



The Informed Arizona Equestrian HORSE HEALTH SERIES

Blister Beetle Toxicity in Horses

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You did everything right, gradually changing your horses over to the new alfalfa hay that you purchased a few weeks ago. One morning, you discover your favorite horse (Miss Piggy) is dead in her stall. Most of the other horses seem fine, except for Jubel, he has stopped eating, and is showing signs of colic along with blood-tinged urine. You examine the hay, and it seems great, no mold, no dust, etc. But, when the vet tests Jubel's urine, it comes back positive for cantharidin.

Blister beetles belong to a family of beetles called Meloidae. This family contains approximately 300 species distributed across the continental United States, including 150 in Arizona. Blister beetles have a peculiar life cycle. Females of some species lay eggs directly on plants and the emerged larvae interact with the host insect, while other blister beetles deposit clusters of eggs in small depressed areas of soil that form following rains and water runoff. The hatched larvae (called triungulin) feed on subterranean grasshopper egg pods or eggs of ground-nesting bees to complete development. The larvae pass through three growth stages (instars), with each becoming less active, and eventually they overwinter in the pupal stage. The adults emerge in the spring, and deposit eggs again in the summer to complete the cycle.

Blister beetles can be hazardous to animals feeding on contaminated forage. The beetles produce an irritating compound called cantharidin. This compound is toxic to all livestock when ingested, and horses are particularly susceptible. Cantharidin is a component of the beetle's bodily fluids and is released when the beetle is crushed or defensively if handled roughly, causing damage and blistering of livestock's sensitive gastrointestinal tract. Mildly affected animals will show symptoms of colic and frequent urination, while large doses can cause death in 6-72 hours. One hallmark of blister beetle poisoning is a significant drop in the levels of calcium and magnesium present in the bloodstream of the affected animal.

Blister beetles are common in the desert southwest and vary considerably in size and shape, from ½ to 1½ inches long (Figure 1). Typically they are black, brown, or grey and may feature brightly colored spots or stripes of orange, yellow,

red, or brown (Figure 2). A few species are metallic green or turquoise in color. Many of these species are not commonly found in hay fields, but they may show up in hay fields on an opportunistic basis; for example if there are extensive weeds around the edge of the fields. Meloidae can be distinguished from other families of beetles by their broad and exposed head and thinner neck (thorax). Their body and wings are generally soft and flexible, not as hard as other groups of beetles. When squeezed or poked, live blister beetles will "bleed" from their leg joints. This defensive reaction releases the haemolymph containing cantharidin.



Figure 1: *Epicauta pardalis*, a blister beetle commonly associated with cantharidin poisoning in horses in Arizona, sometimes improperly referred to as the spotted blister beetle or horse hay blister beetle.
Photo Credit: Chip Hedgcock, Department of Entomology, University of Arizona.



Figure 2: Two types of blister beetles in Arizona, but not noted as common contaminants of alfalfa hay. (Left: *Tegrodera aloga*, and Right: *Lytta magister*) Photo Credit: Chip Hedgcock (left), Peter Ellsworth (right), Department of Entomology, University of Arizona.

Blister beetles generally do not feed directly on alfalfa foliage. Instead, they are attracted to and feed on the flowers and pollen of blooming alfalfa or weeds present in the field, such as solanaceous weeds, including silverleaf nightshade. They can also be found on legumes, composites, and amaranths. Beetles tend to aggregate or cluster in small areas of the field or around the edges, particularly wherever there are blooming weeds. Large numbers can swarm onto alfalfa fields and end up baled into hay or cubes. The level of cantharidin produced by each species of beetle is highly variable, therefore it could take as few as 5-10 beetles or as many as 200 to provide a lethal dose of cantharidin. Species of the genus *Epicauta* (e.g., Figure 1) are usually associated with alfalfa related to horse toxicities.

Is my horse at risk?

