

Seasonal Rhinitis in a Cat Sensitized to Japanese Cedar (*Cryptomeria japonica*) Pollen

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ABSTRACT. A cat showing seasonal allergic symptoms of rhinitis was examined for reactivities to Japanese cedar (*Cryptomeria japonica*, CJ) pollen allergen by intradermal skin test (IDST), Prausnitz-Küstner (P-K) test, and lymphocyte blastogenic response. In IDST for 26 common allergens, the cat showed a positive reaction to CJ pollen allergen. P-K test using CJ pollen allergen also showed a positive reaction, indicating the presence of serum IgE specific to CJ pollen. In the lymphocyte blastogenic response, the stimulation index in the presence of CJ pollen allergen was 2.4. These data suggested that the seasonal rhinitis observed in the cat was caused by the sensitization to CJ pollen allergen.

KEY WORDS: feline, Japanese cedar pollen, rhinitis.

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Japanese cedar (*Cryptomeria japonica*, CJ) pollen is one of clinically important inhalant allergens in Japan, causing Japanese cedar pollinosis which is a very common type I allergic disease in Japanese people. The reactivities to CJ pollen allergen has been demonstrated in humans [5] and monkeys [2] with seasonal clinical signs of rhinitis and conjunctivitis. Recently, approximately 10 % of the dogs with atopic dermatitis were found to be sensitized to CJ pollen allergen [4]. But, it has not been reported whether cats with allergic diseases in Japan are sensitized to CJ pollen allergen. In the present study, a cat case with seasonal rhinitis was shown to be sensitized to CJ pollen allergen by intradermal skin test (IDST), Prausnitz-Küstner (P-K) test, and lymphocyte blastogenic response.

A 4-year-old neutered female Japanese domestic cat was referred to the Veterinary Medical Center, the University of Tokyo because of serous nasal discharge and sneezing in spring. The seasonal rhinitis has been observed since the cat was 1 year of age. Physical examinations and complete blood cell counts revealed no other abnormalities in this case.

IDST was carried out for 26 common allergens including CJ pollen allergen by a method which we previously employed for atopic dogs [4]. Twenty-five allergen extracts for IDST were purchased from a commercial company (Greer Laboratories, Lenoir, NC) except for an extract of CJ pollen which was prepared as reported by Yasueda *et al.* [9]. These allergens were classified into 8 groups: house dust mites (*Dermatophagoides farinae* and *D. pteronyssinus*), arthropods, cat epithelia, grasses (Kentucky blue, orchard, redtop, etc), weeds (cocklebur, lambs quarter, rough pigweed, etc), trees (Japanese cedar, white ash, red birch, etc.), foods (wheat, rice, beef, etc.), and molds (*Curvularia spicifera*, *Penicillium camemberti*, etc.). The allergen extracts were diluted with a sterile diluent containing 0.9% sodium

chloride and 0.4% phenol at concentrations of 1/5000 w/v for house dust mite allergens, 200 ng/ml for CJ pollen allergen, and 1000 PNU/ml for the other allergens, and used for intradermal injection. The diluent itself and histamine phosphate solution (0.0275 mg/ml) were used as negative and positive controls, respectively. All medications were discontinued 7 days before IDST. The hair coat on the lateral thorax was clipped under the sedation with intramuscular injection of medetomidine (0.04 mg/kg) and midazolam (0.3 mg/kg). Each allergen solution (0.05 ml) was injected intradermally by a skin test syringe with a 26-gauge needle. The diameters of wheals were measured 10 min post injection. When the size of reactive wheal was equal to or greater than that of the positive control, it was judged to be a positive reaction to the injected allergen. The cat showed a reactive wheal only for the crude extract of CJ pollen among the 26 allergens tested, indicating that an immediate phase reaction of type I hypersensitivity could be induced by injection with CJ pollen allergen.

