

# Diagnostic standards for occupational nasal allergy

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## SUMMARY

*Based on studies of 70 outpatients having occupational nasal allergy as well as mass examinations of workers in two industries, diagnostic standards for this condition were evaluated.*

*In practice, interviews concerning the causal relation, frequency, latent period and atopic disposition often provide suggestions, but sometimes give unreliable evidence for the basis by which to diagnose occupational nasal allergy. Both rhinoscopy and nasal smear test for eosinophilia are available, but these only distinguish allergy from non-allergy. Therefore, examinations, such as skin tests, nasal tests and determination of the IgE antibody level, using allergen extract of good quality, are necessary for a final diagnosis.*

## INTRODUCTION

In recent years, interest in occupational allergy has been increasing. Knowledge of this condition, however, is still not very extensive, and the diagnosis is not always easy to arrive at. The purpose of the present study is to provide diagnostic standards for occupational nasal allergy on the basis of studies of 70 patients with this condition in the authors' outpatient clinic as well as mass examinations of workers in two industries.

## MATERIAL AND METHODS

The subjects and industrial materials examined were as follows (Table 1): 1. Wood dusts of Western red cedar (34 lumberers, wood workers and cabinet makers), of Chinese quince (one wood worker), of Japanese cypress (two wood workers), of deal (one wood worker) and of lauan (one cabinet worker); 2. Pollens of Japanese cedar (one forestry technician), of strawberry (one farmer), of grass (one mandarin orange farmer) and of pyrethrum marc (11 workers in a mosquito insecticide factory); 3. Dusts of wheat flour (three bakers) and of green tea (one green tea refiner); 4. Dusts of cotton bags (one warehouse keeper), of silk (two cloth merchants) and of wool (five workers in a wool textile mill); 5. Kallikrien, a drug used in treating hypertension (three workers in a pharmaceutical factory) and

Table 1. Patients with occupational nasal allergy in the authors' clinic

allergens	no. of cases	associated allergy			incidence	causal relation	atopic disposit.	latent period	allergic testing			IgEAb
		asthma	eye	skin					rhin.	eosin.	skin	
western red cedar	34	22/34	5/34	8/34	7/23	20/34	6m-10y	22/32	28/34	31/34	14/28	9/11
another wood dusts	5	0/5	0/5	0/5	4/5	1/2	1-18y	5/5	5/5	5/5	5/5	5/5
wheat flour	3	0/3	3/3	3/3	3/3	1/3	2m-2y	3/3	3/3	3/3	3/3	3/3
green tea	1	0/1	0/1	0/1	1/1	0/1	?	1/1	1/1	1/1	1/1	1/1
pyrethrum	11	1/11	1/11	2/11	8/64 (12.5%)	3/11	1-15y	11/11	3/3	11/11	3/3	3/3
another pollens	3	0/3	3/3	0/3	3/3	1/1	1-15y	3/3	3/3	3/3	3/3	3/3
cotton dust	1	0/1	0/1	0/1	1/1	?	3y	1/1	1/1	1/1	1/1	nd
silk dust	2	1/2	0/2	0/2	2/2	1/2	8-15y	2/2	2/2	2/2	2/2	2/2
wool dust	5	0/5	4/5	0/5	5/102 (4.9%)	3/5	1-2y	5/5	5/5	5/5	nd	nd
kallikrein	3	3/3	0/3	0/3	3/3	1/3	3m-9m	3/3	2/2	3/3	2/2	2/2
chrysalis	1	1/1	0/1	0/1	1/1	1/1	8y	1/1	1/1	1/1	1/1	1/1
hog waste	1	1/1	0/1	0/1	1/1	1/1	3y	1/1	1/1	1/1	1/1	1/1
total	70	26/70 (37.1%)	17/70 (24.3%)	13/70 (18.6%)	31/59 (52.5%)	33/64 (51.5%)	2m-18y	58/68 (85.3%)	55/61 (90.2%)	67/70 (95.7%)	36/50 (72.0%)	30/32 (93.7%)

In the figures with a denominator and numerator, the denominators are the number of cases examined and the numerators show the number with positive results.

The incidence indicates the results obtained from the mass examinations.  
nd: not done



6. Powdered chrysalis (one fish farmer) and hog waste (one dog breeder).

A few comments on the above-mentioned materials may be helpful. Western red cedar timber, a product of Canada and the U.S.A., has been imported and is in increasingly wide use in Japan and Europe. Both Chinese quince from China and lauan from Southeast Asia are exotic woods for indoor construction. Many strawberry pollens are floating in the air of small air-conditioned vinyl-covered greenhouses in which the patient worked growing strawberries. The mandarin orange farmer in this study uses the mixed dusts of wool and grass, imported from Australia, for fertilizer. In the mosquito insecticide factory, pollens of pyrethrum marc, imported from South Africa are mixed with some other inert ingredients and hardened into coils. Cotton bags for steel bars were stored in a warehouse where their dusts were floating in the air. Kallikrien powder is produced from pig pancreas and packed by the patients in a pharmaceutical factory. Powdered chrysalis is used for breeding carp for Chinese dishes.

