

## CASE REPORT

# Buckwheat Anaphylaxis: An Unusual Allergen in Taiwan

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**SUMMARY** IgE-mediated hypersensitivity to buckwheat is common in Korea, Japan, and some other Asian countries. However, buckwheat is not a common allergen in Taiwan. We report a woman with asthma who had anaphylactic shock, generalized urticaria, and an acute exacerbation of asthma five minutes after ingesting buckwheat. The patient underwent skin prick and Pharmacia CAP testing (Uppsala, Sweden) for specific IgE to buckwheat, white sesame and soybean as well as other common allergens in Taiwan including *Dermatophagoides pteronyssinus* (*Dp*), *D. farinae* (*Df*), cat and dog dander, cockroach, egg white, cow milk and codfish. The patient had a strongly positive skin prick test response to buckwheat and positive reactions to *Dp* and latex. Specific IgE results were class 6 for buckwheat, class 4 for *Dp* and *Df*, and class 2 for dog dander, wheat, sesame and soybean. Results of an open food challenge with white sesame and soybean were negative. Although buckwheat is a rare allergen in Taiwan, it can cause extremely serious reactions and should be considered in patients presenting with anaphylaxis after exposure to buckwheat.

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Buckwheat (*Fagopyrum esculentum*), a member of the *Polygonaceae* family of weeds, is used as a wheat substitute in a variety of foods but is not taxonomically related to other cereal grains (including wheat).<sup>1</sup> Buckwheat flour and its seeds are commonly used as a food in Europe and some Asian countries. There is growing interest in buckwheat products as health foods and as a substitute for wheat flour in gluten-allergic persons. Sensitization to buckwheat usually occurs by ingestion, but it can also occur by inhalation in occupational or domestic exposure to flour.<sup>1,9,11,15-17</sup> It has been reported to cause occupational asthma in noodle makers,<sup>7</sup> bakers,<sup>8</sup> packing workers,<sup>9</sup> and workers in pancake restaurants.<sup>10</sup> Sensitization has also been reported in people sleeping on a pillow stuffed with buckwheat husk.<sup>17,20,21</sup> Buckwheat allergy is an IgE-mediated,

type I hypersensitivity reaction.<sup>3-13</sup> The first case was reported in 1909 in a man who developed repeated vomiting and angioedema caused by what was called "buckwheat poisoning".<sup>14</sup> Buckwheat has been reported as a food allergen in Korea, Japan, and other countries,<sup>2-6</sup> To our knowledge, however, this allergy has not been reported in Taiwan, where buckwheat is rarely consumed. We report such a case.

## CASE REPORT

### A 32-year-old woman developed dyspnea,

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generalized urticaria, and an acute exacerbation of asthma five minutes after ingesting porridge that contained buckwheat, white sesame seeds, and soybeans. The patient had a history of mild persistent asthma for which she intermittently used inhaled corticosteroids and fenoterol. She denied any previous ingestion of buckwheat or exposure to pillows stuffed with buckwheat chaff, and there was no family history of buckwheat hypersensitivity.

On arrival in the emergency department after she ate the porridge, she was in obvious respiratory distress, her systolic blood pressure was 84 mmHg, and she had diffuse wheezing bilaterally on chest exam. Her oxygen saturation by pulse oximeter was 88%. She was given intravenous saline and epinephrine, hydrocortisone, and chlorpheniramine, as well as oxygen by mask and inhaled ipratropium and albuterol. A chest x-ray revealed bilateral hyperinflation compatible with her asthma. Her hemoglobin was 13.2 gm/dl (normal value, 11.0 to 16.0 gm/dl), hematocrit 38.8% (normal value, 34.0 to 50.0%), white blood cell count 24,500/ $\mu$ l (normal value, 4,000 to 10,000/ $\mu$ l), and platelets count 332,000/ $\mu$ l (normal value, 140,000 to 450,000/ $\mu$ l). Five hours later, her white blood cell count was 8,500/ $\mu$ l with a left shift. She had hyperglycemia and hypokalemia, but these values returned to normal on repeat testing. She responded well to therapy and was referred to our outpatient department for further evaluation.

