is presumed to be the dust brought home in the worker's overalls (10, 31). Likewise, the association between residence near a mine, mill, or factory and the occurrence of mesothelioma brought to light the importance of neighborhood exposures (27). Such neighborhood exposure is also presumed to account for occurrence of pleural plaques and/or calcification in residents of the mining area of Finland (32). Pleural plaques have also been described in agricultural populations (33–35); in some instances, they have been attributed to the working of soil that contains asbestos fibers, e.g., in Bulgaria (33, 34).

The surprisingly high prevalence of asbestos bodies (as evidence of exposure) in routine autopsies indicates an environmental exposure for the residents of most of the larger cities of the world; however, the amounts in the general atmosphere are small (36), and these autopsy findings should probably be regarded more as an index of exposure rather than of disease potential. The Advisory Committee report that followed the Lyon Conference (7) concluded that "there is at present no evidence of lung damage by asbestos to the general public," and "the amount of asbestos in the lungs of members of the general public is very small compared to those occupationally exposed."

Finally, attention has recently been directed toward the widespread occurrence of asbestos fibers in certain natural water sources (37–40). An event that brought this to the notice of the general public was the discharge of mine tailings containing fiber into Lake Superior, a source of drinking water to many cities in the center of the North American continent (38). It is now also recognized that fibers also occur in many natural waters, particularly in mining regions; however, the Advisory Committee report emanating from the Lyon Conference (7) judged there to be no evidence at present of "an increased cancer risk resulting from asbestos fibers present in water, beverages or food or in the fluids used for the administration of drugs." The question must, however, remain under close scrutiny.

The Fate and Biologic Effects of Inhaled Asbestos Particles

Deposition in the Lung

Whether or not inhaled asbestos fibers will be deposited in the lung depends on the aerodynamic behavior of the particles, the dimensions of the respiratory tract they enter, and the pattern of breathing that carries the particles. The aerodynamic behavior of particles is a function mainly of diameter, but also of size, shape, and density. The varying characteristics of commercially used asbestos fibers make it obvious that the environment to which asbestos workers are exposed will contain particles having great variation in size and composition. These include fibers (so-called if their length is at least 3 times their diameter), which may be long (as long as 200 μm) or short. In addition, a working environment is likely to include a range of smaller particles and/or fibers released from the breakdown and disruption of the primary fiber, as well as those due to any other nonasbestos particles added by the mining or industrial process.

Inhaled asbestos particles follow the moving airstreams with each inspiration, and, once they make contact with any part of the surface of the airways or airspaces, are not resuspended in the expiratory airstreams (41, 42). Deposition of the larger inhaled particles (more than 5 μm in diameter) occurs mainly in the nose (assuming nose breathing) and major airways, owing to inertial impaction and sedimentation. Because of Brownian movement, deposition of the smaller particles (less than 1 μm in diameter) occurs mainly in the more peripheral airways and airspaces. This deposition profile is summarized in figure 3.

Deposition patterns can be profoundly modified by breathing patterns; nose breathing causes a high retention rate, even of small fibers, within the nose (41, 42). However, under working conditions, including heat and exertional stress, most workers resort to mouth breathing. Deeper, slower respirations favor a more even distribution of inspired air, and, thus, a more even distribution of inhaled particles. Lung volume also influences distribution and, possibly, retention patterns, particularly if breathing occurs at less than the normal functional residual capacity (FRC) in the range of airway closure (43, p. 98). Likewise, there is some evidence that the state of the airways in smokers is such that inhaled particles will penetrate less deeply into the bronchial tree and thus tend to be deposited more centrally than in nonsmokers (44).

Pulmonary Clearance

Clearance of particles deposited on the mucous blanket is brisk, with half-times of minutes