Evaluation of altered erythrocytic oxidative stress indices in association with canine pyoderma

S Meher, AR Gupta, HK Dalai, SM Nayak, P Samal, K Sethy, P Meher, MR Das and RC Patra

Abstract
Canine pyoderma is a major skin disease of dog that may lead to increased risk of oxidative stress. The following study was carried out in 40 dogs out of which twenty were pyoderma affected taken as Group 2 and twenty were healthy dogs (Group 1) treated as control. This study was done to estimate oxidative stress biomarkers (Lipid peroxidase, Super oxide dismutase, Catalase). Analysis of these erythrocytic oxidative stress indices revealed significantly high (p<0.05) Lipid peroxidase (LPO) value and significant low (p<0.05) Super oxide dismutase (SOD) and Catalase values at day 0 of experiment. Bacterial isolation and culture was done where Coagulase positive staphylococcus aureus species was isolated. In antibiotic sensitivity test azithromycin was found to be highest sensitive. After antibiotic therapy the altered oxidative stress indices are subsequently found to be normalised at day 30 of the experiment.

Keywords: Canine pyoderma, LPO, sod, catalase

1. Introduction
The skin which functions like a protective barrier to external elements, reflects the health condition of dog. Pyoderma is one of the most common dermatological problem in dogs. Dogs are more prone to pyoderma due to the unique characteristics of their skin consisting of a thin stratum corneum, lack of lipid plug in the hair follicles and high skin pH which possess a risk for bacterial invasion, subsequent growth and over colonization [1]. Bacterial pyoderma caused by gram positive bacteria (Staphylococcus) [2] which may be superficial, affecting the epidermis or surface or deeper structures of the skin characterized by pustules, papules, pruritus, and alopecia [3]. Reactive oxygen species (ROS) are a group of oxygen based free radicals which gets elevated during oxidative stress, causes biomolecular damage manifested by lipid peroxidation [4], ROS-induced cellular damage can be prevented by antioxidants [5]. Antioxidants include high-molecular-weight antioxidant enzymes represented by glutathione peroxidase, superoxide dismutase, and catalase enzymes and antioxidant vitamins like vit-A, E, C [6].

2. Materials and Methods
2.1. Ethical approval
The experimental procedures have been conducted in accordance with the guidelines laid down by the Institutional Ethics Committee.

2.2 Area of study
The present study was carried out in the Teaching Veterinary Clinical Complex (TVCC), College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar.

2.3 Experimental design
Twenty healthy dogs were selected and grouped as Group 1 as healthy control. Another twenty dogs with clinical signs of pyoderma like erythema, alopecia, pruritus, papules, crusts, pustules, epidermal collarettes, Pus in skin etc were selected and taken as Group 2. Blood sample (5 ml) from each dog on day 0, day 15 and day 30 of treatment was collected in heparinised vials for preparation of RBC hemolysate for estimation of erythrocytic oxidative indices. The Group 2 dogs were treated with Azithromycin @ 10 mg/kg.b.wt once daily for three consecutive days in a week [6] for four weeks and topically mupirocin was applied till
2.4 Parameters studied
Erythrocytic oxidative enzymes like SOD, Catalase and LPO were estimated from the 10% RBC haemolysate prepared from heparinised blood by the manual method using double beam UV-VIS spectrophotometer [7, 8].

2.5. Statistical analysis
All the data generated in the above experiments were statistically analyzed using SPSS (1996) computer package. For comparison of groups, Generalized Linear Model, ANOVA procedure and Duncan’s multiple range tests were used [9].

Table 1: Erythrocytic oxidative stress enzymes in different groups of different observation period

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Groups (n=20)</th>
<th>Mean± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPO (nmol /mg Hb)</td>
<td>G1</td>
<td>0.71 ± 0.02A</td>
</tr>
<tr>
<td></td>
<td>G2</td>
<td>1.53 ± 0.06cB</td>
</tr>
<tr>
<td>SOD(units/mg Hb)</td>
<td>G1</td>
<td>1.17 ± 0.06B</td>
</tr>
<tr>
<td></td>
<td>G2</td>
<td>0.69 ± 0.02aA</td>
</tr>
<tr>
<td>CATALASE(units/mg Hb)</td>
<td>G1</td>
<td>1.31 ± 0.17B</td>
</tr>
<tr>
<td></td>
<td>G2</td>
<td>0.54 ± 0.03A</td>
</tr>
</tbody>
</table>

(Groups 1: healthy control group with no treatment, Groups 2: Animals treated with azithromycin. Values (mean ± SE) having no common superscripts (small letters in row and capital letters in a column) differ significantly at p<0.05).

4. Discussion
Among the clinical signs recorded in the present study erythema, alopecia, pruritus, papules, crusts and pustules were more common. These were similar to the findings of Craig [10]; Hillier et al. [11]; Kelany and Husein [12] and Beigh et al. [13]. Bacterial isolation revealed *staphylococcus aureus* as the major pathogen which is in accordance with Senapati et al. [14] and Hariharan et al. [15] also identified *S. aureus* as the major pathogen in dogs with pyoderma. Regarding oxidative stress marker activity, the pyoderma-infected group showed a significant high LPO value with a significant low SOD and catalase values. This indicates existence of oxidative stress at a significantly higher level in pyoderma affected stress. There was significant decrease in the LPO value on day 30, which is in agreement with Jewell et al. [16], Behera et al. [17], Packer et al. [18] Saskia et al. [19], Rock et al. [20]. On day30 of the experiment the significant reduction in the erythrocytic mean LPO values may be due to killing the causative organisms and reducing the altered function in different vital organs through antibiotic therapy. Significant increase in SOD and Catalase values were observed on both day 15 and day 30 which may be due to stimulation of body reticulo-endothelial sytem enhancing antioxidative enzyme level and reducing oxidant level in absence of bacteria related stress. The results of the present study suggested that canine pyoderma is a stress related skin disease that affects the antioxidant mechanism of the body, causes significant changes in the erythrocytic oxidative indices which can be normalised after proper antibiotic therapy.

4. References
7. Samal P, Patra RC, Gupta AR, Sethy K, Sardar KK. Erythrocytic oxidative stress indices and haemato-biochemical changes in fluorotic cattle from industrial fluorotic zone of Odisha. Proceedings of the National Academy of Sciences, India Section B: Biological


