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The Effect of Tulathromycin Treatment on Biochemical Parameters in Montofon Calves with Pneumonia

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Abstract: The purpose of this study is to examine changes in some biochemical parameters of treatment with tulathromycin in Montofon calves with pneumonia. For this purpose, 30 calves exhibiting clinical signs of pneumonia with fever, cough, lack of appetite, nasal flaring, mandibular lymph node enlargement, dyspnea and nasal discharge were studied. A control group of 20 healthy calves was also studied. Blood samples were collected from the healthy and diseased calves before and after treatment with Draxxin (Tulathromycin-Pfizer). Compared to the control group, Ca, K, total bilirubin, albumin, urea levels were affected ($p < 0.001$) and Na ($p < 0.05$) in the diseased animals and total protein, ALP, Glucose, Creatin levels were not affected in the diseased animals ($p > 0.05$). Single dose tulathromycin therapy was characterized by significantly fewer treatment days, a higher response rate, significantly better reduction of pyrexia and fever and other pneumonia symptoms in calves requiring treatment.

Key words: Pneumonia, biochemical parameters, calf, tulathromycin

INTRODUCTION

Calf pneumonia is caused by many pathogens and several contributory factors such as warm wet weather, mixing age groups, poor ventilation, stress and high stocking densities (Hartel *et al.*, 2004). Pneumonia is a major cause of economic losses because of decreased production, high levels of mortality and morbidity and increased veterinary and labour costs (Ganaba *et al.*, 1995). Moreover, calves experienced pneumonia at early age might have severe depression in the production capabilities in the future (Sayed and Zaitoun, 2009). Some adjustments applied in calf management strategies might reduce the impact of calf pneumonia on the farm. In order to prevent future outbreaks veterinary precautions, such as use antibiotics, should be applied (Potter, 2007). Early and an effective treatment of pneumonia is very important in calf barns (Poulsen and McGuirk, 2009; Ozen *et al.*, 2009). Tulathromycin is one of the several antibiotics used in the treatment of calf pneumonia. Tulathromycin, a new antimicrobial agent, is a member of the triamilide subclass of macrolide antibiotics and is a semi-synthetic macrolide. The common Tulathromycin dose used in the treatment of calf pneumonia is a single subcutaneous injection of 2.5 mg kg^{-1} (CVMP, 2002; Godinho *et al.*, 2005).

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The aim of this study was to investigate the changes in the blood serum concentration of some biochemical parameters in the 2-3 months old pneumonia calves after treatment with Tulathromycin.

MATERIALS AND METHODS

This study included 30 Montofon calves with pneumonia and 20 clinically healthy calves at 2-3 months of age. All animals were from Van district, Turkey and were subjected to similar management conditions during 2007 and 2008.

A complete physical examination was performed on each animal. The diagnosis of pneumonia was established based on clinical symptoms. Diseased animals showed some or all clinical signs of pneumonia, including fever, cough, dullness, an increase in pulsation and respiration rates, lack of appetite, nasal flaring, signs of auscultation, mandibular lymph node enlargement and respiratory difficulties.

Blood samples were collected from both groups by jugular venipuncture before treatment (0 days) and one week after treatment (7 days). Treatment was subcutaneous (s.c.) injections of tulathromycin (Draxxin-Pfizer) at a single dose of 2.5 mg kg⁻¹. Sera were separated and analyzed for biochemical parameters (Ca, K, total bilirubin, albumin, urea, Na, total protein, ALP, Glucose, Creatin levels) using an autoanalyser (Modular PP, Roche/Hitachi, Japan) (Tanritamir *et al.*, 2009). The SPSS statistical program was utilized to evaluate data. Values were expressed as mean standard error. The Duncan-ANOVA test was used to compare the parameters between the groups.

RESULTS AND DISCUSSION

Generally, clinical symptoms observed in calves with pneumonia were fever, cough, dullness, increased pulse and respiration, lack of appetite, mandibular lymph node enlargement, nasal flaring, conjunctival hyperemia, signs of auscultation and difficulty in respiration. After treatment with tulathromycin, none of these clinical signs were observed in the calves with pneumonia.

There were significant alterations in Ca, K, total bilirubin, albumin, urea ($p < 0.01$) and Na, ($p < 0.05$) levels one week post-treatment with tulathromycin (Table 1). There were not any significant differences between other parameters statistically.

Pneumonia is an inflammation and a multifactorial infection of the lung tissue affecting one or both sides of the chest. Respiratory system diseases are observed in calves more than the other animals. This is attributed to lobular anatomical structure of calf liver. This lobular anatomical structure causes low purgation capacity in livers. Phrangial liquids in calves flow into low purgation capacity livers. Decreased ventilation capacity during the cold weathers increased the risk of pulmonary hypertension in calves (Arslan, 2008).

