The impact of supplemental zinc concentrations and either ractopamine hydrochloride or dietary energy content on blood metabolite measures

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Introduction

• The trace mineral zinc (Zn) is crucial to a variety of pathways and enzymes in the body. Protein synthesis, one of the affected processes, is critical for muscle accretion and therefore growth in animals (Suttle, 2010).
• Zinc interacts with an intracellular signaling cascade, decreasing degradation of the secondary messengers resulting in the activation of enzymes initiating protein translation (Watanabe et al., 2011).
• Introduction of supplemental ractopamine hydrochloride (RAC), a β-adrenergic agonist (BA), initiates action of this same cascade increasing protein synthesis and lipolysis (Genther-Schroeder, et al., 2016a,b).

Materials and Methods

• Angus-type steers were blocked by BW (n = 12 per Exp; Exp. 1, 324 ± 2.1 kg; Exp. 2, 428 ± 2.7 kg) to receive one of three Zn supplementation strategies (ZNTRT) for 157 or 89 d (respectively).

Materials and Strategies

1. CON – no supplemental Zn
2. ZS – Zn sulfate added at 120 mg Zn/kg DM (CON + 60 mg Zn/kg DM as ZnSO4)
3. ZA – Zn sulfate added at 240 mg Zn/kg DM (CON + 120 mg Zn/kg DM as ZnSO4 + 60 mg Zn/kg DM as Zn-AA complex [Avala-Zn, Znpro, Edin Prairie, MN])

Results: Experiment 1

• Plasma NEFA were increased in diets providing less energy suggesting mobilization of non-esterified fatty acids (NEFA).
• Plasma NEFA were unaffected by Zn supplementation or beta agonist presence.

Results: Experiment 1 cont’d

• Plasma NEFA were greater in LOW vs. HI (P = 0.02; Fig. 2) and remained unchanged due to ZNTRT (P = 0.40).
• Average daily gain was lesser in LOW vs. HI (P = 0.03; Fig. 3) and remained unchanged due to ZNTRT (P = 0.62).
• Blood urea nitrogen was unaffected by either ZNTRT or ENERGY (P ≥ 0.42).
• No two- or three-way interactions were detected for ADG, NEFA or BUN (P ≥ 0.44).

Preliminary Conclusions

• Plasma NEFA were unaffected by Zn supplementation or beta agonist presence.
• Plasma NEFA were increased in diets providing less energy suggesting mobilization of triglyceride stores to accommodate this need for energy.
• In experiment one, BUN was not affected by Zn supplementation. In experiment two, BUN was increased as a result of Zn supplementation as well as with a blended organic inorganic Zn source suggesting a difference in nitrogen utilization based on dietary components.
• Blood urea nitrogen decreased with beta agonist presence likely because beta agonists decrease protein degradation.
• In the future, identifying what component of the diet affects BUN could be useful in maximizing beef cattle growth efficiency.

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