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Haemato-biochemical changes in cats affected with flea allergy dermatitis

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Abstract
Dermatological disorders are commonly encountered problems in small animal practice. In veterinary medicine, very minimal information is available regarding the demographics of feline dermatologic disorders. Based on the anecdotal information, it has been estimated that about 20 to 75 percent of the cases seen in small animal practice have the dermatologic problem as a chief or concurrent owner's complaint. Geographic variations affect the prevalence of flea hypersensitivity in cats but it is definitely one of the most common hypersensitivities reported in the cats. FAD has manifested with different clinical signs and has many possible differential diagnoses. The clinical signs in FAD are greatly variable and include miliary dermatitis, symmetrical alopecia, eosinophilic plaques, linear granuloma, indolent ulcers and regional or generalized pruritus. Intradermal Skin Test can be used to diagnose FAD in cats. The cats with FAD can be managed efficiently using topical anti-flea agent, antibiotics, antihistamines, prednisolone, and oral supplement of essential fatty acids.

Keywords: Cat, FAD, miliary dermatitis, monocytosis

1. Introduction
Despite the fact that feline allergic skin diseases are common conditions, our understanding of allergic skin diseases in cats have been growing very slowly compared to dogs. The most common allergic skin diseases in cats are flea allergy dermatitis; cutaneous adverse food reactions (food allergies); non-flea, non-food hypersensitivity dermatitis and mosquito bite hypersensitivity. Many diseases have been associated with fleas, such as anaemia, tape worm infestations, Lyme disease, the pest, viruses, haemoparasites, cat scratch disease and flea allergy. Flea allergy dermatitis (FAD) has been considered the most frequently diagnosed hypersensitivity condition in the cat and its prevalence depends on the geographical region. FAD may be seen as a sole entity or in conjunction with other allergic skin disease. In the survey conducted in United Kingdom on prevalence of flea infestation in the cats was 21.09 percent, significantly higher than in the dogs (6.82 percent). Prevalence of skin lesions compatible with flea allergy dermatitis in cats (8.02 percent) was also significantly higher than in the dogs (3.32 percent). They opined that geographic variations had affected the prevalence of flea hypersensitivity in cats but it was definitely one of the most common hypersensitivities reported in the cats (Bond *et al*., 2007) [1]. FAD is initiated with the bite of a flea. The saliva flea contains amino acids, histamine like compounds, proteolytic enzymes and anticoagulants. Non-allergic animals suffer little or no discomfort while being bitten and only flea-allergic subjects develop pruritus and skin disease.
It was not always possible for finding of fleas or flea dirt. In flea allergic cats even one or few fleas could elicit severe pruritus. Allergic cats were excellent groomers in particular and could eliminate all the fleas put on them in less than forty eight hours. Intradermal skin test using allergens derived from whole fleas was one of the principal tests for diagnosis of flea allergy dermatitis in cats (Reedy, 1997) [1].

2. Headings and Footnotes
2.1 Materials and Methods
In the present study blood samples were collected from cephalic vein or medial saphenous vein from eight cats which were tested positive for intradermal skin test using flea salivary antigen the blood was collected from six control cats as well.

2.1.1 Haematology
About two milliliters of blood was collected by using ethylene diamine tetra-acetic acid

(EDTA) coated vacutainers for estimation of the following parameters with the help of automatic animal blood cell counter using standard techniques.

a) Total erythrocyte count (10^6/µL)
b) Haemoglobin concentration (g/dL)
c) Total leukocyte count (10^3/µL)
d) Differential leukocyte count (%)
e) Volume of packed red cells (%)
f) Platelet count (10^3/µL)
g) Mean corpuscular volume (fl)
h) Mean corpuscular haemoglobin (pg)
i) Mean corpuscular haemoglobin concentration (g/dL)

2.1.2 Serum biochemistry

About two millilitre of blood was collected in a clot activator vacutainer and centrifuged to 3000 rpm for 15 minutes. Serum was separated for the estimation of total protein, albumin, globulin and albumin: globulin ratio. Total protein and albumin was estimated semiautomatic biochemical analyser. Serum zinc and copper was estimated using Atomic Absorption Spectrophotometry.

The data obtained were analysed using computer software SPSS version 24.0. Comparison between diseased and control group was done by independent 't' test (Kaps and Lamberson, 2009) [4].

