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CLINICAL EXAMINATION OF PERSONS OCCUPATIONALLY EXPOSED IN WOOD INDUSTRY

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About 50 patients a year are admitted to the Clinic of Occupational Medicine in Umeå because of respiratory symptoms caused by work in saw-mills, construction industry, paper pulp industry and wood chip handling. They are examined according to a standardized procedure including skin prick test, spirometry, metacholine test and clinical examination of the upper and lower respiratory tracts. Exposure measurements in the industries include organic dust, formaldehyde, terpenes and mould spores. Challenge tests with irritants are undertaken in an exposure chamber at the Medical Division (NIOH) with measurements of reaction from the eyes, nose, throat and bronchi. Often reactions are found at exposures lower than TLV.

The Clinic of Occupational Medicine in Umeå receives about 50 patients a year from the northern part of Sweden because of respiratory symptoms caused by work in saw-mills, paper pulp industry and wood chip handling. Subjective symptoms are also common in farmers who predominantly handle timber. At their workplaces workers are exposed to various chemical and/or physical agents.

In saw-mills they are exposed to wood dust, terpene, moulds (*Rhizopus, Aspergillus fumigatus, Paecilomyces, Mucor*), in paper pulp mill to wood dust, terpenes, mercaptans, moulds, SO_2, H_2S, in lumber jacks to exhaust gas (motor saws), cold, in construction industry to wood chips (formaldehyde or other glues), organic dust, paints, insulation materials containing isocyanate from polyurethane foam, etc.

METHOD

The investigation programme includes a structured interview covering occupational history, physical parameters determined by lung auscultation and blood pressure

measurement. Very often workplace inspection implying additional measurements is undertaken. If relevant, provocation testing is done at the workplace and symptoms are recorded by means of a vitalograph or PEF-meter. Vitalograph recording is easy to compare with measurements done by industrial doctors. A self-administered PEF-meter is used for 24 h monitoring.

Estimation of metacholine sensitivity is done according to the standardized method of *Hargreave and co-workers* (1) at the Department of Lung Medicine. At the Department of Clinical Physiology static and dynamic spirometries are performed as is also a test of diffusing capacity for carbon monoxide. Skin prick test with common, and if necessary, special antigens (i.e. pine and corn) is undertaken at the Lung Clinic. The investigation programme includes a structured clinical interview, determination of the physical status (blood pressure, lung auscultation), chest X-ray, prick test for common (and specific) allergens, metacholine test, spirometry (dynamic and static), DCO (diffusing capacity) if needed and precipitating antibodies if relevant.

If eye symptoms are dominant an eye photograph is taken with standardized equipment and eye blink frequency is recorded. If the suspected noxious agent is an irritant gas, a challenge test might be included where controlled exposure is generated for 30–60 minutes in an exposure chamber. The chamber conditions are: size 15 m^3, ventilatory capacity 150 or 400 L/h, temperature 15–30 °C, relative humidity 15–60%, particle – corresponding ambient indoor air and, workload 50–100 W or rest. The parameters recorded are as follows: eye blink frequency, respiratory rate, pulse frequency, rated symptoms, naso-pharyngo-laryngoscopy, dynamic spirometry before and immediately after exposure and estimation of closing volume before and immediately after exposure.

RESULTS

Case 1. A male construction worker, 27 years of age, non-smoker, worked in an environment where wood chip boards were used. After a few years of work, in connection with an infection, he started to complain of a burning sensation in his throat which gradually increased and finally did not permit him to work at all. Inspection and measurements at the workplace showed the presence of the aerosol formaldehyde, HCHO, with the mean concentration over the workday of 0.4 mg per m^3. Vitalograph recording in the morning and after a workday did not show any significant decrease in FEV_1. He was admitted to the Clinic while away from work and was included in an investigation programme. The challenge tests focussed on exposure to formaldehyde as the irritant, using concentrations 0.2 and 0.8 mg/m^3 for 30 minutes. In the exposure chamber at a formaldehyde concentration which was below the Swedish TLV value (1.3 mg/m^3) the patient gradually reported a burning sensation in his throat. The first low exposure signalled a slight increase of redness of the throat. Therefore, the test was repeated with a concentration of 0.8 mg/m^3 for another 30 minutes. Dose-related redness and oedema in the pharyngeal mucosa was reported by the E.N.T. specialist.

Case 2. A middle-aged woman worked in a small carpentry shop 150 km west of Umeå, where, among other things, wood lamp stands from the exotic wood obechi were produced. In the same plant fir tree was also handled. After a year of work the patient developed night asthma. Prick test showed a weak reaction to pine and was negative for obechi. IgE and Rast test were negative. Metacholine test was also negative. The patient was, nevertheless, removed from the workplace and given asthma medication. Before this, PEF values showed a decrease, related to occupational exposure. However, spirometry while the patient was away from work was normal.

DISCUSSION

Obvious cases of asthma are handled at the Department of Lung Medicine. The prevalence of asthma in the northern region is 3–4 per cent and the prevalence of chronic bronchitis among active population is around 1.5 per cent The climate in the northern part of Sweden is dominated by long and cold winters and a low relative humidity, with temperatures from −10 to −35 °C and humidity from 10 to 15%. *Kolmodin-Hedman and co-workers* (2) studied health effects of occupational exposure among workers engaged in wood chip handling. In the case of distinct work-related symptoms which are not easily proved by provocation tests at the workplace or by clinical investigation the above model can help. Reactions to exposure values lower than the existing Swedish TLVs have often been recorded.

A negative challenge test (if exposure conditions are relevant) also offers valuable information. However, in some cases of mixed exposure it cannot exclude a work-related effect. The issue is discussed by *Malo and co-workers* (3) in connection with asthma in workers handling soft wood in Canada. Reactions to four out of 11 prick tests to wood from the pine and spruce tree were recorded, seven of 11 positive prick tests were proven for other trees, and a distinct decrease of FEV_1, repeatedly measured under work conditions, as well as positive metacholine reactions were reported in connection with clinical asthma. However, tests in the laboratory did not provoke an asthmatic reaction in the patients.

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Sažetak

KLINIČKO ISPITIVANJE RADNIKA ZAPOSLENIH U DRVNOJ INDUSTRIJI

U Klinici za medicinu rada u Umei godišnje se hospitalizira pedesetak pacijenata s respiratornim simptomima uzrokovanim radom u pilanama, građevinarstvu, industriji papira i tzv. šper-ploča. Standardni postupak za ispitivanje ovih pacijenata sastoji se od kožnih testova, spirometrije, metakolinskog testa te kliničkog ispitivanja gornjeg i donjeg respiratornog trakta. U industrijskim postrojenjima mjeri se eskpozicija organskim prašinama, formaldehidu, terpentinima i sporama plijesni. Provokacijski testovi s iritansima provode se u komorama za eskpoziciju Medicinskog odjela (NIOH), pri čemu se mjeri reakcija očiju, nosa, grla i bronha. Često se nađu pozitivni nalazi i pri ekspoziciji koja je manja od dopustive granice za određeni kontaminant.

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