was negative to differentiation; nevertheless, the FAK pathway plays a key role in the regulation of SC migration.

Key Words: focal adhesion kinase–mammalian target of rapamycin pathway, proliferation, differentiation, and migration, satellite cells

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362 Identification of a beneficial role of proteasome-mediated protein degradation in the differentiation of bovine myoblasts into myotubes. X. Leng* and H. Jiang, *Department of Animal and Poultry Sciences, Virginia Tech, Blacksburg.*

The objective of this study was to determine the role of proteasome-mediated protein degradation in the differentiation of bovine myoblasts into myotubes. This objective stemmed from an earlier, unexpected observation that the ubiquitin–proteasome pathway in bovine myoblasts was upregulated during their differentiation into myotubes. Satellite cells, the myogenic progenitor cells in adult skeletal muscle, were isolated from 5 Angus or Angus crossbred steers (experimental unit) and were expanded as myoblasts in growth medium. Myoblasts were then induced to differentiate into myotubes in differentiation medium in the presence or absence of 5 μ*M* lactacystin, a specific inhibitor of the 20S proteasome, for 6, 12, 24, 48, and 72 h. The differentiation status of myoblasts was assessed by reverse-transcription quantitative PCR of myosin heavy chain 3 (MYH3), muscle creatine kinase (CKM), and Myomaker (TMEM8) mRNA, markers of myotubes. Compared with control myoblasts, lactacystin-treated myoblasts expressed less MYH3, CKM, and TMEM8 mRNA at 24, 48, and 72 h of differentiation ($P < 0.01$). These differences indicated that lactacystin inhibited the differentiation of bovine myoblasts into myotubes. Differentiation of myoblast into myotubes is primarily controlled by myogenin at the transcriptional level. The DNA binding and transcriptional activity of myogenin can be inhibited by the inhibitor of DNA-binding 1 (ID1) protein. Based on western blot analyses, ID1 protein expression was decreased ($P < 0.05$) during bovine myoblast differentiation into myotubes, and this decrease was reversed ($P < 0.05$) by including lactacystin in the differentiation medium. Collectively, these results suggest a beneficial role of proteasome-mediated protein degradation in bovine myoblast differentiation into myotubes, and this role may involve the degradation of the ID1 protein.

Key Words: myogenin, proteasome, skeletal muscle

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363 Color and lipid oxidation of meat from young bulls finished in feedlot supplemented with clove or cinnamon essential oils. J. A. Torrecilhas*[1], C. Mottin[2], M. G. Ornaghi[2], P. A. C. Rodrigo[2], M. V. Valero[2], K. A. Souza[2], F. Zawadzki[2], A. M. Bridi[3], and I. N. Prado[2], *[1]São Paulo State University (UNESP) School of Agricultural and Veterinarian Sciences, Jaboticabal, Brazil, [2]Maringá State University, Maringá, Brazil, [3]Londrina State University, Londrina, Brazil.*

This study examined color and lipid oxidation of meat, from young bulls finished in feedlot supplemented with clove (84.5% of eugenol) or cinnamon (78.8% of cinnamaldehyde) essential oils. Forty bulls (1/2 Brown Swiss - 1/2 Nellore) 10 ± 2.2 month-old and with initial average BW of 219.0 ± 11.7 kg were used in a complete randomized design, assigned to individual pens. The diet consisted of 90% concentrate and 10% of sugar cane pellets. The young bulls were randomly assigned to the groups: CON control, no clove or cinnamon oil, CLO35 inclusion of 3500 mg/animal/d of clove oil, CLO70 inclusion of 7000 mg/animal/d of clove oil, CIN35 inclusion of 3500 mg/animal/d of cinnamon oil, and CIN70 inclusion 7000 mg/animal/d of cinnamon oil. After 187 d the bulls reached an average of 443.5 ± 26.2 kg BW, and were transported to a slaughterhouse. The carcasses were stored in a chilling chamber at 4°C. After 24 h, Longissimus muscle samples were collected for analysis. Three steaks (two-half centimeters thick) were cut, packed in polystyrene trays over wrapped with a retractile film (oxygen permeable) and stored in expositor (4°C) during 1, 7, and 14 d. The color was evaluated using a Minolta colorimeter (CM 700). The lipid oxidation was evaluated by thiobarbituric acid-reactive substances protocol, and the results were expressed in mg of malondialdehyde (MDA) per kg/meat. The data were assessed via analysis of variance using GLM procedures with SPSS v21.0 and the averages were compared at the 5% level of significance. The inclusion of oil in diets did not affect the color on 1, 7, and 14 d, the average values were 40.0, 40.27, and 32.05 for lightness (L*), 11.73, 16.08, and 7.6 for redness (a*), and 11.82, 14.91, and 7.98, for yellowness (b*). The concentration of MDA in meat on 1 and 14 d of storage was not influenced ($P = 0.832$ and $P = 0.183$, respectively) by the treatments. However, on the 7 d, the MDA concentration of meat were lower ($P = 0.001$) for animals from groups fed with diets supplemented with both oils, compared to animals from control group (0.681, 0.594, 0.540, 0.592, 0.573 mg/kg for CON, CLO35, CLO70, CIN35, CIN70, respectively). The essential oils added to the cattle diet did not alter the color parameters of meat and were efficient in the protection of the lipid oxidation.

Key Words: antioxidant, natural additive, shelf life

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