2.2 Results and Discussion

2.2.1 Haematology

There was no statistically significant difference in the mean values of TEC, Hb, VPCV, MCV, MCH, MCHC, TLC, lymphocytes and granulocytes of diseased group compared to control group and the values were within normal range (Rizzi *et al*., 2010) [10]. This was in contrast with Kutlay and Hosturk (2005) [6]. Authors reported statistically significant decrease in TEC, Hb and VPCV, MCV, MCH and MCHC in flea allergic dogs due to anaemia caused by fleas. Unlike flea allergic dogs, cats with FAD harbour very less number of fleas on their body due to their extensive and vigorous grooming nature (Scheidt, 1988 and Noli, 2009) [13, 14]. Hence the clinical anaemia encountered in heavily flea infested dogs and cats are not seen in flea allergic cats. Nesbitt (1983) [15] observed that lymphocytes and granulocytes to be in normal range in flea allergic cats.

The mean value of monocytes was higher than control group and the difference was found to be statistically significant. Monocytosis observed in the present study might be due to stress induced by pruritus (Sreedharan, 2004) [12] or inflammatory reaction directed towards fleas and their products (Javinsky, 2011) [3]. Toxins released due to tissue necrosis produced by inflammation or secondary bacterial infection might also be the cause for monocytosis (Gupta and Prasad, 2001) [2].

The mean value of platelet count of diseased group was significantly decreased when compared to control group. This was in accordance with Wei *et al*. (2016) [16]. Authors reported that there was an increased risk for the development of primary immune-mediated thrombocytopenia (ITP) in children affected with atopic dermatitis.

2.2.2 Serum biochemistry findings

There was no statistically significant difference in the mean values of total protein, albumin, globulin, A:G ratio, zinc and copper of diseased and control group. The mean values of diseased and control group were within the normal range (Kaneko *et al*., 2008) [5]. This was suggestive of absence of intercurrent systemic disease and normal appetite as reported by Sharma and Gupta (2005) [11]. Zinc and copper deficiency was unlikely in cats fed with commercial diets, as they contain adequate and balanced amount of minerals (Outerbridge, 2012) [8].

The cats affected with FAD are managed with selamectin, applied topically at a minimum dosage of 6mg/kg body weight (Shanks, 2000) [17]. Systemic antibiotics were administered to treat secondary bacterial infections. The empirical choice of the drug and dose was usually to treat staphylococcal colonization. To decrease inflammation and pruritus oral prednisolone @ 2.2 mg/kg every twenty-four hours for 5 – 7 days and chlorpheniramine maleate @ 2 mg orally every twelve hours for 7 days were used (Miller *et al*. 2013) [7]. All the treted cats have shown positive clinical response.

Mean values of the haematological parameters and biochemical parameters are presented in the Table 3 and Table 4.

Table 3: Haematological parameters in diseased (FAD) and control group

Parameters	Diseased group n = 8	Control group n = 6	*p* – value
Total erythrocyte count (×10^6/µL)	6.49±0.29	7.44±0.86	0.33^{ns}
Haemoglobin (g/dL)	10.16±0.30	10.48±0.36	0.51^{ns}
Volume of packed red cells (%)	31.06±1.09	37.06±2.69	0.06^{ns}
Mean corpuscular volume (mm^3)	48.16±2.15	51.26±2.28	0.34^{ns}
Mean corpuscular haemoglobin (pg)	15.06±1.38	15.73±0.46	0.65^{ns}
Mean corpuscular haemoglobin concentration (%)	32.76±0.68	28.96±1.66	0.06^{ns}
Total leukocyte count (x10^3/µL)	17.03±3.4	11.86±2.09	0.22^{ns}
Monocytes (%)	4.38±0.46	2.76±0.40	0.02^{*}
Lymphocytes (%)	44.88±5.31	36.83±1.44	0.18^{ns}
Granulocytes (%)	50.72±5.40	60.40±1.15	0.12^{ns}
Platelets count (x10^3/µL)	152.25±41.58	258.50±27.47	0.05^{*}

* - Significant at 5% interval ($p \leq 0.05$)
ns - Not significant

Table 4: Serum biochemical parameters in diseased (FAD) and control groups

Parameters	Diseased group n = 8	Control group n = 6	*p* – value
Total protein (g/dL)	6.59±0.25	6.03±0.20	0.11^{ns}
Albumin (g/dL)	2.52±0.10	2.48±0.11	0.80^{ns}
Globulin (g/dL)	4.06±0.25	3.55±0.10	0.94^{ns}
A: G ratio	0.63±0.05	0.69±0.02	0.40^{ns}
Zinc (mg/L)	0.82±0.03	0.87±0.03	0.34^{ns}
Copper (mg/L)	0.50±0.60	0.62±0.07	0.22^{ns}

ns – Not significant

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