Skin prick tests were performed using solutions of isotonic sodium chloride containing buckwheat, white sesame, or soybean prepared at a concentration of 1 gm/ml. In addition, she was tested

using commercially available extracts of *Dp*, wheat, and latex (ALK-Abello Co, Hoersholm, Denmark), with histamine base, 1 mg/ml (ALK-Abello Co, Hoersholm, Denmark) as a positive control and isotonic saline as a negative control. The tests were read after 15 minutes, with a wheal greater by at least 3 mm in the longest diameter than that produced by the saline control considered as a positive response. The patient had positive reactions to *Dermatophagoides pteronyssinus* (*Dp*), buckwheat, and latex (Table 1). Using the Pharmacia CAP system (Uppsala, Sweden), we tested her serum for specific IgE to *Dp*, *D. farinae* (*Df*), cat and dog danders, cockroach and food allergens, including egg white, milk, fish, sesame, soybean, and buckwheat (Table 2). Her serum was positive (i.e. > class 2) for IgE *Dp* and *Df* and markedly positive for buckwheat-specific IgE (class 6).

The patient was instructed not to eat any more buckwheat. She was subsequently challenged orally with sesame and soybean after those two substances had been eliminated from her diet for 14 days. She discontinued antihistamines for 7 days and inhaled  $\beta$ -adrenergic agonists for 24 hours before the testing. The open food challenges were performed in the morning on an empty stomach. We administered sesame or soybean separately, beginning with 50 mg of each substance. The dose was doubled at 30-minute intervals to a total of 10 g and the patient monitored for urticaria, dyspnea, angioedema, vomiting, or abdominal pain. She had no symptoms with either sesame or soybean, indicating a negative challenge. The lack of response to these plus the positive skin prick test and very high spe-

**Table 1** Results of skin prick tests of the patient

	Erythema (mm)	Wheal (mm)
<b>Histamine hydrochloride (1g/ml)*</b>	18	11
<b>Isotonic sodium chloride solution#</b>	2	0
<b><i>D. pteronyssinus</i></b>	15	8
<b>White sesame (1 g/ml)</b>	4	2
<b>Soybean (1 g/ml)</b>	3	2
<b>Buckwheat (1 g/ml)</b>	21	14
<b>Latex</b>	6	4

\*Positive control; #Negative control

cific IgE to buckwheat were considered sufficient to confirm the diagnosis of buckwheat-induced anaphylaxis.

## DISCUSSION

In Taiwan, buckwheat is not a major crop, although it is commonly added to certain foods such as buckwheat noodles. As there is, however, a growing interest in health foods among Taiwanese, exposure to this substance can be expected to increase. The largest published study on buckwheat allergy was performed by Takahashi *et al.*<sup>3</sup> who surveyed 92,680 schoolchildren in Yokohama and found a prevalence of buckwheat allergy of 0.22%. The most common reactions among sensitized children were urticaria (37.3%), wheezing (26.5%), and anaphylactic shock (3.9%).

The allergenic components are still under investigation, although a major one is thought to be a 24-kDa allergen designated Fag e 1.<sup>18</sup> Other candidate allergens include 19-, 16-, and 9-kDa substances, with the 19-kDa protein being relatively specific for patients with buckwheat allergy.<sup>22</sup>

Although the double-blinded placebo-controlled food challenge is the gold standard for diagnosis of food allergy, it is time-consuming and not without risk. Sampson<sup>23</sup> showed the utility of food-specific IgE concentrations by Pharmacia CAP system (Uppsala, Sweden) in reducing the need for such challenges. Sohn *et al.*<sup>24</sup> concluded that a cutoff level of 1.26 kU/l of specific IgE for buckwheat was adequate for diagnosis in children with strong clinical history and positive skin prick test. The severity of our patient's reaction and the very high IgE to buckwheat were convincing evidence that buckwheat was the offending agent in her case. We therefore considered an oral challenge with buckwheat to be dangerous and unnecessary.

Because of the danger of severe reactions, patients known to be sensitive to buckwheat should be advised to avoid it completely, even in small amounts. As organic health food products become more popular in Taiwan, physicians may expect to see increasing numbers of patients with buckwheat allergy. In patients presenting with unexplained hy-

**Table 2** Specific IgE of the patient

Antigen	Level (kU/l)	Class
<i>D. pteronyssinus</i>	20.9	4
<i>D. farinae</i>	27.4	4
Cat dander	< 0.35	0
Dog dander	1.49	2
Cockroach	< 0.35	0
Egg white	< 0.35	0
Milk	< 0.35	0
Fish	< 0.35	0
Sesame	2.97	2
Soybean	1.85	2
Buckwheat	> 100	6

Class 0: < 0.35 kU/l, Class 1: 0.35-0.7 kU/l, Class 2: 0.7-3.5 kU/l, Class 3: 3.5-17.5 kU/l, Class 4: 17.5-50 kU/l, Class 5: 50-100 kU/l, Class 6: > 100 kU/l.

persensitivity reactions, a careful history should include questions about exposure to buckwheat.

