

Research Article

CHANGES OF SOME BIOCHEMICAL BLOOD PARAMETERS IN WITH
SKIN PROBLEMS AND HEALTHY DOGS

Kemal KUTLAY*

Gülhan TÜRKAY HOŞTÜRK**

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Sağlıklı ve Deri Problemleri olan Köpeklerde Bazı Biyokimyasal Kan
Parametrelerinde Değişiklikler

Özet : Çalışmada sağlıklı ve farklı dermatolojik problemleri olan köpeklerde bazı biyokimyasal kan parametrelerindeki değişimler incelenmiştir. Sağlıklı olan 15 köpek ile dermatolojik problemleri olan 49 köpekten alınan kan örneklerinde hemoglobin (Hb), kolesterol, glikoz, üre, kreatinin düzeyleri ile alanin aminotransferaz (ALT) ve aspartat aminotransferaz (AST) enzim aktiviteleri kuru kimya sistemi ile ölçülmüştür.

Dermatolojik problemleri nedeniyle kliniğe getirilen köpeklerden deneme grubu, hipersensitiviteye bağlı dermatolojik bozukluklar, fungal kökenli dermatolojik bozukluklar, bakteriyel kökenli dermatolojik bozukluklar, pire dermatiti, uyuz dermatiti ve beslenme yetersizliğine bağlı dermatolojik bozukluklar olmak üzere altı alt gruba ayrılmıştır.

Elde edilen sonuçlar değerlendirildiğinde pire dermatitli köpeklerde kan Hb miktarının sağlıklı köpeklere göre istatistiki olarak anlamlı ölçüde düştüğü görülmüştür ($p<0.01$). Serum kolesterol düzeyinde ise kontrol grubuna (261,06 mg/dl) göre alerjik dermatitli ve fungal kökenli dermatolojik bozukluklu olan gruplarda önemli bir düşüş saptanmıştır. Kontrol grubu ile hasta grupları arasındaki bu farklılıklar istatistiki olarak anlamlı bulunmuştur ($p<0.01$). Ayrıca sağlıklı köpeklerde ortalama 99,04 mg/dl olarak bulunan serum glikoz düzeyinin bakteriyel dermatitli köpeklerde yükseldiği görülmüştür, fakat bu yükselme istatistiki olarak anlamlı bulunmamıştır. Diğer parametrelerde gruplar arasında anlamlı bir farklılık saptanmamıştır.

Anahtar Kelimeler: Köpek, dermatitis, biyokimyasal kan parametreleri,

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** Dr. Gulhan Türkay Hoştürk. Istanbul University, Faculty of Veterinary, Department of Biochemistry, 34320, Avcılar, Istanbul/TURKEY. gturkmen@istanbul.edu.tr Fax:0212 4737241 Tel: 0212 4737070/17212

Summary: This study reports some biochemical parameter's changes in healthy and with different skin diseases' dogs. Serum cholesterol, glucose, urea, creatinine levels, blood haemoglobin (Hb) values and, alanine aminotransferase (ALT), aspartate aminotransferase (AST) activities were measured by colorimetric dry chemistry system in 15 healthy and, 49 dogs with skin problems. Dogs with skin problems were divided into six main groups as; atopic dermatitis, fungal dermatitis, bacterial dermatitis, flea allergy dermatitis, scabie dermatitis, food allergy dermatitis.

The blood haemoglobin value in dogs with flea allergy dermatitis was significantly lower than in the healthy dogs ($p<0.01$). Serum cholesterol level was significantly decreased in with atopic dermatitis and fungal dermatitis dogs ($p<0.01$). Also it has been seen that in dogs with bacterial dermatitis means, serum glucose level was increased compared to the healthy dogs, but this increase was not significant statistically. In the other serum parameters were not significantly different in with skin problems and healthy dogs.

Key Words: dogs, dermatitis, biochemical blood parameters

Introduction

The skin is a largest organ of the body and, depending on the species and age, may represent 12-24% of an animal's body weight. The skin has many functions, including serving as an enclosing barrier against harmful physiologic and chemical factors and negative effects of bacteria, and it can perceive sensory inputs from the things that it touches such as heat, cold, pain and itching (12). In general these functions are not greatly impeded by most diseases of the skin although failure of the sweating mechanism does seriously interfere with body temperature regulation, and severe burns or other skin trauma may cause fatal fluid and electrolyte loss (17, 21).

