

Quantitative Electroencephalographic Findings Associated with Nociception Following Surgical Castration in Conscious Calves

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Introduction

Pain suffered by livestock due to routine husbandry is an issue of growing concern, yet there is no validated model of pain available to assess the efficacy of pain-mitigating procedures. This study assessed quantitative EEG parameters in fully conscious calves in response to surgical castration.

Materials and Methods

Following a 4-6 day acclimation period, six Holstein calves, 12-20 wks of age, were restrained in a standard chute with head-table attachment and electrodes were placed transcutaneously in a 12 channel montage to record EEG. The EEG recording included: baseline recording (before castration), castration, immediate recovery (0-5 minutes after castration), middle recovery (5-10 minutes after castration), and late recovery (10-20 minutes after castration). The mean \pm standard error of the mean (SEM) was calculated for each outcome variable at each time point. Repeated measures data were

analyzed using a univariate split-plot approach. Statistical significance was designated a priori as $P < 0.05$.

Results

Quantitative EEG (qEEG) results showed significant differences in relative power, mean, median, and peak frequency of the single bands. The relative power of delta and beta bands decreased and increased respectively between baseline and castration periods. At castration, an obvious shift toward faster frequencies was visible on the EEG, and was confirmed with qEEG. This change in activity, known as desynchronization, is thought to represent the cerebral processing of noxious stimuli associated with pain in conscious individuals.

Significance

These results suggest that qEEG is useful to assess acute pain attributable to castration and may be valuable in developing science-based procedures to mitigate pain in livestock.