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Intradermal Skin Test and Hyposensitization Therapy in Dogs with Allergic Dermatitis

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ABSTRACT. The intradermal skin test and hyposensitization therapy were carried out for diagnosis and treatment in dogs with allergic dermatitis. Eighty-one (75%) out of 108 dogs tested showed positive reactions against 19 different allergens, in which flea and house dust were major causative antigens. As high as 17 dogs (77%) in 22 cases treated with hyposensitization therapy showed complete or remarkable improvement of skin lesions evaluated by the Halliwell's grading method. It is suggested that hyposensitization therapy based on the results of intradermal skin test is a highly effective treatment for canine allergic dermatitis.
—KEY WORDS: allergic dermatitis, dog, hyposensitization therapy, intradermal skin test.
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和文要約

犬のアレルギー性皮膚炎における皮内反応試験と減感作療法

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アレルギー性皮膚炎を疑診した犬108例に22種類のアレルゲンを用いた皮内反応試験を実施したところ、81例（75%）が19種類のアレルゲンに対し陽性反応を示し、主たるアレルゲンはノミ、ハウスダスト、ブタ草であった。陽性例のうち22例に減感作療法を実施したところ、17例（77%）で著しい改善が認められ、皮内反応に基づく減感作療法の有用性が確認された。

The number of canine cases with allergic dermatitis has been increasing in Japan, however their diagnosis was usually based on the anamnesis and/or clinical signs of skin lesions. It has been widely accepted intradermal skin test is an available and useful method for diagnosis of canine allergic dermatitis. On the results of the test, 3 allergens, such as flea [7-9], house dust [2, 8, 11, 14] and ragweed pollen (Ambrosia, Compositae) [3, 8, 11, 12], are major causative allergens in canine allergic dermatitis in the United States. It is also reported that hyposensitization therapy was effective in appoximate 80% of the canine cases in the United States[1]. However, there are few reports on the findings of intradermal skin test and also on the hyposensitization therapy for canine allergic dermatitis in Japan.

This paper deals with major allergens related to canine allergic dermatitis in Tokyo area and with hyposensitization therapy for canine cases.

MATERIALS AND METHODS

Dogs : Total 108 Dogs admitted to the Tokyo University of Agriculture and Technology Veterinary Hospital with chief complaints of pruritus and/or dermatitis were examined. Their clinical signs were included pruritus, hair loss, local or generalized erythema, pyoderma, otitis externa, conjunctivitis and flea infection. From the findings of their skin inspection for fungi by Wood's lamp or cultivation, and for ectoparasites

by skin scraping, positive cases were out and negative cases suspected strongly as allergic dermatitis were used in this study only exception with flea infection.

Allergens : Twenty-two different kinds of allergens such as house dust, Japanese cedar, ragweed pollen, wheat flour, cow milk, whole egg, beef, pork, chicken, yeast for bakery, dog hair, cat hair, feather, wool, tobacco smoke, kapok, Alternaria, Aspergillus, Candida, Cladosporium, Penicillium and flea were used for intradermal skin test. All allergens except flea used in this study were supplied by Torii Pharm. Co. Ltd., Tokyo. According to the industrial informations, almost these allergens were raw material extracts in physiological saline with 0.5% phenol at a ratio of 1:1,000 (weight/volume). Cow milk and tobacco smoke extracts were contained 1 μg of protein nitrogen / ml, fungal allergens in physiological saline with 0.5% phenol at a ratio of 1:10,000 was prepared from freeze-dried culture mediums. The flea allergen solution was made in our laboratory. Briefly, fleas collected from cats and dogs were emulsified by tissue grinder and ultrasonic cell crusher after adding a small quantity of physiological saline with 0.5% phenol. Then, the solution was centrifuged at a high speed to obtain a supernatant, which was finally diluted at a ratio of 1,000 (weight / volume) with physiological saline containing 0.5% phenol.

Intradermal skin reactions: The 0.05 ml each of the 22 different allergens was injected intradermally using 1 ml tuberculin syringes and needles designed for intradermal injection. Physiological saline with 0.5% phenol and histamine phosphate (1:10,000) in physiological saline with 0.5 % phenol were used as a negative and positive control, respectively. The diameter of wheals which appeared on the skin was measured at 15 min after the injection. Any wheal with a diameter equal to or greater than that of the positive control was regarded as a positive allergic reaction.

