Hematobiochemical alterations in ectoparasite infestation in canines

Avinash Katariya, Niddhi Arora, VS Rajora, Wani Ilyas, Meena Mrigesh, AK Das and Amit Prasad

Abstract
The study was carried out to determine the hematobiochemical alterations in dogs suffering from ectoparasite infestation presented to TVCC, Pantnagar. Two groups of dogs infested with mange and tick/flea/lice and one healthy group each comprising of eight dogs were selected for the study. Hemoglobin, packed cell volume, total erythrocyte count showed a significant (P<0.05) decrease where as erythrocyte sedimentation rate, total leukocyte count values recorded a significant (P<0.05) increase in both groups as compared with healthy group. Also a significant (P<0.05) decrease in the mean values of serum glucose, total protein, albumin and albumin globulin ratio where as a significant (P<0.05) increase in the mean values of globulin were recorded. In mange affected dogs serum alanine amino transferase (ALT) and aspartate amino transferase (AST) values were significantly (P<0.05) higher than control group where as no such significant (P<0.05) difference in serum enzymes was found in case of tick/flea/lice group.

Keywords: Canine, mange, ticks/fleas/lice, hematology, serology

1. Introduction
The skin is home to a vast array of biological life forms. These exist on the surface of skin along with various skin appendages like hair follicles, sebaceous and sweat glands. Inspite of continuous insult to the skin by various microorganisms, the homeostasis of skin is maintained by interaction of physical barrier of the stratum corneum, the various epidermal and specialized appendageal cells, as well as the immune cells with these microorganisms. Ectoparasites are of frequent occurrence in dogs often difficult to control and require long duration of therapy. The most relevant ectoparasites of dogs globally are ixodid ticks (Ixodidae), fleas (Siphonaptera) and mites. Mange (sarcoptic or demodectic) caused by mites is a pivotal and common skin disease of dogs. Apart from the discomfort and nuisance caused by the constant irritation by ectoparasites, they are also capable of adversely affecting the health and well being of dogs by their blood sucking behaviors leading to severe anemia, inducing dermatitis which can lead to life-threatening hypersensitive reaction and also reducing the cosmetic appearance of skin and hair of dogs. Ectoparasites don’t only affect the animal infested but some of them are capable of infesting or transmitting to humans as well thus leading to various zoonotic disease. The feeding habit of ectoparasites results in the alteration of various blood parameters. In addition, ectoparasite infestation is associated with physiological changes and stress which can be detected by hematobiochemical alterations. These hematological and biochemical parameters assists in diagnosing the severity of infestation and also helps in the management of infested dogs. The main objective of the present study was to assess the alterations in hemato-biochemical alterations in dogs suffering from ectoparasite infestations.

2. Materials and methods
The present investigation was carried out on dogs with ectoparasite infestation at Teaching Veterinary Clinical Complex (TVCC), GBPUAT, Pantnagar Uttarakhand, India. Dogs with primary and secondary skin lesions were included in this study. Three groups of dogs were framed each containing eight dogs. Group III includes dogs suffering from mange where as group II contain dogs suffering from ticks, fleas or lice infestation. Another group (group I) contains healthy dogs which served as control. All the dogs were initially screened for the presence of mites by skin scrapings (10% KOH), tape impression smears and hair pluck.
examination. The presence of tick/fleas/lice on the skin surface and in hair coat of affected dogs was recorded by naked eyes. The presence of flea infestation was also confirmed by the presence of flea’s dirt on the hair coat of affected dogs [5].

For hematological purpose, 2 ml blood was aseptically collected from the cephalic vein, using 24 gauge needles separately for each dog. The 2ml blood was separately collected in vacuum tube containing sodium ethylene diamine tetra acetate (EDTA) as an anticoagulant for hematological estimations. Hemoglobin (Hb), Total erythrocyte count (TEC), Total leukocytes count (TLC), Differential leucocyte count (DLC) Erythrocyte sedimentation rate (ESR) and Packed cell volume (PCV) was calculated as per standard laboratory procedures described by Jain [6].

The blood for serum required for biochemical assessment was collected in 5 ml capacity gel clot activator with no anticoagulant and was allowed to stand undisturbed for about 3-4 hours. The clot was retracted and serum separated after rapid centrifugation at 3000 rpm for 10 minutes. Commercially available diagnostic kits provided by ERBA were used for colorimetric determination of serum protein, albumin, globulin, blood urea nitrogen (BUN), glucose, alanine amino transferase (ALT) and Aspartate amino transferase (AST). In addition to this computation of albumin: globulin ratio was also calculated.

Statistical difference between respective means for various parameters was evaluated using appropriate statistical tests. One-way ANOVA technique was employed to compare means as per the method described by Snedecor and Cochran [7]. Data were analyzed by SPSS software, version 16 and P<0.05 was accepted as statistically significant.

### 3. Results and Discussion

#### 3.1 Hematological Profile

A low hemoglobin value than normal in both tick/flea/lice and mange group was observed in the present study which is in agreement to the findings of Jani et al. [8], who reported that canine cases of parasitic dermatitis had significantly (P<0.05) lower hemoglobin than healthy dogs (Table.1). Similar findings were reported by Biswas and Roy [9] in demodectic dogs, Chhabra et al. [10] in sarcoptes scabiei infestation and Nair and Nauriyal [11] in pyoderma and demodicosis in dogs. Reduction in hemoglobin (Hb) level of the affected dogs was probably due to decrease in total erythrocytes as a result of blood loss due to blood sucking behavior of ectoparasites causing anemia in the affected host. In the present study, packed cell volume (PCV) was found significantly low in both the groups as compared to healthy control group. The values recorded in ticks/fleas/lice (29.25±0.68) and mange (29.81±0.79) were significantly low (P<0.5) as compared to healthy dogs (45.62±0.49). Beigh et al. [12] also found that there is significant decrease in PCV level of Mange affected dogs with Sarcoptic scabiei. Decrease in the values of PCV might be due to blood sucking activity of parasites. The ESR calculated was 9±0.28 mm/hr in case of ticks/fleas/lice infestation and 8.75±0.41 mm/hr, in mange affected group which was significantly (P<0.05) higher when compared with healthy dogs (4.25±0.16). In anemia, accelerated ESR may be due to the less number of cells that can settle more easily in the large volume of fluid (plasma) indicating immature forms of erythrocyte of various shapes and sizes showing oligocytemia and poikilocytosis. Rise in ESR values may also occur due to the rise in globulin molecules in blood [13]. Therefore, it can be concluded that increased ESR owes to decreased TEC and increased serum globulins.

