

# Healthy and Happy

Reseachers look into improving health through welfare management.

by *Kasey Brown*, associate editor, & *Troy Smith*, field editor

**E**ver hear of cattle-fatigue syndrome?

It's something that has become part of cattle welfare discussions since beta-agonist feed supplements became suspects for causing increased incidence of mobility problems among finished cattle arriving at beef-packing plants. Dan Thomson, a third-generation bovine veterinarian and director of the Kansas State University (K-State) Beef Cattle Institute, shared his perspective regarding the connection between beta-agonists and cattle fatigue syndrome during the 4th International Symposium on Beef Cattle Welfare hosted July 16-18 in Ames, Iowa.

Thomson is one of many researchers who have been investigating how beta-agonists affect cattle performance, health and welfare in response to packer reports of slaughter cattle being stiff or lame and reluctant to move. Researchers also were interested in why signs of fatigue typically show up after delivery to slaughter facilities.

According to Thomson, researchers observed the same kinds of symptoms, plus muscle tremors, during field investigations at packing plants. Blood chemistry and other diagnostic analysis, as well as cattle behavioral symptoms, showed similarity to those found among market hogs 15-20 years ago and attributed to pig-fatigue syndrome.

Thomson said the swine industry was already using beta-agonists at that time, but studies showed that the only animals severely affected by fatigue syndrome had been subjected to significant stress. Animals at greatest risk were those that were most heavily muscled and posted very heavy market weights. That was especially true

when the hogs were aggressively handled.

Studies showed that physical stress could induce clinical signs of fatigue in "at-risk" animals, whether they had received beta-agonists or not.

Thomson said the evidence suggests that a combination of influences contribute to cattle-fatigue syndrome.

Because of genetics and feeding management, including beta-agonist use, the beef industry now produces cattle that are bigger, more heavily muscled and heavier at slaughter.

Stressors, including aggressive handling, transportation times and distances and heat,

appear to be key contributors to cattle-fatigue syndrome.

"It's not just the beta-agonists. It's multifactorial. It's the stacking of stressors," stated Thomson, calling for more study of sources of stress.

Thomson sees a particular need to look closely at stressors feedlot cattle may be subjected to during the last 30 days on feed, since that's the period during which beta-agonists are added to rations. He said the industry also needs to better understand the clinical and physiological responses to beta-agonists and the impact of different dosages in cattle rations.

"I believe we need a flexible label on these products to better manage their use," stated Thomson.

— by *Troy Smith*

## Improving immunity, health, well-being in production environments

Not all creatures respond in the same way to stress. It depends on the particular challenge. It depends on the environment. It depends on the type of animal involved, and it depends on the individual. According to

USDA Agricultural Research Service (ARS) scientist Jeff Carroll, response variation exists between and within breeds of cattle, but also among animals of the same herd. Variation between animals can result in different impacts to individual health and productivity.

"We want to know more about the variations, why they occur and how to manage them," said Carroll.

He explained how he and colleagues at the Livestock Issues Research Unit of Lubbock, Texas, have been focused on identifying natural and nutritionally induced variations in the stress and immune response of cattle exposed to a challenge. Studies have revealed variations based on

gender (steers vs. heifers), as well as variations directly linked to an animal's disposition.

"Does temperament influence stress response, innate immune response and metabolic profile? Finding the answers has been a major research effort of our team for the past decade," said Carroll.

The work has demonstrated that, compared to 'calm' cattle, temperamental cattle maintain a higher basal body temperature prior to a challenge, but

a lesser temperature change in response to challenge. Studies also showed that temperamental animals are less apt to exhibit typical sickness behavior than are calm cattle. Carroll said the evidence suggests these natural variations are linked to metabolic differences between temperamental cattle and calm cattle.

"Collectively, these data suggest that level of flightiness or arousal can modulate the physiological, behavioral and endocrine responses of cattle to a provocative immune challenge that targets activation of the innate immune system," reported Carroll. "Developing a more precise understanding of



► Genetics; feeding management; and stressors including aggressive handling, transportation times and distances; and heat contribute to cattle fatigue syndrome, said Dan Thomson, bovine veterinarian and director of K-State's Beef Cattle Institute.



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the relationship among stress hormones, the immune system and animal temperament to early inflammation may lead to methods of early intervention to minimize the debilitating impacts of illness on growth and productivity.”

Carroll said this research raises the question of whether cattle producers can go too far with genetic selection for cattle with calm dispositions. The up side is that heavy selection pressure may result in cattle that perform very well under conditions that are ideal or nearly so.

