

Olive pollen induces asthmatic response

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Summary

We provide evidence that olive pollen extract can induce asthmatic response. The pattern of airway response to olive pollen is investigated. Nineteen patients with seasonal allergic rhinitis and asthma, suspected to be due to olive pollen, all of whom had positive skin-prick test, were investigated. Bronchial challenge with olive pollen extract were performed and the peak flow rate was followed for 20 hr. Eight patients developed dual asthmatic response (DAR), six patients developed early asthmatic response (EAR) and five patients had no asthmatic response. The early maximal fall in FEV1 and the PD15 were not different between the group with DAR and the group with EAR only. We conclude that olive pollen can induce dual asthmatic response.

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Introduction

The olive tree is a typical part of the Mediterranean flora and is considered to be an indicator of the Mediterranean climate. It pollinates during the spring when grass and other trees are also dispersing their pollen. Although its pollen is not typically wind-pollinating, it is light enough to remain airborne for a significant distance from the tree of origin [1,2]. The olive tree is one of the major allergenic trees in the Mediterranean region, including Israel [3–6], where it is second only to grass pollen as a cause of hay fever [4,5]. Since it is unusual to find a patient who is allergic to olive pollen alone, its clinical significance is hard to prove.

The evidence for the clinical significance of olive pollen is indirect, and based on compatible case histories and positive skin tests. However, direct evidence for its potential to cause hay fever and allergic asthma is lacking.

Inhalation of a relevant allergen in an allergic asthmatic patient leads to an early asthmatic response. About 50% of the responders show also a late asthmatic response (LAR).

Occurrence of LAR in response to allergen inhalation was shown to increase bronchial sensitivity to histamine [7] and metacholine [8] and to be associated with moder-

ate to severe asthma [9,10]. This study was designed to provide direct evidence of the potential of olive pollen to induce early and asthmatic response (EAR) and LAR.

Patients and methods

Patient selection

Nineteen patients (11 men and eight women, aged 9–50 years), with histories of moderate to severe nasal, ocular and asthmatic symptoms, volunteered to participate in the study. All had variable dyspnea and wheezing that were limited to spring time, with no perennial asthma. All had positive responses to skin-prick tests with olive pollen extract that was 3 mm or more bigger than the diluent control. All patients had at least one more positive skin test to common grass pollen extracts.

Skin tests

Patients were skin tested with intradermal injection of olive pollen extract (*Olea europea*; Hollister-Stier; lot no. A72023250) that had 10.7 mg of protein/mm of 1:20 (w/v) solution in 50% glycerin. Final concentration was 0.21 mg/ml.

Histamine 10:000 (w/v) and normal saline were used as positive and negative controls. At 15 min, the size of the weal was recorded. All patients showed a large weal greater by at least 5 × 5 mm than the diluent control.

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Allergen inhalation tests

The tests were started between 8:00 and 9:00 AM and were all performed off season (at least 3 months after season). All the patients were symptom-free for at least 2 months and had normal FEV₁/FVC values. Allergens were reconstituted from freeze-dried olive extract (*O. europea*) containing 100 000 biological units (BU)/ml (Pharmacia, Uppsala, Sweden), with a diluent containing normal saline and 0.3% human albumin. Allergen inhalation tests were performed by a modification of the method described by Chai *et al.* [11]. Aerosols were generated with a 645 De Vilbiss nebulizer and compressed air giving an air flow of 6 l/min. Each solution was inhaled five times from FRC to TLC. Spirometry and peak expiratory flow rates (PEFR) were measured at baseline at 5, 10 and 15 min following each solution. The first solution nebulized contained the diluent alone.

When the change in FEV₁ following the diluent was smaller than 5% of baseline value, allergen solution was subsequently inhaled.

An increasing concentration of the extract was given: 100 BU, 1000 BU, 10 000 BU and 100 000 BU. When a sustained drop in FEV₁ higher than 15% was observed, the challenge test was considered a positive EAR and terminated. Spirometry and PEFR were measured at 30 min, 1 hr, 2 hr, 3 hr and 4 hr. Following the first 4 hr, only PEFR was measured every 2 hr up to 20 hr.

Pulmonary function measurements

Spirometry was performed using a spironalyser (CSA-800 Fukuda, Sangyo, Tokyo, Japan) and measurement of peak flow rate was performed using a mini Wright peak flow meter. Each test was performed three times and the best one was used for calculating EAR and LAR. PD15 was calculated by interpolating the dose-response curves on semilogarithmic paper. A fall of PEFR exceeding 20% of baseline which was measured 4–12 hr after the end of challenge was considered a LAR.

Statistical analysis

The difference between the results of the three groups was evaluated using analysis of variance (ANOVA).

Results

The patients were divided into three groups according to the airway response to the allergenic challenge: group A patients with dual asthmatic response (DAR) (eight patients); group B patients with EAR only (six patients); and group C patients, who did not respond to the maximum dose of the allergen inhaled (five patients).

