DROUGHT AND LIVESTOCK DISEASE ON THE HIGH PLAINS

Dr. Donal O'Toole, Dr. Merl Raisbeck and Dr. Lynn Woodard
Wyoming State Veterinary Laboratory
Department of Veterinary Sciences
University of Wyoming

Three years of drought in the High Plains have had an appreciable impact on the range of diseases that University of Wyoming diagnosticians at the Wyoming State Veterinary Laboratory (WSVL) recognize in Wyoming livestock. Many of these are just worse cases of what is seen in normal years, but some are unique to periods of extended drought.

Nitrate poisoning

A major risk during periods of drought is nitrate (NO_3) poisoning of adult ruminants. Drought stress exacerbates the tendency of many plants to accumulate nitrate, particularly oat hay and Sudan grass hybrids that were fertilized in anticipation of normal moisture. While it is a good idea to test hay before feeding it, it is especially important during a drought. Nitrate poisoning impairs the ability of blood to carry oxygen. The result is sudden death, which may strike a large number of adult cattle in a herd at once without warning. In most cases, cattle are found dead, and treatment is impractical. This is one of the more common causes of poisoning confirmed by the WSVL in cattle. Lower concentrations of dietary nitrate may also cause abortion.

Hay should be sampled for nitrate testing after it is cut and cured. Use a bale corer, which can be obtained from a county agent, to collect 10 to15 sub-samples from each stack or load of hay. Results obtained from testing samples collected by grabbing handfuls here and there are unreliable since they are likely to miss nitrate "hot-spots" in the hay. It is important to have testing done at a laboratory familiar with this type of analysis. Forage nitrate analysis is different from the similar-sounding nitrate-nitrogen test on water samples by environmental laboratories. It is recommended that samples be tested at the Wyoming Department of Agriculture's Analytical Services Laboratory in Laramie [(307) 742-2984; accession forms available online at http://wyagric.state.wy.us/aslab/aslab.htm.] Be sure you understand how results are reported, since there are several ways to express nitrate concentration. In fact, one measure of a laboratory's expertise is whether its personnel make recommendations based upon results and offer more than just a number.

The WSVL uses less than 0.5 percent NO_3 (measured as the nitrate ion) as a "safe" cutoff for forage. Many authorities suggest concentrations of less than 500 ppm as a safe cutoff for water. If both feed and water contain appreciable concentrations of nitrate, one has to consider the contribution from both sources. In other words, subtoxic concentrations of NO_3 in water combined with subtoxic concentrations in hay may result in toxicity.

Horses are resistant to nitrate intoxication. Assuming the hay is good in other respects, moderately high NO_3 hay can be fed to horses. If the NO_3 concentration is not too high (less than 1.5 percent), it can be diluted to acceptable concentrations with clean feed. Feed must be thoroughly mixed before serving (e.g., using a grinder), otherwise some cattle may still get a toxic dose. Merely throwing out one bale of "bad" and two bales of "good" hay does not constitute dilution. Fermentation may decrease NO_3 content somewhat if there is sufficient soluble carbohydrate present, but most Wyoming forages lack the necessary energy to fuel the reaction. The probiotic feed additive Bova Pro® (FarMor Biochem, Milwaukee), based upon a patented *Propionibacterium* bacteria, is advertised to decrease rumen NO_3 and blood methemoglobin concentrations by 40 to 50 percent. Preliminary data looked promising when the product was introduced several years ago.

Dust and pneumonia

Bovine respiratory disease, especially due to bovine respiratory syncytial virus (BRSV) and *Pasteurella* (*Mannheimia)* bacteria, may be more serious during drought due to irritation caused by dust. Fine dust particles enter the airways and damage the lungs, setting the scene for infection by microbial agents. Feedlot and ranch operators sometimes use the term "dust pneumonia," but this is not specific and the condition seen may have nothing to do with inhaled dust. One way to minimize losses is to give

modified live vaccines for viruses like BRSV with preconditioning shots. By contrast, killed products have, in some cases, increased the disease severity in BRSV outbreaks. Stressed animals are more susceptible to infections of all kinds. It is important to stick with a good vaccination program during a drought.