“However,” said Carroll, “if they are hit with a significant health challenge, they could crash and burn.”

— by Troy Smith

### Research examining the impact of stress

Animal scientist Bernadette Earley talked about beef production in Ireland. A researcher with Teagasc, which is responsible for agricultural research and development, plus training and advisory services in Ireland, Earley explained how improved animal welfare is supported by scientific research.

Earley called weaning a multifactorial stress event that combines physical, nutritional and psychological stresses. Abrupt weaning is stressful for both calves and cows, resulting in alterations to their immune systems that can be measured at both physiological and molecular levels.

“Our research at Teagasc has indicated, using conventional blood indicators of stress, that abrupt weaning (vs. not weaning) alone is stressful to the suckler beef calf with alterations in immune function and hormonal mediators of stress still evident seven days postweaning,” reported Earley.

Earley said studies show that reducing simultaneous stressors by avoiding abrupt changes in diet and weaning calves in close proximity to their dams can reduce immunological and behavioral stress responses in calves. Feeding dietary supplements prior to weaning can also reduce nutritional stress.

Ireland’s beef industry is heavily reliant on

exports. Earley said Teagasc scientists have studied welfare implications for live animal shipments, mostly to Europe, which typically take eight hours or more. Results show that animals exhibit the “classic response” shown by other transportation studies, where blood levels of the stress hormone cortisone are elevated during the journey, but return to baseline levels soon afterward.

However, Earley said Teagasc has also explored gene expression changes in blood neutrophils following truck transportation of yearling cattle. Neutrophils are the most abundant form of white blood cells and form an important part of the innate immune system. Earley’s group has found that following nine hours of transportation, stress altered the expression of four neutrophil genes whose protein products are key in the regulation of inflammation related to clearance of bacterial infections.

Turning the discussion to castration, Earley explained that, in Ireland, local anaesthesia is required for surgical castration, or when using a Burdizzo device to crush the spermatic cords of cattle over 6 months of age. She said Burdizzo castration has been shown to be less stressful to 5- and 6-month-old calves than either surgical or rubber-ring castration methods.

“Our research demonstrated that the routine practice of castration of calves without use of analgesia or anesthesia should occur before 2 months of age in order to minimize the physiological stress, inflammatory reactions, and pain,” reported Earley.

— by Troy Smith

### Characterizing BRD sickness response with welfare

Bovine respiratory disease (BRD) is a big deal from both a health and an economic perspective, but animal behavior is being researched on helping to diagnose the disease more quickly. University of California–Davis (UC–Davis) graduate student Rachel Toaff-

Rosenstein explained that her research “thinks outside the bottle” on BRD diagnosis.

Treatment for BRD hinges on diagnosis accuracy so treatment can be given in a timely manner, especially with increasing opposition to antibiotic use. Four symptoms recalled by the acronym DART — depression, appetite loss, respiratory changes and temperature elevation — are the main means of diagnosing BRD in cattle, though sensitivity and specificity are only 62% and 63%, respectively. There is much room for improvement, she noted.

DART symptoms are only part of the BRD sickness response. Inflammation leads to the sickness response, which includes increased lethargy, pain sensitivity, immune activity and fever; and decreased appetite, social interaction and grooming.

Her study asked whether a diagnosis can be improved with continuous monitoring using technology. Rumen boluses indicated fever; however, at more than \$50 each, they proved to be cost-prohibitive. Feed efficiency equipment, like the GrowSafe model, measure bunk attendance and feed intake. This did notice sick calves four days before the pen rider, but it is also very expensive. There isn’t much research in grooming response.

In her challenge model, 40 steers were divided into two groups. One was given viral and bacterial challenges and the other was maintained as a control. She observed the clinical sum score, which is the composite score to describe the clinical severity of disease, and performed necropsies on the challenged steers. Results showed that the relationship between the clinical sum score and the number of lung lesions was not straightforward. A higher rectal temperature was observed, but not lung lesions. She granted that may have been attributed to heat stress.

“There was a significant correlation between severe lung lesions and decreased bunk attendance,” Toaff-Rosenstein reported.

There was no relationship between brush use (to observe grooming behavior) and clinical illness, though she did observe less brush use in steers with more lung lesions.

— by Kasey Brown



► Treatment for BRD hinges on diagnosis accuracy so it can be given in a timely manner, especially with increasing opposition to antibiotic use, said UC–Davis graduate student Rachel Toaff-Rosenstein.



► Bernadette Earley, researcher with Ireland’s Teagasc, explained how improved animal welfare is supported by scientific research.