# Approach to the Diagnostics of Atopic Dermatitis in Dogs in Conditions of Clinical Practice

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**Abstract**

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The aim of this work was to elucidate the incidence of atopic dermatitis in dogs regarding their age, sex and individual breeds, verify the diagnostic criteria of the disease by Willemse and Prélaund and evaluate their sensitivity in the conditions of this country. In the group of 94 dogs, atopic dermatitis was diagnosed in the period from 1994 to 2005. The highest frequency among breeds was documented in Boxer (100%) and French Bulldog (84.6%), being significantly ($p < 0.05$) higher than in Shar-pei (41.7%) and Dalmatian (41.7%). The difference was even highly significant ($p < 0.01$) compared to Dachshund (2.7%), German Shepherd (6%), Cocker Spaniel (11.1%), and Poodle (3.3%).

On the other hand, no significant differences were found between sexes. The commonly affected age group was 67 patients (71.2% cases) at the age between three and six years. The diagnosis was made using the clinical criteria by Willemse and Prélaund to verify the sensitivity of these criteria. It was found to be 72% by Willemse, 68% by Prélaund, and the difference was not statistically significant. In all 94 patients various stages of pruritus were detected. The most frequent clinical signs were facial or digital affecting 94.7% patients (89/91) and secondary pyoderma was found in 72.3% patients (68/94). Skin allergy test for specification of the diagnosis was performed in 73.4% cases (69/94).

*Hypersensitivity, atopy, allergen, clinical criteria, pruritus*

Atopic dermatitis (AD) in dogs is defined as genetically conditioned inflammatory and pruritic allergic skin disease with a characteristic clinical picture. It is most often associated with the production of IgE antibodies against environmental allergens (Olivry 2001). Dogs with atopic dermatitis also have a higher tendency to other types of hypersensitivity. Flea allergy dermatitis and food sensitivity commonly occur in one patient with atopic dermatitis (Halliwell et al. 1987).

Atopic dermatitis usually occurs in dogs aged six months to three years, despite the fact that clinical signs have been documented in individuals younger than six months and in dogs seven-year-old (Nesbitt et al. 1984; Griffin 1993; Scott et al. 1995; Saridomichelakis et al. 1999). Although the disease may occur in all breeds including crossbreeds, breed predisposition and higher frequency has been observed in West Highland White Terrier and other Terriers, Boxer, Dalmatian, French Bulldog, Shar-pei, English and Irish Setter, Schnauzer, Dachshund, Labrador Retriever, Lhasa-apso, and Yorkshire Terrier (Halliwell and Schwartzman 1971; Scott 1981; Halliwell and Gordman 1989; Carlotti and Costargent 1992; Saridomichelakis et al. 1999).

Reports on sex predisposition to atopic dermatitis are not uniform. Sex predilections have been described for male in one study (Nesbitt 1978), and for female in other studies (Halliwell and Schwartzman 1971; Scott 1981; Nesbitt et al. 1984), and for neither sex

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by other authors (Willemse and van den Brom 1983; Carlotti and Costargent 1992; Saridomichelakis et al. 1999).

The primary clinical sign of atopic dermatitis is pruritus without any skin changes (Halliwell and Schwartzman 1971; Scott 1981). The most common clinical manifestation of AD are lesions of the face, periocular area, lips, chin, innner part of the ear lobes and the top third of ear holes, axillae, ventrum, distal part of the legs and interdigital space of the paws and fingers. Pruritus on the whole body affects more than 40% dogs (Scott 1981; Nesbitt et al. 1984).

Atopic dermatitis has often been diagnosed as a chronic disease. Pruritus and chronic inflammatory changes cause alopecia, hyperpigmentation, lichenification (Scott et al. 1995), red-brown staining of the coat from saliva in the region of paws due to licking, changes of the skin colour in the eye region and oral cavity due to lacrimation and salivation. Atopic otitis and conjunctivitis that may be observed in more than half of the cases (Scott 1981) are frequent too. Atopic patients often suffer from secondary pyoderma or yeast infection (Mason and Lloyd 1989; McEwan 1990).