If your horse is consuming alfalfa baled hay, cubes, or pellets, blister beetle toxicity is a possibility (Figure 3 and 4). Hay should be purchased from reputable alfalfa growers who regularly scout their fields for signs of blister beetle infestations, and have an integrated pest management (IPM) plan in place. Beetles are more likely to be found in baled alfalfa that has been



Figure 4: Ingredients of blue buckets in figure 2. Left: 100% Sun Dried Alfalfa pressed into cubes, with no added ingredients. Right: A complete feed horse pellet with alfalfa as the main ingredient. Alfalfa Cubes and Pellets may contain additional ingredients such as vitamins and minerals, depending on the individual product and manufacturer. (Photo Credit: Betsy Greene)



Figure 3: These are the most common alfalfa products fed to horses: baled (Top), cubed (lower left) or pelleted (lower right). (Photo Credit: Betsy Greene)

simultaneously cut and crimped with a mechanical conditioner, which crushes the beetles during harvest instead of allowing them to escape. Cutting alfalfa at less than 10% in bloom will reduce the number of beetles in a field (Figure 5). Additionally, growers should remove flowering weeds from around the field edges and control grasshopper populations, as their eggs are the main food source for the blister beetle larvae.

Signs

Blistering: Cantharidin is a contact irritant, causing significant blistering and affecting the tissues of the mouth, esophagus, stomach, and intestinal tract, as well as the kidney, bladder, and heart muscle tissue. Horses may salivate excessively and become anorexic (stop eating) due to painful lesions on the mouth and tongue.

Colic: Ulceration of the stomach and intestinal tract can cause colic like symptoms, as well as diarrhea and possibly bloody feces. The damage done to the intestinal walls could allow infiltration of intestinal bacteria into the bloodstream, leading to a rapid onset of endotoxic shock (gums may have purple-blue line around the base of the incisor teeth).



Figure 5: Alfalfa in the field with some purple flowers visible (left) and in a bale (right) from Safford, AZ. (Photo Credit: Betsy Greene)

Signs

- Blisters on lips, tongue, and gums
- Decreased eating/drinking due to painful mouth.
- Colic signs are common
- Lethargic and may have a stiff gait
- “Thumps” (a rhythmic contraction of the diaphragm and abdominal muscles that resemble hiccups)
- Frequent urination, possibly blood tinged urine

In severe cases, the horse may rapidly go into shock or be found dead.

Bloody Urine: If the renal system (kidney), bladder, or urethra have been damaged, blood-tinged urine may result.

Thumps: Cantharidin poisoning also disrupts electrolyte levels and can severely damage heart muscle tissue, which can lead to cardiac abnormalities. This is caused by the decreased calcium (hypocalcemia) and magnesium levels (hypomagnesemia). The term “thumps” is used to describe the rhythmic contractions or fluttering of the diaphragm and abdominal muscles, and often results from dehydration and/or the drop in calcium levels.

Diagnosis

Blood work may indicate hypocalcemia and hypomagnesemia, as well as increased packed cell volume (percent of blood that is red blood cells) due to dehydration and increased urea nitrogen

It Can Happen To You

What do you see?

In 2004, the UArizona Veterinary Diagnostic Laboratory described the observed clinical signs of 3 Benson, AZ horses with Blister Beetle Poisoning as:

“depression, shaking, refusal to eat, “toxic” mucous membranes, diarrhea, colic with sweating, and immersion of the muzzle and playing with the water as though the horses were attempting to flush their mouths. Straining to urinate was also observed in some and one horse was observed to void bloody urine”.

How do you know?

1. Is your horse showing signs?
2. Are you feeding alfalfa hay?
3. Did you find blister beetles in hay/bottom of feed bunk?

How to be sure?

1. Clinical signs + alfalfa + presence of blister beetles gives a good indication, or
2. Your vet may confirm clinical signs and diagnosis by performing chemical analysis for cantharidin on urine, serum, or stomach contents.

and creatinine from kidney damage. Diagnosis is made by finding the beetles in hay samples or by finding cantharidin in urine or stomach contents.

Treatment

There is no specific antidote to cantharidin poisoning beyond supportive care. First, your veterinarian will clean out and protect the GI tract using mineral oil, activated charcoal, and a gastro protectant product such as Kaolin Pectin or Bismusal Anti-Diarrheal Liquids. The liver and kidney should be supported with IV fluids (possibly with added calcium), and pain relief is recommended. The prognosis for a horse showing serious clinical signs or with severe kidney damage is poor. The amount of cantharidin ingested can dictate the severity of the clinical signs. A horse taking in a lower dose of the toxin may recover, and prognosis and outcomes may improve if the horse survives for 2-3 days.

