

## HYPERSENSITIVITY AND RESPIRATORY FUNCTION IN WOOD INDUSTRY

V. Cvetanov, N. Ežova, J. Vasevski, J.  
Karadžinska-Bislimovska, and E. Štikocina

*The Institute of Occupational Health, Health Service, Skopje*

Ventilatory functions and skin hypersensitivity to allergens present in the wood industry were assessed in 47 workers with an average exposure of 12.8 years. On the basis of the MRC questionnaire for respiratory symptoms, each worker was submitted to the measurements of ventilatory lung function parameters for acute and chronic effects of exposure. Intradermal testing with five specific dust allergens was performed, and the level of serum immunoglobulins was determined. Fifty-five per cent of the workers were found to be hypersensitive to specific allergens. In those with positive skin tests, acute and chronic effects of wood dust on  $FEF_{75-85\%}$  and FVC were noted, which points to a possible constrictive effect of wood dust localized mostly in the small airways in sensitized persons.

Respiratory diseases due to the inhalation of wood dust reported earlier by other authors have been attributed to mechanical irritation, to pharmacological effects, or to hypersensitivity mechanisms (1). Clinical patterns of an immediate or late asthmatic reaction have been described, or a combination of the both. Extrinsic allergic alveolitis has also been detected among wood workers and reports have been published of chronic obstructive respiratory effects (2).

The aim of the present study was to assess skin hypersensitivity to allergens to which wood workers are exposed at work, and to determine their ventilatory functions.

### SUBJECTS AND METHODS

A total of 47 male wood workers were examined, with the mean age of 45.7 years, and average exposure to wood dust of 12.8 years (1987). MRC questionnaire (3) was filled out for each individual worker, to estimate the prevalence of chronic respiratory symptoms. Ventilatory lung function measurements were made with the Godart Spirometer. They included VC,  $FEV_1$  and the maximum expiratory flows  $FEF_{25-75\%}$  and  $FEF_{75-85\%}$  of FVC. They were carried out before the beginning and at the end of

Table 1  
*Prevalence of respiratory symptoms in workers with positive and negative skin tests to allergens from wood industry*

	Workers			
	with positive skin test		with negative skin test	
	N	%	N	%
Morning cough	12	35	3	23
Cough and phlegm	10	29	1	8
Chronic bronchitis	10	29	1	8
Dyspnea	6	18	1	8
Wheezing	13	38	2	15
Asthma	1			

the shift. The chronic effect was determined by comparing the values obtained in ventilatory tests before the beginning of work with the referent CECA values for VC and FEV<sub>1</sub> and with those of Morris and Koski for FEF. Intradermal tests were performed with five different allergens from the working environment. Those were applied on the volar side of the forearm and the results were read in 10-20 minutes and after four hours. The intensity of the reaction was determined according to the recommendations of the 11th Congress of Allergologists of Scandinavia (4). Three classes of immunoglobulins, IgG, IgM and IgA, in serum were determined on RID plates, made by the «Torlak» Institute of Immunology and Virusology in Belgrade.

In working environment dust was measured gravimetrically; samples were taken by electric vacuum pumps; the detection limit was  $\pm 0.2 \text{ mg/m}^3$ .

#### RESULTS AND DISCUSSION

A total of 17 dust samples taken from the wood factory workshops showed a total dust concentration range of 10-98  $\text{mg/m}^3$  (mean 37.8  $\text{mg/m}^3$ ). Considering current regulations all the values recorded were above normal. The exposed workers were placed into two groups: those with positive skin tests (Group 1), and those with negative skin tests to specific allergens originating in the place of work (Group 2).

The prevalence of respiratory symptoms based on the MRC questionnaire is shown separately for workers with positive and those with negative intradermal tests (Table 1).

In workers with a positive intradermal test, the highest prevalence was established for wheezing and morning cough and in workers with a negative intradermal test, for cough. There was no significant difference in the prevalence of respiratory symptoms between the two groups. Generally the most frequent symptoms were wheezing (32%) and morning cough (32%). Similar data on respiratory symptoms were obtained

Table 2  
*Ventilatory functions in workers after intradermal testing with specific allergens from wood industry: acute changes over work shift*

Skin tests	VC <sub>(L)</sub>			FEF <sub>(L)</sub>			FEF <sub>25-75%</sub>			FEF <sub>75-85%</sub>		
	I	II	p	I	II	p	I	II	p	I	II	p
	positive	4.18 ± 0.43	4.17 ± 0.42	NS	3.2 ± 0.41	3.1 ± 0.43	NS	3.41 ± 0.30	3.2 ± 0.58	NS	0.84 ± 0.13	0.76 ± 0.17
negative	4.08 ± 0.49	4.08 ± 0.51	NS	3.29 ± 0.34	3.27 ± 0.33	NS	3.27 ± 0.48	3.26 ± 0.46	NS	0.99 ± 0.12	0.95 ± 0.11	NS

Table 3  
*Ventilatory functions in workers with respect to intradermal reactions to specific allergens compared to the standards. The values are presented as  $\bar{X} \pm SD$ .*

	Group 1			Group 2		
	before work	normal	p	before work	normal	p
	VC <sub>(L)</sub>	4.18 ± 0.43	4.38 ± 0.39	DNS	4.08 ± 0.49	4.30 ± 0.37
FEV <sub>1</sub> (L)	3.26 ± 0.41	3.36 ± 0.28	DNS	3.29 ± 0.34	3.34 ± 0.34	DNS
FEF <sub>25-75%</sub> (L)	3.24 ± 0.58	3.41 ± 0.30	DNS	3.37 ± 0.48	3.49 ± 0.28	DNS
FEF <sub>75-85%</sub> (L)	0.84 ± 0.17	0.95 ± 0.13	<0.05	0.99 ± 0.12	1.0 ± 0.13	DNS

through the MRC questionnaire by a number of authors (1, 5, 6). Table 2 shows the ventilatory function parameters before the beginning and at the end of the working hours in workers with positive and in those with negative intradermal tests.