Blue green algae poisoning

Blooms of toxic blue green algae leading to cattle losses occur on rare occasions in the High Plains. Blooms form on bodies of water under conditions of heat, stagnation, eutrophication (high nitrogen and nutrients), low flow rates, and a concentrating wind. Toxic algal blooms lead to sudden death due to liver damage, shock, and/or central nervous system injury. This is a rare cause of loss in Wyoming. When losses occur, death loss can be heavy and sudden.

Dehydration-salt poisoning and sulfate poisoning ("polio")

High levels of NaCl (common salt) and/or water deprivation are hazardous to livestock. Sodium may affect production in sensitive animals, particularly dairy cattle, when concentrations exceed 1,000 ppm. Concentrations in excess of 5,000 ppm will decrease production in range animals and may cause illness and/or death.

Salt poisoning leads to seizures and prostration. Salt poisoning/water deprivation is especially hazardous during times of high temperatures. High levels of magnesium (greater than 250 ppm) may aggravate the problem. Thus, complete salt screens should be requested when water samples are collected for testing. One recent case occurred when yearlings were moved to a pasture where they could not locate a water tank. The dehydrated yearlings developed constipation and/or diarrhea, weakness, emaciation, and aggressive behavior. Some died before finding water. Some dehydrated steers that found water drank to excess, developed convulsions, and died. In another recent episode, 130 cattle died in a 48-hour period as a result of salt poisoning.

Figure 1: Three of 130 dead cattle that died in March 2003 of salt poisoning over a 48-hour period in one herd are shown (arrows).

Polioencephalomalacia ("polio" or PEM) due to high sulfate (more than 2,500 ppm) water is another disease exacerbated by drought. Sulfate is concentrated in stock ponds and sinkholes by evaporation so that water sources that were previously safe become deadly under drought conditions. Like nitrate poisoning, the sulfur content of feed and water are additive in causing the disease. In spite of its name, it has nothing to do with the infectious disease poliomyelitis in children – polioencephalomalacia is a technical term for breakdown of gray matter in the brain, which is what happens in both dehydration/salt poisoning and sulfate poisoning.

