BOOK REVIEWS


Nearly 40 years ago Dutton, an American doctor, described a group of symptoms which he attributed to chronic poisoning with vanadium pentoxide. This group included a characteristic paroxysmal, dry, irritating cough which could lead to hemorrhage in the lung; irritation of the nose, eyes, and throat; anorexia, nausea; diarrhea or constipation, anemia, cachexia, albuminuria with casts, hematuria (renal), tremor, headache, neuroretinitis, amaurosis, vertigo, and mental disorders. The prognosis of this apparently devastating syndrome was held to be good. About 30 years later Symanski, an observer in Germany, studied 19 cases and reduced the picture to irritation of the upper respiratory tract and of the conjunctiva, and an x-ray picture of chronic bronchitis sometimes with bronchiectasis. All the other phenomena alleged by Dutton were discarded. Seven years later Wyers in Great Britain gave an account of 10 cases observed in a factory in Essex. The syndrome was attributed to the inhalation of vanadium pentoxide dust and included the following: pallor of the skin (without signs of anemia); greenish-black discoloration of the tongue which disappears in a few days if removed from exposure; paroxysmal cough (rarely associated with hemoptysis); dyspnea; pains in the chest; palpitation on exertion; tremor of the fingers and arms; emphysema; bronchitis; bronchospasm; raised blood pressure; reticulation of the lung (x-ray); and a probable greater liability to colds and pneumonia. Clearly almost the whole of this syndrome relates to the respiratory tract. The alleged pallor and tremors also described by Dutton are unexplained. The discoloration of the tongue is said to occur most frequently among men with septic teeth and furred tongues. Actually Wyers mentions this sign in one only of his 10 summarized cases.

Certain features of Wyers' description must be grasped. He lays special emphasis on emphysema and reticulation of the lung; he refers to three cases of lower lob pneumonia of which one was fatal, and one case of middle lobe pneumonia with the later comment that "it seems likely that colds and pneumonia are of more frequent occurrence than in the general population"; he holds "raised blood pressure and accentuated pulmonary second sound" to be an observed feature of the syndrome but examination of the figures given in his 10 illustrative cases does not appear to support this observation.

The recent findings of Sjöberg as presented in this painstaking publication are somewhat laboriously repetitive, but the result of reading this work is to leave no doubt about what he has found. He has studied 36 workers for four years in a vanadium factory which started operations in 1946 and soon experienced cases of illness. Some of these 36 workers had worked in the "old vanadium works" where conditions had been bad. Concurrently with thorough and modern clinical, chemical, radiographic, and other examinations, the author also performed experiments on rabbits using finely ground pure vanadium pentoxide, the proportion of very small particles being much greater than that found in factory dust.

Clinically Sjöberg observed slight conjunctival irritation; mucosal irritation with nasal catarrh; dry and irritable throat but no serious changes in larynx or trachea; violent cough; wheezing chest; dyspnea; seven cases of pneumonia or bronchopneumonia. This author found no evidence of chronic pulmonary changes indicative of pneumoconiosis, fibrosis, or emphysema. Blood pressure was not raised. Sjöberg showed by spectrographic analysis of the ash of blood and urine that vanadium is absorbed into the circulation in quantities which cannot be regarded as negligible.

By patch tests he demonstrated that skin sensitivity to vanadate occurs in some cases, but he is not dogmatic as to possible allergic factors in the respiratory symptoms.

The "disease" is acute, comes on within a week of the first exposure to dust and lasts from a few days to a few months according to the degree of exposure. The symptoms subside except for some residual chronic changes in the pharynx and some skin sensitivity.

The differential diagnosis may be difficult, for the condition simulates a simple acute respiratory infection. The temperature curves in the pneumonia cases were similar to those found in non-industrial cases.

Sjöberg points out that, in spite of the undoubted systemic absorption of vanadium in his cases, there was no definite evidence of toxic effects. It is interesting that during the period of investigation the workers gained in weight.

