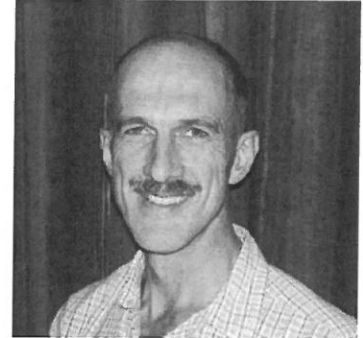


**1. The efficiency of Vitamin D3 supplementation to counteract the negative effect of beta-agonist on meat quality of feedlot cattle.**

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**Research Institute:** Agricultural Research Council,  
Animal Production Institute  
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**EXECUTIVE SUMMARY**

Beta agonists are known to affect meat tenderness (and other quality traits) negatively. Various researchers have found that supplementing extremely high levels of dietary vitamin D3 for a limited time prior to slaughter improved meat tenderness by increasing blood calcium levels which play an important role in activating the enzyme system involved in meat tenderization during aging. Electrical stimulation of carcasses during slaughter is also a well-known method to improve meat tenderness, mostly by advancing the process of muscle changing to meat and the start of the aging process. In this trial we investigated various levels and durations of vitamin D3 supplementation in an attempt to establish the best scenario in terms of cost, safety and efficacy to overcome meat tenderness problems in beta agonist (zilpaterol) treated feedlot cattle. We also compared the efficacy of vitamin D3 with that electrical stimulation and verified if their effects were additive. Other quality measurements were also recorded, such as meat colour and drip loss. We also included a scenario where we measured the response of the various treatment combinations to a high oxidative packaging environment (65% oxygen modified atmosphere packaging, or MAP) with regard to all the meat quality traits. Finally we investigated the utilization of two-dimensional gel electrophoresis (2- DE) as a technique for identifying differentially expressed proteins that are associated with meat quality and can be used as molecular biomarkers for meat quality.

Our results confirmed that meat tenderness is significantly compromised when the bet agonist zilpaterol is used, even after 14 days aging. In addition, supplementing high levels of vitamin D3 did not counteract the negative effect of zilpaterol on meat tenderness and with certain combinations the combined effect of vitamin D3 and zilpaterol was worse than feeding zilpaterol alone. Considering the results however, it seems that very high vitamin D supplements (7million IU) for a

shorter (3days) rather than for a longer period (6 days) had a slightly better effect. Also a moderate level (1 million supplemented for a long period (9 days) tended to do better than high levels for fairly long periods (6 days). In both cases vitamin D steaks did not compare with samples produced without the beta agonist zilpaterol. A possible reason for the apparent failure of vitamin D3 (despite claims in the commercial sector that it does) is that the apparent increase in Ca caused by higher vitamin D, which is supposed to assist in activation of the calcium enzymes system is not sufficient to overcome the high levels of calpastatin activity in zilpaterol steaks. Calpastatin is an inhibitor that works against the enzymes involved in meat tenderization. Zilpaterol also increased drip loss, produced lighter coloured meat (paler) and reduced redness and we found that. Vitamin D3 supplementation could not consistently overcome these negative effects. However, under high oxygen conditions (MAP) some vitamin D3 treatments reduced protein oxidation and improved meat colour. Since official toxicity level guidelines for vitamin D3 are not clearly stated, we could not confirm if high vitamin D supplements could result in toxic levels in edible products such as the liver. Nevertheless, on average the vitamin D3 levels increased by up to 8 and 64 times, respectively, in meat and liver samples of supplemented animals. The recorded values also varied over a wide range and therefore danger of consuming a product with toxic levels of vitamin D is possible. In contrast to vitamin D3 supplements, electrical stimulation improved tenderness of zilpaterol treated meat significantly and when combined with extended aging it is possible to produce a steak that is closer to (but not the same) a steak produced without zilpaterol. Finally, the utilization of two-dimensional gel electrophoresis to identify molecular biomarkers for meat quality seems promising but the technique is complicated and much more effort and time is needed to establish and validate the method for meat science.

## REPORTS

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2. **Report on vitamin D3 residues:** Vitamin D3 metabolism after ultra-high supplementation to beef animals to alleviate the effects of beta-agonist supplementation in feedlot cattle by K.W. Moloto, L. Frylinck, P.E. Strydom, K.Y. Modika & G. Koorsen also submitted as short paper for ICoMST 2011, Ghent Belgium.
3. **Report on 2-D Page:** Effects of Zilpaterol supplementation on the proteomic profile of non-electrical stimulated and electrical stimulated beef longissimus by L Frylinck, Modika, K. & Anderson J.

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2. Moloto, K.W. Determination of levels of vitamin D and its metabolites after feeding of high levels of vitamin D3 to beef animals to alleviate the effects of beta-agonist supplementation in feedlot cattle. B.Sc Hons Biochemistry. University of Limpopo

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2. Hope-Jones, M., 2011. The effects of a beta-agonist treatment, Vitamin D3 supplementation and electrical stimulation on meat quality of feedlot steers – Partial fulfillment of requirements for the degree Ph.D (Agric) Animal Science, (Meat Science), (University of Pretoria) – Supervisors : Prof E.C. Webb and Dr P.E. Strydom. To be submitted – July 2011.

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#### SALEABLE PRODUCTS / SERVICES / CONSULTANCIES

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#### PHOTO's