Individual data are presented in Table 1. There was no difference between the size of the immediate skin response of the three groups, neither was there any difference between the baseline airway caliber among the groups as measured by the FEV₁/VC ratio. There was also no significant difference between the mean PD15 or the mean of the early maximal fall in FEV₁ between group A and group B.

Figure 1 demonstrates the airway response in groups A and B to the inhalation of the olive pollen extract.

Discussion

We provide here for the first time direct evidence that olive pollen causes asthmatic response in allergic patients with positive skin tests who present asthma symptoms during the olive pollen season. These findings would support the demand that olives should not be planted as ornamental trees and alternatives should be sought. However, positive bronchial challenge in itself does not constitute a definitive evidence that olive pollen is the only cause of asthma in our patients since a positive bronchial challenge to a pollen allergen extract has been observed in patients with seasonal allergic rhinitis alone [12], and our patients were sensitive to other pollen allergens.

The correlation between immediate cutaneous and airway responsiveness to allergen has been found to be inconsistent [13–16]. Later it was shown that the degree of the early asthmatic response to an allergen is dependent on the degree of the specific allergy as measured by RAST or by an immediate skin response and on the bronchial responsiveness to histamine [17,18].

Immediate skin-prick test response was reported to be similar in patients with DAR and EAR only [19,20].

In our patients, the baseline airway calibre and the immediate skin-test response was similar in patients with

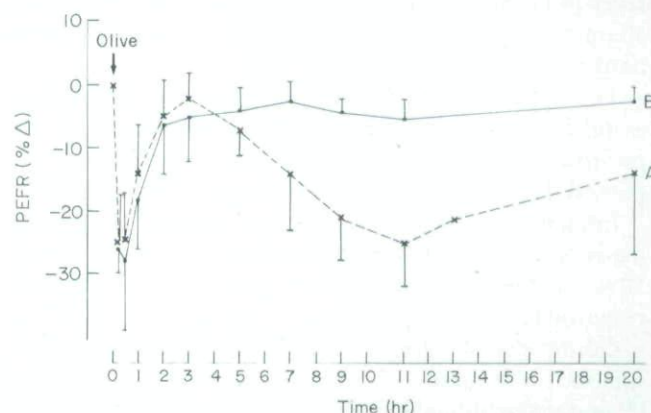


Fig. 1. Bronchial response to olive pollen extract inhalation. A, early and late asthmatic responses; B, early asthmatic response. Mean $\pm$ s.d.

Table 1. Skin and bronchial responses to olive pollen allergen

Patient no.	Age (years)	Sex	Skin test (mean diameter)	Basal FEV ₁ /VC	Aller. PD15	Early max. fall (% of baseline)		Late max. fall (% of baseline)
						FEV ₁	PEFR	PEFR
Group A								
1	44	M	26	74	22.0	42	22	24
2	9	F	11	76	27.0	33	26	36
3	44	M	16	80	3.0	48	29	24
4	24	F	22	77	0.6	47	38	40
5	38	M	13	84	2.8	16	12	22
6	15	M	17	78	16.0	45	36	20
7	9	M	13	84	7.0	30	25	30
8	9	F	13	93	62.0	17	17	24
Mean $\pm$ s.d.			16 $\pm$ 5	81 $\pm$ 6	17.6 $\pm$ 19	35 $\pm$ 12	26 $\pm$ 8	27 $\pm$ 7
Group B								
9	32	M	18	77	1.7	50	29	2
10	27	F	16	80	33.0	28	28	4
11	14	M	16	92	17.0	36	23	3
12	17	F	20	100	19.0	41	25	10
13	50	M	31	79	34.0	28	32	0
14	15	M	19	80	17.0	29	25	8
Mean $\pm$ s.d.			20 $\pm$ 5	84 $\pm$ 4	20.0 $\pm$ 11	35 $\pm$ 8	27 $\pm$ 3	3 $\pm$ 3
Group C								
15	38	F	35	85	—	5	—	5
16	23	F	12	80	—	3	—	6
17	19	M	9	87	—	0	—	4
18	14	F	10	80	—	9	—	15
19	41	M	15	88	—	0	—	0
Mean $\pm$ s.d.			16 $\pm$ 10	84 $\pm$ 3		3 $\pm$ 3		6 $\pm$ 5

DAR, patients with EAR only and in patients who did not respond to the maximum dose of the inhaled allergen.

The PD15 and the maximal early fall in FEV₁ were comparable between the group with DAR and the group with EAR only. This suggests that these factors do not determine the appearance of a late asthmatic response. However, we have not studied the bronchial histamine reactivity of the patients.

We provide here evidence that inhalation of olive pollen extract can induce a DAR. This supports the role of olive pollen as a cause of seasonal asthma. However, we were not able to identify a parameter or a combination of parameters that could predict the occurrence and the nature of the asthmatic response and this deserves further study.

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