Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(5): 743-746

Received: 29-07-2018
Accepted: 30-08-2018

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Hematobiochemical alterations in ectoparasite infestation in canines

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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 [1]. Ectoparasites are of frequent occurrence in dogs often difficult to control and require long duration of therapy [2]. 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-threatning hypersensitive reaction and also reducing the cosmetic appearance of skin and hair of dogs [3]. Ectoparasites don't only affect the animal infested but some of them are capable of infesting or transmiting 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 [4]. 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 scabies* 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 scabie*. 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 oligocythemia 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

Parameters		*Healthy control*	*Tick/Flea/lice*	*Mange*
Hb (g/dl)		14.6±0.17^a	10.49±0.32^b	9.83±0.18^b
PCV (%)		45.62±0.49^a	29.25±0.68^b	29.81±0.79^b
ESR (mm/hr)		4.25±0.16^a	9±0.28^b	8.75±0.41^b
TEC (106/)		7.04±0.27^a	5.32±0.16^b	5.18±0.15^b
TLC (103/ mm3)		10.96±0.23^a	16±0.20^b	19.33±0.21^b
DLC (%)	N	71.12±0.51^a	73.62±0.83^a	76.12±0.32^b
	E	5.62±0.32^a	10±0.53^b	8.93±0.48^b
	L	20.37±0.67^a	14.75±1.00^a	11.93±0.40^b
	M	3.37±0.53^a	2.12±0.22^a	2.5±0.25^a
	B	0.37±0.18^a	0.37±0.12^a	0.5±0.18^a

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 leukocyte 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 scabie* 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 [16] where as contrary findings were reported by Narang *et al.* [18] 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 (74.75±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 [20] in dogs suffering from demodicosis.

Table 2: Biochemical alteration in dermatoses affected dogs

Parameters	Healthy group A (n=8)	Ticks/Fleas/Lice	Mange
Glucose (mg/dl)	94.75±1.69^a	74.75±0.68^b	57.31±0.60^b
Total protein (g/l)	6.51±0.08^a	7.36±0.06^b	8.03±0.07^b
Albumin(g/l)	2.81±0.05^a	1.53±0.03^b	1.78±0.01^b
Globulin(g/l)	3.70±0.08^a	5.82±0.07^b	6.25±0.07^b
A:G ratio	0.76±0.02^a	0.26±0.00^b	0.28±0.00^b
ALT (IU/l)	56.49±1.30^a	61.15±1.03^a	104.71±0.27^b
AST(IU/l)	46.25±1.58^a	42.87±0.78^a	75.62±0.50^b

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

Serum total protein values in dogs infested with ticks/fleas/lice (7.36±0.06) and mange (8.03±0.07) were significantly (P<0.05) higher than healthy dogs (6.51±0.08). The increased values may be due to increased immunoglobulins and circulatory immune responses [21]. Similar findings were reported by Gupta and Prasad [22] who found a significant increase in total proteins in both mange and scabies. Albumin level reduced significantly (P<0.05) in ticks/fleas/lice (1.53±0.03) and mange (1.78±0.01) affected dogs respectively in comparison to healthy dogs (2.81±0.05). Our findings are in association with Patel *et al.* [14]. Reduction in albumin values may be due to increased protein catabolism due to presence of stress condition produced by various ectoparasites infestation. Serum globulin concentrations increased significantly (P<0.05) in ticks/fleas/lice infestation (5.82±0.07) and mange infestation (6.25±0.07) as compared with healthy dogs (3.70±0.08) as supported by Patel *et al.* [14]. The increase might be due to stimulating effects of the products of tissue breakdown and/or superimposed infections, which are very commonly encountered in the skin infections [16]. Beta globulins increase in case of chronic skin infections, whereas gamma globulins reflect the response of reticulo-endothelial system to various antigens [13]. The A:G ratio decreased significantly (P<0.05) in ticks/fleas/lice (0.26±0.00) and mange (0.28±0.00) infestation in comparison with healthy dogs (0.76±0.02). Dimri [17] also reported a decreased A:G ratio in cases of mange. A:G ratio could usually alter by a decrease in albumin and/or an increase in globulins.

Activity of serum enzyme alanine amino transferase and aspartate amino transferase changed significantly (P<0.05) in mange (104.71±0.27 and 75.62±0.50) than the healthy dogs (56.49±1.30). The increased liver specific enzymes were attributed to the hepatic damage caused by the toxic byproducts of tissue breakdown. However, no significant alteration was observed in serum enzyme concentrations in ticks/fleas/lice infestation (61.15±1.03 and 42.87±0.78). These findings are in association with Patel *et al.* [14].

