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The Effect of Draxxin Treatment on Blood Gases Levels of Montofon Calves with Pneumonia

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Abstract: The purpose of this study was to investigate examine changes in venous blood gases of Brown Swiss calves with pneumonia. For this purpose, 30 calves exhibiting having clinical sings of pneumonia and 20 healthy calves were used. Venous blood samples were collected from the healthy and diseased calves before and after treatment with Draxxin (tulathromycin-Pfizer) in order to determine pH, pCO_2, pO_2, tCO_2 and HCO_3 levels by Blood Gas Analyzer. Compared to the controls group, in the diseased animals, there was a significant increase of pCO_2 and HCO_3 levels, together with a significant decrease of pH and pO_2 levels ($p<0.05$). One week after treatment, pH, pCO_2 and HCO_3 levels were significantly changed. Despite this change, these levels were still similar with other groups. Also, the venous blood pO_2 level went back increased to be statistically the same as the healthy animals. The tCO_2 level was not found statistically different among the three groups. It is concluded that pneumonia in calves impairs gas exchange, but that gas exchange improves rapidly after treatment.

Key words: Dyspnea, venous blood gases, calves

INTRODUCTION

Pneumonia is a multi-factorial respiratory infection to be frequently existent in the 2 week and one-year calves (Kaymaz *et al*., 2001). Respiratory system has a defense mechanism against the infection factors which may go into body with air. It is reported that the factors producing disposition like the gradual decrease of maternal antibodies 3-5 weeks after parturition, physiological factors affecting the resistance of the organism, qualitative and quantitative hunger, extreme warmness, coldness and humidity of the environment in terms of sudden climatic changes, transportation, stress, crowded, covered and ill-air conditioned barns spoiled; this special defense mechanism and accordingly mycoplasmal, viral and secondary bacterial factors caused respiratory system infections (Kaymaz *et al*., 2001; Poulsen and McGuirk, 2009). Principal respiratory diseases in the organism, many pathological conditions affecting acid-base balance change the blood gas values (Karademir *et al*., 1999).

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Blood gases (pH, pCO_2, pO_2, tCO_2 and HCO_3) and related parameters are important criteria to make comments on the diagnosis, treatment and prognosis of the disease affecting respiratory system and acid-base balance (Radostits *et al*., 2005). Many factors affect the balance of these parameters. At the same time, the factors like age, species, race, disposition, feeding and sheltering of animals include. Altitude, atmosphere components of the environment may affect these parameters (Karademir *et al*., 1999).

Various metabolic and respiratory diseases affect venous blood gas composition and acid base values of cattle's (Radostits *et al*., 2005; Karademir *et al*., 1999). It is reported that because hypoxia comes up in pneumonias, oxygen carrying capacity of blood and accordingly there has been a change in the balance of blood gases (Cambier *et al*., 2002). Therefore, this study was designed to determine changes in venous blood pH, pCO_2, pO_2, tCO_2 and HCO_3 before and after treatment in Brown Swiss calves with pneumonia.

MATERIALS AND METHODS

The study is comprised of 30 Brown Swiss calves, aged between 1-3 months, suffering from pneumonia and 20 clinically healthy calves of similar age. All animals were from three private farms in Van district, Turkey during 2007-2008 years and were subjected to similar management conditions. A complete physical examination was performed on each animal. Diseased animals showed some or all clinical signs of pneumonia including fever, cough, dullness, increase in pulse and respiration number, inappetence, nasal flaring, auscultation sings and difficulty in respiration.

Heparinised syringes were used to collect 1 mL of venous (jugular vein) blood under anaerobic conditions. Venous blood samples were collected from the control and infected groups before and one week after treatment with subcutaneous (sc) injection of Draxxin (tulathromycin- Pfizer) at a dose of 2.5 mg kg^{-1}. Syringes were placed on ice and pH, pCO_2, pO_2, tCO_2 and HCO_3 were measured immediately by Blood Gas Analyzer (Nova-Phox, YoC 2001, UK).

Statistical analysis was performed made using the SPSS statistical program. Values were expressed as mean standard error. Duncan-ANOVA test was used to compare the parameters between among the groups. The significant level was set at $p<0.05$.

RESULTS

Table 1 shows that pCO_2 and HCO_3 levels were significantly higher and pH and pO_2 levels were significantly lower in calves with pneumonia than in healthy calves ($p<0.05$).

One week after treatment with Draxxin, pH, pCO_2 and HCO_3 levels were significantly changed. Despite, these levels were still similar with other two groups. Also, the venous blood pO_2 level went back increased to be statistically the same as the healthy animals.

