



Extension

UNIVERSITY OF WISCONSIN-MADISON



Equine Toxicity Concerns due to Blister Beetles

- Poisoning by blister beetles is rare
- All hay can potentially contain blister beetles, but alfalfa hay has a greater risk
- Alfalfa blossoms can serve as a food source for adult blister beetles
- Blister beetles contain cantharidin, a burning agent or poison
- If equine and/or livestock animals display signs of toxicity, stop feeding your current hay source and contact your veterinarian immediately for diagnosis and treatment options
- Onset of toxicity symptoms can take a few hours to days
- Contact UW's Insect Diagnostic Lab for insect analysis

What are Blister Beetles?

Blister beetles, known as meloids to entomologists, are insects that naturally contain a toxin, known as cantharidin. Stored within their bodies it can cause blistering of human skin, or the intestinal tracts of animals that ingest blister beetles^{1,2,3}. Poisoning caused by blister beetles is rare, but being aware of these insects and their potential impacts is worthwhile for owners of horses or other livestock.

Cantharidin, a burning agent or poison, is produced within the reproductive systems of male blister beetles and production is stimulated due to copulation^{2,4}. During this time, males transfer the cantharidin they produced to the female blister

beetle^{2,4}. Due to this production and transfer, there is variation of cantharidin concentrations across sexes of blister beetles with female blister beetles containing lower concentrations of cantharidin compared to their male counterparts². There is also a variation in cantharidin concentrations across species of blister beetles³.

Blister beetles' range in size from 3-70 mm⁵. Blister beetles have a cylindrical shape, distinctive cranial neck, and have many different color variations depending on species^{5,6}. PJ Liesch, University of Wisconsin – Madison (UW) Entomologist and Director of UW's Insect Diagnostic Lab, also notes that blister beetles are not particularly hard or crunchy as they have a somewhat softer exoskeleton, similar to fireflies.



Figure 1 Blister beetles for size reference⁷.

Nearly 30 species of blister beetles have been documented in Wisconsin with most of these species feeding off ground nesting bee larvae⁶. While twenty-eight species of blister beetles may seem high, there are nearly 400 species of blister beetles documented within the United States, according to

Liesch. Each species varies in terms of where and when adult blister beetles are active around the United States³. According Liesch, *Epicauta*, *Lytta*, and *Meloe* are some of the most common genera of blister beetles found in the Midwest and around the country.

Where are Blister Beetles Found?

Blister beetle larvae live in the ground and feed off both nesting bee larvae and grasshopper eggs^{2,3,8}. Adult blister beetles can feed on alfalfa blossoms and many other plants³. While it is possible for blister beetles to be present within grass hay, it is much more common for blister beetles to be found in alfalfa hay as alfalfa blossoms can serve as a food source for the adult blister beetles. Blister beetles have also been found on tomatoes, potatoes, beets, lima beans, and other garden vegetables within the United States⁹. Additionally, blister beetles have been observed throughout Wisconsin on black-eyed Susan, native sunflowers, rosinweed, and prairie coreopsis, and other plants⁶.

Examples of blister beetles found within Wisconsin



Figure 2 Picture 1 - *Epicauta cinerea*⁶,
Picture 2 - *Gnathium minimum*⁶,
Picture 3 - *Tricrania sanguinipennis*⁶,
Picture 4 - *Zonitis vittigera*⁶.

Blister beetles are found in every state across the United States and in parts of Canada, Mexico, and Central America^{6,10}. Additionally, blister beetles are typically found in clusters or aggregations causing variable incorporation of blister beetles into hay².

Blister Beetles and Equine

Blister beetle toxicity in equine has been documented since the 1960s¹¹. Since concentrations of cantharidin range across species and sexes of blister beetles, it is challenging to determine how many blister beetles equine need to ingest before experiencing toxicity². The minimum lethal dose of cantharidin is estimated to be ≤ 1 mg/kg².

