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# Haematological and Serum Biochemical Analysis of Atopic Dogs

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**Abstract**

Canine atopic dermatitis is a chronic relapsing skin disease of dogs affecting 10 percent of the canine population throughout the world and it is the second common skin disease of dogs. Environmental allergens, genetic and breed predisposition, immune status of the dogs are categorized as the common etiological factors of the disease. Based on the history and diagnostic criteria, the dogs were grouped into three - Group I (control dogs), Group II (Dogs with canine atopic dermatitis)and Group III(Dogs concurrently affected with canine atopic dermatitis and cutaneous adverse food reaction). As a part of diagnostic investigation, the three groups were subjected to hematological and serum biochemical analysis. On hematological analysis, a decreased erythrocyte count and elevated eosinophil count was observed in the majority of the dogs in the Groups II and III. Also, both the groups exhibited a mild leukocytosis when compared to the control group. In serum biochemical tests, total proteins and cholesterol levels were decreased in Groups II and III. Rest of the hematological and serum biochemical parameters did not show apparent difference from the control group.

**Key words**: Canine atopic dermatitis, hematology, serum biochemistry.

Canine atopic dermatitis (CAD) is a chronic relapsing skin disease of dogs predominantly characterized by pruritus (Reedy *et al*., 1997). It is regarded as the second most common skin disease of dogs. The typical age of onset of CAD is between six months to three years. The clinical signs of CAD may be seasonal or non-seasonal, however seasonality is often reported in 40-75 per cent of the cases (Griffin and DeBoer, 2001).The etiology of CAD is multifactorial, and it includes genetic and breed predisposition, immune status, skin barrier defects and environment allergens in the micro and macro environment of dogs. IgE mediated hypersensitivity reactions are observed in the dogs affected with CAD, which plays a pivotal role in the pathogenesis of the disease (Marsella and Samuelson, 2009). This study aims to investigate the alterations in hematological and serum biochemical parameters in dogs affected with CAD. For better interpretation, the dogs were grouped into three. The results of the test groups were compared with that of the control group. Together with control animals, a total of 60 dogs were included in this study.

## Materials and Methods

### Control animals

Ten apparently healthy dogs that were brought to the Madras Veterinary College Teaching Hospital were randomly selected and taken as control group. Control group was free from all the infectious and non-infectious diseases and were apparently healthy.

### Clinical cases

Canine patients brought to the Small Animal Dermatology Unit of Madras Veterinary College Teaching hospital with the history of severe recurrent pruritus were screened for Canine Atopic Dermatitis based on the criteria proposed

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**Table I**. Mean± S.E values of haematological parameters in Group I, II and III

| Parameters | Group I (n=10) | Group II (n=36) | Group III (n=14) | F value | Significance |
|---|---|---|---|---|---|
| | MEAN ± S.E | MEAN ± S.E | MEAN ± S.E | | |
| Hemoglobin (g/dL) | 10.53 ± 0.37 | 9.72 ± 0.30 | 9.66 ± 0.45 | 0.981$^{NS}$ | 0.381 |
| Packed Cell Volume (%) | 30.86 ± 1.47 | 29.43 ± 0.95 | 28.65 ± 1.30 | 0.491 $^{NS}$ | 0.615 |
| Red Blood Cells (millions / cmm) | 5.58$^{c}$ ± 0.11 | 4.23$^{a}$ ± 0.80 | 4.63$^{b}$ ± 0.90 | 28.04$^{**}$ | 0.000 |
| White Blood Cells (per cmm) | 10720.00 ± 490.53 | 14963.88 ± 930.22 | 15107.14 ± 1414.85 | 2.957 $^{NS}$ | 0.060 |
| Platelet (Lakhs / cmm) | 206100.00 ± 13560.11 | 236916.66 ± 21782.70 | 177428.57 ± 29271.88 | 1.382 $^{NS}$ | 0.259 |
| Neutrophil (per cmm) | 7857.10 ± 365.43 | 11430.14 ± 887.23 | 12048.14 ± 1330.70 | 2.618 $^{NS}$ | 0.082 |
| Lymphocyte (per cmm) | 2210.70 ± 157.60 | 2469.61 ± 279.51 | 1867.21 ± 113.32 | 1.031 $^{NS}$ | 0.363 |
| Monocyte (per cmm) | 429.20 ± 28.77 | 509.97 ± 50.25 | 581.92 ± 55.39 | 1.024 $^{NS}$ | 0.366 |
| Eosinophil (per cmm) | 223.00$^{a}$ ± 25.21 | 534.27$^{b}$ ± 63.26 | 632.00$^{b}$ ± 61.87 | 5.171$^{**}$ | 0.009 |

NS – Non significant ; * - Significant (P<0.05) ; ** - Highly significant (P<0.01)

by Favrot *et al.* (2010). Thirty-six dogs that met this criterion were included in Group II.

Fourteen dogs were concurrently affected with CAD and CAFR and were included in Group III.

### Hematological analysis

Hematological analysis was done using automated hematology analyser (Mindray-BC-2800 Vet) and parameters such as Haemoglobin, Packed Cell Volume, Total Erythrocyte Count, Platelet count, Total Leucocyte Count and Differential Count were estimated.

### Serum biochemical analysis

The serum samples collected were analyzed for blood urea nitrogen, creatinine, total protein, albumin, ALT, ALP, calcium, phosphorous, glucose and cholesterol with an autoanalyzer using Agappe Diagnostic Kits.

