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Assessment of Hematobiochemical and Thyroxine (T4) Profiles in Dogs with Flea Allergic Dermatitis, Adverse Food Reactions, and Dermatophytosis

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Abstract

THE most common causes of itching in dogs are flea allergic dermatitis (FAD), adverse food reactions, and dermatophytosis. The present study aimed to evaluate the effects of these conditions on hematological, serum biochemical, and thyroid hormone parameters in dogs. A total of 35 dogs were enrolled and allocated into four groups: healthy control (n = 8), FAD (n = 12), adverse food reactions (n = 5), and dermatophytosis (n = 10). In the FAD group, affected dogs exhibited reduced hemoglobin, hematocrit, and lymphocyte counts, along with increased total leukocyte counts (TLC), eosinophils, monocytes, total protein, albumin, and lipid profile levels. Dogs with adverse food reactions demonstrated leukopenia, with elevated eosinophil and monocyte counts and increased lipid profile values. The dermatophytosis group showed a significant ($p < 0.05$) decrease in hemoglobin concentration, with significant ($p < 0.05$) elevations in eosinophil counts, total protein, and albumin levels. Thyroid hormone (T4) levels did not differ significantly across the three diseased groups. The comparison among the three disease groups revealed that dermatophytosis had the most pronounced effect on hematobiochemical parameters. Dogs in this group showed a significant ($p < 0.05$) increase in mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), eosinophil counts, and albumin levels, along with a significant ($p < 0.05$) decrease in red blood cell count (RBCs), packed cell volume (PCV), and TLC. The findings of this study suggest that dermatophytosis had the most obvious impact on hematobiochemical parameters, whereas T4 levels were not significantly affected by the different dermatopathies in dogs. Hematobiochemical parameters evaluation contribute to a better diagnosis and assist in making therapeutic decisions for canine skin diseases.

Keywords: Hematobiochemical, Thyroxine, Flea allergic dermatitis, Adverse food reactions, Dermatophytosis.

Introduction

Dermatitis accounts for a significant proportion of clinical cases in small animal practice. Allergic dermatitis is the most prevalent type of dermatitis and is defined as an inflammatory skin disorder triggered by various allergic responses. The characteristic clinical signs include erythema, pruritus, papules, alopecia, and, in chronic cases, lichenification and hyperpigmentation [1]. The most common causes of allergic dermatitis in dogs include flea allergic dermatitis (FAD), adverse food reactions, dermatophytosis, atopic dermatitis, and contact dermatitis. In the present study, we focus primarily on the first three etiologies of allergic dermatitis.

FAD is one of the most prevalent dermatological conditions in small animals and is likely the most common cause of pruritic dermatosis in these species [2]. Flea bite hypersensitivity develops as pruritic dermatitis in animals that have become sensitized to

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antigenic components present in flea saliva. Most affected dogs exhibit immediate hypersensitivity reactions of the skin [3]. The clinical signs of flea infestation are generally mild and include low to moderate pruritus, the severity of which is directly related to the flea burden [2].

Adverse food reactions are relatively common in dogs, although their underlying mechanisms remain poorly understood. They are defined as abnormal responses to otherwise harmless dietary substances in certain susceptible individuals. These reactions may be immunological, such as food allergy (FA) or dietary hypersensitivity, or non-immunological, such as food intolerance [4]. Dermatological clinical manifestations include pruritus with or without gastrointestinal signs, erythema, papules, erosions, excoriations, pododermatitis, and seborrhea [4, 5, 6]. Unusual manifestations, including anaphylaxis and respiratory or ocular signs, have also been documented [7].

Dermatophytosis is a superficial fungal infection caused by species of the genera *Microsporum*, *Trichophyton*, and *Epidermophyton*, compose more than 40 identified species. Among these, *Microsporum canis* is the most frequently isolated pathogen in dogs [8]. The clinical presentation varies depending on the host's immune and inflammatory responses. Multifocal or diffuse lesions are most often observed in animals with concurrent dermatological or systemic diseases, or in those experiencing physiological stress [9].

