

Prevalence of sensitization and allergy to potato in a large population

Anca Mirela Chiriac, MD^{a,b}, Jean Luc Bourrain, MD^a,
Eve Lepicard, MD^c, Nicolas Molinari, PhD^{d,e,f}, and
Pascal Demoly, MD, PhD^{a,b}



Clinical Implications

- The most important finding of our study resides in the absence of severe allergy to potato in a large population, suggestive of a good profile of tolerance to potato.

TO THE EDITOR:

Potato (*Solanum tuberosum*) is a very common ingredient in the diet of Western countries, and in its cooked form it is one of the first solid foods introduced in the child's diet, usually around the age of 4 to 6 months. Prepared by numerous means, potatoes are consumed on a nearly worldwide basis. Potato is a typical example of food to which the majority of the general population is regularly exposed, but is rarely involved in food allergy. Allergy to potato has been described, mostly in pediatric populations.¹ A spectrum of clinical manifestations, IgE-mediated reactions (contact urticaria, protein contact dermatitis, anaphylaxis upon ingestion) or atopic dermatitis² and acute food protein-induced enterocolitis syndrome (FPIES),³ have been reported. However, the prevalence of potato sensitization and allergy has not been studied in large populations.

Between February 2013 and December 2015, we carried out a cross-sectional study in the Allergy Unit of the University Hospital of Montpellier to assess the frequency of positive skin test results to raw and cooked potato among 2000 consecutive patients. The Institutional Review Board of the University Hospital of Montpellier (France) approved the trial (Comité de Protection des Personnes Sud Méditerranée III, Montpellier, France). All subjects older than 2 years consulting for a new diagnosis of allergic asthma and/or rhinitis and food or drug allergy were given a chance to participate in the study. Patients were tested for atopy with a battery of inhalant allergens of the Montpellier area.⁴ Skin prick tests (SPTs) were performed with a 23G intravenous needle, using the modified Pepys technique as described previously.⁵ Raw (as such) and cooked (boiled for 15 minutes) potato were prepared and kept in the freezer before usage.

The prick-to-prick SPT to potato was performed using ALK metal lancet. An SPT result was considered positive if the wheal size was more than 3 mm in diameter, provided histamine control test result was positive. Atopy was defined as a positive SPT result to at least 1 inhalant allergen.

Most patients were females (1304 [66.1%]) and adults (≥ 18 years old, 85.4%). The age range in this cohort was 2 to 94 years. A quarter were patients with asthma (26.1%) and more than half (1146 [56.2%]) had symptoms of allergic rhinitis (22.2% had intermittent and 34% persistent symptoms of rhinitis). Eczema was reported by 16.8% and food allergy by 14.1% of the

patients. Atopy (described as at least 1 positive SPT result to the battery of respiratory allergens) was present in 61.6% of patients and among them, almost three-fourth (73%) were polysensitized. Ranked by decreasing order of frequency, the most prevalent sensitizations concerned house dust mites (*Dermatophagoides pteronyssinus*, 34.4%; *Dermatophagoides farinae*, 32.5%), cypress pollen (29.7%), grass pollen (27.6%), olive pollen (23%), and cat dander (22.3%). Sensitization to birch pollen, mugwort, and ragweed concerned less than one-tenth of the patients (9.1%, 9.8%, and 7.1%, respectively).

Among the 2000 subjects, 203 (10.1%; 95% CI, 8.8%-11.4%) were sensitized to potato, either raw or cooked. Most of them (128 [6.4%]) were sensitized to raw potato only, 1.6% to cooked potato only, and 2.1% had a mixed profile of sensitization. Twenty-seven subjects (1.3% of the total population and 13.3% of the sensitized patients) described symptoms upon ingestion or contact with potato. They were all sensitized to potato. Fifteen described contact pruritus/urticaria/eczema or rhinoconjunctivitis when peeling potatoes, and the rest (12 subjects) described digestive symptoms (nausea, diarrhea, or abdominal pain) upon cooked potato ingestion (but continued eating potatoes). No anaphylaxis was described.

