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

1Pinar Tanritanir, 2Cennet Raqbetli, 3Yeter Deger and 4Eubebirk Ceylan
1Van Health Services College, University of Yuzuncu Yil, 65080-Van, Turkey
2Van Health Services Vocational College, University of Yuzuncu Yil, 65080-Van, Turkey
3Department of Biochemistry, Faculty of Veterinary, Yuzuncu Yil University, 65080-Van, Turkey
4Department of Internal Medicine, Faculty of Veterinary, Yuzuncu Yil University, 65080-Van, Turkey

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, pCO2, PO2, tCO2, and HCO3- levels by Blood Gas Analyzer. Compared to the controls group, in the diseased animals, there was a significant increase of pCO2 and HCO3- levels, together with a significant decrease of pH and PO2 levels (p<0.05). One week after treatment, pH, pCO2, and HCO3- levels were significantly changed. Despite this change, these levels were still similar with other groups. Also, the venous blood PO2 level went back increased to be statistically the same as the healthy animals. The tCO2 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 existed 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; Poulson 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).
Blood gases (pH, pCO₂, pO₂, tCO₂ and HCO₃⁻) 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, pCO₂, pO₂, tCO₂ and HCO₃⁻ 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, pCO₂, pO₂, tCO₂, and HCO₃⁻ were measured immediately by Blood Gas Analyzer (Nova-Phox, YOÇ, UK).

Statistical analysis was performed 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 pCO₂ and HCO₃⁻ levels were significantly higher and pH and pO₂ levels were significantly lower in calves with pneumonia than in healthy calves (p<0.05).

One week after treatment with Draxxin, pH, pCO₂ and HCO₃⁻ levels were significantly changed. Despite, these levels were still similar with other two groups. Also, the venous blood pO₂ level went back increased to be statistically the same as the healthy animals.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pneumonia group (n = 30)</th>
<th>Control group (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
</tr>
<tr>
<td>pH</td>
<td>7.42±0.02a</td>
<td>7.45±0.01b</td>
</tr>
<tr>
<td>pCO₂ (mmHg)</td>
<td>37.14±0.71a</td>
<td>35.73±0.47b</td>
</tr>
<tr>
<td>pO₂ (mmHg)</td>
<td>27.83±0.51a</td>
<td>33.60±0.60b</td>
</tr>
<tr>
<td>tCO₂ (mmHg)</td>
<td>26.89±1.23</td>
<td>24.96±1.11</td>
</tr>
<tr>
<td>HCO₃⁻ (mmHg)</td>
<td>25.71±0.50a</td>
<td>24.90±0.36b</td>
</tr>
</tbody>
</table>

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\textsubscript{2}, PaCO\textsubscript{2}, HCO\textsubscript{3} and SaO\textsubscript{2} levels were significantly different in the patients. As a result, they suggest that if the radiographic infiltration of a patient is bilateral or multilobar, then the patient would develop lower PaO\textsubscript{2} and O\textsubscript{2} saturation and will have increased risk of complications compared to patients with lobar 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\textsubscript{2} and PCO\textsubscript{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\textsubscript{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\textsubscript{2} and HCO\textsubscript{3} levels, together with significant decreases of pH and pO\textsubscript{2} levels. One week after treatment, pH, pCO\textsubscript{2} and HCO\textsubscript{3} levels were significantly changed. Despite this change, these levels were still similar with other two groups. Also, the venous blood pO\textsubscript{2} level in the treated animals was similar with in the control group. The TCO\textsubscript{3} 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.

REFERENCES


