

Effects of dehorning on welfare indicators in beef cattle: systematic review-meta-analysis approach

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This study is a meta-analysis of the effects of dehorning on welfare indicators, measured by cortisol concentration, average daily gain (ADG) or vocalization in beef cattle. We conducted a literature search on five electronic databases (CAB Abstracts, ISI Web of Science, PubMed, Agricola and Scopus) from January 1900 to May 2015 and included conference proceedings and electronically contacted experts, as well as we checked references of relevant review manuscripts. Inclusion criteria were complete studies using beef cattle until 12 months of age undergoing dehorning that showed one of the following outcome measures: cortisol level, ADG or vocalization. Data were extracted using pre-defined protocols. The included documents were written in English, Spanish, Portuguese or Italian. Random effect meta-analyses were conducted for each indicator separately with the mean of control and treated group. Possible influences of study characteristics and quality were assessed in meta-regression analyses. Four publications reporting seven studies and 69 trials were included in this MA involving 287 animals. Significant heterogeneity between studies was observed for each outcome. Cortisol concentration decreased at 30 ($MD = -0.767 \text{ nmolL}^{-1}$; $P < 0.001$; 95% CI: -1.099, -0.435) and 120 min ($MD = 0.680 \text{ nmolL}^{-1}$; $P = 0.023$; 95% CI: -1.267, -0.093) after intervention favouring non-dehorned group in comparison to amputation dehorning animals. Local anaesthesia was not effective in reduce cortisol concentration 30 min after dehorned by amputation. The number of vocalization showed a marginal significant decrease ($MD = -0.929$; $P = 0.081$; 95% CI: -1.973, 0.116) in non-dehorned animals compared to dehorned by amputation. For comparison groups by meta-analysis for ADG, no significant effects were obtained. Publication bias was observed for ADG outcome, i.e. small size studies reporting non-significant effect were less likely to be published than similar studies that found a significant effect. The continent where the study was performed, sample size, blinding the outcome assessment, type of drug used, and the publication type explained 95% of the between-study variance, and these variables were associated to the outcome when cortisol was analysed. Pain management in the routine dehorning of beef cattle is recommended. However, further investigations are required to improve confident decision in pain relief.

Keywords:animal welfare, cattle, cortisol, pain, vocalization, weight