

# Allergic Rhinitis in *Rosa domescena* Cultivators: A Novel Type of Occupational Allergy?

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Allergic rhinitis is an IgE-mediated response to an allergen.<sup>1</sup> Seasonal allergic rhinitis is a specific allergic reaction of the nasal mucosa to allergens, and is characterized mainly by watery rhinorrhea, nasal congestion, sneezing, and pruritis of the eyes, nose, ears, and throat. In seasonal allergy, symptoms are periodic in nature and occur during the pollinating season of the plants to which the patient is sensitive.<sup>2</sup>

When historical information from the patient is combined with observations from the directed physical examination, it is possible to develop a clinical suspicion of the presence of allergic rhinitis in that individual. When allergy is suspected, a skin prick test for common allergens is required to confirm the presence or absence of allergic disposition in the individual. The goal of specific antigen testing is to determine which, if any, antigenic substance is causing the patient's symptoms.<sup>3</sup> The physician who takes the history should know

**SUMMARY** After the diagnosis of allergic rhinitis due to *Rosa domescena* was suspected in one subject with skin prick and nasal provocation tests, we recruited all other workers employed in rose cultivation in Yakaören village, Isparta. From May 2000 to July 2000 (exposure period 'time of rose handling'), we studied 600 individuals employed in rose cultivation. A questionnaire was administered by a physician, and skin testing was done by a nurse on 75 individuals suffering from asthma and/or rhinitis. Sera from these 75 subjects were available for immunologic testing. The diagnosis of atopy against rose was based on the presence of work-related symptoms, positive skin prick test (SPT) with rose extracts, and positive RAST. While no subject reported asthmatic symptoms, twenty of them reported either rhino-conjunctivitis, rhinitis or both on exposure to *Rosa domescena*. Fourteen of these subjects had increased specific IgE levels to *Rosa domescena*. Eleven (78.5%) also had a positive skin reaction to *Rosa domescena*. Out of the six negative sera with normal specific IgE levels to rose, only two (33.3%) had positive skin reactivity. No subject had significant daily peak expiratory flow rate (PEFR) variations. We conclude that exposure to *Rosa domescena* may represent a risk for allergic rhinitis. The possibility of an occupational rose allergy should therefore be taken into consideration in the subjects working in rose cultivation.

the various allergens in the local and regional environment and their various seasonalities.<sup>4</sup> Factors that aggravate symptoms must be evaluated, including outdoor pollen allergens, indoor and outdoor mold spores, indoor animal allergens, and dust mite and other allergens. Patients should be asked about factors that improve symptoms, such as moving from home to work or to a recreational environment.<sup>1</sup> Past and

present occupations are of interest, and the patients should be asked whether symptoms change at work.<sup>1</sup>

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Rose is a plant with a wide food, domestic and industrial use in our city. The *Rosa domescena* flowers once a year between May and July. The occupational allergy to rose in exposed workers has not been described up to now. The aim of this study was to investigate whether the symptoms induced by rose were IgE-mediated.

## MATERIALS AND METHODS

After the diagnosis of allergic rhinitis due to *Rosa domescena* was made in a subject by means of skin prick and nasal provocation test, we recruited all other workers employed in rose cultivation in Yakaören village, Isparta.

From May 2000 to July 2000 (exposure period to *Rosa domescena*), after obtaining informed consent, 600 subjects were recruited to the study. A questionnaire was administered by a physician to all subjects, and skin testing was done by a nurse on 75 individuals suffering from asthma and/or rhinitis. Sera from these 75 subjects were collected for immunological testing.

### Questionnaire

A standardized asthma questionnaire<sup>5</sup> with additional questions on occupational items that had been used in previous studies<sup>6</sup> was administered by a physician to every employee. Asthma was diagnosed in the presence of two or more positive answers on wheezing, chest tightness, dyspnea, cough either spontaneously or on exercise and after inhaling nonspecific irritants. Rhinitis was defined by the presence of at least one symptom (runny nose, congestion, sneezing). Conjunctivitis was defined by the

presence of at least one symptom (itchy eyes, redness of the eyes, eye watering). Occupational rhinitis was defined from the questionnaire by the presence of at least one symptom (runny nose, congestion, sneezing) during a specific handling period.

