

THE EFFECT OF A VITAMIN D₃ METABOLITE ON MEAT TENDERNESS IN CATTLE

J.P. McMENIMAN^A, B.W. NORTON^A, R. ELLIOTT^B, R.J. LAWRENCE^{A,C} and R.K. TUME^D

^A. Schools of Veterinary Science and Animal Studies, The University of Queensland, St Lucia, Qld 4072

^B. DSM Nutritional Products, Princeton Court, Kenmore, Qld 4069

^C. Integrated Animal Production Pty Ltd, PO Box 1821, Toowoomba, Qld 4350

^D. Food Science Australia, PO Box 3312, Tingalpa DC, Qld 4173

Tenderness has been identified by many Australian surveys as the most important eating quality attribute driving consumer satisfaction of beef. The calpain-proteinase system is a major contributor to post-mortem tenderisation of meat (Koochmaraie 1996). Calpains are endogenous muscle proteinases that are activated by the high levels of free calcium present in the cytosol of muscle fibres post rigour. Once activated, these enzymes hydrolyse key myo-fibrillar proteins essential to the structural integrity of the muscle fibre. Normally, calcium levels in muscle are too low to fully activate the calpain system. Recent research in the US, however, has shown that pre-slaughter supplementation of *Bos taurus* cattle with vitamin D₃ and its metabolites increases muscle calcium, resulting in increased tenderisation. In Australia, the tenderness of meat from *Bos indicus* cattle is highly variable. The objective of the following experiment was to evaluate the effect of time of pre-slaughter administration of a metabolite of vitamin D₃, known as HY•D[®] (25-hydroxycholecalciferol), in conjunction with ageing treatments, to improve the meat tenderness of *Bos indicus* cattle.

A total of 96 Brahman steers of 3 phenotypes (US, Indu Brazil, US/European) and 2 previous hormonal growth promotant (HGP) statuses (implanted, but implant removed before trial began, non-implanted) were randomly allocated to 1 of 4 HY•D[®] application (1 g/head) treatments (nil, 2, 4 and 6 days before slaughter). Steers (24 per treatment, split plot design) were fed a standard domestic feedlot diet for 70 days in a feedlot at QDPI Brigalow Research Station. In the week before slaughter, HY•D[®] (24 g/pen) was applied by mixing with a small quantity of concentrates and sprinkling the mixture over the morning feed. Animal weights were measured in the feedlot, carcass traits were obtained at slaughter (Australian Country Choice abattoir, Cannon Hill, Qld), and tenderness (Warner-Bratzler shear force) and other objective measures of meat quality were measured on *longissimus dorsi* steaks from each steer aged for 1, 7 and 14 days post mortem. Major plasma and muscle cations were also measured in muscle and blood samples collected at slaughter.

There were no differences between the HY•D[®] treatments in cattle weight gains, body condition score or frame size over the 70 day feeding period. There were no significant main effects ($P>0.05$) of treatment on carcass attributes at slaughter, or on objective meat quality parameters such as meat colour, ultimate pH, sarcomere length, cooking loss and Warner Bratzler peak force (PF). Steers supplemented with HY•D[®] 6 days prior to slaughter had significantly ($P<0.05$) higher initial yield (IY) values when compared with steers supplemented with HY•D[®] 2 days prior to slaughter. A significant treatment x phenotype/HGP interaction was found for IY ($P=0.028$) and PF ($P=0.062$), with Indu-Brazil Brahman cattle not previously implanted with HGP showing a consistent increase in tenderness as HY•D[®] supplementation came closer to slaughter. Although there was a trend for HY•D[®] supplemented steers to have elevated calcium levels, these differences were not significant. The HY•D[®] supplements significantly decreased plasma magnesium ($P<0.001$) and iron ($P<0.05$) levels. There were no significant effects of treatment on muscle cation content.

Initial results from this study indicated that HY•D[®] supplements were not effective in raising either blood or muscle calcium, or for improving meat tenderness in *l. dorsi* steaks from Brahman cattle. However, the interaction between treatment, phenotype and HGP status merits further study since the results suggest that HGP implants may inhibit supplement efficacy, and/or some genotypes may be more responsive than others to HY•D[®] supplements. Further research is also needed on optimal dose rates and routes and methods of administration of HY•D[®] for *Bos indicus* cattle in feedlots.

KOOHMARAIE, M. (1996). *Meat Sci.* 43, S193-S201.

Email: b.norton@uq.edu.au