In most skin disorders, blood biochemistry shows either no changes or only nonspecific alterations. Fortunately, diagnostic lesions are usually easily identifiable during physical examination. Nevertheless, secondary blood biochemical changes may develop as a result of chronic stress caused by skin pathology. These changes are investigated biochemically to support rational therapeutic approaches, especially in cases where treatment of skin diseases becomes prolonged and frustrating [10]. Since skin diseases may induce alterations in biochemical mechanisms, relying solely on clinical findings is insufficient for accurate prognosis and treatment. Therefore, biochemical blood parameters should also be considered [11].

Thyroid hormone concentration showed considerable variation in dogs affected with different dermatopathies [12] Therefore, the aim of this work was to investigate the effect of canine FAD, adverse food reactions, and dermatophytosis on hematobiochemical parameters and T4 in dogs.

Material and Methods

Ethical approval

The study was approved by the Institutional Animal Care and Use Committee (Vet. CU. IACUC) at the Faculty of Veterinary Medicine, Cairo University, under approval number Vet CU290720251220

Animals

This study was conducted on 35 dogs of different breeds and sexes, which were allocated into four groups: 1. Healthy group (n = 8): Included eight apparently healthy dogs, aged 2–11 years, consisting of four males and four females. 2. Flea allergy Dermatitis (FAD) group (n = 12): Comprised twelve dogs (three males and nine females) aged 3–11 years. Diagnosis was based on the detection of fleas or flea dirt on the body. 3. Adverse food reactions group (n = 5): Included five dogs (two males and three females) aged 2–7 years, showing allergy signs such as pruritus and erythema. Diagnosis was confirmed through elimination diet trials over a two-week period. 4. Dermatophytosis group (n = 10): Included ten dogs (four males and six females) aged 2–14 years, presenting with dermatological signs such as pruritus, dandruff, and localized alopecia. Diagnosis was confirmed by skin scraping and Wood's lamp technique.

All animals were examined and sampled at a private pet clinic in Cairo, Egypt. Sampling was performed during both summer and winter between August 2024 and June 2025. Dogs were fed freshly cooked food and had free access to clean drinking water. Prior to sample collection, each animal underwent a complete physical and dermatological examination. All dogs were regularly vaccinated, and—except for the FAD group—maintained on routine deworming and ectoparasite control programs.

Sample collection and analysis

Blood samples were collected without sedation from the cephalic vein. Each sample was divided into two aliquots: One into an EDTA tube for hematological analysis and the other in a plain tube for serum separation to perform biochemical assays and thyroid hormone profiling. Complete blood count (CBC) was performed using a Mindray analyzer. Serum was obtained by centrifuging blood samples in plain tubes at 3000 rpm for 10 minutes to separate non-hemolytic serum, which was then stored at -20 °C until further analysis. Serum biochemical parameters included total proteins, albumin, triglycerides, and total cholesterol, were measured using a Fujifilm chemistry analyzer with specific diagnostic kits (Global Technology Company, Egypt). Serum thyroid hormone estimation was performed using a VIDAS KUBE analyzer, France.

Statistical analysis

Data were analyzed using SPSS software version 25. The Shapiro–Wilk test was used for determination of descriptive statistics and normality checking. Comparisons between healthy and diseased groups in the three disease categories were

performed using the independent samples t-test. One way analysis of variance (ANOVA) and LSD Post Hoc test were used for comparing means between control group and three diseases groups. Results are expressed as Mean ± SE, and values of $P < 0.05$ were considered statistically significant.

Results

The comparison between the healthy group and the FAD group is presented in (Table 1). The erythrogram of diseased dogs showed decreased values of hemoglobin and hematocrit. The leucogram demonstrated elevated TLC, eosinophils, and monocytes, along with reduced lymphocyte counts. Serum biochemical analysis revealed higher concentrations of total proteins, albumin, and lipid profile parameters in the diseased group compared to the healthy controls. T4 levels, however, were not affected in FAD-affected dogs.

The comparison between the healthy group and the adverse food reactions group is presented in (Table 2). Affected dogs exhibited leukopenia, accompanied by increased eosinophil and monocyte counts relative to healthy animals. Biochemically, only cholesterol and triglyceride levels were elevated in diseased dogs. T4 concentrations showed no significant difference between the two groups.

