

half all the way down to five hundredths of a micron. So there are a whole series of these fibers. The microfibers, as has been mentioned, are a very small part of this (less than 1%), but in any study of people who are exposed to fibers, if you don't separate the generic terms of microfibers from "textile" fibers, and from the not "broomstraws," from the "broom-handles," that used to be made years ago (i. e., 10 to 20 μ in diameter), the validity of studies would need to be questioned. You are talking about two different types of exposures completely. I think that in any mention of glass fibers, you have got to tie the fiber diameter in.

DR. CRALLEY: We are going to do environmental characterization of the fibers being processed versus those in the air.

DR. KONZEN: I agree completely that the type of exposure should be more precisely defined in order to relate the ultimate data properly; but I think that we also have to recognize that in environments where, normally, the fibers are large, there are still some fibers of respirable sizes found, so in reality, all sizes can be tied together in an industrial exposure.

CLIFFORD SHECKLER: The point is really this: in textile fibers where you are "pulling" fibers under controlled conditions, you do have a very small range. In other words, if there are 5 μ fibers, it will go say from 4 to 7 or something like that. Insulation fibers spread all over. Numberwise you have a lot of "fines"; weightwise, of course, these make up an insignificant fraction of the total. How do you measure; what do you measure? Weight? Numbers? The important point is that in insulation you do have a spread and it ties in with the age of the production equipment and many other factors.

DR. KONZEN: And it has over the years. The spread has become narrower. Normal or average diameter was formerly much larger, but if you look at some of this "old stuff," there were fibers well down into the respirable range; so our production workers from the first have been exposed to relatively large quantities of small diameter fibers. I have a sneaking suspicion, just from comments made about the "old process" by old timers in my company that they must have had significant exposure to microfibers.

FELIX STEIN (University of Pittsburgh): We have been talking to Dr. Gross about a phase of this study and as I listen to the discussion, I am inclined to think it takes on greater and greater significance. He has asked us if we could analyze post-mortem lung residues for size distribution. Now certainly in considering post-mortem findings, one must take into consideration the intervening clearance processes in the lung;