

## Concentrations of Total Serum Immunoglobulin E, A, G and M in Stray Dogs with Healthy and Dermatological Problems

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### Summary

In this study, clinical and laboratory findings along with serum IgE, IgA, IgM and IgG concentrations were determined in stray dogs (healthy and with dermatological problems). It was determined that skin lesions were localized in the rate of 69.8% (n=44) and generalized in the rate of 30.2% (n=19) of sick animals. Serum IgE concentration in stray dogs with dermatologic problems was significantly higher (P<0.001) than that of healthy dogs whereas serum IgM and G concentrations were significantly lower (P<0.05). It was evaluated that, serum total immunoglobulin concentrations could be useful in making contribution to differential diagnosis of skin diseases in stray dogs.

**Keywords:** Skin disease, Immunoglobulin E, A, G and M, Dog

## Sağlıklı ve Dermatolojik Problemlili Başiboş Köpeklerde Total Serum İmmunoglobulin E, A, G ve M Konsantrasyonları

### Özet

Bu araştırmada sağlıklı ve deri problemleri bulunan başiboş köpeklerde serum IgE, IgA, IgM ve IgG konsantrasyonları ile birlikte klinik ve laboratuvar bulgular belirlendi. Köpeklerde gözlenen tüm deri lezyonlarının %69.8 (n=44) oranında lokalize, %30.2 (n=19) oranında generalize lezyonlardan oluştuğu belirlendi. Deri problemleri bulunan köpeklerde sağlıklı gruba göre IgE konsantrasyonunun önemli düzeyde (P<0.001) yüksek, IgG ve IgM konsantrasyonlarının ise önemli düzeyde (P<0.05) düşük olduğu tespit edildi. Sonuç olarak, serum total immunoglobulin konsantrasyonlarının deri hastalıklarının ayırıcı tanısına katkı sağlayabileceği değerlendirildi.

**Anahtar sözcükler:** Deri hastalığı, İmmunoglobulin E, A, G ve M, Köpek

### INTRODUCTION

Most skin diseases are diagnosed by detailed anamnesis, physical examination and able to be treated <sup>1</sup>. Immunoglobulin E (IgE)-mediated hypersensitivity against environmental allergens is associated with atopic diseases in both humans and dogs <sup>2</sup>. Significant increase in serum IgE concentration has been observed in flea-bite allergic and atopic dermatitis. IgE is also known to be principal antibody class in food allergy <sup>3</sup>. Fadok <sup>4</sup>, has suggested that measurement of IgE with ELISA was a useful tool in the diagnosis of food allergy. Similarly, it has been suggested

that measurement of IgE using ELISA was a reliable method (93-97%) in the diagnosis of atopic dermatitis in dogs <sup>5</sup>. Day <sup>6</sup>, has suggested that markedly low serum IgA and subnormal serum IgG concentrations was found in Rottweiler pups with inflammatory skin diseases. In the majority of canine cases of bacterial diseases, hypersensitivity disorders, endocrine dermatosis, dermatomycosis, parasitic disease, cutaneous Leishmaniasis and non-specific dermatopathies of uncertain aetiology were found to show intercellular deposits of IgG, M and A in skin sections <sup>7</sup>.



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Stray dogs are susceptible to many diseases due to life conditions. Stray dogs live in dirty environments, eat spoiled food remains in dump, sleep in dirty areas and are highly susceptible to a wide variety of fatal diseases. In a study, low body condition score (70%), and skin problems (69%) were the most common health problems in stray dog population<sup>8</sup>. Therefore, this study was carried out in the stray dogs.

The aim of this study was to determine IgE, A, G and M concentrations, and to evaluate their clinical value in the differential diagnosis of skin disease in stray dogs by comparing healthy and sick individuals.

## MATERIAL and METHODS

A total of 84 stray dogs [21 healthy (control group) and 63 with dermatologic problem (experimental group)] of both sexes, and different ages (from 1 to 3 years old) were used as materials. All dogs admitted to the Animal Hospital of Faculty of Veterinary Medicine for treatment from the Animal Facilities of Konya Municipality. The study was approved by the Ethic Committee of Selcuk University Faculty of Veterinary Medicine (code: 2012/052).

All dogs were examined for the presence of dermatological disorders including pruritis, erythema, papula, pustule, seborrhoea, crusted lesions, hyperpigmentation, erosion, ulcer and complications (pyoderma, dermatitis etc.) were evaluated in the dogs. Endo- and ecto-parasitic examinations were performed in all dogs.

