

Allergy to eggs from duck and goose without sensitization to hen egg proteins

Belén Añibarro, MD,^a F. Javier Seoane, MD,^a Concepción Vila, MD,^a and Manuel Lombardero, PhD^b Madrid, Spain

Background: Eggs are among the foods most frequently causing allergy. Hen eggs are the most important. Those of other birds are of lesser significance.

Objective: We report an unusual case of food allergy after consumption of eggs from duck and goose in an adult patient without hen egg allergy.

Methods: Skin prick tests were performed with fresh white and yolk from eggs of duck and goose and egg white, egg yolk, ovalbumin, and ovomucoid from hen egg. Specific serum IgE was measured to hen egg proteins. SDS-PAGE and IgE immunoblotting were carried out with egg white extracts from hen, duck, and goose.

Results: Skin tests were positive to egg whites from duck and goose. The skin tests and specific serum IgE were negative to hen egg proteins. Immunoblotting demonstrated the presence of specific IgE to a proteic band of molecular weight around 45 kd.

Conclusions: We report a patient with an IgE-mediated allergy to egg white from duck and goose without hen egg allergy. Ovalbumin seems to be the responsible protein. The antigenic determinant of this protein seems to be specific of order *Anseriforme* and it is not present in the ovalbumin of order *Galliforme*. (*J Allergy Clin Immunol* 2000;105:834-6.)

Key words: Egg allergy, duck, goose, hen, ovalbumin, egg proteins, food allergy

Eggs have been consumed since ancient times. Hen eggs are the most important. Those of other birds (geese, ducks, plovers, seagulls, quail) are of lesser significance. Hen egg is one of the foods that most frequently cause allergy, mainly in children.

In this report we describe an unusual case of food allergy after consumption of eggs from duck and goose in an adult patient without hen egg allergy.

CASE REPORT

The patient was a 49-year-old woman who had symptoms of oral allergy syndrome (tingling and itching of the lips, tongue, oral mucosa and throat and swelling of the lips), abdominal pain, nau-

Abbreviations used

mw: Molecular weight
OVA: Ovalbumin
OVM: Ovomucoid
PPT: Prick-prick test
SPT: Skin prick test

sea, and vomiting. She had had several episodes in the last 2 years, whenever she ate eggs from duck and goose. Symptoms began 10 minutes after intake this food. The ingestion of fresh or cooked hen eggs did not induce symptoms.

She claimed to have eaten these foods before without problem. She denied allergic reactions to any other food but did complain of hay fever symptoms in the spring and contact urticaria from latex exposure.

METHODS

Skin prick test

Skin prick tests (SPTs) were performed with commercially available extracts of common inhalant allergens (house dust mites, molds, animal danders, and pollens), latex (0.5 mg/mL, ALK-Abelló, Madrid, Spain), and hen egg proteins: egg white 1/20 wt/vol, egg yolk 1/20 wt/vol (Dome-Hollister-Stier, Madrid, Spain), ovalbumin (OVA) 1 mg/mL, and ovomucoid (OVM) 1 mg/mL (Leti, Madrid, Spain).

A prick-prick test (PPT) with fresh uncooked white and yolk from eggs of duck (*Anas domesticus*), goose (*Anser domesticus*), and hen (*Gallus domesticus*) was done according to the method of Dreborg and Foucard.¹ Five atopic patients without egg allergy were skin tested as a control group.

Histamine hydrochloride (10 mg/mL) and physiologic saline solution were used as positive and negative controls, respectively. Skin tests were performed by puncture with a Morrow-Brown needle on the volar side of the forearms. A wheal diameter 3 mm greater than the negative control was considered a positive response.

Serologic IgE determinations

Specific and total IgE were measured with the Pharmacia CAP System (Pharmacia Diagnostics, Uppsala, Sweden) according to the manufacturer's instructions.

Levels of specific IgE were measured to latex and hen egg proteins (yolk, white, OVA, and OVM).