Generally bacterial, fungal, allergic, parasitic and hormonal skin diseases occur in dogs. Less commonly, numerous hereditary and immune-mediated forms of skin disease also effect dogs. Many skin diseases cause intense itching and this leads to further skin damage from self-mutilation. Rare causes of skin disease include nutritional deficiencies, viruses and poisons. Skin tumours and cysts are common in older dogs. Dermatologic problems are told to be the most commonly encountered and the hardest solved problems by the Veterinarians in small animal Veterinary Medicine (5,6,9,10).

In this reason, skin lesion of dogs, can be determined easily, should be checked, and some blood parameters should be examined and origin of skin diseases that have similar symptoms should be searched. Some blood parameters like haemoglobin, cholesterol, AST, ALT, glucose, creatinine, urea that are thought to have great importance by means of diagnosis in veterinary clinical biochemistry, is thought to form important data whether skin diseases are primary or secondary.

The aim of this study was, to observe the origin of skin diseases by looking in to the some routine blood parameters of dogs, and search the clinical relation, which have similar symptoms, and to provide the distinctive diagnosis.

Materials and Methods

In the study, 64 mixed breed dogs from different age groups were used as material. Dogs were obtained from in-houses (in- veterinary clinics) of Istanbul city. From these 25 males and 24 females, a total of 49 dogs, which were brought to the clinic because of skin diseases, designated as a experimental group. Fifteen clinically normal dogs (9 males and 6 females) were designated healthy group. All of the dogs were clinically examined according to the examination picture and none of these dogs receive any treatment before. The experimental group, which have the dermatologic disorders, is divided into six mean groups as, atopic dermatitis (AD), fungal dermatitis (FD), bacterial dermatitis (BD), flea allergy dermatitis (FLD), scrabie dermatitis (SD), food allergy dermatitis (FAD).

Blood samples were taken from the vena cephalica antebraichii at least 12 h fast, samples were taken from. For haemoglobin values analysis, whole blood and for other blood samples serum, which is obtained according to the procedure were used. Haemoglobin (Hb) values, serum cholesterol, glucose, urea, creatinine concentrations and, ALT and AST enzyme activities were measured by colorimetric dry chemistry system using Refletron measurement equipment and strips (11).

Skin samples are sorted according to if it's primary or secondary, the area it covers, localisation, shape and to the itching type. The changes they make on the skin are observed. The skin samples, which are taken by scraping according to procedures, are examined under the microscope by checking the fluoesans properties (13,14). Skin samples taken for fungal culture, are planted twice into sabouraud dextrose medium and dermatophyte test medium and first of them is kept in room temperature (22-26 °C) and the latter in 37°C in an etuve for 4 weeks and are examined in every 3 days (14).

The significance of differences between control and experimental groups were assessed by analysis of student's t- test.

Results

The mean Hb values, mean cholesterol, glucose, urea, creatinine levels, and AST, ALT activities are shown in table 1. In the with FLD dogs, Hb values were significantly lower than in the healthy dogs. The serum cholesterol levels were significantly lower in with AD and FD than in the healthy dogs. Statistical comparison of means levels of between SD - FAD groups and healthy group hasn't been done because of the insufficient number of dogs with SD and FAD groups.

Discussion

Since some changes occur in biochemical mechanism in skin diseases, in distinctive prognosis and therapy of the disease only assessment of clinical findings aren't enough but also the biochemical blood parameters should be taken into consideration (12,17).

In the study the lowest mean blood hb value amongst the experimental group was determined in FLD, it's seen that the decrease is significant ($p<0.01$). During control of dogs with flea comb in flea dermatitis group, severe amount of flea is founded and we reached a conclusion that, that much flea could cause the decrease in blood haemoglobin level (13).

Table 1. Some biochemical parameters in the serum of dogs with healthy and different skin diseases
Tablo 1. Sağlıklı ve farklı deri hastalıklarına sahip köpeklerde bazı biyokimyasal parametreler

