

BRIEF COMMUNICATION

Understanding the molecular sensitization for Cypress pollen and peach in the Languedoc-Roussillon area

D. Caimmi^{1,2}, D. Barber³, K. Hoffmann-Sommergruber⁴, H. Amrane¹, P.-J. Bousquet¹, H. Dhivert-Donnadieu¹ & P. Demoly¹

¹Département de Pneumologie, University Hospital of Montpellier, Hôpital Arnaud de Villeneuve and INSERM U657 - EA2415, Montpellier, France; ²Department of Pediatrics, Fondazione IRCCS Policlinico San Matteo, University Hospital of Pavia, Pavia, Italy; ³ALK-Abelló R&D, Madrid, Spain; ⁴Department of Pathophysiology and Allergy Research, Medical University of Vienna, Vienna, Austria

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Correspondence

Prof. Pascal Demoly, Département de Pneumologie, Hôpital Arnaud de Villeneuve and INSERM U657 - EA2415, University Hospital of Montpellier, 37, avenue du Doyen Gaston Giraud 34295 Montpellier Cedex 5, France.
Tel.: +33 467336127
Fax: +33 467042708
E-mail: pascal.demoly@inserm.fr

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Abstract

Background: Cypress allergy is a typical winter pollinosis and the most frequent one in the South of France. Main symptoms are rhinitis, conjunctivitis, and asthma. Peach allergy is common too in Southern Europe. Allergic cross-reactions between cypress and peach have been reported, including an oral allergy syndrome. We wanted to investigate whether a cross-reactive allergen between cypress and peach might be responsible for the observed clinical association.

Methods: We analyzed 127 patients included over a 3-month period, outside the pollen season, and we dosed specific IgE levels, for selected, individual allergens.

Results: Patients sensitized to peach were mainly positive for the peach-nonspecific lipid-transfer protein.

Conclusions: Profilins or thaumatin-like proteins could not explain the observed clinical association between cypress and peach.

The role of Cupressus species in winter pollinosis has been clearly demonstrated (1). This pollinosis is now considered as the most common pollinosis in Southern France: In fact, over a third of patients attending our service are sensitized to this pollen, and almost half of them present allergic symptoms during the pollen season (2). Main symptoms include rhinoconjunctivitis and asthma. We currently use an extract of *Cupressus arizonica* as representing the most common Cupressus species (1). *Cupressus arizonica* pollen contains six immunoglobulin E-binding protein bands, with the 43-kDa component being predominant both in its intensity and by the frequency of recognition by human IgE antibodies (1). This band was identified as the major allergen of *C. arizonica* (Cup a 1), a pectate lyase. Besides Cup a 1, two other proteins have been cloned: the thaumatin-like proteins (TLP) Cup a 3 (3) and the calcium-binding polycalcin Cup a 4 (4).

Peach (*Prunus persica*) is a documented source of food allergens. Cases of local reactions (labial edema and buccal pruritus) and systemic reactions (urticaria, asthma, and ana-

phylactic shock), resulting from the ingestion of fresh or processed fruit, have been described (5). Several allergens have been identified. The major allergen Pru p 3 is a nonspecific lipid-transport protein (nsLTP) of 9 kDa. Its concentration is seven times higher in skin than in the pulp (6). Pru p 3 is involved in cross-allergic reactions within fruits from the Rosaceae family (6). Another allergen, Pru p 4 (12–15 kDa), profilin, plays an important role in cross-reactions (7). Anti-profilin IgE antibodies are partly responsible for the observed cross-reactivity with pollens of grasses and some trees (olive) (7). Several cases of cross-reactive allergic reactions between cypress and peach have been reported and include an oral allergy syndrome (OAS) (8). Clinical and *in vitro* data show that other types of cross-reactivity between fruit and pollen mainly involve the Bet v 1 family or LTPs (9–11).

