

CASE REPORT

Wheat-Induced Anaphylaxis

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Allergic reactions to foods are common among children and young adults. They can either be confined to a single organ system such as to the gastrointestinal tract (vomiting, diarrhea), the cutaneous system (urticaria and angioedema), the respiratory system (rhinorrhea and asthma) or can occur as a generalized systemic reaction (systemic anaphylaxis with hypotension and shock). Although food-induced anaphylaxis is an uncommon event, the syndrome has been fully described¹ and fatal cases have been reported.² Examples of food antigens that have been implicated in causing food-induced anaphylaxis included egg, milk, chocolate, barley, rice, citrus, soybeans, and nuts.^{3,4} Anaphylaxis due to wheat protein, however, is uncommon particularly among individuals beyond the infantile age range. We reported here a case of near fatal anaphylaxis in an adolescent boy after ingesting wheat flour containing foods.

CASE REPORT

VS is a 13 year old male Thai patient seen at the Pediatrics Allergy Clinic, Siriraj Hospital, Bangkok, Thailand. VS has a history of gene-

SUMMARY A 13 year old boy suffered two separate episodes of severe anaphylaxis after consuming sandwiches and a piece of bread. Prick skin testings with available food allergens only revealed a positive reaction to a 1:10 w/v of wheat flour extract. A diagnosis of wheat-induced anaphylaxis was made and a double blind food challenge was suggested however was declined by the family. The patient was instructed to avoid all wheat containing foods and to carry a kit containing an epinephrine pre-loaded syringe and an antihistamine tablet to be used in the event of inadvertent consumption with an instruction to seek medical assistance as soon as possible. Thus far, no further recurrence of anaphylaxis was encountered. A review of the current literature discloses that wheat-induced anaphylaxis is an uncommon event and could occur either immediately after the ingestion or with a concomitant exercise. The natural history of wheat allergy is currently not fully understood but may possibly be a life long event.

ralized pruritic, urticarial rash occurring within 15 minutes after consuming 5 hot dog sandwiches at age 10. The rash spontaneously faded away within 40 minutes, but soon after, he developed swellings of both eye lids, profuse sweating, vomiting, and inability to breathe with a fainting episode necessitating a visit to a nearby emergency room where doses of epinephrine and bronchodilators were given for the diagnosis of anaphylaxis. He recovered uneventfully. The family had a strong suspicion of bread as being the culprit for this incident and completely eliminated bread and related foods (cereals, doughnuts, crackers, etc) from their every day diets and the child was instructed

to avoid these foods on his own as well. At 11 years of age, against the previous precaution, the patient suffered another similar episode of severe anaphylaxis after consuming only a piece of plain bread (without any other additional food). On this occasion, symptoms occurred within 15 minutes after the ingestion and proceeded in an accelerated fashion; nevertheless, he was successfully treated.

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The past history revealed frequent urticarial eruptions following the ingestions of butter coconut cookies, Pa Tong Ko (Thai style doughnut) and various locally pre-packed noodles when he was at a very young age and therefore these food had been mostly avoided. Atopic tendency was neither elicited in his past history nor among his family members.

A physical examination revealed a healthy 13 year old boy without any abnormal physical stigmata. A complete blood count and a stool examination were negative. Allergy skin testings with available extracts (without wheat flour and yeast) were all negative by prick method. Prick skin testings with 1:10 w/v extracts of bread and Thai doughnut in Coca's solution gave positive wheal and flare reactions (Fig. 1, 7 mm and 7.5 mm wheals and 35 mm and 45 mm erythema, respectively). These extracts failed to produce any reaction in a normal control subject. Further skin testing with a 1:10 w/v wheat flour extract (prepared in a similar manner) was positive with a 13.5 mm wheal and a 45 mm erythema (Fig. 1). Testing with a 10% yeast extract (in Coca's solution) yielded a negative result. The possibility of graded double blind food challenge was discussed with the family however was declined by the parents (the child was the only child of the family). The diagnosis of wheat induced anaphylaxis was then circumstantially made. Besides being instructed to avoid all wheat flour containing food, he was also prescribed a package of an epinephrine-preloaded syringe, and an antihistamine tablet to be self administered in the event of an inadvertent consumption of wheat flour and to seek medical assistance at once. To date, he remains well and healthy.

DISCUSSION

Although wheat protein is currently being listed among the

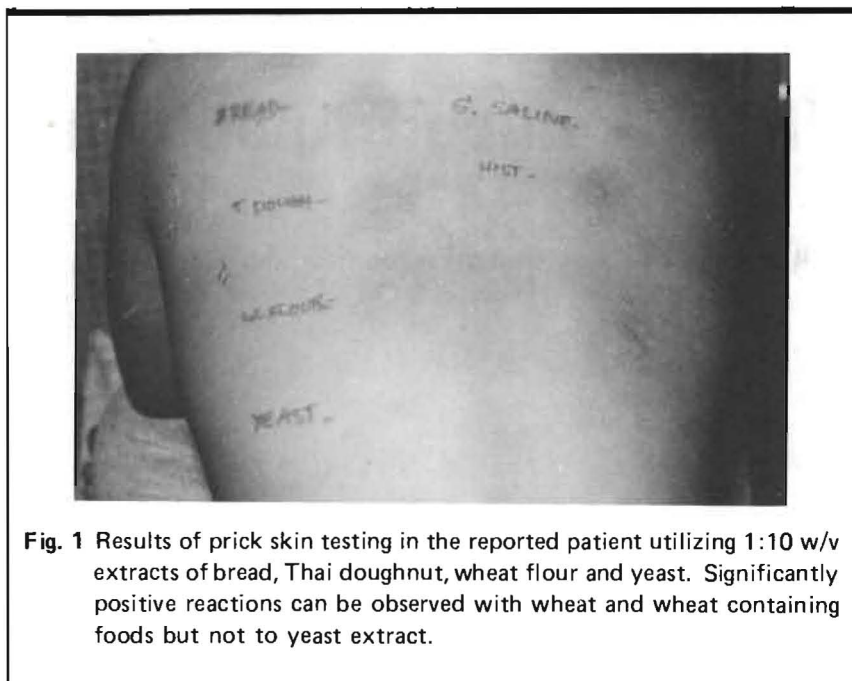


Fig. 1 Results of prick skin testing in the reported patient utilizing 1:10 w/v extracts of bread, Thai doughnut, wheat flour and yeast. Significantly positive reactions can be observed with wheat and wheat containing foods but not to yeast extract.