Extracts

Egg whites from hen, goose, and duck were extracted with magnetic stirring at 10% wt/vol in PBS for 90 minutes at 6°C. After centrifugation, the supernatants were filtered through 0.22 µm and stored at -20°C until use.

From the ^aSección de Alergia, Hospital Severo Ochoa, Leganés, and ^bALK-Abelló, Madrid, Spain.

Received for publication June 21, 1999; revised Nov 16, 1999; accepted for publication Nov 19, 1999.

Reprint requests: Belén Añibarro, MD, C/ Arzobispo Morcillo 42 9C, 28029 Madrid, Spain.

Copyright © 2000 by Mosby, Inc.

0091-6749/2000 \$12.00 + 0 1/1/104547

doi: 10.1067/mai.2000.104547

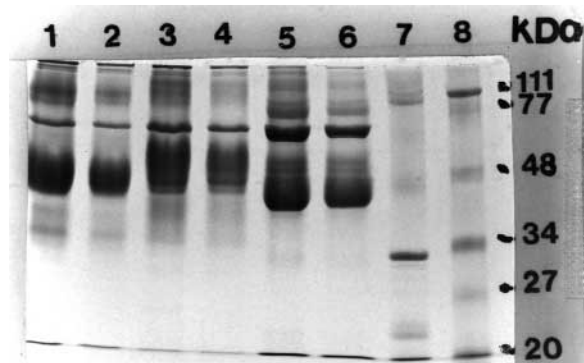


FIG 1. SDS-PAGE gel of egg white proteins from duck (lanes 1 and 2), goose (lanes 3 and 4), and hen (lanes 5 and 6). Molecular weight markers (lanes 7 and 8).

SDS-PAGE and IgE immunoblotting

SDS-PAGE was carried out according to Laemmli,² with use of nonreducing conditions and 15% polyacrylamide running gel. The egg white extract proteins separated by SDS-PAGE were transferred onto nitrocellulose membranes as described by Towbin et al.³

Immunoblotting of IgE-binding proteins was achieved by enhanced chemiluminescence according to the manufacturer's instructions (ECL-Amersham). As negative controls, blots were also incubated with dilution buffer instead of patient serum.

RESULTS

SPTs were positive to pollens (trees, grasses, and weeds) and latex. No SPT response was registered to the other common inhalants tested. The SPTs to hen egg proteins were also negative.

The PPT with fresh uncooked materials were positive to duck egg white and goose egg white. Egg yolk from all birds tested and hen egg white were all negative. No response was observed in the control group.

Total serum IgE was 688 kU/L. The patient had 1.37 kU/L (class 2) of serum specific IgE against latex. Serum specific IgE to OVA, OVM, hen egg yolk, and hen egg white was negative.

SDS-PAGE of egg white proteins from the different birds is shown in Fig 1. Several protein bands were seen between 34 and 111 kD of molecular weight (mw) on the egg white from all birds tested. OVA was seen as a wide diffuse band from 40 to 48 kD in the egg white from the 3 birds, but there were differences on their electrophoretic mobility; thus the electrophoretic mobility decreased in the following order: hen, duck, and goose, indicating similarity between the various OVAs but no complete immunochemical identity.

Immunoblotting (Fig 2) with serum from patient showed an IgE-binding band in the extract from goose and duck that seemed to be OVA because of its electrophoretic mobility (40 to 48 kD mw). Immunoblotting also showed a different electrophoretic mobility between the OVAs from duck and goose (Fig 1). OVA from duck's egg gets the higher migration distance, straight after OVA from goose's egg. This one has the lower migration distance.

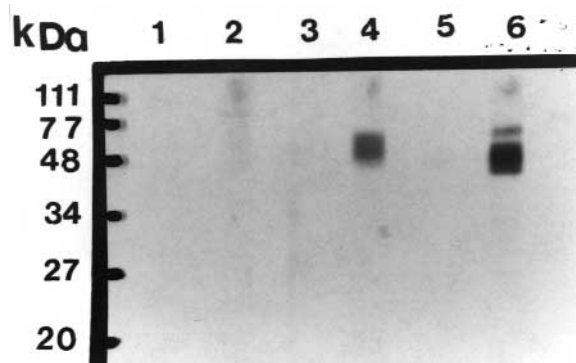


FIG 2. Autoradiograph of IgE immunoblotting from the SDS-PAGE gel with use of negative control serum (lanes 1, 3, and 5) and serum from patient (lanes 2, 4, and 6), with hen egg white (lanes 1 and 2), duck egg white (lanes 3 and 4), and goose egg white (lanes 5 and 6).

