CASE REPORT

Anaphylaxis After Eating Italian Pizza Containing Buckwheat as the Hidden Food Allergen

E Heffler, G Guida, I Badiu, F Nebiolo, G Rolla

Department of Allergology and Clinical Immunology, Università di Torino, Torino, Italy

Abstract

A 20-year-old woman developed anaphylaxis after eating pizza on 4 different occasions in 2 restaurants. Both restaurants made their pizza dough with a mixture of wheat and buckwheat flours. A prick-to-prick test with buckwheat flour was positive. Skin prick tests and specific immunoglobulin E responses to soybean and peanut were weakly positive while the response to buckwheat was negative. We ruled out a pathogenic role for peanut and soybean because the patient usually eats both with no signs of allergic reaction. Double-blind, placebo-controlled food challenges with buckwheat flour were positive after the administration of a cumulative dose of 2.3 g of the culprit flour. To our knowledge, our report describes the first case of anaphylaxis after intake of buckwheat flour as the hidden allergen in pizza dough.

Key words: Buckwheat. Pizza. Hidden allergen. Anaphylaxis. Allergy.

Resumen

Una mujer de 20 años de edad presentó anafilaxia después de comer pizza en cuatro ocasiones en dos restaurantes distintos. En ambos restaurantes, la masa de la pizza se hacía con una mezcla de harinas de trigo normal y de trigo sarraceno. La prueba cutánea con harina de trigo sarraceno fue positiva. Las pruebas cutáneas y las respuestas de la inmunoglobulina E específica al grano de soja y al cacahuete fueron levemente positivas, mientras que la respuesta al trigo sarraceno fue negativa. Descartamos el papel patogénico del cacahuete y del grano de soja, porque la paciente suele comer ambos sin presentar signos de reacción alérgica. Las pruebas de provocación con alimentos controladas con placebo y a doble ciego con trigo sarraceno dieron positivo tras administrarse una dosis acumulativa de 2,3 g de la harina responsable. Hasta donde sabemos, nuestro informe describe el primer caso de reacción anafiláctica tras la ingesta de harina de trigo sarraceno como alérgeno oculto en la masa de la pizza.

Palabras clave: Trigo sarraceno. Pizza. Alérgeno oculto. Anafilaxia. Alergia.

Introduction

Common buckwheat (*Fagopyrum esculentum*) is a crop that is taxonomically unrelated to wheat. A member of the Polygonaceae family, it grows in several parts of Asia and Europe. Its flour is gluten-free and it serves as a common supplement for patients with celiac disease. Buckwheat is also an important ingredient of several traditional Asian, Russian, and European dishes. In Italy the most famous traditional dishes made with buckwheat flour are *polenta taragna* (a hot porridge from the north of Italy) and *pizzoccheri* (a type of pasta from Valtellina, a small area close to the northern Italian lakes). Pizza is sometimes made with a mixture of flours, among which buckwheat may be one.

Few cases of allergic reaction to buckwheat have been described in literature. Those reported have involved asthma or allergic rhinitis due to buckwheat pillow exposure, occupational buckwheat asthma, atopic dermatitis, urticaria, and anaphylaxis, according to a review, and different allergens have been identified [1]. To date, allergic reactions due to buckwheat flour

have been reported following the intake of Japanese noodles [2], muesli bars [3], buckwheat crepes [4], French *galettes* (a type of pastry or crepe) [5] and *poffertjes* (small Dutch pancakes) [6]. Here we present the case of a patient who developed several anaphylactic reactions after eating Italian pizza in which buckwheat was present as a hidden allergen.

Case Description

A 20-year-old woman, with no known allergic sensitizations, was referred to our outpatient allergy clinic because she had developed severe nasal obstruction, dyspnea with stridor, abdominal pain and diarrhea a few minutes after eating Italian pizza Margherita (tomato sauce, mozzarella cheese, basil, and oregano) on 4 different occasions and in 2 restaurants over the past 2 years. Surprisingly, she could safely eat pizza prepared in other restaurants as well as home-made pizza. On all occasions she had not drunk any alcoholic beverages and she had not been taking any medication. She reported no allergic manifestations apart from abdominal pain and diarrhea 7 years ago soon after eating *pizzoccheri*, which she avoided afterwards. Considering that the anaphylactic reactions occurred specifically in 2 restaurants, we asked the owners for their pizza recipes. We discovered that the specialty of both restaurants was a pizza made with a mixture of wheat and buckwheat flours.