The examinations were carried out by such methods as inter viewing (history-taking), intracutaneous testing and nasal provocation with allergen extracts, nasal smear test for eosinophilia, rhinoscopy and Prausnitz-Kustner or radio-allergosorbent test (RAST) for determining serum antibody levels.

In interviewing, the causal relation was adjudged to be positive if the symptoms usually disappeared or decreased when the patients stopped having contact with the materials involved in their occupations and, conversely, worsened when they were in contact with them. Atopic disposition was also judged positive when the patients had allergic diseases, such as asthma, allergic rhinitis, allergic dermatitis, conjunctivitis and food and drug allergies in their family histories.

For intracutaneous testing, crude allergen extracts were prepared in the authors' laboratory by Unger's dextrose phenol method (Unger, 1932). No extract induced any non-specific reactions, through intracutaneous injections of extracts in concentrations of 1 : 1000 (W/V) in more than 10 normal subjects. The Western red cedar extract was specially prepared by Mitsui's high-pressure method (Mitsui, 1970) because Unger's method produced only less potent extract. The nasal provocation test has already been described in a previous paper (Okuda, 1980). Pharmacia RAST kits were employed for RAST.

In addition to the outpatient examinations, mass examinations were performed on 64 workers in a mosquito insecticide factory in Wakayama and on 102 workers in a wool textile mill in Chiba by the test methods of history-taking and skin testing with allergen extracts.

## RESULTS

All patients were found to have developed the same typical symptoms of atopic inhalant nasal allergy as seen in non-occupational nasal allergy. Associated with

nasal symptoms, other allergic symptoms, such as asthma, conjunctivitis and dermatitis were found in 37.1%, 24.3% and 18.6% of all patients, respectively. Asthma occurred most frequently in the allergy to kallikrien (all three patients) and Western cedar (22 out of 34 patients), and conjunctivitis was common in allergies to wheat flour, pollens and wool dusts. Dermatitis was most often encountered in bakers. The causal relation between the contact with industrial materials and symptoms was found in 52.5% of all patients, the lowest frequency in the allergy to Western red cedar (30.4%). Atopic disposition was found in 51.5% of all patients, with higher frequencies among those with allergies to Western red cedar (58.8%) and wool (60.0%) and a lower frequency among those allergic to pyrethrum ((27.2%).

The exact incidence of occupational allergy to the prevalence of each industrial material was not demonstrated since all the workers with or without symptoms were not examined in each industry. Mass examinations were undertaken for only two kinds of materials, and the incidence was 12.5% in the mosquito insecticide factory and 4.9% in the wool textile mill. The period from the first contact with allergenic industrial materials to the appearance of symptoms (latent period) varied widely from person to person, ranging from two months to 18 years, even in the same industrial workshop.

Typical rhinoscopic characteristics, i.e. pale nasal mucous membrane and accumulation of watery secretion, were found in 85.3% of all patients. Each of the tests for allergy showed positive results in high frequencies: 90.2% in nasal eosinophilia, 95.7% in skin reaction, 72.0% in nasal provocation and 93.7% in serum IgE antibody level. In the mass examinations in the wool textile mill, there was a marked difference in the incidence of positive skin reaction between workers with and without atopic disposition (30.7% and 8.9%, respectively). Positive reaction was 11.8% in total. Positive skin reaction to pyrethrum was found in 18.7% of the workers in the insecticide factory.

## DISCUSSION

Some of the present occupational allergies to different allergens have already been reported in Europe, America and Japan (Western red cedar, wheat flour, cotton, wool, silk, hog waste) (Pepys, 1978 and Michel, 1958) or suggested to be present (Solomon, 1978). On the other hand, some allergens have been recognized only in Japan (Japanese cypress, deal, grass pollen, Japanese cedar pollen, kallikrein and chrysalis) (Nakamura, 1979). All of these showed the characteristics of atopic inhalant nasal allergy in symptoms and test results.

