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Diseases of the Chest

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DIATOMITE FIBROSIS

Diatomaceous earth (infusorial earth) consists of the remnants of skeletons of unicellular organisms deposited in great quantity during geologic times. In its pure form it consists of silicon dioxide, but the commercial material is often admixed with clay. It is used in the manufacture of insulating materials, in sugar refining, pottery glazing, the making of dynamite, metal polishes, paper, paint, dentifrices and for the filtration of many substances. It is often altered during commercial preparation by heat in the presence of soda ash. Considerable amounts of dust may be created when the material is in a finely divided form and when it is transported by blowers. Industry has found it necessary to provide elaborate protective equipment to insure the safety of workmen.

Diatomaceous earth is capable of producing diffuse pulmonary fibrosis. The fibrous tissue is not necessarily formed into nodules as in other types of silicosis. Linear strands, at first fine but subsequently coarse and massive, may develop within a year or two if exposure is excessive. Others have worked in the material for many years without any evident pulmonary disease. Dyspnea may be severe and some cases of bullous emphysema have developed spontaneous pneumothorax, similar to that observed in bauxite disease.

Fibrosis associated with diatomaceous earth inhalation probably has an unfavorable effect upon tuberculous infection, similar to that noted for miners' silicosis. The record is not entirely clear on this point however. The complication of right heart strain and failure may occur in very severe cases of diatomite fibrosis.

The roentgenographic findings are unfamiliar and have not been well classified in relation to the type of material inhaled, and the duration and intensity of exposure. Often there is a mere accentuation of the vascular markings but, in severe cases, massive linear fibrosis with or without nodulation is observed. Conglomeration of shadows probably indicates associated infection.

GRAPHITE FIBROSIS

Graphite is crystallized carbon but often contains considerable amounts of other minerals including as much as 10% silicon dioxide. Different opinions have been expressed as to the pathogenicity of graphite, some holding it to be harmless if silica is absent, while others believe that graphite is capable of causing disabling pulmonary fibrosis.[10]

PNEUMOCONIOSIS DUE TO SILICATES

Silicates are among the most abundant components of the earth's surface. They occur in hundreds of different compounds, crystalline forms and combinations. When inhaled, most silicates are nonpathogenic but there are a few notable exceptions.

Asbestosis

Asbestos is hydrated calcium-magnesium silicate useful on account of its resistance to heat and its insulating properties. Its great industrial value lies in the fact that it is a silky fibrous mineral—the fibers being as long as six inches—which can be woven into fireproof fabrics. Asbestos textiles were used by the Egyptians and Romans for such purposes as lamp wicks and as cremation attire.

A good quality of asbestos is that known as chrysolite and most of that used in the United States is derived from deposits in Quebec and, more recently, Vermont.

[10] H. E. Harding and G. B. Oliver (Brit. J. Indust. Med., *6*:91, 1949), and L. Dunner and D. J. T. Bagnall (Brit. J. Indust. Med., *7*:100, 1950) offer evidence that graphite is pathogenic. L. Parmiggiani (Brit. J. Indust. Med., *7*:42, 1950) emphasized the importance of the silica in graphite. C. P. McCord (Indust. Med. and Surg., *18*:483, 1949) concluded that disability from graphite had not been proved.

body is a fiber of the mineral surrounded by protein deposits. The ordinary stains used in histology do not demonstrate asbestos bodies well, but the Prussian blue staining procedure may be helpful. When seen in tissue sections or in sputum, these elongated fibers are recognized by their beaded appearance and rounded bulbous ends which may resemble an elongated dumbbell.

The clinical manifestations of asbestosis include progressive shortness of breath on exertion, cough, weakness, weight loss and clubbing of the fingers. Emphysema, bronchiectasis, and occasionally pulmonary tuberculosis, complete the clinical picture. While it is generally believed that asbestosis predisposes to tuberculosis the tendency is not so striking as in the case of silicosis. It has also been surmised that asbestosis may predispose to bronchogenic carcinoma—a hypothesis which has not been fully confirmed.

The earliest radiographic signs of asbestosis are those of a fine haziness in the lower lung fields due to a so-called reticular network of shadows, creating a "ground glass" appearance. Subsequently, there is increasing evidence of more extensive and coarser fibrosis with variable degrees of pleural thickening. A feature sometimes noted is a "shaggy" appearance of the cardiac silhouette resulting from the combination of parenchymal and pleural changes in later stages.

The diagnosis of asbestosis depends upon a radiographic appearance consistent with diffuse pulmonary fibrosis, a history of prolonged exposure (two years or more) to asbestos dusts, and the finding of asbestos bodies in the sputum. In obscure cases diagnosis by lung biopsy may be advisable.

There is no treatment known to be of value. Patients with early signs of asbestosis should be removed from such exposure, and it is probable that the disease will not progress significantly after exposure is terminated. Patients with asbestosis should avoid contact with tuberculosis and should be examined at frequent intervals to detect the earliest sign of tuberculous infection so that prompt and energetic specific antituberculosis treatment may be undertaken.

Pneumoconiosis due to Mica

The micas are a group of complex aluminum-silicate compounds of several types. At least some of these are known to be capable of producing pulmonary fibrosis if inhaled in finely divided form in high concentration over a prolonged period. An exposure of several years to ordinary industrial environments containing these substances is necessary to produce disease.

The micas are used in the manufacture of paper products (especially that type of wall paper which has a glittering surface), in the production of some paint products, as lubricants in combination with oils, and for insulating materials in electrical devices (condensers, [illegible] and electrical heaters).

A study by the United States Public Health Service revealed 10 cases of pneumoconiosis in a group of 57 workmen who had been exposed to mica dust which was free from silica.[11] Policard found that the inhalation of mica dust can produce pathologic changes in the lungs which he believed to be identical to those produced by the inhalation of silica dust.[12]

Talc Pneumoconiosis

Talc is a natural finely powdered hydrous magnesium silicate. Commercial talc is of variable composition and is often mixed with other mineral substances. Talc is widely used in industry in the manufacture of paint, rubber, paper, insecticides and ceramics as well as

[11] Pub. Health Bull. No. 250, Washington, D. C., U. S. Public Health Service, 1940.
[12] J. Indust. Hyg., *16*:160, 1934.