### Table 1: Hematological values of canine affected with ectoparasites

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Healthy control</th>
<th>Tick/Flea/lice</th>
<th>Mange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb (g/dl)</td>
<td>14.6±0.17&lt;sup&gt;a&lt;/sup&gt;</td>
<td>10.49±0.32&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.83±0.18&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>PCV (%)</td>
<td>45.62±0.49&lt;sup&gt;a&lt;/sup&gt;</td>
<td>29.25±0.68&lt;sup&gt;b&lt;/sup&gt;</td>
<td>29.81±0.79&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>ESR (mm/hr)</td>
<td>4.25±1.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9±0.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.75±0.41&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>TLC (103/ mm³)</td>
<td>7.04±0.27&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.32±1.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.18±1.5&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>ESR (mm/hr)</td>
<td>7.04±0.27&lt;sup&gt;a&lt;/sup&gt;</td>
<td>10.96±0.23&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16±0.20&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>M</td>
<td>19.33±0.21&lt;sup&gt;b&lt;/sup&gt;</td>
<td>19.33±0.21&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>8.75±0.41&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.75±0.41&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>5.18±1.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.18±1.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>2.5±0.25&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.5±0.25&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Figures bearing different superscript across the column vary significantly (P<0.05)

In the present investigation there was significantly (P<0.05) decrease in the number of RBC’s per µl of blood in both groups as compared with healthy group which is in agreement with Nair and Nauriyal [11]. Leukocytosis was recorded in both infested groups as also reported by Patel et al. [14]. Leukocytosis in ectoparasite infestation may be explained as a part of inflammatory reaction directed towards ticks, fleas, lice, mites and their products [15]. During the present investigation differential leucocyte count (DLC) showed non-significant alteration in neutrophils with the mean value of 73.62±0.83 in case of ticks, fleas and lice infested dogs and significant (P<0.05) neutrophilia was found in dogs affected with mange with the mean value of 76.12±0.32 in comparison with healthy group (71.12±0.51). Neutrophilia may be due to activation of defense mechanism of the body to combat the infection [6]. Eosinophil count was significantly high (P<0.05) in all dermatologically affected dogs. Eosinophilia in dogs infested with ectoparasite may be due to high antigen-antibody (Ag-Ab) reaction [16].

There was significant lymphopenia in mange affected dogs with the mean values (11.93±0.40) as compared to healthy dogs (20.37±0.67). These results are in agreement with previous reports [11] who also reported the marked lymphopenia in Sarcoptic scabiei infected dogs. There was no significant difference in case of ticks/fleas/lice infestation (14.75±1.0) with respect to lymphocyte count. Dimri [17] observed the infiltration of lymphocyte between the crust and the underlying malpighian layer of skin leads to reduction in circulating lymphocytes. Monocytes and basophils do not show any significant difference as compared with healthy groups. Similar findings were reported by Sharma [18] where as contrary findings were reported by Narang et al. [19] who found significant decrease in monocyte count in mange which may be suggested due to the need for removal of tissue debris
brought about by the activity of mites [19].

### 3.2 Biochemical profile

Mean values of glucose of tick/flea/lice groups (7.45±0.68) and mange groups (57.31±0.60) were significantly (P<0.05) reduced as compared to healthy group (94.75±1.69) as shown in table 2. In association with the current findings Jani et al. [8], also reported lower glucose values in parasitic infestation in dogs where as Chhabra [10] also reported a lower glucose values in dogs suffering from Sarcoptic scabiei infection. A significant decrease in serum glucose was also reported by Solanki and Hasnani [30] in dogs suffering from demodicosis.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Healthy group A (n=8)</th>
<th>Ticks/Fleas/Lice</th>
<th>Mange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (mg/dl)</td>
<td>94.75±1.69&lt;sup&gt;a&lt;/sup&gt;</td>
<td>74.75±0.68&lt;sup&gt;b&lt;/sup&gt;</td>
<td>57.31±0.60&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total protein (g/l)</td>
<td>6.51±0.08&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.36±0.06&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.03±0.07&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Albumin (g/l)</td>
<td>2.81±0.05&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.53±0.03&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.78±0.01&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Globulin (g/l)</td>
<td>3.70±0.08&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.82±0.07&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.25±0.07&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>A:G ratio</td>
<td>0.76±0.02&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.26±0.00&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.28±0.00&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>ALT (IU/l)</td>
<td>46.25±1.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>42.87±0.37&lt;sup&gt;b&lt;/sup&gt;</td>
<td>75.62±0.50&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>AST (IU/l)</td>
<td>56.49±1.30&lt;sup&gt;a&lt;/sup&gt;</td>
<td>61.15±1.03&lt;sup&gt;b&lt;/sup&gt;</td>
<td>104.71±0.27&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Figures bearing different superscript across the column vary significantly (P<0.05)

## 5. Acknowledgement

The authors are highly thankful to department of veterinary medicine, GBPUA&T, Pantnagar.

### References