

sequence of events seems to have occurred: After the accidental spilling of the toluene in a closed space the patient inhaled sufficient amounts to cause loss of consciousness for the next 18 hours, and this is possibly the direct cause for the chemical pneumonitis which developed. The acute renal failure was possibly precipitated by the lack of fluid intake together with the heavy myoglobinuria.

Fever, chemical pneumonia, loss of consciousness, coma, conjunctivitis, headache, tachycardia, leucocytosis, and anaemia have been previously described following toluene poisoning (von Oettingen, 1958). A case of acute toluene intoxication with hyperbilirubinaemia and anuric acute renal failure suggesting hepatorenal syndrome has also been described (O'Brien *et al.*, 1971). The combination of myoglobinuria and dehydration is known to produce acute renal failure in man (Muehrcke, 1969) and in the experimental animal (Thiel *et al.*, 1967).

The low BUN/creatinine ratio described by Hamilton *et al.* (1972) in cases of myoglobinuria due to rhabdomyolysis was also noted in our patient, who had an initial ratio of about 5. This ratio increased rather rapidly and was already about 13 just before his first haemodialysis on the fifth hospital day. This increase to the usual levels of over 10 (Dossetor, 1966) seems to indicate that the muscle damage was acute and transitory followed by acute tubular necrosis without further disproportionate creatininaemia.

It seems that the myoglobinuria was the direct cause of the renal failure which was rapidly transformed into a nonoliguric form by the early administration of intravenous fluids, osmotic diuretics, and frusemide. Recovery was complete.

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Recent progress in the study of occupational lung diseases in Romania

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Barhad, B., Pilat, L., and Teculescu, D. (1975). *British Journal of Industrial Medicine*, **32**, 164-168. Recent progress in the study of occupational lung diseases in Romania. This paper reviews studies of occupational lung diseases in Romania in the last two decades. Work concerned with the effects of exposure to textile fibres, irritant gases and fumes in the chemical industry, welding fumes, asbestos, cadmium oxide, and the relation between dust exposure, pneumoconiosis, and chronic bronchitis is briefly presented.

Diseases of the respiratory tract caused by exposure at work to dust, gases, fumes, fibres, etc. represent a high percentage of occupational diseases in Romania. The present paper reviews the Romanian studies in the last two decades dealing with occupational respiratory diseases (except silicosis).

Textile fibres

The clinical aspects of respiratory disease in workers exposed to textile dust have been discussed by Saragea (1962), and their pathophysiology was reviewed by Saragea *et al.* (1963). In 1962 Manu called attention to byssinosis; the first cases in the country were described in the Department of Occupational Diseases, Colentina Hospital one year later (Preda, Lillis, and Pilat, 1963). A survey in two textile factories in Bucharest, one processing cotton, the other flax, hemp, and jute, was conducted between 1963 and 1965 (Preda *et al.*, 1965). A total of 683 workers were studied using the standard Medical Research Council respiratory questionnaire, physical examination of the thorax, and a ventilatory test. More than half (54%) of the workers complained of respiratory symptoms, but for the most part these were complaints of irritation of the upper airways. Chronic bronchitis was present in 8.8%, bronchial asthma including occupational cases in 4.4%, and byssinosis in only 7.4% of the workers. The prevalence was higher in the dustier workplaces (carding rooms, etc.) and in workers exposed to hemp, flax, and jute, as compared with those exposed to cotton dust (12.8% v 3.5%). The spirographic data showed a decrease after the shift, but, at variance with the results of British authors, the decrease was not limited to Mondays as it could be found on Fridays in some subjects, nor to subjects with a diagnosis of byssinosis as it was found also in subjects with chronic bronchitis, irritative symptoms, etc. The authors were obliged to conclude (Preda *et al.*, 1966) that byssinosis is but one of the illnesses appearing in subjects occupationally exposed to textile dust.

