High-Altitude Heartaches

PAP testing can identify cattle at risk for Brisket disease at high elevations.

Story by
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Producing cattle in the high mountains of Wyoming presents some challenges for Gary and Gloria Parker of Shamrock Angus Ranch, located near Laramie.

"Our herd is unique, since our ranch sits at a 7,500-foot (ft.) elevation, and our cattle go up to 9,000 feet," Gary Parker says. At this elevation, some cattle suffer congestive heart failure. The heart tries too hard to supply blood to tissues that are short of oxygen. The resultant increase in pressure on the right ventricle of the heart can be fatal. In the thin air of high elevations, these cattle don't have enough lung capacity and suffer oxygen shortage.

The condition is called Brisket disease, mountain sickness, High-Mountain Disease, high-altitude disease (HAD) or dropsy, since some cattle develop edema in the brisket before they die. Swelling may spread up the neck, to the jaws, or along the underline of the belly.

"Because of the high blood pressure, fluid is pushed out through blood vessel walls into the chest cavity and brisket," Parker says. Cattle affected by Brisket disease may be lethargic. When on the move, they may drop to the back of the herd, become short of breath or lie down. Chronic cases may have swelling under the jaw, like the onset of wooden tongue.

"Many breeders, when they find a bull they like, can breed 50 or 70 cows to him and not worry," says Gary Parker, Shamrock Angus Ranch, Laramie, Wyo. "If we try that, we're liable to be out of business the next year." [PHOTO COURTESY OF GARY & GLORIA PARKER]

Sometimes, however, producers may see no outward sign, except a dead animal, he adds. "We autopsy anything that dies [for which we don't have an answer], and many turn out to be Brisket disease."

Susceptibility to this problem is

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By using PAP scores in its selection process, Shamrock has provided a means for people to use Angus genetics proven at high altitudes, Parker says. [PHOTOS BY STEVE SUTHER]

inherited; cattle have a genetic predisposition that determines how severely affected they will be. Shamrock Angus is one of a few producers who test significant numbers of cattle for their susceptibility to Brisket disease using a pulmonary arterial pressure, or PAP, test. Parker says it's imperative for people raising cattle at high altitudes to know whether the bulls they buy are free of this weakness.

The higher the elevation, the more risk to an animal with this genetic tendency. Cattle raised at low elevation don't have as much problem; their lack of lung capacity may never be realized. Thus, the weakness has not been selected against, and many cattle today are at risk if taken to higher altitudes.

Personal experience

Parker gained firsthand experience with the disease when he and Gloria moved to Laramie in the fall of 1988. After buying commercial and registered cows from some of the best seedstock producers in Montana and moving them to Wyoming, cows started dying, he recalls. "Neighbors told us that just happens here. But we'd never had that 'just happen' to us."

As he started asking questions about the disease, the Wyoming State Veterinary Lab and Colorado State University (CSU) referred him to Tim Holt, a veterinarian in Gunnison, Colo. "He's been doing tests since the 1970s, using pressure chambers and checking cattle at various elevations," Parker says, adding that the number of animals that can be affected by the disease is amazing. Holt has found aborted fetuses with susceptibility to Brisket disease.

"Many people in the high country always had a higher ratio of late-term abortions; almost all traced to this," Parker says. "The cow herself may be able to survive, but as the fetus starts getting bigger, requiring more oxygen, nature's way is to abort the fetus to save the cow.

"When we were having problems with this and would see a cow starting to show signs of Brisket disease, we'd load her in a trailer and haul her to lower elevation. Usually, we'd save the cow, but we never had one that didn't abort," he continues.

Parker says susceptibility to Brisket disease has caused producers to lose up to 65% of their calf crops — just from using the wrong bulls.

Even feedlot managers are talking about Brisket disease, as it is becoming more common in fat cattle, even in Nebraska, Parker says. "Since it's a disease of lung capacity, which causes them to die of heart failure, it stands to reason that fat cattle — requiring more oxygen for larger body bulk — could have the same problems."

When asked why it seems it has become more prevalent, he says many of the popular Angus bulls carry the predisposition.

"We found we can't use them because of this problem," he says, explaining the extra steps Shamrock takes to prove genetics at the high altitude. "It took a long time to sort through this and get a database put together to find a set of cows that could work and live at this elevation and still raise the kind of calves we wanted."

Shamrock started PAP-testing bulls in 1989. Holt has PAP-tested more than 3,500 bulls for them.

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Testing

On Shamrock's Web site, *www.shamrockangus.com/pap.htm*, Holt describes the testing procedure: "Pulmonary arterial pressures are obtained by a procedure called 'right heart catherization.' In this procedure, a fine plastic catheter is passed through a needle in the jugular vein, with blood flow into the upper right side of the heart, through a valve into the right ventricle, through a valve and into the pulmonary artery just short of the branches to the lungs. Pressure waves are observed on a heart monitor, and the monitor gives a direct readout of the true average pressure."

