Comparative plasma pharmacokinetics of ceftiofur sodium and ceftiofur crystalline free acid in neonatal calves

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Introduction

The objective of this study was to compare the plasma pharmacokinetic profile of ceftiofur crystalline free acid (CCFA) and ceftiofur sodium in neonatal calves.

Materials and Methods

In 1 group (n=7), a single dose of CCFA was administered subcutaneously (SQ) at the base of the ear at a dose of 3 mg/lb (6.6 mg/kg) of body weight. In a second group (n=7), a single dose of ceftiofur sodium was administered SQ in the neck at a dose of 1 mg/lb (2.2 mg/kg) of body weight. Concentrations of desfuroylceftiofur acetamide (DCA) in plasma were determined by HPLC. Comparison of DCA concentrations and pharmacokinetic parameters between treatment groups was done using the Mann-Whitney U test. A value of $P<0.05$ was considered significant

Results

Median time to maximum DCA concentration was 12 h (range 12 to 48 h) for CCFA and 1 h (range 1 to 2 h) for ceftiofur sodium. Median maximum plasma DCA concentration was significantly higher for calves given ceftiofur sodium (5.62 µg/mL; range 4.10 to 6.91 µg/mL) than for calves given CCFA (3.23 µg/mL; range 2.15 to 4.13 µg/mL). **AUC0-∞** and Vd/F were significantly greater for calves given CCFA than for calves given ceftiofur sodium. The median terminal half-life of DCA in plasma was significantly longer for calves given CCFA (60.6 h; range 43.5 to 83.4 h) than calves for calves given ceftiofur sodium (18.1 h; range 16.7 to 39.7 h). Cl/F was not significantly different between groups. The duration of time median plasma DCA concentrations remained above 2.0 µg/mL was significantly longer in calves that received CCFA (84.6 h; range 48 to 103 h) as compared to calves that received ceftiofur sodium (21.7 h; range 12.6 to 33.6 h).

Significance

Based on the results of this study, CCFA administered SQ at a dose of 3 mg/lb (6.6 mg/kg) in neonatal calves provided plasma concentrations above the therapeutic target of 2 µg/ml for at least 3 days following a single dose.

Profiles of serum amino acids to screen for catabolic and inflammation status in calves with mycoplasma bronchopneumonia

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Introduction

Amino acid metabolism in cancer cells is significantly altered compared with that of normal cells. These changes are also reflected in the plasma amino acid profiles of patients with various types of inflammatory disease in human. Our hypothesis is that serum amino acid profiles of calves with mycoplasma Effecbronchopneumonia will be similar to those in human disease due to the inflammation and generalized catabolic state of these animals. The aim of this study was to investigate the relationships with serum amino acid profiles, total amino acids (TAA), branched amino acid:aromatic amino acid (BCAA/AAA) ratio, branched chain amino acid to tyrosine ratio (BTR) and serine to phosphorserine ratio (SPR) in

calves with lung inflammation associated with mycoplasma bronchopneumonia. Receiver operative characteristic (ROC) curves was constructed to describe the performance of amino acid profiles in calves with mycoplasma bronchopneumonia. These data may be useful diagnostically and prognostically in calves with bronchopneumonia.

Materials and Methods

Eighteen calves admitted to the Veterinary Teaching Hospital demonstrating clinical signs compatible with bronchopneumonia. After physical examination and diagnostic imaging confirmed the cause of their signs, a bronchoalveolar lavage was performed and a *M. bovis*-specific PCR assay demonstrated positive responses in all 18 ill calves. **Sixteen calves owned by Rakuno Gakuen University that were *Mycoplasma*-free and had no abnormal clinical signs were used as controls.** Single blood samples were collected by jugular venipuncture from all calves on arrival the hospital. Free amino acid concentrations in serum were determined using automated amino acid analysis system (The Shimadzu Prominence LC-20AD amino acid analysis system, Shimadzu, Kyoto, Japan). We calculated the essential amino acid (EAA), non-essential amino acid (NEAA), TAA (EAA + NEAA), BCAA (Val + Ilu + Leu), AAA (Tyr + Phe), BCAA/AAA, and SPR, respectively. For non-normally distributed data, the Kruskal-Wallis test was employed for comparison among groups. The ROC curves were used to characterize the sensitivity and specificity of a parameter associated with a poor prognosis (euthanized or died). The significance level was set at $p<0.05$.

Results

The average concentrations of serine, alanine, valine, leucine, phenylalanine, and ornithine were significantly lower in the calves with bronchopneumonia than those of normal animals ($p<0.001$). In contrast, calves with mycoplasma bronchopneumonia were found to have large amounts of phosphoserine ($p<0.001$), o-phosphoethanolamine ($p<0.01$), citrulline ($p<0.01$), cysteine ($p<0.001$), tyrosine ($p<0.001$), carnosine ($p<0.01$) and OH-lysine ($p<0.01$) compared to those without respiratory disease. There were no significant differences in the levels of the remaining 16 amino acids or NH4. The calves with mycoplasma were characterized by significantly lower TAA, total EAA, BCAA/AAA, and BTR, and were significantly higher in SPR. The proposed diagnostic cutoffs for BCAA/AAA, BTR and SPR in serum based on ROC analysis in detecting catabolic states associated with mycoplasma bronchopneumonia were set at < 1.75, < 2.86, and >0.85, respectively.

Significance

This study demonstrated that BRD inflammation resulted in increased serum tyrosine, 1 component of serum AAA. This increase was also associated with decreases in serum BCAAs. The serum amino acid profiles described in this study demonstrated significantly lower BCAA/AAA and BTR in calves with bronchopneumonia than in normal calves. In addition, the BTR (AUC=0.892) was similar to BCAA/AAA (AUC=0.882). These ratios characterize the metabolic state of the animal with chronic bronchopneumonia. The observed sensitivity and specificity of the ROC analysis of serum amino acid profiles indicated that these profiles may be useful in managing clinical mycoplasma bronchopneumonia cases. Future studies need to focus on dissecting those changes associated with inflammation, anorexia, and those specific to mycoplasma bronchopneumonia.

Real-time detection of bovine viral diarrhea virus using detection dogs: a proof of concept study

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Introduction

Viral infections are ubiquitous in humans, animals, and plants. Real-time methods to identify viral infections are limited and no rapidly deployable detection technology exists. Previous research identified that tissues produce unique volatile organic compounds (VOC) and demonstrated that VOC concentrations change during pathologic states including infection, neoplasia, or metabolic disease. Patterns of VOC expression may be pathogen-specific and may be associated with an odor that could be used for disease detection.