

THE EFFECTS OF MANAGEMENT STRESSORS ON CORTISOL PRODUCTION IN VARIOUS BREEDTYPES OF BULLS

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Background. In livestock production systems, the stress response can be stimulated by many factors called stressors. A stressor is defined as an environmental factor that contributes to a stressful circumstance or elicits stress responses which can threaten or adversely affect the health of the body. Stressors can be physiological or psychological. Normal management practices which elicit a stress response include handling and restraining animals in squeeze chutes, hot iron branding of animals, change in housing, as well as transporting of animals. Breed of cattle can also affect the level of response to a stressor. It has been reported that circulating ACTH and cortisol were higher for 3/4 Angus than 3/4 Brahman steers and adrenal weight was 15% higher for 3/4 Angus than 3/4 Brahman steers. Producers could select breeds or types of animals which may be better suited to withstand the stressors inherent in their production systems provided that comparative information was developed.

The objective of this study was to evaluate influence of breedtype on response to transportation and restraint in tropically-adapted *Bos taurus* bulls, tropically-adapted *Bos indicus* bulls and temperate *Bos taurus* bulls.

Research Findings. Bulls of six different breeds, Bonsmara (n = 8), Romosinuano (n = 10), Tuli (n = 10), Brahman (n = 8), Angus (n = 7), and Wagyu (n = 10), were utilized for this experiment. The Bonsmara and Tuli both originated in Southern Africa whereas the Romosinuano originated in South America and the Wagyu originated in Japan. The Bonsmara, Romosinuano and Tuli are acclimated the tropical environments and the Wagyu is a temperate breed known for highly marbled carcasses. After reaching sexual maturity, bulls were subjected to a transportation (trailer) stress and a serial blood collection. A blood sample was collected immediately prior to transporting. Three bulls were loaded on a trailer so that each bull had his own compartment. The transportation stress consisted of a pre-determined trip which was 18 miles long and lasted 30 minutes. Following the transportation stress, bulls were weighed and an additional blood sample was collected. Blood samples were collected every 15 minutes for six hours from an indwelling catheter to determine concentrations of cortisol in the circulation.

Pre-transportation cortisol concentrations were not different between breeds of bulls. Angus, Brahman, Romosinuano and Tuli bulls were similar and higher in cortisol response to transportation than Bonsmara and Wagyu bulls which were lower in cortisol response. Similar findings were found for the restraint stress. Angus, Brahman, Romosinuano and Tuli bulls had similar and higher cortisol concentrations

during restraint than Bonsmara and Wagyu bulls which had lower concentrations of cortisol during restraint. Either stressor elicited responses with bulls from different breedtypes responding in the same rank order for both stressors.

Application. Angus, Brahman, Romosinuano and Tuli bulls demonstrated the greatest adrenal cortical response to both management stressors. Bonsmara and Wagyu bulls had the lowest adrenal cortical response to the same stressors. Breeds of bulls differ in adrenal cortical response to management stressors and it is possible to attain the same ranking using either transportation or restraint testing.

Table 1. Concentrations of cortisol relative to transportation stress in bulls.

Breed	Pre-Trailer Cortisol (ng/ml)	Post-Trailer Cortisol (ng/ml)	Absolute Change of Pre- and Post-Trailer Cortisol
Angus	13.9 ± 3.5 ^a	18.5 ± 4.4 ^{a,c}	4.6 ± 3.6 ^{b,c}
Bonsmara	4.5 ± 3.5 ^a	2.4 ± 4.4 ^b	-2.1 ± 3.9 ^c
Brahman	12.6 ± 3.2 ^a	26.3 ± 4.0 ^a	13.6 ± 3.6 ^{a,b}
Romosinuano	9.5 ± 3.0 ^a	24.3 ± 3.8 ^a	14.8 ± 3.4 ^a
Tuli	8.0 ± 3.0 ^a	17.1 ± 3.8 ^{a,c}	9.1 ± 3.4 ^{a,b}
Wagyu	5.2 ± 3.0 ^a	9.7 ± 4.0 ^{b,c}	4.5 ± 3.6 ^{b,c}

Means with different superscripts within the columns differ P < 0.06.

Table 2. Mean cortisol concentrations for the first two hours, second two hours and third two hours of restraint.

Breed	First two hr (ng/ml)	Second two hr (ng/ml)	Third two hr (ng/ml)
Angus	14.5 ± 3.1 ^{a,b}	8.6 ± 1.7 ^a	7.1 ± 1.4 ^a
Bonsmara	7.8 ± 2.7 ^{b,c}	2.9 ± 1.5 ^a	3.9 ± 1.2 ^a
Brahman	15.1 ± 2.7 ^a	7.6 ± 1.5 ^a	6.3 ± 1.2 ^a
Romosinuano	12.9 ± 2.4 ^{a,b}	5.5 ± 1.3 ^a	3.9 ± 1.1 ^a
Tuli	11.6 ± 2.4 ^{a,b}	4.9 ± 1.3 ^a	4.3 ± 1.1 ^a
Wagyu	5.0 ± 2.4 ^c	4.9 ± 1.3 ^a	5.6 ± 1.1 ^a

Table 3. Average, highest and lowest cortisol concentrations during restraint.

Breed	Average Cortisol (ng/ml)	Highest Cortisol (ng/ml)	Lowest Cortisol (ng/ml)
Angus	10.3 ± 1.9 ^a	25.5 ± 4.4 ^a	1.7 ± 0.7 ^{a,b}
Bonsmara	5.0 ± 1.7 ^a	12.9 ± 3.8 ^b	1.2 ± 0.6 ^b
Brahman	9.9 ± 1.7 ^a	25.7 ± 3.8 ^a	3.1 ± 0.6 ^a
Romosinuano	7.6 ± 1.5 ^a	22.5 ± 3.4 ^a	1.3 ± 0.6 ^b
Tuli	7.1 ± 1.5 ^a	21.1 ± 3.4 ^{a,b}	1.4 ± 0.6 ^{a,b}
Wagyu	5.1 ± 1.5 ^a	12.6 ± 3.4 ^b	0.9 ± 0.6 ^b