

Effects of sex and short-term magnesium supplementation on stress responses and longissimus muscle quality characteristics of crossbred cattle

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Abstract :

Calf-fed heifers ($n = 72$) and steers ($n = 72$) were supplemented with 4 levels (0, 0.25, 0.50, and 0.75%) of dietary Mg as MgO during the final 14 d of finishing and were commingled 1 d before slaughter (inducing stress by mixing unfamiliar cattle) to examine the effects of sex class and Mg supplementation on stress responses and LM quality characteristics. Heifers and steers exhibited markedly different stress responses. Heifers were more excitable than steers during pre-slaughter handling events and exhibited a short-term physiological stress response that involved acute sympatho-adrenal activation and resulted in increased meat toughness, without a concomitant increase in muscle pH. Steers, on the other hand, exhibited greater physical activity, associated with agonistic behavior, during the mixing period and therefore produced carcasses with lesser ($P = 0.008$) LM glycogen concentrations and greater ($P = 0.042$) 48-h LM pH values, compared with heifers. Steers also produced tougher ($P = 0.008$) LM steaks than did heifers. Within the range of pH values observed in this study (5.3 to 6.1), positive, linear relationships between 48-h LM pH and mean LM shear force ($P < 0.05$) were observed in both heifers ($r = 0.25$) and steers ($r = 0.37$). Effects of pH on LM shear force ($P < 0.05$), which were most pronounced at 3 and 7 d postmortem, diminished during postmortem aging and were no longer evident ($P > 0.05$) once LM samples had been aged for 21 d. Results suggested that toughness of LM steaks from beef carcasses with final LM pH values greater than 5.65 could be problematic unless LM cuts are aged for approximately 18 d or longer. Supplementation with dietary Mg increased ($P = 0.011$) serum Mg concentration, but had no effect ($P > 0.05$) on any of the physiological stress indicators or LM quality characteristics measured in this study. There was no evidence to support the premise that Mg supplementation of cattle lessens the effects of pre-slaughter stress on beef quality characteristics.

Key Word :

beef, cattle, magnesium, quality, stress, tenderness

Volume 88, Number 1, January 2010