
Case report

Systemic anaphylaxis after the ingestion of pancake contaminated with the storage mite *Blomia freemani*

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Background: Systemic anaphylaxis after the ingestion of mite-contaminated food has rarely been reported.

Objective: To describe an 8-year-old boy in whom systemic anaphylaxis developed shortly after the ingestion of pancakes prepared with commercial pancake flour.

Methods: The patient underwent skin prick testing for house dust mites and with uncontaminated and mite-contaminated pancake flour. Specific IgE for mites and the main ingredients of the pancake flour were also evaluated, with titers for Der p 1, Der f 1, and Blo t 5 quantitated using immunochemical methods. A sample of pancake flour was examined microscopically for mites.

Results: The patient had positive skin prick test results to contaminated pancake flour extract (1 g/5 mL), *Dermatophagoides pteronyssinus*, and *Dermatophagoides farinae* but a negative skin test response to uncontaminated pancake flour. The patient's serum specific IgE analysis was positive for antibodies to dust and storage mite allergens. There was no response, however, to the main ingredients of the pancake mix. Microscopic examination of the pancake flour revealed the storage mite *Blomia freemani*. Using an immunochemical assay, we found that the contaminated flour contained 5.4 µg/g of the allergen Blo t 5 but no Der p 1 or Der f 1.

Conclusions: This patient's anaphylactic episode was the result of ingestion of the storage mite *B freemani*. To our knowledge, this is the first reported systemic hypersensitivity reaction caused by this mite anywhere in the world.

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INTRODUCTION

All mites can broadly be categorized as pyroglyphid mites, referred to as house dust mites, or nonpyroglyphid mites, referred to as storage mites. Allergy to storage mites was first report by Cuthbert et al¹ in Scottish farmworkers exposed to hay and grain used for feeding cattle wintered indoors. Spieksma and Spieksma-Boezeman² indicated that sensitivity to storage mites is an occupational hazard in farming environments and for people living in damp houses. Systemic anaphylaxis after eating storage mite-contaminated food has been reported.^{3–6} In this article, we describe systemic anaphylaxis in a child after eating pancake flour contaminated by a species of storage mite, *Blomia freemani*, in Taiwan.

CASE REPORT

An 8-year-old boy visited the emergency department complaining of dyspnea, a generalized pruritic rash, and a swollen face. Physical examination revealed expiratory wheezing with subcostal retractions, diffuse erythema, and facial angioedema. Five minutes after an epinephrine injection, his blood pressure was 106/60 mm Hg, his heart rate was 131/min, and his arterial oxygen saturation was 85% as measured using a pulse oximeter. Treatment included epinephrine, methylprednisolone, diphenhydramine, and inhaled fenoterol by nebulizer. The patient's symptoms gradually subsided in more than 4 hours. On questioning, the patient stated that the reaction had started approximately 30 minutes after eating pancakes made by his grandfather. The commercial pancake flour used had been purchased 1 year earlier and opened once, the remainder being left in a plastic box until being used on the day of the child's reaction.

The patient's grandfather brought the remaining flour to the clinic. Direct light microscopic examination of the flour using a low-power field (10×) revealed numerous crawling and dead mites. Mite specimens were collected using a clean and thin plastic dish. Then, the mites were mounted with a drop of Hoyer medium on a microscope slide and sealed with

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a coverslip. After clarifying at 45°C, the mounted specimens were examined using a microscope. Male and female mites had densely pectinate setae standing away from the body. The 2 pairs of verticals (vertical internal and vertical external) arose together and extended forward almost to the tips of the chelicerae, vertical internal being posterior to vertical external. The genital opening was between coxa IV. In female mites, the bursa copulatrix was a long thin tube with a cleft end. Based on these characteristics, this mite was identified as *B freemani*, as previously demonstrated and described by Hughes.⁷ An unopened box of pancake flour was obtained from the same source as the original box. Direct microscopic examination of this product revealed no mites.

Mite-infested and noninfested pancake flour samples diluted in a ratio of 1:5 (wt/vol) in isotonic sodium chloride solution were used for skin testing according to the methods of Sanchez-Borges et al.⁵ Skin prick testing was performed on the patient's forearm, and the results were read after 15 minutes. The reaction was considered positive if a wheal developed that was at least 3 mm greater than that produced by the saline control. The test materials consisted of a commercial panel of aeroallergens (ALK-Abello Co, Hoersholm, Denmark), including *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*, the supernatants from the infested and noninfested pancake flour extracts, and histamine hydrochloride (1 g/mL) and isotonic sodium chloride solution as controls. The patient had positive reactions to dust mites and to the infested pancake flour extract (Table 1). There was no reaction to the noninfested flour.

