

Attenuation of Acute Plasma Cortisol Response in Calves Following Intravenous Sodium Salicylate Administration Prior to Castration

J. F. Coetzee¹, *BVSc, Cert CHP, PhD, MRCVS, DACVCP*; **R. Gehring¹**, *BVSc, MMedVet (Pharm), DACVCP*; **A. C. Bettenhausen**; **B. V. Lubbers¹**, *DVM*; **S. E. Toerber²**; *et al*

¹*Department of Clinical Sciences, Kansas State University, Manhattan, KS*

²*PharmCats Bioanalytical Services, Kansas State University, Manhattan, KS*

Introduction

Based on steer slaughter data from the National Agricultural Statistic Service (NASS) [1], more than 16 million bovine castrations are performed in the United States annually. The short term pain and distress inflicted by castration remain a major animal welfare concern for the beef cattle industry. However, the long term benefits of castration in the form of decreased aggression, improved carcass traits, and exclusion of genetically inferior animals make this a widespread animal husbandry practice. Research to investigate practical, effective methods for minimizing the pain and distress associated with castration is crucial to enhance the wellbeing of animals in production systems. Cortisol is widely used to measure stress since its response magnitude, duration and/or integrated response is reported to correspond with the predicted noxiousness of different procedures [2,3]. It has been shown that ketoprofen reduced plasma cortisol response to Burdizzo castration more effectively than local anesthetic or an epidural [2]. Intravenous ketoprofen, alone or in combination with local anesthesia, before surgery-cut castration was found to decrease the post-castration integrated cortisol response [3]. Although not a specific indicator of pain, these studies support the use of plasma cortisol as a pharmacodynamic indicator of stress associated with castration. However, plasma analgesic drug concentrations and cortisol levels have never been concurrently evaluated in cattle post-castration. 1. USDA. National Agricultural Statistics Service. Available at: <http://www.nass.usda.gov/QuickStats>. 2. Ting S et al. *Journal of Animal Science* 2003; 81: 1281-93. 3. Earley, B. & Crowe, M.A. *Journal of Animal Science* 2002, 80, 1044-1052.

Materials and Methods

Twenty bulls (215-275 kg) were randomly assigned to the following groups: 1) uncastrated, untreated controls, 2) castrated, untreated, 3) sodium salicylate IV

prior to castration and 4) oral aspirin prior to castration. All castrations were performed using a Newberry knife and Henderson castration tool. Blood samples were collected at 3, 10, 20, 30, 40, 50 minutes and 1, 1.5, 2, 4, 6, 8, 10, and 12 hours post-castration. Samples were analyzed by competitive chemiluminescent immunoassay and fluorescence polarization immunoassay for cortisol and salicylate, respectively. Data were analyzed using noncompartmental analysis and a simple cosine model followed by ANOVA and t-tests. The integrated cortisol responses were calculated from this analysis.

Results

Mean plasma cortisol concentrations in the animals receiving IV sodium salicylate were lower than other groups including the uncastrated controls for at least 120 minutes post-castration although this difference was not statistically significant at every time point. Once salicylate concentrations decreased below 5 µg/mL in this group, cortisol response was similar to the other castrated groups. Significant attenuation of cortisol response in this group coincided with plasma salicylate concentrations above 25 µg/mL. Plasma salicylate concentrations following oral aspirin administration remained below 10 µg/mL for the duration of the study and failed to attenuate the cortisol response.

Significance

The aim of this study was to examine the effect of oral aspirin and intravenous (IV) sodium salicylate on acute plasma cortisol response following surgical castration. These findings have implications for designing effective drug regimens to alleviate cortisol response associated with pain and distress during routine animal husbandry procedures. ** The complete study is currently under review for publication by the *Journal of Veterinary Pharmacology and Therapeutics* – Blackwell Publishing, Inc.