Sensitizations to the following pollens were independent risk factors for potato sensitization (regarded as a whole, ie, positive SPT result to either raw or cooked potato, or to both): birch (odds ratio [OR], 4.49; 95% CI, 2.74-7.38; $P < .0001$), ragweed (OR, 3.45; 95% CI, 2.01-5.92; $P < .0001$), and plane tree (OR, 2.21; 95% CI, 1.32-3.71; $P = .002$). Some nonatopic patients ($n = 20$) were also sensitized to potato, but significantly to a lesser extent than atopic subjects (OR, 0.40; 95% CI, 0.21-0.77; $P = .006$). Monosensitization *per se* was not a risk factor for potato sensitization (sensitization to both *D pteronyssinus* and *D farinae* was considered as monosensitization), but polysensitization (described as positive SPT result to at least 2 inhalant allergens from the battery) significantly increased the risk of having a positive SPT result to potato. The increase was slightly higher if pollen polysensitization (ie, positive SPT result to at least 2 pollens) was present (OR, 4.53; 95% CI, 1.85-11.06; $P < .0001$) compared with polysensitization to allergens, irrespective of their nature (OR, 3.65; 95% CI, 1.70-7.82; $P < .0001$). Reported food allergy was also an independent risk factor for sensitization, but only to raw potato (Figure 1).

The most important finding of our study resides in the absence of severe allergy to potato in a large population. The population we studied has a profile of sensitization to respiratory allergens that is similar to the one we encountered over a decade ago, in another sensitization study.⁵ Therefore, we can consider that this cohort, issued from the general population, is representative for the allergy consultation in our area.

Sensitization to potato was found in one-tenth of the study population, which is not a negligible rate in our Mediterranean population. However, we may presume that sensitization to potato in our population is not a marker of isolated allergy to potato, but rather cross-sensitization to other plants. Indeed, we found that sensitization to birch and mugwort was a strong independent risk factor associated with a positive skin test result to potato. Patatin is the major protein present in potato tubers,

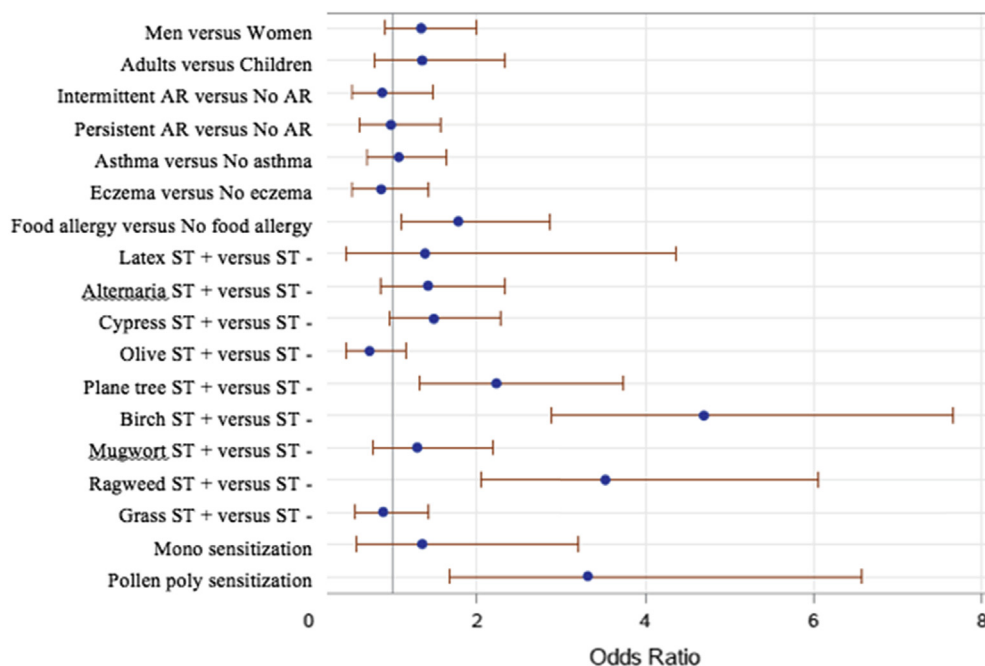


FIGURE 1. Risk factors of sensitization to raw potato. AR, Allergic rhinitis; ST, skin tests.