The comparison between the healthy group and the dermatophytosis group is presented in (Table 3). Diseased dogs demonstrated a significant ($p<0.05$) reduction in hemoglobin concentration and lower PCV values compared to healthy controls. The leucogram revealed leukopenia, accompanied with elevated monocyte counts and a significant ($p<0.05$) increase in eosinophil counts in affected dogs. Serum biochemical analysis showed a significant ($p<0.05$) increase in total protein and albumin levels, with non-significant elevations in cholesterol and triglycerides. T4 levels were not significantly affected in either group.

The comparison of the effects of FAD, adverse food reactions, and dermatophytosis on hematobiochemical parameters and thyroid hormone is presented in (Table 4). FAD group showed a significant ($p<0.05$) increase in TLC and a significant ($p<0.05$) decrease in MCV. Adverse food reactions were associated with a significant ($p<0.05$) decrease in TLC, MCH, and red blood cell distribution width (RDWc). Dermatophytosis had the most pronounced effect, characterized by significant ($p<0.05$) increases in MCV, MCH, eosinophil counts, RDWc, and albumin levels, along with significant ($p<0.05$) decreases in RBCs, PCV, and TLC.

Discussion

Hematological and biochemical analyses are valuable tools in assessing the severity of ectoparasites infestation and play a crucial role in the management of affected dogs [11, 13]. This study evaluated the effects of different dermatopathies, including FAD, adverse food reactions, and dermatophytosis, on hematobiochemical parameters and thyroid hormones in dogs.

In cases of FAD, hematological findings revealed reduced values of hemoglobin and hematocrit in diseased animals, which consistent with the previous reports [11, 13, 14]. These reductions are attributed to the blood-sucking behavior of ectoparasites, leading to anemia, with the severity of hemoglobin decrease being proportional to the degree of flea infestation. Leucogram analysis showed elevated total leukocyte counts, eosinophils, and monocytes, along with decreased lymphocyte counts in affected dogs. These findings align with previous studies [1, 10, 13, 14, 15]. The observed leukocytosis has been linked to cellular and humoral immune responses in allergic dermatitis, or to the release of toxins resulting from inflammation and tissue necrosis. Eosinophilia may occur due to hypersensitivity reactions, as increased histamine levels stimulate eosinophil release into circulation. Monocytosis may reflect a response to chronic inflammatory stimuli, as well as stress on animal due to parasitic infestations. Conversely, the reduction in circulating lymphocytes may be due to antigen–antibody (Ag-Ab) reactions and the migration of lymphocytes into the inflamed skin, particularly between the crust and the Malpighian layer. Serum biochemical analysis showed increased levels of total proteins, albumin, and lipid profile parameters in diseased dogs, in agreement with earlier studies [10, 13]. These changes have been explained by elevated immunoglobulin concentrations and immune responses, while lipid profile alterations may reflect stress in affected animals. T4 levels, however, did not show significant difference between the diseased and control groups, consistent with the findings of [15].

In dogs with adverse food reactions, hematological analysis revealed leukopenia compared to healthy controls, which could be attributed to leukocyte redistribution into inflamed tissues during allergic reactions. This migration reduces circulating leukocyte counts. Similar to FAD, eosinophil and monocyte counts were elevated in the diseased group, likely due to hypersensitivity reactions and chronic inflammatory stimuli, respectively [1, 14]. Serum biochemical parameters and thyroid hormone levels generally showed no significant differences between diseased and healthy groups, except for cholesterol and triglyceride levels, which were higher in affected dogs. As previously explained for FAD, these increases may be related to stress in diseased animals [10].

Dogs diagnosed with dermatophytosis exhibited significant alterations in hematological parameters compared to healthy controls, unlike the FAD and

food allergy groups. Hemoglobin levels were significantly ($p<0.05$) reduced, while PCV showed a non-significant decrease, these findings consistent with [16, 17]. These changes were explained by reduced appetite and blood loss caused by scratching and inflammation. Leucogram results in dermatophytosis were similar to those observed in adverse food reaction, with decreased total leukocyte counts, elevated monocyte counts, and significantly ($p<0.05$) increased eosinophil levels, in line with previous reports [16, 17]. Serum biochemical analysis revealed a significant ($p<0.05$) increase in total protein and albumin levels, along with non-significant elevations in cholesterol and triglycerides. These findings are consistent with the observations of [16], who attributed the rise in serum proteins to the inflammatory response induced by dermatophyte infection. This immune activation leads to an overall increase in serum protein content. Similar to the findings in FAD and food allergy, T4 levels showed no significant differences between healthy and diseased group.