### Skin tests

Skin prick test (SPT) was performed with 6 grass pollens, 6 tree pollens, 5 weed pollens, 3 animal danders and 2 house dust mite, and rose allergens. Histamine, 10 mg/ml, and saline solution were used as positive and negative controls. These were applied using the prick method of Pepys.<sup>7</sup> It is generally recommended that prick tests be placed at least 3 cm apart and intradermal tests be placed at least 5 cm apart.<sup>8,9</sup> False-positive skin test results have been reported even when these distances were used; a 4 to 5 cm distance for prick testing<sup>10</sup> and at least 6 cm for intradermal testing<sup>11</sup> may be more appropriate. That is why, allergens were placed at 5 cm intervals in our study group. The skin was pricked with a Stallerpoint needle (Stallergenes, France). SPT weals were recorded after 20 minutes and a resulting wheal with a mean diameter of 5 mm or more was taken as a positive reaction. Rose allergen extract was prepared and standardized by Laboratories Stallergenes, France. Atopy was defined by at least one positive skin response to allergens. The diagnosis of atopy against flowers was based on work-related symptoms due to the handling of flowers and/or positive SPT with flower extracts.

### Specific IgE assessment

Protein concentration was measured as previously described.<sup>12</sup>

Protein concentration was measured as 2.94 mg/ml for *Rosa domescena* in our study. Circulating IgE levels in the sera of 75 participants were quantified according to Di Felice *et al.*<sup>13</sup>

A modified procedure was used in the laboratory by using an antigen concentration of 25 µg protein/ml for coating the plates (Nunc<sup>TM</sup>-immuno plate, Maxisorp surface polisteren). The mean value ( $\pm 3$  SD) of the mean optical density was obtained from a group of six normal subjects selected as negative controls.

### Nasal provocation test

Nasal provocation test (NPT) was performed by applying the allergen to the nasal mucosa as follows: A small piece of cotton wool (diameter 1-2 mm) was impregnated with a small amount of test material, together with physiological saline. The cotton wool was applied to the anterior opening of the inferior nasal meatus for one hour. The simultaneous use of another piece of cotton wool with physiological saline alone served as a control. The nose was examined at 15-min intervals for one hour. The test was interpreted as positive if at least two of the following signs were clearly present: (a) itching, (b) swelling of the mucosa, (c) water discharge, and (d) sneezing, and if the other provocation test with saline was negative.<sup>14</sup>

### Follow-up of peak expiratory flow rate

Some authors suggest that the measurement of specific bronchial challenge tests is not necessary<sup>15</sup> which is why we did not perform such measurements because it



is potentially dangerous, being a potential trigger for severe asthmatic reactions. Instead, a daily peak expiratory flow rate (PEFR) diary for four times a day for two weeks was recorded by a Personal Best<sup>®</sup>, Full Range Peak Flow Meter (USA) in persons reported having occupational rhinitis on exposure to *Rosa domescena*, during work followed by two days without exposure. Diurnal variability in PEFR was calculated as (PEFR high-PEFR low)/ PEFR average.

### Statistical analysis

Data are presented as mean  $\pm$  standard deviation (SD). The correlation analysis was made using Sperman's correlation test. A *p* value of  $< 0.05$  was considered statistically significant.

## RESULTS

We have questioned 600 subjects (430 women, 170 men) working in rose cultivation for allergic symptoms elicited by *Rosa domescena* (Fig. 1). They have been involved in rose cultivation for various periods ranging from 1 to 25 years. During those years they had been exposed to rose flowers for various periods of time. The mean age was  $36.8 \pm 9.48$  years (M:  $39.7 \pm 8.57$  vs F:  $33 \pm 7.48$ ).

Thirty-five subjects reported having asthma diagnosed by their physician ( $n = 18$ ), asthma and rhinitis ( $n = 10$ ), rhinitis ( $n = 3$ ), and rhinoconjunctivitis ( $n = 4$ ). The frequency of allergic disorders that we have diagnosed is depicted in Fig. 2. While no subject reported asthmatic symptoms, twenty persons reported either rhinoconjunctivitis, rhinitis or both on specific exposure to *Rosa domescena* (Table 1). Seventeen subjects were



Fig. 1 *Rosa domescena*.

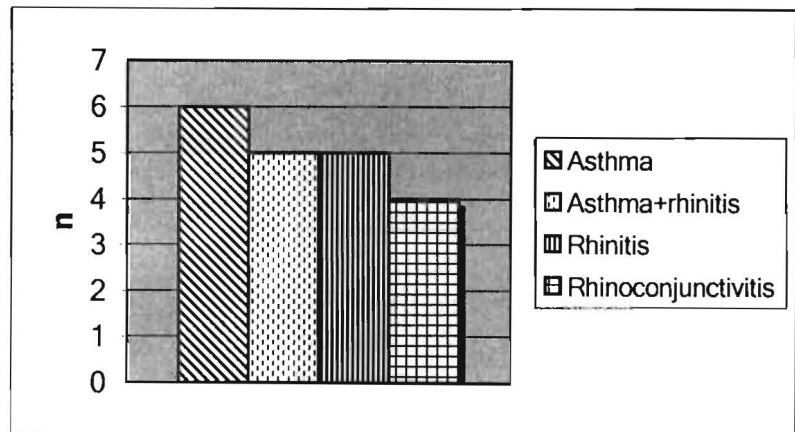


Fig. 2 The frequency of allergic disorders among the workers.

sensitized to at least one allergen. Thirteen of them had skin reactivity to rose. In fifteen of these 20 subjects, nasal provocation with rose extract was positive eliciting nasal obstruction, itching, sneezing, or nose running.

