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Letter to the Editor

Pediatric case with rice bran allergy induced by epicutaneous sensitization in a family rice shop

Dear Editor,

Rice is consumed worldwide and is a common causative allergen source in food allergies; however, rice bran allergy is rare. We herein report the first pediatric case of rice bran allergy after ingestion of rice bran pickles.

A five-year-old Japanese boy was referred to our hospital owing to a history of oropharyngeal symptoms, such as itching and tingling, immediately after ingestion of rice bran pickles. From birth until one and a half years of age, he was raised in his grandparents' house, which also served as a family rice shop, and where rice was threshed and polished. Starting from the age of 2 months, he developed eczematous lesions, which gradually worsened. He was subsequently diagnosed with atopic dermatitis by a dermatologist at the age of 6 months. There was no family history of atopic dermatitis. Even though topical corticosteroids were applied to his eczematous lesions, the lesions exacerbated and spread across his whole body. At the same time, he developed itching on his skin and eyes, generalized urticaria, and cough. After he moved from his grandparents' house to an apartment with his parents at the age of one and a half years, his eczema dramatically improved. However, whenever he visited the rice shop or he got close to his grandfather, he developed itching on the skin and eyes as well as eczema. Thereafter, he felt itching in the oral cavity immediately after ingestion of rice bran pickles. He was able to eat cooked rice without any symptoms. His medical history also included pollinosis due to Japanese cedar and orchard grass pollen.

Specific IgE measurement using the ImmunoCAP® (Thermo Fisher Scientific, MA, USA) showed positivity to rice (1.53 UA/mL), wheat (<0.34 UA/mL), orchard grass pollen (0.86 UA/mL), and Japanese cedar pollen (19.5 UA/mL). The results of skin prick tests (SPTs) with rice bran (0.3 g/mL in saline) and unpolished raw rice (0.2 g/mL in saline) were positive. The average wheal diameter induced by rice bran (7.1 mm) was larger than that induced by unpolished raw rice (3.9 mm). The SPT result with cooked rice was negative. The SPT results with extracts of rice bran and polished rice were negative in five control subjects. Therefore, he was diagnosed with rice bran allergy, which was suspected to be induced by epicutaneous sensitization during his stay at his grandparents' rice shop.

In IgE immunoblotting using the rice bran extract, IgE-binding banding to proteins at molecular weights of approximately 50 kDa and 100 kDa were specifically found in the serum of the

present patient, but not in three controls without rice bran allergy (Fig. 1).

Based on the above findings, we hypothesize that the present patient developed eczematous symptoms followed by contact urticaria and respiratory symptoms due to rice bran after living his first year and a half in a house with a rice shop. Consequently, he developed allergic reactions after ingestion of rice bran pickles. His clinical history indicated that sensitization to rice bran via inflamed skin might induce subsequent IgE-mediated allergic reactions of multiple organs, including the skin, eye, and respiratory tract.

Recently, a new concept has been emerging that children, especially those with atopic dermatitis, can become sensitized to food allergens through an impaired skin barrier.¹ In 2003, Lack *et al.* reported that exposure to peanut oil in skincare products to inflamed skin was associated with an increased risk of peanut allergy.² In addition, the household presence of food allergen is a risk factor for development of food allergy. Brough *et al.* reported that household peanut consumption correlated strongly with peanut protein levels in household dust, resulting in a risk factor for peanut allergy.³ They also demonstrated that atopic dermatitis increases the effect of household exposure to peanut antigen in dust on peanut sensitization and likely peanut allergy. Furthermore, the effect of environmental peanut exposure on peanut SPT sensitization and peanut allergy was augmented in children with a history of atopic dermatitis.⁴ Lavigne *et al.* reported that a 3-year old boy developed oral symptoms after the first ingestion of sunflower seed butter.⁵ As his brother had peanut allergy, his parents ate sunflower seed oil and butter products as peanut alternatives, whereas the patient and his brother avoided both oils. The authors suspected that household exposure due to frequent parental consumption of sunflower seed might induce epicutaneous sensitization in patients with atopic dermatitis. However, household exposure to the causative allergen in the present case occurred in the family food shop, thus it represents a different context of exposure than that of family consumption of food products. Due to the high amount of household allergen exposure in his family rice shop, the patient might have become sensitized to rice bran, a rare source of food allergy, via inflamed skin.

