

Our current studies demonstrate that the introduction of the gene encoding the EPSPS protein to confer glyphosate tolerance caused no discernible changes, either qualitatively or quantitatively, in the composition of endogenous soybean allergenic proteins in either of the glyphosate-tolerant varieties analyzed.

We thank Cathie Connaughton for her excellent technical contributions and Stephen Padgett from Monsanto for providing the defatted soybean meal from the parental control and glyphosate-tolerant soybean varieties.

REFERENCES

1. Barry G, Kishore G, Padgett S, et al. Inhibitors of amino acid biosynthesis: strategies for imparting glyphosate tolerance to crop plants. In: Singh BK, Flores HE, Shannon JC, eds. Biosynthesis and molecular regulation of amino acids in plants. Rockville, Maryland: American Society of Plant Physiologists, 1992:139-45.
2. Padgett SR, Re DB, Barry GF, et al. New weed control opportunities: development of soybeans with a Roundup Ready™ gene. In: Duke SO, ed. Herbicide-resistant crops: agricultural economic, environmental, regulatory, and technological aspects. CRC Press, 1994 (in press).
3. Burks AW, Brooks JR, Sampson HA. Allergenicity of major component proteins of soybean determined by enzyme linked immunosorbent assay (ELISA) and immunoblotting in children with atopic dermatitis and positive soy challenges. J ALLERGY CLIN IMMUNOL 1988;81:1135-42.
4. Thanh VH, Shibasaki K. Major proteins of soybean seeds: a straight forward fractionation and their characterization. J Agri Food Chem 1976;24:1117-21.
5. Ogawa F, Tsuji H, Bando N, et al. Identification of the soybean allergenic protein, *Gly m* Bd 30K, with the soybean seed 34-kDa oil-body associated protein. Biosci Biotech Biochem 1993;57:1030-3.

Removal of mite allergens from blankets: Comparison of dry cleaning and hot water washing

Mika Watanabe, MS,^a Masahiro Sakaguchi, PhD,^b Sakae Inouye, MD,^b
Hiroshi Miyazawa, MT,^c Mino Mitsuseki, MS,^d Hiroshi Nitta, PhD,^e
Ryutaro Ohtsuka, PhD,^a and Hiroshi Yasueda, PhD^f Tokyo, Hachioji,
Tsukuba, and Sagami-hara, Japan

Allergy to house dust allergens is common among patients with bronchial asthma and allergic rhinitis. Two species of *Dermatophagoides* mite, *D. pteronyssinus* and *D. farinae*, are important sources of house dust allergens. Two groups of major allergens, Der 1 and Der 2, have been purified

from each *Dermatophagoides* species.¹ Immunoassays to measure the Der 1 and Der 2 levels have been used in studies of the level of mite allergens in indoor environments.¹

We previously reported that dust specimens obtained from bedding had more mite allergens per weight of dust than those from floors,² indicating that bedding may be a major reservoir of mite allergens. Because a great portion of our lifetime is spent in bed, it is important to reduce the allergen concentration in bedding.

Blankets are a part of bedding. McDonald and Tovey³ reported that dry cleaning of blankets did not reduce the allergen content in the dust, whereas Vandenhove et al.⁴ reported that dry cleaning reduced mite allergens and was an effective means for reducing the mite allergen level. In these studies the dust in blankets was collected with a vacuum cleaner before and after washing,

From ^aDepartment of Human Ecology, University of Tokyo;

^bDepartment of Epidemiology, National Institute of Health, Tokyo; ^cDepartment of Medical Technology, Kyorin University, Hachioji; ^dHitachi Lifestyle Research Center, Tokyo; ^eRegional Environment Division, National Institute for Environmental Studies, Tsukuba; and ^fClinical Research Center for Allergy and Rheumatology, National Sagami-hara Hospital, Sagami-hara.

Reprint requests: Masahiro Sakaguchi, PhD, National Institute of Health, Toyama 1-23-1, Shinjuku-ku, Tokyo 162, Japan.

J ALLERGY CLIN IMMUNOL 1995;96:1010-2.

Copyright © 1995 by Mosby-Year Book, Inc.