In order to investigate patient sensitization profiles in the Languedoc-Roussillon area (South of France) and to identify a molecular cross-reaction between cypress and peach allergens, we included over a 3-month period all consecutive adult

patients with a compatible clinical history of winter pollinosis, referred to our center. The evaluation took place outside the pollen season. Patients had to be living in the Languedoc-Roussillon area for at least 5 years before our visit. None of them had previously been treated with allergen immunotherapy. All participants provided written informed consent. The following clinical criteria were collected: symptoms during pollen season, severity of the respiratory disease, the presence of food allergy and type. All patients underwent skin prick tests with a battery consisting of histamine (10 mg/mL), and other inhalant allergens, as previously described (2). Serum samples were collected from participants, identified by bar code labels, stored at -20°C , and thawed immediately before use. The level of specific IgE to different allergens was analyzed according to Barber et al. (11) and included olive pollen allergens Ole e 1 and Ole e 9; panallergens: profilin (Pho d 2), cross-reactive carbohydrate determinants, CCD (peroxidase); grass pollen allergens group 1 (Phl p 1) and group 5 (Phl p 5); other plant pollen allergens Cupressus (Cup s 1), Artemisia (Art v 1, Art v 3), Parietaria (Par j 2), Birch (Bet v 1); nsLTP peach (Pru p 3), mugwort (Art v 3), apple (Mal d 3); TLP cypress (Cup a 3).

A total of 129 patients were included in the study. Mean age was 39 (± 14) years and 51% were females. All patients suffered from rhinitis, 28% from asthma and 28% presented with both. Among the 129 patients, nine had symptoms of peach allergy and two disliked this fruit. The results of our analysis are shown in Tables 1 and 2. It seems clear that LTP is the leading allergen in our peach group (9/9 are Pru p 3 positive, Table 1). It might also be that patients living in areas with high pollen counts are sensitized to minor allergens, including the cypress LTP, as it happens with *Platanus acerifolia* in the Barcelona area (11) or *Olea europaea* in Cordoba (10). Cup s 1 sensitization is a clear marker for *C. arizonica* pollen allergy in our population, while Cup a 3 seems to play

a minor role. Also, as shown in Table 2, Cup a 1 sensitization is not a predictor of asthma. Two patients were Pho d 2 (profilin) positive and Bet v 1 positive. The first one presents symptoms with peach, chestnut and cherry, and the second one with peach and artichoke. Profilin sensitization is not relevant in our cohort (12/129, 9.3%); it does not help to further discriminate among the subgroups, and it seems to be linked to grass sensitization. Indeed, we rarely have patients with OAS, and they usually live in the rear part of the region, where birch trees can be found, and such a manifestation is Bet v 1 related. Finally, with the molecular panel we used, we have not been able to find a link between peach and cypress. Pru p 3 and Mal d 3 sensitization are clear markers of peach allergy, but their positivity does not relate to cypress pollen allergy. In a previous clinical study, we showed that only about 4% of the patients sensitized to cypress pollens and symptomatic during the pollen season were affected by OAS to peach (2). We cannot exclude, from a clinical point of view, that during the pollen season, if the amount of pollen released into the atmosphere is greater than usual, some patients sensitized to both allergens may experience an OAS to fruit, as previously described in other areas (10, 11). Moreover, we were not able to find the correlation through the 45-kDa protein previously highlighted by Huges et al. (8) between cypress pollen and peach when performing cross-inhibition assays (data not shown). A further step to this analysis could be to test our patients for the 15-kDa cypress LTP recently described by Sánchez-López et al. (9).

