



MEMORANDUM

Research

By R. J. Lee
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Date July 14, 1978

Ref. No.

Subject: TRIP REPORT: WORKSHOPS ON THE SIGNIFICANCE OF ASPECT RATIOS AND THE REGULATION OF ASBESTOS FIBER EXPOSURE (PART OF "SCIENCE WEEK," SPONSORED BY NEW YORK ACADEMY OF SCIENCES), NEW YORK HILTON, JUNE 21 TO 30, 1978

Summary

Science Week was organized to document "The Scientific Basis for the Public Control of Environmental Health Hazards." In fact, the central theme was "The Control of Potential Health Hazards." It was clear that EPA and OSHA rely heavily on the opinion of persons such as I. J. Selikoff of Mt. Sinai School of Medicine to formulate their position.

Much of the data being used to justify regulatory action in the area of potential health hazards due to mineral fragments is weak, faulted or nonexistent. It will be successfully countered only if industry takes the lead in developing and publicizing methods for characterizing minerals and correlating their characteristics with biological data.

The program at Johns-Manville Corporation provides an excellent example where Paul Kotin, M.D. (a J-M Vice President) and his colleagues have developed a high degree of credibility and won support for their views of the degree of risk associated with asbestos manufacturing and processing.

Introduction

This meeting was a highly emotional event riddled with controversy and contradiction. Much of the controversy was the result of an apparent bias in the organization and conduct of the meeting. Many participants were vocal in their frustration over not being able to either get on the program to report results which varied from the "party line," and their inability to raise serious questions from the floor during the meeting. Most attendees felt that the Mt. Sinai group dominated the meeting. This was evidenced by frequent accusations from the floor that the "Germans" had been excluded from the program, as well as the visibility of the Mt. Sinai group in the Science Week program and the media (Dr. Selikoff seemed to hold a press conference during every coffee break).

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In contrast, the workshops proved to be a good forum for an open exchange of views and presentation of new data. The salient points of interest to U. S. Steel are summarized in this report.

Workshop 1: Significance of Aspect
Ratios in the Regulation of Asbestos

Several papers presented at this workshop demonstrated physical differences between asbestiform and nonfibrous amphiboles, as well as differences in the biological activity of the various varieties. An important result was presented by L. D. Palekar of Northrup, Inc., who reported the results of cytotoxicity and hemolytic activity tests on four samples of cummingtonite-grunerite from Lead, South Dakota. Her tests demonstrated a clear correlation between the degree of fibrosity as defined by mineralogists and the toxicity of the corresponding mineral. Thus the asbestos amphiboles proved highly biologically active and the nonfibrous amphiboles were biologically inert. Dr. Palekar's results imply that Reserve Mining Company's tailings should be biologically inactive.

An important contribution to the significance of particulate aspect ratios was reported by F. Pooley of Cardiff. In a study of lung tissues obtained from mesothelioma patients, he found very few particles which had aspect ratios between 3:1 and 20:1. Most acicular particles observed had much higher aspect ratios. Furthermore, the size distributions obtained in the tissues were very stable, indicating the lung is a highly selective filter.

T. Zoltai, University of Minnesota, presented a paper in which he discussed the occurrence of asbestiform varieties of silicate minerals. His definition of asbestiform is a mineral variety which has the mechanical and thermal properties of commercial asbestos, and which would be mined as commercial asbestos if it occurred in sufficient quantity. He presented examples of pyroxenes, clay minerals, and other silicates which have asbestiform varieties. He suggested that such minerals as stilpnomolene, minnesotaite, and other silicates found in the Western Mesabi may well occur in an asbestiform habit. An obvious implication of his paper was that all the taconite mining operations in Minnesota have potential sources of asbestiform particles. The exceptions to this would be Reserve's Peter Mitchell Pit and Erie's mine which have been extensively documented and for which no asbestiform minerals have been found in those areas being actively mined.

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Several papers presented at this workshop covered physical differences between the asbestiform and nonfibrous amphiboles. These included: (a) our paper in which the growth habit of an asbestos amphibole (amosite) was reported and distinguished from that of nonfibrous amphiboles for the first time; (b) a paper by A. Wiley, University of Maryland, which demonstrated that the particle aspect ratio was a linear function of the length in the asbestiform varieties of amphiboles and not a linear function of length for the nonfibrous varieties; and (c) a paper by R. Walker, University of Minnesota, in which a tenfold difference in tensile strength of asbestiform and nonfibrous amphiboles was observed.

Representatives of the Bureau of Mines, OSHA, MESA, and other government organizations described their current programs and approaches to regulatory issues. The positions taken in these talks were unchanged from those presented at the NBS Workshop last year.

