

3. Animal experiments have demonstrated that administration of high concentrations of amorphous hydrated alumina unfavorably influences resistance to tuberculosis. While the result has not yet been reported for metallic aluminum, caution in the application of aluminum therapy to human beings is recommended.

4. The use of aluminum might appear as an easy short-cut to healthful working conditions, thus saving large expenditures for ventilation and other control methods. Actually, there is no substitute for the accepted methods of dust control.

5. If industry indiscriminately treats all employees with aluminum dust, there may be aggravation of tuberculosis or other pulmonary conditions.

6. The therapeutic use of aluminum in man appears to relieve symptoms in a very small number of cases in which silicosis develops rapidly. Experience in some groups is more favorable than in others.

7. In view of these considerations it is recommended that the general application of aluminum therapy in industry be delayed until adequately and impartially controlled clinical observation demonstrates its effectiveness in preventing or alleviating silicosis in man. In the meantime, there should be no slackening in the control measures that have been found effective in reducing the incidence of dust diseases in industry.

This statement still represents the thinking of most authorities in this country. There have been no conclusive data from scientifically controlled studies in the past ten years that make it necessary to change this statement in any way.

d. *Other Therapy.* In the past few years, there has been increasing interest in hormone imbalance as a cause of excessive fibrotic response and in the use of hormones to retard the progression of silicotic fibrosis in the lungs. Cortisone, insulin, estrogens, and thyroxine were shown by Schiller⁷⁹ to have an inhibitory effect on fibrous tissue production; while androgens, such as desoxycorticosterone acetate and testosterone propionate, increased the formation of fibrous tissue. Vyskočil⁸⁰ agrees that silica certainly is the primary agent that produces silicosis but he theorizes that it does so by way of hormones and their effect on the lymphoid tissue and plasmocytes. Short- and long-term stresses tend to deplete the levels of antifibrotic hormones, resulting in increasing fibrosis. He lists tuberculous inflammation, physical fatigue, excessively hot environment, and inhalation of large quantities of dust as examples of such stresses.

Regarding the prevention of silicosis, Vyskočil concludes that it is necessary to look for a constitutional factor in persons tending to develop increased fibrotic response after inhaling silica. He feels that eventually such persons might be identified by comprehensive studies and excluded from the dusty type of work. As for treatment, he believes that silicosis already well under way can be retarded by giving ACTH and cortisone in small doses, alternating insulin with the ACTH. He further says:

Persons with thyrotrophic evidence should be given thyroglobin, which affects experimental silicosis beneficially. Testosterone, although administered to persons having silicosis and

⁷⁹ E. Schiller, The influence of hormones on the development of silicotic nodules, *Br. J. Ind. Med.*, 10, 1-8 (January, 1953).

⁸⁰ Jiri Vyskočil, Endocrine functions in silicotics, *Arch. Ind. Hyg. and Occupational Med.* 9, 402-413 (May, 1954).

tuberculosis by Raule and Grisler,⁸¹ should be given, in my opinion, only to persons with active tuberculosis. It should not be given in cases of purely silicotic reactions because of the danger of enhancing the silicotic process. Important is the prevention of inflammation, both the inflammation of bronchitis in the spring and autumn and that of tuberculous origin. I suggest the prophylactic administration of salicylates in spring and autumn, as these depress the inflammatory reaction, and, as is the case with fibrous rheumatic nodules, may also beneficially affect the silicotic nodules.

Undoubtedly, we shall see much research in this direction in the next few years, which may lead to satisfactory drug prophylaxis and therapy of silicosis. The evidence today, however, is not sufficiently conclusive to warrant applying any of these methods clinically.

Until more specific therapy is available, treatment of disabling silicosis will continue to be symptomatic. It is principally directed at the associated emphysema to improve drainage of retained bronchial secretions. Bronchodilator drugs, such as Neo-Synephrine (1.5 cc. of 0.5 per cent) or Isuprel (6 to 8 drops of 1:200 solution) when placed in a nebulizer with 100 per cent oxygen and inhaled with the intermittent positive-pressure technique proposed by Motley, have given very favorable results. The resulting improved ventilation, although temporary, has caused such a frank improvement in the morale and feeling of well-being of many coal miners that this form of therapy is recommended for disabling silicosis and emphysema from any cause. Courses of treatments may have to be repeated at rather frequent intervals, depending on the severity of the case.

Other measures that must be a part of the therapy regimen are prevention and early treatment of colds and other respiratory infections, the maximum possible prevention of contacts with active cases of tuberculosis, and discouragement of smoking to reduce bronchial irritation and secretion to a minimum. Any measures that will prevent bronchial obstruction are indicated. The cough reflex, therefore, should not be subdued and codeine should be withheld unless the cough is severe. Maintenance of the general nutrition of the patient also must be part of the treatment program. Continuing graded exercise is especially necessary to prevent further atelectatic areas of the lungs from developing. Support of the lower abdomen with its resulting support of the diaphragm will improve ventilation in many cases with advanced nonobstructive emphysema, but is contraindicated where there is considerable bronchial obstruction.

B. ASBESTOSIS

Asbestos is a hydrated magnesium silicate. More than 90 per cent of the raw mineral used in this country and Great Britain is produced in the Canadian province of Quebec. Asbestos is used in two general types of manufacturing processes. It may be used either by itself or mixed with other insulating materials, such as diatomaceous earth, for fireproofing, packing, or insulating; or it may be com-

⁸¹ Raule and R. Grisler, Primi risultati clinici ottenuti nella silico-tuberculosis, *Med. Italian.* 43, 4 (1952).