

Food-dependent Exercise-induced Anaphylaxis due to Ingestion of Orange

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Sir,

Food-dependent exercise-induced anaphylaxis (FDEIA) is an unusual clinical syndrome of immediate allergic reaction that requires both ingestion of an allergenic food and exercise to induce anaphylaxis (1). Since the first occurrence as a result of exercise and the ingestion of shellfish was published in 1979 (2), foods such as shrimp, shellfish, wheat, celery, tomato, nuts and fruits (including grapes and apples) have been reported in relation to FDEIA (1–5). However, citrus fruit such as orange has never been reported as a cause of FDEIA, although it is widely eaten throughout the world. We report the first case of exercise-induced anaphylaxis in association with ingestion of orange.

CASE REPORT

An 18-year-old Japanese woman was referred to our dermatology department with a history of recurrent redness and swelling of the face with irritation

accompanied by dyspnea and abdominal distress. The first attack was experienced in high school when she was 16 years. After eating lunch, she suddenly felt ill, developed redness on the face and collapsed. She recovered after drip infusion of medication. She did not remember what she ate or whether or not she had exercised before the attack. She experienced six additional attacks after eating certain foods and exercise in the following 2 years. No attack occurred without exercise.

She suffers from allergic rhinitis against cedar pollen, but has never developed cutaneous manifestations in association with nasal symptoms. She often takes citrus fruit, including *Citrus hassaku Hort.* and squeezed juice of *Citrus sudachi Hort.*, for breakfast without the occurrence of clinical symptoms.

Physical examination was normal. She had 0.7% eosinophils with white blood cell count of 4,400/mm³. The radio-immunosorbent test (RIST) for total IgE antibody was 189.0 IU/ml. The radio-allergosorbent

test (RAST) for antigen-specific IgE antibodies against orange was 0.83 U/ml (class 2), and 0.38 U/ml (class 1) against tomato and apple. An intradermal skin test with standard allergens (Torii, Japan) was positive only for cedar pollen – being negative for bread, wheat, yeast, shrimp, egg and cow milk. A prick test revealed positive reaction to orange flesh, orange juice and grapefruit juice.

Five series of provocation tests were performed. Exercise was loaded for 20 min according to Bruce's protocol (target heart rate=175 bpm) using the treadmill-ECG system, which can monitor heart rate, blood pressure and ECG to reduce the risk of anaphylactic shock. Exercise only, bread ingestion and orange ingestion, or bread ingestion followed by exercise did not induce any symptoms. However, after orange ingestion followed by exercise she developed redness and swelling on her face, and mild dyspnea and abdominal distress was felt 30 min after the exercise. Her plasma histamine level was elevated when she developed the symptom, as shown in (Fig. 1). We therefore diagnosed FDEIA due to orange ingestion.

DISCUSSION

FDEIA was first reported in 1979 (2), as a subtype of exercise-induced anaphylaxis, where the combination of food ingestion and exercise was required to cause anaphylactic symptoms. Cutaneous manifestations, pruritus, erythema and urticaria, may be followed by obstruction of the upper respiratory tract and gastrointestinal distress as well as occasional hypotension, loss of consciousness and anaphylactic shock (6). Precise information on FDEIA should therefore be made available especially to athletes, school teachers

and students who undertake exercise. Among the foods that have been reported to be associated with FDEIA (1–5), wheat is most frequently identified as a cause of FDEIA in Japan (5). We therefore suspected that wheat was the cause of our patient's symptoms. However, skin tests for wheat and bread were all negative and provocation to bread with exercise did not develop the symptom. On the other hand, she showed positive skin reactions to citrus fruit with the prick test, and developed all symptoms with ingesting orange followed by exercise. Moreover, her plasma histamine level was elevated along with the symptoms.

Various foods may cause type I hypersensitivity with manifestations such as urticaria, latex-fruit syndrome, oral allergy syndrome and FDEIA. Each disease tends to be associated with certain groups of foods: Fish, peanut, tree nuts, and cow's milk are the major antigens in acute urticaria (7, 8); banana, chestnut, buckwheat and avocado in latex-fruit syndrome (9); apple, peach and melon in oral allergy syndrome (10); and shrimp, wheat, celery and tomato in FDEIA (1–5). Although citrus fruits such as orange and lemon are popular and may be taken before exercise, rarely have they been reported as causative antigens.

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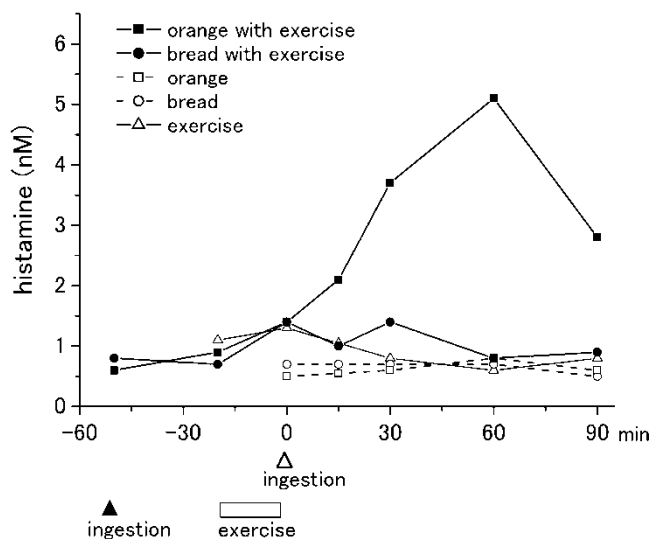


Fig. 1. Blood plasma histamine level was increased in parallel with the clinical manifestations after provocation with orange and exercise.