The comparison between the three diseased groups and the healthy control group revealed significant hematobiochemical alterations in dogs affected by dermatophytosis, whereas only minimal changes were observed in dogs with FAD and adverse food reactions. Erythrogram findings demonstrated a significant ($p<0.05$) decrease in RBCs count, hemoglobin, and PCV in the dermatophytosis group, indicating a tendency to anemia. This may result from chronic inflammation and the associated suppression of erythropoiesis, as reported by [18]. In contrast, no marked erythrogram changes were observed in FAD and adverse food reactions. Red blood cell indices showed a significant ($p<0.05$) increase in MCV and MCH in dermatophytosis, indicating macrocytic changes potentially linked to regenerative anemia. Conversely, FAD was associated with slightly reduced MCV, indicating a microcytic tendency that may reflect mild chronic inflammation. Leukogram analysis showed leukocytosis in FAD, with a significant ($p<0.05$) rise in eosinophil percentage in dermatophytosis group. Eosinophilia is a well-established marker of hypersensitivity and allergic reactions, mediated by interleukin-5 and other Th2 cytokines [19]. Adverse food reactions showed a relatively lower TLC, which could be attributed to chronic inflammation and leukocyte redistribution into inflamed tissues. Serum biochemical analysis revealed elevated total protein and albumin levels in both FAD and dermatophytosis groups. Hypercholesterolemia and hypertriglyceridemia were more pronounced in the dermatophytosis group, which may reflect metabolic dysregulation associated with fungal infection or inflammatory stress [10]. T4 levels did not differ significantly among the groups, indicating that dermatological disorders did not induce thyroid dysfunction, consistent with the findings of [20].

Conclusion

This study demonstrated that among the investigated dermatopathies, dermatophytosis had the most pronounced effect on hematobiochemical parameters in dogs, as evidenced by significant alterations in erythrogram, leukogram, and serum biochemistry, while FAD and adverse food reactions induced only minimal changes. Thyroid hormone concentrations remained unaffected across all studied groups, suggesting that these dermatological conditions do not influence thyroid function. Overall, hematobiochemical alterations can serve as useful indicators for evaluating the systemic impact of dermatopathies, particularly dermatophytosis, and may aid in improving diagnosis and prognosis and guiding therapeutic decisions in canine skin diseases.

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Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical of approval

The study was approved by the Institutional Animal Care and Use Committee (Vet. CU. IACUC) at the Faculty of Veterinary Medicine, Cairo University, under approval number Vet CU290720251220

Authors contributions

All authors contributed to the study conception and design. Sample collection and analysis were carried out by Nardeen Nashaat Nashed. Mariam Gamal Zaki performed the statistical analysis and prepared the first draft of the manuscript. Noha Y. Salem and Hitham Abdel-Saeed contributed to the conceptualization of the research idea, methodology, as well as reviewing and editing the manuscript. All authors have read and approved the final version of the manuscript.

TABLE 1. Effect of flea allergic dermatitis (FAD) on hematobiochemical parameters and thyroid hormone

Parameters	Control (n=8)	FAD (n=12)
RBCs ($\times 10^6$)	7.37±0.27	7.07±0.25
Hemoglobin (g/dl)	17.64±0.22	16.70±0.42
Platelets ($\times 10^3$)	259.20±27.93	289.25±38.60
PCV (%)	50.40±1.50	46.50±1.32
TLC ($\times 10^3$)	10.34±0.94	12.12±1.71
Basophils (%)	0	0
Eosinophils (%)	4.80±1.52	7.16±1.39
Segmented (%)	58.±4.07	55.81±5.33
Lymphocytes (%)	23.80±1.59	18.81±2.16
Monocytes (%)	8±3.02	14.75±2.82
MCV (fL)	68.42±1.93	66.59±0.82
MCH (pg)	23.96±0.67	23.32±0.55
MCHC (g/dl)	34.72±0.47	34.66±0.43
RDWc (%)	12.40±0.24	12.50±0.26
Total protein (g/dl)	6.72±0.15	7.89±0.43
Albumin (g/dl)	3.78±0.22	4.38±0.23
Cholesterol (mg/dl)	188.60±18.90	234.08±16.13
Triglycerides (mg/dl)	56.40±17.23	88.41±19.33
Total T4 (µg/dl)	1.25±0.14	1.32±0.08

Asterisks (*) in the row mean significant difference ($p < 0.05$) between control and diseased groups.

