Selenium Supplementation of Beef Heifers: Comparison of a Sustained-Release Selenium Bolus to an 120 PPM Selenium Salt-Mineral Mixture

William S. Swecker, Jr.
Dennis K. Blodgett
Dan E. Eversole*
Craig D. Thatcher
Virginia-Maryland Regional College of Veterinary Medicine
**Department of Animal Science, Virginia Tech.*
Blacksburg, VA 24061-0442

The objective of the study was to compare the effect of a sustained-release selenium (Se) bolus to an 120 ppm Se salt-mineral mixture on blood Se concentrations in yearling beef heifers. Thirty nine heifers (blood Se 143 μ g/1) were allotted by weight and breed to one of three Se treatments: 1) Control - no Se supplementation; 2) One sustained-release Se bolus was given on day 0; and 3) *ad libitum* supplementation of an 120 ppm Se salt-mineral mixture (40% trace mineral salt, 40% dicalcium phosphate, and 20% magnesium oxide). Heifers in groups 1 and 2 were given Se-free salt-mineral mix. The heifers grazed a Se-deficient (< 0.02 ppm Se) pasture for the 168 day study. Blood Se concentrations were analyzed by atomic absorption spectrophotometry. Selenium supplementation (treatments 2 and 3) increased blood Se concentrations to >200 μ g/1, whereas blood Se concentrations decreased to 70 μ g/1 in control heifers. Heifers given 120 ppm Se salt-mineral mix had higher blood Se concentrations than heifers given the sustained-release Se bolus on days 140 and 168 ($P < 0.03$). We conclude that both the sustained release Se bolus and an 120 ppm Se salt-mineral mix are adequate to maintain Se status in heifers that graze Se-deficient pastures.

Concurrent Infection of Young Calves With *Eimeria bovis* and *coronavirus*

K.H. Hoblet, *DVM, MS*
W.P. Shulaw, *DVM, MS*
L.J. Saif, *PhD*
S.E. Weisbrode, *DVM, PhD*
S.E. Lance, *DVM*
D.R. Redman, *DVM, PhD*
Department of Veterinary Preventive Medicine
The Ohio State University
Columbus, OH

Over a period of 3 summers, 21 colostrum-fed Holstein bull calves, 1-3 days of age, were selected to form 7 replicates, each consisting of 3 calves. The project was conducted during the summer because screen-testing of calves indicated a higher likelihood during warm months of obtaining calves without evidence of coronavirus infection. Within each replicate of 3 calves, 2 were selected randomly, to receive 100,000-146,000 sporulated coccidia oocysts 60 hours after arrival at the college research farm. On the 13th day after coccidia inoculation, 2 calves in each replicate, one that had previously been given coccidia and the remaining uninoculated calf, were given coronavirus by oral and intranasal routes. Each day calves were observed and feces were scored visually according to consistency. Nasal swabs for indirect immunoflourescent antibody testing for coronavirus and feces for oocyst determination were obtained approximately every 3rd day. Three of 7 calves that received only coronavirus developed diarrhea of 1 days's duration. Six of 7 calves given only coccidia developed diarrhea. All 7 calves inoculated initially with coccidia and subsequently with coronavirus developed diarrhea. When compared to calves given only coccidia, diarrhea developed first in coccidia-coronavirus inoculated calves in 6 to 7 replicates. When overall severity, as mea-

sured by diarrhea and the presence of blood in the feces was compared, the coccidia-coronavirus infected calves were more severely affected ($p < 0.05$) than calves that received only coronavirus. Calves that had received only coccidia oocysts appeared more severely affected than calves that had received only coronavirus but differences were not significant. Calves in each replicate were euthanatized and necropsied 9 days after coronavirus inoculation. Calves that had received either coccidia alone, or coccidia and coronavirus had more severe lesions of mucosal degeneration and epithelial necrosis than calves that had received only coronavirus ($p < 0.05$). Lesions, however, were generally most severe in calves that had received coccidia and coronavirus. In 4 calves fibrinopurulent typhlitis and/or colitis was present; 3 of these observations were made in calves that received coccidia and coronavirus. Results from this project suggest that although coronavirus infection in young calves is very common and may, on occasion be quite mild, when combined with *E. bovis* infection, the resultant disease may be more severe than infection with either coronavirus or *E. bovis* alone.

Ibuprofen Therapy in Lactating Dairy Cows

F. J. DeGraves
K. L. Anderson
Department of Food Animal and Equine Medicine
College of Veterinary Medicine, North Carolina State University
Raleigh, North Carolina

Introduction

Ibuprofen is a phenylpropionic acid derivative that inhibits prostaglandin biosynthesis by cyclo-oxygenase inhibition, a property common to the nonsteroidal anti-inflammatory drugs. Ibuprofen may produce anti-inflammatory effects by additional mechanisms of action, which may be of considerable importance. Ibuprofen's role as an iron chelator may be one such mechanism of action. Chelation of iron may inhibit the Fenton reaction, to reduce the formation of extremely toxic hydroxyl radicals from less toxic hydrogen peroxide and superoxide radicals. In addition, ibuprofen has been demonstrated to influence inflammatory cells, the neutrophil in particular. Ibuprofen has been demonstrated to alter the clinical course of endotoxemia and septicemia in man and domestic species and may have potential in the therapy of endotoxic conditions of dairy cows, including coliform mastitis, bacterial pneumonia, septic metritis, and acute diarrhea.

The purpose of this study was to evaluate the pharmacokinetic properties of ibuprofen in lactating dairy cows and then to study the clinical effect of ibuprofen during experimental endotoxin-induced mastitis.

Materials and Methods

Pharmacokinetic studies

Healthy lactating Holsltein cows ($n = 6$) were treated intravenously with ibuprofen at 25 mg/kg by jugular vein catherization. After a one week washout period, cows were treated with 25 mg/kg ibuprofen per os. Jugular blood and milk samples were collected at 0, 15, 30, 45, 60, 90, 120, 240, 360 and 480 minutes after ibuprofen administration. Milk and serum were analyzed for ibuprofen concentration by high performance liquid chromatography. Intravenous data were analyzed with a two compartment open pharmacokinetic model (PETDR).

Endotoxin studies

Acute mastitis was induced in healthy lactating Holstein dairy cows by intramammary inoculation of 1 mg *E. coli* 026.B6 endotoxin. Cows were randomly assigned to ibuprofen (25 mg/kg iv, $n = 6$) or saline control (iv, $n = 6$) treatment groups. Treatments were given as a rapid bolus one time, by jugular catheterization at 2 hours post-endotoxin administration. Data were analyzed with a repeated measures design (SAS).

Results

Pharmacokinetic studies

Mean serum ibuprofen concentrations after intravenous ($n = 6$) and oral ($n = 6$) ibuprofen administration are graphically displayed in Figure 1. The serum half-life of elimination of ibuprofen was 1.57 $\pm$0.14 hours. There was a 14.6 $\pm$5.1 minute time lag after the oral administration of 25 mg/kg ibuprofen, before ibuprofen appeared in serum. Peak serum ibuprofen concentrations after oral administration occurred at 2 hours. The bioavailability (F) of orally administered ibuprofen was 91 $\pm$11%. Additional pharmacokinetic parameters are listed in Table 1.

Ibuprofen was present in milk shortly after oral and intravenous ibuprofen administration. Peak milk ibuprofen levels were .64 $\pm$0.21 mcg/ml and occurred 30 minutes after intravenous treatment. Ibuprofen was not detectable in milk after 2 hours post intravenous treatment. Low levels of ibuprofen were detectable in milk after oral adminis-