Anaphylaxis from ingestion of mites: Pancake anaphylaxis

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Oral mite anaphylaxis is a new syndrome characterized by severe allergic symptoms occurring immediately after eating foods made with mite-contaminated wheat flour. This syndrome, which is more prevalent in tropical environments, is triggered more often by pancakes, and for that reason, it has been designated "the pancake syndrome." Because cooked foods are able to induce the symptoms, it has been suggested that thermoresistant allergens are involved in its pathogenesis. A variety of this syndrome can occur during physical exercise (dust mite ingestion–associated exercise-induced anaphylaxis). (J Allergy Clin Immunol 2013;131:31-5.)

Key words: *Anaphylaxis, exercise-induced anaphylaxis, food allergy, IgE, mites*

In our new mini-series, "Allergy and clinical immunology around the world," we ask experts from different parts of the world to tell us about issues that are of particular interest in their regions, reflecting either distinctive diseases or unique approaches to common problems.

Domestic mites have been recognized as the most important allergenic source responsible for highly prevalent allergic diseases, such as asthma, rhinitis, and atopic dermatitis.[1] Since 1982, our group observed a number of atopic patients with severe allergic symptoms immediately after eating foods prepared with wheat flour contaminated with mites. This new syndrome has been designated oral mite anaphylaxis (OMA) or "pancake syndrome." In this article we summarize the clinical and experimental observations on this allergic disorder that have been published since 1993. Interestingly, in 1963, Herranz[2] reported the case of a 56-year-old man who died after a massive ingestion of mites contained in a pap (soft semiliquid food, usually mashed or pulped, especially for babies or sick people) made with milk and wheat flour. Autopsy revealed intense bowel irritation and disseminated granulomas in multiple organs, and *Tyroglyphus farinae* mites were present in stools and the gut.

Although most cases of OMA have been reported from countries located in tropical areas of the world, new patients from more temperate regions are being increasingly observed, especially in North America (see below). Because most patients with OMA might not be properly managed, clinicians around the world should be aware of this clinical picture and be ready to recognize, treat, and prevent the occurrence of this life-threatening condition. Further investigations on this syndrome could provide new research directions for a better understanding of the basic mechanisms of allergic inflammation and hopefully for new therapeutic strategies for allergic diseases.

Abbreviations used
NSAID: Nonsteroidal anti-inflammatory drug
OMA: Oral mite anaphylaxis

OMA

Various contaminants with pathogenic potential are often present in food. Among them, the most frequent are microorganisms (bacteria, viruses, and parasites), toxins, chemical substances, food additives (dyes, sulfites, and benzoic acid), allergens from other foods, cross-reacting allergens from pollens and latex, and drugs (penicillin).

In 1995, the first 2 cases of systemic reactions induced by the ingestion of beignets contaminated with mites were reported in Detroit and Philadelphia. These 2 patients ingested beignets prepared with a beignet mix mailed from New Orleans.[3,4] After those initial cases, a number of patients with this clinical picture have been described in different parts of the world, including North America, South America, Asia, and Europe (Table I[3-20]). In addition to the list of cases included in Table I, we are aware of unpublished cases in other locations, including the Dominican Republic, Peru, Colombia, Israel, and New Zealand. Only 2 small series of patients from Caracas, Venezuela, and the Canary Islands, Spain, have been reported.[7,8]

In general, most cases have been observed in tropical and subtropical locations in which climatic conditions, especially high temperature and relative humidity, are favorable for mite proliferation in the food. Outside the intertropical region, there are only 2 cases, one in Porto Alegre, Brazil, and one in Massachusetts in the United States (Fig 1).[9,13] Sometimes the contaminated flour has been transported from distant locations (eg, patients with OMA seen in Detroit or Philadelphia). This syndrome frequently goes unnoticed or is wrongly confused with allergy to wheat, and quite often, allergologic evaluation is not requested.

Most publications are on isolated case reports and small series of patients. Major differences between the reports in the literature are related to the number of patients studied, geographic setting, and mite species involved. The clinical picture and induction by mite-contaminated food prepared with wheat flour are common to

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Disclosure of potential conflict of interest: M. Sanchez-Borges is on the board for the World Allergy Organization. The rest of the authors declare that they have no relevant conflicts of interest.

Received for publication June 15, 2012; revised September 17, 2012; accepted for publication September 26, 2012.

Available online November 13, 2012.