TABLE 2. Effect of adverse food reactions on hematobiochemical parameters and thyroid hormone.

Parameters	Control (n= 8)	Adverse food reactions (n=5)
RBCs ($\times 10^6$)	7.37±.27	7.49±0.41
Hemoglobin (g/dl)	17.64±0.22	17.40±0.48
Platelets ($\times 10^3$)	259.20±27.93	284.40±67.45
PCV (%)	50.40±1.50	50.60±1.50
TLC ($\times 10^3$)	10.34±0.94	7.68±0.93
Basophils (%)	0	0
Eosinophils (%)	4.80±1.52	7.40±1.83
Segmented (%)	58.±4.07	51.40±4.55
Lymphocytes (%)	23.80±1.59	23.60±3.78
Monocytes (%)	8±3.02	15.40±6.28
MCV (fL)	68.42±1.93	67.94±2.01
MCH (pg)	23.96±0.67	23.36±0.74
MCHC (g/dl)	34.72±0.47	34.36±0.54
RDWc (%)	12.40±0.24	12.14±0.22
Total protein (g/dl)	6.72±0.15	7.42±0.33
Albumin (g/dl)	3.78±0.22	3.78±0.15
Cholesterol (mg/dl)	188.60±18.90	234.20±22.32
Triglycerides (mg/dl)	56.40±17.23	61.0±13.24
Total T4 (µg/dl)	1.25±0.14	1.30±0.09

Asterisks (*) in the row mean significant difference ($p < 0.05$) between control and diseased groups

TABLE 3. Effect of dermatophytosis on hematobiochemical parameters and thyroid hormone.

Parameters	Control (n= 8)	Dermatophytosis (n=10)
RBCs ($\times10^6$)	7.37±0.27	6.21±0.40
Hemoglobin (g/dl)	17.64±0.22*	15.86±0.72
Platelets ($\times10^3$)	259.20±27.93	328±54.84
PCV (%)	50.40±1.50	43.6±2.22
TLC ($\times10^3$)	10.34±0.94	9.92±0.56
Basophils (%)	0	0
Eosinophils (%)	4.80±1.52	9.10±0.84*
Segmented (%)	58.±4.07	49.70±5.56
Lymphocytes (%)	23.80±1.59	20.40±3.24
Monocytes (%)	8±3.02	18.80±3.21
MCV (fL)	68.42±1.93	70.65±1.21
MCH (pg)	23.96±0.67	25.08±0.57
MCHC (g/dl)	34.72±0.47	35.41±0.35
RDWc (%)	12.40±0.24	13.10±0.23
Total protein (g/dl)	6.72±0.15	7.90±0.32*
Albumin (g/dl)	3.78±0.22	4.68±0.24*
Cholesterol (mg/dl)	188.60±18.90	245±30.32
Triglycerides (mg/dl)	56.40±17.23	144.70±43.80
Total T4 (µg/dl)	1.25±0.14	1.36±0.07

Asterisks (*) in the row mean significant difference ($p < 0.05$) between control and diseased groups.

TABLE 4. Comparison between the effect of FAD, adverse food reactions and dermatophytosis on hematobiochemical parameters and thyroid hormone.