Skin prick tests were performed for many food and inhalant allergens, including corn flour, yeast, tomato, cow's milk proteins (albumin, globulin, casein), goat's milk casein, soybean, basil, and oregano. The tests were positive for *Artemisia absinthium* pollen (6 mm), soybean (4 mm), peanut (5 mm) and peach (4 mm). A prick-to-prick test with buckwheat flour (1 g of buckwheat flour mixed with 1 mL of distilled water) was positive with a wheal of 9 mm. Prick-to-prick tests with buckwheat were negative in 5 nonatopic and 5 atopic control subjects, confirming that the wheal of 9 mm induced in our patient was not an irritative reaction.

The patient denied any summertime symptoms of rhinitis that might be related to *A absinthium* pollen sensitization, but she reported oral pruritus, swelling of lips and pharyngitis with unpeeled peach.

Tests for specific immunoglobulin (Ig) E (CAP-Pharmacia, Uppsala, Sweden) for soybean and peanut were 6.4 kU/L and 2.6 kU/L respectively, while tests for buckwheat-specific IgE were negative.

As the patient usually eats peanuts and soybean without any allergic manifestations, double-blind placebo-controlled food challenge with buckwheat flour was performed. Both placebo and active sample were prepared by a trained dietitian. The recipes called for 5 g of either buckwheat flour or amino acid formula, 4 tablespoons of peppermint oil to mask the taste, 280 mL of mineral water, and a coloring agent so that the placebo sample would have the same viscosity, appearance, volume, smell, color, and texture as the active sample. The patient had not taken any medication in the week leading up to the 2 food-challenge sessions (placebo in 1 session and buckwheat in 1 session). The dose was doubled every 20 minutes starting from 1 mL of solution. The interval between the 2 test days was 7 days. Five minutes after the administration of a cumulative dose of 2.3 g, the patient complained of abdominal pain and she had diarrhea and cough. Spirometry revealed a 15% decrease in forced expiratory volume in 1 second compared to the baseline value. The patient recovered in about 30 minutes after 200 μg of salbutamol was administered from a metered dose inhaler. The patient recovered spontaneously from abdominal complaints in about 30 minutes.

When last seen, a year later, the patient reported that she had followed our instructions on how to avoid foods containing buckwheat and had had no more episodes of food-related allergic reaction.

Discussion

Anaphylaxis after ingestion of pizza has been previously attributed to hidden allergens, specifically soybean [7] and peanuts [8]. We can exclude the pathogenic relevance of these allergens in the case we report because our patient, even if mildly sensitized to peanut and soy, reported she could safely eat these foods. However, the anaphylactic reactions of our patient were indeed related to another hidden allergen, buckwheat, which was also the cause of the first episode of anaphylaxis the patient had previously experienced after the ingestion of a kind of pasta made of buckwheat flour (*pizzoccheri*).

The reason for cross-sensitization of buckwheat, peanut and soy may be related to the presence of homologous allergens, legumin (Fag e1) and 2S albumin (Fag e 10 kd) [9]. Our patient also had the well-known mugwort–peach cross-sensitization, which seemed to be a consequence of peach sensitization, as she did not complain of hay fever symptoms during summertime, the season of *Artemisia* species pollen in the patient's area. Pastorello and colleagues [10] demonstrated that hypersensitivity to mugwort in patients with peach allergy is due to a common lipid transfer protein (LTP). Whether mugwort–peach sensitization may be related to buckwheat sensitization is not presently known, as no buckwheat LTP has been identified so far.

In conclusion, we report the first case to our knowledge of anaphylaxis after intake of buckwheat flour as the hidden allergen in pizza dough. In clinical practice, cases of systemic allergic reactions after intake of pizza are not very rare in the Mediterranean area. This case underlines the need to carefully investigate the composition of complex dishes such as pizza in order to eventually identify unusual ingredients that may act as hidden allergens. Another key point emerging from this case report concerns the controversial role of allergen-specific IgE measurement in the diagnosis of anaphylaxis induced by certain foods: our patient was negative for such a response to buckwheat, but 2 in vivo tests performed (prick-to-prick and double-blind, placebo-controlled food challenge) confirmed allergic sensitization to buckwheat, supporting the need to better standardize the extracts used for specific IgE assays.

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Enrico Heffler

Allergologia e Immunologia Clinica
ASO Ordine Mauriziano "Umberto I"
Largo Turati 62 - 10128 Torino (Italy)
E-mail: enrico_heffler@yahoo.it