sclerosis is of some interest because the patient had been given X-ray treatment for the persistent irritation, though there was no evidence of any skin affection and the symptoms were probably the result of changes in the sensory nerves.

**PSYCHIC**

Eight cases only have been included in the psychic group though the existence of a psychic factor was recognised in many cases in addition to the definite causes which were found.

The patients included in this group showed no skin changes. One of the patients had become a syphilitic after the discovery of her husband’s infidelity. A second, a young married woman, was referred after she had been treated for months for acute recurrent vulval irritation and insomnia, and it was discovered that for a long time she had had a child in hospital with bladder and kidney trouble. It was suggested to her that her thoughts were in consequence concentrated on her own genital area, and that she must cease thinking of it, and within two weeks her condition was relieved and did not recur.

**METHYLENE DICHLORIDE INTOXICATION IN INDUSTRY**

**A REPORT OF TWO CASES**

**BY HOWARD COLLIER, M.C., M.B. Edin.**

**READER IN INDUSTRIAL HYGIENE AND MEDICINE IN THE UNIVERSITY OF BIRMINGHAM**

Methylene dichloride (CH₂Cl₂) is a chlorinated hydrocarbon of relatively low flash-point, widely used in modern industry as a solvent for cellulose esters, fats, oils, resins, and rubber. It forms a large proportion of certain proprietary “paint removers,” some of which are of German origin, and has also been used in the paint trade to raise the flash-point of lacquers.

It is an anaesthetic with a pleasant chloroform-like smell, slightly more toxic and irritant than chloroform. In commercial use it may be contaminated by the presence of methyl chloride (CH₃Cl); this sometimes might complicate the clinical picture. It was once used as a general anaesthetic by Richardson (1867); “10 fatal cases resulting from its use as an anaesthetic have been misquoted as due to its use in industry.” “Otherwise no definite cases of poisoning have been reported,” and Zernik sums up the existing opinion concerning methylene dichloride when he says that “with good ventilation its industrial use is practically harmless.”

In contrast, however, to this opinion may be set the practical experience of a manufacturer of lacquers who informs me that so far as possible he has abandoned the use of methylene dichloride “because of its ill-effects” upon the workers. “It does them, makes them stupid, they suffer from headache, are unreliable at their work and are awfully apt to tumble about and to hurt themselves.” The same observer remarks upon the curious effect of this solvent and of other solvents upon the “psychology” of the workers. He says that “they are irritable, unhappy and require constant supervision if they are to be kept from making silly mistakes.”

This shrewd observation, coupled with the effects of the drug upon the cases recorded below, raises a point of the utmost importance in industrial hygiene. Whilst it may be admitted—may even be proved—that many of these solvents do not (if pure) cause any discoverable industrial disease, nevertheless they may detrimentally affect industrial health. As typical examples of this class of “physiological, non-disease-producing toxins” we may take methylene dichloride or trichloroethylene (which resembles it in very many of its pharmacological properties). It seems to me that this is a point of the first importance to industry. Workers who are constantly exposed to concentrations of these solvents may be rendered inefficient in their work without the production of discoverable pathological lesions.

These cases serve to illustrate another problem which always faces the industrial physician. That problem is the almost invariably “mixed” nature of industrial diseases (Alice Hamilton?). It will be observed that the first of the cases recorded below showed definite signs of chronic lead absorption, whilst the other suffered from a definite peptic ulcer and had recently fractured his skull. It is more than probable in fact that, but for these added disabilities, the connexion of methylene dichloride with the illness from which these workers suffered would never have come to the notice of any medical man.