Lists of clinical criteria have been arranged by various authors (Willemse 1986; Willemse 1988; Prélaund et al. 1998). Due to the variability of clinical signs of atopic dermatitis in the individual patients, these criteria cannot be considered reliable enough and the evaluation of their sensitivity and specifity has not been performed so far (DeBoer and Hillier 2001).

The diagnosis is based on a very detailed history, clinical signs of this disease, differential diagnostics and skin allergy test, possibly also serologic examination of the specific IgE. The most important differential diagnoses to be ruled out were flea allergy dermatitis, adverse food reactions, sarcoptic mange, cheyletiellosis, bacterial folliculitis and *Malassezia* dermatitis, pediculosis, skin strongyloidosis, contact dermatitis and disorders of keratinisation (Scott et al. 1995; DeBoer and Hillier 2001).

## Materials and Methods

The group under study consisted of 94 canine patients suffering from pruritus and clinical signs of atopic dermatitis and presented between 1994 and 2005. The influences of breed, sex and age of patients have been monitored, and occurrence of the first signs of the disease were recorded. The occurrence of atopic dermatitis was evaluated with respect to the total number of treated patients of individual breeds between 1994 and 2005.

Data on the history were completed during the clinical examination and formed an essential part of the elaboration of differential diagnostics of the disease.

Other special examinations for precluding pruritic diseases were performed for differential diagnostics.

Skin-scratching was done routinely in all patients for the microscopic diagnostics of skin parasites. Self-adhesive tape was often used for the same purpose. Microscopic examination of skin-scratching was also used for approximate establishment of bacterial and *Malassezia* infections or cytologic examination of the lesions. Microscopic examination of extracted hairs and examination using a Wood lamp as an auxiliary method for the diagnostics of dermatophytosis were done. Dermatophytic test was employed for yeast culture, and eventually the samples were sent to the state laboratory for analysis.

In the patients with the *Staphylococcus* pyoderma or *Malassezia* dermatitis treatments of pyoderma were initiated. In many cases the typical clinical signs of the disease were obscured by previous therapy and therefore all medicaments were withdrawn for at least two to three weeks. Patients suspect of food hypersensitivity (24/94) were fed an elimination diet for six to eight weeks or more, with a following testing of individual components of formerly presented foods.

To establish the diagnosis of atopic dermatitis, criteria according to Willemse (1988) and criteria by Prélaund et al. (1998) were also used with the aim to compare their informative value with one another as well as their sensitivity and specificity with diagnostic procedure of the atopic patient as mentioned above. In the case of clinical criteria by Willemse the patient must comply with at the least three main and three related criteria.

The main criteria include: pruritus, facial or digital involvement, lichenification of flexor surfaces of the tarsus or extensor surfaces of carpus, chronic or chronically relapsing dermatitis, individual or family history of atopy, breed predisposition.

Associate criteria: first signs of disease before the third year of life, facial erythema and cheilitis, bacterial conjunctivitis, surface staphylococcus pyoderma, hyperhidrosis, positive reaction to a skin allergy test, enhanced level of serum allergen specific IgGd, enhanced level of serum allergen specific IgE.

Criteria by Prélaund et al. (1998) include five clinical criteria, of which the patient must fulfil at least three: pruritus reacting to application of glucocorticoids, erythema of the pinnae, bilateral erythematous pododermatitis of the forelimbs, cheilitis, first signs of disease at the age between six months and three years.

Skin allergy test (ARTU Biologicals, the Netherlands) was performed in all 69/94 dogs for diagnosis specification. In some patients (25/94) the skin allergy test was not carried out due to financial reasons or lacking interest of the owner for further treatment of the skin affection. In patients with positive flea findings, or positive flea allergen test (22/94) a long-term antiparasitic programme was also recommended.

