

# HEALTH ZONE

## Blister Beetle Poisoning in Horses

BY HEATHER SMITH THOMAS

**B**lister beetle poisoning has probably been occurring for as long as horses have been fed alfalfa hay, but was not identified until a herd of horses in Oklahoma became ill in 1969 and many of them died. The owner sought help from Oklahoma State University to find the cause of the mysterious deaths, and the lethal toxin cantharidin was discovered (from dead blister beetles in the hay being fed). Since then, these lethal beetles have been found in all regions (but primarily the Southwest) where alfalfa hay is grown.



ANNE M. EBERHARDT

Blister beetles are concentrated in bales of hay; if you find one, you will usually find many

Dr. John Reagor, Veterinary Toxicologist Emeritus (Texas A&M Veterinary Diagnostic Laboratory), worked with blister beetle poisonings for 40 years. “During the early 1970’s when we first started working with a chemist in the diagnostic lab, one of the first problems we tackled was blister beetle poisoning. There was no good way to diagnose it at that time. We did a lot of work on blister beetles and found ways to determine cantharidin levels. Improved diagnostic methods were developed,” he said.

“Blister beetles are most numerous in a year following a drought,” said Reagor. Grasshopper populations are higher during a dry year (they don’t survive as well in wet conditions), and the blister beetle larvae feed on grasshopper eggs. In dry years the grasshopper populations are high, enabling a bumper crop of blister beetles to thrive through the winter. Irrigated alfalfa fields in western states are often adjacent to drier pastures or rangelands where there are lots of grasshoppers.

Blister beetles are flying insects that feed on blossoms, especially the blooms of tomatoes, potatoes, soybeans, and alfalfa. Blister beetles have one generation a year. Egg clusters are deposited in the ground during summer. One female can lay 10,000 eggs. Within two weeks the eggs hatch, and tiny larvae migrate around in the ground searching for grasshopper egg pods. Within a month the larvae go through three more stages and develop a thick skin, enabling them to withstand cold weather. They remain in this stage seven months. When favorable moisture and temperature conditions return in late spring, the final immature stage (pupa) develops. The new adults emerge in June (sometimes a little earlier or later depending on the region and climate) to feed on alfalfa blooms.

If an abundance of grasshopper eggs were laid, blister beetle larvae thrive, and greater numbers survive. If a swarm of beetles are feeding on blooms when the hay is cut, some are killed by the swather or mower and end up in the hay. “The first

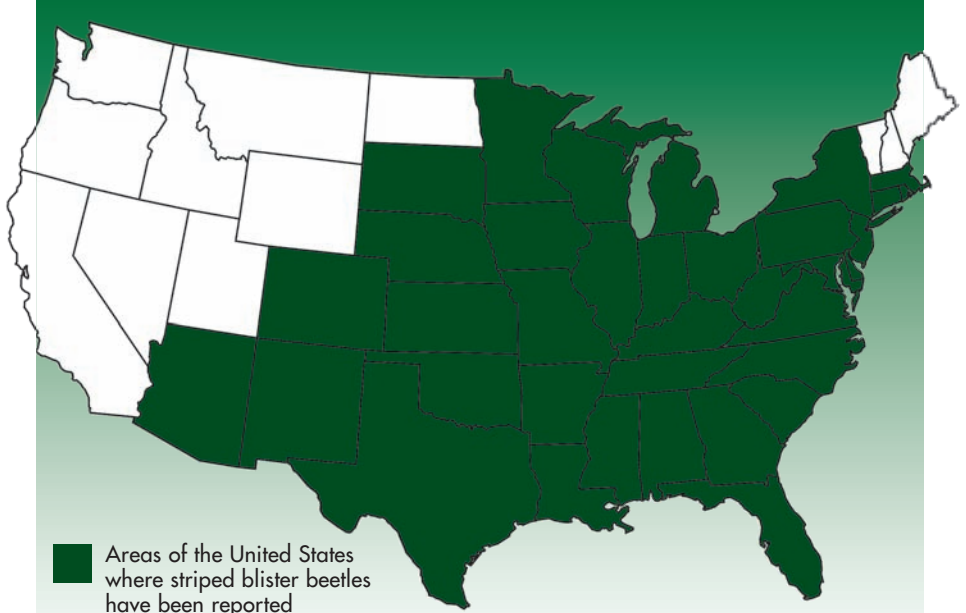


Striped blister beetles have been reported in most of the United States

cutting of alfalfa, which some horse owners don't like because it tends to have more grass and weeds, almost never contains blister beetles," said Reagor. The first crop is generally cut and baled ahead of when blister beetles emerge.

