



Anaphylaxis to sunflower seed

Anafilaxia à semente de girassol

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ABSTRACT

Sunflower seed (*Helianthus annuus*) is an uncommon allergenic source frequently consumed in snacks, as component of some types of bread, as condiment in some dishes, and also used in animal feeding. Occasional cases of anaphylaxis to this seed have been reported in the current literature, mainly in workers occupationally exposed to sunflower allergens and bird breeders. The allergenic nature of the storage protein albumin 2S and the non-specific lipid transfer protein (nsLTP) of this seed has been described. The authors report the case and diagnostic approach of a seed anaphylaxis.

Keywords: Anaphylaxis, food hypersensitivity, food allergy, *helianthus*.

RESUMO

A semente de girassol (*Helianthus annuus*) é uma fonte alergênica incomum frequentemente consumida em lanches, como componente de alguns tipos de pães, como condimento em alguns pratos, e também utilizada na alimentação animal. Casos eventuais de anafilaxia a esta semente têm sido relatados na literatura atual, principalmente em trabalhadores com exposição ocupacional a alérgenos de girassol e criadores de aves. A natureza alergênica da proteína de armazenamento albumina 2S e da proteína não específica de transferência de lipídios (nsLTP) dessa semente foi descrita. Os autores relatam o caso e a abordagem diagnóstica de uma anafilaxia por sementes.

Descritores: Anafilaxia, hipersensibilidade alimentar, alergia alimentar, *helianthus*.

Introduction

Sunflower seed (*Helianthus annuus*) is an uncommon allergenic source frequently consumed in snacks, as component of some types of bread, as condiment in some dishes, and also used in animal feeding. Occasional cases of anaphylaxis to this seed have been reported in the current literature, mainly in workers occupationally exposed to sunflower allergens and bird breeders. The allergenic nature of the storage protein albumin 2S and the non-specific lipid transfer protein (nsLTP) of this seed has been described. The authors report the case and diagnostic approach of a sunflower seed anaphylaxis.

Case report

A 47-year-old man, with no personal history of atopy, experienced generalized hives, vocal change, dyspnea, wheezing, and repetitive vomiting few minutes after eating a snack with sunflower seeds. He referred previous symptoms like sneezing, itching, and a runny nose while feeding his birds with sunflower seeds.

In the allergology and clinical immunology appointment, skin prick tests (using extracts from Roxall®, Spain) were performed. The tests were positive for sunflower seed (24 mm) and negative for common inhalant allergens, sesame seed, peanut,

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and other nuts such as almond, hazelnut, pistachio, cashew, and walnut. Total serum immunoglobulin E (IgE) was 34 IU/mL and specific IgE to sunflower seed extract was 3.44 kU/L (Thermo Fisher Scientific®, Sweden). Specific IgE against Pru p 3 (peach nsLTP) analyzed by ImmunoCAP was negative.

To determine the molecular mass of IgE-reactive proteins, a sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) using an immunoblot assay under reducing conditions (with 2-mercaptoethanol) was performed as described by Laemmli,¹ with raw and roasted sunflower seed extracts. The immunoblot assay revealed an intense IgE-binding band with an apparent molecular mass lower than 14 kDa in the two samples. No bands were detected in control serum (pool of sera from non-atopic subjects). SDS-PAGE immunoblotting was performed as described by Schagger and Jagow,² with raw sunflower seed extract to better assess the molecular mass of the IgE-reactive band, obtaining a value of 11 kDa (Figure 1).

The patient is currently under strict avoidance of sunflower seed, including eating food cooked in sunflower seed oil. An epinephrine autoinjector device was prescribed.

Conclusion

Sunflower seed (*Helianthus annuus*) is frequently consumed but rarely induces anaphylaxis.³⁻⁶ The first case of sunflower seed allergy was described in 1979.⁷ Allergy to sunflower seed has been reported mainly in bird breeders, but cases as the one described here with severe IgE-mediated food allergy are rare.⁸ In our report, the patient had symptoms of allergic rhinitis on exposure to sunflower seed prior to food allergy, which led us to consider a sensitization by inhalation while feeding birds with sunflower seeds.

Sunflower allergens have so far been relatively poorly described. To date, the following have been reported: Hel a 1 (a 34-kDa major allergen); Hel a 2 (a 14.7-kDa profilin); Hel a 3 (a 9-kDa LTP); and