P-K test was performed for a qualitative measurement of IgE specific to CJ pollen allergen by using a healthy cat kept for experimental purposes and found not to be sensitized to CJ pollen allergen by IDST before the P-K test. A serum sample (0.05 ml each) from the cat case was intradermally injected into the clipped skin on the ventro-lateral thorax of the normal cat for P-K test. CJ pollen extract was intradermally injected into the same site 48 hr after the injection of the serum sample. The histamine phosphate solution and physiological saline were used as positive and negative controls, respectively. After 10 min, sizes of wheals were measured and judged by the same criteria as used in IDST. In this P-K test, a distinct reactive wheal to CJ pollen allergen was induced by the serum sample and crude CJ pollen extract, indicating the presence of IgE specific to CJ pollen allergen

in the serum from the cat. Instead of the serum sample from the cat case, sera from 3 normal cats were examined by using the same procedures in the P-K test. When we used these normal cat serum samples, there was no detectable reactive wheal after injection with CJ pollen extract.

Lymphocyte blastogenic response to CJ pollen allergen was measured, using peripheral blood mononuclear cells (PBMCs) prepared by density gradient centrifugation with Ficoll-Hypaque (NYCOMED PHARMA AS, Oslo, Norway). PBMCs were suspended in RPMI-1640 containing 10% heat-inactivated fetal bovine serum and antibiotics (100 U of penicillin per ml and 100 μ g of streptomycin per ml) at a cell count of 1.25×10^6 per ml. Two hundred μ l of the cell suspension was allocated into each well of a 96-well round-bottomed plate and incubated at 37°C for 72 hr with or without CJ pollen extract at a final concentration of 3 μ g/ml. Cell proliferative responses were measured in triplicate cultures by incorporation of ^{3} H-thymidine (37 kBq/ml) for 18 hr and the stimulation index (mean cpm in the antigen-stimulated samples/mean cpm in samples without stimulation) was calculated. In our routine tests for antigen-specific lymphocyte blastogenic responses, stimulation indexes more than 2.0 were judged to be positive. In the present cat case, distinct lymphocyte blastogenic response was shown by the stimulation with CJ pollen extract, showing the stimulation index of 2.4 (Fig. 1). The result indicates the presence of T lymphocytes reactive to the CJ pollen allergen in the peripheral blood from this cat case.

From these *in vivo* and *in vitro* allergy tests, it was found that the cat with seasonal rhinitis was sensitized to CJ pollen allergen. The positive reactions to CJ pollen allergen in IDST and P-K test indicated that the sensitization to CJ pollen allergen in the cat was mediated by type I hypersensitivity to CJ pollen allergen. Blastogenic responses of PBMCs to crude CJ pollen allergen were detected in the cat case, suggesting that the antigen recognition by T lymphocytes could take place as an initiation of type I hypersensitivity against CJ pollen allergen. The seasonal manifestation of clinical signs in the cat during CJ pollination could support the fact that the cat was sensitized to CJ pollen allergen. These evidences showing the sensitization to CJ pollen allergen in the cat were similar to those reported in humans [3, 5, 8], monkeys [2, 6], and dogs [4, 7] which showed type I hypersensitivity to CJ pollen allergen. Thus, it is suspected that allergic rhinitis can be induced by type I hypersensitivity to CJ pollen allergen in cats as well as in other species.

There still remains an argument on major clinical signs of CJ pollinosis. In this study, the cat showed seasonal rhinitis, similar to that in humans [5] and monkeys [2]. Rhinitis and conjunctivitis are well known as major clinical signs of CJ pollinosis in humans [3, 5] and monkeys [2], however, it has been only reported that dogs sensitized to CJ pollen presents atopic dermatitis as clinical signs [4, 7]. A study of CJ pollinosis in atopic dogs showed that a provocation test using CJ pollen allergen induced a nasal discharge [7], suggesting that reactions to CJ pollen allergen might also occur in the nasal cavity in the atopic dogs. It is still unknown what sort of fac-

