



Research

MEMORANDUM

PLAINTIFF'S EXHIBIT

USX-1252

By R. M. Fisher
Senior Research Consultant
Physics

Date January 30, 1976

Ref. No. 18-E-015(064)

Subject TRIP REPORT: VISIT TO ENVIRONMENTAL SCIENCES
LABORATORY, MOUNT SINAI SCHOOL OF MEDICINE, NEW YORK

Purpose

To review methods of counting and identifying particles
in air samples.

Attendance

U. S. Steel

Dr. M. Bundy	- Director-Industrial Medicine
Dr. R. M. Fisher	- Research Laboratory
Dr. J. S. Lally	- Research Laboratory
Dr. R. J. Lee	- Research Laboratory

Mount Sinai

Dr. A. M. Langer	Dr. I. J. Selikoff
Dr. W. J. Nicholson	Mr. S. B. Shirey
Dr. A. N. Rohl	Dr. Mary Wulf

Summary

Detailed discussions, held with Dr. Selikoff and his staff on January 19, 1976, provided valuable insight into their current activities and attitudes concerning potential health hazards from exposure to asbestos and the analytical methods being used. Procedures used at the Research Laboratory for particle identification are superior to the Mount Sinai methods. The meeting proved to be extremely cordial and the excellent rapport developed with the Mount Sinai group could prove to be valuable in the future.

Research Memorandum:

Trip Report: Visit to Environmental Sciences
Laboratory, Mount Sinai School of Medicine, N.Y.

January 30, 1976

- 2 -

Introduction

Dr. Selikoff directed one of the pioneering studies of the incidence of asbestosis and cancer among American insulation workers in New York and New Jersey. This epidemiological research utilized union records which date back more than 50 years. As a result of his extensive research and publications, he has gained an international reputation as an expert on the effect of particulates on occupational and public health. He was an expert witness in the Reserve case and is an advisor to the Environmental Protection Agency. The purpose of the trip was to discuss what is known and what is surmised about the effects of particulates with Dr. Selikoff and his staff and to learn about the techniques used at Mount Sinai to count and identify particles

The Mount Sinai group does not appear to undertake any toxicological studies. At present, they are continuing epidemiological studies of asbestos plant and insulation workers, NYC tunnelers, and train and truck brake service men. They also undertake a considerable amount of analytical service work examining samples sent in from many sources. A current program is concerned with the presence of a large amount of actinolite and tremolite fibers in platey talc used for talcum powder.

It is important to note that Dr. Selikoff was very cooperative and generous with his time and that of his staff. Discussions began at 9:30 a.m. and did not finish completely (R.J. Lee/J.S. Lally) until after 6:00 p.m. Dr. Selikoff clearly holds Dr. Bundy in high regard, a fact which made this visit possible and effective.

Summary of Salient Points of Discussions

The relevant points of the far-ranging discussions are summarized under the following categories. n. nt

Industry Responsibility - Dr. Selikoff believes that each industry has the prime responsibility for thoroughly understanding its processes, products and wastes, and their effects on the environment. However, he is well aware (perhaps more so than in earlier years) of the economic impact of changes (especially abrupt changes) in regulations limiting emissions, etc.

He seemed to appreciate the initiative taken by U. S. Steel to develop reliable methods to characterize particulates.

Effects of Asbestos on Public Health - Long-term exposure to asbestos, especially to high concentrations of respirable fibers (less than 20 μ m in length) can produce a number of malignant and non-malignant

Research Memorandum:
Trip Report: Visit to Environmental Sciences
Laboratory, Mount Sinai School of Medicine, N.Y.

January 30, 19

- 3 -

diseases. Asbestosis was first recognized about 1900 and is now relatively easy to diagnose. It was much later that health scientists became aware of the occurrence of a higher than normal incidence of cancer among exposed persons. In part, this was due to the much longer period required for cancer to develop but also to a fact that in earlier years many victims succumbed to asbestosis or other pulmonary disease before cancer was recognized.

