

The poppy 11S storage protein is a genuine allergen in a poppy allergic patient with limited cross-reactivity to other seed storage proteins

Michaela Mieke¹, Anders Hviid Jørgensen¹, Frederic Jabs¹, Steen Vang Petersen³, Connie Jenning Melchjorsen¹, Henning Seismann⁴, Ann Engholm Justesen², Hans-Jürgen Hoffmann², Johannes Schmid², and Edzard Spillner¹

¹ Immunological Biotechnology, Department of Engineering, Aarhus University, Denmark

² Department of Respiratory Medicine and Allergy, Institute for Clinical Medicine, Aarhus University, Denmark

³ Department of Bioscience, Aarhus University, Denmark

⁴ Euroimmun, Lübeck, Germany

Introduction

Seeds of the poppy plant are traditionally used in bakeries, e.g., for garnishing bread or making cakes. Reports of allergic type I sensitivity to poppy seed are not frequent but can be associated with severe reactions, in particular patients with allergy to pollens or nuts.

Methods

IgE reactivity of the serum was assessed by determination of sIgE levels. Activation of basophils by different seed and nut extracts was analyzed by using CD63 as activation marker. Clinical reactivity to extracts was further assessed by skin testing and food challenge. IgE-reactivity and cross-reactivity to different seed and nut extracts was addressed by SDS-PAGE and immunoblotting. Identification of the allergen was performed by mass spectrometry of poppy allergens and subsequent database analysis.

Results

We report on a 43-year-old patient who reported anaphylaxis upon ingestion of pastry potentially containing seeds from different sources. Serological analysis showed pronounced sensitization to several inhalation and food allergens including poppy, hazelnut, soy, rye, grass pollen, mugwort, sesame, ect. IgE reactivity to available molecular allergens from different nuts, peanut, sesame, suggested a sensitization to different storage proteins.

Basophil activation tests using extracts from different nuts and seeds documented pronounced activation for the majority of the source material. Positive skin prick tests for walnut, hazelnut and macadamia nuts and sesame, poppy and sunflower seeds and positive food challenges with hazelnut (e.g.), sesame (750 mg) and poppy seed (500 mg threshold dose for generalized reactions, respectively) primarily underlined the clinical relevance of poppy sensitization.

SDS-PAGE analysis and immunoblotting using the patient serum for detection of IgE-reactive proteins suggested the presence for a major allergenic component present in poppy extract. Weaker IgE reactivities were observed in the other extracts for proteins in the same molecular weight range, suggesting a limited extent of molecular cross-reactivity. Mass spectrometry analysis yielded sequence data identifying the putative allergen as 11S storage protein, well known major allergens in several nuts and seeds. The limited cross-reactivity with other 11S storage proteins point to a genuine role in poppy sensitization.

Conclusion

In summary, our data provide molecular evidence for the role of storage proteins in allergy to poppy seed. Moreover, the data show the relevance of protein-based cross-reactivity within seed and nut allergic patients and thus may contribute to our understanding of food allergy.