ly, the greater mesothelioma and, possibly, cancer potential of amosite in manufacturing processes, compared to mining, could be attributed to the smaller particle size for the fiber released in a production plant compared to that at the mine head.

At the practical level of environmental control, regulations proposed for chrysotile in 1968 (225) by the British Occupational Hygiene Society were at a level (2 fibers per cm³ averaged over 3 months) that, it was hoped, would allow no more than 1 per cent risk of disease (specifically, asbestosis) in a 50-year working life. Evidence suggests that this would also reduce risk of bronchogenic cancer. At the time, the British Occupational Hygiene Society was uncertain that standards for other fibers should follow "by analogy." They subsequently proposed the same standards for amosite (226), but a standard 10 times more stringent for crocidolite (227) was promulgated by government regulation. Furthermore, because all standards should be regarded as no more than an expression of the "best available hypothesis" of levels adequate to protect human health, they should always be reviewed in the light of subsequent evidence. This was done in 1973 for chrysotile, and no change was recommended (228). In the United States, the Occupational Health and Safety Administration (OSHA) promulgated a standard of 5 fibers per cm³ in 1972, to be reduced to 2 fibers per cm³ in 1976 (229), and there was a recent proposal to lower further the standard to 0.5 fibers per cm³ (230). These standards apply to all fiber types.

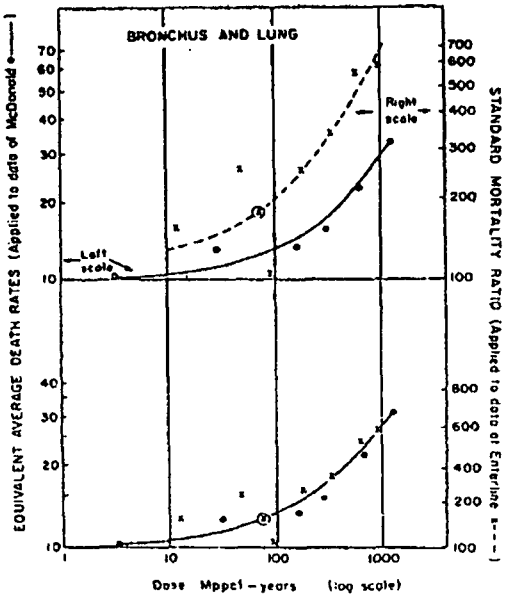

Fig. 5. [From Schneiderman (93); reprinted by permission of publisher.] Dose-response relationship for cancer of the bronchus and lung. The data shown are those of McDonald (7, p. 189), describing chrysotile asbestos miners (*left* scale), and those of Enterline and associates (82, 83), describing production workers (*right* scale). In McDonald's data, mortality was expressed as equivalent average death rates (85, 92) to enable a within-population comparison between men with low and higher dust exposure. The data of Enterline and associates were reported as standardized mortality ratios, which used for comparison the most appropriate general population statistics. Dust exposure in both studies was calculated in similar fashion and expressed in million particles per foot³-years (82, 83, 91). The vertical scales are drawn so that an equivalent average death rate of 20 is equated with a standardized mortality ratio of 200 in the top panel and 400 in the bottom panel, which results in both sets of data falling on the same curve.

Research should continue in an attempt to identify more precisely the reasons for between-fiber differences in biologic effect, because a better understanding of what determines the biologic responses of this mineral can only result in its human use being conducted under conditions that more effectively protect the health of the exposed worker.

Clinical Implications of the Epidemiologic Findings

Faced with a patient in whom the diagnosis of one of the described diseases has been made, i.e., fibrosis of the lungs and/or pleura, or cancer of the lungs and/or pleura, it may be important to establish whether, in this particular case, the disease is asbestos related. If the patient is currently known to be exposed, this rarely presents a problem. If not, a systematic history is called for, and should include all his or her previous occupations (including short-term jobs, summer jobs, and so on), as well as those of his or her work colleagues and family members. In addition, places of residence should be noted, particularly if the diagnosis is mesothelioma and/or pleural plaques. The discovery of asbestos fibers, coated or uncoated, in biologic material (sputum or biopsy or surgical material) requires explanation, if not already evident from the history. Establishment of an association with asbestos has importance if attributability is questioned (in cases of compensation), as well as for other workers if the risk had not previously been recognized.

The dose relationship, particularly of fibrosis,