0091-6749/95 \$5.00 + 0 1/54/66380

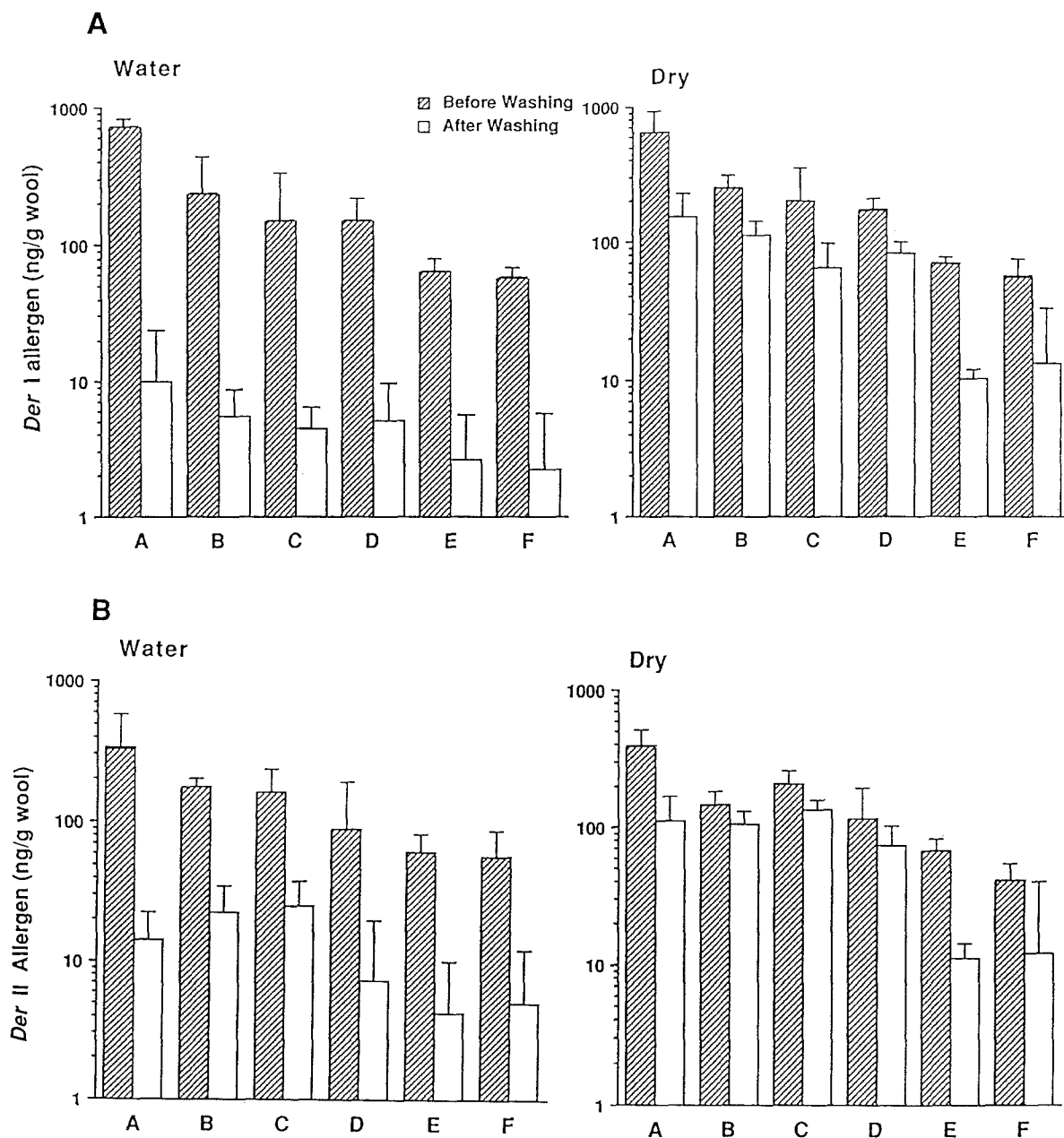


FIG. 1. Mite allergen levels in six blankets before and after washing. Allergen levels are expressed as nanograms per gram of material. The value is geometric mean of six spots in each half of a blanket. There was no difference in mean levels of allergens between the two halves of the same blanket before washing. **A**, Der 1, **B**, Der 2.

and mite allergen levels in the dust extract were measured.

In this study we compared the removal of mite allergens from blankets by dry cleaning with that by hot water washing. A blanket was cut into halves for dry cleaning and wet washing, respectively. Material from six spots on each half of the blanket were collected before and after washing, and mite allergen levels per gram of material were mea-

sured; we then compared the effects of dry cleaning and wet washing on allergen removal.

