

A Case of Mite-Ingestion-Associated Exercise-Induced Anaphylaxis Mimicking Wheat-Dependent Exercise-Induced Anaphylaxis

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Established Facts

- Oral mite anaphylaxis is a unique food allergy that is characterized by severe allergic reactions occurring after consuming foods prepared with mite-contaminated wheat flour, such as pancakes.
- Wheat is an allergen that can cause food-associated exercise-induced anaphylaxis.

Novel Insights

- In most cases, oral mite anaphylaxis symptoms develop immediately after eating mite-contaminated foods, but they can occur during physical exercise after the oral ingestion of the mites.
- The possibility of mite-ingestion-associated exercise-induced anaphylaxis should be eliminated when making a diagnosis of wheat-dependent exercise-induced anaphylaxis.

Key Words

Exercise-induced anaphylaxis · Food allergy · Mite allergy

Abstract

We present a case of mite-ingestion-associated exercise-induced anaphylaxis mimicking wheat-dependent exercise-induced anaphylaxis (WDEIA). A 17-year-old boy was referred for an episode of anaphylaxis while jogging, 1.5 h after having eaten okonomiyaki (a Japanese pancake). Laboratory measures revealed a slightly elevated specific immunoglobulin E (IgE) antibody against omega-5 gliadin (0.41 kU_A/l) and a marked elevation of specific IgE antibody against house-dust

mite, *Dermatophagoides farinae* (142 kU_A/l). A detailed interview revealed that, in spite of the referring doctor's advice to discontinue postprandial exercises, he continued his jogging routine after consuming foods containing wheat and also that his younger brother, who had mild intermittent asthma, had suffered a mild asthma attack 2 h after eating the same food. We therefore examined the okonomiyaki mix, which had been stored for several months after opening the package until this episode, under a microscope, and we found an abundant number of live mites, *D. farinae*. Finally, a diagnosis of mite-ingestion-associated exercise-induced anaphylaxis was made. This clinical entity should be excluded when making a diagnosis of WDEIA.

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Introduction

Oral mite anaphylaxis is a unique food allergy that is characterized by severe allergic reactions which occur after consuming foods prepared with mite-contaminated wheat flour, such as pancakes [1]. Although in the majority of cases, symptoms develop immediately after eating mite-contaminated foods, they can occur during physical exercise after the oral ingestion of the mites [2]. Wheat is also an important allergen that induces food-dependent exercise-induced anaphylaxis [3]. Therefore, differential diagnosis between these two entities is important.

Case Report

A 17-year-old boy was referred to our hospital with the diagnosis of wheat-dependent exercise-induced anaphylaxis (WDEIA). The patient had suffered from anaphylaxis during his jogging routine after his evening meal. That evening he had consumed okonomiyaki, a Japanese pancake containing cheese and pork, as a part of his evening meal with his mother and younger brother. The family had also eaten dried squid and rice porridge containing wheat noodles and soy curd. One and a half hours later, the patient went jogging. After running for several minutes, he experienced abdominal cramps and rushed home. At home, he began to complain of dyspnea, and his mother noticed swelling of both his eyelids and generalized urticaria. The patient was taken to the hospital in an ambulance. In the emergency room, his oxygen saturation level was below 80%. The patient recovered without any consequences after treatment with beta-agonist inhalations and intravenous corticosteroid infusion. Laboratory measures revealed that his total serum immunoglobulin E (IgE) level was 1,008 IU/ml. Specific IgE antibodies against *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae* were highly elevated, but antibodies against other mites were only slightly elevated (table 1). Although specific IgE antibody against omega-5 gliadin, the major allergen involved in WDEIA [3], was slightly elevated, there was no increase in specific IgE antibodies against wheat and gluten. The patient had no history of food allergies or exercise-induced anaphylaxis. Until the age of 6 years, he had experienced recurrent wheezing episodes. After this time, he had been free of asthmatic symptoms even during and following physical exercise.