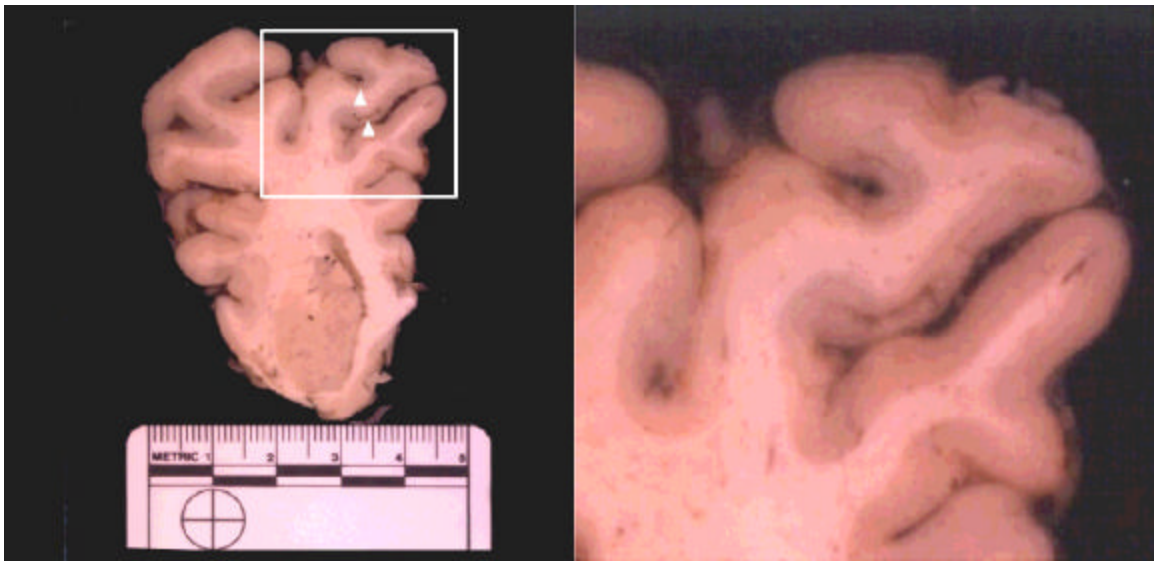


Figure 2: Sliced sample of brain of a steer with PEM. The arrowheads point to areas of damaged gray matter. Higher magnification of the boxed area shows necrotic gray matter of brain.

Ponds are the biggest problem, but well water may also be high in sulfates. Although PEM is normally a problem in spring and summer when water consumption is greatest, it may occur in any season when sulfate concentrations are high or if animals are abruptly exposed to high sulfur waters. Clinically, animals become blind and show nervous signs such as incoordination and a goose-stepping gait. Testing stock water is important to prevent problems. Cattle develop some tolerance to elevated sulfate waters if they are introduced to it gradually. There is no cost-effective method of removing sulfate from stock water. Hauling water may be the only option on some ranches with a high sulfate problem.

Salinity

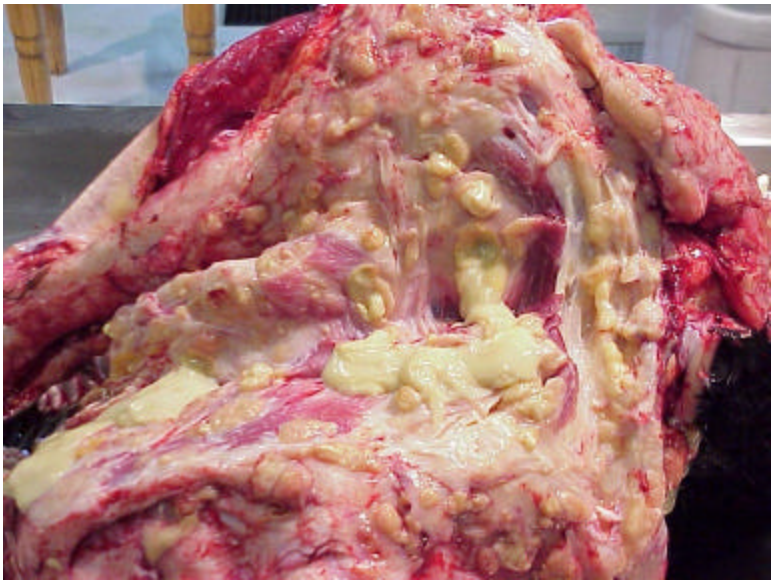
Sodium and sulfate are not the only elements concentrated in livestock water supplies by drought. A number of different inorganic substances cumulatively contribute to the property of water referred to as "salinity." Simply stated, the salinity of a water sample is what is left after the water is boiled off and organic compounds are oxidized. Salinity may be indirectly measured as total dissolved solids (TDS) or conductivity. Although the relationship between salinity and disease is not as clear-cut as for sodium and sulfur, high-salinity water does not support productive animals. The impact depends upon the class of animals and their water requirements. For example, lactating dairy cows may be affected by as little as 1,000 ppm TDS, whereas beef cattle may tolerate as much as 5,000 to 7,000. High salinity is more likely to result in productivity losses than clinical disease and deaths.

Coarse feed

Poor quality feed can lead to disease when nutritional contents are low and/or alternate feeds are abused. Feeding large amounts of dense, poor roughage may cause extensive lesions in the mouth and throat, resulting in abscesses of the head region.

