

## Letter to the Editor



# No Difference in Allergenicity Among Small-Sized Dog Breeds Popular in Korea

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To the Editor,

Pet ownership is increasing worldwide, including in Korea, with dogs being the most common household pets. This rise in pet ownership has increased the dog allergen sensitization rate and the incidence of allergic diseases in Korea over the past decade.<sup>1</sup> Hypoallergenic pets are a lucrative business, but the real existence of hypoallergenic dog breeds remains controversial.<sup>2</sup> In Korea, most pets are kept indoors; therefore, small-sized breeds are more popular.<sup>3</sup> Here, we evaluated the popularity of different dog breeds in Korea and investigated the allergenic differences in the hair extracts of popular small-sized dog breeds in the country.

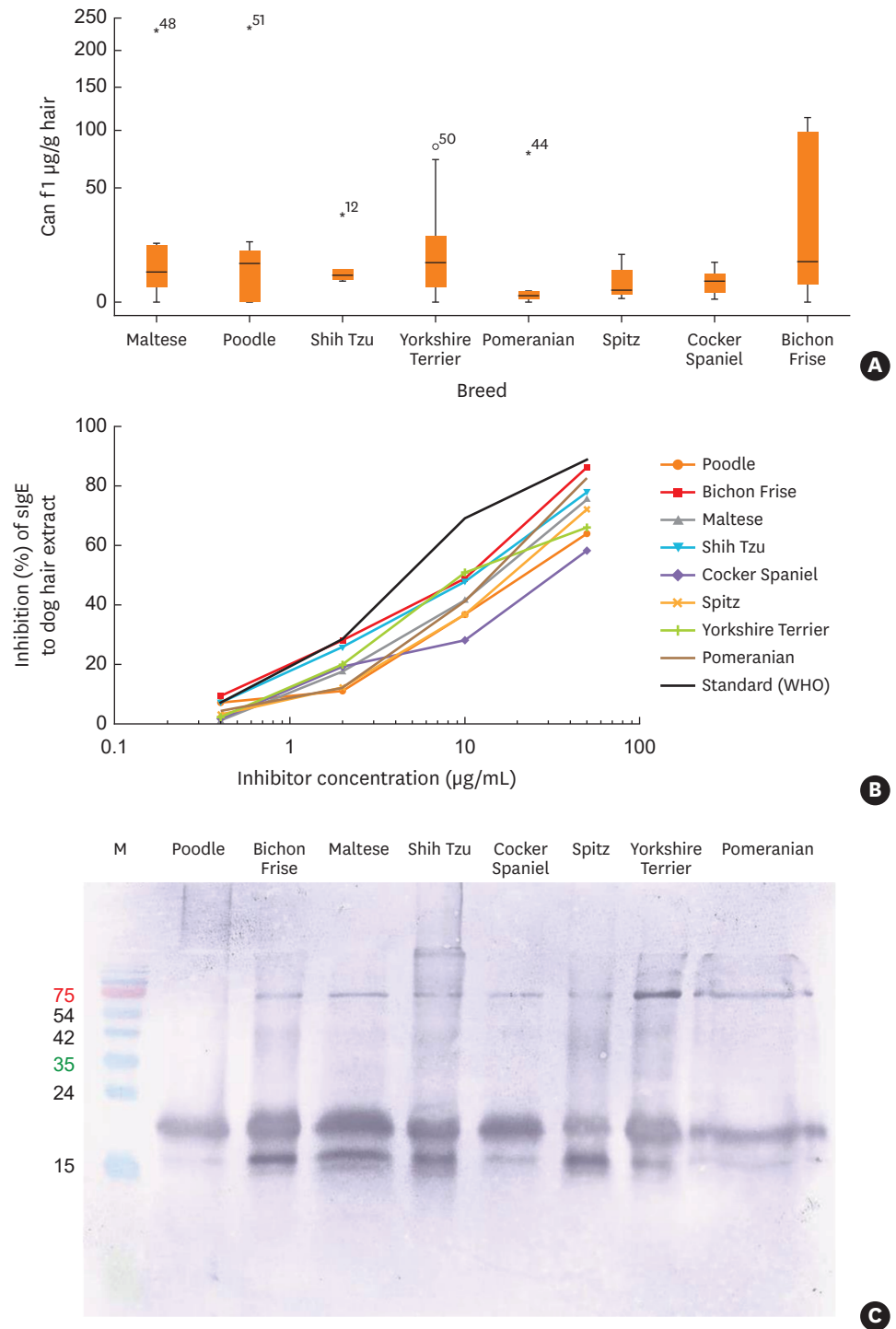
We assessed the records of the Animal and Plant Quarantine Agency database to determine the ownership status of dog breeds in Korea. Allergen extracts were prepared from the hair of 52 healthy purebred dogs (Maltese [n = 8], Poodle [n = 7], Shih Tzu [n = 5], Yorkshire Terrier [n = 9], Pomeranian [n = 5], Spitz [n = 7], Cocker Spaniel [n = 5], and Bichon Frisé [n = 6]) representing 8 popular breeds in Korea. Hair samples were collected from the dorsum or flanks of the animal at a pet hospital by a single veterinarian. To extract allergens, samples were defatted in ethyl ether, extracted using sonication, dialyzed using a membrane with a 3.5-kDa molecular weight cut-off, filtered, and freeze-dried. We measured the concentration of the most potent dog allergen, Can f1, a salivary lipocalin, also found in dog hair.<sup>4,5</sup> Immunoglobulin E (IgE) immunoblotting was used to determine the components in the allergen extracts that reacted to IgE in pooled sera from dog allergen-sensitized patients. Differences among dog breeds and various factors were analyzed using the Kruskal-Wallis and Mann-Whitney tests, respectively.  $P < 0.05$  was considered statistically significant.