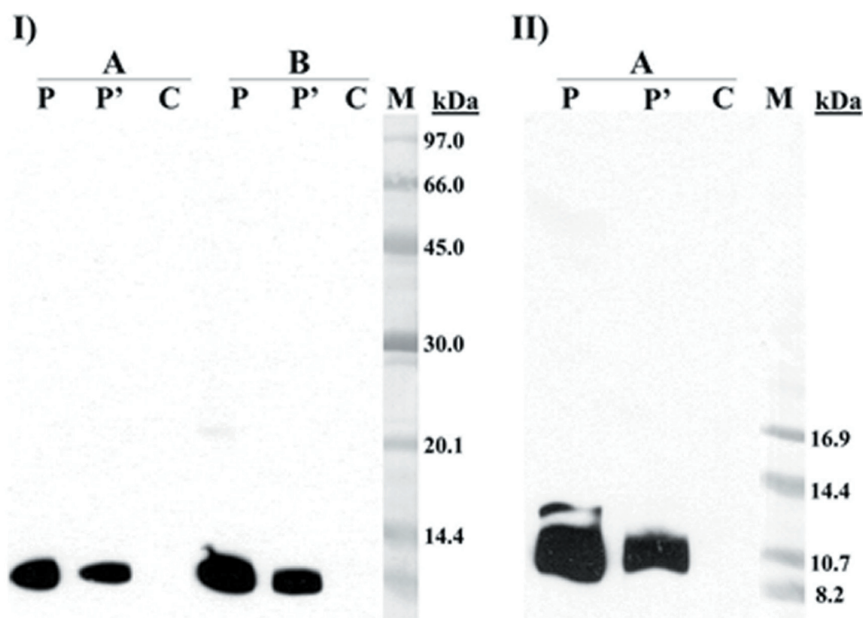


Figure 1

I) SDS-PAGE immunoblotting (Lowry). II) SDS-PAGE immunoblotting (Schagger). A) Raw sunflower seed extract. B) Roasted sunflower seed extract. Lane P, P': Patient serum, two dilutions; Lane C: Control serum (pool of sera from non-atopic subjects); Lane M: Molecular mass standard

Hel a 6 (a 42-kDa pectate lyase).⁹ Others have also been described as potential allergens, such as Hel a 2S albumin, a 12-kDa storage protein that appears as a 16-kDa protein in immature form, and a 13-kDa nsLTP. Furthermore, various 2S albumins have been described in sunflower seed with molecular mass of 18-10 kDa.¹⁰⁻¹⁴

Our study confirmed the diagnosis of anaphylaxis to sunflower seed. In our patient, the diagnosis of IgE-mediated sensitization to sunflower seed was demonstrated by a positive skin prick test for sunflower seed extract and detection of sunflower-seed IgE-reactive proteins. The *in vitro* SDS-PAGE immunoblot assay revealed a protein band with molecular mass of 11 kDa. Although in our case the IgE-binding protein was not identified, its molecular mass suggests that the methionine-rich 2S albumin is involved in this case.¹⁰⁻¹¹

To our knowledge, this is the fourth report of a monoallergic patient experiencing an anaphylactic reaction after the consumption of sunflower seeds. In addition, the severity of the clinical reaction reported here and the high likelihood of consumption of sunflower seed as a hidden allergen in snacks justifies the publication of this case: this allergy should be considered during the diagnostic workup of patients when the foodstuff causing the allergic reaction is not clear. A prompt and definite diagnosis allows a timely recommendation of strict avoidance, minimizing the possibility of recurrence of severe anaphylactic reactions.

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References

1. Laemmli U. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature*. 1970;227(5259):680-5.
2. Schagger H, von Jagow G. Tricine-sodium dodecyl sulfate-polyacrylamide gel electrophoresis for the separation of proteins in the range from 1 to 100 kDa. *Anal Biochem*. 1987 Nov 1;166(2):368-79.
3. Labela Álvarez M, De Aramburu Mera T, Baynova K, Bartolomé Zavala B, Prados Castaño M. Anaphylaxis due to roasted sunflower seeds with tolerance to raw sunflower seeds. *Ann Allergy Asthma Immunol*. 2018;120:330-1.
4. Barbarroja-Escudero J, Sánchez-González MJ, Pineda F, Rodríguez-Rodríguez M, Antolín-Amérigo D, Castillo M, et al. Identification of lipoproteins from sunflower seeds in 2 monosensitized anaphylaxis patients. *J Investig Allergol Clin Immunol*. 2018;28(5):334-6.
5. Ukleja-Sokołowska N, Gawrońska-Ukleja E, Zbikowska-Gotz M, Bartuzi Z, Sokołowski L. Sunflower seed allergy. *Int J Immunopathol Pharmacol*. 2016;29(3):498-503.
6. Axelsson IG, Ihre E, Zetterstrom O. Anaphylactic reactions to sunflower seed. *Allergy*. 1994;49:517-20.
7. Noyes JH, Boyd GK, Settignano GA. Anaphylaxis to sunflower seed. *Journal of Allergy and Clinical Immunology*. 1979;63:242-4.
8. Asero R, Mistrello G, Roncarolo D, Amato S. Airborne allergy to sunflower seed. *J Investig Allergol Clin Immunol*. 2004;14:244-6.
9. The WHO/IUIS Allergen Nomenclature Sub-committee (2015) [Internet]. Available at: <http://www.allergen.org>.
10. Kelly JD, Hefle SL. 2S methionine-rich protein (SSA) from sunflower seed is an IgE-binding protein. *Allergy*. 2000;55:556-9.
11. Berecz B, Clare Mills EN, Tamas L, Lang F, Shewry PR, Mackie AR. Structural stability and surface activity of sunflower 2s albumins and nonspecific lipid transfer protein. *J Agric Food Chem*. 2010;58,6490-7.
12. Labela Álvarez M, De Aramburu Mera T, Baynova K, Bartolomé Zavala B, Prados Castaño M. Anaphylaxis due to roasted sunflower seeds with tolerance to raw sunflower seeds. *Ann Allergy Asthma Immunol*. 2018;120:330-1.
13. Yagami A. Anaphylaxis to lipid transfer protein from sunflower seeds. *Allergy*. 2010;65:1340-9.
14. Patel A, Bahna SL. Hypersensitivities to sesame and other common edible seeds. *Allergy*. 2016;71:1405-13.

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