

# Food-dependent exercise-induced anaphylaxis

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## ABSTRACT

Food-dependent exercise-induced anaphylaxis (FDEIA) is a specific variant of exercise-induced anaphylaxis that requires both vigorous physical activity and the ingestion of specific foods within the preceding several hours. When patients present to the emergency department (ED) with allergic reactions, careful history regarding these 2 factors is required to establish the correct diagnosis. Correct diagnosis of FDEIA will allow patients to take control of their lifestyles and avert repeated events and ED visits. Two cases of FDEIA are presented, and the diagnosis, pathophysiology and therapy of food-dependent exercise-induced anaphylaxis are reviewed.

## RÉSUMÉ

L'anaphylaxie provoquée par l'exercice et l'ingestion alimentaire est une variante spécifique de l'anaphylaxie provoquée par l'exercice caractérisée par une activité physique vigoureuse accompagnée de l'ingestion d'aliments spécifiques au cours des quelques heures précédant l'exercice. Lorsque le patient se présente à l'urgence pour une réaction allergique, une anamnèse minutieuse concernant ces deux facteurs est nécessaire pour poser le bon diagnostic. Le diagnostic de réaction anaphylactique liée à l'exercice et à l'ingestion alimentaire permet aux patients de reprendre le contrôle de leur vie et d'éviter les récives et les visites à l'urgence. Nous présentons deux exemples d'une telle réaction. Le diagnostic, la physiopathologie et le traitement de cette entité sont passés en revue.

**Key words:** anaphylaxis, exercise, food

Food-dependent exercise-induced anaphylaxis (FDEIA) is a specific variant of exercise-induced anaphylaxis.<sup>1-3</sup> Urticaria, angioedema, upper respiratory obstruction and cardiovascular collapse can occur. Anaphylaxis only ensues after ingestion of a food allergen if this is followed by exercise or vigorous physical activity within hours of the ingestion. Neither the food allergen nor exercise alone can trigger the anaphylactic reaction.

FDEIA was first described in 1979<sup>4</sup> and reported in the literature in 1983.<sup>5</sup> We report 2 cases of FDEIA; both patients presented to the emergency department (ED) within 1 month and both had prior visits to the ED for allergic reactions. The diagnosis, pathophysiology and therapy of FDEIA are reviewed.

## Case 1

A 53-year-old woman presented to the ED with a pruritic erythematous rash. She had eaten a popular Middle Eastern staple, tabouleh (bulgur, parsley, carrots and celery). Approximately 2 hours later, while exercising, she developed a rash and became short of breath. She then used an epinephrine auto-injector that had been prescribed to her after a similar episode 2 months previously. She was on no medications and had no history of allergies. On examination, her blood pressure was 130/75 mm Hg, the oropharynx was normal, her chest was clear, and the skin was mildly erythematous. Diphenhydramine 50 mg was given orally, after which she was observed and subsequently discharged with a prescription for auto-injectable epinephrine

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and diphenhydramine. The diagnosis of FDEIA was strongly suspected, and she was cautioned not to exercise after consuming bulgur, parsley, carrots or celery.

Two months prior to this episode, she had been jogging and developed sudden onset of pruritis, swelling of her eyes and mild dyspnea. She immediately went to a physician's office, where she was given epinephrine 0.3 mg subcutaneously, diphenhydramine 50 mg intramuscularly, and transported to the ED via ambulance. She had normal vital signs, a slightly swollen uvula and mild facial swelling, but no wheezes. She received another 50 mg dose of oral diphenhydramine, was observed, and later discharged after recovering fully. The cause of this reaction was not clarified.

An allergy consultation was arranged after her second episode. Skin-prick testing revealed diagnostic reactions to parsley, celery and carrots, the common ingredients in tabouleh. Pulmonary function tests were normal. An exercise challenge test was not performed due to the risks of anaphylaxis in an office setting. The patient was advised of her diagnosis of FDEIA.

## Case 2

One hour after eating homemade spaghetti with vegetable sauce, a 28-year-old male played soccer and developed urticaria and lightheadedness. He attempted to drive himself to the hospital but, en route, felt much worse and pulled into a fire station for help. Paramedics found his pulse to be 80 beats/min, blood pressure 80/42 mm Hg, and respirations 24 breaths/min. They administered epinephrine 0.3 mg subcutaneously and 1 litre of normal saline, then transported him to the ED, where a repeat blood pressure was 130/85 mm Hg. At this time his chest was clear and his urticaria had improved, but his skin was still erythematous. Diphenhydramine 25 mg was given orally.

History revealed that he had eaten the same food on other occasions with no ill effects. He was on no medications but had allergies to soy, peanut butter, shellfish and sesame seed. He reported 2 previous episodes of lightheadedness and urticaria over a 2-year period, both involving vigorous activity

after eating. On both occasions he presented to the ED via ambulance and, on both occasions, paramedics administered oxygen, epinephrine and intravenous saline boluses. The diagnosis of FDEIA had not been entertained during either ED visit.