In workers with a positive intradermal test a significant acute reduction was recorded for the parameter  $FEF_{75-85\%}$  of FVC, while reductions in other parameters were somewhat lower but statistically non-significant. In workers with negative intradermal tests no significant reduction of the ventilatory parameters was noticed.

In Table 3 the ventilatory function values before the beginning of work are compared with the standard values for the estimation of the chronic effect of wood dust.

In workers with positive intradermal tests  $FEF_{75-85\%}$  values of FVC were significantly lower than the reference values. For the other parameters there was no statistically significant difference concerning the standards in either group.

Acute reduction of the parameters of the small airways in wood workers has been reported by a number of authors (1, 7). Our results which showed a decrease in  $FEF_{75-85\%}$  of the FVC in workers who were sensitized with specific allergens from wood industry indicate a possible constrictive effect of wood dust, which was mainly localized in the small airways. Intradermal testing of wood workers was performed with five specific allergens taken from the working environment (Table 4).

Table 4

*Prevalence of skin hypersensitivity to allergens from wood industry*

Allergen	Reaction			
	after 10 min		after 4 h	
	N	%	N	%
Masonite	15	32	7	12
Dust from the workshop	14	30	4	9
Lacquered wood	1	2	2	4
Beech	26	55	10	21
Chipboard	7	15	—	—

The greatest number of positive intradermal tests was obtained after the application of the beech allergen, dust from the workshop and masonite. The sensitizing effect of the wood allergens is believed to be related to the great number of isolated and identified substances which are, in addition to their toxic effect, strong allergens: chinone, turpentine, alcohol etc. Of interest is the research of *Culaud* (8) who reports that specific, exotic trees have potent allergenic effects (makore iroko, teak). Different authors inform of different prevalence of hypersensitivity in workers exposed to wood dust: from 15% (1) up to 64% (9).

A comparatively high percentage of exposed workers showed an increase in the level of IgM (32%). The percentage of those with increased IgG (8.5%) and IgA levels (4.2%)

was much smaller. There was no significant difference with respect to the increased level of certain classes of immunoglobulins between workers with positive and those with negative skin tests.

The concentrations of all classes of immunoglobulins were within normal. Similar results have been reported by other authors (1).

Among wood workers who underwent intradermal testing for the purpose of this study, 55.3% showed sensitivity to specific allergens from the working environment.

A significant acute reduction of FEV<sub>75-85%</sub> of FVC was found in workers with positive intradermal tests. This points to a possible constrictive effect of wood dust localized primarily in the small airways in sensitized persons.

#### REFERENCES

1. Carosso A, Ruffino C, Bugiani M. Respiratory diseases in wood workers. Br J Ind Med 1987;44:53-6.
2. Both B H, Le Foldt R H, Moffit E M. Wood dust hypersensitivity. J Allergy Clin Immunol 1976;57:352-7.
3. BMRC, British Medical Research Council. Committee on the Aetiology of Chronic Bronchitis. Standardized Questionnaires on Respiratory Symptoms. Br Med J 1961;II:1665-80.
4. Arner B. Intracutaneous test with histamine and allergen extract. Reproducibility of the method. Acta Allergol 1974;29:222.
5. Catilina P. Risques professionnels et prevention. Arch mal prof 1981;42:253.
6. Haxhiu M, Đokić D. Occupational asthma in wood workers, Arbete och Halsa 1982;19:35.
7. Chan-Yeung M. Maximal expiratory flow and airway resistance induced bronchoconstriction in patients with asthma due to western red cedar (*Thuja plicata*). Am Rev Respir Dis 1973;108:1103-10.
8. Culaud H P. Pathologie professionnelle et travail du bois, Arch mal prof 1981;42:275.
9. Cvetanov V, Seizova V, Stojanovski V, Karadžinska J. Alergiska preosetljivost na materiji od radotno mesto vo Drvnata industrija. In: Zbornik radova VI kongresa medicine rada Jugoslavije. Novi Sad: Društvo lekara Vojvodine, 1983:870-3.

#### Sažetak

#### HIPERSENZITIVNOST I RESPIRATORNA FUNKCIJA KOD RADNIKA U DRVNOJ INDUSTRIJI

Kod 47 radnika drvne industrije sprovedena su ispitivanja u cilju procene senzibilizacije sa specifičnim alergenima i ventilatorne funkcije. Svim ispitivanim osobama popunjavao je MRC upitnik za respiratornu simptomatologiju, određivan je akutni i hronični efekt drvne prašine na ventilatornu funkciju (na njene pojedine parametre) izvršeno je intradermalno testiranje sa pet specifičnih alergena drvne industrije i određivan je nivo serumskih IgG, M i A. Ispitivanja su pokazala senzibilizaciju na specifične alergene kod 55,3% radnika intradermalnim testiranjem. Kod radnika sa pozitivnim intradermalnim testovima registrovan je i akutan i hroničan efekt drvne prašine na parametar FEV<sub>75-85%</sub> od FVK-a. Ovo ukazuje na eventualni mogući konstriktorni efekat drvne prašine, pretežno lokaliziran u malim disajnim putevima kod senzibiliziranih osoba.

Zavod za medicinu rada, Dom zdravlja Skopje