

Anaphylactic reactions to raw eggs after negative challenges with cooked eggs

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Together with cow's milk and peanuts, hen's egg is one of the most common foods involved in children with IgE-mediated food hypersensitivities, and ovomucoid and ovalbumin have been identified as 2 major allergens.¹ It is also commonly observed that most children tolerate egg again after an avoidance diet.^{2,3} These patients have follow-up challenges, either by double-blind, placebo-controlled food challenges with lyophilized egg powder or by open challenges with cooked eggs (eg, hard-boiled eggs, scrambled eggs, French toast). We report 2 patients with negative follow-up food challenges to cooked eggs who had subsequently severe allergic reactions to raw eggs.

CASE REPORTS

The first patient was a 12-year-old girl with a history of atopic dermatitis since infancy, milk hypersensitivity with a negative follow-up challenge 1 year before, and moderate seasonal asthma. She had restricted eggs since infancy after positive skin testing and also had a history of reaction to fish and shellfish. Egg-specific serum IgE antibody levels (by the Pharmacia CAP-RAST FEIA system) before the challenge were 4.94 UI/mL. An open follow-up challenge was performed with 1 hard-boiled egg given over a period of 60 minutes. No symptoms were noted during the following 3 hours, and the patient was discharged after a normal physical examination. Two hours later, she went with her parents to a restaurant and ate one slice of lemon pie containing eggs heated for a short time at less than 100°C. The patient immediately complained of itching in her face and respiratory distress. At the emergency department severe urticaria of the face and signs of laryngeal edema were noted. The patient rapidly recovered after treatment with inhaled epinephrine and intravenous H₁ antagonists. Skin prick tests to a commercial egg-white extract (Stallergène, Antony, France), to raw or hard-boiled eggs, and to a preparation of either 40 mg/mL ovomucoid or ovalbumin (Sigma, Buchs, Switzerland), native or boiled for 10 minutes, were performed (Table I). The patient continues to avoid eggs in all forms but eats all other allowed foods without having reported any allergic reaction.

The second patient was a 4-year-old boy with a history of severe atopic dermatitis in infancy and multiple food hypersensitivities. Egg sensitivity was diagnosed in infancy by a positive skin test, although he had never overtly ingested egg. A highly positive specific IgE to egg (25.4 IU/mL) confirmed the diagnosis at age 2 years, and his specific IgE to egg was 8.9 UI/mL before the challenge. Similar to patient 1, one hard-boiled egg could be given without any objective symptoms. Approximately 6 weeks after the negative challenge, the patient ate a small piece of dough containing raw egg and within minutes a diffuse, severe urticarial reaction and profuse vomiting developed. Because of rapid improvement after emesis, no emergency medications had to be administered by his mother. Skin prick tests were performed as described for the first patient (Table I).

DISCUSSION

Specific IgE levels for eggs were above the 90% positive predictive value (2 IU/mL), as defined previously in a population of patients with atopic dermatitis and egg allergy.⁴ In both patients skin prick tests showed lower reactivity to heat-processed egg proteins. Similar to our report, Urisu et al⁵ described a subset of patients tolerating heated, but not freeze-dried egg proteins. These patients also had lower specific IgE to egg than did those reacting to heated eggs. These results were obtained with use of an ELISA assay developed by the authors, unfortunately not comparable to RAST or CAP-RAST testing widely used in clinical settings. It is therefore not possible to extrapolate IgE levels for tolerance to raw or heated eggs in other patients. Although it is commonly believed that major food allergens are stable after heat treatment or proteolysis, Cooke and Sampson⁶ recently showed reduced IgE binding to denatured ovomucoid. Thus patients progressively losing their sensitivity might tolerate boiled or cooked eggs.

These reports and our observations raise several questions of importance to the clinician. Should we do follow-up challenges for egg hypersensitivity with raw eggs exclusively? There will be food safety issues emerging, even if the risk of a bacterial contamination remains low. Furthermore, we may delay reintroduction of eggs into the diet, although cooked egg might be well tolerated. In the presence of numerous processed foods containing egg proteins, an egg avoidance diet is rather difficult to follow. On the other hand, should we continue to challenge with cooked eggs? By allowing cooked eggs and processed products containing eggs in patients with a negative challenge test, we might delay complete immunologic tolerance to egg proteins. These patients may

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TABLE I. Skin prick tests (mean diameter of wheal in millimeters)

	Patient 1	Patient 2
Positive control (histamine 10 mg/mL)	5	5
Commercial egg-white extract	2	5
Hen's egg		
Raw	5	9
Hard boiled	3	2
Ovomucoid		
Native	14	Negative
Boiled	6	Negative
Ovalbumin		
Native	6	5
Boiled	5	Negative

remain at risk for several years with foods containing raw eggs (eg, homemade mayonnaise, salad sauces, doughs, egg nog). Or might the consumption of cooked eggs even favor acquisition of complete oral tolerance and recovery from egg allergy? More studies will be necessary to answer these questions. In the meanwhile, we suggest

mixing freeze-dried egg with oatmeal or with any other food tolerated by the patient. If the patient does not become tolerant in a "reasonable" follow-up time period, we would recommend testing cooked eggs to allow a diversification of the diet. In any doubtful case, the patient should be carefully instructed about the risk of an anaphylactic reaction and be appropriately equipped with emergency medications.

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