From the desk of Manny Encinias…………………………………….

Performance Testing Bulls at High Altitude - Why?

In 2009, the New Mexico Beef Cattle Performance Association (NMBCPA’s) and NMSU’s Extension Animal Sciences and Natural Resources Department and Clayton Livestock Research Center developed the nation’s newest centralized performance bull testing facility at the Valles Caldera National Preserve in northcentral NM. Unlike the NMBCPA’s Tucumcari Bull Test that has been performance testing bulls for 50 years in a confinement (pen) setting, the Top of the Valle (TOV) High Altitude Bull Test facility is a grazing performance test that utilizes a 100% grass diet made up of mixed, cool season grasses on the high altitude (8500 ft) meadows of the Preserve. The program was developed to provide a unique performance testing venue for seedstock producers to evaluate performance potential of bulls in a grazing scenario, and evaluate an individual bull’s susceptibility to high altitude disease (HAD), commonly known as brisket disease.

High altitude disease affects cattle living 5000 or more feet above sea level. The disease is most commonly observed above 6800 feet and increases in incidence and severity as elevation rises. The disease is characterized by pulmonary arterial hypertrophy and pulmonary hypertension resulting in congestive heart failure. Descriptively, the disease results from thickening and increased restriction of blood flow in small arteries in the lungs as a result of reduced blood oxygen saturation at high altitudes. The pulmonary system compensates by increasing blood pressure that may, in turn, increase leakage of fluids into the chest cavity and brisket, and may also enlarge the heart to a point that valves no longer function, resulting in backflow of blood at each contraction. The increase in blood pressure and an overworked, weakened heart prevents blood from circulating sufficiently, which leads to blood congestion in the heart, and if undiagnosed and/or not treated, death.

The symptoms of HAD are directly related to congestive heart failure. Edema (abnormal fluid accumulation) in the lower body and brisket, abdomen, and chest is the most common visual symptom. Bulging eyes, depression, weakness, and diarrhea are other symptoms observed with HAD. Observation of an enlarged pulsating jugular vein is routinely used by tenured producers to identify HAD candidates prior to visual edema symptoms. Moving cattle to low altitude usually leads to prompt recovery when detected early.
Though all animals are likely to experience a degree of hypertension at high elevations, cattle experience a higher incidence and severity due to the physiological makeup of and small size of their lungs relative to their body weight. All breeds of cattle are susceptible to HAD, however some breeds and pedigrees within breeds appear to be more naturally resistant. The scientific literature has described cattle either selected for or native to high altitudes may experience a 0.5 to 5% incidence of HAD, whereas non-adapted, low-altitude cattle moved to high altitudes for grazing may experience rates as high as 40%. Cattle experiencing respiratory disease, pneumonia, heavy parasite loads, or extended periods of exposure to cold temperatures of less than 10°F further increase their susceptibility to the non-contagious disease.

For more than 30 years, the beef cattle industry has utilized a technique that measures the pulmonary arterial pressure (PAP) to predict an animal’s susceptibility to HAD. This test measures pulmonary hypertension, or blood-flow resistance. The test generates a numerical figure commonly known as a PAP score. Measured in millimeters of mercury (mmHg), the PAP score is an average of diastolic and systolic blood pressures. It is determined via a heart monitor after a catheter is inserted through the jugular vein and fed through numerous sections of the heart into the pulmonary artery. This score is used as an indicator trait to assist producers in selection. Scores are moderate to highly heritable and highly repeatable when measured by a skilled technician.

Most PAP scores range between 30 and 130 mmHg. Cattle well-suited for high altitude have PAP scores between 30 and 40. Typically scores in the 40’s are acceptable, and scores above 49 are considered high risk for HAD.

Veterinarian Dr. Tim Holt (Colorado State University) is a recognized expert in HAD and PAP testing, and commonly encourages producers to consider the following factors that may impact PAP scores as these data are interpreted:

- The PAP scores in cattle less than 12 months of age are less accurate than those measured in cattle older than 12 months.
- For the PAP scores to be accurate, cattle must experience at least three weeks above 5000 feet.
- A PAP score becomes more accurate the higher a test-site’s altitude is above 5000 feet.
• A PAP score can be expected to increase approximately 1-2 mmHg for every 1000 feet increase in altitude.
• Interactions of physiological (i.e. estrus), environmental (i.e. temperature) and nutritional (i.e. diet energy density, ionophores, etc.) stressors and PAP scores have not been scientifically substantiated, but have been suspected in the field to affect scores.

According to Dr. Holt, who has PAP-tested more 100,000 cattle in his career, The TOV High Altitude Bull Test facility provides one of the most accurate PAP scores in the nation because the facility is the highest centralized test-site in the U.S. and cattle are in a natural grazing (unsupplemented) environment with abundant grazing resources. With the signing of a four-year contract extension in March 2010 to continue the TOV Bull Test at the Valles Caldera, NMSU has teamed with Dr. Holt and Dr. Jonathan Beever (University of Illinois, molecular geneticist) to further define genetic variables (i.e. genetic markers) for HAD, and evaluate the physiological, environmental, and nutritional interactions suspected to affect PAP scores and susceptibility to HAD.

The NMBCPA and NMSU will host their Second Annual Top of the Valle High Altitude Bull and Female Sale on Saturday, September 11, 2010. Additional sale details and performance reports will be available August 1st on the program website [http://aces.nmsu.edu/highcountrybeef/](http://aces.nmsu.edu/highcountrybeef/). County Agents and producers interested in the TOV program, annual sale, or PAP-testing are encouraged to contact me at mencinia@nmsu.edu or (505) 927-7935.

Other Departmental News

After twelve years as an Extension Livestock Specialist for NMSU, Dr. Clay P. Mathis has been selected as the director and endowed chair of the King Ranch Institute for Ranch Management (KRIRM), part of the Dick and Mary Kleberg College of Agriculture, Natural Resources, and Human Sciences at Texas A&M University-Kingsville.

Contact Manny Encinias at (575)374-2566 or (505)927-7935 or Dr. Allison at (575)644-2460 for further assistance. We all will miss Dr. Mathis tremendously!