Several episodes have occurred in which adult animals had such severe oral lesions they were unable to swallow and lost weight or died due to pus draining into the lungs from mouth abscesses. In one episode, 23 of 150 adult cattle belonging to one producer developed large chronic pus-filled facial swellings. Cattle had large lymph nodes due to secondary bacterial infections. Treatment was unavailing. No foxtail or other penetrating plant fragments were found, and the owner was adamant that he avoided foxtail stands when haying. The owner ran the cattle on an arid creek where there were there were heavy stands of greasewood (*Sarcobatus vermiculatus*). Due to the drought and lack of forage, the cattle probably

grazed on greasewood and developed extensive wounds of the mouth due to the stiff spines of the plant. Opportunistic bacteria infected the wounds and created the clinical problem.



Caption for Figure 3: This is the skinned head of a cow with extensive abscess formation in the cheeks, probably due to coarse feed.

Coarse feed can also result in abomasal impaction in cattle. Heifers in late pregnancy are at most risk due to the increased nutrient demands of combining growth and gestation. Pregnant heifers develop bloat, recumbency, and die with large amounts of black fluid in the rumens and impactions in the abomasum.

Pulmonary emphysema ("cow asthma")

Pulmonary emphysema with edema ("cow asthma," "grunts," "fog fever") is associated with an abrupt change from dry pastures to meadows, especially regrowth meadows after haying. The disease occurs because of high concentrations of the amino acid L-tryptophan in forage. The amino acid is converted to a toxin in the rumen, causing an acute reaction in the lungs. The result is an acute respiratory distress syndrome in a high proportion of the herd. Cattle display characteristic breathlessness, distress, and open-mouth breathing in the absence of coughing shortly after they are turned out on fertilized or irrigated aftermath. This disease presents a challenge to producers during periods of drought. Most ranchers don't move cattle to meadows until after heavy frosts, which lower the risk. During a drought this may not be an option. Preventative strategies include gradually adapting cattle to a pasture over 10 to 12 days, cutting and windrowing the pasture before turnout, and exposing less susceptible younger stock (less than 15 months old) or sheep to the pasture first. Ionophores such as monensin will prevent or reduce pulmonary emphysema if fed in advance, but many cows won't use the blocks and they are of no value once clinical signs begin. Keep a close eye on cows for a few days after a change to lush meadows.

Toxic plants

The danger from poisonous plants is magnified during drought. Overgrazing, aggravated by poor pasture growth, forces animals to seek less palatable, potentially toxic plants. Plant populations in pastures tend to change as drought-resistant weeds begin to dominate more desirable forage plants. Drought stress may increase the toxicity of some plants such as nitrate-accumulating and cyanide-forming species. Exposure to toxic plants may occur directly on the pasture or in poor quality feeds obtained from fields stressed by drought and/or overgrown with toxic weeds. Plants containing high concentrations of soluble

oxalates (*Halogeton* and greasewood) are more toxic when ingested by sheep lacking adequate water. Locoweeds remain toxic even in winter months. Cattle may consume more locoweed during a drought. Clinical signs are abortion, nervous signs, and brisket disease. Pine needle abortion cases may occur more commonly during drought, as cattle will eat the needles more readily.

Management of plant poisonings centers on prevention. Grazing management involves the prevention of overgrazing by proper pasture rotation and by reducing stocking rates. Weed control can be attained by proper fencing, prudent application of weed killers, and mowing/plowing. If herbicides are used, beware that some can temporarily increase toxicity and/or decrease the palatability of plants.

Unusual feedstuffs

Feeding of unusual feeds or those of unknown quality and composition may be tempting to ranchers when quality feed is scarce. Unusual or unbalanced rations can lead to mineral and other dietary deficiencies leading to insidious disease in herds. An example of toxicosis due to an unusual feed involves whey, which when used as a supplement may contain toxic quantities of salt (causing seizures) or fat (causing bloat). Grazing of turnips has led to polioencephalomalacia (PEM) from excessive sulfur.