## REFERENCES

- Valdivieso R, Moneo I, Pola J, Munoz T, Zapata C, Hinojosa M, *et al.* Occupational asthma and contact urticaria caused by buckwheat flour. *Ann Allergy* 1989; 63: 149-52.
- Nakamura S, Yamaguchi M, Oishi M, Hayama T. Studies on the buckwheat allergose report 1: on the cases with the buckwheat allergose. *Allerg Immunol (Leipzig)* 1974; 20-21: 449-56.
- Takahashi Y, Ichikawa S, Aihara Y, Yokota S. Buckwheat allergy in 90,000 school children in Yokohama. *Arerugi* 1998; 47: 26-33.
- Davidson AE, Passero MA, Settignano GA. Buckwheat-induced anaphylaxis: a case report. *Ann Allergy* 1992; 69: 158-9.
- De Maat-Bleeker F, Stapel SO. Cross-reactivity between buckwheat and latex. *Allergy* 1998; 53: 538-9.
- Wuthrich B, Trojan A. Wheatburger anaphylaxis due to hidden buckwheat. *Clin Exp Allergy* 1995; 25: 1263.
- Park HS, Nahm DH. Buckwheat flour hypersensitivity: an occupational asthma in a noodle maker. *Clin Exp Allergy* 1996; 26: 423-7.
- Schumacher F, Schmid P, Wuthrich B. Sarrasin allergy: a contribution to buckwheat allergy. *Schweiz Med Wochenschr* 1993; 123: 1559-62.
- Gohte CJ, Wieslander G, Ancker K, Forsbeck M. Buckwheat allergy: health food, an inhalation health risk. *Allergy* 1983; 38: 155-9.
- Choudat D, Villette C, Dessanges JF, Combalot MF, Fabries JF, Lockhart A, *et al.* Occupational asthma caused by buckwheat flour. *Rev Mal Respir* 1997; 14: 319-21.
- Wieslander G. Review on buckwheat allergy. *Allergy* 1996; 51: 661-5.

12. Takahashi Y. Analysis of immune responses in buckwheat allergy. *Arerugi* 1996; 45: 1244-55.
13. Nakamura S, Yamaguchi MY. Studies on the buckwheat allergose report 2: clinical investigation on 169 cases with the buckwheat allergose gathered from the whole country of Japan. *Allerg Immunol (Leipzig)* 1974; 20-21: 457-65.
14. Smith HL. Buckwheat-poisoning with report of a case in man. *Arch Intern Med* 1909; 3: 350-9.
15. Horesh AJ. Buckwheat sensitivity in children. *Ann Allergy* 1972; 30: 685-9.
16. Davidson AE, Passero MA, Setticone GA. Buckwheat-induced anaphylaxis: a case report. *Ann Allergy* 1992; 69: 439-40.
17. Matsumura T, Tateno K, Yugami S, Fujii H, Kimura T. Detection of allergens in bronchial asthma in childhood and its therapy. Bronchial asthma induced by buckwheat flour attached to buckwheat chaff in the pillow. *Arerugi* 1969; 18: 902-11.
18. Yamada K, Urisu A, Kondou Y, Wada E, Komada H, Inagaki Y, *et al.* Cross-allergenicity between rice and buckwheat antigens and immediate hypersensitive reactions induced by buckwheat ingestion. *Arerugi* 1993; 42: 1600-9.
19. Agata H, Kondo N, Fukutomi O, Takemura M, Tashita H, Kobayashi Y, *et al.* Pulmonary hemosiderosis with hypersensitivity to buckwheat. *Ann Allergy Asthma Immunol* 1997; 78: 233-7.
20. Fritz SB, Gold BL. Buckwheat pillow-induced asthma and allergic rhinitis. *Ann Allergy Asthma Immunol* 2003; 90: 355-8.
21. Lee SY, Lee KS, Hong CH, Lee KY. Three cases of childhood nocturnal asthma due to buckwheat allergy. *Allergy* 2001; 56: 763-6.
22. Park JW, Kang DB, Kim CW, Koh SH, Yum HY, Kim KE, *et al.* Identification and characterization of the major allergens of buckwheat. *Allergy* 2000; 55: 1035-41.
23. Sampson HA. Utility of food-specific IgE concentrations in predicting symptomatic food allergy. *J Allergy Clin Immunol* 2001; 107: 891-6.
24. Sohn MH, Lee SY, Kim KE. Prediction of buckwheat allergy using specific IgE concentrations in children. *Allergy* 2003; 58: 1308-10.