Table 1: Some biochemical parameters in calves with pneumonia before and after treatment of Draxxin

Parameters	Before treatment	After treatment	Healthy control
Calcium	8.570±1.2600 ^a	10.890±0.1800 ^b	12.450±0.2100 ^c
Sodium	138.130±0.8100 ^a	141.500±0.8700 ^b	136.580±0.8800 ^a
Potassium	4.700±0.0700 ^a	4.550±0.1700 ^a	6.250±0.1700 ^b
Total bilirubin	0.386±0.0240	0.340±0.0390	0.220±0.0120
Total protein	6.390±0.1500	6.390±0.2400	6.940±0.1700
ALP	573.500±21.090	544.250±56.430	467.000±64.150
Albumin	1.460±0.1500 ^a	1.160±0.0500 ^b	3.590±0.1000 ^c
Urea	6.630±0.3800 ^a	5.750±0.6200 ^a	15.870±1.2000 ^b
Glucose	91.130±9.1900	91.000±6.0500	67.350±5.4400
Creatin	0.988±0.0850	1.050±0.1550	0.962±0.1010

Means having different letters within the same row are different ($p < 0.05$)

Globally, the susceptibility of calves to pneumonia is higher during the first 1 to 3 months of age than at any other time. Enzootic pneumonia, according to both case definitions, occurred most frequently within the first two months of life and the recurrence risk was high, similar to previous studies (Waltner-Toews *et al.*, 1986). Instances of pneumonia vary based on the conditions where the calves are held. Housing systems, feeding, climate and management are some examples of the factors that influence calves' susceptibility (Meglia *et al.*, 2001). Weaning of calves before 5 weeks of age has been associated with increased respiratory disease. Rearing systems where calves of different origin are mixed together at a young age suffer from high levels of respiratory diseases (Miller *et al.*, 1987). Large, shared air spaces, calves from different age groups and poor sanitation between calf batches often make these systems even more vulnerable (Losinger and Heinrichs, 1996).

An antibiotic treatment, which could be administered as a single dose injection, would offer numerous advantages for veterinary management. Tulathromycin is more efficacious new injectable macrolide antibiotic used for the treatment of pneumonia of ruminants compared with other antibiotics in recent years (Venner *et al.*, 2007; Nutsch *et al.*, 2005; Godinho *et al.*, 2005; Skogerboe *et al.*, 2005; Robb *et al.*, 2007).

Respiratory signs were assessed by scoring respiration rate, ocular and nasal discharges, inflammation and lesions of the nasal mucous membranes and conjunctiva and presence of cough and salivation. In the clinically examined calves with pneumonia calf, there were observed generalized fever, cough and dullness, increase in pulse and respiration number, inappetence, nasal flaring, auscultation sings and difficulty in respiration in our study. After treatment with Draxxin, none of these clinical sings was observed at the end of the 7 days.

Diseased calves that were treated with tulathromycin (Draxxin-Pfizer) and one week after (7 day) treatment with Draxxin, Ca, K, total bilirubin, albumin, urea ($p < 0.01$) and Na ($p < 0.05$) were significantly altered. Total protein, ALP, Glucose, Creatin levels weren't affected in the diseased animals ($p > 0.05$).

Hypoalbuminaemia is a ubiquitous finding in a severe illness. Moreover, the effect of sepsis on liver synthesis of albumin remains controversial. In the man the synthesis increases, whereas in animals it increases, decreases or does not change (Michael *et al.*, 2003). In present study, albumin levels decreased in calves with pneumonia compared to healthy animals. Vestweber *et al.* (1990) study reported that 72 h after *Pasteurella haemolytica* endobronchial inoculation in 2-week-old Holstein calves, the total WBC counts, absolute band neutrophil counts, monocyte counts and blood fibrinogen concentrations were significantly higher than normal and albumin concentration was significantly decreased.

Inadequate intake of colostrum or poor quality colostrum will affect the calves' defense against respiratory agents and make them more susceptible to infection (Virtala *et al.*, 1999). McKeever *et al.* (2008) reported that estimates of intakes of a range of dietary nutrients are related to both lung function level and rate of decline, but far less evidence on the relation between lung function and objective measures of serum levels of individual nutrients. Although, all of the nutrient levels they analyzed were dependent at least to some degree on dietary intake, some (such as sodium and calcium) were closely regulated by homeostatic systems in the body, so in these and in some other cases levels were likely to be low only when intake is extremely low. However, they have included these nutrients in the analysis since all have potential links with lung defences. Their analysis of mineral effects found strong effects of serum sodium and potassium levels were also related to lung function needs to be tested in other datasets and if confirmed, the relative importance of intake

and homeostatic control mechanisms investigated (McKeever *et al.*, 2008). Infections (e.g., pneumonia, gastroenteritis, sepsis) result in release of cytokines, which produce anorexia, worsen muscle wasting and cause a marked decrease in serum albumin levels (Herrmann *et al.*, 1992). It was reported that albumin concentration was significantly decreased (Vestweber *et al.*, 1990)

Song *et al.* (2004) reported that compared with healthy person serum Ca concentrations were significantly lower. Lambs with pneumonia K and Na levels were significantly increased (Ekin *et al.*, 2006). In this study, Ca and K levels are low in pneumonic calves and after tulathromycin treatment Ca, K ($p<0.01$) and Na levels increased ($p<0.05$).

Protein recommendations appear adequate to maximize skeletal growth up to about 6 month of age. Crude protein digestion increased linearly with increasing percent dietary crude protein (Bagg *et al.*, 1985). Protein levels didn't affect pneumonic calves ($p>0.05$). Glucose concentrations showed a non significant trend to increase relative to confinement in sick calves in present study ($p>0.05$).

Significantly decreased liver Albumin production may be associated with possible hepatocellular dysfunction induced by severe inflammation and subsequent sepsis (Karima *et al.*, 1999; Mendez *et al.*, 2003).

The elevation of liver enzymes is common in adult patients with bacteraemia (Sikuler *et al.*, 1990). So that in these study, Ure levels so much decreased and effected in diseased calves ($p<0.01$).

Single dose tulathromycin therapy was characterized by significantly fewer treatment days, a higher response rate, significantly better reduction of pyrexia and fever and other pneumonia symptoms in calves requiring treatment.

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