"There are many species of blister beetles, but only a few of them cause problems—the dangerous ones are the species that travel and feed in swarms, feeding on pollen in alfalfa blooms. If there are a lot of

## THOSE DREADED BEETLES



■ Areas of the United States where striped blister beetles have been reported

Source: P. Mulder, R. Shawley, and J. Caddel  
Blister Beetles and Alfalfa, OSU Extension Facts F-2072 Blister Beetles and Alfalfa. 1996

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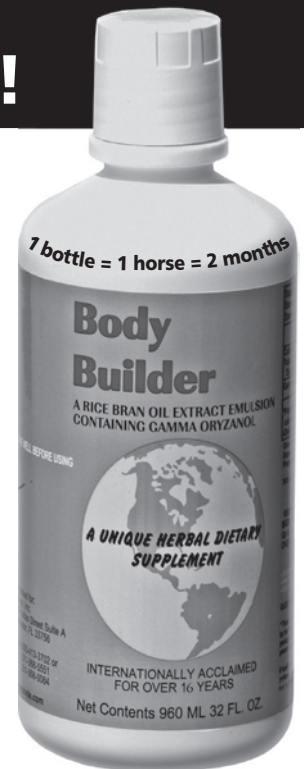
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## HEALTH ZONE

### Blister Beetles

blister beetles in a certain area, the hay can be cut pre-bloom to avoid beetles in the hay,” he said.

When purchasing hay, it’s wise to examine a few bales to see if the alfalfa has blooms.

“Even though there is a lot more risk for blister beetles if the alfalfa has bloomed, 99% of that hay won’t have blister beetles in



Blister beetles come in many different colors

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it. The beetles travel in a swarm together and will only be in one area in that hay field. If there are beetles in the hay, they will end up in just a few bales, rather than throughout the bales from that field,” he explained.

A person might feed nearly all the bales from that field without a problem and then suddenly find some bales loaded with dead beetles. If you don’t see the beetles and don’t discard those bales or flakes of hay, you could end up with dead horses.

“Years ago, before we had cantharidin assays, we searched through a lot of alfalfa bales looking for blister beetles—tearing bales apart and looking at the hay. I’ve opened up some bales and found that one end of the bale was perfectly safe, with no blister beetles, and by the time I got to the other end, those flakes were just full of beetles,” he said.

The beetles will be very concentrated in the hay; if you find one you will usually find many.

All blister beetles contain cantharidin. People used to think that certain kinds of beetles were more poisonous than others, but all species contain this toxin. The difference is that some species fly in swarms and there will be many beetles in the hay from that part of the field, versus a single beetle here and there.

“I doubt if any of the solitary beetles have ever fatally poisoned a horse. None of them have enough cantharidin to be that toxic. The problem occurs when the horse consumes multiple beetles. Also, there is a great variation in size of different kinds of blister beetles, as well as variation in the concentration of cantharidin, and it’s not uniform through a given species,” explained Reagor.

“When the beetles first emerge as adults, only the males have cantharidin in their bodies. But once they copulate and the female becomes gravid (developing fertilized eggs), the male passes cantharidin to the female. Thus, any gravid female contains cantharidin, just like the male beetles. Thus there are some timing factors regarding life cycle of the blister beetle that can have an affect on the concentrations of cantharidin in their bodies. I’ve seen it run from zero to eight or 10% of their body weight on a dry matter basis. Most of them are typically around one to two percent cantharidin, and these cause us problems with horses,” he said.

“Horse owners often ask how many blister beetles it takes to poison a horse. It’s highly variable, depending on the cantharidin concentration and size of the beetles. Some of them, even though they feed on alfalfa blooms and are gregarious, are extremely small. Others—even though they are not as common or widespread—are very large. Some species can be less than one-quarter inch in length and others are over an inch long,” he said.

If a large beetle has very much cantharidin, it doesn’t take very many beetles to cause a problem, whereas it may take more of the smaller beetles to poison a horse.

