

LETTER TO THE EDITOR

Food-dependent exercise-induced anaphylaxis due to shrimp associated with 43 kDa, a new antigen

Dear Editor,

Food-dependent exercise-induced anaphylaxis (FDEIA) is a subtype of anaphylaxis and a rare disease.¹ Neither the food allergen nor exercise alone triggers anaphylaxis. The typical symptoms of FDEIA are skin manifestations, dyspnea, abdominal pain and fatigue. FDEIA due to crustaceans is less common than FDEIA due to wheat. Here, we present a case of FDEIA due to shrimp consumption in an 18-year-old woman with specific immunoglobulin (Ig)E antibodies against 43 kDa, a new antigen.

The patient was an 18-year-old Japanese woman who presented with a history of anaphylactic episodes 7 years previously, which had developed in association with exercise after eating shrimp. Her total IgE level was 4 IU/mL, and her serum levels of specific IgE to shrimp, crab, wheat, gluten and ω -5 gliadin with ImmunoCAP[®] (Thermo Fisher Scientific, Uppsala, Sweden) were less than the limits. The skin prick test results with shrimp and crab using allergen scratch extract (Torii[®]; Torii Pharmaceutical, Tokyo, Japan) were negative. An oral challenge test with aspirin (500 mg) and shrimp (three boiled black tiger shrimps) was negative. Furthermore, an oral challenge test with the combination of aspirin and shrimp was negative. However, a combination challenge test with aspirin and shrimp, along with exercise (treadmill electrocardiogram system, Bruce method) was positive, and itching, wheal on the face and a dull feeling in the throat were noted (Fig. 1a,b). Thus, she was diagnosed with FDEIA due to shrimp.

Immunoblotting with anti-IgE antibody revealed antigens of 20 kDa, 36–38 kDa and 43 kDa in her serum (Fig. 1c). We considered that the 20-kDa band may be indicative of the myosin light chain² or sarcoplasmic calcium-binding protein.³ The 36–38-kDa bands were consistent with the molecular weight of tropomyosin which is the major shrimp antigen,⁴ although specific IgE to tropomyosin (Pen m1; ImmunoCAP[®]) was undetectable (anti-tropomyosin IgE, <0.1 U_A/mL). However, FDEIA due to shrimp associated with specific IgE to the 43-kDa band is rare. In 2014, Gamez *et al.* identified new allergens from *Solenocera melantha* shrimp, including a 43-kDa protein.⁵ A total of 60 patients with seafood allergy were studied, and the allergenic profiles to shrimp were analyzed using IgE immunoblotting. Some of the most frequently recognized protein bands were analyzed using mass spectrometry. It was reported that fructose 1,6-bisphosphate aldolase (FBPA), a 43-kDa protein, is a new shrimp allergen.⁵

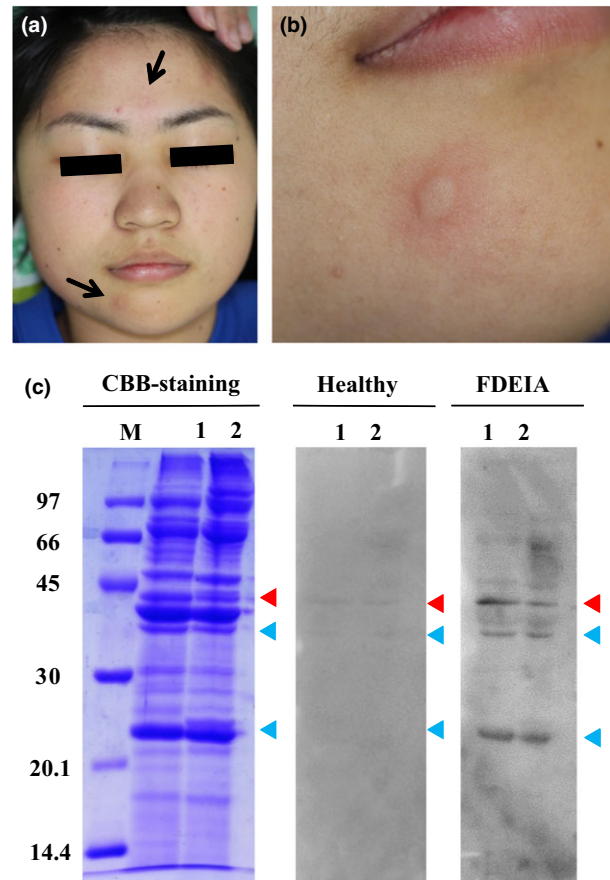


Figure 1. (a,b) Clinical features after combination challenge test with exercise, and ingestion of shrimp and aspirin. Erythematous wheal appeared on the (a) face and (b) jaw. (c) Results of protein extracts from shrimp were analyzed by sodium dodecylsulfate polyacrylamide gel electrophoresis (12.5%) and immunoblotting with mouse antihuman immunoglobulin (Ig)E antibody. Bands of 20 kDa, 36–38 kDa (blue arrowhead) and 43 kDa (red arrowhead) were detected in the FDEIA patient. M, molecular weight marker; lane 1, soluble protein from black tiger shrimp (*Marsupenaeus japonicus*); lane 2, soluble protein from white Pacific shrimp (*Litopenaeus vannamei*). Enhanced chemiluminescence exposure of two membranes with healthy control and FDEIA patient were performed at the same time. CBB, Coomassie Brilliant Blue.

Fructose 1,6-bisphosphate aldolase from *S. melanoto* shrimp is the first reported crustacean FBPA with an IgE-binding property. FBPA has previously been reported as an allergen in fish, *Forcipomyia taiwana*, *Anisakis* and fungi, and recently in *Manihot esculenta*. This protein is an important glycolytic enzyme. Thus, there is a possibility that the major allergen of FDEIA due to shrimp is the 43-kDa new antigen because of its high intensity band of immunoblotting and report by Gamez *et al.*⁵ This report suggests that the 43-kDa antigen is a new antigenic candidate in FDEIA due to shrimp; nevertheless, tropomyosin is a major antigen in general shrimp allergy.

CONFLICT OF INTEREST: None declared.

Hiroshi KIMURA,^{1,2} Maiko INAMI,^{1,3}
Yasuhito HAMAGUCHI,¹ Kazuhiko TAKEHARA,¹
Shiori AKIMOTO,⁴ Tomoharu YOKOOJI,⁴
Hiroaki MATSUO,⁴ Takashi MATSUSHITA¹ 

¹Department of Dermatology, Faculty of Medicine, Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University, Ishikawa,
²Department of Dermatology, Kaga Medical Center, Ishikawa, ³Department of Dermatology, Fukui Prefectural Hospital, Fukui, and ⁴Department of Pharmaceutical Services, Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

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