



*Horns and thermoregulation* is one of a range Animal Welfare Approved technical papers designed to provide practical advice and support to farmers. For more information visit our website.

## **SHORT DESCRIPTION OF TECHNICAL PAPER CONTENT**

### **About this technical paper**

This technical paper provides farmers who are participating in the Animal Welfare Approved program with information about horned cattle and thermoregulation. Key topics include the facts about horn structure and whether cattle horns are involved in cattle temperature regulation.

### **KEYWORDS**

Welfare; cattle; horns; thermoregulation

## Horns and thermoregulation

Some concern has been raised regarding the ability of cattle to cool themselves if their horns are not permitted to grow because the horn bud is destroyed at a young age in line with allowances within the *Animal Welfare Approved (AWA)* standards.

There is potential for sheep, goats, cattle and bison to use their horns as part of their thermoregulatory (temperature regulating) processes. In cattle the extreme is the Ankole Watusi, a cattle breed native to Africa which has horns that can grow up to six feet long, honeycombed with blood vessels. This makes perfect sense as the Ankole Watsui evolved to live in areas where the temperature stays very high all year round.

The way the heat exchange process works is for blood to be pumped round the 'core' of the horn – the bit that actually has blood vessels in it – and as this blood passes close to the outside of the horn heat can be lost to the atmosphere and cooler blood returns to the body of the animal.

However, other cattle breeds evolved to live in colder environments and there is a difference in horn morphology for cattle breeds from tropical and temperate zones. Research has shown that in temperate species the surface area of the vascularised inner core is reduced while the thickness of the outer keratin sheath is increased. This limits heat loss from the horns, as in colder climates loss of heat would be a welfare negative.

Animals have evolved to adapt to their environment but this adaptation takes many thousands of years. An animal from a hot climate cannot suddenly switch from using their horns to cool themselves to stopping that heat loss. It is worth noting that antelope originating from Africa have actually been found to have frostbite at the tips of their horns when they are kept in zoos in cold countries – the cooling effect of having horns cannot be controlled by the animal. Further to the research showing the difference in temperate and tropical cattle breeds the same team in later research argued that differences in horn morphology between temperate and tropical cattle appeared to have evolved as adaptations to restrict heat loss in the former while facilitating heat loss in the latter group.

Therefore temperate cattle breeds; such as the Dexter originating from south west Ireland, the Hereford originating from England, the Devon cattle also from England and many others will have horns but these are not a major part of their cooling process. In fact, according to the research quoted above their horns are adapted to restrict heat loss.

In any case thermoregulation in cattle is not solely a function of having horns. There are a number of breeds and strains of cattle that are polled – that is they naturally do not have horns. A number of popular cattle breeds such as the Angus are polled cattle and other widespread breeds such as the Hereford have polled strains. If the only way cattle could heat regulate was through their horns these animals would not look very healthy.

When temperatures exceed the thermo neutral zone for cattle – at around 85F or more – the animals regulate their temperature by evaporative cooling. Evaporative cooling is mainly effected through sweating and respiration. Heat stress is a function of time, temperature and humidity, because cattle rely on water evaporation via sweating and panting to dissipate an excess of heat they have generated metabolically or absorbed from the environment. High humidity makes evaporative cooling less efficient. Cattle will seek shade when it is available to minimize the effects of high temperatures.

There are negative points to having horns for the animals and for the stock people managing their health and welfare. Animals can damage one another with horns – a boss animal whether male or female will keep less dominant animals away from feed and water with its horns. Breeding males can fight and injure one another with their horns. In the wild this is about survival of the fittest and allowing younger animals with different genetics to take charge of the herd and breed. In a farming situation this could be the incapacity or loss of your best bull. Lastly there is a human health and safety issue with handling horned cattle. A horned steer that throws its head around when it is being handled can be a considerable danger to those trying to work with it.

There are some farmers who choose to keep horned cattle and who have the particular skills and equipment to manage them – for example feeders and squeeze chutes must be specially adapted for horned animals to prevent them being trapped or injured. AWA would never require that such farmers moved to breeding polled cattle or that they disbud their calves to stop horns growing. However AWA does recognize that for other farmers and other breeds disbudding calves may offer the best welfare for life. AWA does of course specify the age and methods of disbudding that are acceptable to minimize the stress of the operation. AWA does not allow the mutilation of dehorning – the removal of the horn once it is fully formed and attached to the skull.

#### References:

Blackshaw A K and Blackshaw J W (1994) Heat stress in cattle and the effect of shade on production and behaviour: a review. In: *Australian Journal of Experimental Agriculture* 34(2) 285 - 295

Picard K, Festa-Bianchet M, Thomas D (1996) The cost of horniness: heat loss may counter sexual selection for large horns in temperate bovids. In: *Ecoscience* 3(3): 280-284

Picard K, Thomas D, Festa-Bianchet M, Belleville F and Laneville A (1999) Differences in the thermal conductance of tropical and temperate bovid horns. In: *Ecoscience* 6 (2): 148-158