To date, only one adult case with rice bran allergy has been reported. The case was a 50-year-old Japanese housewife, who developed oral itching, facial angioedema, and cough immediately after the ingestion of paella.⁶ The patient was suspected to have been sensitized through the skin because the allergic reactions after ingestion of rice bran followed contact urticaria while pickling

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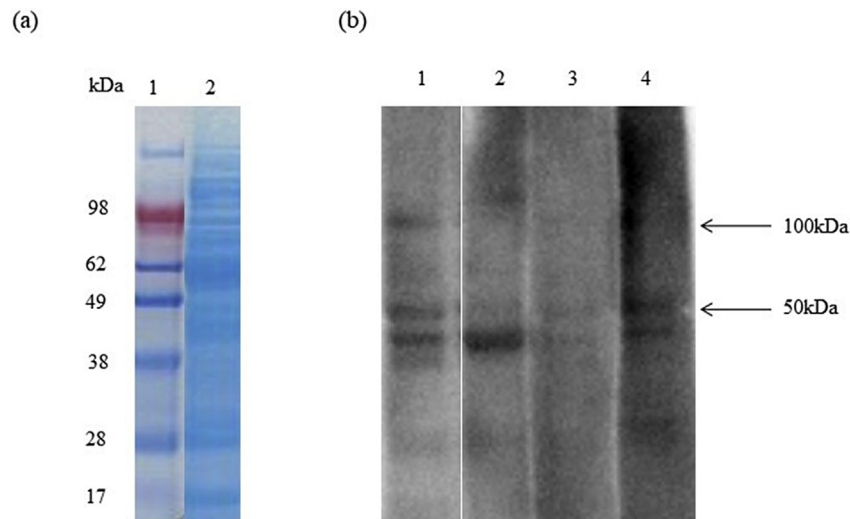


Fig. 1. Sodium dodecyl sulfate–polyacrylamide gel electrophoresis (12% gel) and immunoblotting analyses of rice bran. **(a)** Gel stained with Coomassie Blue. Lane 1, molecular weight marker and lane 2, the rice bran extract under the reducing conditions. **(b)** IgE immunoblotting using rice bran. Lane 1, patient's serum and lanes 2, 3 and 4, sera of patients non allergic to rice bran. kDa, kilodalton.

vegetables in rice bran paste. Although people with hand eczema have the opportunity to make pickles by touching rice bran, cases with bran allergy have been rarely reported. In addition, people who frequently polish rice, including farmers, who are likely at risk of being exposed to rice bran allergy, do not always develop allergic symptoms. This suggests that, in addition to environmental exposure to rice bran, a predisposing characteristic may be necessary for epicutaneous sensitization to rice bran. One example is a disrupted skin barrier, which is involved in atopic dermatitis. In addition, it is possible that there are patients who manifest rice bran allergy with symptoms that are diagnosed as chronic eczema, rather than an IgE-mediated allergy.

Several rice allergens have been reported: Ory s1 (beta-expansin, 35 kDa), Ory s12 (profilin, 14 kDa), glb33 (glyoxalase I, 33 kDa), and a 9 kDa-allergen (lipid transfer protein).^{7,8} This prior adult case as well as the present case of rice bran allergy could also have been induced by a 50 kDa-allergen.⁶ The similarity in the molecular weight of proteins bound by IgE from two patients' sera indicate that the 50 kDa protein might be a rice bran allergen related to epicutaneous sensitization and which is heat-unstable. The present case history suggests that being raised in a house with a food-associated shop might be a risk for epicutaneous sensitization in children with atopic dermatitis, because food shops provide repeated environmental exposure to food allergens. Atopic dermatitis in children should be carefully observed for potential development into a food allergy, especially when the patients live in a food-associated family shop.

Conflict of interest

The authors have no conflict of interest to declare.

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