### Results and Discussion

On haematology, a decrease in total erythrocytes could be appreciated in Group II and III. The mean ± S.E of total erythrocyte count of Group I, Group II and Group III were 5.58 ± 0.11, 4.23 ± 0.80 and 4.63 ± 0.90 millions/cmm respectively. Ahighly significant difference was found (P<0.01) between the three groups. This diminished erythrocyte count could be partly attributed to the bleeding associated with the self-mutilation due to intense pruritus.

Additionally, a mild leucocytosis was observed in both the groups when compared to the control group. This could be due to the immediate type hypersensitivity which in turn could have been caused by the release of toxins by tissue damage and bacterial infections (Gupta and Prasad, 2001).

**Table II.** Mean ± S.E values of serum biochemistry parameters in Group I, II and III

| Parameters | Group I (n=10) | Group II (n=36) | Group III (n=14) | F Value | Significance |
|---|---|---|---|---|---|
| | MEAN ± S.E | MEAN ± S.E | MEAN ± S.E | | |
| Blood Urea Nitrogen (mg/dl) | 16.25 ± 4.11 | 12.91 ± 1.47 | 13.87 ± 1.71 | 0.524 NS | 0.595 |
| Creatinine (mg/dl) | 1.42 ± 0.05 | 1.23 ± 0.07 | 1.27 ± 0.08 | 0.863 NS | 0.427 |
| Total Protein (g/dl) | 7.66$^{b}$ ± 0.08 | 7.13 $^{a}$±0.10 | 7.35 $^{ab}$ ± 0.11 | 3.937* | 0.025 |
| Albumin (g/dl) | 2.61 ± 0.14 | 2.39 ± 0.03 | 2.54 ± 0.07 | 2.692 NS | 0.076 |
| Alanine Transaminase (mg/dl) | 60.40$^{b}$ ± 8.54 | 26.83 $^{a}$ ± 3.25 | 24.28 $^{a}$ ± 2.24 | 13.462** | 0.000 |
| Alkaline Phosphatase (mg/dl) | 158.20$^{b}$ ± 21.27 | 116.27 $^{a}$ ± 7.32 | 108.78$^{a}$ ± 11.71 | 3.572* | 0.035 |
| Calcium (mg/dl) | 11.34 ± 0.31 | 11.43 ± 0.25 | 11.42 ± 0.50 | 0.016 NS | 0.984 |
| Phosphorous (mg/dl) | 3.60 ± 0.18 | 4.06 ± 0.16 | 4.13 ± 0.28 | 1.061 NS | 0.353 |
| Glucose (mg/dl) | 73.30 ± 3.84 | 64.86 ± 2.59 | 72.35 ± 4.04 | 2.010 NS | 0.143 |
| Cholesterol (mmol/dl) | 150.10$^{b}$ ± 12.93 | 113.47 $^{a}$ ± 5.82 | 116.85 $^{a}$ ± 9.31 | 4.154* | 0.021 |

NS – Non significant ; * - Significant (P<0.05) ; ** - Highly significant (P<0.01)

Marked eosinophilia was present in Group II and III which could be related to the mast cell degranulation and increased histamine concentration in blood (Wuersche *et al.,* 2006). Eosinophilia leads to immediate type hypersensitivity in CAD. Other parameters such as haemoglobin, packed cell volume, platelets, neutrophils, lymphocytes and monocyte values were within the normal range. The result of haematological analysis is summarised in Table I.

Serum biochemical tests revealed low levels of alanine transaminase (ALT) and alanine phosphatase (ALP) in Group II and III compared to the control group. However, the mean ± S.E values of ALT and ALP falls within the normal range.

Total protein was found to be slightly low in the test groups. Protein could have been broken down during pruritus induced injury of the skin. This could have eventually lead to its decrease in the blood circulation (Sakina *et al.,* 2012).This hypoproteinemia predisposes to skin barrier defects and facilities allergen penetration into the skin.

Cholesterol level of the test groups was significantly lower than that of the control group. This low cholesterol could have predisposed to dermatitis associated hypersensitivity (Nieman and Suter, 1994). The values of blood urea nitrogen, creatinine, albumin, calcium, phosphorous and glucose did not differ significantly between the groups. The serum biochemical analysis result is listed in Table II.

## Conclusion

The above said alterations in the haematological and biochemical parameters are predominantly associated with pruritus. Hence, treatment protocols should be aimed at minimizing pruritus and the resulting secondary bacterial infections. Further, skin barrier defects and hypoproteinaemia observed in the present study could be counteracted by supplementing essential nutrients in the diet including zinc, omega 3 fatty acids and high quality amino acids. This would in turn minimise the hematological and serum biochemical abnormalities in the atopic dogs.

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# Seasonal Variations in Luteal Dynamics and Serum Progesterone Levels in Murrah Buffaloes

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### Abstract

Domestic buffaloes exhibit distinctive breeding patterns that are influenced by seasonal variations. The hot and humid summer season influence reproductive performance affecting by modulating corpus luteum (CL) dynamics and functionality. The present study describes the changes in CL dynamics and serum progesterone ($P_4$) profiling during the breeding (October to February) and non-breeding seasons (April to August) in the Murrah buffaloes (n=6/group). The CL morphometry was recorded using trans-rectal B-mode ultrasonography and blood samples were collected every day for serum $P_4$ estimation using commercial ELISA kit. There was no significant difference observed in CL diameter although the growth and regression rates were higher during the breeding season and luteal regression started earlier in the non-breeding season. The peak $P_4$ concentration was notably higher during the breeding season as compared to the non-breeding season. Additionally, a strong positive correlation between CL diameter and $P_4$ concentration was evident during the breeding season in contrast to the non-breeding season. From this study, it can be concluded that sub-optimal luteal development and function during the non-breeding season could be the key contributing factor

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