Threshold Level - The relatively rapid onset and early diagnosis of asbestosis facilitated efforts to reduce exposure to asbestos in the textile and other industries utilizing this material. Studies of medical histories and their correlation with exposure indicated that below a threshold level (2.5 fibers/ml) asbestosis almost never occurs. No threshold level has been established for cancer and Dr. Selikoff and others believe that for some individuals at least there is no lower limit to the exposure to asbestos or any of the other 100 or so known carcinogens.

Acceptable Risk - Most people understand and accept that many occupations and personal living habits carry some risk. This concept was utilized by the British Occupational Hygiene Society in setting hygiene standards on the basis of a 1% risk of developing asbestosis during a working life of 50 years. Dr. Selikoff believes that it may be possible eventually to also establish a similar exposure level for a 1% (or less) risk of cancer.

Since he believes that the effects of extensive inhalation or ingestion of carcinogenic particles may take up to 40 years to appear, a definite correlation between particulate concentration (and type) and risk level will be difficult to establish to everyone's satisfaction. Counts of asbestos concentration were not made 40 and 50 years ago, although the levels are estimated to have been far higher than at present. Counts made 20 or more years ago (primarily in the UK) which are the basis of current EPA and OSHA regulations are open to question and were probably higher than reported. However, it is generally assumed that measurements being made at the present time are applicable to earlier years unless changes in the process, raw materials, or dust control procedures have been introduced.

If the risk level is appreciable this should become evident after 30 years exposure (i.e. 10 more years for the Reserve case) and might be suspected from extensive X-ray examination of a large cohort after 20 years.

Research Memorandum:

Trip Report: Visit to Environmental Sciences
Laboratory, Mount Sinai School of Medicine, N.Y.

January 30, 197

- 4 -

X-Ray Examination and Autopsies - Dr. Selikoff advocates X-ray examination of every worker and said that a lack of any evidence of pulmonitis in workers with 20 years seniority would be very significant. He estimated the cost at \$50-100 per employee. He also advocates conducting autopsies on workers who succumb to injuries suffered in traffic or other accidents to check for the presence of lesions.

Synergistic Effects - A growing body of evidence suggests that many of the carcinogens encountered at low levels in the atmosphere (in contrast to massive exposures in laboratory experiments) act in concert to cause cancer. For example, asbestos workers who smoke are eight times more likely to contract cancer than those who do not. These effects complicate efforts to identify hazardous materials and determine risk factors quite considerably. Individual factors, such as variation in breathing patterns which affect particulate retention, are also very important and contribute to large statistical fluctuations in epidemiological studies.

Effects of Particle Parameters - Most of the thoroughly documented information concerning effects of atmospheric particulates is based on studies of workers exposed to amosite or chrysotile, either in the mines, processing plants, insulation applications, or shop service on heavy vehicle brake linings. Very recent studies have indicated that some hard rock miners (Homestake) or tunnel workers (for a new NYC water supply - construction suspended at present) exposed to amphiboles in the cummingtonite-grunerite series may also develop a higher than normal incidence of cancer in addition to asbestosis. These reports have raised questions about the importance of particle size, aspect ratio, and mineral type, in addition to number per unit volume of air or water. Although very little information is available and much of it is contradictory or controversial because of inadequate experimental methods, these issues are likely to be topics of considerable discussion during any future EPA hearings on new regulations affecting taconite mining and processing.

Fibers of commercial asbestos are thought to be particularly hazardous because their long length, strength and flexibility promote their entry into cells. Long fibers are known to stay in cells longer than more equiaxed particles although they are eventually broken into shorter lengths and also split by cell movements.

The basic mechanism causing cancer is not known. Some researchers believe that two different agents must both be present and react together to cause a malignant condition. Others have suggested that biological effects are associated with chemically-active surface "sites" exposed when a fiber splits inside a cell. Whatever the basic mechanism, it is likely that particle size, shape and mineralogy will play some role.

Research Memorandum:

Trip Report: Visit to Environmental Sciences
Laboratory, Mount Sinai School of Medicine, N.Y.