Blister beetles come in many different colors—striped, spotted, black, and gray. “Two species cause us most of the problems. These are the three-striped blister beetles. The light stripes are yellowish, with darker brown for the dark stripes. The two species look alike, and they are very similar in their habits—swarming, feeding on alfalfa blooms—and they have similar concentration of cantharidin,” said Reagor.

“Typically the Southwest has had most of the blister beetle poisoning problems. But today alfalfa hay is shipped all over the country, and blister beetles may end up anywhere. There is a tiny black beetle that lives in Pennsylvania, but we’ve only seen a few poisoning cases from that particular beetle because it is so small that it takes a tremendous number of them to cause problems,” he added.

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To avoid poisoning, look at the hay before you feed it. "Even if there are blooms in the hay, you can prevent poisoning if you diligently check the hay. Inspect both sides of every flake before you feed it. Once you learn what a blister beetle looks like (the shape is the same—regardless of size or color), you can recognize them and sort them out, and prevent a toxicity problem in horses," said Reagor.

"We have had hundreds of insects sent to us for identification—picked out of the hay and sent in for us to check. They were definitely blister beetles, but those people found them and didn't feed that flake of hay, and didn't have any problems," he said.

The chances are that if you find one beetle, you will find many. "You need to flake that hay off and inspect every flake. You should discard any part of the bale that has beetles," Reagor said.

### Signs of poisoning

Cantharidin is a severe irritant, damaging external and internal body tissues. If a beetle walks across a human hand it leaves a string of tiny blisters that if broken burn painfully. When a horse eats a beetle, the lining of the digestive tract becomes blistered. Action of digestion ruptures the blisters, causing sores and ulcers, and extensive tissue damage. The pain causes colic; the horse goes off feed and is usually treated for colic. Blister beetle poisoning may not be suspected until several horses become sick from eating the hay.

Tissue damage in the gut causes shock, dehydration, and death. The stomach lining may slough away. Lesions may be found in intestines and other internal organs, such as liver or kidneys. The chemical is just as potent when taken from a poisoned horse's urine or manure as when extracted from a live beetle; it does not break down. As the poison is absorbed, the horse's temperature rises due to massive inflammation throughout the body, and his gums become purple due to circulatory failure. He may have a foul body odor, caused by failure of the kidneys to remove the offending substance from the bloodstream.

"In the literature, we read that cantharidin poisoning causes blistering of the nose, mouth, and the mucous membranes of the mouth and throat, but if there are blisters on the nose and in the mouth, this animal was exposed to live insects—rather than eating dead beetles in hay. We see some blister beetle poi-

soning when the beetles swarm to barn or stable lights at night and crawl all over the feed and troughs. Those horses have blisters on their noses and in their mouths. Typically the first lesion you see from eating beetles in hay will be in the

**"Two species (of blister beetles) cause us most of the problems. These are the three-striped blister beetles. The two species look alike, and they have similar concentration of cantharidin."**

**— DR. JOHN REAGOR**

esophagus and stomach—farther down," said Reagor.

A horse will show signs of colic and painful urination—from blistering in the gut and in the bladder. "The cantharidin absorbed in the body is eliminated in urine and that's why there are changes in the urinary tract—bladder, urethra, and ureter. The typical sign that confirms blister beetle poisoning is a horse that is feeling bad, with colic, passing frequent small amounts of urine. The cantharidin

is burning the urinary tract and the horse is eliminating just a few squirts of urine at a time," he said.

If a horse owner suspects blister beetle poisoning, it's important to start treatment immediately. "If it's a mild case and treatment is started quickly, some of these horses can be saved," he said.

### Treatment

The main problem is that often the true cause of colic is not recognized in time. Valuable time may be lost while the horse is being treated for spasmodic colic or undergoing surgery for a suspected twisted gut.

Mineral oil may hasten elimination of stomach contents that include the beetles, but the toxin may continue to blister the gut on the way through, in spite of the soothing and lubricating effect of oil. Treatment is mainly aimed at alleviating shock and providing good supportive care. The best treatment is replenishing fluids and electrolytes intravenously, to help keep the horse from going into shock and to keep the kidneys working. Pain can be minimized with drugs.

Early recognition and aggressive therapy may save a horse. If heart rate and respiration are still elevated after several days, however, prognosis is poor. Even if the horse survives, he may be impaired. A horse can live with 75% of the kidneys nonfunctioning and still be clinically normal, but this impairment becomes serious in times of stress. **BH**

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