Table 1 Estimated number of blisters beetles consumed for a lethal (1 mg/kg) dose of cantharidin in equine².

Cantharidin content of a blister beetle (mg)	Equine Weight (lb)	
	550	1000
1	250	455
2	125	244
3	83	161
4	63	122
5	50	97

Possible signs of toxicity within equine include:

- Acting like they are colicky, in shock, have depression (depressed equine tend to have lowered heads)^{3,11}
- Frequently drinking small amount of water or keeping their muzzle submerged in water (this helps soothe lesions or blisters on the lips and within the mouth)^{3,12}
- Frequently attempting to void urine^{12,13,14}
- Profusely sweating or showing symptoms of gastric ulcerations or abdominal pain³
- Experiencing loss of appetite, weight loss, diarrhea, increased heart rate or body temperature, and laminitis¹²



Figure 3 Horse resting their muzzle in water to soothe muzzle and mouth blisters¹⁵.

The onset of symptoms can range from hours to days^{3,11,12}. If you notice signs of blister beetle toxicity, contact your local veterinarian immediately.

Tips for Hay Producers

Scout for blister beetles in alfalfa fields during second, third, and consecutive growths as well as new seedings¹⁶. Scouting is not needed during the spring growth as the alfalfa has not yet blossomed¹⁶.

Cut alfalfa before blossoms begin, to deter blister beetle attraction. As mentioned before, adult blister beetles can be attracted to alfalfa blossoms as a food source. Cutting alfalfa before flowering will decrease the amount of food available to blister beetles and will deter them from that specific area.

Avoid crimping as hay crimping and/or conditioning crushes blister beetles². While this kills the blister beetles, their carcasses are then incorporated into the bales². If hay is not conditioned or crimped, beetles are able to disperse before baling occurs^{2,17}. It is important to note that cantharidin can still be found within the carcass of the blister beetle for months after the beetle dies¹⁷.

Scout your field frequently for blister beetles if you are growing alfalfa near rangeland. Rangeland supports grasshoppers, in turn supporting blister beetle larvae².

If you see blister beetles within your fields, contact your local agronomist to discuss the appropriate insecticide. It is important to note that not all states have the same guidelines for insecticide application.

Additionally, it is important to note that spraying an insecticide directly onto alfalfa fields could cause the blister beetle to die within the field and become incorporated into hay bales. You may want to consider cultural responses, such as controlling primary weeds in and near alfalfa fields and directly controlling for grasshopper populations, as an alternative to chemical responses.

Tips for Hay Buyers

Grow your own hay or purchase hay from producers you trust. However, this is not always an option. If you need to purchase hay for your equine, or other animals, purchase first-crop hay when possible. Incorporation of blister beetles will likely be lower in first-crop hay compared to consecutive crops as there is less likely to be alfalfa blossoms to attract adult blister beetles to the first crop hay.

When purchasing hay from producers you do not know, consider testing your hay for presence of blister beetles. Contact your local extension educator, veterinarian, or Liesch at UW's Insect Diagnostic Lab to test hay for blister beetles.

Routinely examine flakes of hay before feeding.

What to do if Equine Toxicity is Suspected

If equine display signs of cantharidin ingestion, immediately stop feeding your current source of hay and contact your local veterinarian.

Before feeding the same hay source, collect a hay sample for further insect analysis. To collect an insect sample from hay sources, lay a white or light-colored sheet or tarp on the ground. Shake hay flakes or samples over the sheet or tarp, catching the dislodged insects onto the tarp or sheet. Next, collect all insects (whole and crushed insects) and place in a hard-sided container. Take caution while collecting samples by avoiding contact with skin and mucous membranes.

Once you have a sample of insects, contact your local Extension educator or entomologist.

If you are not feeding square bales, consider taking many cores throughout the round bale and shaking those out over a light-colored tarp or sheet.