January 30, 1976

- 5 -

Dr. Selikoff emphasized that for the present, at least, it is extremely important to characterize particulates in air samples as thoroughly as possible. He agreed that, for comparable concentrations short stubby particles (3:1 aspect ratio) of fibrous amphiboles will likely prove to be less hazardous than long aspect ratio (10:1) fibers of amosite or chrysotile.

Facilities

The facilities for electron optical and X-ray spectrochemical analyses at Mount Sinai are barely adequate. They have two Japanese 100 kV electron microscopes without specimen tilting stages and a low-cost (Cwicksan) SEM with poor resolution because of excessive vibration and stray magnetic fields.

Particle Identification

For the most part, particle identification is no more than an "opinion" based on the "characteristic" appearance of the electron diffraction patterns or the chemical analysis obtained with the SEM. Most of their work has been with amosite or chrysotile which are relatively easy to identify. They conceded that tilting particles into two different zone axes as well as determining chemistry is the only way to obtain a positive identification. They demonstrated strong interest in learning to use our identification procedures.

Dr. Selikoff hopes that optical methods can be used eventually so that it becomes feasible to generate large amounts of data on particulate concentrations at many locations.

Nicholson's Report

The report prepared last year at Mount Sinai for the Minnesota Pollution Control Agency was discussed with Dr. Nicholson, who states that most, if not all, of the particles listed as amphiboles in his report were actually minnesotaite.

Counting Methods

The counting procedures used are comparable to methods used in our laboratory. On occasion, they use a rub-out procedure (sample dispersed in dilute solution of nitrocellulose is spread between two glass slides) which they concede breaks up the large particles and changes the size distribution.

Research Memorandum:
Trip Report: Visit to Environmental Sciences
Laboratory, Mount Sinai School of Medicine, N.Y.

January 30, 197

- 6 -

Analytical Laboratories

Dr. Selikoff and his staff mentioned the Ontario Research Foundation, McCrone, Battelle, and Dow Chemical in response to a request to suggest laboratories equipped and experienced in particulate analysis. However, they did not make a strong recommendation for any of them.

Importance of Brake Lining as a Source of Asbestos Contamination

We had an opportunity to examine a new EPA report (now on order for our Library) documenting the contribution of asbestos in brake linings to atmospheric pollution (10^{13} particles per axle mile!).

Miscellaneous

Our discussions with Dr. Selikoff clearly revealed that he is not adamant that taconite emissions (even from Reserving Mining) constitute a serious health hazard. However, he believes that a health hazard of some degree may exist and that everyone concerned, i.e. environmental health experts, government regulatory agencies, and industry must look carefully at all aspects of the question. He emphasized that the programs underway now should have been started by all concerned parties 10 or 20 years ago. He expressed satisfaction that U. S. Steel was utilizing available expertise for this work.

Away from their Mount Sinai Laboratory, some members of Selikoff's staff (especially Dr. Nicholson) may be more intemperate in their comments. However, they seemed to be somewhat chastened by their failure to appreciate the difficulty involved in identifying amphiboles and the consequences of incorrect statements. They clearly agreed that only our methods can produce positive or even highly probable identification of single particles. Dr. Selikoff expressed interest in bringing some of his people to the Research Laboratory to review our methods.

The discussions were extremely cordial and the likelihood of acrimonious disagreement on some future more public occasion seems very remote.

RMF/d

Distribution List Attached

RMF.

Research Memorandum:

Trip Report: Visit to Environmental Sciences
Laboratory, Mount Sinai School of Medicine, N.Y.

January 30, 1976

- 7 -

Distribution List

C. A. Bishop
R. L. Bleifuss
M. Bundy
J. E. Forciea
J. H. Gross
L. G. Hendrickson
W. E. Jackson
W. C. Janes
J. S. Lally
W. T. Lankford, Jr.
R. J. Lee
P. X. Masciantonio
C. W. Niemi
H. W. Paxton
D. J. Smith
C. T. Spivey
R. W. Sundquist