Blood samples were collected from each dog by cephalic venipuncture into plain and anticoagulated Vacutainer tubes (Venoject® - Terumo Corp. Belgium) in the morning following 12 h of fasting. Blood samples with anticoagulant were kept for complete blood count. Serum was separated by centrifugation at 3.000 rpm for 15 min and stored at -20°C until biochemical analyses. Serum Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Alkaline phosphatase (ALP), Creatinine phosphokinase (CPK) enzyme activities, total protein (TP), albumin (ALB), triglyceride (TRI), cholesterol (COL), urea nitrogen (BUN) and creatinine (CR) concentrations were determined using a commercial enzyme immunoassay kit (Biocon®) on a Shimadzu spectrophotometer (UV-Vis 2100 Model). Serum total immunoglobulin concentrations (IgE, A, M and G) were measured by use of a commercially available Sandwich ELISA kit (E40-125, E40-104, E40-118 ve E40-116; Bethyl Lab. Inc., Montgomery, TX). Complete blood count (erythrocyte (RBC), leukocyte (WBC), haemoglobin (Hb) and packed cell volume (PCV) was performed in all dogs.

Data were analyzed by the two-sample *t* test in order to detect statistically significant differences between the results of control and experimental groups (SPSS 10, Statistical Package of Social Science, SPSS Inc., USA).

## RESULTS

The local and general skin lesions were determined in 69.8% (n=44) and 30.2% (n=19) dogs, respectively. Local lesions were observed in neck, thorax, extremities, tail, gluteal areas, periocular and perioral areas of the face, abdomen, inguinal areas and ears. *Table 1* shows the extent and rates of these lesions. Non of the dermatologic lesions were observed in healthy dogs.

Serum IgE concentration was significantly higher ( $P<0.001$ ) while serum IgG and M concentrations were significantly lower ( $P<0.05$ ) in dogs with dermatological problems (*Table 2*). The biochemical and haematological parameters measured for each group and the results of statistical analyses are summarized in *Table 3* and *Table 4* respectively.

**Table 1.** The extent and rates of skin lesions in stray dogs with dermatological problems (n=63)

**Tablo 1.** Deri problemleri bulunan başıboş köpeklerde deri lezyonlarının kapsamı ve oranları

Lesions	%	Lesions	%
Pruritis	75.7	Hyperkeratosis	35.1
Hyperpigmentation	45.9	Seborrhoea	21.6
Papula	24.3	Erosion	18.9
Pustule	18.9	Ulceration	10.8
Alopecia	86.5	Pyoderma	18.9
Crustacea	45.9		

**Table 2.** Total serum concentrations of IgE, A, G and M (g/L) in healthy stray dogs and stray dogs with dermatological problems

**Tablo 2.** Sağlıklı ve deri problemleri bulunan başıboş köpeklerde total serum IgE, A, G ve M (g/L) konsantrasyonları

Parameters	Healthy Dogs Mean±SD (n: 21)	Dogs with Dermatological Problems Mean±SD (n: 63)	P
IgE	0.029±0.028 (0.005-0.122)	0.092±0.056 (0.027-0.203)	0.001***
IgA	0.78±0.38 (0.26-1.45)	0.62±0.33 (0.22-1.58)	0.127
IgG	16.35±2.74 (10.57-19.98)	14.33±2.67 (10.29-19.09)	0.015*
IgM	1.45±0.53 (0.79-2.6)	1.10±0.39 (0.59-2.08)	0.015*

∴  $P>0.05$ , \*  $P<0.05$  \*\*  $P<0.01$  \*\*\*  $P<0.001$

## DISCUSSION

In this study, clinical and laboratory findings along with serum IgE, IgA, IgM and IgG concentrations were determined and their contribution to differential diagnosis of skin diseases in healthy and dermatologically sick stray dogs. Serum IgE concentration in stray dogs with dermatologic problem was significantly higher ( $P<0.001$ ) than that of

healthy dogs whereas serum IgM and G concentrations were significantly lower ( $P<0.05$ ).

The significant increases of IgE concentrations were observed in the cases of flea-bite dermatitis, atopic dermatitis and food allergy <sup>6,9</sup>. Taszkun <sup>10</sup> found polysensitization in 98.6% of dogs with atopic dermatitis in intradermal skin tests. Hence, the differential diagnosis of dermatologic disease is difficult problem for veterinary clinician. Hill et al.<sup>11</sup> have found that increases of total serum IgE and IgG concentration and decrease of total serum IgA concentration in atopic and parasitized dogs. In a study <sup>12</sup>, IgE and IgG response to different food antigens have found indicating significant variation between dogs with atopic dermatitis (78.0-92.3 µg/ml, 2.3-4.01 µg/ml), gastrointestinal diseases (21.9-98.4 µg/ml, 2.6-4.09 µg/ml), and healthy (55-100 µg/ml, 1.9-4.12 µg/ml). A variety of factors may influence antigen-specific serum IgE production. These include possible genetic variation within and between breeds, the type of antigen, and the dose, route, frequency and interval of administration. Previous or concurrent gastrointestinal, parasitic and microbial infections may influence immune responses <sup>11</sup>. Even age and gender may be associated with variation in total serum IgE concentrations <sup>13</sup>. In our study, mean total serum IgE concentrations significantly

increased ( $P<0.001$ ) in stray dogs with dermatological problems. So, it could be said that increases observed in the serum IgE concentrations may be indicator of any allergic diseases in stray dogs.

