

Maize: a new occupational allergen in the pharmaceutical industry

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Maize is part of contemporary nutrition and can be found in breakfast cereal, snacks, pastries, tortilla chips, polenta and many other foods. Moreover, maize flour and starch are often added to processed food, and starch is a widespread excipient of tablets. Allergic reactions to maize have previously been reported in southern

Europe and Mexico where maize is commonly ingested. The major food allergen of maize, Zea m 14 is a heat-resistant lipid transfer protein and has a molecular weight of 9 kDa (1). Three other potential allergens have been detected: a 16-kDa α -amylase trypsin inhibitor, a thioredoxin named Zea m 25 (2) and a not yet characterized 50-kDa protein that belongs to the so-called reduced soluble protein fraction of the corn endosperm (3).

A 19-year-old girl, apprentice of a pharmaceutical company, noticed an erythematous itching rash on both hands and the face associated with dyspnea everyday 2 hours after starting work in

tablet manufacturing. She was not known for any kind of seasonal or perennial allergic rhinoconjunctivitis, food or drug allergy, or atopic dermatitis.

Her company produces tablets of acetylsalicylic acid (ASA), nifedipin, acarbose, ciprofloxacin and moxifloxacin. Main excipients of these tablets are maize starch, microcrystalline cellulose and lactose.

The total IgE level was 46 kU/l (< 100 kU/l) (Pharmacia ImmunoCAP, Phadia, Sweden). Specific IgE to common seasonal or perennial allergens, to maize and latex was not detected. The skin prick test for major food allergens was negative.

We then performed prick to prick testing of the tablets she was working with. Positive reaction was found for ASA tablets from her and a competing drug company. Excipients were identical for both tablets.

Testing of 10% pure ASA in 20 g glycerin was negative. An allergy to the tablet coingredients was then suspected, especially to its maize components.

A type I sensitization to maize bran was detected by skin prick test, then by intracutaneous tests for maize bran and flour. Spirometry showed a light obstructive syndrome, and metacholin provocation confirmed a bronchial hyperreactivity at 4 mg/ml of metacholin. Nasal provocation test with maize bran revealed a strong positive reaction with sneezing, conjunctival injection and pruritus of the nose and eyes after 6 min. Moreover, the nasal flow diminished from 70 to 35 l/min after 10 min.

Western blot of maize flour incubated with patient serum showed a marked band at 50 kDa (Fig. 1) possibly matching the reduced soluble protein allergen of the maize endosperm (3).

These findings suggest that our patient developed her maize allergy during occupational exposure by airway and cutaneous contact to the allergen.

Although maize starch consists almost exclusively of carbohydrates it may contain 0.3–1% protein, whereas flour contains about 7–13% protein. As maize starch particles measure 5–10 μ m in diameter, they can easily be inhaled. Allergic respiratory reactions to inhaled maize dust in exposed workers and anaphylactoid reactions with contact urticaria because of maize starch in exam or surgical gloves have been described previously (4, 5). To our knowledge, this is the first report of maize as an occupational allergen in tablet manufac-

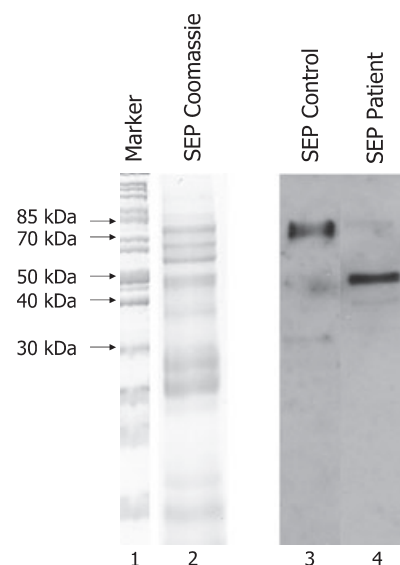


Figure 1 Western blot of maize flour incubated with patient serum and anti-IgE (i) Marker, (ii) Salt extractable proteins (SEP) Coomassie, (iii) SEP Control and (iv) SEP Patient.

turing. Our data suggest that patients working in tablet manufacturing and presenting occupational allergy symptoms should be tested for sensitization to drug excipients in particular maize starch.

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References

1. Pastorello EA, Farioli L, Pravettoni V, Is-pano M, Scibola E, Trambaioli C et al. The maize major allergen, which is responsible for food-induced allergic reactions, is a lipid transfer protein. *J Allergy Clin Immunol* 2000;**106**:744–751.
2. Weichel M, Vergoossen NJ, Bonomi S, Scibilia J, Ortolani C, Ballmer-Weber BK et al. Screening the allergenic repertoires of wheat and maize with sera from double-blind, placebo-controlled food challenge positive patients. *Allergy* 2006;**61**:128–135.
3. Pasini G, Simonato B, Curioni A, Vincenzi S, Cristaudo A, Santucci B et al. IgE-mediated allergy to corn: a 50 kDa protein, belonging to the Reduced Soluble Proteins, is a major allergen. *Allergy* 2002;**57**:98–106.
4. Park HS, Nahm DH. Identification of IgE-binding components in occupational asthma caused by corn dust. *Ann Allergy Asthma Immunol* 1997;**79**:75–79.
5. Medical glove powder report, U.F.a.D. Administration, Editor. 1997.