

strators as the Duc de Sully (1560-1641) and Jean Baptiste Colbert (1619-1683) had long advocated such enquiries. Apart from "Statements of Population" of which numerous records are extant, the French authorities carried out fifteen censuses between 1665 and the time of the English Conquest in 1759."

We feel that this very sketchy review of the work of the Organization will impress every reader with the magnitude of the task to which the Organization has set itself, and with the importance of its activities to the whole world. So representative a body of

eminent experts, selected with full consideration of their ability for the duties required of them, working together under the aegis of a League established primarily to bring about good will between nations, and unfettered by local or national restrictions, has surely a unique opportunity to solve problems which interest us all and which have quite baffled us in the past. Many of us will subscribe to the opinion which has been frequently expressed that the Health Organization alone is sufficient justification for supporting the League of Nations.

W.H.H.

SILICOSIS

THE valuable paper on "Silicosis", by Dr. T. H. Belt, of Toronto, which appears on page 802 of this issue, serves to direct attention to a disease which is likely to assume increasing importance in Canada as an industrial hazard. For many years past silicosis has presented a problem of serious economic importance in connection with the mining industry in South Africa, and it has received considerable attention also in certain of the New England States where granite cutting is an important occupation. Only within the past six years, as Dr. Belt points out, has the disease received serious attention in Canada, but it is now recognized in Ontario, at least, as a compensable form of disability. So seriously, indeed, is silicosis now regarded that the International Labour Office of Geneva, which is the executive secretariat of the International Labour Office, a society comprising fifty-six States which have entered into an agreement to improve the conditions of Labour, convened a conference, which was held during the latter half of August last at Johannesburg, to study the matter. The conference was divided into three sections: one to suggest preventive measures; one to deal with the medical aspects of the disease; and the third to consider prognosis, compensation and after-care.

Silicosis may be defined as a form of chronic inflammation of the lung resulting in widespread fibrosis, due to the inhalation of

silicon dioxide. The disease is found particularly pronounced in those working with hard rock, notably quartz and granite. To produce the condition the particles of silica must reach the lung in sufficient amount, over a sufficiently long period of time, estimated at from four years to twenty, or longer; they must be less than ten microns in size; and must be chemically uncombined. The disease may, on occasion, assume a relatively "acute" form, as in two fatal cases reported recently¹ by Macdonald, Piggot, and Gilder, to which further reference will be made shortly.

Pathologically speaking, silicosis may be divided into five stages. First, a bronchiolitis, due to the accumulation in the terminal bronchioles of dust-laden phagocytes; secondly, the accumulation of dust-laden phagocytes in and about the intrapulmonary lymphatics, resulting eventually in their deposit within the tracheo-bronchial lymph-nodes; thirdly, the formation of fibrous tissue within the masses of phagocytes and its aggregation into hyaline fibrous nodules, at which point the affection becomes "silicosis" in the legal aspect of the term; fourthly, degeneration of the foci; and, fifthly, the coalescence of adjacent foci and the involvement of large areas of the lungs.

Clinically, three stages can be recognized. At first the symptoms are slight, or absent,

1. MACDONALD, PIGOTT AND GILDER, *Brit. M. J.* 2: 846, 1930.

and the working capacity of the patient may be only slightly impaired. The physical signs in the lung may, however, be found to be slightly abnormal and the radiogram may show linear and nodular shadows. In the second stage the physical signs are increased, the nodular shadows are larger and more numerous, and the physical powers of the patient are definitely decreased. In the third stage all the signs and symptoms are markedly exaggerated, and the patient's disability is complete. There is, it should be noted, a special tendency for silicosis to be combined with tuberculosis. In this last connection Dr. Belt hazards the speculation as to whether silica, which is a ubiquitous substance, may not play a rôle in the etiology of tuberculosis in the ordinary walks of life.

The pathogenesis of the disease is not so simple as it looks at first sight. Silica is a relatively inert substance, soluble with great difficulty, and yet silicosis is, perhaps, the most serious of the several forms of pneumokoniosis. To produce the typical disease the silica must reach the lung in an uncombined state, as silicon dioxide. The silicates, as found in clay, shale, slate, and limestone, are much less harmful. It is well known to chemists that silica can be dissolved by boiling the powdered substance with an alkali, as in making "water-glass".

Several theories have been advanced. The oldest is that the silica dust acts simply as a foreign body in the lung, producing a chronic pneumonitis with fibrosis. Another view is that obstruction of the lymphatics of the lung by dust-laden cells contributes to the development of the fibrosis. Cummins and Sladden², in a recent study of coal-miners' lung accept this mechanism in pulmonary fibrosis, and further hold that anthracosis is accompanied by silicosis which converts a relatively unimportant pneumokoniosis into a serious affection. Still another view is that the phagocytes of the lung become laden with particles of silica which are gradually converted into water-glass and thus the cells, virtually, become petrified. The most recent idea is that the silica is gradually dissolved in the tissues, liberating a toxic substance that produces the fibrotic change. There is experimental

evidence in favour of this view, and it is also supported by Dr. Belt's observation that, while in the recent areas of deposit the dust can be readily seen with the microscope, in the older fibrotic tissue the particles have disappeared. This seems to fit in, too, with the clinical observation that the progress of silicosis does not cease when the affected person is protected from further exposure. It seems reasonable, from the evidence, to suppose that the silica is very slowly soluble in the alkaline fluids of the body, so slowly, indeed, that many years are required before the disease takes its final toll. Silicosis is, therefore, essentially a chronic disease, and, possibly would not assume any special importance, were it not for the fact that it notoriously predisposes to tuberculosis.