Hyposensitization therapy : Upon the agreement with owners, hyposensitization therapy was given to 22 dogs showing positive reactions in intradermal skin test. The certain allergen solution diluted at 1: 1,000 was selected by the results of the test and used for hyposensitization therapy. After diluting the antigen at a rate of 1:5,000, 1 : 2,500, and 1 : 1,616 in physiological saline was injected in a step wise manner. Total of 12 times subcutaneously injection on the right and left sides of the back of the dog were carried out with 1 ml allergen solution (1: 5,000 solution for 1st to 4th, 1: 2,500 solution for 5th to 8th, and 1: 1,616 solution for 9th to 12th) at one-week intervals. Eleven dogs with a positive reaction against flea antigen were injected only flea antigen, and one dogs (No.12) showed positive reaction against housedust alone was injected only housedust antigen. Among 4 dogs which had positive reactions against both flea and house dust (No. 13-16), one (No. 15) was injected flea only, and remaining 3 was injected both antigens. The other 7 dogs showed positive reactions against three or more antigens were injected selective antigens according to the results of skin test (Table 3). In any dogs treated, no side effects was observed during hyposensitization therapy. During the therapy, all dogs were put a collar around their neck to prevent licking and washed every other day with a medical shampoo containing sulfur to keep their skin clean.

Evaluation of the hyposensitization therapy was depended on the grading of the severity in skin lesions by the Halliwell's method [4] with a slightly modification. Briefly, the clinical severity of skin lesions devided into 9 grades (Table 1). The improvement ratio was caluculated by the following formula : Improvement Rate (%) = (1 - grade of severity of skin lesions after treatment / grade of severity of skin lesions before treatment) x 100.

RESULTS

Intradermal skin test : Eighty-one (75%) out of 108 dogs tested showed positive reactions against one or more of a total of 19 different allergens. The major allergens showed positive reactions were flea (53 out of 81; 65.4%), house dust (26 out of 81; 32.1%), and ragweed pollen (17 out of 81; 21.0%). A variety of food allergens as well as several species of molds also showed positive reactions. As a rare case, tobacco smoke was positive in one dog (Table 2).

Hyposensitization therapy : The improvement of dermatitis, which were defined as a improvement ratios of the severity of skin lesions, were ranged from 0 to 100%.Thirteen (59%) out of 22 dogs treated with hyposensitization therapy showed completely recover of their skin lesions. The skin conditions were also improved in four cases (improvement rations : 67-80%). No improvement on the skin lesion was observed in only 2 cases (No. 1 and 10) (Table 3).

DISCUSSION

In this study, dogs suspected allergic dermatitis were selected by the negative results on routine methods for detection of fungi and ectoparasites excepting flea infection. It is widely accepted that the immunoresponse was remarkably varied in individuals. Since the histamine phosphate diluted with physiological saline at a 1: 10,000 or 1: 100,000 solution was used as a positive control in some reports[12, 13], the 1: 10,000 solution (lower one) of histamine phosphate and physiological saline were used in this study as a positive and negative control, respectively, due to the elimination of false-Positive reaction. Approximate 75% of the dogs suspected allergic dermatitis showed positive reactions in intradermal skin test. Therefore, it was considered that there were so many cases of allergic dermatitis in dogs with skin lesions in Tokyo area. Among allergens, flea and house dust were major causative alergens in dogs with allergic dermatitis, like as those in the United States. It was necessary to be checked in canine cases suspected allergic dermatitis.

Hyposensitization therapy induced completely or significantly improvement of skin lesions in dogs with allergic dermatitis, since 17 (77%) out of the 22 dogs treated responded to the therapy with a full or good recovery. The two cases in which hyposensitization therapy showed no effect on skin lesions, suggesting that the allergen used for the treatment was not the real cause of the illness or some allergy other than an immediate allergy was involved. A relative low concentration of flea allergen at a dilution of 1: 5,000 (weight / volume) was used for hyposensitization therapy in this study. This concentration was usually used by many researchers[4, 6, 7, 9, 10], however 2 different protocols on the allergen injection were caried out in order to avoid harmful side effects. One is to keep injection a fixed concentration of allergen solution, while the other is to start with a low concentration of allergen followed by gradually increase the concentration. The latter was adopted in this study and almost treated dogs showed remarkable improvement of skin lesions without any side effects. Therefore, it was suggested that the latter one was easier protocol for starting hyposensitization therapy.

