

Desensitization to cross-reacting allergen in egg yolk and chicken meat



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Clinical Implications

- We present a desensitization with egg, in a bird-egg syndrome, allowing the patient to acquire tolerance not only to egg but also to poultry.

TO THE EDITOR:

Bird-egg syndrome can present in 2 ways. Patients may be sensitized to airborne avian allergens following exposure to feathers and droppings of birds, a type mostly seen in adults or in cases of late-onset egg allergy in childhood. The other type is characterized by sensitization to egg yolk allergens through the intestinal mucosa. Both clinical presentations result from sensitization to α -livetina, a serum albumin found in egg yolk (identified as Gal d 5) and one with high cross-sensitization between egg and chicken proteins, leading to an IgE-mediated allergic reaction after consumption of raw egg or chicken meat.¹

The main treatment for food allergy is strict avoidance of the offending food. This approach is not curative and places great burden on patients and their families.² Oral desensitization consists of exposing allergic individuals to food allergens at low doses that do not trigger an allergic reaction, periodically escalating the dose until a maintenance dose is reached, thereby allowing the patient to either ingest traces of the culprit food without risk of allergic reaction or inducing maintained tolerance of the food.³ This procedure harbors the risk of allergic reaction during the build-up phase. There is a published case of eosinophilic esophagitis after egg desensitization in a bird-egg syndrome.⁴

We present a 32-year-old woman with symptoms of rhinoconjunctivitis and persistent asthma since childhood. The patient reported symptoms of oral itching upon consumption of eggs, chicken, and turkey meat since age 4 years. When accidentally ingesting larger quantities of egg, she tended to present dyspnea, hot flashes throughout her body, and pruritic rash on the trunk, and as a result she has required attention in the emergency department several times. Her diet is entirely egg- and poultry-free. She also reports suffering from rhinoconjunctivitis symptoms on occasional contact with birds and dyspnea with maintained contact. The patient has not lived with birds.

Intraepidermal tests were carried out with commercial extracts (ALK-Abelló, Hørsholm, Denmark) for pollens, mites, fungi, and epithelia, revealing positive results for *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*, *Alternaria alternata*, and dog epithelium. Intraepidermal tests were also carried out with commercial extract of egg, chicken, turkey, and duck, with

TABLE I. Desensitization protocol with pasteurized whole egg

Step	Dose (mL)	Protein (g)
1	1	0.056
2	5	0.28
3	10	0.57
4	20	1.13
5	30	1.7
6	60	3.4

positive results. We decided to carry out an ImmunoCAP (Thermo Fisher, Uppsala, Sweden), the results of which were as follows: rCan f5 2.26 kU/L, rAlt a1 7.08 kU/L, egg white 0.43 kU/L, egg yolk 2.90 kU/L, turkey 1.22 kU/L, chicken 0.70 kU/L, chicken serum protein 2.62 kU/L, chicken feathers 1.01 kU/L, nGal d1 0.00 kU/L, nGal d2 0.06 kU/L, nGal d3 0.24 kU/L, nGal d4 0.14 kU/L, *Dermatophagoides pteronyssinus* 3.50 kU/L, and total IgE 22.20 kU/L.

Given that the patient adheres to a restricted diet and wished to know whether she had overcome her food allergies, an open oral challenge with pasteurized egg extract was performed with a positive result (oral itching and generalized urticaria) at a dose of 5 mL (280 mg of egg protein). We also performed an oral challenge test with grilled chicken; the patient suffered oral itching and hot flashes from the first dose ingested. The procedure was performed under the supervision of a physician and nurse and with emergency medication readily available. It was decided to perform a pasteurized whole-egg desensitization following an explanation of the risks of the procedure.

The desensitization started at the last known tolerated dose (5 mL) with weekly dose increases. Pretreatment was performed with 10 mg of cetirizine administered daily. The patient was instructed to consume the last dose tolerated on a daily basis until the next week (Table I). After 5 weeks of desensitization, tolerance of 3.4 g of egg protein was reached, and the patient continued consuming 3 undercooked eggs weekly. Two months later, we decided to perform an oral provocation with chicken meat, revealing that the patient tolerated 200 g of grilled chicken without incident.

SDS-PAGE IgE immunoblotting assay was carried out in nonreducing conditions as previously described⁵ and revealed reactivity to a high-intensity (66-70 kDa) IgE-binding band, and less intense bands of approximately 40 kDa and 45 kDa were observed in raw chicken extract (Figure 1, A).

