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PHYSIOLOGICAL AND ANATOMICAL DIFFERENCES IN ADAPTED AND NON-ADAPTED CATTLE IN THE TROPICS

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Background. *Bos taurus* cattle from temperate climates in tropical and subtropical environments decrease fertility, growth, lactation, and ability to work, which makes them improductive. It has been suggested that regulation of body temperature by *Bos indicus* cattle is more efficient than *Bos taurus*, which makes *Bos indicus* breeds more adaptable to tropical and subtropical climates. The objective of this study conducted in tropical Brazil was to characterize some physiological and histological responses to environmental temperature in imported *Bos taurus*, native *Bos taurus*, and native *Bos indicus* cattle.

Research Findings. Imported Simmental (n = 107), native Simmental (n = 99), and native Zebu (n = 121) (42-80 mo) were evaluated. Animals were walked 7 km at 37°C and 60-65% relative humidity during mid-day. Rectal temperatures and respiration rates were taken before and after the walk. A 0.01 cm^2 sample of cutaneous tissue from the lateral cervical region was obtained from each animal. Slices were stained with hematoxylin-eosin solution and numbers of epithelial strata were counted. Perimeter of the sweat glands was also calculated. Results of physiological parameters are shown in table 1 and results from histological parameters are shown in table 2.

Table 1. Effects of heat stress on physiological parameters in imported Simmental, native Simmental and Zebu cattle (LSM±SE).

Parameter	Imported Simmental	Native Simmental	Native Zebu
RT[a]-Resting (°C)	40.52 ± .04[a]	38.90 ± .04[b]	38.90 ± .04[c]
RT-Exertion (°C)	*	38.87 ± .05[a]	39.46 ± .05[b]
RR[b]-Resting	64.2 ± .6[a]	35.0 ± .6[b]	15.0 ± .2[c]
RR-Exertion	95.8 ± .8[a]	56.8 ± .8[b]	33.2 ± .8[c]

[abc]means in rows with different superscripts differ P < .0001.

[a]RR=Respiration rate, [b]RT=Rectal Temperature.
*=Animals could not complete walk and RT was not collected.

Table 2. Effects of heat stress on skin histologic parameters in imported Simmental, native Simmental and native Zebu cattle (LSM±SE).

Parameter	Imported Simmental	Native Simmental	Native Zebu
SG[c] Perimeter (μm)	497.2 ± 17.4[a]	382.0 ± 27.6[b]	540.5 ± 19.1[a]
ES[d] Number	4.5 ± .12[a]	7.15 ± .12[b]	14.93± .12[c]

[abc]means in rows with different superscripts differ P < .0001.
ES[d]=Epithelial Strata.

Applications. In a tropical environment, native Simmental had elevated body temperatures and respiration rates, imported Simmental had dramatically increased body temperatures and respiration rates while Zebu cattle had the lowest body temperatures and respiration rates. Results from this study indicate that *Bos indicus* cattle are the best adapted to tropical and subtropical environments. Adaptation to these environments by *Bos indicus* cattle may be related to sweat gland histometry and greater numbers of epithelial strata which may permit them to maintain body temperature more efficiently than *Bos taurus* breeds.