On the other hand, effects of 2 different antiallergics on skin lesions were also reported in dogs with allergic dermatitis [5]. Orally administration with 10 mg/kg of tranilast or with 1 mg/kg of oxatomide to dogs with allergic dermatitis induced improvement of their skin lesions at a rate of 47.8 and 46.4 %, respectively, by the evaluation of Halliwell's grading system[4]. Hyposensitization therapy is more effective therapy than antiallergics treatment for dogs with allergic dermatitis, because of the remarkably higher improvement ratio was obtained in hyposensitization therapy, compared with that in antiallergics treatment.

From these results, it is suggested that hyposensitization therapy is strongly recomemnded for canine allergic dermatitis based on the results of intradermal skin test.

Table 1 Grading of the Severity in dermatitis by Halliwell's method

0 : No abnormalities.
1 : Intermittance of 0 and 2.
2 : Some evidence of mild pruritus with papular eruptions.
3 : Intermittance of 2 and 4.
4 : Extensive papular eruption with some crusting. Generalized erythema with evidence of self-trauma.
5 : Intermittance of 4 and 6.
6 : Extensive hair loss with secondary lichenification and generalized erythema. Marked evidence of self-trauma.
7 : Intermittance of 6 and 8.
8 : Lesions spreading over most of the body surface. Extreme pruritus with widespread macular/papular eruptions. Obvious evidence of continued self-mutilation.

Table 2 Intradermal skin test in dogs with allergic dermatitis

Positive cases	81	
Allergen		
Flea	53	(65.4%)
Housedust	26	(32.1%)
Ragweed pollen	17	(21.0%)
Cow milk	7	(8.6%)
Whole egg	6	(7.4%)
Japanese cedar	4	(4.9%)
Wheat flour	3	(3.7%)
Yeast	3	(3.7%)
Pork	3	(3.7%)
Feather	3	(3.7%)
Beef	2	(2.5%)
Alternaria	2	(2.5%)
Aspergillus	2	(2.5%)
Chicken	1	(1.2%)
Cladosporium	1	(1.2%)
Penicillium	1	(1.2%)
Candida	1	(1.2%)
Kapok	1	(1.2%)
Tobacco	1	(1.2%)
Negative cases	27	
Total	108	

Table 3 Hyposensitization therapy for dogs with allergic dermatitis

Dog No.	Breed	Sex	Age (years)	Positive allergen(s)	Allergen(s) used for treatment	Number of injection	Severity of skin lesions* Treatment before	Severity of skin lesions* Treatment after	Improvement ratio (%)
1	Shiba dog	male	2	flea	flea	12	3	3	0
2	Schnauzer	female	2	flea	flea	12	3	0	100
3	Mongrel	female	3	flea	flea	12	4	0	100
4	Mongrel	female	5	flea	flea	8	6	0	100
5	Mongrel	female	5	flea	flea	5	4	0	100
6	Shiba dog	male	7	flea	flea	12	4	1	75
7	Retriever	female	7	flea	flea	12	8	4	50
8	Beagle	female	8	flea	flea	12	6	2	67
9	Mongrel	male	8	flea	flea	12	2	1	50
10	Japanese dog	male	11	flea	flea	12	4	4	0
11	Mongrel	female	11	flea	flea	12	5	1	80
12	Beagle	female	8	housedust	housedust	12	7	0	100
13	Irish setter	male	1	flea housedust	flea housedust	12	5	0	100
14	Schnauzer	female	5	flea housedust	flea housedust	12	4	0	100
15	Shiba dog	female	12	flea housedust	flea	12	5	1	80
16	Japanese dog	female	13	flea housedust	flea housedust	12	4	2	50
17	West highland white terrier	male	2	flea candida	flea candida	12	8	0	100
18	Shiba dog	male	3	flea cow milk	flea	12	5	0	100
19	Mongrel	female	11	flea ragweed	flea	10	4	0	100
20	Shiba dog	female	10	flea housedust ragweed	flea housedust ragweed	12	8	0	100
21	Shiba dog	female	6	flea housedust pork	flea housedust pork	12	5	0	100
22	Pug	female	4	flea housedust cow milk whole egg yeast	flea housedust	6	3	0	100

*: A Halliwell's grading method

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