common causes of food allergy,^{4,5} we were not aware of any reported cases of direct wheat-induced anaphylaxis in adults or older children. Rudd *et al* described a 3 month old greek boy who presented with vomiting, explosive diarrhea and shock after ingesting a piece of wheat rusk.⁶ On challenging with another piece of wheat, similar anaphylactic episode was observed. The infant was then taken off wheat completely with a resolution of the symptoms and was fortunately found to have lost his wheat sensitivity at 14 months of age. The task of complete avoidance of all wheat containing foods for those who reside in the U.S., Europe and Australia is extremely difficult, if not, impossible since wheat is used, essentially, as the main source of carbohydrates for all age groups.

Fortunately, rice and rice flour is almost the sole carbohydrate source utilized in almost all Thai dishes and for most of the countries in Southeast Asia. Wheat is not grown in Thailand due to the hot climate and therefore has to be imported. It is priced higher than rice flour and therefore has led to the unpopularity of its

use. Moreover, bread and related foods are seldomly consumed by Southeast Asians. These factors could have led to the success of a complete avoidance of wheat flour containing foods by this family. Should this family have resided in the western hemisphere, it is conceivable that anaphylaxis could have been encountered much earlier and the patient could have suffered many more episodes of anaphylaxis thereafter. Although double blind food challenge was suggested for the definitive diagnosis, the family, for an appropriate reason, declined the challenge. Since bread was the only food consumed, especially for the second episode, and other food constituents in bread are not likely to be the cause of anaphylaxis (additives are being used in other diets as well), we feel that the diagnosis of wheat-induced anaphylaxis, although tentative, was appropriate for this patient.

Among the six interesting patients reported by Kushimoto *et al*,⁷ there were observed to develop urticaria and angioedema with anaphylaxis occurring only after the consumption of wheat with accompanying exercise, thus, fulfilling the

criteria for exercise-induced anaphylaxis, a condition with which several other foods have been associated.^{8,9} Immediate hypersensitivity skin testings in these 3 patients were positive to several wheat antigens. These antigens were gluten, gliadin and glutenin and their pepsin-digested fractions. From these findings, it is suggested that not only the native antigens were involved in the generation of hypersensitivity reactions but the newly generated antigens in the gastrointestinal tract might have been continually absorbed and produced delayed reactions in these patients as well as in our patient. Anaphylaxis in our patient occurred soon after the ingestion of wheat and did not require exercise as a precipitating event suggesting that wheat antigens were readily digested and absorbed through his gastrointestinal barrier. Different wheat antigens may be more important in Baker's asthma, another type of wheat induced hypersensitivity disease, since specific IgE in these patients were found to be more reactive to wheat albumins and globulins than to those of gluten, gliadin or glutenin fractions.¹⁰

Systemic allergic reactions to food antigens, many of which were life threatening anaphylaxis, were reported by Golbert *et al* in fifteen patients after the ingestions of specific foods such as pinto bean, halibut, rice, potato, Brazil nut, shrimp, milk and tangerine.¹ Similarly, during an evaluation of 102 patients with idiopathic anaphylaxis, Stricker found 10 different food antigens to be the causes of anaphylaxis in seven of these patients. These antigens were aniseed, cashew nut, celery, flaxseed, hops, mustard, mushroom, shrimp, sunflower, and walnut.¹¹ Thus, food-induced anaphylaxis, although uncommon, can occur in adults. In some instances, these anaphylaxis can be delayed, protracted and quite resistant to treatment.¹² Food-induced anaphylaxis can not

be taken lightly since fatal cases have been observed.² Common factors contributing to the severity in these individuals included denial of symptoms, concomitant intake of alcohol, reliance of oral antihistamines alone to treat symptoms, and adrenal suppression by chronic glucocorticoid therapy for coexisting asthma. Currently, self administrable "Epipen" is commercially available and can be carried at all time with these patients. None of the patients who died had used epipen prior to their demise.

The natural history of food hypersensitivity in children, even severe cases, have been well examined.¹³⁻¹⁵ From this series of reports, it can be concluded that most children who are allergic to foods may gradually develop tolerance to foods that they were allergic to and are able to consume them by three to eight years of age. On the other hand, the natural history of food allergy in adults has been very poorly understood. Preliminary observations have indicated that hypersensitivity to peanuts and to other legumes may be a lifelong event.^{16,17} The experience from Kushimoto *et al*,⁷ from our group and from an unpublished case (Bock, personal communication) have suggested that wheat-induced anaphylaxis may also be similar to that of the legumes and peanut. Therefore, avoidance remains the mainstay of the treatment of this type of food hypersensitivity. We feel that a counseling on the nature of these reactions to the patient should be thoroughly performed. A list of specific foods to be avoided should be provided. A kit containing an epinephrine-preloaded syringe, an antihistamine tablet should always be carried by these patients with an instruction to self administer these medications promptly in the event of an inadvertant ingestion and to seek medical assistance without undue delay.

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