4. Conclusion

In conclusion, dermatosis associated with parasitic infestation is of major and principal concern to canine species. A proper baseline diagnostic testing during examination is critical to evaluate each dermatological case. A significant alteration in hematobiochemical parameters were detected which should be taken into consideration to improve the therapeutic management, avoid major complications and speed up the prognosis.

5. Acknowledgement

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

6. References

1. Belkaid Y, Segre JA. Dialogue between skin microbiota and immunity. Science. 346(6212):954-959.
2. Arora N, Rajora VS, Gupta DK. Effect of Abamectin on Canine Ectoparasites. Indian Veterinary Journal. 2011; 88(2):77-78.
3. Araujo FR, Silva MP, Lopes AA, Ribeiro OC, Pires PP, Carvalho CME, *et al*. Severe cat flea infestation of dairy calves in Brazil. Veterinary Parasitology. 1998; 80(1):83-86.
4. Sakina A, Mandial RK, Mudasir Q. Haemato Biochemical changes in canine demodecosis. Vet Scan, 2012; 7:75-78.
5. Soulsby EJL. Helminths, arthropods and protozoa of domesticated animals (7th edition). London: Baillière Tindal, 1982, 809. Illus. ISBN 07020-0820-6.
6. Jain NC. The dog: normal hematology with comments on response to disease. Veterinary hematology, 4th Edn. Lea &Febiger, Philadelphia. 1986, 103-125.
7. Snedecor and Cochran. Statistical Methods. 8th Ed. Journal of Educational and Behavioral Stat. 1994; 19:304-307.
8. Jani RG, Soni VK, Patel PR. Clinico-haemato biochemical findings in metazoan dermatitis in canines. Journal of Veterinary Parasitology. 2004; 18(1):89-90.
9. Biswas L, Roy S. Haematological changes of demodectic mange infectiation in dog. Indian Journal of Animal Health. 2005; 44(1):83-85.
10. Chhabra S, khahra SS, Nauriyal DC. Prevalence of ectoparasitic infestation on dogs in and around Ludhiana. Journal of Research, Punjab Agricultural University. 2000; 36(3, 4):263-266.
11. Nair SS, Nauriyal DS. Diagnostic significance of haematological changes associated with various canine dermatoses. Intaspolivet. 2007; 8(1):68-72.
12. Beigh SA, Soodan JS, Bhat AM. Sarcoptic mange in dogs: Its effect on liver, oxidative stress, trace minerals and vitamins. Veterinary Parasitology. 2016; 227:30-34.

13. Benjamin MM. Outline of veterinary clinical pathology, 3rd edition. Lowa State University Press. Anes, Lowa, U.S.A, 2010.
14. Patel J, Maiti SK, Sanyal PK, Tiwari SP. Haemato Biochemical and mineral profiles in generalized canine demodicosis. Intas Polivet, 2005; 6(2):331-334.
15. Shah H. Clinico–biochemical and therapeutic studies on mange in dogs. MV Sc thesis, IVRI, Izatnagar, India, 1994
16. Sharma J. Hematochemical and enzymological studies in dermatological disorder in dog. M.V. Sc. Thesis, G.B. Pant Univ. Agri. & Tech., Pantnagar, 2002.
17. Dimri U. Clinicotherapeutic studies on skin diseases in dogs, sheep and goats. Thesis Ph.D. Deemed University, Indian, Veterinary Research Institute, Izatnagar, India, 1998.
18. Narang A, Arora N, Rajora VS, Mrigesh M, Das AK, Krishan G. Hematological and biochemical studies on dermatoses in canines. Indian Journal of Veterinary Sciences & Biotechnology. 2015; 10(4).
19. Ramakrishnan R, Sundararaj A, Damodaran S, Chandrasekaran KP. Haemogram and Serum Proteinogram in some Canine Diseases, 1972.
20. Solanki JB, Hasnani JJ. Clinico-prevalence of canine demodicosis in Gujarat. Indian Journal of Field Veterinarians 2006; 1(3):11-13.
21. Aujla RS, Singh N, Jand SK, Sodhi S, Sood N, Gupta PP. Mycotic Dermatitis in Dogs in Punjab: Clinicopathological Studies. Indian Journal of Comparative Microbiology Immunology and Infectious Diseases. 1999; 20(2):134-136.
22. Gupta N, Prasad B. Clinico-diagnosis and therapeutic management of acriasis in dogs. Indian Journal of Veterinary Medicine. 2001; 21(2):73-75.