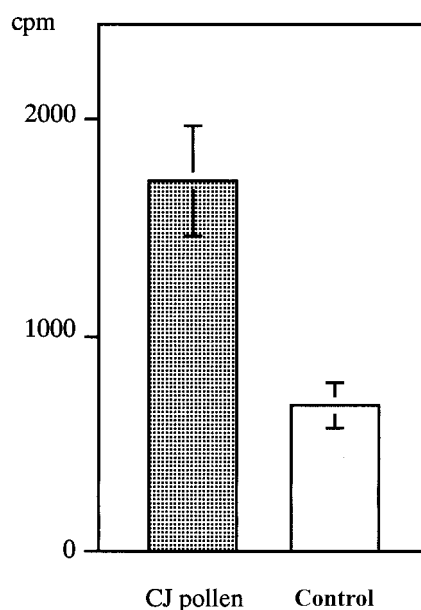


Fig. 1. Lymphocyte blastogenic response to CJ pollen allergen. Columns indicate mean cpm of ^{3} H-thymidine incorporated into the PBMCs with vertical bars showing the standard errors in triplicate cultures.

tor can cause the difference of major clinical signs in animals sensitized to CJ pollen allergen. Although clinical signs of rhinitis were found in the cat naturally sensitized to CJ pollen in this study, more cat cases sensitized to CJ pollen allergen should be examined to characterize the clinical manifestation of CJ pollinosis in cats.

It was reported that cats could be sensitized to allergens, resulting in atopic dermatitis such as miliary dermatitis [1], however, there has been no report indicating a specific allergen inducing rhinitis in cats. In this study, the present case was considered to be affected with allergic rhinitis to CJ pollen allergen because of the seasonality of clinical signs and positive results in *in vivo* and *in vitro* allergy tests for CJ pollen allergen. A provocation test using CJ pollen allergen would be necessary to confirm the direct association between sensitization to CJ pollen allergen and allergic rhinitis as a clinical sign of CJ pollinosis in cats, however, an appropriate protocol of the provocation test has not been established in small animals. This report can provide a consideration that cats sensitized to an inhalant allergen may be affected with allergic rhinitis.

In the present study, we demonstrated that a cat case with seasonal rhinitis was sensitized to CJ pollen allergen. The data will add a novel information in the research field on feline allergic diseases with an increasing importance in small animal practice.

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REFERENCES

1. Halliwell, R. E. W. 1997. *J. Am. Anim. Hosp. Assoc.* 33: 282–288.
2. Hashimoto, M., Kobayashi, T., Nigi, H., Saito, S., Nakayama, I., Narita, T., Iwata, M., Yasueda, H., Taniguchi, Y. and Inouye, S. 1997. *Int. Arch. Allergy Immunol.* 112: 88–92.
3. Inouye, S., Sakaguchi, M., Hori, T. and Watanabe, T. 1986. *Igaku no Ayumi* 136: 959–960 (in Japanese).
4. Masuda, K., Sakaguchi, M., Fujiwara, S., Kurata, K., Yamashita, K., Odagiri, T., Nakao, Y., Matsuki, N., Ono, K., Watari, T., Hasegawa, A. and Tsujimoto, H. 2000. *Vet. Immunol. Immunopathol.* 73: 193–204.
5. Ogino, S., Irifune, M., Harada, T., Matsunaga, T. and Ishida, M. 1990. *Rhinology* 28: 163–168.
6. Sakaguchi, M., Inouye, S., Imaoka, K., Hashimoto, M., Nigi, H., Nakamura, S., Gotoh, S., Minezawa, M., Fujimoto, K., Honjo, S., Taniguchi, Y. and Ando, S. 1992. *J. Med. Primatol.* 21: 323–327.
7. Sasaki, Y., Kitagawa, H., Fujioka, T., Kitoh, K., Iwasaki, T., Sakaguchi, M. and Inoue, S. 1995. *J. Vet. Med. Sci.* 57: 683–685.
8. Sone, T., Morikubo, K., Miyahara, M., Komiyama, N., Shimizu, K., Tsunoo, H. and Kino, K. 1998. *J. Immunol.* 161: 448–457.
9. Yasueda, H., Okuda, M., Yoshida, H., Ito, K., Baba, M., Iikura, Y., Okudaira, H., Inoue, S., Sakaguchi, M. and Miyamoto, T. 1997. *Allergol. Int.* 46: 135–140.