One purpose of the workshop was to develop recommendations relating to the importance of aspect ratio and particle size in terms of regulatory issues. Three such recommendations were adopted by consensus: (a) In order to minimize confusion, all persons and/or agencies involved in this area should adopt a common terminology. The recommended source was the recent Bureau of Mines circular No. IC-8751, "Selected Silicate Minerals and Their Asbestiform Varieties." (b) Minerals used in animal studies should be characterized by mineralogists and described using the above terminology. Such samples should also be characterized completely by the most advanced electron-probe methods. (c) Further research should be funded to develop an understanding of the differences between asbestiform and nonfibrous varieties of minerals, as well as methods for distinguishing between them in the electron microscope.

The consensus of the meeting was that a 20:1 aspect ratio is more consistent with recently developed data on asbestos than the 3:1 aspect ratio for regulatory purposes. The 5-micron size limit, while convenient as a lower limit for regulatory purposes, is clearly not a physically significant number. However, because of the problems, expense, and difficulty of performing electron-microscope monitoring, studies aimed at correlating electron optical and light optical data should be instituted.

These conclusions were challenged by A. Langer of Mt. Sinai who contended that (a) mineralogical terms are not adequate and that extensive confusion in the literature already exists; (b) the 3:1 aspect ratio is valid and possibly should be lower; (c) the 5-micron

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limit was scientifically significant but possibly should be lowered; and (d) electron optical methods should be used for monitoring exposures because of the presence of particles not resolvable optically.

International Conference on the Health
Hazards of Asbestos Exposure

The differences in the toxicity or biological potency of the various forms of asbestos are becoming well documented. Exposure to crocidolite asbestos should be considered extremely hazardous and carefully controlled. This is exemplified by the occurrence of an extremely high incidence (approaching 50%) of mesothelioma in a group of 300 workers involved in producing gas masks during World War II.

A controversy over the incidence of excess risk to chrysotile miners in the Thedford Mines in Quebec appears to have been resolved. McDonald et al. documented a small increase in risk to chrysotile miners. In addition, his studies demonstrated a quantitative difference in potency in crocidolite over chrysotile. A continuing controversy over the excess risk resulting from the exposure to amosite asbestos exists. While very little or no incidence of mesothelioma has been documented in studies of amosite miners in South Africa, several studies have implicated amosite asbestos in Great Britain and in the United States. However, these studies have been discredited because of the widespread mixing or blending of crocidolite with amosite in order to improve machinability. Until this is resolved, the carcinogenicity of amosite will continue to be the subject of controversy.

The reported association of mesothelioma with zeolites in Turkey seems to have been complicated by discrepancies in the results reported at a workshop on zeolites. Apparently fibrous zeolites have been found in both the villages with an increased incidence in mesothelioma, and in the control villages with no incidence of mesothelioma. Complicating the problem is the presence of tremolite asbestos in much of the stucco used to plaster buildings throughout Turkey.

Miscellaneous

The EPA may have a source of asbestiform minnesotaite from which they have conducted toxicity tests with positive results. This was inferred from a discussion with several EPA representatives.

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It is very probable that a Duluth TV station will present a documentary on the occurrence of asbestiform minerals in the Mesabi Range in the near future. It was not clear from the discussion whether this documentary would be favorable or unfavorable to the mining industry.

Discussion

Many of the contradictions of the current environmental hysteria in the United States are exemplified by a comparison of three papers:

1. A paper by the prosecuting attorney in the Reserve Mining trial in which he implied that many, if not most, industrial scientists and managers either manipulate or permit their data to be manipulated in order to avoid compliance with government regulations. The attorney suggested that this type of behavior posed a serious threat to public and employee health.

2. Klaus Robok, noted German M.D., charged repeatedly that Mt. Sinai Hospital deliberately excluded German researchers from Science Week and manipulated data in studies. He asserted that their purpose was to force the promulgation of even more stringent regulation even though the level of employee exposure to substances such as asbestos is currently orders of magnitude below what it was 30 years ago.

3. A government official, J. Chiriboga from Puerto Rico, presented a talk in which he showed slides of houses and schools in Puerto Rico that were constructed entirely from blue and white asbestos. Many slides were shown of children playing and sleeping in asbestos dust. Dr. Chiriboga pointed out that economic necessities dictate the selection of building materials in Puerto Rico and in third-world countries. In their case, the benefits to them resulting from the use of materials considered hazardous in the United States may far outweigh the risks associated with such usage.

There were strong indications at this meeting that many people are still determined to remove the last vestige of hypothetical risk from the environment even if the deleterious effects on society far outweigh the benefits. However, there was some indication that the public is becoming weary of scientists crying "wolf" and this may force recognition of risk assessment by policy-makers.

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USS/EPA Critique

S. Ring, Minnesota Department of Health, read our critique of "Provisional Methodology Manual on Electron Microscope Measurements of Airborne Asbestos Concentrations" during the conference. His group has submitted a very similar comment to EPA through the Minnesota Pollution Control Agency.

Gil Wood of EPA's ESCD Division indicated that our letter and critique had created a good deal of consternation within the EPA. He would like to meet with R. M. Fisher and myself as soon as possible.


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