The results of breed predilection were evaluated using the Chi-squared test.

## Results

Atopic dermatitis was diagnosed in patients aged six months to 17 years (median: three years), most frequently in the age group from six months to three years in 48.9% cases (46 patients) and in the age group between 3.1 and 6 years in 39.3% cases (37 patients).

Although atopic dermatitis has commonly been diagnosed in the French Bulldog (12), German Shepherd (9) and Boxer (8) breeds, the highest frequency of atopic dermatitis was documented in Boxer (100%) and French Bulldog (84.6%). It was significantly more frequent ($p < 0.05$) than in Shar-pei (41.7%) and Dalmatian (41.7%), and highly significantly so ($p < 0.01$) than in Dachshund (2.7%), German Shepherd (6%), Cocker Spaniel (11.1%) and Poodle (3.3%). On the other hand, the lowest frequency of atopic patients was noted in Dachshund, Poodle and German Shepherd. It was in all cases highly less significant ($p < 0.01$) than in Dalmatian, Shar-pei, French Bulldog and Boxer.

No significant differences were found in the occurrence of atopic dermatitis between males (48) and females (46).

Atopic dermatitis was diagnosed in most cases as independent hypersensitivity in 52/94 patients (55.3% cases), in combination with flea allergy dermatitis in 26/94 patients (27.7% cases), in combination with hypersensitivity to food in 7/94 patients (7.5% cases), in combination with flea allergy dermatitis and hypersensitivity to food in 4/94 patients (4.2% cases), or in other combinations with other hypersensitivities in 5/94 patients (5.3% cases).

Clinical signs were very variable. Pruritus as the main sign of atopic dermatitis was diagnosed in all 94 patients (100%), from which in 55 patients (58.5% cases) as non-seasonal. In the patients with atopic dermatitis (52) the following clinical signs were found as the only nosological units: erythema, hyperpigmentation and lichenification of the ventral part of the neck, axillae and abdomen in 46.1% cases (24/52 patients), papulo-crustulous pyoderma of the dorsal part of the neck and back was diagnosed in 36.5% cases (19/52 patients), licking, biting and erythema in the interdigital space with appropriate interdigital papulaes or fistulous tracts was found in 88.4% cases (46/52 patients). Erythema on the medial part of the pinnae was diagnosed in 67.3% cases (35/52 patients), reccurence of bilateral otitis externa was diagnosed in 42.3% cases (22/52 patients). In patients with atopic dermatitis in conjunction with other hypersensitivities, erythema, hyperpigmentation and lichenification of the ventral part of the neck, axillae and abdomen were established in 45.7% cases (43/94 patients), papulo-crustulous pyoderma of the dorsal part of the neck and backbone was diagnosed in 46.8% cases (44/94 patients), licking and erythema in the interdigital space in 91.4% cases (86/94 patients), erythema of the pinnae in 70.2% cases (66/94 patients) and bilateral recurrence of otitis externa in 42.5% cases (40/94 patients). Lichenification of the joint surface of the extensor carp face and flexor tarsus face was diagnosed in 23% patients (12/52) and 35.1% patients of all (33/94). Lacrimation and bacterial conjuctivitis were diagnosed in 38.5% patients (20/52) and 46.8% patients of all (44/94). Presence of the secondary pyoderma was proved in 72.3% patients (68/94). Seborrhoea was observed in 21.3% cases (20/94 patients).

Diagnostic criteria by Willemse (1988) are shown in particular in Table 1.