Surprisingly, the patient had no specific IgE to proteins from hen egg white or to OVA.

Control did not recognize any protein from duck, goose, or hen extracts.

Binding of specific IgE to other proteins different from OVA, such as conalbumin (80 kD mw) or OVM (30 kD mw), was absent in this patient.

The IgE immunoblotting showed a small protein band on hen's egg white. This band is seen around 80 kD mw and could belong to conalbumin. We cannot detect similar bands on egg white from duck and goose.

DISCUSSION

We report an unusual case of food allergy after consumption of eggs from duck and goose in an adult patient without hen egg allergy. The results of skin tests, serum-specific IgE, and immunoblotting IgE confirm an IgE-mediated reaction.

Egg is one of the foods that most frequently causes allergy in children. The major allergens are OVA, OMV, and conalbumin.⁴ Hen eggs are the most important. Allergy to eggs of other birds is less frequent and has always been described in patients with hen egg allergy.⁵ To our knowledge, no prior cases have been reported of sensitization to egg from birds other than hen alone.

The presence of cross-reacting proteins in various avian egg whites has been reported elsewhere.⁵ The different turkey, duck, goose, seagull, and hen egg whites contain proteins cross-reacting with most of the allergens in hen's egg white, but the degree of cross-reactivity varies considerably among the various egg whites.⁵ OVA, OVM, and conalbumin from various fowls are all able to bind human IgE but in varying degrees. The similarity between the various ovalbumins and conalbumins and the respective proteins from hen decrease in the following order: turkey, duck, goose, and seagull. There are, however, considerable differences between (for instance) egg white from turkey and egg white from seagull with respect to the degree of immunochemical identity with allergens in hen's egg

white. Hen and turkey both belong to the order Galliformes; these birds are closely related. Duck and goose are classified in the same order (Anseriformes) and the egg whites from these two birds are very similar in their immunochemical reactions. Seagull, belonging to the order Charadriiformes, is the most distant relative of the hen. According to the results discussed above, it seems reasonable that all egg whites may provoke allergic reactions when ingested by patients who are allergic to hen's egg white. Results of immunoblot indicate that OVA might be the protein responsible for the sensitization in the patient reported here. OVA from the egg whites tested showed differences in electrophoretic mobility. The antigenic determinant of this protein seems to be specific to the Anseriformes (ducks and goose), and it is not common to a different order such as the Galliformes (hen).

The considerable variation of specific allergen activity in the various egg whites indicates that patients with hen egg

allergy may tolerate eggs from other birds, for instance, duck or goose, like the patient reported here tolerated hen's egg despite her allergy to egg from duck and goose.

REFERENCES

1. Dreborg S, Foucard T. Allergy to apple, carrot and potato in children with birch pollen allergy. *Allergy* 1983;38:167-72.
2. Laemli UK. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature* 1970;227:680-5.
3. Towbin H, Staehelin T, Gordon J. Electrophoretic transfer of proteins from polyacrylamide gels to nitrocellulose sheets: procedure and some applications. *Proc Natl Acad Sci U S A* 1979;76:4350-4.
4. Hoffman DR. Immunochemical identification of the allergens in egg white. *J Allergy Clin Immunol* 1983;71:481-6.
5. Langeland T. A clinical and immunological study of allergy to hen's egg white, VI: occurrence of proteins cross-reacting with allergens in hen's egg white as studied in egg white from turkey, duck, goose, seagull and in hen egg yolk, and hen and chicken sera and flesh. *Allergy* 1983;38:399-412.