

Effects of lameness on semen quality in beef bulls: a case-control study

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Introduction

High cortisol levels resulting from lameness-associated pain decrease testosterone release and disrupt normal spermatogenesis in breeding bulls. As a result, lameness might negatively affect semen quality and lead to increased sperm defects. The objective of this study was to investigate the effect of lameness on cortisol and testosterone concentrations and semen quality of breeding beef bulls presented to a veterinary teaching hospital.

Materials and methods

Beef bulls, 2-years of age or older, that presented for lameness, foot trim and/or breeding soundness examination, were enrolled. Blood samples were collected for cortisol and testosterone evaluation. From all bulls, semen was collected by electroejaculation, and morphology was assessed on 200 spermatozoa. Abnormalities of the head, midpiece and tail were recorded. A complete lameness examination was performed, and foot lesions recorded for all bulls. A blinded evaluator used a lameness score of 1 to 5 to classify each bull as lame or not lame (1 = not lame; 5 = non-weight bearing lameness). A total of 49 bulls were enrolled (25 cases and 24 controls). Chi-square, Kruskal-Wallis and Wilcoxon Rank-Sum tests, with case and control as main grouping factor, were used to analyze data. Correlation between cortisol and testosterone was calculated with a Spearman's test. Data are presented as median [Interquartile range]. Significance was set at $P \leq 0.05$.

Results

In all lame bulls, the origin of lameness was the foot with no cases of upper limb lesions. The most common lesions found in case and control bulls were laminitis-related (64% and 56.5%, respectively), and lesion types were similar between groups ($P = 0.14$). The percentage of normal sperm was higher in the control group 76.25% [57.88, 81.00] compared with the case group 66.00% [46.00, 77.50]; however, it was not significantly different ($P = 0.24$). A high proportion of lame bulls with a lameness score of ≥ 3 (54%; $n = 13$) had lower than optimal semen quality compared with lame bulls with a score of < 3 and non-lame bulls. Cortisol concentrations in the case and control groups were 54.00 [28.00, 78.00] and 53.00 nmol/L [41.50, 68.25], respectively ($P = 0.83$). Testosterone concentrations in the case and control groups were 4,081.02 [1,287.03, 8,321.59] and 5,551.52 pg/mL [1,988.52, 11,874.45], respectively ($P = 0.54$). There was a weak negative correlation between testosterone and cortisol (-0.37 , $P = 0.006$). A high prevalence (63.2%) of laminitic lesions were observed in beef bulls from this study.

Significance

Although there was a trend for non-lame bulls to have a greater proportion of normal sperm, the effect of lameness in semen quality was not significant. However, the negative correlation between cortisol and testosterone levels in bull semen quality warrants further investigation.

