

Clinical Notes

A rare case of food-dependent exercise-induced anaphylaxis triggered by chicken meat

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Food-dependent exercise-induced anaphylaxis (FDEIA) is a type of immunoglobulin E (IgE)-mediated food allergy that is brought on by physical exertion after ingesting the causative food. The causative foods in FDEIA differ by food culture and eating habit. The most prevalent items implicated in FDEIA in Japanese children are wheat and crustaceans.¹ On the other hand, FDEIA triggered by chicken meat is rarely reported. We describe here a female patient who experienced FDEIA due to chicken meat, which was diagnosed based on the results of three provocation tests adjusted by an increasing load amount combined with aspirin administration and exercise.

A 14-year-old female patient had a history of four anaphylaxis episodes from age 12 years. She received treatment for two of them at the emergency room in our hospital. Before the onset of all the anaphylactic episodes, she had consumed chicken meat prior to exercising (e.g., running, walking, playing basketball). Prior to some of the episodes, she had also consumed rice, cows' milk, and orange. The patient had a liking for chicken meat and often ate it without experiencing any allergic symptoms. She also never experienced an allergic reaction after ingesting hens' eggs, rice, cows' milk, or oranges. She had a history of asthma but no other allergic diseases, such as other food allergies or atopic dermatitis. She had no family history of allergic disease and had never been in close contact with birds.

The results of allergen-specific IgE testing were negative for chicken meat, egg white, egg yolk, ovomucoid, rice, cows' milk, and orange (ImmunoCAP, ThermoFisher Scientific, Uppsala, Sweden). However, prick-to-prick tests with raw and boiled chicken meat resulted in 3 mm wheals. Saline was negative, and histamine elicited wheals about 5 mm in diameter.

After obtaining her parents' written informed consent, the patient was admitted for provocation tests using chicken meat with/without aspirin and exercise. The test protocol was based on the Japanese Pediatric Guidelines for Food Allergy.²

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The patient experienced no symptoms after ingesting 184 g of chicken meat and exercising or after ingesting 160 g of chicken meat, orange, and apple with 500 mg of aspirin, then exercising. Because she was avoiding fruit, such as orange and apple, from fear of causing an allergic reaction, these items were tested in the second provocation test. Finally, a provocation test with 245 g chicken meat and 500 mg aspirin followed by exercise induced nasal secretions, eyelid edema, generalized erythema, hives, and wheezing accompanied by hypoxemia requiring treatment with intramuscular adrenaline, β_2 -stimulant inhalation, oxygen administration, oral antihistamine, intravenous hydration, and a steroid.

Based on the provocation test findings, FDEIA due to chicken meat was diagnosed. We speculated that neither aspirin alone nor ingesting chicken meat alone could have caused her allergic symptoms without cofactors, such as exercise and aspirin. The patient was instructed to refrain from exercise for at least 4 h after ingesting chicken meat and to carry an adrenaline auto-inducer in case she experienced any FDEIA symptoms. Thereafter, she experienced no further episodes of anaphylaxis in the 6 months leading up to the writing of this manuscript.

After obtaining the consent of the patient's parents and the approval of the ethics committee at Tokyo Metropolitan Children's Medical Center (2020b-44), IgE immunoblotting using raw chicken meat protein extract was conducted. Around 3 μ g of the extract and molecular weight markers were separated by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) (acrylamide concentration, 4–20%) under nonreducing conditions (Fig. 1, lanes 1 and 2). The extract proteins separated by SDS-PAGE (acrylamide concentration, 4–20%) were transferred onto polyvinylidene difluoride (PVDF) membranes, which were incubated with sera from the patient and a negative, nonatopic control subject after 10-fold dilution. Immunoglobulin E antibody binding was detected using alkaline phosphatase (AP)-labeled rat anti-mouse IgE-specific antibodies and an AP substrate reagent kit (Fig. 1, lanes 4 and 5). The IgE immunoblotting (see above) revealed a band of approximately 35 kDa only in the patient's sera, and faint reactions were observed in the patient and negative control at 37, 50, and 75 kDa (Fig. 1, lanes 4 and 5), which were not

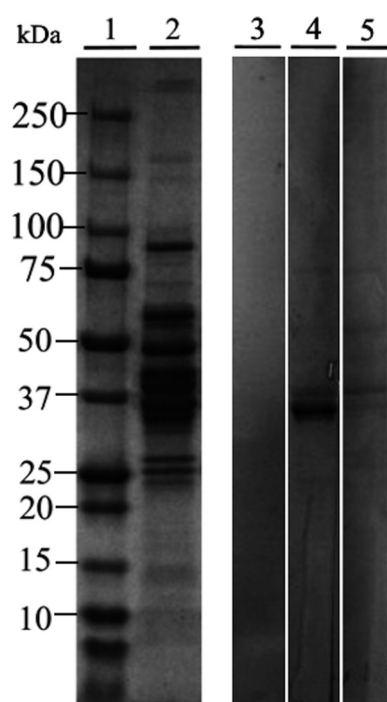


Fig. 1 Immunoglobulin E immunoblotting of chicken meat extract. Lane 1, color marker. Lane 2, Coomassie Brilliant Blue staining with chicken meat extract. Lane 3, chicken meat plus buffer. Lane 4, chicken meat plus patient serum. Lane 5, chicken meat plus negative control serum (serum from a nonatopic subject). Molecular weight markers are indicated on the left (10, 15, 20, 25, 37, 50, 75, 100, 150, and 250 kDa).

observed in the lane incubated with buffer instead of serum, followed by incubation with the secondary antibody (Fig. 1, lane 3). This fact indicates that these bands were not the background binding of the secondary antibody.

In a study analyzing 33 patients with immediate-type chicken meat allergy, all the patients had levels of chicken meat-specific IgE exceeding 0.36 kUA/L on ImmunoCAP (Thermo Fisher), and the major allergens identified were Gal d 5 (69 kDa) and Gal d 7 (22 kDa).³ Nevertheless, the present patient was negative for chicken-meat-specific IgE, and a 35 kDa band was detected on IgE immunoblotting using chicken meat extract, suggesting that different antigens in an immediate-type allergy may be responsible for FDEIA triggered by chicken meat. Similarly, the pattern of IgE reactivity to wheat protein fractions in patients with wheat allergy differed among immediate-type food allergy, baker's asthma, and

FDEIA.⁴ However, further studies are warranted to verify the present findings.

Food-dependent exercise-induced anaphylaxis due to chicken meat is extremely rare. A retrospective study reported the results of provocation tests in 20 patients with FDEIA, with only one case, that of a 16-year-old female patient, being diagnosed as FDEIA triggered by chicken meat.⁵ Physicians should bear in mind that chicken meat can induce FDEIA. Further studies are needed to understand the difference between the phenotypes of immediate-type allergy and FDEIA due to chicken meat.

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Disclosure

The authors declare no conflicts of interest.

Author contributions

N.K. provided medical care and wrote the manuscript. E.M. also provided medical care. K.K. provided the experimental procedure. Y.Y. and M.N. critically reviewed the manuscript. All the authors read and approved the final manuscript.

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