Table 1: The venous blood pH, pCO_2, pO_2, tCO_2 and HCO_3 levels in the groups with pneumonia (before and after treatment) and control

	Pneumonia group (n = 30)		
Parameters	Before treatment	After treatment	Control group (n = 20)
pH	7.42±0.02a	7.45±0.01ab	7.47±0.01b
pCO_2 (mmHg)	37.14±0.71a	35.73±0.47ab	34.18±0.27b
pO_2 (mmHg)	27.83±0.51a	33.60±0.60b	33.73±0.76b
tCO_2 (mmHg)	26.89±1.23	24.96±1.11	25.97±0.84
HCO_3 (mmHg)	25.71±0.50a	24.90±0.36ab	23.45±0.72b

Values are expressed as Means±SD, Value with different letters are significantly different between healthy and diseased animals ($p<0.05$)

The tCO_2 level was not found statistically different significant between among the three groups.

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. After treatment with Draxxin, none of these clinical sings was observed in the calves with pneumonia. No side effects were observed in any of the animals treated with tulathromycin.

DISCUSSION

Pneumonia is a significant respiratory disease appearing with filling up of lungs alveoli with oedema and exudative materials. It is reported that pneumonia appears as a result of a complicated interaction whose reason cannot be explained yet between primary factors of respiratory system and disposition factors pressing the immunity of the host and consequently causing the bacteria to live in lower respiratory tract (Giles *et al*., 1991).

In the present study, expected clinical signs were observed in all or some calves infected with pneumonia including lack of appetite, fever, cough, nose flowing, hyperemia in conjunctivas and pathological lungs voices.

In this study, it was demonstrated that the concentration of pH decreased in calves with pneumonia (Kiorpes *et al*., 1990; Cambier *et al*., 2002; Kolsuz *et al*., 2001; Ok *et al*., 2005). On the other hand, normal pH level in patient suffering from the pleuropneumonia (Kiorpes *et al*., 1989) and airway obstruction (Pifferi *et al*., 2005) has been reported. Blood pH is a biochemical indicator which must be between narrow intervals (7.2-7.6) for the tissues to perform in the body and affects the body functions negatively and even causes death, if not (Guyton, 2001; Karademir *et al*., 2001). In the findings of this study, pH was determined within normal limits although it changed between 7.42-7.45.

The arterial or venous blood gases have measured in the different pulmonary diseases. Kiorpes *et al*. (1990), measured arterial CO_2 tension and arterial O_2 tension in pigs with experimentally-induced peracute porcine pleuropneumonia and control pigs. They reported that decreased arterial O_2 tension; however, arterial CO_2 tension was unchanged. On the other hand, Kiorpes *et al*. (1989) previous study showed normal blood gases in acute nonfatal porcine pleuropneumonia.

Blood oxygen levels binding in hypoxemic calves were investigated (Cambier *et al*., 2002). They showed that diseased animals exhibited a significant acidosis in arterial and venous blood. Furthermore, in hypoxemic calves, $PaCO_2$ and arterial P50 were significantly higher than in healthy animals. At the same time, diseased animals exhibited lower PaO_2, PvO_2, SO_2 and SvO_2 values than healthy ones.

In the preschool children with acute airway obstruction, Pifferi *et al*. (2005), reported paO_2 and SaO_2 were significantly higher in subjects with normal X-rays compared with subjects with lung opacities. However, $paCO_2$ was lower in subjects with normal X-rays compared to subjects with lung opacities.

Hastings *et al*. (1924) studied the oxygen content and capacity of the blood and the carbon dioxide content and capacity of the plasma in both venous and arterial blood of pneumonia patients. From the gas contents of the blood they observed that even when pulmonary conditions in pneumonia become so involved that the arterial blood is incompletely oxygenated, the arterial and venous carbon dioxide values are not increased above the usual normal levels (Hastings *et al*., 1924).

Kolsuz *et al.* (2001) investigated the relations between arterial blood gases and radiographic findings of community acquired pneumonia which classification recommended the 1993 American Thoracic Society guidelines. They showed that PaO_2, $PaCO_2$, HCO_3 and SaO_2 levels were significantly different in the patients. As a result, they suggest that if the radiographic infiltration of a patient is bilateral or multilober, then the patient would develop lower PaO_2 and O_2 saturation and will have increased risk of complications compared to patients with lober infiltration.

In a study had investigated importance of arterial blood gases in the diagnosis of experimentally induced respiratory tract diseases in lambs, Ok *et al.* (2005) showed that PO_2 and PCO_2 levels from venous blood gases were found to be different, whereas they were reported to be similar other arterial blood levels, except for pCO_2 in the lamb with pneumonia as compared to the control group.

In the present study, compared to controls, in the diseased animals, there was a significant increase of pCO_2 and HCO_3 levels, together with significant decreases of pH and pO_2 levels. One week after treatment, pH, pCO_2 and HCO_3 levels were significantly changed. Despite this change, these levels were still similar with other two groups. Also, the venous blood pO_2 level in the treated animals was similar with in the control group. The tCO_2 level was not found statistically different between the three groups. It is concluded that pneumonia in calf impairs gas exchange, but that gas exchange improves rapidly after treatment.

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