Fourteen subjects had increased specific IgE levels to *Rosa*

*domescena*. Eleven (78.5%) of them also had a positive skin reaction to rose. Out of the six negative sera with normal specific IgE levels to rose, only two (33.3%) had positive skin reactivity to rose. No subject had significant ( $> 20\%$ ) daily and day to day PEFR variations during both work days and a period without exposure.

**Table 1** Subjects with occupational complaints caused by handling of rose

Subjects	Sex	History	Other sensitization	Rose SPT results	Specific IgE to rose	Nasal provocation test
1	M	R	-	-	N	-
2	M	RC	-	P	I	P
3	F	R	Dust mite	P	I	P
4	F	R	Dust mite	P	I	-
5	F	R	-	P	N	P
6	M	RC	Pollens	-	N	-
7	F	RC	-	P	I	P
8	F	R	Dust mite	P	I	P
9	M	RC	Pollens	P	I	P
10	M	RC	-	-	N	P
11	F	R	Pollens	P	I	P
12	F	R	-	-	N	-
13	M	R	Pollens	-	I	P
14	F	R	Dust mite	P	I	P
15	F	RC	-	P	I	P
16	F	R	Pollens	-	I	P
17	F	R	-	P	N	-
18	M	R	Pollens	-	I	P
19	F	R	Dust mite	P	I	P
20	F	RC	-	P	I	P

M = male, F = female, R = rhinitis, RC = rhinoconjunctivitis, P = positive, N = normal, I = increased, - = negative

In our study, specific IgE against rose correlated positively with the nasal provocation test ( $r = 0.630$ ,  $p < 0.01$ ). There was no significant correlation between the prick test and the specific IgE ( $r = 0.435$ ,  $p > 0.05$ ).

## DISCUSSION

Flowers are being cultivated all over the world since hundreds of years. Flower allergy is rare but can develop into occupational rhinitis. The handling or smelling of flowers or contact with flower pollen, is commonly thought to cause respiratory and nasal symptoms. In a questionnaire study 80% of patients

with asthma or allergic rhinitis reported that flowers worsened their symptoms.<sup>16</sup> However, case reports of occupational allergy to *Rosa domescena* could not be found in the literature so far.

In another study of 65 workers handling flowers in a large floral company in the United States, one quarter reported a history of hand dermatitis, and nearly half of the workers reported symptoms of asthma or rhinitis, or other symptoms which possibly were also of allergic origin.<sup>17</sup>

In our study, the nasal provocation test with rose extract was negative in 25% of subjects

with a positive case history. Discrepancy between case history and SPT might be due to the incorrect case history or non-immunological mechanisms.

Occupational rhinitis is a common but generally overlooked entity. It frequently coexists with asthma. While not as dramatic a presentation as bronchial asthma, it nevertheless results in significant discomfort and work inefficiency. Medical history and physical examination are the most important components of the work up of the patient. A site visit to the specific work area may give helpful insights to the patient's exposure.<sup>18</sup>



Florists, greenhouse workers, and floriculturists run an increased risk of type I occupational allergies to decorative plants.<sup>19</sup> Cut flowers of the compositea family are a frequent cause of occupational IgE-mediated sensitization in florists and horticulturists.<sup>20</sup>

In the region of Hamburg, Germany, 150 floral workers were investigated, one-half had skin problems and 44% some kind of respiratory or other allergic symptoms, including asthma (7.8%) and symptoms of rhinitis (19.6%).<sup>21</sup> Interestingly, in our study, no subject had occupational asthmatic symptoms against *Rosa domescena*. Clinical symptoms of rhinitis or rhinoconjunctivitis improved when the subject moved away from the place where rose was handled.

Nasal symptoms were best predicted by a positive skin test result together with specific IgE positivity to the same allergen.<sup>22,23</sup> In our study, there was a positive correlation between specific IgE and the nasal provocation test.

Our results suggest that an IgE-mediated reaction may be responsible for the respiratory symptoms of the patients. No similar cases of allergy to *Rosa domescena* have been previously reported.

We conclude that exposure to *Rosa domescena* may represent a risk for occupational rhinitis. The possibility of an occupational rose allergy should therefore be taken into consideration for the patients living in the rose cultivation region.