METHODS

Dry cleaning and washing procedures

Dry cleaning was conducted in a large laundry in Japan. Blanket material was steeped with perchloroethylene and detergent, spun, and dried. For wet washing, we used a home washing machine (KW-70R3; Hitachi

Ltd., Tokyo, Japan), which has a capacity of up to 7 kg and is equipped with a washing program for blankets: wash cycle (76 minutes) and two rinse cycles (5 minutes each). A soap solution (Akuron; Lion Co., Tokyo, Japan) was added to hot water (55° C) for washing.

Extraction of allergens from blankets

Six blankets, which had been used for more than 1 year, were selected for use in this study. The blankets were about the same size (about 140 × 200 cm) and thickness (about 10 mm). The weight of blankets ranged from 1179 to 1606 gm (mean ± SD, 1420 ± 153 gm). All the blankets were made of acrylic fiber. Each blanket was cut into halves. Before and after washing, pieces (20 mm diameter) of material from six spots were removed with a large puncher. Each piece of material was weighed and immersed overnight in 25 times its weight of phosphate-buffered saline solution containing 0.1% bovine serum albumin and 0.05% Tween-20. The extracts were centrifuged, and the supernatants were stored at -30° C.

Measurement of Der 1 and Der 2 levels

Der p 1, Der f 1, and Der 2 allergens were quantified by a fluorometric sandwich ELISA as previously described.⁵

RESULTS AND DISCUSSION

The levels of Der 1 in the six blankets (A to F) ranged from 57.2 to 681 ng/gm of material (geometric mean, 162 ng/gm of material) (data not shown). The levels of Der 2 in the blankets ranged from 48.3 to 359 ng/gm of material (geometric mean, 124 ng/gm of material) (data not shown). The ratio of Der 1 to Der 2 in blanket samples ranged from 2:1 to 1:2. This result demonstrated that Der 2 allergen in blankets was as abundant as Der 1 allergen.

Fig. 1, A, shows Der 1 allergen levels in 1 gm of material before and after washing. Washing in hot water reduced the levels of Der 1 in the blankets by more than 95% (mean ± SD, 97% ± 1.0%). However, dry cleaning reduced the levels of Der 1 by 52% to 86% (mean ± SD, 69% ± 13%). The reduction of the level of Der 1 by hot water washing was significantly greater than that by dry cleaning ($p < 0.05$, Wilcoxon signed-rank test).

Fig 1, B, shows Der 2 allergen in 1 gm of material before and after washing. The reduction of the level of Der 2 by hot water washing ranged from 85% to 96% (mean ± SD, 91% ± 4.1%). In contrast, the reduction of the allergen by dry cleaning varied from 29% to 84% (mean ± SD, 54% ± 24%). The reduction of Der 2 by hot water washing was again significantly greater than that by dry cleaning ($p < 0.05$). The reduction rate of Der 2 in blankets appeared lower than that of Der 1. Der 1 allergen is associated with mite feces, but Der 2 allergen is associated with mite bodies rather than feces.¹ Der 2 allergen might be less extractable from mite bodies than Der 1 allergen from feces.

In this study we found that dry cleaning reduced Der 1 by about 70%, whereas washing in hot water reduced the allergen by more than 95%. Washing in water reduced the Der 2 by 91%. Water washing at 55° C is effective in killing mites and removing mite allergen.¹ Large-sized washing machines may facilitate regular washing of blankets at a low cost at home. Frequent washing of blankets in hot water may be beneficial for patients with mite allergy.

REFERENCES

1. Platts-Mills TAE, Thomas WR, Aalberse RC, Vervloet D, Chapman MD. Dust mite allergens and asthma: report of a second international workshop. *J ALLERGY CLIN IMMUNOL* 1992;89:1046-60.
2. Sakaguchi M, Inouye S, Yasueda H, Irie T, Yoshizawa S, Shida T. Measurement of allergens associated with dust mite allergy. II. Concentrations of airborne mite allergens (*Der I* and *Der II*) in the houses. *Int Arch Allergy Appl Immunol* 1989;90:190-3.
3. McDonald LG, Tovey E. The role of water temperature and laundry procedures in reducing house dust mite populations and allergen content of bedding. *J ALLERGY CLIN IMMUNOL* 1992;90:599-608.
4. Vandenhove T, Soler M, Brinbaum J, Charpin D, Vervloet D. Effect of dry cleaning on mite allergen levels in blankets. *Allergy* 1993;48:264-6.
5. Sakaguchi M, Inouye S, Irie T, et al. Airborne cat (*Fel d I*), dog (*Can f I*), and mite (*Der I* and *Der II*) allergen levels in the homes of Japan. *J ALLERGY CLIN IMMUNOL* 1993;92:797-802.