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A NOTE ON HEAT TOLERANCE AND THYROID FUNCTION IN AFRICANDER AND HEREFORD COWS.

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Production in farm animals is dependant on their ability to accommodate or to tolerate their environment without disruption of the optimal internal equilibrium necessary for growth and production. Under advantageous conditions, productivity of *Bos taurus* breeds is greater than that of *Bos indicus* breeds. However, the former is more susceptible to environmental stress (Ragsdale, Cheng & Johnson, 1957). Yousef, Hahn & Johnson (1968) stated that the inverse relationship between thyroid activity and suitability of environment provides a means of adaptation to environments above or below thermoneutral temperature. The present experiment comprised part of a programme of investigations on physiological and endocrine factors involved in breed differences in productivity and resistance to stress. This experiment was designed to examine the interrelationships between thyroid function and body temperature of Africander and Hereford cows subjected to high temperatures.

Four pairs of indentical mature Africander twin cows and unrelated mature Hereford cows were included in the experiment. One of each twin pair (Africander) and four Hereford cows were kept in crates in hot rooms for ten days. The other cows were housed indoors in the shade for the same period. Diurnal fluctuations in temperature in the hot rooms was controlled by air conditioners (Table 1). Air temperatures and humidity were recorded by thermohygrographs. Blood was teken from the jugular vein at the beginning and end of the hot room treatment for the determination of thyroid function with the T_3 uptake test (Trilute-Ames Company). At 12h00 rectal and skin temperatures were recorded using thermisters and a digital readout thermometer. The respiration rate was counted. The cows were weighed before and after the hot room treatment.

From Table 1 it is obvious that rectal and skin temperatures and respiration rate were lower in Africander than in Hereford cows both under hot room and control

Table 1

The mean environmental temperature and body temperatures and thyroid function of Africander and Hereford cows under normal and hotroom conditions

	AFRICANDER		HEREFORD	
	Control	Hot Room	Control	Hot Room
Air temperature 12h00 °C	24,0 ± 1,3[a]	40,7 ± 2,8[b]	24,0 ± 1,3[a]	40,7 ± 2,8[b]
Air temperature 0 h °C	16,2 ± 1,3[a]	24,3 ± 2,8[b]	16,2 ± 1,1[a]	24,3 ± 1,5[b]
Rectal temperature* °C	38,1 ± 0,1[a]	39,3 ± 0,7[a]	38,4 ± 0,2[a]	41,1 ± 1,0[b]
Skin Temperature* °C	36,6 ± 0,6[a]	38,4 ± 0,9[b]	37,0 ± 0,8[a]	40,2 ± 0,8[c]
Respiration rate/min*	31 ± 3[a]	135 ± 14[b]	47 ± 4[c]	142 ± 18[b]
Initial body mass. kg.	1098 ± 88[a]	1063 ± 90[a]	952 ± 123[a]	1006 ± 125[a]
Change in body mass. kg.	+ 3,3 ± 1,5[a]	- 19,3 ± 7,6[b]	+ 1,5 ± 1,3[a]	- 31,1 ± 8,6[b]
Thyroid function (T_3 uptake)				
Before	66,1 ± 8,5[a]	63,8 ± 9,5[a]	69,4 ± 6,8[b]	71,2 ± 9,7[b]
After	66,6 ± 7,4[a]	62,4 ± 4,4[a]	62,7 ± 9,3[a]	67,7 ± 8,2[a]

abc Within each set of figures means having the same superscript are not significantly different from each other.

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conditions. Towards the end of the hot room treatment two Herefords collapsed repeatedly with severe alkalosis and were removed from the hot rooms. Although under extreme discomfort, the Africanders tended to adapt to hot room conditions and resumed eating. By contrast the Herefords became more and more affected by the extremely high temperatures and lost 12,6% of their initial body mass as compared with 7,2% for the Africander. In corroboration with Bonsma (1940) these findings show that Africanders can maintain lower body temperatures under high ambient temperatures better than can *Bos taurus* (Hereford).

T_3 uptake of Africanders was lower initially than that of Herefords but neither breed showed any significant change in T_3 uptake during the hot room treatment. However, from Table 2 it is obvious that, under conditions of high temperatures the correlation coefficients of skin and body temperatures with thyroid function increased as the hotroom treatment progressed. This was mainly due to a regular rise in body temperature towards the end of the hotroom treatment. It is also of interest that the two Herefords that collapsed regularly had the highest initial thyroid activities (77,2 and 80,8 - mean 69,4). Bearing in mind the relatively long latent period of thyroxine, the results from the present experiment demonstrates the significant role of the thyroid in metabolic regulation of thermal stability. It is therefore concluded that the animals ability to accommodate heat stress is inversely related to its thyroid activity at that time.

Table 2

Correlations of thyroid function (T_3 uptake) with body temperature towards the end of the hotroom treatment.

	Correlation coefficient	
	Rectal temperature	Skin temperature
Control	0,46	0,21
After one day	0,59	0,48
After ten days	0,67	0,61

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