On the third visit, the patient was counselled about FDEIA, prescribed an epinephrine auto-injector, and referred to an allergist. Pulmonary function tests were normal, but skin-prick testing revealed a strong reaction to peanut antigen. A specific food-exercise challenge could have been performed to confirm the diagnosis of FDEIA; however it was not done because of the risk of anaphylaxis in an office setting. The patient was advised of the probability of peanut residues in the spaghetti and vegetable sauce, and told that exposure to this allergen followed by vigorous exercise had caused his anaphylactic reaction.

## Discussion

FDEIA was first recognized in 1979, and other cases have been reported since.<sup>4</sup> It is a variant of exercise-induced anaphylaxis that occurs in both adults<sup>6,7</sup> and children.<sup>8</sup> Anaphylaxis occurs only when the allergenic food ingestion is followed by exercise within a few hours.

The anaphylactic reaction is IgE mediated with mast-cell degranulation.<sup>3</sup> The specific mechanisms of FDEIA have yet to be elucidated; however, it is postulated that the food allergen and subsequent IgE response lowers the mast-cell release threshold. Exercise then triggers mast-cell degranulation and anaphylaxis.<sup>3</sup> FDEIA must be distinguished from 2 similar entities: cholinergic urticaria and exercise-induced anaphylaxis (Table 1).

### *Cholinergic urticaria*

Cholinergic urticaria presents as an urticarial rash that occurs in response to an elevation of body temperature.<sup>1,2,3,7</sup> This may occur because of active heat generation (i.e., exercise) or passive overheating (e.g., warm water bathing). Cholinergic urticaria is not usually associated with angioedema, bronchospasm or hypotension.<sup>2,3,7</sup>

**Table 1. Exercise-induced allergic syndromes**

	Cholinergic urticaria	EIA	FDEIA
Stimuli	Heat, stress, exercise	Exercise only	Food + exercise
Dermatologic effects	Urticaria (2–4 mm)	Urticaria (10–15 mm)	Urticaria (10–15 mm)
Vascular collapse	Rare	Yes	Yes
Respiratory effects	Rare	Laryngeal edema; bronchospasm	Laryngeal edema; bronchospasm
Reproducible by same stimuli?	Yes	Variable	Yes

EIA = Exercise-induced anaphylaxis; FDEIA = Food-dependent exercise-induced anaphylaxis

### Exercise-induced anaphylaxis

Exercise-induced anaphylaxis (EIA) results from exercise-related temperature elevation independent of food intake.<sup>1,2,3,7</sup> It is associated with other atopic disorders such as seasonal rhinitis, eczema and asthma.<sup>9</sup> EIA is episodic, and the attack frequency tends to stabilize or decrease over time. In EIA, exercise is not always problematic and a particular degree of exertion does not reproducibly trigger anaphylaxis,<sup>10</sup> but patients often curtail their physical activity when given this diagnosis.

### Food-dependent exercise-induced anaphylaxis

FDEIA requires both the ingestion of specific foods and vigorous physical activity within several hours of ingestion. Skin-prick testing may identify solitary or multiple food allergens that trigger EIA.<sup>2,3,11,12</sup> Food triggers most often implicated in FDEIA are shellfish, alcohol, tomatoes, cheese, celery, strawberries, milk, wheat products and peaches.<sup>9</sup> In FDEIA, reaction severity ranges from urticaria to cardiovascular collapse, and severity may depend on the amount of allergen ingested.<sup>13</sup> The relationship of both food and exercise is usually evident on careful history-taking. FDEIA may be confirmed by subjecting the patient to an exercise challenge after ingestion of the identified food allergen,<sup>11,10,14</sup> but the need for diagnostic certainty must be weighed against the risk of inducing anaphylaxis. Given the history in these 2 patients and extensive literature on FDEIA, it was felt that exercise challenge tests were not warranted.

Epinephrine is the mainstay of treatment for anaphylaxis — including that associated with FDEIA. H<sub>1</sub> antagonists and salbutamol are secondary agents, and combined H<sub>1</sub>-H<sub>2</sub> antagonist therapy may improve symptom relief.<sup>15</sup> The role of corticosteroids in anaphylaxis remains unclear, but corticosteroids may help prevent biphasic reactions and may help in severe episodes, particularly those requiring resuscitation and intubation.<sup>1-3</sup>

Emergency physicians should enquire about vigorous exercise within 6 hours of eating in all patients who present with severe allergic reactions. If FDEIA is suspected, consultation with an allergist should be arranged. In the interim, patients should be counselled not to exercise for 6 hours following eating<sup>1,11,10</sup> and instructed to carry antihistamines and auto-injectable epinephrine when performing vigorous activity. If patients are known to have FDEIA as opposed to EIA, prescribed or self-imposed physical activity limitations may be more specific and less severe.

### Conclusion

Emergency physicians should consider FDEIA, EIA and

cholinergic urticaria in patients presenting with allergic reactions. Patients with FDEIA should avoid exercise or vigorous activity for at least 6 hours after eating until the specific food precipitants can be identified. Patients should avoid exercising alone and should carry prescribed auto-injectable epinephrine and antihistamines for emergency situations.

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