Authors' contributions

Davide Caimmi and Hasnaa Amrane collected the data and wrote the manuscript. Domingo Barber and Karin Hoffmann-Sommergruber designed the study, performed the biological analysis, and corrected the manuscript. Philippe-Jean

Table 1 Global results of our patients' molecular patterns

Sensitization	All	No peach	Peach	No cypress	Cypress	No Pho d 2	Pho d 2
N	129 (%)	120 (%)	9 (%)	30 (%)	99 (%)	117 (%)	12 (%)
Inhalant allergens							
Art v 1	41 (31.8)	37 (31)	4 (44.4)	15 (50.0)	26 (26.2)	35 (29.9)	6 (50.0)
Art v 3	7 (5.4)	1 (0.8)	6 (66.6)	2 (6.6)	5 (5.1)	2 (1.7)	5 (41.6)
Bet v 1	11 (8.5)	10 (8.3)	1 (11.1)	1 (3.3)	10 (10.1)	5 (4.2)	6 (50.0)
Cup s 1	99 (76.7)	93 (77.5)	6 (66.6)	0 (0)	99 (100)	89 (76)	10 (83.3)
Ole e 9	1 (0.8)	0 (0)	1 (11.1)	0 (0)	1 (1.0)	0 (0)	1 (8.3)
Ole e 1	47 (36.4)	44 (36.6)	3 (33.3)	9 (30.0)	38 (38.4)	39 (33.3)	8 (66.6)
Par j 2	4 (3.1)	4 (3.3)	0 (0)	0 (0)	4 (4.4)	4 (3.4)	0 (0)
Perox	13 (10.1)	10 (8.3)	3 (33.3)	4 (13.3)	9 (9.1)	9 (7.6)	4 (33.3)
Phl p 1	56 (43.4)	52 (43.3)	4 (44.4)	12 (40.0)	44 (44.4)	43 (36.7)	12 (100)
Phl p 5	30 (23.3)	28 (23.3)	2 (22.2)	9 (30.0)	21 (21.2)	18 (15.3)	12 (100)
Pho d 2	12 (9.3)	10 (8.3)	2 (22.2)	4 (13.3)	8 (8.1)	0 (0)	12 (100)
Food allergens							
rMal d 3	7 (5.4)	0 (0)	7 (77.7)	1 (3.3)	6 (6.1)	5 (4.2)	2 (16.6)
rPru p 3	9 (7.0)	0 (0)	9 (100)	2 (6.6)	7 (7.1)	7 (5.9)	2 (16.6)
Cup a 3	1 (0.8)	1 (0.8)	0 (0)	0 (0)	1 (1.0)	1 (0.9)	0 (0)

Table 2 Patients' molecular pattern according to asthma and profilin (Pho d 2)

	Asthmatic patients % of asthmatic patients positive to the allergen on the left	Pho d 2			
		% of patients positive to Pho d 2 and to the allergen on the left	% of patients positive to Pho d 2 and negative to the allergen on the left	% of patients negative to Pho d 2 and positive to the allergen on the left	% of patients negative to Pho d 2 and to the allergen on the left
<i>Art v 1</i>	17.9	4.7	4.7	26.0	64.6
<i>Art v 3</i>	28.6	1.9	8.3	5.7	84.1
<i>Bet v 1</i>	36.4	4.7	4.7	3.9	86.7
<i>Cup s 1</i>	30.6	7.1	2.4	68.4	22.1
<i>Ole e 9</i>	100	0.8	8.7	0	90.5
<i>Ole e 1</i>	31.9	7.1	2.4	28.4	62.1
<i>Par j 2</i>	25.0	0	9.4	3.1	87.5
<i>Pero x</i>	40.0	3.4	6.6	5.9	84.1
<i>Phl p 1</i>	30.4	9.4	0	35.4	55.2
<i>Phl p 5</i>	29.0	9.4	0	12.6	78.0
<i>Pho d 2</i>	25.0	\	\	\	\
<i>rMal d 3</i>	42.9	1.6	7.9	3.9	86.6
<i>rPru p 3</i>	33.3	1.6	7.9	4.7	85.8
<i>Cup a 3</i>	0	0	6.9	6.9	86.2
<i>TLP1.2</i>	28.6	3.5	3.5	13.8	79.2

Bousquet performed the data analysis. Henriette Dhivert-Donnadieu and Pascal Demoly designed and supervised the study and corrected the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors disclose any potential conflict of interest for the present work.

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