

## INFLUENCE OF BOS TAURUS AND BOS INDICUS BREEDTYPE ON PRODUCTION OF CORTISOL

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**Background.** The genetic influence on the physiological response to stress is not well understood. Recent studies in humans have shown that racial differences exist in the function of the hypothalamic-pituitary-adrenal (HPA) axis and that some functional aspects of the HPA axis may be heritable. Earlier studies in cattle showed breed differences in dominance rank within the herd and temperament in a squeeze chute. Breed differences were also reported for baseline and ACTH-stimulated plasma cortisol concentrations in beef calves. We have noted that adrenal gland weight, adrenal cortical area and plasma concentration of ACTH and cortisol are greater for *Bos taurus* (Angus) relative to *Bos indicus* (Brahman) cattle. For instance, plasma concentration of cortisol was higher for Angus ( $44.9 \pm 2.3$  ng/ml) than for Brahman ( $35.5 \pm 3.4$  ng/ml) steers. Computer-assisted image analysis of adrenal gland morphology revealed that Angus steers had 13% greater cortical area than Brahman steers. These studies imply that genotype and heredity influence the stress response; however, they do not fully explain the mechanisms for these genotypic effects.

Cortisol is a steroid hormone produced by the outer zones of the adrenal gland in response to environmental or managerial or psychological stimuli. In addition to its role in responding to stressors and mobilizing energy, cortisol can be anti-inflammatory. However, cortisol can also be catabolic and diminish protein production. It is of interest to develop systems to assess or predict an animal's stress responsiveness and relate adrenal gland cortisol production to production and carcass traits.

**Research Objective and Method.** The objective of this experiment was to determine if differences exist in proportional response (fold increase) of plasma cortisol following an injection of adrenocorticotropin; ACTH, (0.1 IU/kg of bodyweight). Full blood *Bos taurus* (BT, n = 58), 3/4 *Bos taurus* - 1/4 *Bos indicus* (.25 BI, n = 137), 1/2 *Bos taurus* - 1/2 *Bos indicus* (.5 BI, n = 96), and full blood Brahman (BI, n = 24) stocker steers and heifers owned by the Texas Agricultural Experiment Station were utilized for this study. A blood sample was taken via tail venipuncture and followed immediately by an intravenous injection of ACTH into the jugular vein. A second blood sample was taken via tail venipuncture 30 minutes following ACTH injection.

**Research Findings.** There were no differences ( $p > .10$ ) in proportional response of cortisol (PR) between steers and heifers within breedtype. The PR was higher ( $p \leq .0028$ ) in the BT cattle compared to the .50 BI cattle and the BI cattle ( $2.48 \pm 0.20$  vs.  $1.69 \pm 0.15$ ;  $1.37 \pm 0.31$ , respectively). There was no difference ( $p = .31$ ) in PR between the BT cattle and .25 BI cattle ( $2.48 \pm 0.20$  vs.  $2.24 \pm 0.13$ , respectively). The PR was higher ( $p \leq .010$ ) in the .25 BI cattle compared to the .50 BI cattle and BI cattle ( $2.24 \pm 0.13$  vs.  $1.69 \pm 0.15$ ;  $1.37 \pm 0.31$ , respectively). The proportional response was not different ( $p = .36$ ) between the .50 BI cattle and the BI cattle ( $1.69 \pm 0.15$  vs.  $1.37 \pm 0.31$ , respectively). These results indicate animals of various percentages of *Bos indicus* and *Bos taurus* breedtype respond differently in production of cortisol after exogenous ACTH.

The ACTH challenge protocol will be used again at the end of the grazing period and near termination of the feedlot period. Adrenal responsiveness will be compared among breed types and its relationship, if any, to carcass traits will be determined

**Application.** An animal's genetic make-up may affect its susceptibility and(or) resistance to stressors. A certain breedtype or individual may possess traits that reduce (enhance) the negative consequences of stress and allow for greater (less) production efficiency. Additional studies may provide a more complete understanding of how genotype controls these traits which could lead to methods of selection for animals that are stress resistant.