Animal experiments with exposure to high concentrations of vanadium pentoxide for short periods and to low concentrations for periods up to eight months showed that inhaled vanadium pentoxide may be lethal; that it is a strong irritant to the respiratory tract producing tracheitis and bronchopneumonia which may
leave some chronic effects; that vanadium pentoxide is absorbed systemically; that there is a sparse deposition of vanadium pentoxide dust in the lungs since the smallest particles (< 5 μm) are (says Sjöberg) absorbed from the lungs and can no longer be seen in them after a few weeks irrespective of the period of exposure or concentration of the dust; that there is no development of pneumoconiosis; that vanadium pentoxide does not produce fibrosis in the lungs. The whole, or nearly the whole, picture in the exposed animals is one of an acute disease when a high concentration of dust is used. When a low concentration is used for a long period there result chronic inflammatory changes in the nasal and tracheal mucosa, some slight emphysema, and occasional atelectasis in the lungs. Some pathological changes were found in the liver but they were difficult to assess, and on the whole the author is not inclined to lay much stress on them. Even with low concentrations and long exposure the effects must be regarded as of an acute kind, the vanadium pentoxide being apparently rapidly carried away from the lungs and excreted in the urine. Clearly the animal experiments confirmed the clinical findings.

Thus, Sjöberg was unable to confirm Wyers’ description of the pulmonary part of the syndrome.

The common features which remain are conjunctivitis and pneumonia. It is clear from Wyers’ account, but not from the 10 cases he summarizes, that he believed he was dealing with an industrial disease in which there was the unusual combination of systemic intoxication and “dust reticulation”.

The physical properties of vanadium pentoxide are not such that long continued action in situ would be expected. For example, as Sjöberg showed, the solubility of this oxide in body fluids is quite high when compared with its solubility in water. In the absence of data on the particle size distribution to which Wyers’ cases were exposed, it is difficult to say what would be expected to occur in the lungs. His brief description of the method of manufacture of vanadium pentoxide applied in his factory is not sufficient to indicate precisely to what the workers were exposed nor is the description of men as “vanadium workers” more enlightening. Sjöberg explains the very sparse presence of vanadium pentoxide in the lungs (5 μm particles in pneumonic foci) of his animals exposed to the dust referred to above as due to the solution and absorption of the smallest particles or to their being easily taken up by phagocytes. There is something unsatisfactory about this for at least two reasons: the smaller the particles the less easily are they wetted, and quantitative data on the ease with which small particles of an acidic substance are taken up by phagocytes are needed before any view on this can be justified. It would be rash to say more than that the evidence thus far tends to discount the suggestion that vanadium pentoxide dust can set up a chronic fibrosing process in the lungs. But it will be necessary to follow the cases already described for a number of years before final judgment can be made. The work under review is certainly the best on the industrial toxicology of vanadium pentoxide.

M. W. GOLDBLATT


Conferences convened by industry have considerable educational value. They are attended by those with practical knowledge of industrial medicine, together with a leavening of official and academic representatives. They are not the place to present new work, but rather provide an opportunity for the discussion of some of the older problems such as, in this instance, the relation between toxicity of lead compounds and their solubility; stipple counts or basophilic aggregation as indicators of lead absorption; the place of lead in urine determinations in the prevention of lead poisoning.

A study of this report provides an interesting contrast between the practice of industrial hygiene in the United States and in this country. We are apt to overlook the great advantages we enjoy as a result of the work of our early pioneers. We are inclined to accept the regulations applying to the lead trades without appreciating their value. This is emphasized when we see that in many States of the U.S.A. there is no compulsory routine examination of lead workers, and that the occupier is not obliged to provide such simple provisions as washing and feeding accommodation. It is true that these precautions are carried out voluntarily by most of the large and more progressive firms, but many of the smaller establishments fall far behind in these simple preventive measures. On the other hand we can learn much from the wide application in the United States of the more accurate laboratory methods in use in the control of lead exposure.

It is refreshing to find Dr. Lanahan emphasizing the value of lead in urine estimations, not as a diagnostic measure, but as a means to prevent excessive lead absorption.

The discussion on treatment is of great interest; the consensus of opinion agrees with that of the more experienced workers in this country, that de-leading is bad therapy and that the patient is better left to get rid of his excess lead by himself. Papers were given on the use of BAL in lead poisoning (the conclusion that it has no use in industrial medicine is what one would anticipate), on the value of porphyrin estimations in the control of industrial plumbism, and on lead-in-air standards. The presence of experts on air pollution at this conference is an interesting feature, in that it draws attention to an aspect of industrial hygiene often overlooked by those concerned only with conditions inside the factory.

The proceedings include a report of a speech by an American industrialist. Here the interest for us lies in the fact that the United States is facing some of the same problems we have had to face here; that industrial medicine is something more than a luxury service, and that it has an important part to play in establishing good industrial relations. “The industrialist... should examine the philosophy of his daily life and the things he does, to see if he is contributing something to reduce the fears and bitterness which beset us.”

The breadth of approach and the success of this conference reflect the organizing ability of Manfred