Parameters	Healthy n=15 X ± SE	AD n=16 X ± SE	FD n=12 X ± SE	BD n=8 X ± SE	FLD n=7 X ± SE	SD n=3 X ± SE	FAD n=3 X ± SE
Hb g/dl	15.16±0.67	14.51±0.82	14.55±0.48	14.44±1.02	12.26±1.34*	13.78±0.86	14.63±1.48
Cholest. mg/dl	261.06±1.89	205.88±15.07*	189.25±17.46*	213.63±30.51	223.71±24.22	227.67±18.44	177.0±23.25
AST IU/L	16.38±1.89	14.42±1.09	17.92±0.75	26.72±7.43	21.96±3.11	18.80±3.47	20.80±9.16
ALT IU/L	24.12±4.78	23.68±2.61	27.03±2.67	30.11±11.31	30.20±3.72	21.28±7.76	51.39±37.50
Glucose mg/dl	99.04±4.25	102.59±1.77	110.01±4.52	135.43±34.16	106.24±2.87	105.33±7.68	99.43±4.71
Urea mg/dl	38.36±3.28	39.49±9.77	38.42±3.76	37.50±5.18	29.21±3.24	37.93±5.51	56.00±12.20
Creat. mg/dl	1.02±0.03	1.33±0.41	1.07±0.06	1.04±0.98	0.95±0.09	0.95±0.06	0.90±0.06

* $p<0.01$ Significance difference between the healthy group and experimental groups.
Experimental Groups; AD= Atopic dermatitis, FD= Fungal dermatitis, BD= Bacterial dermatitis, FLD=Flea allergy dermatitis, SD= Scabic dermatitis, FAD= Food allergy dermatitis

Mean cholesterol level (261,06 mg/dl) for healthy group was within the normal range for the references (3,11,14,18). Mean serum cholesterol level (205,87 mg/dl) was significantly lower ($p<0.01$) in dogs with atopic dermatitis. It is thought that this result could be associated to the lipid level in diet and it is indicated with the idea that diets containing low lipid levels that is insufficient in fatty acids could help in formation of dermatitis associated with hypersensitivity (4,13). In the study that, performed on dogs with atopic dermatitis, they emphasized the effect of diet on dermatitis claiming that if ratio of omega-6 fatty acid to omega-3 fatty acid is between 5:1 to10:1, the construction of proinflammatory agents at skin is decreased (15). In this study, spotting of lowest cholesterol value (177 mg/dl) in dermatitis associated with dietary insufficiency shows the importance of diet. Results from recent studies have indicated that atopic dogs have disordered fat metabolism, due to decreased desaturase activity. Differences in the serum fatty acid pattern indicating a reduction in desaturase activity were not detected in atopic dogs when compared with control groups (16). Additionally dogs in fungal dermatitis had significantly lower ($p<0.01$) cholesterol level (189,25 mg/dl). Since 1/3 of the lipid structure of skin is consisted of cholesterol (8), the decrease in serum cholesterol level could effect the lipid composition of skin and could cause fungal dermatitis.

Mean glucose level (99,04 mg/dl) for the all groups were within normal ranges for the references (3,11,18 20). Only the mean serum glucose level (135,43 mg/dl) for

dogs with bacterial dermatitis was not significantly higher than for dogs with healthy and other skin diseases. In patients with hyperglycemias, the reason of decreased resistance to diseases is associated with insufficient phagocytic activity of leukocytes and this prepares a suitable environment for peripheric circulation disorders to develop. Also delayed recovery of traumatic wounds makes it possible for pathologic microorganisms to settle (7,12). Based on these data we came to a conclusion that, pathologic increase of serum glucose levels also causes an increasing in bacterial dermatitis.

In this study, mean urea and creatinine levels of control and experimental groups were found within the reference levels given in literatures (11,18,19).

Mean AST and ALT enzyme activities of the control group were determined to be within the reference values claimed by other researchers (3,11,14,18). The activity of AST was lower in dogs with atopic dermatitis than for dogs with healthy and other skin diseases but this difference was not significant, although have reported significant increases in activities of ALT, AST and ALP in demodectic dogs (2). In the other study (9), on dogs with eczema claimed that, the decrease in serum AST activity is significant and this decrease could be associated with reduced enzyme synthesis and release. There were no significant differences between mean serum ALT activities of groups with control and dermatitis.

Results indicate that examined routine blood parameters in serum are insufficient indicators of skin diseases in dogs. We conclude that to provide the distinctive diagnosis, there must be specific analysis in serum of dogs. As Angarano (1), reported that a systematic approach is required in the diagnostic evaluation in order to arrive at a tentative or definitive diagnosis. A variety of diagnostics tests, including haematology, serum biochemical profiles, urinalysis, serology, intradermal skin testing, hypoallergenic diet trials, histopathology, and direct immunofluorescence, may be necessary in some cases before a definitive diagnosis is reached.

