The Dust Hazards in Industry

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The speaker said in part: Realizing the importance of the dust problem in industry, the United States Public Health Service in cooperation with the Bureau of Mines began its first study of the health of workers in dusty trades in 1914, in the mines of Joplin, Missouri; and later, in 1923, the Public Health Service inaugurated a series of dust studies. These later studies were all conducted in the same manner in order to permit as detailed a comparison as possible between the different investigations.

Briefly, these methods of study may be divided as follows: (1) examination to determine the general physical condition of the workers under observation; (2) special physical examination to determine the prevalence of specific diseases of the respiratory system and the lung pathology resulting from exposure to the particular dust hazard; (3) record of the nature and severity of the disabling illnesses; (4) analysis and detailed study of the occupational environment; (5) occupational mortality statistics relating to the specific dust; and (6) autopsies.

The first six intensive investigations carried out by the Service dealt with the health of workers exposed to dusts in a cement plant, granite cutting industry, anthracite and bituminous coal mining, silverware manufacturing plant, cotton cloth manufacturing, and in municipal street sweeping. Brief studies were later conducted in certain slate, granite, marble and talc quarries, while more recently a rather extensive study of the health of anthracite coal miners was completed.

These six dust studies showed that the workers in the granite cutting plants who were exposed to the highest dust concentrations were found to suffer from an excess of pulmonary tuberculosis after 15 years or more of exposure and developed silicosis from 2 to 10 years. In the group exposed to a lesser amount of dust, silicosis developed only after prolonged exposure, with no excess of tuberculosis. It was found that a close relationship existed between the degree of dust exposure and the extent and severity of the pulmonary damage. Anthracite coal miners suffered from dyspnoea and other signs of pneumoconiosis and experienced a high rate of respiratory sickness; in addition, an excessive mortality from influenza-pneumonia and possibly tuberculosis was found. Bituminous coal miners experienced a generalized fibrosis of the lungs and an excess mortality from influenza and pneumonia. Cement workers showed some signs of early pneumoconiosis with an excess of diseases of the upper respiratory tract. On the other hand, workers in the cotton cloth and silverware manufacturing plants and municipal street sweepers were negative for respiratory conditions and other illnesses when compared with the general industrial population.

Rock Drilling. For five years, the United States Bureau of Mines studied lead and zinc miners in the Tri-State District, Oklahoma. The ore here is high in free silica. Of the 7,722 men examined, a group of 1,647, or 21.3 per cent, was definitely diagnosed as having silicosis, not including those diagnosed as having tuberculosis. All the men diagnosed as having first-stage silicosis had worked an average of 13 years, but those men starting in the mines after 40 years of age worked an average of only 8 years.

The work of rock drilling in subway and tunnel construction in New York City is in some respects similar to that of some of the activities in the hard rock mines, at least in so far as the manner in which dust is evolved, the type of dust and the resultant hazard. Recently the result of a study of rock drillers, blasters and excavators was reported by the New York Tuberculosis and Health Association. An examination of 208 rock drillers, blasters and excavators showed that 118, or 57 per cent of the men had silicosis in various stages of progression. The exposure of most of these men (75 per cent) had been for 20 years or more.

Sandblasting. No study of the health of sandblasters has been reported in the United States; however, a study of the dust exposure of sandblasters was recently completed by the United States Public Health Service in cooperation with the

National Safety Council. This investigation indicated that, judged by the nature of the dust and degree of the exposure, a real hazard exists in this occupation. This study also brought out the fact that it is possible to conduct sandblasting with safety, provided properly designed and well maintained equipment is used.

Diatomaceous Silica Workers. Most of the data on silicosis have been gathered from studies made both in industry and experimentally on dusts containing free silica in the form of quartz. Such studies have been made in the granite industry, pottery trades, hard rock drilling, etc. There are other free silica minerals in existence that are not crystalline in nature but of an amorphous composition. In Santa Barbara County, California, there exists the largest and purest diatomaceous silica deposit in the world. This substance consists of about 85 per cent free silica. Recently an examination was made of 108 workers selected among those employed less than 1 year, 1 to 2 years, 2 to 5 years, and more than 5 years. All of the workers were Mexican laborers and the examinations consisted of x-ray determinations, social and medical histories, and clinical examinations of the chests. Dust determinations were also made but these were not reported. The outstanding feature revealed by the examination was the splendid physical condition of the men. Eighty-four per cent of the workers were reported in excellent physical condition. It was found that 60 men showed signs of early pneumoconiosis; 15 were in the moderately advanced stage and 6 in the advanced stage. This latter finding was among workers with a history of exposure of more than 5 years.

Dust Hazard in the Granite Quarry Industry. It is a common belief that granite quarrying is not so dangerous an industry as granite cutting in enclosed sheds; quarry work is done outdoors and hence may not be attended with very much dust exposure. However, certain quarry operations require the use of pneumatic tools, which are usually associated with the formation of considerable quantities of dust. It was thought that a study made in a representative granite quarry might cast some light on our problem. Accordingly, a study of a clinico-radiographic nature of 63 quarriers was made and occupational dust exposures were also obtained. The dust determinations show that nearly 38 per cent of the workers (drillers) were exposed to many times the amount of dust considered safe at the present time. Drillers were the only persons showing pathologic lung changes. Half of these workers with an exposure of 5 to 19 years had silicosis, and 4 of the 5 men with more than 20 years of such trade life showed this condition. This study suggests that quarry drillers may experience as high a death rate from pulmonary tuberculosis as do pneumatic-tool workers in granite cutting sheds.

Effect of Inhaled Marble Dust. The pulmonary fibrotic changes due to the inhalation of marble dust appear to be slight in comparison with those caused by stone dust containing a high percentage of silica in the form of quartz. A recent study made by us among marble workers showed that although marble dust, when inhaled in concentrations averaging about 25 million particles per cubic foot of air, produced a mild bilateral, linear fibrosis in a certain number of the 80 men examined, no serious lung changes were noted and there was no disability due to the dust, even after many years of exposure (more than 40 years in some cases). The marble dust under consideration consisted of 98 per cent calcite and 2 per cent dolomite, with no silica present.

Dust Hazard in Abrasive Industry. Artificial abrasives are widely used in industry and for this reason the effect of the inhalation of dusts produced in the manufacture or preparation of these products is of great importance. In 1925, 1929 and again in 1931, Dr. Clark of the Norton Company at Worcester, Mass., made investigations of workers exposed to aluminium oxide and silicon carbide dust produced in the manufacture of grinding wheels, which showed that during a period of 13 years there were proportionately twice as many cases of pulmonary tuberculosis among those working in the abrasive dust departments as in departments where no abrasive dust occurred. In 1931, Kessler, of New Jersey, reported the occurrence of over 100 cases of alleged silicosis in the abrasive powder industry, in which the dust consisted of 99 per cent free silica.

Exposure to Silicate Dust. It has been the belief that the inhalation of dusts composed of silicates (combined silica), in comparison with silica (free silica in the form of quartz), was innocuous. Of recent years many investigators have become cognizant of the hazards of silicate dust exposure. Asbestosis, a fibrosis