A sample of the patient's serum was tested for specific IgE to wheat, milk, egg white, *D pteronyssinus*, *D farinae*, and various storage mites using the CAP System (Pharmacia, Uppsala, Sweden). Serum specific IgE was titrated by means of a fluoroenzyme immunoassay using a CAP kit (Pharmacia). The patient had specific IgE to house dust mites and storage mites but not to the ingredients of the pancake flour (Table 2).

We assayed mite-infested flour for Blo t 5, Der p 1, and Der f 1 antigens by means of enzyme-linked immunosorbent assay (ELISA) (Indoor Biotechnologies, Cardiff, England).^{8,9} Anti-Blo t 5 monoclonal antibody was supplied as a high-performance liquid chromatography-purified stock solution at a concentration of 5 mg/mL in phosphate-buffered saline (PBS). Polystyrene microtiter wells were coated with 100 µL of diluted anti-Blo t 5 monoclonal antibody (200 µL/10 mL) per well. After overnight incubation at 4°C, the wells were

Table 2. Total and Specific IgE Levels

IgE type	Level
Total serum IgE, IU/mL	3,310
Specific IgE, KU/L	
Egg white	<0.35
Wheat	<0.35
Milk	<0.35
<i>Dermatophagoides pteronyssinus</i>	>100
<i>Dermatophagoides farinae</i>	>100
<i>Dermatophagoides microceras</i>	>100
<i>Lepidoglyphus destructor</i>	19.1
<i>Tyrophagus putrescentiae</i>	61.9
<i>Blomia tropicalis</i>	88.4
<i>Acarus siro</i>	70.0
<i>Euroglyphus maynei</i>	19.4
<i>Glyphus domesticus</i>	6.13

washed with PBS containing 0.05% Tween 20 (PBS-T) (pH 7.4). Extracts of the infested and noninfested flour, as well as double-diluted standard Blo t 5, Der p 1, and Der f 1 allergens (Indoor Biotechnologies), each in a volume of 100 µL, were added to the antibody-coated wells. After incubation for 1 hour at room temperature, the wells were washed with PBS-T, and 100 µL of diluted biotinylated anti-Blo t 5 monoclonal antibody and biotinylated anti-group 1 monoclonal antibody were added. After incubation again for 1 hour at room temperature, the wells were washed, followed by the addition of 100 µL of diluted streptavidin-peroxidase and incubation for 30 minutes at room temperature. Finally, the wells were washed again with PBS-T, and the assays were developed by adding 100 µL of 1-mmol/L 2,2-azino-di-(3 ethylbenzthiazoline sulfonic acid) in 70-mmol/L citrate phosphate buffer. The plates were read when the optical density at 405 nm reached 2.0 to 2.4. The infested pancake flour sample contained 5.4 µg of Blo t 5 allergen per gram of flour. No Der p 1 or Der f 1 was present on ELISA.

To further investigate the prevalence of mite contamination, we collected samples from 51 opened flour products stored in homes in Taipei. The packages had been opened for periods ranging from 1 week to 2 years. Direct microscopic examination revealed mature mites in 4 (13%) of 31 flour samples from packages opened 3 months to 1 year earlier. The mite species of these 4 flour samples were *D pteronyssinus* and *D farinae*. No mites were found in 20 samples from packages that had been opened for less than 3 months. The ELISA also showed the same results as revealed by microscopic examination.

DISCUSSION

In 1993, Erben et al¹⁰ described a 48-year-old man who developed systemic anaphylaxis after eating beignets contaminated with *D farinae*. Since this first report, there have been several published reports of the ingestion of dust- or storage mite-infested foods inducing anaphylaxis in patients with a history of mite sensitivity.³⁻⁶ Herein we report anaphylaxis

Table 1. Results of Skin Prick Tests

	Wheal, mm	Erythema, mm
Isotonic sodium chloride	0	3
Histamine	3	5
Infested pancake flour	8	13
Noninfested pancake flour	0	3
<i>Dermatophagoides pteronyssinus</i>	14	20
<i>Dermatophagoides farinae</i>	12	15

after the ingestion of pancakes made with flour containing *B freemani*. The commercial pancake flour used had been opened and put in an old plastic candy box in the kitchen for 1 year. We believe that the pancake flour was contaminated in this plastic candy box.