What to do with Infested Hay

If the blister beetles within your infested hay have moderate or low levels of cantharidin, you could consider feeding the hay to healthy equine and/or other animals². While this may seem alarming, moderate levels of blister beetles that contain low levels of toxic cantharidin may not induce toxicity symptoms. Prior to feeding infested hay, regardless of cantharidin level, contact your local veterinarian to discuss potential feeding options and/or concerns.

If you choose to feed infested hay, watch your animals for signs of toxicity. If toxicity symptoms are observed, contact your local veterinarian immediately. If you do not want to feed any infested hay, consider burning or burying it. This will prevent exposure of cantharidin to other animals.

Just Equine?

Blister beetles have caused documented human health cases ranging from skin blisters, fever, shock, and abdominal pain to myocardial necrosis^{12,18,19}. Myocardial necrosis is death of heart tissues, which can be observed after a heart attack. It is not uncommon for hay producers to squish a blister beetle that crawled under their clothing, producing a blister on their skin. The lethal dose of cantharidin for humans is estimated to be <1 mg/kg².



Figure 4 Human blistering as a result of smashing one blister beetle on the neck²⁰.

Humans and equine are not the only animals negatively influenced by cantharidin. The lethal dose of cantharidin is estimated to be 1.0 – 1.5 mg/kg for feline and canine and 20 mg/kg for rabbits^{3,21}. Sheep, goats, poultry, cattle, and rats have also exhibited cantharidin toxicity from ingestion of blister beetles within alfalfa hay^{3,23,24}.

When compared to other animals, equine tend to have a greater response or reaction to blister beetles. The reason for this is unknown.

For More Information

Contact your local Extension Educator; local veterinarian; forage testing facilities; or Liesch with UW's Insect Diagnostic Lab at pliesch@wisc.edu or (608) 262 - 6510. Additionally, Dr. Darlene Konkle, Wisconsin State Veterinarian, can be contacted at darlene.konkle@wisconsin.gov or (608) 224 - 4884 and Dr. Keith Poulsen, Director of Wisconsin Veterinary Diagnostic Laboratory, can be contacted at keith.poulsen@wvdl.wisc.edu or (608) 262 - 5422.

Authors:

Dr. Megan Nelson – Livestock Outreach Program Manager
Alana Voss – Sauk and Juneau County Crops and Soils Educator

Reviewers:

PJ Liesch – Entomology Specialist
Dr. Darlene Konkle – Wisconsin State Veterinarian
Dr. Keith Poulsen – Director of WI Vet Diagnostic Lab
Ryan Sterry – St. Croix County Livestock Educator
Amanda Young – Dodge County Dairy Educator

