Stress in Cattle: Temperament, Performance, and Immune Function

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Various environmental, pathogenic and managerial stressors to which animals may be exposed throughout the life or production cycle have the potential to adversely impact animal health, performance and product quality. The concept of a genetic basis for resilience, tolerance or responsiveness to stressors has been expanded to recognize the integrative role of numerous endocrine, immune and metabolic factors. In the post-genomic era, it is timely to investigate how endocrine and immune system factors coordinate immunity and animal performance. Therefore, our collaborative team investigates immuno-endocrine interactions because the appropriate functioning of these integrative communication systems is vital to sustain animal health and productivity. Stress or stressfulness has been defined as the sum of the physiological, biochemical, and behavioral responses by which animals cope with threats to homeostasis. Two chemical classes of adrenal gland-derived hormones (i.e., the glucocorticoids and catecholamines) are advocated as endocrine mediators or indicators of this coping response. We have demonstrated that these endocrine markers of stress responsiveness are associated with various subjective and objective measures of temperament in beef cattle. Moreover, we detected negative consequences of temperament and/or heightened stress responsiveness on immune function, growth rate and carcass quality. These phenotypic inter-relationships should be explored via a physiological genomics approach. Animal production enterprises should now benefit from on-going and imminent translational research efforts to identify genetic and physiologic mechanisms that influence fertility, growth, temperament, metabolism and immunity. We are implementing a coordinated, translational approach to integrate basic and applied investigations of the psychoneuroimmunoendocrinology of livestock.

Objective and Process

The objective is to assess inter-relationships among measures of temperament, stress responsiveness, performance and immune function in beef cattle. We will apply in vivo and in vitro methods to acquire phenotypic and genotypic information regarding endocrine, immune and growth parameters. For example, specific tissue samples and blood samples are now stored for evaluation of vaccination response of calves near weaning (calves maintained by both Texas AgriLife Research and the Mississippi Agricultural and Forestry Experiment Station, MAFES).

Outcomes

Tissue samples are stored at -80°C from approximately 1,000 calves that also had blood samples collected to study immune and endocrine response to vaccination. Phenotypic measures of temperament and growth have been recorded. Genomic evaluation of this population could provide the basis for developing or validating markers for stress and immune responses in cattle.

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