

Modulation of the acute phase and metabolic response in feedlot steers supplemented with *Saccharomyces cerevisiae* subspecies *boulardii* CNCM I-1079

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Introduction

Bovine respiratory disease (BRD) has a devastating economic impact on the beef industry. The annual estimated cost of BRD is well over \$600 million. A possible way to mitigate the devastating effects of BRD is the supplementation of *Saccharomyces cerevisiae*. The supplementation of yeast has the potential to offset the impact of BRD due to its ability to alter the innate immune response, directly interact with pathogenic bacteria within the GIT tract, and/or through alteration of ruminant metabolism. To further evaluate yeast supplementation as a means to improve health, performance, and immunity in cattle, a receiving and immune challenge study was conducted to evaluate the effects of active dry yeast, *Saccharomyces cerevisiae* subspecies *boulardii* CNCM I-1079 (SC; Lallemand, Inc.), in feedlot steers.

Materials and Methods

Newly received steers (462 hd; BW 584±48.5 lb or 265±22 kg) were stratified upon arrival and randomly assigned to 5 treatment groups: Control (CON), no *Saccharomyces cerevisiae* subspecies *boulardii* (SC) supplementation; 0.5-SC, supplementation of 0.5 g/hd/d; 1.0-SC, supplementation of 1.0 g/hd/d; 3.0-SC, supplementation of 3.0 g/hd/d, and 5.0-SC, supplementation of 5.0 g/hd/d. For supplementation, SC was mixed 1:1 with a ground corn carrier and top-dressed immediately after daily delivery of feed for a period of 32 d. On d 25, 18 steers (6 steers from CON, 0.5-SC, and 5.0-SC treatment groups) were randomly selected for an immune challenge and moved into a tie-stall barn. Immune challenge steers were fitted with indwelling rectal temperature monitoring devices and jugular catheters, and placed into individual tie stalls on d 27. On d 28, blood samples were collected at 30-min intervals from 0800 h to 1600 h (-2 h to 8 h). At 1000 h (0 h), steers were administered an intravenous bolus of *E. coli* lipopolysaccharide (LPS, 0.5 µg/kg BW). Serum was analyzed for cortisol, pro-inflammatory cytokines, and blood urea nitrogen (BUN) concentrations.

Results

For the receiving trial, there was no difference ($P=0.66$) in DM offered/hd/d (based upon previous day intake), average daily gain, or body weight gain between treatment groups. Regardless of treatment, 14.2% of the steers were pulled during the trial; 73% of all pulls occurred during the first 8 d period. In terms of morbidity, during the first 8 d period, 2.8%, 12.7%, 9.9%, 10.4%, and 15.7% of CON, 0.5-SC, 1.0-SC, 3.0-SC, and 5.0-SC, respectively were treated. At the conclusion of the second 8 d period, while there was an increase in percentage of steers pulled in the CON group (32% increase), pulls in the 0.5-SC, 1.0-SC, 3.0-SC, and 5.0-SC decreased by 79%, 91%, 83%, and 77%, respectively. For the immune trial, post-LPS challenge, there was a treatment x time interaction ($P=0.005$); SC-5.0 steers had decreased ($P<0.02$) cortisol concentrations compared to CON steers from 4.5 to 7 h post-challenge. There was a treatment effect ($P\leq 0.05$) for tumor necrosis factor- α , interleukin-6, and interferon- γ . Cytokine concentrations were decreased in SC-0.5 and SC-5.0 steers compared to CON steers following LPS challenge. There was a treatment ($P<0.001$) and time ($P<0.001$) effect for BUN concentrations; concentrations were greater ($P<0.001$) in SC-0.5 steers (14.5 ± 0.2 mg/dL) than CON (12.8 ± 0.2 mg/dL) and SC-5.0 (12.8 ± 0.2 mg/dL) steers. For all 3 groups, BUN concentrations increased ($P<0.001$) in response to LPS challenge.

Significance

These results indicate that SC supplementation may alter the pro-inflammatory and metabolic response to LPS challenge. These results also suggest that the supplementation of SC during the receiving phase may have helped counteract the negative performance typically associated with respiratory disease in newly received cattle. Further research is needed to determine whether or not live yeast supplementation with *Saccharomyces cerevisiae* subspecies *boulardii* CNCM I-1079 is beneficial when cattle are exposed to a live pathogen.