

Analgesic Efficacy of Sodium Salicylate in an Amphotericin B Induced Bovine Synovitis-Arthritis Model

J.L. Kotschwar¹, DVM, MS; **J.F. Coetzee¹**, BVSc, Cert. CHP, PhD, MRCVS;
D.E. Anderson¹, DVM, MS, DACVS; **R. Gehring¹**, BVSc, MMedVet (Pharm), MRCVS, DACVCP;
B. KuKanich², DVM, PhD, DACVCP; **M.D. Apley¹**, DVM, PhD, DACVCP

¹Kansas State University, Department of Clinical Sciences, Manhattan, KS 66502

²Kansas State University, Department of Anatomy and Physiology, Manhattan, KS 66502

Introduction

Over the past decade, the issue of food animal welfare has come to the forefront of veterinary medicine. Much of this interest has centered on pain management both in relation to routine production practices and pain involving diseases encountered in production environments. Lameness is one of the most common reasons for premature culling in dairy cows and is also an important cause of loss in beef cattle. Cook (2003) found the prevalence of lameness in dairy cows to be as high as 33.7%. The 1999 National Market Cow and Bull Beef Quality Audit was conducted to examine the quality of market cows and bulls and to compare to the data collected from the 1994 National Non-Fed Beef Quality Audit. Roeber *et al* (2001) found that 31.4% of all cattle audited were lame and that losses due to lameness were significantly greater than reported in the 1994 audit. In order to evaluate pain and then evaluate interventions, an objective method of measurement is required. Induction of lameness allows for controlled evaluation of pain in animals because pre- and post-lameness measurements can be taken from the same animal, thereby reducing the confounding effects of individual differences. This study examined the efficacy of sodium salicylate for providing analgesia in an amphotericin B-induced bovine synovitis/arthritis model.

Materials and Methods

Ten male Holstein calves, 4-6 months old, and weighing approximately 550 lb (250 kg) were used in our repeated measures partial cross-over design study, with two phases consisting of three treatment periods within each phase. Calves were blocked by weight and randomly assigned to sodium salicylate (50 mg/kg intravenously) or placebo group for Phase 1. In Period 1, lameness induction was simulated with a needle-prick of the coronary band, followed by drug or placebo administration. At predetermined timepoints, serial blood samples for cortisol and salicylate concentrations,

electrodermal activity measurements, heart rates, and pressure mat data were collected. Visual lameness scores were recorded by a blinded observer. In Period 2, lameness was induced with injection of amphotericin B into the distal interphalangeal joint followed by drug or placebo administration with sample collection as previously described. In Period 3, drug or placebo was administered to the respective calves with sample collection. After a 10-day washout, Phase 2 was conducted with treatments crossed over between groups. Cortisol and salicylate samples were analyzed by competitive chemiluminescent immunoassay and fluorescence polarization immunoassay, respectively. The pharmacokinetic data were analyzed using compartmental analysis. Mean intravenous salicylate apparent volume of distribution (V_d) was 0.2 ± 0.005 L/kg, total body clearance (CLB) was 4.3 ± 0.2 mL/min*kg, and elimination half life ($T_{1/2}$ el) was 36.9 ± 1.2 minutes. The repeated measures data were analyzed based on a univariate, split-plot approach with a random effects-mixed model.

Results

Differences in stance phase duration and serum cortisol concentration values were seen between both periods and treatment group*periods; differences in heart rate, contact surface area, and contact pressure values were seen between periods, suggesting that our lameness model was effective. No differences were seen between treatment groups. When analyzed by visual lameness score, differences were seen in heart rate, contact surface area, contact pressure, and cortisol concentrations.

Significance

This amphotericin B-induced synovitis/arthritis model is a useful tool for studying changes associated with lameness in cattle. Sodium salicylate was not effective in providing analgesia following lameness.