Parameter	Control	FAD	Adverse food reactions	Dermatophytosis
RBCs (×106)	7.37±0.27^{a}	7.07±0.25^{a}	7.49±0.41^{a}	6.21±0.40^{b}
Hemoglobin (g/dl)	17.64±0.22	16.70±0.42	17.40±0.48	15.86±0.72
Platelets (×103)	259.20±27.93	289.25±38.60	284.40±67.45	328±54.84
PCV (%)	50.40±1.50^{a}	46.650±1.32^{a}	50.60±1.50^{a}	43.60±2.22^{b}
TLC (×103)	10.34±0.94^{b}	12.12±1.71^{a}	7.68±0.93^{c}	9.92±0.56^{b}
Basophils (%)	0	0	0	0
Eosinophils (%)	4.80±1.52^{b}	7.16±1.39^{b}	7.40±1.83^{b}	9.10±0.84^{a}
Segmented (%)	58.±4.07	55.81±5.33	51.40±4.55	49.70±5.56
Lymphocytes (%)	23.80±1.59	18.81±2.16	23.60±3.78	20.40±3.24
Monocytes (%)	8±3.02	14.75±2.82	15.40±6.28	18.80±3.21
MCV (fL)	68.42±1.93^{b}	66.59±0.82^{c}	67.94±2.01^{b}	70.65±1.21^{a}
MCH (pg)	23.96±0.67^{b}	23.32±0.55^{b}	23.36±0.74^{c}	25.08±0.57^{a}
MCHC (g/dl)	34.72±0.47	34.66±0.43	34.36±0.54	35.41±0.35
RDWc (%)	12.40±0.24^{b}	12.50±0.26^{b}	12.14±0.22^{c}	13.10±0.23^{a}
Total protein (g/dl)	6.72±0.15	7.89±0.43	7.42±0.33	7.90±0.32
Albumin (g/dl)	3.78±0.22^{b}	4.38±0.23^{ab}	3.78±0.15^{b}	4.68±0.24^{a}
Cholesterol (mg/dl)	188.60±18.9	234.08±16.13	234.20±22.3	245±30.32
Triglycerides (mg/dl)	56.40±17.23	88.41±19.33	61±13.24	144.70±43.80
Total T4 (µg/dl)	1.25±0.14	1.32±0.08	1.30±0.09	1.36±0.07

Values in the same raw having different letters ($^{a,b \text{ and } c}$) are significant difference at $P<0.05$

Fig. 1. A five years old German Shepherd with FAD, the image showing alopecia at the end of back and the tail with crusts

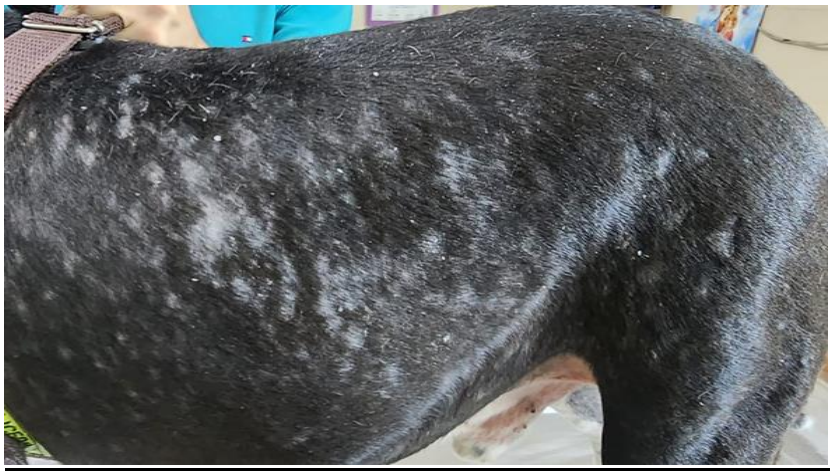

Fig. 2. A five years old Pitbull with canine dermatophytosis, the image showing circular alopecic lesions with thick crusts