References

- 1- **Angarano, D.W.:** Diseases of the pinna. Vet. Clin. North Am. Small Anim. Pract., 1988; 18: 4869-4884.
- 2- **Biswas, L., Mukhopadhyay, S.K., Bhattacharjya, M.K., Roy S.:** Biochemical parameters of demodectic mange infected dogs. Journal of Interacademia 6 (Special), 2002; 734-736.
- 3- **Boyd, J.W.:** Serum enzymes in the diagnosis of diseases in man and animals, J. Comp. Path. 1988; 98: 381-395.
- 4- **Burger, I.H.:** The Waltham Book of Companion Animal Nutrition. Pergamon Press. Oxford, 1993; 5-24.
- 5- **Deboer, D.J., Hillier A.:** The ACVD task force on canine atopic dermatitis (XV):

- fundamental concepts in clinical diagnosis. *Vet. Immun Immunopath*, 2001; 81: 271-276.
- 6- **Duclos, D.D., Jeffers, J.G., Shanley K.J.:** Prognosis for treatment of adult onset demodicosis in dogs. *JAVMA*, 1994; 204: 616-619.
 - 7- **Ersoy, L.:** Diabetes mellitus ve deri. *Haseki Hast. Vak. Yay.* 1959, (2): 667-699.
 - 8- **Ersoy, E., Baysu N.:** Biyokimya. *Ankara Univ. Vet. Fak. Yay.*, 1986; 408, 257-258.
 - 9- **Gulsen, N.:** Erenköy hayvan hastanesine gelen sağlıklı ve hastalıklı köpeklerde ALT, AST, GGT ve AP enzimleri ile total protein, bilirubin, albumin ve globulin düzeyleri üzerine araştırmalar. *Dissertation. Vet. Med. Fak., Istanbul Univ.* 1997, Istanbul, Turkey.
 - 10- **Kırkpınar, A., Aytuğ, N.:** Köpeklerde atopik dermatitis. *Vet. Cerh. Derg.* 1996, (1), 10-13.
 - 11- **Madaus, M., Weis, N.:** *Refletron Reference Guide Veterinary Medicine.* Boehringer Mannheim GmbH, Mannheim, 1993, 6-28.
 - 12- **Muller, G.H., Kirk, R.W. Scott, D.W.:** *Kleintier –Dermatologie.* Gustav Fisher Company, Stuttgart, 1993, 1-689.
 - 13- **Niemand, H.G., Suter, P.F.:** *Praktikuder Hundeklinik.* Blackwell Wissenschafts-Verlag. Berlin: 1994, 248- 668.
 - 14- **Quinn, P.J., Carter, M.E., Markey, B., Carter, G.R.:** *Clinical Veterinary Microbiology .* Mosby, London, 1994, 381-390.
 - 15- **Reinhard, G.A., Scott, D.W., Miller, W.H.:** Controlled dietary omega-6: omega-3 ratio reduces pruritus in non-food allergic atopic dogs recent advances in canine and feline. *Nutritional Research: Proceedings of the 1996 Iams; Int. Nutr. Symp.* Wilmington, Ohio, 1996; 277-284.
 - 16- **Saevik, B.K., Thoresens, I., Taugbol, O.:** Fatty acid composition of serum lipids in atopic and healthy dogs. *Res.Vet.Sci.* 2002; 73 (2): 153-158.
 - 17- **Scott, D.W., Muller, H.W., Griffin, E.C.:** *Muller and Kirk's Small Animal Dermatology.* ed 5. Philadelphia, WB Saunders, Co., 1995, 506–510.
 - 18- **Sodikoff, C.H.:** *Laboratory Profiles of Small Animal Diseases.* Mosby London: 1995, 1-59.
 - 19- **Strasser, A., H. Niedermüller, G., Hofecker, G. L.:** The Effect of aging on laboratory values in dogs. *J. Vet. Med A.* 1993; 40, 720-730.
 - 20- **Turkmen, G., Özcan, M., Mengi, A.:** Kangal ve Alman Çoban Köpeği ırklarının bazı biyokimyasal kan parametrelerinin karşılaştırılması. *Istanbul Univ. Vet. Fak. Derg.* 1998; 23 (2): 11-21.
 - 21- **Wilkinson, G.T., Harvey, R.G.:** *Small Animal Dermatology.* Volfe, Barcelona, 1994, 1-201.