UF-Gainesville Beef Cattle News Corner

Sweating as a heat exchange mechanism in beef cattle.

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In response to heat stress, beef cattle regulate their internal ***heat production*** (by modulating basal metabolic rate through thyroid hormone actions and changing feed intake, growth, lactation, and physical activity) and the ***heat exchange*** with the environment (by increasing blood flow to the skin, and increasing evaporative heat loss through sweating, panting and behavioral wetting of the skin).

Under heat stress, cattle lose heat primarily via cutaneous evaporation at the skin-hair coat interface. Many factors affect the efficiency of evaporative cooling including sweating capacity, sweat gland properties and hair coat properties. Sweating is an important method of heat loss. Did you know that when the ambient temperature exceeds 86°F, **85%** of the heat loss is achieved through sweating??

To investigate the natural variation present in our different beef cattle populations and the role this variation plays in the thermotolerance phenotype, we started with the UF multibreed population in the UF Department of Animal Sciences. The herd, initiated in 1989, consists of group of cattle spanning the range from 100% Angus to 100% Brahman are represents a great research resource for investigating the effect of different Brahman and Angus percentages on a multitude of traits, from growth traits, to meat quality to thermotolerance. For two years we collected skin biopsies and used them for histological analyses. Pictures of the stained histology slide (**Figure 1**) were taken under a microscope and skin properties were measured using a computer program. Skin properties measured include number of sweat glands, sweat gland area, number of sebaceous glands, depth of sweat glands from skin surface, epidermis/dermis thickness, and epidermis/dermis area. Tremendous differences in skin properties are evident when comparing the skin histology of Brahman and Angus, with Brahman having larger sweat glands located closer to the skin surface than Angus cattle (**Figure 1**).

A significant linear effect of Brahman percentage on sweat gland area (**Figure 2**) was identified in the UF multibreed population which ranges from 100% Angus (100%A) to 100% Brahman (0%A). However, large variation within each breed group is evident, indicative of opportunities for selection.

These preliminary results indicate that there are significant differences in skin properties related to heat exchange ability between Brahman and Angus cattle, such as sweat gland size and the depth of the sweat glands in the skin. These differences are also accompanied by significant levels of variation within each breed, which is encouraging and indicative that selection for these skin traits would result in improvement of heat exchange ability in beef cattle. **Further, selecting beef cattle for these skin traits would lead to increased resilience to heat stress without disruption of production traits.**

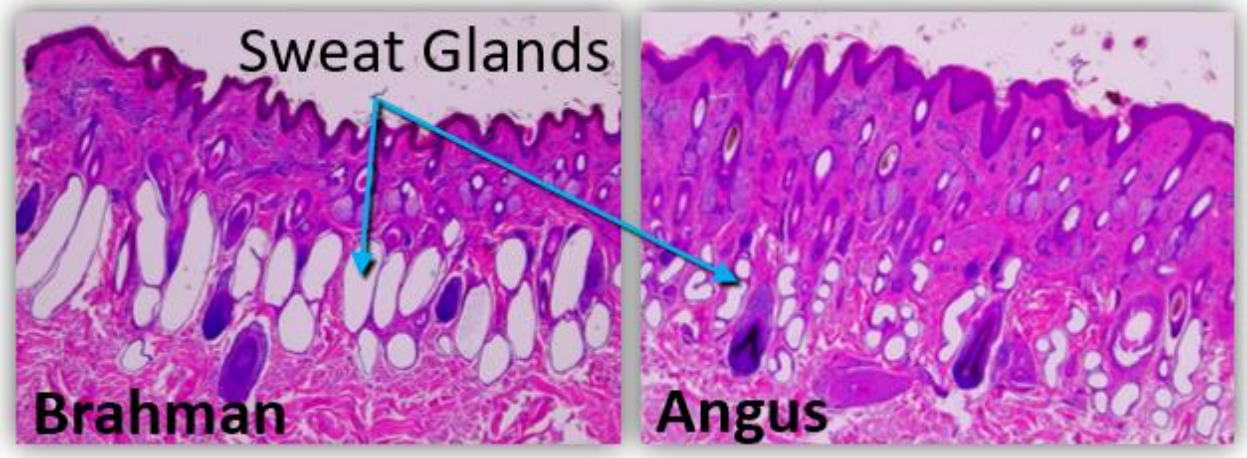

Figure 1. Example of 2 skin histology slides prepared from 6mm skin biopsies. Skin properties measured on these slides include: number of sweat glands, sweat gland area, number of sebaceous glands, depth of sweat glands from skin surface, epidermis/dermis thickness, and epidermis/dermis area. Tremendous differences in skin properties are evident when comparing the skin histology of Brahman (left) and Angus (right), with Brahman having larger sweat glands located closer to the skin surface than Angus cattle.

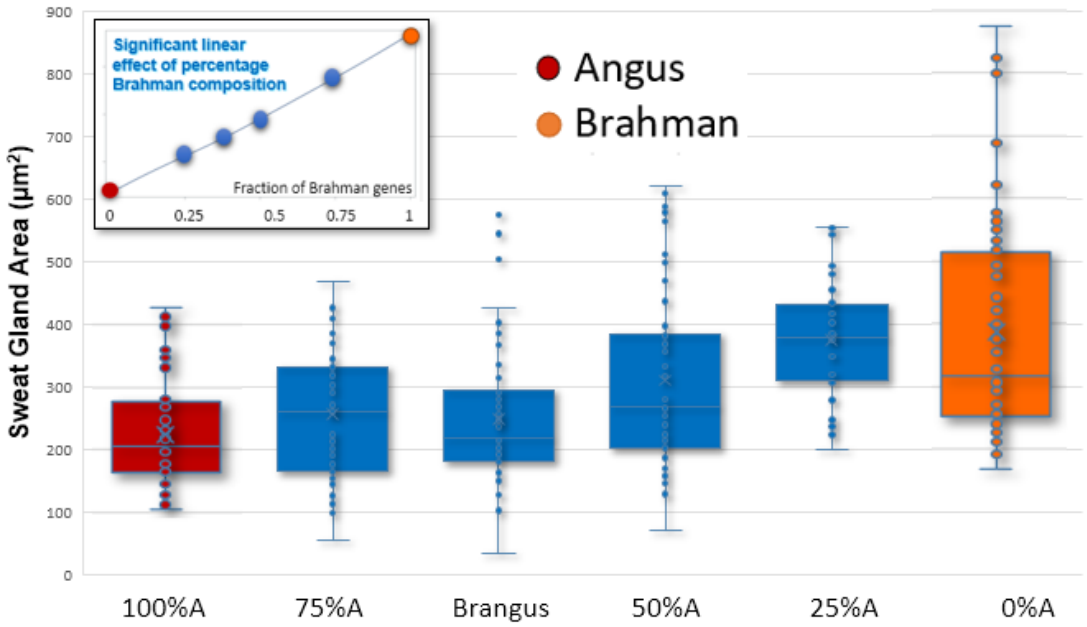

Figure 2. A significant linear effect of Brahman percentage on sweat gland area was identified in the UF multibreed population which ranges from 100% Angus (100%A) to 100% Brahman (0%A). However, large variation within each breed group is evident, indicative of opportunities for selection.