

# Evaluation of the stress-reducing effect of injectable trace minerals in beef calves

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## Introduction

Very few studies have shown that trace minerals supplementation may have stress-reducing effects in humans. In beef cattle, to the best of our knowledge, no available information about the mechanistic effects of injectable trace-minerals supplementation (ITM) on beef calf's stress response. The aim of the current study was, therefore, to address this gap in knowledge by evaluating the stress-mitigation effects of ITM in beef calves exposed to different types of stress.

## Materials and methods

In a randomized clinical trial, serum cortisol concentration [cort] was measured in 30 calves randomly assigned to 2 groups: 15 calves received modified-live virus (MLV) vaccine and ITM subcutaneously (SC; VAC+ITM), and 15 calves received MLV vaccine and saline SC (VAC+SAL). The calves were exposed to the stress of treatment and vaccination (d0), nasal aerosol with bovine viral diarrhea virus-2 strain 890 (BVDV-2) challenge (d5), and liver biopsy (d26). Health status was evaluated, leukocyte counts, BVDV-2 serum neutralizing antibodies (SNA), and percentage of CD4(+), CD8(+), WC1(+) and CD25(+) T-cells were measured.

## Results

Marked associations were reported between [cort] and percentage of CD8(+) ( $r_s = 0.50$ ;  $P < 0.001$ ), BVDV2-SNA ( $r_s = 0.43$ ;  $P < 0.001$ ), WC1CD25(+) ( $r_s = 0.41$ ;  $P < 0.001$ ), and rectal temperature ( $r_s = -0.40$ ;  $P < 0.001$ ). The overall average of [cort] was lower in VAC+ITM-treated calves ( $37.3 \pm 22.8$  ng/ $\mu$ L, mean  $\pm$  SD), compared to calves that received VAC+SAL ( $41.0 \pm 22.7$  ng/ $\mu$ L). The highest level of [cort] was reported post-aerosol BVDV-2 challenge. Three days post-BVDV-2 challenge, [cort] was markedly decreased ( $P < 0.001$ ) in calves received VAC+ITM, compared to VAC+SAL, with an average reduction of 18.5 ng/ $\mu$ L (95% CI, -6.07 to -31.3).

## Significance

The key findings of this study were that the intensity of stress could modulate the antibody response to vaccination in beef cattle. Viral infection challenges seem to be among the high-level stress that is considered a significant welfare concern. Injectable trace minerals were showing promising stress-mitigation effects in beef cattle. Our finding is potential of great relevance and may increase our understanding of mechanisms of beneficial interventions of ITM at different stages of the production cycle in beef cattle.

