J. Econ. Entomol. 88* (2): 398-406; 1995.

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