The patient had a positive skin prick test reaction to the infested flour but not to similar noninfested flour. The patient also underwent skin prick testing with a commercial glycerosaline solution (ALK-Abello Co) at the same time. The results of skin prick testing with glycerosaline and isotonic sodium chloride solution were also identical. Because isotonic sodium chloride is a nonallergenic solution and was used to prepare the suspension for pancake flour in the skin test, we adopted isotonic sodium chloride solution as the negative control for skin testing in this study.

The patient's serum contained specific IgE to *Blomia tropicalis*, and the infested pancake mix had 5.4 µg of Blo t 5 allergen per gram of flour. Because the mite was identified on microscopic examination as *B freemani*, we believe that the allergen to which the patient reacted was actually from that organism, which likely has cross-reactivity with *B tropicalis*. This cross-reactivity is a matter of speculation, however, because, to our knowledge, no studies have actually demonstrated it.

To our knowledge, there have been no previous reports of anaphylaxis or allergy to *B freemani*. The literature on this organism is limited.^{7,11} Lai¹¹ collected 1,497 dust samples from houses in Guangzhou, China, and found that 1,255 samples (83.8%) contained mites. The predominant species were *D pteronyssinus*, *D farinae*, and *B freemani*. The latitude and climates of Taipei and Guangzhou are similar. Therefore, we suspect that *B freemani* may also be widely present in Taipei.

Matsumoto et al⁶ examined 30 random flour samples from homes in Kumamoto, Japan, and found microscopic evidence of mites in 4 (13%). The packages had been opened for 2 to 11 weeks. Regardless of the organism involved, our investigation of flour products in Taipei demonstrated mite infestation in some opened packages, specifically those that had been open for more than 3 months. One hopes that a properly sealed container would prevent the entry of mites. Matsumoto et al⁶ suggested that mite-sensitive patients be advised to store flour products in firmly sealed containers in the refrigerator. It may well be that some cases of food allergy in

tropical environments are actually due to mite sensitivity rather than to sensitization to the food ingredients themselves. This may occur more often than is recognized because of the failure to test appropriately for specific allergens.⁵

REFERENCES

1. Cuthbert OD, Brostoff J, Wraith DG, et al. Barn allergy: asthma and rhinitis due to storage mite. *Clin allergy*. 1979;9:229–236.
2. Spieksma FT, Spieksma-Boezeman MI. The mite fauna of house dust with particular reference to the house-dust mite *Dermatophagoides pteronyssinus* (Trouessart, 1897) (Psoroptidae: Sarcoptiformes). *Acarologia*. 1967;9:226–241.
3. Matsumoto T, Hisano T, Hamaguchi M, Miike T. Systemic anaphylaxis after eating storage-mite-contaminated food. *Int Arch Allergy Immunol*. 1996;109:197–200.
4. Spiegel WA, Anolik R, Jakabovics E, Arlian LG. Anaphylaxis associated with dust mite ingestion [abstract]. *Ann Allergy Asthma Immunol*. 1995;74:56.
5. Sanchez-Borges M, Capriles-Hulett A, Fernandez-Caldas E, et al. Mite-contaminated foods as a cause of anaphylaxis. *J Allergy Clin Immunol*. 1997;99(pt 1):738–743.
6. Matsumoto T, Goto Y, Miike T. Anaphylaxis to mite-contaminated flour [letter]. *Allergy*. 2001;56:247.
7. Hughes AM. *The Mites of Storage Food and Houses*. London, England: Karger Publishers; 1976:161–165.
8. Vailes LD, Rizzo MC, Nasipitz CK, et al. Analysis of IgE antibody responses to *D. pteronyssinus* and *Blomia tropicalis* using recombinant group 5 allergens [abstract]. *J Allergy Clin Immunol*. 1996;97:213.
9. Arruda LK, Vailes LD, Platts-Mills TAE, et al. Sensitization to *Blomia tropicalis* in patients with asthma and identification of allergen Blo t 5. *Am J Respir Crit Care Med*. 1997;155:343–350.
10. Erben AM, Rodriguez JL, McCullough J, Ownby DR. Anaphylaxis after ingestion of beignets contaminated with *Dermatophagoides farinae*. *J Allergy Clin Immunol*. 1993;92:846–849.
11. Lai NK. Study of dust mite allergy in the Guangzhou area [in Chinese]. *Zhonghua Yu Fang Yi Xue Za Zhi*. 1988;22:347–349.

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