References

- ¹Karras, D. J., S. E. Farrell, R. A. Harrigan, F. M. Henretig and L. Gealt. 1996. Poisoning from “Spanish fly” (cantharidin). *The American Journal of Emergency Medicine* 14: 478-483.
- ²Capinera, J. L., D. R. Gardner and F. R. Stermitz. 1985. Cantharidin levels in blister beetles (Coleoptera: Meloidae) associated with alfalfa in Colorado. *Journal of Economic Entomology* 78: 1052-1055.
- ³D. G. Schmitz. 1989. Cantharidin Toxicosis in Horses. *Journal of Veterinary Internal Medicine*. 3: 208 – 215.
- ⁴Sierra, J. R., W.-D. Woggon and H. Schmid. 1976. Transfer of cantharidin during copulation from the adult male to the female *Lytta vesicatoria* (‘Spanish flies’). *Experientia* 32: 142-144.
- ⁵J. D. Pinto. 1991. The taxonomy of North American *Epicauta* (Coleoptera: Meloidae), with revision of the nominate subgenus and a survey of courtship behavior. University of California Publication Entomology Bulletin 110, 372 p.
- ⁶Daniel A. Marschalek. 2013. Blister beetles (Coleoptera: Meloidae) of Wisconsin: Distribution and ecology. Dissertation. University of Wisconsin – Madison, Entomology.
- ⁷C. Sommardahl. 2015. Blister Beetles: Alfalfa Hay Contamination. UTCVM Large Animal Clinical Sciences.
- ⁸Szczepaniec, A., and C. M. Rush. 2019. Unusual flare-up of Black Blister Beetles in the Panhandle of Texas. *American Entomologist*. 65(4): 232 – 235.
- ⁹United States Department of Agriculture: Plant Pest Control Division. 1960. Cooperative Economic Insect Report. 10 (1). Print.
- ¹⁰Samlaska, C. P., G. A. Samuelson, M E. Faran, and N. I. Shparago. 1992. Blister beetle dermatosis in Hawaii caused by *Thelyphassa apicata* (Fairmaire). *Pediatric Dermatology*. 9 (3): 246 – 250.
- ¹¹A. J. Bahme. 1968. Cantharides toxicosis in the equine. *Southwestern Veterinarian*. 21: 147-148.
- ¹²Schoeb, T. R. and R. J. Panciera 1979. Pathology of blister beetle (*Epicauta*) poisoning in horses. *Veterinary Pathology* 16: 18-31.
- ¹³R. J. Panciera. 1982. Cantharidin (blister beetle) poisoning. In Mansmann R.A., McAllister E.S., eds. *Equine Medicine and Surgery*. Santa Barbara, CA: American Veterinary Publications. 203-204.
- ¹⁴J. B. Rollins. 1985. Blister beetle poisoning in horses. *Equine Pract*. 7:6 – 8.
- ¹⁵A. Trimble. What is lurking in the alfalfa hay? Blister beetle poisoning in horses. Kansas State University. Web. Accessed on: 1/15/2020. Access link: <https://www.vet.k-state.edu/vhc/services/equine/timely-topics/blisterbeetleFeb16.html>.
- ¹⁶Ryan Dewerff, Bryan Jensen, Patrick J. Liesch, Glenn Nice, Mark Renz, Damon Smith, and Rodrigo Werle. 2020. *Pest Management in Wisconsin Field Crops: A guide to managing weeds, insects, and diseases in corn, soybean, forages, and small grains*. UW-Madison, Division of Extension.
- ¹⁷Madeline McCurry-Schmidt. 2012. How to protect horses from toxic blister beetles. *American Society of Animal Science*. <https://www.asas.org/taking-stock/blog-post/taking-stock/2012/08/10/how-to-protect-horses-from-toxic-blister-beetles>.
- ¹⁸Schoeb, T. R. and R. J. Panciera 1978. Blister beetle poisoning in horses. *Journal of the American Veterinary Medical Association* 173: 75-77.
- ¹⁹Craven, J. D., & Polak, A. (1954). Cantharidin Poisoning. *British medical journal*, 2(4901), 1386–1388. doi:10.1136/bmj.2.4901.1386
- ²⁰Selander, R.B. and T.R. Fasulo. 2017. Blister Beetles. University of Florida. Web. Accessed on 1/16/2020. Access Link: http://entnemdept.ufl.edu/creatures/urban/medical/blister_beetles.htm.
- ²¹T. Sollman. 1943. *A manual of pharmacology*. Philadelphia: WB Saunders. 154-155.
- ²²Ray, A. C., L. O. Post, J. M. Hurst, W. C. Edwards, and J. C. Reagor. 1980. Evaluation of an analytical method for the diagnosis of cantharidin toxicosis due to ingestion of blister beetles (*Epicauta lemniscata*) by horses and sheep. *Am J Vet Res*. 41: 932 – 933.
- ²³Ray, A.C., S. H. Tamulinas, and J. C. Reagor. 1979. High pressure liquid chromatographic determination of cantharidin, using a derivatization method in specimens from animals acutely poisoned by ingestion of blister beetles, *Epicauta lemniscata*. *Am J Vet Res*. 40 (4): 498 – 504.
- ²⁴K. Ghoneim. 2013. Cantharidin toxicosis to animal and human in the world: A review. *Standard Research Journal of Toxicology and Environmental Health Services*. 1(1):1-16.