

Letters

ALLERGY TO JERUSALEM ARTICHOKE DUE TO IMMEDIATE IgE REACTION TO Bet v1-LIKE ALLERGEN

Jerusalem artichoke (JA) (*Helianthus tuberosus*), also called topinambur, is a vegetable from the Asteraceae family. Its tuberous rhizomes can be eaten raw or cooked, and it underwent a resurgence of interest in Europe during the end of the 20th century. We report the first case, to our knowledge, of IgE-mediated food allergy to JA due to a Bet v1-like allergen (e-Fig 1).

A 40-year-old woman presented with springtime rhinitis for the preceding 4 years. She reported an oral allergy syndrome (OAS) to apples, cherries, peaches, hazelnuts, and raw JA. Reactions to raw JA were more severe than with other fruits (OAS, laryngeal edema, and face swelling). Cooked JA was tolerated.

Skin prick tests (SPTs) (ALK-Abello, Courbevoie, France) were positive for *Dermatophagoides pteronyssinus* (4/15 mm) and birch pollen (5/15 mm) (codeine, 4/15 mm). Orchard grass, mugwort, and inulin SPT results were negative. SPT results for JA were positive for fresh and cooked pulp (9/30 mm and 5/20 mm, respectively) and for fresh and cooked peel (6/20 mm and 2/10 mm, respectively). Specific IgE immunoassay results (ImmunoCAP, Phadia, Sweden) were positive for major birch pollen allergen Bet v1 (33.2 kU/L) and orchard grass (0.29 kU/L) and negative for sunflower pollen and seeds, birch pollen profilin Bet v2, bromelain, and peach lipid transfer protein (LTP) Pru p3.

Extract from pulp of raw JA was prepared at a 1/5 (wt/vol) ratio in 0.55% sodium bicarbonate, 1% sodium chloride buffer, pH 8, for 2 hours, under agitation at 2°C to 8°C (raw JA). After centrifugation and filtration with a 0.2- μ m filter, part of the extract was boiled for 10 minutes followed by centrifugation and filtration (JA 100°C). The protein concentration of the extracts (raw JA, 0.33 mg/mL; JA 100°C, 0.25 mg/mL) was determined with the Bradford method.¹ JA total extract (raw) and birch pollen extract were analyzed by Western blot using the patient's serum (Fig 1). The patient's serum contained specific IgE for Bet v1 and for a 17-kDa allergen in the raw JA extract. Polyclonal monospecific antibodies raised against Bet v1 could detect the 17-kDa allergen in JA. IgE inhibitions were performed by enzyme-linked immunosorbent assay. rBet v1 (Biomay, Vienna, Austria) was used as solid phase. After blocking, serum from the patient (1/10) was incubated with blocking buffer (no inhibition) or inhibitors: birch pollen (50 μ g/mL), Bet v1 (10 μ g/mL), and raw and 100°C JA extracts (50 μ g/mL). After washing, the IgE was revealed by alkaline phosphatase anti-IgE. The patient's serum specific anti-Bet v1 IgE was inhibited by Bet v1 and birch pollen extract and was significantly inhibited (50%-60%) by raw JA or JA 100°C extracts (e-Fig 2). These findings confirmed the presence of a Bet v1-like allergen in JA.

Our patient presented with allergic rhinitis related to birch pollen with classic OAS to Rosaceae family fruits. Sensitization to birch pollen extract was only related to the major Bet v1 allergen as confirmed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis and Western blot.

Symptoms after consuming crude JA were probably due to IgE-mediated reactivity to a 17-kDa protein corresponding to Bet v1-