Day <sup>6</sup>, has reported that markedly low serum IgA and subnormal serum IgG concentration was found in Rottweiler pups with inflammatory skin disease. IgA concentrations in serum and skin washings have been compared in a study <sup>14</sup> and showed that there was no significantly difference in the mean serum IgA concentration in normal dogs versus atopic animals. When skin washings from all sites in both groups were compared, atopic dogs had significantly greater concentrations of IgA in their skin washings than normal dogs. In a study <sup>14</sup> further investigations that need to determine whether the greater concentrations were caused by nonspecific inflammation or by secretion of allergen-specific IgA onto the skin surface were emphasized. Similarly, skin sections from 71 dogs and 10 cats with bullous autoimmune skin diseases and various non-auto-immune dermatopathies have been studied for the presence of immunoglobulins (canine IgG, IgM, IgA; feline IgG) using the direct immunofluorescence and indirect immunoperoxidase methods. Positive reactions have been found in canine cases with hypersensitivity disorders,

**Table 3.** Biochemical parameters in healthy stray dogs and stray dogs with dermatological problems

**Tablo 3.** Sağlıklı ve deri problemleri bulunan başıboş köpeklerde biyokimyasal parametreler

Parameters	Unit	Healthy Dogs Mean±SD (n: 21)	Dogs with Dermatological Problems Mean±SD (n: 63)	P
ALT	U/L	31.9±14.88	16.9±11.3	0.004**
AST	U/L	28.6±12	27±22.17	0.833
ALP	U/L	111.2±42.39	208.38±157.55	0.067
CPK	U/L	162.1±66.54	210.95±137.07	0.300
TP	g/dl	5.89±0.677	6.05±1.10	0.683
ALB	g/dl	3.73±0.298	3.114±0.292	0.001***
TRI	mg/dl	97.1±79.25	32.95±20.8	0.001***
KOL	mg/dl	169.2±55.71	162.43±32.97	0.673
BUN	mg/dl	20.1±6.82	59.57±23.91	0.001***
CR	mg/dl	0.75±0.23	0.51±0.39	0.096

∴  $P>0.05$ , \*  $P<0.05$  \*\*  $P<0.01$  \*\*\*  $P<0.001$

**Table 4.** Hematological parameters in healthy stray dogs and stray dogs with dermatological problems

**Tablo 4.** Sağlıklı ve deri problemleri bulunan başıboş köpeklerde hematolojik parametreler

Parameters	Unit	Healthy Dogs Mean±SD (n: 21)	Dogs with Dermatological Problems Mean±SD (n: 63)	P
WBC	$\times 10^3 /\mu\text{l}$	19.42±9.49	13.44±2.11	0.115
RBC	$\times 10^6 /\mu\text{l}$	5.52±1.4	7.12±0.721	0.010 <sup>†</sup>
HGB	g/dl	11.59±2.66	15.23±1.26	0.002**
HCT	%	35.06±8.566	46.34±4.74	0.003**
MCV	fL	64.51±5.11	65.57±4.44	0.634
MCHC	g/dl	33.36±1.65	33.91±0.96	0.417

∴  $P>0.05$ , \*  $P<0.05$  \*\*  $P<0.01$

endocrine dermatosis, dermatomycosis, parasitic disease, cutaneous Leishmaniasis and in cases with non-specific dermatopathies of uncertain aetiology<sup>15</sup>. Furthermore, it was suggested that the determination of anti-canine IgG, IgM and IgA using an immunoperoxidase method in skin sections from dogs with autoimmune skin disease were useful<sup>9</sup>. In our study, it could be considered that insignificant decreases ( $P>0.05$ ) in serum IgA concentrations and significant increases ( $P<0.05$ ) in serum IgG and IgM concentrations might be resulted from local accumulation in skin surface.

Serum ALT, ALB and TRI concentrations in dogs with dermatologic disease significantly decreased ( $P<0.01$ ) when compared with healthy dogs in our study. The BUN concentration significantly increased ( $P<0.01$ ) in dogs with dermatologic disease (Table 3). It was determined that these parameters were including reference range except BUN concentration which was interpreted as prerenal azotemia and dehydration considered along with haematological parameters. The significant increase of RBC, Hb and PCV concentrations were found in dogs with dermatologic disease in this study (Table 4). This might be attributed to hemoconcentration and dehydration on the basis of clinical and laboratory findings. When management and feeding conditions for these dogs were evaluated, it was concluded that these dogs were fed insufficiently by an inappropriate diet.

Skin disease of uncertain aetiology is common in the stray dogs and generally complicated by allergic, parasitic, and inflammatory conditions. Therefore clinical diagnosis of stray dogs with dermatologic disease is challenging cases. In our study, it was also concluded that serum total immunoglobulin concentrations (IgE, A, G and M) could be useful in making contribution to differential diagnosis of allergic or inflammatory skin diseases in stray dogs. However, the measurement of specific immunoglobulin formations could be recommended in the definitive diagnosis of allergic skin disease in stray dogs.

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