Prevention

For the Hay Producer: Blister beetle species, alfalfa field elevation, and time of cutting are all factors that contribute to the risk of alfalfa infestation with blister beetles. Chemical control has never been the best option to manage blister beetles. There are a few insecticides that are effective, but creates a dangerous situation where dead beetles may end up in bales. Practicing good field management is the most effective approach to managing blister beetle risk. Controlling weeds in and around alfalfa fields is one of the most effective prevention practices. Additionally, maintain cutting schedules to harvest fields before alfalfa is flowering to decrease the attractiveness of the field to blister beetles.

Other good management practices to prevent blister beetle contamination in hay is to avoid harvesting areas where the beetles are found, since they tend to cluster in one or a few areas in a field. Harvest processes that include cutting without mechanical conditioning, and just windrowing and curing can allow blister beetles to leave the hay mass; reducing the infestation of bales and the hazard to animals. Green chopping or any other “all-in-one” methods of harvesting should be avoided in fields with history of or known infestation of blister beetles. Growers should eliminate harvest operations that may increase the fragmentation of blister beetle body parts in the hay bale, such as compressing bales and using a swather with a mechanical conditioner. While conditioning allows the hay

Integrated Pest Management (IPM)

This involves sustainable management practices which include documented individualized plans for growers (crops, hay, etc.) to manage pests using physical, chemical, biological, and cultural tools, while decreasing financial, environmental, and health risks to all involved. IPM practices include monitoring, recordkeeping, prevention, and evaluation of effectiveness.

to dry faster (due to crimping/crushing of the stems), it can significantly increase the amounts of beetles (or beetle parts) in the hay. Finally, hay cut before mid-May and after late August are at least risk of beetle infestation.

For the Horse Owner: Purchase alfalfa hay from a grower that regularly scouts their fields and has an integrated pest management (IPM) plan in place to control weeds in and around their fields. Because of the large number of species of blister beetles, the danger of contaminated hay can persist year round. Generally, adults emerge in the spring and can infest alfalfa fields. Cantharidin is a very stable compound. It will remain toxic in dead beetles (or their body parts) that end up in hay bales and will not decrease in toxicity with storage.

Always visually inspect hay as you are feeding it, as beetles tend to cluster in swarms (Figure 6), however crushed beetles may be difficult or impossible to spot in the hay. Blister beetles don't actually "swarm" like some bees will, the swarm refers to how they congregate in large groups to feed (nectar, pollen) and mate. Hay should be cut at the late bud stage, before the bloom stage (the blooms attract beetles); the first and last cuttings are often safest. If your hay has many purple flowers, it may have been harvested later than the "10% bloom" recommendations. Regardless, in the event that one horse in a barn suffers from blister beetle toxicity; stop feeding the hay immediately, and keep a close eye for signs of toxicity in other horses.

Many horse owners buy their hay from a feed store or hay dealer and may not have information from the actual hay grower. This makes it difficult or impossible for the horse owner to have control over or make purchasing decisions based on all of the preventative measures listed. Thus, your vigilance and

attentiveness to your horse's health, purchasing high-quality hay from a reputable source, and closely inspecting all hay and feed for signs of beetle infestation will provide the best chance of avoiding blister beetle poisoning.

Become Beetle Savvy!

UArizona Cooperative Extension Entomologists and Integrated Pest Management experts provide excellent pictures and information about blister beetles at these links:

<https://cals.arizona.edu/crops/cotton/files/BBid.pdf>

<https://cals.arizona.edu/crops/cotton/files/BBinFood.pdf>

Other resources

<http://pods.dasn.okstate.edu/docushare/dsweb/Get/Document-2080/PSS-2072.pdf>

http://aces.nmsu.edu/pubs/_circulars/CR536.pdf

<http://extension.colostate.edu/topic-areas/insects/blister-beetles-in-forage-crops-5-524/>

<https://aaep.org/horsehealth/blister-beetle-poisoning>

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Figure 6: *Epicauta pardalis* congregating (swarming) on mesquite in Naco, AZ (Cochise County). Photo Credit: Doug Danforth, Bisbee, AZ



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