There are several categories of occupational allergy. The first is the allergy provoked only by occupational allergens during work. The second is the allergy to proper occupational allergens associated with sensitization to common naturally-occurring allergens, such as house dust, pollens and airborne fungi. The third is



that characterized by proper occupational materials acting not only as allergens, but as aggravating factors of a non-allergic nature. The fourth is the allergy caused by common naturally-occurring allergens which are special to the work in the amount of the allergen or the conditions of exposure. The fifth is caused by exposure to allergens resulting from contact not only with industrial workers but with their families or people in the neighbouring community outside the workshop or industry. Also included in this latter category are the families of workers, who are exposed to occupational allergens at home, as seen in the children of bakers, furriers, farmers and so on. When an allergy without relation to work is manifested or aggravated by factors of a non-allergenic nature with relation to work, this should be excluded from the category of occupational allergy. The present patients fall into categories 1 to 4. Western red cedar allergy, however, is a somewhat atypical in nature when compared with the others. The patients showed red, not pale, nasal mucous membrane, negative provocation, obscure causal relation and more association with asthma than found in patients with allergies to other allergens. This atypical nature may be caused by the direct irritant effect of the vaporous substance contained in the wood. Hirose (1966) extracted several terpenoid oils from this wood, in which nezukone was believed to be the main volatile oil, as the irritant substance. Therefore, the allergy to Western red cedar may belong to category 3.

As supportive evidence for occupational allergy, it has been emphasized by many investigators (Panzani, 1958 and Pepys, 1980) that the causal relation, frequency of occurrence, latent period and atopic disposition are the most important factors. The causal relation between the contact with industrial allergen and the onset of nasal symptoms are usually clear in the occupational allergies of categories 1 and 2, and, on the other hand, often obscure in those in categories 3 to 6. In the present study, only half of the patients revealed such relations. Occupational asthma occurs more frequently during the evening and night at home and is not at its worst during working hours (Pepys, 1978).

A more frequent occurrence should be found among workers in contact with special allergenic materials involved in manufacturing than among the general population. In the present mass examination in the mosquito insecticide factory, the incidence of phyrethrum allergy was 12.5% and positive skin reaction to phyrethrum was 18.7%. In the wool textile mill, these values were 4.9% and 1.8%, respectively. The incidence, however, varied according to the kind of duty or the conditions of exposure, even in the same industry. In the above-mentioned insecticide factory, allergy occurred only among the workers who were in contact with the dried powder of phyrethrum, but not among those handling the material in a diluted form. The hog breeder's symptoms were especially severe in the dry, air-conditioned room where the baby hogs were kept. In practice, it was often difficult to ascertain the accurate incidence since the patients mostly worked in small-

scale factories in which only a few people were employed. The latent period from the first contact with industrial allergen to the occurrence of symptoms is important for diagnosis, but varied widely from person to person, even in the same workshop. Therefore, this factor was not always helpful in the diagnosis of occupational allergy.

The predisposing factors in atopic allergy were clearly shown in the present study. In the mass examinations in the wool textile mill, the positive skin reaction to wool allergen was obtained in workers with atopic family histories three times more frequently than in those without such a disposition. In practice, however, it is rather difficult to ascertain this disposition in individual patients since we have no reliable method to investigate it, although family histories are mainly used.

From the above discussion on the significance of history-taking in the diagnosis of occupational nasal allergy, it has been revealed that tests for allergy are indispensable. As seen in the present study, rhinoscopy and the nasal smear test showed specific positive results at a high frequency. These were simple, easy and available for distinguishing allergy from non-allergy, but not for distinguishing occupational from non-occupational allergy.

On the other hand, skin tests, nasal provocation as well as the determination of IgE antibody levels are reliable methods for identifying the causal allergens and diagnosing occupational allergy. Positive results from these tests were obtained from the majority of the patients. However, the preparation of specific allergen extract presents a troublesome problem, since extracts are not often commercially available due to limited use. Laboratory preparation is time-consuming and the quality of extract made affects the test results. From the point of view of methodology, preparation from metal salts, vapors, gases, fumes and low molecular chemicals of inorganic origin is usually impossible.

In conclusion, interviewing on the causal relation, frequency, latent period and atopic disposition is not sufficient for the diagnosis of occupational nasal allergy and should be accompanied by tests for allergy.

#### RÉSUMÉ

Une étude portant sur 70 patients atteints d'allergie nasale d'origine professionnelle et sur la population entière des travailleurs de deux industries est utilisée pour explorer les facteurs permettant de déterminer l'étiologie professionnelle de l'affection. En pratique, l'interrogatoire relatif à la relation causale des manifestations nasales, à leur fréquence, à la prédisposition atopique, fournit souvent une probabilité étiologique mais donne parfois des éléments insuffisants pour établir un diagnostic évident d'allergie professionnelle. La rhinoscopie et la recherche de l'éosinophilie nasale sont utiles, mais font seulement la distinction entre manifestations allergiques et non allergiques. C'est pourquoi, des explora-



tions comme les tests cutanés et les tests de provocation nasale ainsi que la détermination du taux des IgE à l'aide d'extraits allergéniques de bonne qualité sont nécessaires pour établir un diagnostic définitif.

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