The patient was referred to our hospital for management of WDEIA. A detailed interview revealed that he continued his jogging routine after consuming foods containing wheat, despite the referring doctor's advice to discontinue postprandial exercises. Furthermore, it was revealed that his younger brother, who had mild intermittent asthma but who had not had asthma symptoms in the last 3 years, had developed wheezing and mild dyspnea 2 h after eating the same food. The younger brother did not perform any physical exercise after the meal, and his symptoms were limited to the respiratory complaints. The patient's mother had also eaten the same foods but did not develop any symptoms. We microscopically examined the okonomiyaki mix, which, before the episode, had been stored at room temperature for several months after being opened. We found an abundant number of live mites

Table 1. Allergic evaluation

Allergen	Specific IgE Titer, kU _A /l
Mites	
<i>Dermatophagoides farinae</i>	142.00
<i>Dermatophagoides pteronyssinus</i>	179.00
<i>Glycyphagus destructor</i>	9.96
<i>Tyrophagus putrescentiae</i>	5.22
<i>Acarus siro</i>	2.42
Foods	
Wheat	<0.35
Gluten	<0.35
Omega-5 gliadin	0.41
Squid	<0.35

in different stages of development. The mites were identified as *D. farinae*, and the concentration was approximately 9,000 mites per 0.5 g of wheat. Finally, a diagnosis of mite-ingestion-associated exercise-induced anaphylaxis was made.

Discussion

In this report, we present a case of mite-ingestion-associated exercise-induced anaphylaxis that mimicked WDEIA. It is known that the oral ingestion of mites can cause immediate allergic reactions and that in most cases, symptoms developed immediately after ingesting foods prepared with wheat flour contaminated with dust mites [1]. However, in this case, severe allergic symptoms occurred while jogging 1.5 h after the consumption of mite-contaminated foods. This clinical pattern is rare. To the best of our knowledge, there is only one case report describing this clinical pattern: a 16-year-old girl who developed anaphylaxis while playing soccer after eating pancakes contaminated with the mite, *Suidasia medanensis* [2].

Wheat is also an important allergen that is related to food-dependent exercise-induced anaphylaxis [3]. In patients with WDEIA, neither wheat intake alone nor physical exercise alone induces any symptoms, but the ingestion of wheat before exercise can trigger severe allergic symptoms. The major wheat allergen in WDEIA has been identified as omega-5 gliadin [4], and measuring the serum level of specific IgE antibody against omega-5 gliadin has been reported to be useful for identifying patients with WDEIA [3, 5]. Matsuo et al. [6] reported that the sensitivity and specificity of the test were 80 and 68%, respectively, when the cut-off value was set at 0.35 kU_A/l.

Based on the clinical features of our patient, which were similar to those of WDEIA, and the detection of omega-5 gliadin-specific IgE antibody, it was logical for the referring doctor to make the diagnosis of WDEIA.

Although an exercise provocation test after having wheat-containing food was not conducted, the fact that the patient continued his jogging routine after consuming foods containing wheat even after the episode caused us to exclude the diagnosis of WDEIA. We suspect that the slightly elevated omega-5 gliadin-specific IgE antibody level may have been due to the patient's atopic status; it has been shown that omega-5 gliadin-specific IgE antibodies are detected in certain atopic subjects without WDEIA [5, 6]. Along with the fact that the patient's younger asthmatic brother developed wheezing and mild dyspnea 2 h after eating the same food, we suspected an oral mite allergy and identified an abundant number of live mites in the okonomiyaki mix. The mites were identified as *D. farinae*, a species that is often found in wheat flour [1]. Matsumoto et al. [7] reported 2 Japanese cases of oral mite anaphylaxis that resulted from consuming foods prepared with wheat flour contaminated with *D. farinae*. Matsumoto and Satoh [8] evaluated the occurrence of mite contamination in packages of wheat flour in Japanese houses; *D. farinae* was found in 7 of 74 packages that had been kept in the cupboard after opening [8].

An oral provocation test with the remaining flour was not conducted because the previous anaphylactic reaction had been life-threatening, but the ingestion of a high amount of the mite allergen almost certainly induced the allergic symptoms in both of the brothers. Their clinical features differed, however; our patient developed anaphylaxis while jogging after the meal while his younger brother complained of only mild asthma symptoms and did not perform any exercise. There is a possibility that the physical exercise was a factor that enhanced the severity of the oral mite allergy. However, according to Sanchez-Borges et al. [1], this case may be an example of a new clinical entity, mite-ingestion-associated exercise-induced anaphylaxis.

This case report demonstrates that the clinical entity of mite-ingestion-associated exercise-induced anaphylaxis should be eliminated as a possibility when making the diagnosis of WDEIA. Further studies are warranted to evaluate the mechanisms by which exercise elicits allergic symptoms after the oral ingestion of mites.

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