The pressure is measured in millimeters of mercury (mmHg). Holt offers guidelines for reading a PAP test in Table 1. (For more on conducting and reading a PAP test, see "Danger at 5,000 Feet," in the November 2000 *Angus Journal*, available online via a back issue search at *www.angusjournal.com/aj_backissues.html*.)

The higher the blood pressure, the lower the maximum elevation that bull's body can handle, Parker explains. "The PAP test gives us that animal's risk for developing Brisket disease."

Gary Parker, of Shamrock Angus Ranch, is one of the few producers who test significant numbers of cattle for susceptibility to Brisket disease using a PAP test.

PAP testing must be done above 6,500 ft. for any accuracy, says Parker, who admits to trying all kinds of testing and at different elevations, seasons and ages. "We've found the tests very accurate if done by the right person at the right elevation."

Parker says PAP testing bulls at lower elevations just causes heartache for buyers who don't quite understand the disease. "He's (the customer) learned enough to know he needs a PAP-tested bull, but he doesn't know what's involved. So he'll buy a bull out

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Table 1: PAP score evaluations

Note: *The following figures from Tim Holt, Gunnison, Colo., are based on cattle 12 months old or older and tested at or above 6,500 feet. If an animal does not meet this criteria, adjustments must be made.*

PAP score, mmHg	Evaluation
30-35	An excellent and highly reliable score.
36-40	An excellent score for any animal older than 12 months. For a younger animal, the score is fairly reliable; but retesting is suggested.
<41	Reliable score in all animals older than 12 months. It is recommended that yearling cattle score less than 41, depending on testing altitude.
41-45	An acceptable score for animals older than 6 months. Younger animals should be retested.
45-48	An acceptable score for animals older than 6 months that have been in high elevations for an extended period. These animals should be considered at some risk. Testing altitude and the animal's location should be considered.
>49	Animals in this range are considered at high risk for themselves and their offspring. Many animals scoring in this range have died of Brisket disease.

Source: *"How is a PAP test performed?" sidebar to "Danger at 5,000 Feet," November 2000* Angus Journal.

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of low country that's been PAP-tested — and then he'll say PAP testing doesn't work. And it doesn't, unless it's done right," Parker explains.

Providing proven genetics

By using PAP scores in its selection process, Shamrock has provided a means for people to use Angus genetics proven at high altitudes, Parker says. "We sell a lot of semen from PAP-tested bulls, especially to people raising heifers."

Many of the producers had been afraid to use artificial insemination (AI) because they didn't dare use a bull that wasn't PAP-tested due to the eventual resulting death loss in their cow herds, he explains. "Even if the cattle didn't die, they bred this susceptibility into their herd; then it takes 10 years or more to get back out of it."

In the Parker's worst-case experience with an AI sire, they weaned only two of 15 calves sired by the bull.

"We quit using him, but not because we didn't like him," Parker says. Now, before using a bull heavily, the Parkers sample him to see if his offspring can survive the elevation and to try to produce a son with an adequate PAP score. They will use 20 units of semen at most to try out a bull.

Animals at high altitudes can develop Brisket disease — swelling may be noticed along the neck. [PHOTO BY TIM HOLT]

"We take all the gamble for our customers, because we have to continually bring in new genetics — for growth, light birth weight, carcass EPDs (expected progeny differences), or any of the things required of us as seedstock producers. So, as we scour the country trying to find bulls we want, we must add this additional factor," he says.

Parker says often the best bulls — those with the most volume and muscle, the most red meat — have the most brisket problems. "There is a definite genetic correlation," he says.

"But we can get away with some bulls, with careful breeding," he continues. "We use some bulls now that might not work for someone else, because our cows can often cover up for a pretty-bad-PAP-test bull. With our genetic selection, we've added more lung capacity to our cows. … but if we try to double up and use two outside AI bulls in a row, we almost always have a high-PAP-score calf. So we have to keep following through — one generation of our own cattle, back to a generation of new blood, to make this work. It makes you study a lot longer when figuring out what to breed."

Opportunities

Holt has sold his practice in Gunnison and hopes to work part time at CSU to continue research on Brisket disease. Going so far as to offer to feed out steers on the ranch, Parker says he hopes to continue to work with Holt to conduct more testing on cattle of various weights.

"This is so critical to us and to other producers in high country. We'd also like to continue the research on finding a DNA factor involved, so people could check for that," Parker says.

"There are a lot of secondary things than can cause Brisket disease — virtually anything that causes lung damage can predispose an animal," he continues. "But if we can identify bulls that DNA test for this, at least we could take the genetic risk out of it."

DNA testing, he says, would allow him to consider using more AI bulls. It would also provide producers at lower elevations a more accurate means of assessing risk for the predisposition to Brisket disease, so they could select against the tendency.