Table 1.

| Number of the patients with atopic dermatitis | Pruritus | Facial and/or digital affection | Lichenification of flexor surface of the tarsus or extensor surface of the carpus | Chronic, or recurrent dermatitis | Individual or family history of AD | Breed predisposition | 1. Signs of AD disease before the third year of life | Facial erythema and cheyletiellosis | Bacterial conjunctivitis | Surface *Staphylococcus* pyodermia | Hyperhidrosis | Positive skin allergic test | Enhanced level of ser. allergen-specif. IgGd | Enhanced level of ser. alergenspecif. IgE | Patients with AD+/AD- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Whole | | | | | | | | | | | | | | | 68+ |
| 94 | 94 | 89 | 33 | 48 | 0 | 47 | 67 | 63 | 44 | 68 | 2 | 69 | 0 | 0 | 26- |
| Percen-tage | 100 | 94.7 | 35.1 | 51 | 0 | 50 | 71.2 | 67 | 46.8 | 72.3 | 2.1 | 73.4 | 0 | 0 | 72 |
| | | | | | | | | | | | | | | | 28 |

According to the above mentioned data, the required number of clinical criteria was met by 68 patients (72.3%) of the whole number of 94 atopic patients, and 26 patients (27.7%) did not meet these clinical criteria.

Diagnostic criteria for atopic dermatitis by Prélaund et al. (1998) are shown in Table 2.

Table 2.

| Number of patients with AD | Pruritus responding to korticosteroids application | Erythema of ears | Bilateral pododermatitis of forelimbs | Cheyletiellosis | The age of 6 months to 3 years | Patients with AD+/AD- |
|---|---|---|---|---|---|---|
| Whole | | | | | | |
| 94 | 61 | 63 | 84 | 9 | 67 | 64/30 |
| Percen-tage | 64.9 | 67 | 89.4 | 9.6 | 71.3 | 68+ 32- |

According to the criteria by Prélaund et al. (1998), there were 64 patients (68%) in the group with atopic dermatitis and 30 patients (32%) that did not meet the criteria for atopic dermatitis.

## Discussion

The age span of the patients with atopic dermatitis was in accordance with data in the literature (Nesbitt et al. 1984; Griffin 1993; Scott et al. 1995; Saridomichelakis et al. 1999), ranging between six months to 17 years (median: three years). The most numerous group was the age category from six months to three years with 48.9% cases (a total of 46 patients). Many dogs were between 3.1 and six years old (39.3%). However, patients of this group were often referred from other veterinary practices with history of a long-term persisting skin problems, so that the true onset of this

disease appeared at a younger age. At an assessment of the clinical criteria by Willemse and Prélaund the patients were ranged into the relevant age group according the history stated by some owners; that is why the number of the patients in the group from six months to three years of age increased to 73.4% cases (67 patients).

A higher incidence of atopic dermatitis has been observed in the following breeds: Boxer (100%) and French Bulldog (84.6%), which was more statistically significant ($p < 0.05$) than in Shar-pei and Dalmatian (41.7%). Breed predisposition is measurably influenced by presentation of dog population in the certain region and popularity of the individual breeds in the respective geographical region. Among predisposed breed frequently cited in the literature (Griffin 1993; Scott et all. 1995; Saridomichelakis et al. 1999; Masuda et al. 2000), belong also Labrador Retriever, Golden Retriever, German Shepherd, Yorkshire Terrier and Poodle. These breeds are also largely presented in our conditions although no higher incidence of atopic dermatitis has been found as yet.

In our conditions higher frequency of atopic patients in the breeds Boxer, French Bulldog, Shar-pei and Dalmatian, on the other hand the lower occurrence has been observed in the breeds such as Dachshund, Poodle and German Shepherd. It would be useful to employ numerous groups of animals to the most objective evaluation of breed predisposition. Similar results were also obtained by Hillier and Griffin (2001).

No sex predisposition in the occurrence of atopic dermatitis was found in our study, dogs of both sexes were nearly equal (48 males/46 females).

