IMPACTS OF BUNK MANAGEMENT ON FEEDLOT PERFORMANCE, CARCASS CHARACTERISTICS, HYDROGEN SULFIDE CONCENTRATION AND BLOOD OXYGEN SATURATION IN STEERS FED EITHER 25% OR 50% MODIFIED DISTILLERS GRAINS PLUS SOLUBLES (DM BASIS)

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ABSTRACT:

One hundred and twenty-six yearling angus steers (initial body weight 445.87 ± 7.13 kg) were utilized in a 2 x 2 factorial design to evaluate the impacts of bunk management and modified distillers grains plus solubles (mDGS) inclusion on feedlot performance, hydrogen sulfide concentrations and blood oxygen saturation. Treatments included bunk management strategy either control bunk management (CON; clean bunks at time of next day's feeding) or long bunk management (LONG; feed remaining at time of next days feeding), and two inclusion rates of mDGS either 25% or 50% (DM Basis). On d 0, 7, 14, 21, 28 and 35 rumen gas samples were collected via rumenocentesis, and arterial blood samples were collected on two steers from each pen. No differences ($P \geq 0.09$) were observed for dry matter intake, average daily gain and gain-to-feed ratio for bunk management or mDGS inclusion. Hot carcass weight, ribeye area, marbling score and quality grade were not affected ($P \geq 0.48$) by either bunk management or mDGS inclusion. Back fat was greater (P = 0.04) for CON steers compared to LONG (1.30 vs 1.12 ± 0.05cm, respectively), but was not affected ($P = 0.59$) by mDGS inclusion. Steers on CON had greater ($P = 0.03$) yield grades compared to LONG (3.21 vs 2.96 ± 0.11, respectively). Bunk management strategy did not impact hydrogen sulfide concentrations or blood oxygen saturation (P =0.82). Hydrogen sulfide concentrations increased ($P < 0.001$) with increasing mDGS inclusion. Blood oxygen saturation was influenced by day of sampling ($P = 0.01$). Blood oxygen saturation was not affected ($P = 0.07$) by mDGS inclusion. The fact ruminal hydrogen sulfide concentrations increased while blood oxygen saturation remained similar raises questions about the quantity of hydrogen sulfide and metabolic fate of excess hydrogen sulfide in the blood of ruminant animals.

INTRODUCTION:

Sulfur-induced polioencephalomalacia (PEM) is an ongoing issue in the feedlot industry. The contribution of dietary sulfur from distillers grains has been identified as one contributing factor to the incidence of PEM in feedlot cattle. Research has successfully fed diets in excess of the maximum tolerable level of sulfur without causing PEM (Neville et al., 2012). Bunk management may increase ruminal hydrogen sulfide concentrations (Lekatz and Neville, 2019). Research has shown hydrogen sulfide can interfere with oxygen transport in the blood (Guidotti 2010). Our hypothesis was that poor bunk management would increase hydrogen sulfide gas concentrations and decrease blood oxygen saturation in steers, with a more pronounced effect shown in steers fed greater concentrations of distillers grains. In addition, we hypothesize feeding greater concentrations of distillers grains will have minimal impacts on animal performance while bunk management strategy will alter feed efficiency.

PROCEDURES:

- One hundred and twenty-six steer calves consigned by North Dakota Angus University and Central Grasslands REC were used in this study.
- Steers were utilized in a 2x2 factorial design to evaluate
  - MDGS inclusion: 25% or 50% mDGS (DM Basis)
  - Bunk management strategy: Control (clean bunks) vs Long (continuous access to feed)
- Steers were allocated to 16 pens. Pen served as experimental unit (n = 4)
- Feedlot performance and carcass characteristics, data were collected.
- Ruminal hydrogen sulfide concentrations were measured on days: 0, 7, 14, 21, 28 and 35 with hydrogen sulfide detector tubes (Gastec) on a subset of steers from each pen.
- Arterial blood samples were taken and evaluated for blood gas profiling including oxygen saturation using an I-STAT machine at the time of ruminal hydrogen sulfide determination.

RESULTS:

- Dry matter intake, ADG, and G:F were not affected ($P \geq 0.09$) by mDGS inclusion or bunk management.
- Hot carcass weight, ribeye area, marbling score and quality grade were no affected ($P \geq 0.48$) by mDGS inclusion or bunk management.
- Bunk management strategies did not alter ($P = 0.82$) hydrogen sulfide gas concentrations or blood oxygen saturation.
- Ruminal hydrogen sulfide concentration increased during dietary adaptation ($P < 0.001$; Fig. 1).
- Ruminal hydrogen sulfide was greater ($P < 0.001$) in steers fed 50% mDGS compared to those fed at 25% mDGS.
- Blood oxygen saturation was influenced by day of sampling ($P = 0.01$; Fig. 2).
- Oxygen saturation was not affected ($P = 0.07$) by mDGS inclusion.

Figure 1. Concentration of ruminal hydrogen sulfide gas in steers fed either 25% or 50% mDGS (DM basis).

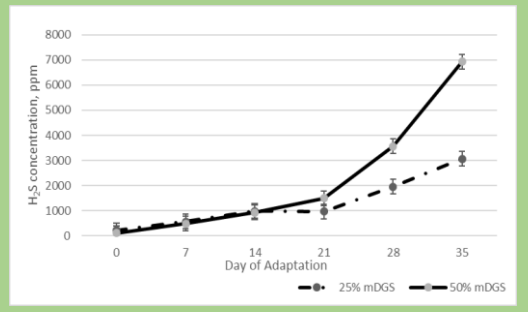
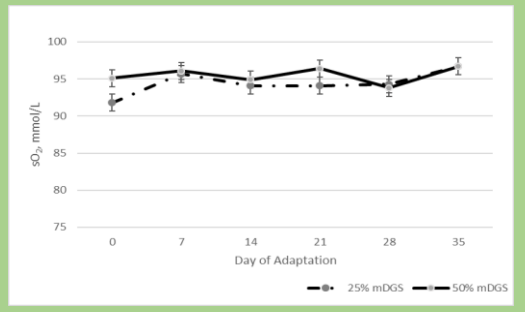


Figure 2. Blood oxygen saturation in steers fed either 25% or 50% mDGS (DM basis).



CONCLUSION:

Insufficient separation in dry matter intake may have diminished the responses to the two bunk management systems in this study. Even though steers fed 50% mDGS had greater ruminal hydrogen sulfide concentrations than those fed 25% mDGS, blood oxygen saturation was similar between the two treatment groups. Further research evaluating ruminal hydrogen sulfide is necessary to understand the relationship between dietary sulfur, ruminal hydrogen sulfide, oxygen saturation, and occurrence of polioencephalomalacia.

*Literature cited available upon request.