Dumitriu (1972) confirmed the higher prevalence of byssinosis in workers processing low quality cotton (9%) compared with those processing high quality cotton (4%), in a study of 1095 workers in three mills. The prevalence of byssinosis was related to the dust concentration. In symptomatic workers from this group the ventilatory impairment was mostly of the obstructive type (Manu, Dumitriu, and Senchea, 1973).

The pathogenesis of respiratory diseases caused by exposure to textile dust was studied by Wasserman (1957) and by workers from the Institute of Hygiene in Bucharest (Gavrilescu *et al.*, 1969; Popa *et al.*, 1969; Preda *et al.*, 1972). These studies demonstrated a hyper-reactivity of the airways of workers exposed

to textile dust, while inhalatory bronchial challenge tests with fibre allergens were negative in all but a few subjects. The significance of some circulating antibodies found was not clear. A follow-up of 12 workers with byssinosis has confirmed that a decrease of forced expiratory volume in one second (FEV₁) during the shift is also present at the end of the week (Preda *et al.*, 1972).

Welders

The vast literature on the respiratory condition of welders has been reviewed by Barhad, Teculescu, and Craciun (1972). Radiographic changes in arc welders were first noticed by Meilă, Kelner, and Dubovan in 1956. Clinical aspects and case reports were published from Bucharest (Pilat, Lillis, and Craciun, 1963) and Timișoara (Ursoniu *et al.*, 1967). The problems raised by the differential diagnosis from other conditions (silicosis, haemosiderosis) have been discussed by Pilat *et al.* (1971a). A tendency to a lower distensibility of the lung of arc welders was recorded (Stănescu *et al.*, 1967). In a large shipyard chest radiographs of the welders were taken in 1965-66 and were repeated in 1968 and 1972; up to 51% of the welders had radiographic changes, but most were linear or reticular opacities (ILO code 'L') (Barhad *et al.*, 1967). Determination of noxious fumes and gases at the workplace demonstrated that the welders are exposed to a great number of substances including metal oxides (iron, zinc, cadmium, manganese), ozone, carbon monoxide, nitrogen oxides, fluoride, etc. The respiratory symptoms were recorded using the standard questionnaire on 173 welders (men only with at least five years' experience) and 101 controls (non-welders from the same shipyard, matched for age and smoking habits). All the symptoms were more frequent among welders, for example, chronic bronchitis was found in 19% of welders and 11% of controls, but the difference was significant only for breathlessness. The authors expressed reservations about the significance of this symptom in a population aware of the potential hazard of its occupational exposure (Barhad *et al.*, 1973). Experimental work on the fumes and aerosols obtained by the use of different types of electrodes was carried out by Gabor *et al.* (1971). A group of workers exposed to pure iron oxide dust developed marked radiographic changes (Albu, 1970) while their pulmonary function was essentially normal (Teculescu and Albu, 1973).

Asbestosis

The occupational hazard related to exposure to fibrous dusts was reviewed by Barhad, Tripsa, and Petrescu (1962). The first cases of asbestosis were described in 1960 by Daniello *et al.* Pilat *et al.*

al. (1962) investigated a group of 40 workers handling asbestos; they detected nine cases with obvious radiographic changes and five with early changes. The pathophysiological pattern in asbestosis was reviewed by Manu, Teculescu, and Stanescu (1968). In a study of 79 cases of asbestosis, some of whom were followed up for several years, Pilat *et al.* (1971b) stressed the fact that although the pulmonary function abnormalities and the severity of clinical symptoms and signs increase with the progress of radiographic changes, within each radiological category great differences in clinical picture and lung function can be found. Among the workers with a similar radiographic picture, those with symptoms tended to have greater impairment of pulmonary function. The restrictive pattern of ventilatory impairment was evident except in those who had medium radiographic abnormalities; the breath-holding transfer factor was decreased only when the lung volume was lower, the transfer coefficient being normal in all but a few cases.