Dog ownership in Korea increased 218-fold from 2008 to 2014. Maltese (24.5%) was the most popular breed, followed by Poodle (12.5%), Shih Tzu (8.3%), Yorkshire Terrier (6.8%), Pomeranian (6.0%), Spitz (2.3%), Cocker Spaniel (1.7%), and Bichon Frisé (1.0%). There were inter-individual variabilities in Can f1 levels within each breed; however, the differences between breeds were not significant ( $P = 0.827$ ) (**Figure A**). Can f1 levels did not differ according to sex, age, or hormonal status (**Table**). Specific IgE ImmunoCAP inhibition revealed that immunoreactivity was preserved (59%–89%) among the breeds (**Figure B**). In patients' sera, IgE immunoreactivity was exhibited by a 23 kDa (a putative Can f1) and a 69 kDa (a putative Can f3) protein in the allergen extracts (**Figure C**). The 23 kDa band was present in the extracts of all of the 8 breeds, but the 69 kDa band was not observed in the Poodle hair extract (**Figure C**).

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**Disclosure**

There are no financial or other issues that might lead to conflict of interest.



**Figure.** (A) Can f1 concentrations in hair extracts from the different dog breeds. (B) Dog allergen potency determined through competitive inhibition (ImmunoCAP) assay, using pooled sera from the patients with dog allergy. (C) IgE immunoblot analysis of hair extracts from the different dog breeds. IgE, immunoglobulin E.

The allergenic potency variation in the small-sized dog breeds evaluated in this study is comparable to that reported for various bigger-sized breeds popular in Western countries.<sup>4,5</sup> We observed differences in the IgE reactivities between Poodle and other breeds. Sex,

**Table.** Factors associated with Can f1 production

Variables	Median (Q1, Q3)	P value
Age		0.606
Young (< 1 yr)	6.66 (1.62, 16.64)	
Adult (1–9 yr)	4.36 (0.50, 11.28)	
Elderly (≥ 9 yr)	3.65 (1.16, 16.39)	
Sterilization status		0.955
Intact	5.46 (0.70, 12.55)	
Neutered	3.65 (0.93, 16.64)	
Sex		0.723
Male	5.02 (1.02, 11.28)	
Female	5.08 (0.62, 17.09)	

age, or sterilization status did not affect allergen production. However, this study had some limitations. Only the concentration of Can f1, which elicits a response in ~64% of dog-allergic patients,<sup>6</sup> was measured and evaluated. Furthermore, we cannot explain the differences in immunoblotting results between poodles and other species. This study was not a comprehensive assessment of dog allergens, and further research is needed in the future.

There has been no evidence of low allergenicity in so-called hypoallergenic breeds. Additionally, we found that the allergenicity of dog hair varies among individuals of the same breed, as reported previously,<sup>4,5</sup> and that the concept of a “hypoallergenic” animal is currently not supported by scientific evidence.

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## REFERENCES

1. Park YB, Mo EK, Lee JY, Kim JH, Kim CH, Hyun IG, et al. Association between pet ownership and the sensitization to pet allergens in adults with various allergic diseases. *Allergy Asthma Immunol Res* 2013;5:295-300.  
[PUBMED](#) | [CROSSREF](#)
2. Butt A, Rashid D, Lockey RF. Do hypoallergenic cats and dogs exist? *Ann Allergy Asthma Immunol* 2012;108:74-6.  
[PUBMED](#) | [CROSSREF](#)
3. Korea Pet Food Association. 2017 companion animal status and National Census Report. Hanam: Korea Pet Food Association; 2017.
4. Vredegoor DW, Willemse T, Chapman MD, Heederik DJ, Krop EJ. Can f1 levels in hair and homes of different dog breeds: lack of evidence to describe any dog breed as hypoallergenic. *J Allergy Clin Immunol* 2012;130:904-9.e7.  
[PUBMED](#) | [CROSSREF](#)
5. Käck U, Asaranoj A, Grönlund H, Borres MP, van Hage M, Lilja G, et al. Molecular allergy diagnostics refine characterization of children sensitized to dog dander. *J Allergy Clin Immunol* 2018;142:1113-1120.e9.  
[PUBMED](#) | [CROSSREF](#)
6. Chan SK, Leung DYM. Dog and cat allergies: current state of diagnostic approaches and challenges. *Allergy Asthma Immunol Res* 2018;10:97-105.  
[PUBMED](#) | [CROSSREF](#)