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0091-6749/$36.00

http://dx.doi.org/10.1016/j.jaci.2012.09.026

TABLE I. Published cases of OMA until May 31, 2012 (n = 135)

Author (year)	No.	Age (y)	Sex (M/F)	Location	Foods	Mites	NSAID hypersensitivity
Erben et al (1993)[3]	1	48	1/0	Detroit (United States)	Beignets	*Dermatophagoides farinae*	No
Spiegel et al (1994)[4]	1	17	0/1	Philadelphia (United States)	Beignets	*Dermatophagoides farinae*	No
Skoda-Smith et al (1996)[5]	1	14	1/0	Birmingham (United States)	Pizza dough	*Dermatophagoides farinae*	Family history
Matsumoto et al (1996)[6]	2	11, 14	1/1	Kumamoto (Japan)	"Okonomi-yaki"	*Tyrophagus putrescientiae*	No
Blanco et al (1997)[7]	16	13-38	4/12	Canary Islands (Spain)	Various	*Dermatophagoides farinae* *Tyrophagus entomophagus*	14 (87%)
Sánchez-Borges et al (1997)[8]	31	13-45	14/17	Caracas (Venezuela)	Various	*Dermatophagoides farinae* *Suidasia* species *Aleuroglyphus ovatus*	20 (66%)
Guerra-Bernd et al (2001)[9]	1	18	0/1	Porto Alegre (Brazil)	Polenta	*Tyrophagus* species *Dermatophagoides farinae* *Dermatophagoides pteronyssinus*	Yes
DeMerrell et al (2004)[10]	1	11	1/0	New Orleans (United States)	Beignets	*Dermatophagoides pteronyssinus*	No
Ott (2004)[11]	1	54	0/1	Minnesota (United States)	Pancakes	*Dermatophagoides pteronyssinus* (?)	No
Wen et al (2005)[12]	1	8	1/0	Taipei (Taiwan)	Pancakes	*Blomia freemani*	No
Miller and Hannaway (2007)[13]	1	52	0/1	Massachusetts (United States)	Pancakes	*Dermatophagoides farinae*	No
Tay et al (2008)[14]	2	15, 30	0/2	Singapore	Wheat flour–coated fish, scones	*Dermatophagoides farinae*	Yes
Iglesias-Souto et al (2009)[15]	1	13	1/0	Canary Islands (Spain)	Pancake	*Tyrophagus entomophagus*	Yes
Geller (2009)[16]	1	36	0/1	Rio de Janeiro (Brazil)	Pancake	*Aleuroglyphus ovatus*	Yes
Sánchez-Machín et al (2010)[17]	42	11-57	21/21	Canary Islands (Spain)	Pancakes	*Tyrophagus entomophagus*	21 (50%)
Barrera et al (2011)[18]	1	22	1/0	Panama	Pancakes	*Blomia tropicalis* *Dermatophagoides pteronyssinus*	No
Takahashi et al (2011)[19]	30	NA	NA	Japan	"Okonomi-yaki" "Takoyaki"	*Tyrophagus putrescientiae* *Dermatophagoides pteronyssinus* *Dermatophagoides farinae*	No
Posthumus and Borish (2012)[20]	1	71	1/0	Charlottesville (United States)	Grits	*Dermatophagoides farinae*	No

Modified with permission from Sánchez-Borges et al.[27] Fifty-nine (43.7%) of 135 subjects had hypersensitivity to NSAIDs.
F, Female; *M*, male; *NA*, not available.

all the reports (Table I). Contamination of wheat flour with mites can occur in locations other than the tropics. Also, a patient with OMA after eating grits contaminated with *Dermatophagoides farinae* (purchased in South Carolina) was reported recently from Charlottesville, Virginia.[20]

CLINICAL PICTURE

The clinical data in our first 30 patients with OMA are summarized in Table II. Most patients are adolescents and young adults, and there is no predominance of sex. All of them have a previous history of atopic disease, more often rhinitis, asthma, or both. Symptoms typically begin within the first 10 to 45 minutes after the meal, but in 1 patient they occurred after 240 minutes. Pancake syndrome also occurs in children.[21]

Outstanding symptoms are dyspnea, face and laryngeal angioedema, wheezing, and other upper and lower airway manifestations. Acute respiratory failure, requiring transfer to the intensive care unit and intubation, has occurred in some patients (≥4 in our centers). Two deaths associated with the ingestion of foods contaminated with mites have been reported in the literature.[22,23] We also described the case of a 16-year-old girl with OMA while playing soccer after eating pancakes contaminated with the mite *Suidasia medanensis*. This clinical pattern has been designated dust mite ingestion–associated exercise-induced anaphylaxis.[24]

CAUSE AND PATHOGENESIS

Foods prepared with wheat flour, most commonly pancakes, are involved in the induction of OMA (Table II). In the literature there are reports of OMA associated with beignets and "okonomi-yaki" (bonito and mackerel covered with flour). The species name *D farinae* originates from the observation that this mite was found in flour ("farina" in Latin). Other foods that more likely can be contaminated with mites are cheese, ham, chorizo, and salami. Because the clinical picture appears after consuming heat-treated meals, skin tests were performed with unheated and heated mite-contaminated flour extracts in subjects with mite allergy. After heating, skin prick testing with the flour extract resulted in a reduced but persistently positive wheal-and-flare response. These results suggest that mite group 2 (thermoresistant allergens) is probably involved in the production of OMA because group 1 allergens are heat labile.[25] In agreement with this hypothesis, we did not find Der p 1 or