

ALLERGYNet

ALLERGY 2009 DOI: 10.1111/j.1398-9995.2009.02233.x

© 2009 JOHN WILEY & SONS A/S

CONTRIBUTIONS TO THIS SECTION WILL NOT UNDERGO PEER REVIEW, BUT WILL BE REVIEWED BY THE ASSOCIATE EDITORS

Food-dependent exercise-induced anaphylaxis in the celery-mugwort-birch-spice syndrome

C.-H. Baek, Y.-J. Bae, Y. S. Cho, H.-B. Moon, T.-B. Kim*

Key words: celery-mugwort-birch-spice syndrome; food-dependent exercise-induced anaphylaxis.

Food-dependent exercise-induced anaphylaxis (FDEIA) is a subtype of exercise-induced anaphylaxis that occurs only as a result of exercise after ingestion of specific foods. To date, FDEIA associated with ingestion of wheat, celery, shellfish, cabbage, peach, grapes, and apple has been reported (1).

Celery-mugwort-birch-spice (CMBS) syndrome describes the cross-reactivity between *Artemisia* and *Apiaceae* foods as well as group sensitization within species of umbelliferous plants. Intolerance to celery and other vegetables, as well as vegetables/spices of the *Apiaceae* or umbelliferous family (e.g. carrots, caraway seeds, parsley, fennel seeds, coriander seeds, aniseed), is frequently observed in patients allergic to birch pollen, and less frequently in those allergic to mugwort pollen, by IgE-mediated hypersensitivity tests (2). We report here a patient with CMBS syndrome who developed celery-induced FDEIA.

An 18-year-old boy visited our allergy clinic complaining of repeated anaphylactic reactions. He had allergic rhinitis, with aggravated symptoms every spring and autumn. His first anaphylactic reaction, 3 years earlier, developed after running for 10 min, after consuming

soup containing brown seaweed, Chinese bellflower, garlic, celery, and vegetables. At that time, he experienced rhinorrhea, nasal obstruction, wheezing, dyspnea, and a rash over his whole body and was diagnosed with anaphylaxis in the emergency room. Since that time, he experienced similar reactions following exercise after eating bibimbab (rice with mixtures of various vegetables) or curried rice with vegetables. However, he never experienced any anaphylactic event simply by consumption of such foods; exercise was essential to induce the reaction.

He was admitted for further evaluation. His physical examination was normal, as were his complete blood counts, serum electrolytes, biochemistry, and urine analysis. His serum concentration of total IgE was 246 kU/l. He was negative on a metacholine bronchial provocation test. On skin prick tests (Allergopharma, Reinbek, Germany) for food allergens, he was positive only for celery. On skin prick tests (Allergopharma) for inhalant allergens, he was strongly positive for pollens, including birch, chrysanthemum, mugwort, and ragweed pollens, as well as for house dust

mites (Table 1). We performed a provocation test to determine whether anaphylaxis developed after exercise or food ingestion. Neither exercise alone, nor the ingestion of celery alone, resulted in any symptoms. However, exercise for 30 min after ingestion of celery resulted in an anaphylactic reaction, including whole body urticaria, facial angioedema, dyspnea, and a 22% decrease in baseline FEV1. The symptoms subsided after injection of intravenous pheniramine and corticosteroid, and nebulization with salbutamol. Over the following 6 months, we administered exercise tests after ingestion of spinach, garlic, Chinese bellflower, curry powder, and brown seaweed, but he was negative for all these other putative culprit foods. Finally, we diagnosed this patient as having an FDEIA to celery and instructed him to avoid exercise after ingestion of celery. We also prescribed self-injectable epinephrine for any anaphylactic reaction.

To the best of our knowledge, this is the first case report of FDEIA in a patient with CMBS syndrome. Of the hypotheses seeking to explain the association between pollinosis and food sensitization, the most widely accepted and experimentally supported idea is that the association is attributable to IgE antibody directed against common cross-reactive structures shared by pollen and plant-derived foods (3, 4). There is some evidence suggesting that pollens are the primary sources of sensitization, leading to induction of IgE antibodies that are capable of cross-reacting with homologous food allergens (5). The reason why ingestion of celery alone, in the absence of exercise, did not induce any allergic reaction, may be because exercise increases histamine release. That is, life-threatening anaphylactic reactions associated with FDEIA may result from the increased release of histamine triggered by physical effort, resulting in transient serum hyperosmolarity after exposure to sensitizing food allergens (6).

Table 1. Results of skin prick tests with food and inhalant allergens

Allergen	Results*
Histamine	5 × 5
Saline	Ø
Celery	7 × 5
<i>Dermatophagoides pteronyssinus</i>	10 × 10
<i>Dermatophagoides farinae</i>	10 × 8
Alder	7 × 6
Birch	18 × 14
Chrysanthemum	26 × 18
Mugwort	25 × 19
Ragweed	13 × 12

Celery is a food allergen; all others are inhalant allergens.

*longest length × perpendicular length of the wheal.

In summary, ingestion of celery by a patient with CMBS syndrome may induce FDEIA, not food-induced anaphylaxis.

Conflict of Interest: There are no potential conflicts of interest related to this article described.

*Division of Allergy and Clinical Immunology
Department of Internal Medicine
Asan Medical Center
University of Ulsan College of Medicine
388-1 Pungnap-2dong, Songpa-gu
Seoul 138-736
Korea

Tel.: 82 2 3010 3287

Fax: 82 2 3010 6969

E-mail: allergy@medimail.co.kr

Accepted for publication 20 September 2009
Allergy 2009

© 2009 John Wiley & Sons A/S

DOI: 10.1111/j.1398-9995.2009.02233.x

References

1. Volcheck GW, Li JT. Exercise-induced urticaria and anaphylaxis. *Mayo Clin Proc* 1997;**72**:140–147.
2. Egger M, Mutschlechner S, Wopfner N, Gadermaier G, Briza P, Ferreira F. Pollen-food syndromes associated with weed pollinosis: an update from the molecular point of view. *Allergy* 2006;**61**:461–476.
3. Caballero T, Martin-Esteban M. Association between pollen hypersensitivity and edible vegetable allergy: a review. *J Invest Allergol Clin Immunol* 1998;**8**:6–16.
4. Bauer L, Ebner C, Hirschwehr R, Wuthrich B, Pichler C, Fritsch R et al. IgE cross-reactivity between birch pollen, mugwort pollen and celery is because of at least three distinct cross-reacting allergens: immunoblot investigation of the birch-mugwort-celery syndrome. *Clin Exp Allergy* 1996;**26**:1161–1170.
5. Kazemi-Shirazi L, Pauli G, Purohit A, Spitzauer S, Froschl R, Hoffmann-Sommergruber K et al. Quantitative IgE inhibition experiments with purified recombinant allergens indicate pollen-derived allergens as the sensitizing agents responsible for many forms of plant food allergy. *J Allergy Clin Immunol* 2000;**105** (1 Pt 1):116–125.
6. Barg W, Wolanczyk-Medrala A, Obojski A, Wytrychowski K, Panaszek B, Medrala W. Food-dependent exercise-induced anaphylaxis: possible impact of increased basophil histamine releasability in hyperosmolar conditions. *J Invest Allergol Clin Immunol* 2008;**18**: 312–315.