Immunoblotting inhibition assays were performed with the patient's serum (obtained before undergoing desensitization), using egg yolk, solid-phase raw chicken and egg yolk, and raw chicken and BSA extracts as inhibitors. Partial inhibition was obtained when inhibition assays were performed with serum preincubated with raw chicken and egg-yolk extracts (Figure 1).

Although the protein has not been identified by mass spectrometry, the revealed band was inhibited by the yolk extract and the chicken extract. This inhibition, together with its approximate molecular weight of 67 kDa, suggests that it may be a protein that is present in both foods (eg, serum albumin Gal d 5).⁶ When ImmunoCAP inhibition analysis was performed

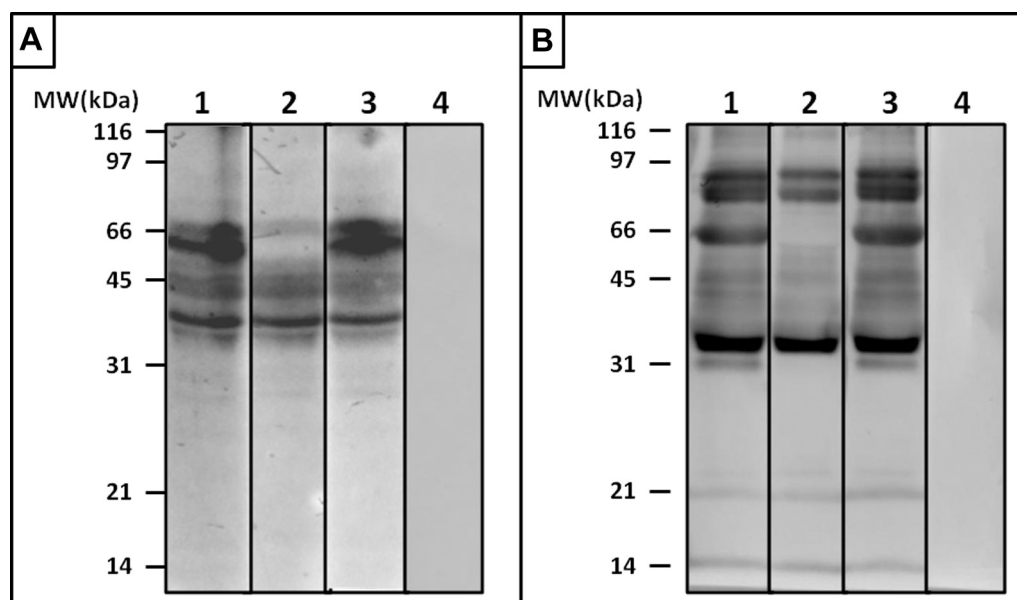


FIGURE 1. SDS-PAGE Immunoblotting. **A**, Solid phase: chicken extract. Lane 1: Patient sera. Lane 2: Patient sera preincubated with egg yolk extract. Lane 3: Patient serum preincubated with BSA. Lane 4: control serum (pool of sera from nonatopic subjects). **B**, Solid phase: egg yolk extract. Lane 1: patient serum. Lane 2: patient serum preincubated with chicken extract. Lane 3: patient serum preincubated with BSA. Lane 4: control serum (pool of sera from nonatopic subjects). *MW*, Molecular mass standard in kDa.

before desensitization, IgE values of 2.62 kU/L and 2.90 kU/L were obtained for egg yolk and chicken serum protein; a result for Gald5 could not be obtained, because this protein is not available in our clinic. These values reinforce the theory that the clinical presentation is due to the Gald 5 protein and therefore is a genuine bird-egg syndrome.⁷

Desensitization was performed with pasteurized whole egg to ensure that the extract contained all egg proteins and not only those of the egg white.^{8,9} Dose increases were carried out weekly, and, as shown in Table 1, the dose was increased until the patient presented an adverse reaction, reaching the full dose of 3.4 g of protein in only 5 weeks. Most of the adverse reactions were mild, with epinephrine required on only 1 occasion because of shortness of breath.

Six months after completing the desensitization protocol, with a maintenance dose of 3 undercooked eggs per week, the patient transitioned to a free diet, consuming egg and poultry without incident, bringing about an increase in her quality of life.

In summary, we present a case of bird-egg syndrome in an adult woman who was successfully desensitized with egg, allowing her to acquire tolerance to egg and poultry.

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Conflicts of Interest: The authors declare that they have no relevant conflicts of interest.

Received for publication August 2, 2018; revised September 18, 2018; accepted for publication September 19, 2018.

Available online October 5, 2018.

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2213-2198

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<https://doi.org/10.1016/j.jaip.2018.09.019>

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