

Objective Measurement of Pain and Fear in Cattle Using Infrared



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Introduction

Understanding and identifying agricultural practices that can cause fear and pain in animals is of importance from the perspective of animal welfare and animal industry economics. However, the availability of tools to measure such responses has been lacking. The non-invasive use of infrared thermography has been used to study pain (Cook et al. 2005), stress (Stewart et al. 2005) and disease (Schaefer et al. 2004, 2006) in animals. However, the differentiation of factors such as distress or acute pain has received limited attention. The fear response of animals for example is thought to involve and operate principally through catecholamine, beta adrenergic systems whereas stress responses are typically thought to be more reflective of hypothalamic-pituitary-adrenal mechanisms. The intent in the present study was to further differentiate the stress/pain/fear reactions in animals and to define thermal characteristics related to each.

Results and discussion

As illustrated in the accompanying figures, a sudden drop in orbital temperature occurred in both the fear treatment calves (-0.36 ± 0.11 °C) and the pain treatment calves (-0.47 ± 0.01 °C) over the first 50 seconds after treatment ($P < 0.05$). Furthermore, there was a delayed return to baseline in the pain treatment calves compared to the fear treatment animals.

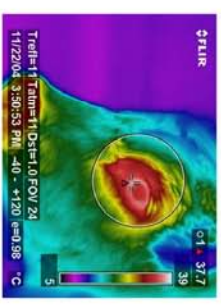
Results and discussion

Orbital temperatures in the pain treatment animals remained lower than temperatures in the fear treatment both at 50-100 and 150-200 seconds following treatment ($P < 0.05$). Representative time thermal response graphs (below) of control, fear and pain treatment animals. Data is shown for 5 min pre and post event.

Conclusions

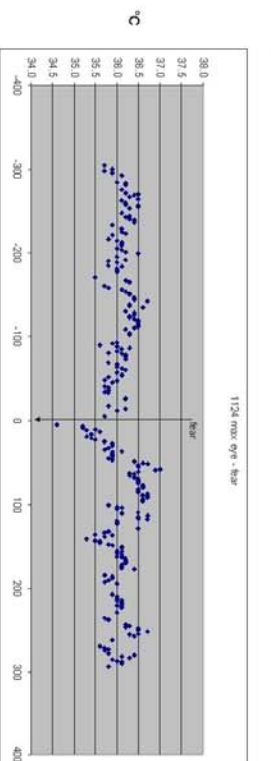
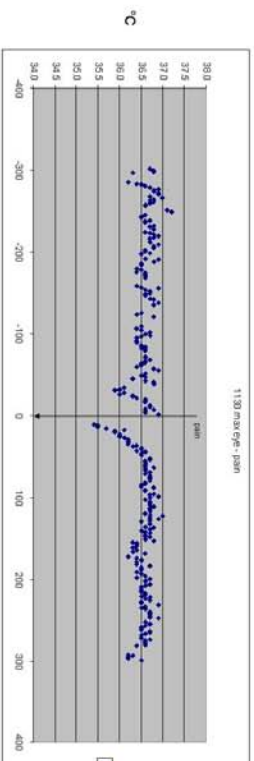
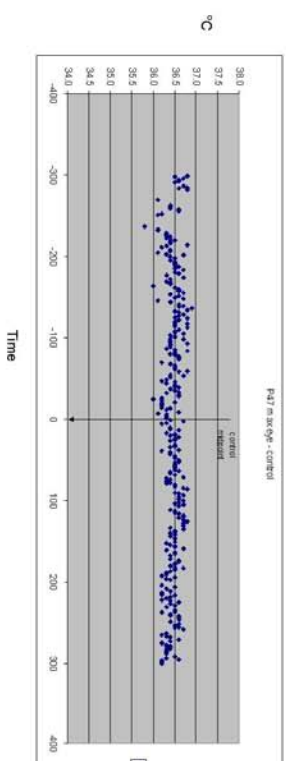
The data suggest that it is possible to non-invasively use infrared thermography to detect both acute pain and fear in cattle and potentially differentiate between these two stressors.

Representative Infrared Image of Calf Orbital Region



Materials and methods

The current study was a three factorial design with three treatments as Control, fear and acute pain. Control treatments consisted of restraining a calf in a conventional cattle squeeze for 20 minutes. The fear treatment consisted of restraint of a calf in the same squeeze followed by flashing a plastic bag in front of the calf twice. The flashing of the plastic bag was accompanied by uttering a fearful word to the calves. The investigators used the word “ne” in the present study since “ne” is the most fearful word in the English language. The pain treatment consisted of again capturing the calves in a squeeze followed by two-one second bursts of a conventional battery cattle prod. Twenty one crossed calves averaging 350 Kg were used in the study. All animals were randomly assigned to the treatments and each calf was allowed a five minute rest period post capture in the squeeze. Continuous infrared images were collected from a distance of 2m using a FLIR S60 broadband camera. A SAS mixed model was used to analyse the data.



References

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Shrubbery circa Knights of “ne”



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