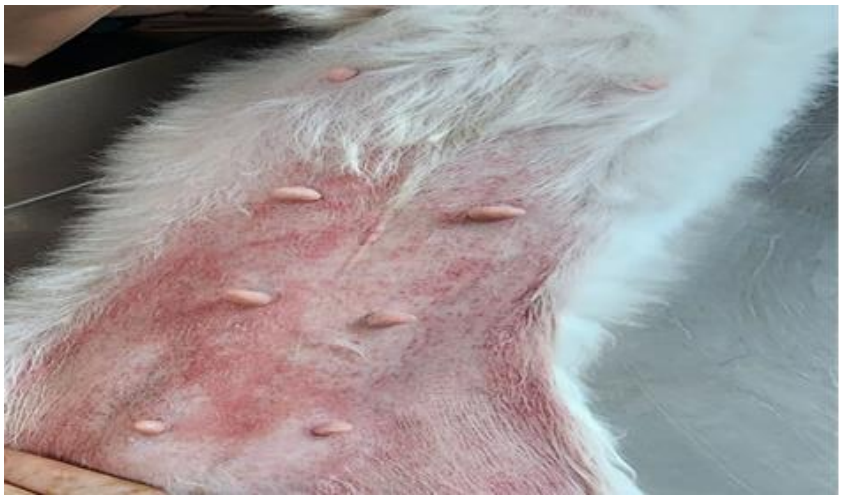

Fig. 3. A seven years old Griffon with adverse food reaction, the image showing severe redness of the skin at the lower abdomen and thighs.

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تقييم مكونات والكيمياء الحيوية للدم، ومستويات الثيروكسين (T4) في الكلاب المصابة بالتهاب الجلد التحسسي الناتج عن البراغيث، والتفاعلات الغذائية الضارة، والفطريات الجلدية

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الملخص

الأسباب الأكثر شيوعًا للحكة في الكلاب هي التهاب الجلد التحسسي الناتج عن البراغيث (FAD)، والتفاعلات الغذائية الضارة، والفطريات الجلديه.هدفت هذه الدراسة إلى تقييم تأثير هذه الحالات على تقييم مكونات والكيمياء الحيوية للدم ، وهرمون الثيروكسين في الكلاب. شملت الدراسة 35 كلبًا ، وتم تقسيمها إلى أربع مجموعات: مجموعة ضابطة سليمة (عددها = 8)، مجموعة التهاب الجلد التحسسي الناتج عن البراغيث (عددها = 12)، مجموعة التفاعلات الغذائية الضارة (عددها = 5)، ومجموعة الفطريات الجلديه (عددها = 10). في مجموعة الـ FAD، أظهرت الكلاب المصابة انخفاضًا في تركيز الهيموغلوبين، وحجم الخلايا المضغوط، وعدد الخلايا اللمفاوية، إلى جانب زيادة في عدد كريات الدم البيضاء الكلي(TLC) ، وعدد الحمضات(eosinophils) ، والوحيدات(monocytes) ، ومستويات البروتين الكلي، والألبومين، والدهون في الدم. أما الكلاب التي تعاني من التفاعلات الغذائية الضارة فقد أظهرت قلة الكريات البيضاء(leukopenia) ، مع ارتفاع في عدد الحمضات والوحيدات وزيادة في قيم الدهون. مجموعة الفطريات الجلديه أظهرت انخفاضًا ملحوظًا ($p < 0.05$) في تركيز الهيموغلوبين، مع ارتفاعات ملحوظة ($p < 0.05$) في عدد الحمضات، ومستويات البروتين الكلي، والألبومين. لم تُظهر مستويات هرمون الغدة الدرقية (T4) اختلافًا كبيرًا بين المجموعات الثلاث المصابة. أظهرت المقارنة بين المجموعات الثلاث أن االفطريات الجلديه كان له التأثير الأكثر وضوحًا على المؤشرات الدموية والبيوكيميائية؛ إذ أظهرت الكلاب في هذه المجموعة زيادة ملحوظة ($p < 0.05$) في متوسط حجم كريات الدم الحمراء (MCV)، ومتوسط تركيز الهيموغلوبين في الكرية(MCH) ، وعدد الحمضات، ومستويات الألبومين، إلى جانب انخفاض ملحوظ ($p < 0.05$)في عدد كريات الدم الحمراء(RBCs) ، وحجم الخلايا المضغوط(PCV) ، وعدد كريات الدم البيضاء الكلي. تشير نتائج هذه الدراسة إلى أن الفطريات الجلديه كانت لها التأثير الأبرز على المكونات الدموية والكيمياء الحيويه للدم، في حين أن مستويات T4 لم تتأثر بشكل ملحوظ بالأمراض الجلدية المختلفة في الكلاب.

الكلمات الدالة: مكونات والكيمياء الحيوية للدم، هرمون الثيروكسين، التهاب الجلد التحسسي الناتج عن البراغيث،التفاعلات الغذائية الضارة، الفطريات الجلديه.