The sudden switching of feeds or increases in grains may lead to rumen acidosis and diarrhea. Drought-related acidosis is common when short feed inventories necessitate more frequent switches or when some non-traditional feeds such as baker's byproducts or dough (high carbohydrate sources) are added suddenly to rations. The prevention of abomasal impactions, rumen acidosis, and hazards of unusual feeds centers on providing a proper diet. Rations should be balanced to allow for optimal protein, mineral, energy, and roughage contents. Roughage should be of the proper density to allow for optimal gastrointestinal activity. Unusual feeds, while tempting at times, should be consciously avoided or viewed with skepticism. Sudden feed switches should be avoided. It is helpful to acclimate cattle to new rations slowly.

Pigeon fever myositis in horses

A disease that is unusual for Wyoming except in drought years is a bacterial infection that most often affects the brisket of horses. It is called pigeon fever because of the pigeon-breasted appearance of affected horses.

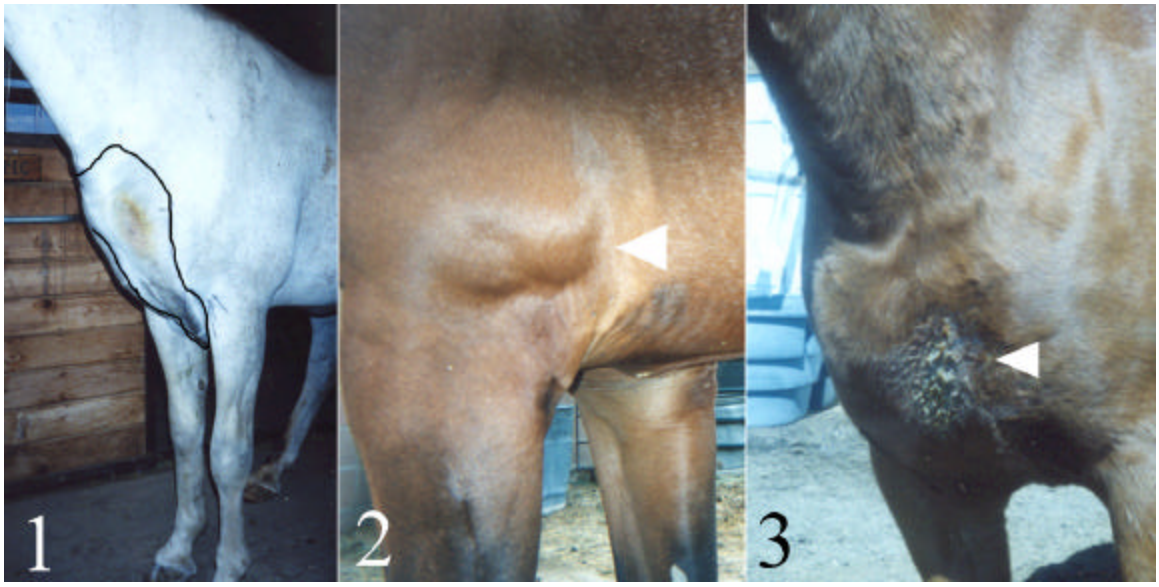


Figure 4: These three horses (1 – 3) have swelling of the brisket or shoulder area due to pigeon fever. The extent of the swelling is outlined in horse 1. Swelling may occur over the shoulder (horse 2)(arrowhead). The area of swelling may eventually rupture, discharging thick purulent exudate (arrowhead) due to infection by *Arcanobacterium pyogenes* (horse 3).

The disease is caused by a specific bacterial agent and is probably spread by flies. It is not known how drought predisposes horses to this non-fatal disease. More than 100 horses with this disease were diagnosed in Wyoming in 2002, most in the months of August to November.

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