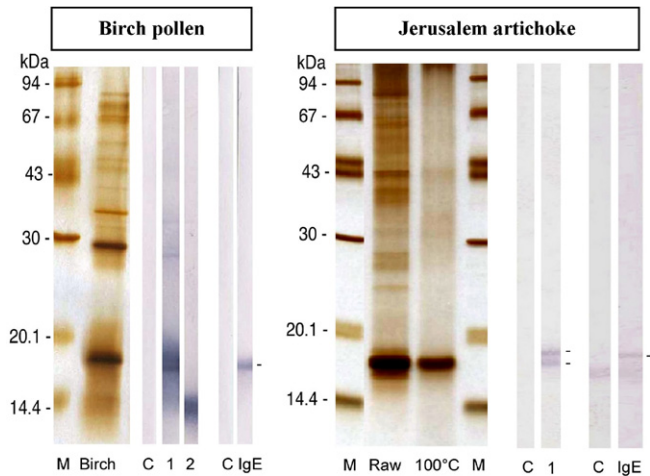


Figure 1. Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) and Western blot immunoblot on birch pollen extract (A) and on Jerusalem artichoke extracts (B). Molecular mass marker (lane M). SDS-PAGE on birch pollen extract (lane birch) and on Jerusalem artichoke extracts: raw (lane raw) and boiled for 10 minutes (lane 100°C). Western blot on birch and raw artichoke extracts were incubated with negative control (lanes C), patient's serum (lanes IgE), and monospecific antibodies anti-Bet v1 (lanes 1) and anti-Bet v2 (lane 2). Lane IgE: patient serum IgE. Monospecific antibodies anti-rBet v1 (lane 1) or rBet v2 (lane 2) were tested. Lanes C are the respective negative controls. Nonspecific binding is observed on JA extract (C and IgE) due to high concentration of a 16-kDa protein, not corresponding to Bet v1-like allergen.

related protein. Anti-Bet v1 IgE reactivity of the patient was partially inhibited by JA extract that confirmed cross-reactivity with Bet v1. No IgE reactivity to other cross-reactive vegetable allergens, such as LTP, profilin, and cross-reactive carbohydrate determinants (bromelain), was found.^{2,3} No specific IgE was detected to inulin, a fructose polymer associated with immediate food allergy and abundant in JA.⁴ We propose that OAS to JA was due to cross-reactivity between the specific IgE to Bet v1 and a Bet v1-like substance in the JA. Usually, food allergy symptoms caused by Bet v1 homologues are relatively mild. However, more severe reactions can occur, such as with celery, carrot, and soybean.⁴⁻⁶ A potential reason for the milder allergic symptoms from other Bet v1 cross-reacting foods compared with our patient may be a lower degree of similarity to Bet v1 in the other foods and a greater similarity in JA. Another interesting finding is the positivity of the SPT for cooked JA. Thermostability of this Bet v1 homologue was confirmed by the partial inhibition of the anti-Bet v1 IgE with the cooked JA extract. However, in our case there were discrepancies between *in vitro* thermostability and clinical tolerance to cooked JA.⁷

In summary, we describe for the first time, to our knowledge, a patient with IgE-mediated food allergy to JA due to sensitization to a 17-kDa protein belonging to the superfamily of Bet v1 homologous allergens. In contrast to other Bet v1 homologues, the JA Bet v1-like protein is immunologically thermostable and the symptoms associated with ingestion of raw JA are more severe, suggesting greater similarity to Bet v1. The pathogenesis related 10 protein from *Helianthus tuberosus* is not available in protein sequence databases.

Disclosures: Authors have nothing to disclose.

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SUPPLEMENTARY DATA

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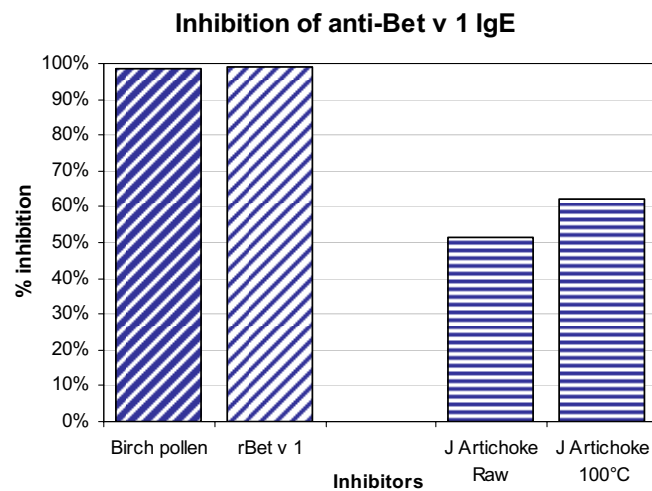
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e-Figure 1. Jerusalem artichoke with peel (left) and pulp (right).



e-Figure 2. Enzyme-linked immunosorbent assay inhibition of patient IgE to Bet v1 solid phase by birch pollen extract (50 $\mu\text{g/mL}$), rBet v1 (10 $\mu\text{g/mL}$), and Jerusalem artichoke extracts (raw or 100°C, 50 $\mu\text{g/mL}$).