Clinical signs were very variable, and only pruritus was diagnosed in all patients (94). At the examination of the atopic patients according to the criteria by Willemse (1988), 72% cases were found as positive (68 patients) and 28% cases (26 patients) did not fulfil these criteria. Sensitivity of these clinical criteria was 72%, i.e. in 28% patients incorrect diagnoses could have been made. Although the clinical criteria are numerous in comparison with Prélaund, some criteria seem not to have sufficient evidence value. To the main criteria belong the individual or familial history. This indicator is difficult to find objectively, because it is often based on inaccurate information of the owners or cannot be obtained at all, and a number of the principal criteria thus decreases to five. Facial or digital involvement is on the contrary very broad and inexact really clinical sign that should be divided in two independent parts, with eventual closer clarification of the clinical changes. Chronic or relapsing pyoderma does not describe exactly cases that are characterized only by development of the atopic dermatitis, especially in young patients or in case of the primary eruption of atopic patient. This criterium is not possible to use in a case of incorrect anamnestic data. From the accessory clinical criteria the expression staphylococcal pyoderma is rather incorrect, because it is already partly included in the principal criteria, and a patient with pyoderma without exact history thus fulfills two criteria by one clinical sign.

Due to this duplicity, 46 patients of 68/94 with pyoderma were included in our group of patients.

Similar duplicity of clinical criteria pertains to the facial erythema and cheilitis that affected the same part of the body, but facial criterion is already included as the principal criterion and in conjunction with cheilitis as the accessory criterion. Cheilitis of the face with erythema also does not need to have the same causality. Finally, determination of the serum level allergen specific IgG is not possible to be considered as sufficiently conclusive indicator for many false positive reactions with IgE (Patel et al. 1995) and generally for diagnostics of atopic dermatitis it has not been employed any longer (Halliwell and DeBoer 2001). It should be more suitable to place in the clinical criteria, for example involvement of ventral part of the neck, axillae and abdomen, ear affection with closer specification of possible causal agents of relapsing otitis externa and also elaboration of current data on the clinical changes of the limbs or head. Clinical criteria by Willemse

do not consider cases with only local lesions, so that confined development of clinical signs can lead to incorrect diagnosis. In our study, false negative results were obtained in patients (9/94) with positive skin allergy test, in which atopic dermatitis proceeds in primary eruption, i. e. these patients showed only pruritus and had no secondary lesions with developed pyoderma yet. False negative results were also marked in patients (3/94) with positive skin allergy test that fulfilled minimally three criteria in the main or accessory group, but in the second group only two criteria.

According to the clinical criteria by Prélaund included in the group of patients with atopic dermatitis were 68% dogs (64/94), and 32% dogs (30/94) did not fulfill the criteria for inclusion. DeBoer and Hillier (2001) found the sensitivity and specifity of these criteria to be about 80%, however, in our study 32% patients were misdiagnosed. There are several causes for low sensitivity of the clinical criteria by Prélaund. Above all it is an insufficient number of criteria for the establishment of correct diagnosis. When a patient is presented at an older age and the history of onset of disorders reported by the owner is not exact, the choice for the four remaining criteria is lower. Administration of corticoids does not always result in control of pruritus; numerous patients suffer from other types of hypersensitivity (in our group 45% patients). In some patients, corticoid administration at the time of presentation in a veterinary practice may be contraindicated because atopic patients can suffer from deep pyoderma, *Malassezia* pyoderma currently with demodicosis or mange. Cheilitis was not observed in our group of the atopic patients as an exceedingly frequent clinical sign (9/94). Moreover, it may not be properly interpreted by examining veterinarian. In patients with local problems, such as on ears or footpads these criteria are not sufficient and patients with atopic dermatitis cannot be diagnosed at all. Thus both systems of criteria do not solve sufficiently disease of other origin with similar clinical picture, e.g. mange or flea allergy dermatitis. There is also a need to consider the subjective role of the clinician in the assessment of clinical signs as well. The schedule of clinical criteria by Willemse had higher sensitivity (72%) in comparison with the sensitivity criteria by Prélaund, where the sensitivity was 68%. However, the difference was not significant.