making up about 40% of the water-soluble proteins.⁶ Cross-sensitization between thermolabile proteins (PR-10, profilins) is the most probable hypothesis because such proteins have been identified in pollens and vegetables such as potato.⁷ This hypothesis is also supported by the absence of anaphylaxis in our study population and by the high prevalence of positive SPT result to raw (84.2%) rather than cooked (36.9%) potato. Our population from the Mediterranean area could presumably be sensitized to a cross-reactive lipid transfer protein. Plane tree and ragweed, both identified as independent risk factors for potato sensitization in our study, contain lipid transfer protein allergens, namely, Pla a 3 and Amb a 6. However, another study from the Mediterranean area suggested the absence of lipid transfer proteins in the edible part of potato.⁸

When intense and acute, digestive symptoms could be suggestive for FPIES, and this clinical entity has been described following potato ingestion.³ In our series, 44.4% of the patients reported symptoms to potato ingestion, but they were mild to moderate and thus not compatible with FPIES. Besides, all our patients continued potato ingestion.

Our study has a few limitations. Food allergy was reported by patients, but not necessarily proven because the study was carried out only during 1-day hospital visit, and in most cases, this lapse of time cannot ensure thorough diagnosis of food allergy. Raw and cooked potato were not freshly prepared, but were rather stocked in the freezer before usage. Because fresh seasonal fruits or vegetables are not always available throughout the year, it is common practice to perform skin testing by using frozen aliquots of these fruits. The validity of this method has already been confirmed.⁹ No biological tests were performed in our study because it was primarily intended to be an observational study.

Although we cannot rule out an absence of severe reaction, described mostly in children (including infants) related to the selection bias (85.4% of our patients are adult patients and children younger than 2 years were not included in the study), our data prove a good profile of tolerance to potato, in a large population. These findings are consistent with the long history of safe use of the potato in the human diet, compared with other fruits or vegetables. The nutritional value and potential health benefits of potatoes have been of interest in recent years, given the high yield at which potatoes can be produced.

We thank the Clinical Research Department of the University Hospital of Montpellier for their assistance in this study. We also thank *Comité National Interprofessionnel de la Pomme de Terre* for the unrestricted educational grant given for performing the study.

^aDivision of Allergy, Department of Pulmonology, Hôpital Arnaud de Villeneuve, University Hospital of Montpellier, Montpellier, France

^bPierre and Marie Curie University, University of Paris VI, Mixed Research Unit 1136, Epidemiology of Allergic and Respiratory Diseases Team, Pierre Louis Institute of Epidemiology and Public Health, Sorbonne University, Paris, France

^cInstitute of European Expertise in Physiology, Paris, France

^dDepartment of Clinical Information, Clinical Research Unit, University Hospital of Montpellier, Montpellier, France

^eMontpellier University, Montpellier, France

^fAlexander Grothendieck Montpellier Institute, Mixed Research Unit 5149, University Hospital of Montpellier, Montpellier, France

This study was funded by the University Hospital of Montpellier, via the *Contrat Fort Chercheur* funds.

Conflicts of interest: A. M. Chiriac's institution has received research support from Comité National Interprofessionnel de la Pomme de Terre (CNIPT). E. Lepicard's institution has received consultancy fees and provisions for writing assistance, medicines, equipment, or administrative support from CNIPT. P. Demoly has

received consultancy fees from ALK-Abelló, Stallergenes Greer, Circassia, Chiesi, ThermoFisherScientific, and Ménarini; has received lecture fees from ALK-Abelló, Stallergenes Greer, and Meda Pharmaceuticals; and his institution has received research support CNIPT. The other authors declare that they have no relevant conflicts of interest.

Received for publication September 25, 2016; revised December 4, 2016; accepted for publication December 9, 2016.

Corresponding author: Anca Mirela Chiriac, MD, Allergy Unit, Arnaud de Villeneuve Hospital, University Hospital of Montpellier, 371, Avenue du Doyen Gaston Giraud, 34295 Montpellier Cedex 5, Montpellier, France. E-mail: a-chiriac@chu-montpellier.fr.

2213-2198

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<http://dx.doi.org/10.1016/j.jaip.2016.12.011>

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