Chemical industry

One of the most dynamic branches of Romanian industry has been the chemical industry. Problems arose from its fast development both for the workers and sometimes for the general population as well. A team led by the late Professor Dinischiotu studied a group of workers exposed to sulphur dioxide in a sulphuric acid plant. A high prevalence of ocular, nasopharyngeal, and tracheobronchial irritative symptoms was found (Dinischiotu *et al.*, 1962). The postgraduate thesis of Senchea (1970) included a follow-up of this group and an analysis of the patients hospitalized in the Department of Occupational Diseases, Colentina Hospital over a period of ten years with acute intoxication caused by irritant gases. It was found that in some of the subjects mild respiratory symptoms persisted for weeks after cessation of exposure. Experimental work by Ardelean *et al.* (1966) has stressed the depression of the immunological defence mechanisms of animals chronically exposed to low concentrations of SO₂, inducing minimal structural changes. A survey of 130 workers (mean age 38 years; average exposure 8.1 years) exposed to fluorine in a superphosphate plant (Preda, Muica, and Craciun, 1971a) pointed out the high prevalence of irritative symptoms of the upper airways, and a moderate excess (17%) of chronic bronchitis.

A critical review of the literature led Teculescu and Stănescu (1970) to question the relation between pulmonary emphysema and exposure to cadmium compounds. They insisted that postmortem studies had been carried out at that time in only seven cases, and that the classical clinical, radiographic, and physiological criteria for the diagnosis of emphy-

sema are no longer accepted today as they do not differentiate between overinflation and true emphysema. In support of their statements they reported comprehensive pulmonary function studies in 11 workers (mean age 38.6 years) exposed for 7 to 11 years to moderate (1.2-2.7 mg/m³) concentrations of cadmium oxide fumes, but in whom abnormalities compatible with pulmonary emphysema could not be demonstrated. Static lung volumes, elastic recoil, and diffusing capacities were practically normal.

Chronic bronchitis

Occupational exposure to mineral dusts may be incriminated in the pathogenesis of chronic bronchitis but as is well known this problem has been a matter of debate for a long time, because of the multifactorial nature of the aetiology of chronic bronchitis. Chronic cough and expectoration were frequent complaints of a group of 400 hospitalized miners (Preda *et al.*, 1971b). Prevalence of these symptoms rose with increase in radiographic abnormalities from 17% in patients with linear opacities to 30% in those with category 1 to 3 nodulation, and 56% in patients with large opacities. These results have prompted an epidemiological study of working miners in the Jiu Valley coalfield (Preda *et al.*, 1971c). Among 545 miners with more than five years' underground experience, the prevalence of chronic bronchitis was influenced mainly by tobacco consumption (39% in smokers *v* 22% in non-smokers), to a lesser extent by length of underground work, and was not related to the presence of radiographic nodulation (28% in miners with nodulation and 36% in those with linear or reticular opacities). To ascertain the role of smoking, a further survey was set up (Preda *et al.*, 1971d) of active miners with a strictly limited age (from 35 to 40 years) and work experience of 10 to 15 years' span. The studies included the MRC questionnaire, physical examination of the thorax, standard 30 × 40 cm chest films, and spirometry (vital capacity and FEV_{1.0}). The prevalence of chronic bronchitis was again elevated (31%) with a 1.6 to 1.0 gradient between smokers (41.5%) and nonsmokers (26.2%), ex-smokers sharing an intermediate position (35.4%). A control group of non-miners from the same district matched for age, smoking, and socio-economic status had a significantly lower prevalence (20%; $\chi^2 = 13.4$; $P < 0.001$) of chronic bronchitis. When the analysis was limited to nonsmokers, work underground was found to increase the prevalence of bronchitis by a factor of 2.5 (26.2% *v* 10.7%). Better climatic and work conditions in a lignite coalmine in the Prahova Valley were reflected by a lower (28%) prevalence of chronic bronchitis in 400 active miners (Craciun *et al.*, 1971). A research group from Cluj (Ossian *et al.*, 1971) has recently reported an

increased prevalence of respiratory symptoms in workers of the iron and steel industry.

The reader will realize the limitations of a review like the present one; we hope however that we have succeeded in drawing an approximate picture of the many interests of Romanian research workers in the stimulating field of occupational respiratory diseases.

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