Despite the above-mentioned deficiencies, it is possible to use the clinical criteria by both authors as auxiliary means of the clinical picture of atopic dermatitis.

At present, the schedule of these clinical signs includes their onset at the age of six months to three years, breed predisposition, seasonal signs depending upon the allergens involved, anatomic localisation of pruritus in the region of face (muzzle, periocular skin), concave ears, footpads, dorsal and ventral aspect of the limbs, axillae and abdomen, groin, medial aspects of thighs. One or more regions or even all the above-mentioned regions can be affected simultaneously. Involvement of the dorsolumbar region cannot be employed to differentiate atopic dermatitis from flea allergy dermatitis (Griffin and DeBoer 2001); in our group of the patients it was diagnosed only rarely - in 3.9% cases (2/52). In atopic dermatitis, only erythema can be regarded as primary lesion (Griffin and DeBoer 2001). Secondary lesions stem from self-traumatisation and chronic skin inflammation (Scott et al. 1995). Ears are frequently affected, in our group of atopic patients reccurent bilateral otitis was found in 42.5% cases (40/94 patients), erythema on the medial site of pinnae was observed in 70.2% cases (66/94 patients). Conjunctivitis was reported in more than in 50% cases (Scott 1981), and in our group it was detected in 46.8% cases. Secondary pyoderma is present in excess of 68% cases (Griffin 1993), and in our work it was found in 72.3% of dogs. In some cases acute moist dermatitis may also appear, but also acral pruritic nodules and bacterial pododermatitis (Scott et al. 1995), paw inflictions are frequent, reportedly in 85% cases (Scott 1981) and in 100% cases (Willemse and van den Brom 1983), in our group of patients forelimbs were affected in 89.4% cases (84/94 patients). Hyperhidrosis diagnosed in 10 - 24% patients with atopic dermatitis by Scott (1981) and Willemse and van den Brom (1983), was in our group of patients diagnosed only sporadically - in 2.1%

cases (2/94 patients). To establish a correct diagnosis it is necessary to properly analyse the anamnestic data including the breed, and rearing of the dog, and to systematically rule out all possible ailments. Furthermore, the individual threshold of each patient plays and important role in clinical signs of disease (Marsella and Sousa 2001). Intradermal tests may be used for completion of diagnosis.

**Přístup k diagnostice atopické dermatitidy u psů v podmínkách klinické praxe**

Cílem práce bylo zjistit incidenci atopické dermatitidy u psů s ohledem na věk, pohlaví a jednotlivá plemena, ověřit diagnostické metody atopické dermatitidy u psů a zhodnotit jejich senzitivitu v našich podmínkách. V období 1994 - 2005 byla u skupiny 94 psů diagnostikována atopická dermatitida. Nejvyšší četnost byla zaznamenána u boxera (100 %) a francouzského buldočka (84,6 %), což bylo statisticky významně více ($p < 0,05$) než u šarpeje (41,7 %) a dalmatina (41,7 %) a statisticky vysoce významně více ($p < 0,01$) než u jezevčíka (2,7 %), německého ovčáka (6 %), kokršpaněla (11,1%) a pudla (3,3 %).

Statisticky významné rozdíly mezi pohlavím zjištěny nebyly. Nejčastěji postiženou věkovou skupinou bylo 67 pacientů (71,2 % případů) ve stáří 6 měsíců až 3 roky. K diagnostice bylo využito klinických kritérií stanovených Willemsem (1988) a Prélaundem (1998) k ověření jejich senzitivity. Senzitivita klinických kritérií podle Willemse byla 72 %, podle Prélaunda 68 %. U všech 94 pacientů byl pozorován různý stupeň pruritu. Nejčastěji zastoupeným klinickým příznakem bylo faciální nebo digitální postižení u 94,7% pacientů (89/91) a přítomnost sekundární pyodermii u 72,3 % pacientů (68/94). Kožní alergický test k upřesnění diagnózy byl proveden u 73,4 % případů (69/94).

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