

Posters

The Effects of Anabolic Growth Implant and Restricted Feed Intake on Proliferation of Bovine Primary Skeletal Muscle Cells

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Introduction

The objective of this study was to evaluate the impact of a steroid implant, Revalor XS (200 mg trenbolone acetate, 40 mg estradiol) and/or restricted feed intake on nutrient metabolism and muscle cell growth of steers.

Materials and Methods

Sixteen crossbred steers were used (BW 645 ± 42.5 lb; 293 ± 19.3 kg) to evaluate the impact of steroid implants (Revalor XS; 200 mg trenbolone acetate, 40 mg estradiol) and nutrient intake on nutrient metabolism and muscle cell growth of steers. Steers were trained to Calan[®] gates and randomly assigned to one of four groups: 1) implant, high intake (2 × ME for maintenance); 2) implant, restricted intake (1 × ME for maintenance); 3) no implant, high intake; or 4) no implant, restricted intake. Serum was collected on days 0, 14, and 28 for application to satellite cells (previously isolated from non-study steers and frozen). After treatment with the serum (20% of total media), the satellite cells were incubated for 72 hours. Protein abundance of myosin heavy chain (MYH; days 0, 14, and 28), phosphorylated extracellular signal related kinase (pERK; days 0 and 28), and phosphorylated mammalian target of rapamycin (pmTOR; days 0 and 28) was analyzed in differentiated satellite cells to determine effects of implant, intake, and their interaction (applied via the serum).

Results

MYH is used as a marker of myotube formation, and pERK and pmTOR are growth factor protein in-

dicators of cell proliferation. Intake had no effect on MYH, but implant increased MYH abundance ($P < 0.01$). There was no interaction between intake and implant on MYH abundance. Implant increased the abundance of pERK ($P < 0.01$), but intake had no effect. At high intake, implant increased abundance of pmTOR ($P = 0.02$), but implant had no effect on pmTOR at restricted intake ($P = 0.21$; interaction $P < 0.01$). This suggests that implanting increases measures of muscle growth and proliferation, but may be affected by nutrient intake. Despite previously finding no significant effect of these treatments on plasma IGF-1 concentrations, these results demonstrate that circulating factors in implanted cattle promote satellite cell differentiation, possibly mediated by ERK phosphorylation.

Significance

Implanting feedlot cattle with anabolic growth hormones increases weight gain due to increased metabolism. These tend to be positive effects in the feedlot, as long as the metabolism needed for maintenance of the animal's normal health and behavior is met and exceeded. However, when animals first arrive in a feedlot, many are stressed and have not yet become accustomed to the environment and feeding routine. In such cases, it has been suggested that implanting cattle upon arrival at the feedlot could be detrimental to their performance. This study was directed at finding a possible cellular mechanism that may contribute to the support of such a theory.