**THE CASES**

Four painters were engaged during the autumn of 1935 in removing paint from the wall of a large room. A paint remover containing a high percentage (96 per cent. approx. by analysis) of methylene dichloride was used for this purpose. The windows were closed and rapid evaporation of the solvent took place. In this work the “remover” softens the old paint which is subsequently scraped off the wall by hand. All of the workers had been more or less exposed to lead absorption for periods varying from 5–14 years. They complained that whilst at work with the “paint remover” they became faint, giddy, and stupid, and stated that “this stupor passed off after a few hours,” that they “felt better when not at work,” and that “the stuff upset their appetite; that they did not care for food” and that they felt dull and were not interested in things which had always interested them before. Of these four men, two were sufficiently ill to have to leave their work. They were examined by me at repeated intervals.

**CASE 1.—A man, aged 42 (a painter for 13 years continuous), first seen on Oct. 12th, 1935. Peronitis at 18 years of age. Five years’ army service; double pneumonia and empyema at 32. Complaints: (a) irregular but severe pains in legs and arms, hot flushes, headache, vertigo, stupidity whilst at work with paint remover; could not read at night because his eyesight was not clear (? transient diplopia); anorexia: (b) precordial pain, rapid pulse, shortness of breath, great fatigue on exertion, and attacks of rapid beating of heart.**


**Course of illness.—Six weeks later the general condition was much improved and he had put on 1 st. in weight; he still complained of precordial pain, but there was less dyspnoea. During this time the only change in his**
circumstances were (a) the cessation of work with the methylene dichloride, and (b) the taking of half a pound of liver a day together with a mixture of ferri et quin. cit. He now looked much better and carried a better colour : pulse-rate 72 (at rest); apex-beat more distinct; heart still dilated; blood pressure 120/86. Blood picture normal. Van den Bergh reaction: direct and indirect negative. Blood count: haemoglobin, 100 per cent.; red cells, 5,320,000; white cells, 5500; no punctate basophilia; differential count normal. Wassermann reaction negative. Blood pressure 130/75. Pulse-rate 80. Heart and lungs normal. Alimentary system: "gastric ulcer on and off for last four years. Has now been away from work for two weeks."

On this evidence the patient was admitted to the General Hospital, Birmingham, under Dr. Stanley Barnes, for observation and the treatment of peptic ulcer. It does not appear necessary to detail his clinical condition which was that of a typical case of peptic ulcer, except to say that a congenital opaque patch was found in right colon. Urinary system: normal. Central nervous system: normal. Urinary system: normal. Alimentary system: "gastrroduodenal ulcer."

The condition rapidly improved on Hulse's diet, and he was discharged from hospital on Dec. 3rd, 1935.

The conclusions drawn from this case are that the patient had suffered from the effects of methylene dichloride intoxication on and off for two years until the condition of his alimentary system forced him to leave work. The methylene dichloride poisoning caused definite and characteristic symptoms which were relieved by the cessation of exposure and which are remarkably similar to those detailed above.

It did not prove possible to persuade the other workers to submit to examination, but I have definite information that they experienced exactly similar effects. As their general health was good, they did not leave work.

CONCLUSION

To sum up therefore, these cases suggest that methylene dichloride is a potential source of ill-health to those who are exposed to it in a confined and unventilated space. Those effects are to be attributed to its anaesthetic action upon the nervous system and are largely subjective—viz., headache, giddiness, stupor-irritability, numbness and tingling in the limbs, and possibly some degree of chronic anaemia. It seems to be important to emphasise that many of the industrial solvents (beside the chlorinated hydrocarbons) whilst they may not cause "occupational disease" may be real factors in the production of lowered efficiency, industrial fatigue, and definite psychological abnormalities of feeling and of conduct. It appears that this valuable industrial solvent (methylene dichloride) can safely be used in industry provided adequate ventilation is maintained.

I must gratefully acknowledge the help of Dr. Stanley Barnes, dean of the faculty of medicine in the university, and of Dr. Ethel Browning, of the Medical Research Council, who has put at my disposal much information and many references concerning the known effects of methylene dichloride. I must express also my thanks to Dr. J. A. Ainscow for permission to see the second patient and for his help in providing me with a remarkably detailed history.

REFERENCES