Following up this line of reasoning, it would also seem probable that if for any reason there were an excess of alkali in the lungs the solution and absorption of the silica might be more rapid, and we might, in that case, expect to find cases which would, clinically, run a relatively rapid course and might properly be termed acute. That this can occur is shown by two remarkable cases reported recently by Macdonald, Piggot, and Gilder. These observers record two fatal cases of acute silicosis, occurring in young women who had been engaged in packing a cleaning powder containing ground silica. One had been at this occupation for two years and nine months, and the other for four years and three months. Thus, there was a relatively short period of exposure to the dust. Death ensued within a very short time from the development of the first symptoms. The powder in question contained about 75 per cent of pure silica and 25 per cent of soap powder, made up of sodium carbonate and soap. In the first case the lung was extensively fibrotic, and of a curious greenish-grey colour punctuated with small pinhead nodules of a lighter shade. The general appearance was that of a kind of marble. With this, there was acute pleurisy and acute pericarditis. In the second case the lungs were similar, but without massive fibrosis. Curiously, here, though there was no caseation and no giant-cells could be found, tubercle bacilli were found in the sections. Examination of the lungs showed the presence of crystalline

2. CUMMINS AND SLADDEN, *J. Path. & Bact.* 33: 1095, 1930.

silica, combined silica, and free silicic acid, derived from the combined silica, together with some iron.

The authors, in connection with these thoroughly well worked out cases, set out the following theory in regard to acute silicosis.

(1) Silica dust is deposited in the lungs and converted to colloidal silica. (2) Colloidal silica reacts with sodium carbonate, also present in the dust, giving sodium silicate, and causing the excess of the colloid to assume the "gel" condition. (3) Sodium silicate reacts with calcium, iron, and other salts present in solution, giving precipitates of insoluble silicates. (4) The deposition of insoluble silicates is cumulative, and continually builds up a film or layer of increasing thickness; at the same time the "gel"

colloid is more slowly absorbed than the "sol", and adds to the condition of general congestion. (5) At a certain stage the deposited layer becomes dense enough to prevent the normal function of the lung in converting silica to colloid, and from this stage onward the silica dust will accumulate in its original state. It is not proved as yet whether this acute form of silicosis is essentially different from the ordinary chronic form or whether it is merely silicosis under the most unfavourable conditions progressing at the maximum rate. It is suggested, however, that the study of these acute cases gives a clue to the mechanism at work in the commoner forms of silicosis due to pure silica dust.

A.G.N.

ADMINISTRATION OF IODIDES BY INHALATION

IODIDES have been used in the treatment of blastomycosis and sporotrichosis for a number of years. Oral administration is the common method used, with comparatively great loss of the drug. Recently, intravenous administration has been tried but has yielded only varied results. For these reasons, and also because they believe that certain mycotic infections are hæmatogenous in origin, Swartz, Blumgart and Altschule¹ determined to try the inhalation method so that the iodide might be introduced directly into the arterial blood.

Ethyl iodide was selected because it has been proved to be both volatile and non-toxic in its previous employment for measuring the minute volume output of the heart in man. Also, it has been proved easy to introduce relatively large amounts of iodine into the blood in this way. Finding that the vapour is irritating when not diluted with a large volume of air, these authors devised a simple apparatus with valves, so arranged that non-irritating concentrations could be inhaled.

Their present study is limited to a report

of the treatment of certain mycotic infections of the skin (epidermophytosis, favus, blastomycosis, tinea, cryptococcosis, psoriasis, pityriasis rosea and seborrhœic eczema). The dose used to date is 2 gm. (1 c.c.) of ethyl iodide, the inhalation being spread over 20 minutes and administered daily. Children are given half the dose. The number of treatments varied from 1 or 2 to 19. The best results were obtained in the cases of epidermophytosis, especially of the groin and intergluteal fold. However, one case of blastomycosis of a year's duration is reported which improved markedly after two treatments, but more slowly after this to the sixteenth. Two cases of pityriasis rosea completely cleared, also one case of favus of the scalp, one of four cases of infection with *Cryptococcus epidermice*, and one of five cases of psoriasis. As would be expected, the amelioration occurred in cases treated the earliest after onset.

The authors above mentioned regard their report as of a merely preliminary nature, and suggest trial of this method of treatment in other conditions where the iodides are indicated, *i.e.*, in asthma, hypertension and tertiary syphilis.

ARNOLD BRANCH

1. SWARTZ, BLUMGART AND ALTSCHULE, *Arch. Dermat. & Syph.* 21: 182, 1930.