

ing ANOVA. Measured dependent variables were compared among groups for each sample collection period using the Student's-test or Mann-Whitney *U*-test after an *F*-test. The significance level was at  $P < 0.05$ .

### Results

All calves observed had clinical diarrhea accompanied with dehydration and metabolic acidosis. The rPV of the AR and ARD groups increased progressively during the fluid infusion period, reaching  $179.0 \pm 58.6\%$  and  $144.3 \pm 22.9\%$  at the end of the fluid infusion, respectively ( $P < 0.05$  by ANOVA). The sequential change of rPV for AR and ARD was not significantly different between the groups. The BE in the 8/8 AR and 8/8 ARD groups were slightly increased compared to the pre-infusion values until the end of fluid infusion, with these average values reaching  $-12.3 \pm 4.4$  mM and  $-14.4 \pm 4.6$  mM at the end of infusion, respectively, but these variables were not significant within the groups. The BHBA of the AR group was slightly increased compared with the pre-infusion values until the end of fluid infusion, reaching  $0.38 \pm 0.34$  mM at the end of infusion, but these variables were not significant

within the group. In contrast, ARD infusion induced progressive and significant decreases in BHBA, which reached  $0.14 \pm 0.07$  mM at 0.5 hrs after initiation of fluid infusion, and was then maintained between 0.10 and 0.06 mM throughout the fluid infusion ( $P < 0.05$  by ANOVA). The sequential changes of BHBA for the ARD group were significantly greater than those for the AR group ( $P < 0.05$ ).

### Significance

The IV infusion of 100 ml/kg of AR and ARD, at a flow rate of 25 ml/kg/hr, did not induce any abnormal clinical signs caused by plasma expansion. In this study, IV infusion of AR and ARD, was found to be effective in increasing plasma volume and correcting BE. While IV infusion of ARD prevented catabolism, AR infusion induced catabolism accentuation. This suggests supplying dextrose maintains glycometabolism and inhibits increasing BHBA caused by lipolysis. These results suggest that ARD infusion may be more beneficial than conventional treatments for wasting diarrheic calves with dehydration and metabolic acidosis.

## Serum iron concentration in dairy cattle with acute coliform mastitis

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### Introduction

Coliform mastitis caused by *Escherichia coli* and/or *Klebsiella pneumoniae* is typically associated with clinical and acute mastitis, which is one of the most frequent causes of culling. Acute coliform mastitis (ACM) shows local and systemic inflammation and is generally recognized as the cause of fatality. Serum iron concentration has been evaluated as a marker of inflammation in dogs, cats, and horses, but limited data exist about whether serum iron concentration can be used to diagnose acute inflammation in cattle. To our knowledge, no comparative studies are available on the serum iron concentration from dairy cattle with and/or without ACM. Thus, the aim of this study was to evaluate a relationship between serum iron concentrations and prognosis of ACM in dairy cattle.

### Materials and Methods

The endotoxin challenge study was performed on six 2-month-old healthy Jersey calves, weighing  $309.9 \pm 79.8$  lb ( $140.9 \pm 36.3$  kg). All calves received intravenous bolus doses at 2.5 µg/kg of O111:B4 LPS in 10 ml of each autologous serum via the jugular vein. Blood samples (10 ml each) were withdrawn from the contra lateral jugular vein before being endotoxin challenged. Serum samples were stored in separate tubes 12, 24, and 48 hrs after being challenged. Serum iron concentrations were measured by the nitroso-PSAP method using an auto-analyzer. A prospective case-control study was performed by recruiting cattle with ACM. Forty-seven Holstein Friesian dairy cattle with ACM and 30 that were healthy with no mastitis were enrolled in the clinical trial. ACM was diagnosed clinically based on the results of the clinical examination by a veterinary practitioner. The definitive diagnosis of

ACM was made in each animal by isolation culture of coliform using raw milk obtained from the affected quarter. Prognosis was divided between good or poor based on milk production within 1 month. Therefore, the poor prognosis group was comprised of culled cattle or death within 30 days after the first medical examination.

### Results

The pre-challenge value of plasma Fe concentration was  $151.7 \pm 57.3$  g/dl. The Fe concentration in plasma then significantly decreased, reaching  $47.7 \pm 29.4$  µg/dl at 24 hr after endotoxin challenge ( $P < 0.001$ ). Significantly low levels of plasma Fe in calves were maintained from 12 to 48 hrs after endotoxin challenge compared with the pre-challenge values ( $P < 0.001$ ). Of the 47 dairy cattle, the good and poor prognosis groups were composed of 30 and 17 cattle, respectively. The dairy cattle with ACM were found to have lower amounts of Fe compared to those without mastitis ( $150.5$  µg/dl,  $P < 0.01$ ). Serum Fe concentration was significantly lower in dairy cattle with poor prognosis ( $15.0$  µg/dl) compared with the cows that had a longer survival and good prognosis ( $54.0$  µg/dl). The area under the ROC curves for Fe concentrations was

$0.781$  ( $P < 0.001$ ). The proposed diagnostic cutoff points for Fe concentrations in serum for identification of poor prognosis of acute coliform mastitis based on the analysis of the ROC curves were set at  $< 31.5$  µg/dl. Sensitivity and specificity of proposed diagnostic cutoffs for serum Fe concentration was 73.3% and 94.1%, respectively.

### Significance

The results from the endotoxin challenge study showed that LPS infusion induced progressive decreases in the plasma Fe concentration between 12 to 48 hr after the endotoxin challenge compared with the pre-challenge values. Therefore, the first clinical examination day is an appropriate time for assessing prognosis of ACM using Fe concentration in serum. Serum Fe concentration was significantly lower in dairy cattle with poor prognosis compared with the good prognosis group on the first clinical examination day. Based on ROC curves, the proposed diagnostic cutoff of serum Fe concentration on the first clinical day for detecting a poor prognosis was set at  $< 31.5$  µg/dl. Our results indicate that the assessment of serum Fe concentration is a promising diagnostic tool for the prognosis of ACM in dairy cattle.

## Endotoxin activities in bronchoalveolar lavage fluids from calves with mycoplasma bronchopneumonia

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### Introduction

The frequency and severity of complex bovine respiratory diseases have increased globally, and respiratory disease is currently regarded as the principle health problem and most economically important disease in young calves. Bovine *Mycoplasmas* are often isolated from pneumonic lungs in combination with other pathogens such as *Pasteurella multocida*. The systemic complications and deleterious outcomes associated with Gram-negative infections have been attributed to the exaggerated inflammatory responses largely elicited by a highly pro-inflammatory component of the Gram-negative bacterial envelope known as endotoxin. To the best of our knowledge, comparative studies on the relationship

between endotoxin activity in plasma and bronchoalveolar lavage fluids (BALF), and between endotoxin activity and bronchopneumonia have not yet been performed in calves. Therefore, the aim of the present study was to determine plasma and/or BALF endotoxin activity in calves with bronchopneumonia.

### Materials and Methods

Seventeen calves were patients at the Rakuo Gakuen University Veterinary Teaching Hospital showing clinical signs such as coughing, nasal discharge, fever, and pulmonary adventitious breath sounds. *M. bovis* was detected in the BALF of all 17 calves by a PCR method based on a 16S rRNA gene. As