## REFERENCES

1. Rachelefsky GS. Pharmacological management of allergic rhinitis. *Allergy Clin Immunol* 1998; 101: S367-9.
2. Ricketti AJ. Allergic rhinitis. In: Paterson R, ed. *Allergic diseases*. 4th ed. Philadelphia, J.B. Lipincott Company 1993; pp. 225-53.
3. Fornadley JA, Corey JP, Osguthorpe JD, Powell JP, Emanuel IA, Boyles JH *et al*. Allergic rhinitis: clinical practice guideline. Committee on Practice Standards, American Academy of Otolaryngic Allergy. *Otolaryngol Head Neck Surg* 1996; 115: 115-22.
4. Storms WW. A comprehensive diagnostic approach to upper airway disease. *J Allergy Clin Immunol* 1998; 101: S361-3.
5. Burney PGJ, Laitinen LA, Perdrizet-shuckauf H, Tattersfield AE, Chinn S, Poisson N, Heeren A, Britton JR, Jones T. Validity and repeatability of the IUATLD (1984) bronchial symptoms questionnaire: an international comparison. *Eur Respir J* 1989; 2: 940-5.
6. Malo JL, Chan-Yeung M. Population surveys of occupational asthma. In: Bernstein IL, Chan-Yeung M, Malo JL, Bernstein DI, eds. *Asthma in the workplace*. New York: Marcel Dekker Inc, 1993; pp. 145-70.
7. Pepys J. Skin tests in diagnosis. In: Gell PGH, Coombs RRA, Lachman PJ, eds. *Clinical Aspects of Immunology*. Oxford, Blackwell Scientific Publication, 1975.
8. Brown WG, Halonen MJ, Kaltenborn WT, Barbee RA. The relationship of respiratory allergy, skin test reactivity, and serum IgE in a community population sample. *J Allergy Clin Immunol* 1979; 63: 328-35.
9. Bernstein IL. Proceedings of the Task Force on Guidelines for Standardizing Old and New Technologies Used of the Diagnosis and Treatment of Allergic Diseases. *J Allergy Clin Immunol* 1988; 82: 487-526.
10. Terho EO, Husman K, Kivekas J, Riihimaki H. Histamine control affects the wheal produced by the adjacent diluent control in skin prick tests. *Allergy* 1989; 44: 30-2.
11. Koller DY, Priker C, Jarisch R, Gotz M. Influence of the histamine control on skin reactivity in skin testing. *Allergy* 1992; 47: 58-9.
12. Smith PK, Krohn RI, Hermanson GT, Mallia AK, Gartner FH, Provenzano MD, Fujimoto EK, Goetze NM, Olson BJ, Klenk DC. Measurement of protein using bicinchoninic acid. *Anal Biochem* 1985; 150: 76-85.
13. Di Felice G, Caiaffa MF, Bariletto G, Afferni C, Di Paolo R, Mari A *et al*. Allergens of Arizona Cypress (*Cupressus arizonica*) pollen: characterization of the pollen extract and identification of the allergenic components. *J Allergy Clin Immunol* 1994; 94: 547-55.
14. Kanerva L, Vaheri E. Occupational allergic rhinitis in Finland. *Int Arc Occup Environ Health* 1993; 64: 565-8.
15. Hausen BM, Shoji A, Jarchow O. Orchid allergy. *Arch Dermatol* 1984; 120:1206-8.
16. Eriksson NE, Löwhagen O, Nilsson JE, Norrlind K, Wihl JA. Flowers and other trigger factors in asthma and rhinitis-and inquiry study. *Allergy* 1987; 42: 374-81.
17. Thiboutot DM, Hamory BH, Marks JG. Dermatoses among floral shop workers. *J Am Acad Dermatol* 1990; 22: 54-8.
18. Slavin RG. Occupational rhinitis. *Ann Allergy Asthma Immunol* 1999; 83: 597-601.
19. Bolhaar STHP, Van Ginkel CJW. Occupational allergy to cyclamen. *Allergy* 2000; 55: 411-2.
20. De Jong NW, Vermeulen AM, Gerth Van Wijk R, De Groot H. Occupational allergy caused by flowers. *Allergy* 1998; 53: 204-9.
21. Hausen BM, Oestman G. Untersuchungen über die Häufigkeit berufsbedingter allergischer Hauterkrankungen auf einem Blumengrossmarkt. *Dermatosen* 1988; 36: 117-24.
22. Droste JHJ, Kerkhof M, de Monchy JGR, Schouten JP, Rijcken B. Association of skin test reactivity, specific IgE, total IgE, and eosinophils with nasal symptoms in a community-based population study. *J Allergy Clin Immunol* 1996; 97: 922-32.
23. Ariano R, Panzani RC, Chiapella M, Augeri G. Respiratory allergy to the pollen of *Mercurialis annua*. *Ann Allergy* 1993; 70: 249-54.