

Additive effects of a steroidal implant and zilpaterol hydrochloride on feedlot performance, carcass characteristics, and skeletal muscle messenger ribonucleic acid abundance in finishing steers

T. J. Baxa*, J. P. Hutcheson**, M. F. Miller***, J. C. Brooks***, W. T. Nichols**, M. N. Streeter**, D. A. Yates** and B. J. Johnson

* Department of Animal Sciences and Industry, Kansas State University, Manhattan 66506; and ** Intervet/Schering-Plough Animal Health, DeSoto, KS 66018; and *** Department of Animal and Food Sciences, Texas Tech University, Lubbock 79409

Abstract :

This experiment investigated the effects of zilpaterol hydrochloride (ZH) and the steroidal implant Revalor-S (RS; 120 mg of trenbolone acetate and 24 mg of estradiol-17 β) on finishing steer performance and the mRNA concentration of β -adrenergic receptors (β -AR) types I and II, and types I, IIA, and IIX myosin heavy chain (MHC) isoforms. A total of 2,279 feedlot steers weighing 426 ± 6.4 kg were administered no implant or RS on d 0, and fed 0 or 8.3 mg of ZH/kg of diet DM during the last 30 d with a 3-d withdrawal. Treatments were randomly assigned to 24 pens ($n = 6$ pens/treatment). At slaughter, semimembranosus muscle tissue was excised for RNA isolation from 4 carcasses per pen. No interactions were detected for any of the variables measured in the experiment. Administration of ZH during the last 30 d of the feeding period increased ($P < 0.01$) ADG, G:F, HCW, and LM area; decreased ($P < 0.01$) 12th-rib fat depth and marbling; and improved ($P < 0.01$) yield grade. Treatment had no effect on β 1-AR mRNA levels, but there was an increase ($P = 0.01$) in β 2-AR mRNA levels due to ZH inclusion. Myosin heavy chain-I (MHC-I) mRNA levels were unaffected by treatment. For MHC-IIA mRNA concentrations, administration of RS tended ($P = 0.08$) to increase mRNA levels, whereas ZH feeding the last 30 d tended ($P = 0.08$) to decrease mRNA levels for this isoform of myosin. Feeding ZH the last 30 d before slaughter increased ($P < 0.01$) mRNA concentrations of MHC-IIX in semimembranosus muscle of steers. These data indicate the combined use of ZH and RS additively contributes to BW and carcass gain in finishing feedlot steers and decreases marbling scores and USDA quality grades. The LM area increased and fat thickness decreased. In addition, ZH feeding changes the mRNA levels of MHC isoforms to a faster, more glycolytic fiber type in bovine skeletal muscle. These changes in mRNA concentrations of MHC isoforms, due to ZH feeding, could be affecting skeletal muscle hypertrophy.

Key Word :

β -adrenergic agonist, cattle, implant, myosin, zilpaterol hydrochloride

Volume 88, Number 1, January 2010