FILE NAME: Johns-Manville (JMA)

DATE: 1973 May 21

DOC#: JMA007

DOCUMENT DESCRIPTION: Presentation on Asbestos by Dr. Irving J. Selikoff at American Industrial Hygiene Conference with BC Notes

7/5/98: American Industrial Hygiene Conference: Selikoff Questions U.K. TLV

Selikoff's (5/21/73) talk at AIHA Conference contrasts H. Lewinsohn's higher diagnosis of asbestos is at T & N's Rochdale plant (40-50%) with the much lower prevalence reported by Dr. Knox (7-8%) in developing the British asbestos standard only a few years earlier. Selikoff calls for review of the OSHA asbestos standard, which was largely referenced to reports from the U.K.

Presentation on Asbestos
by
Dr. Irving J. Selikoff
at
American Industrial Hygiene Conference
May 21, 1973

This year, 1973, marks 50 years since the examination of the first case of death due to asbestosis. Dr. Cooke in Leeds described this fatal disease in 1924. He might well have been asked the question which points a dilemma in which we still are. If he had been asked what exposure of this asbestos textile worker resulted in her fatal pulmonary fibrosis, he would have had to say, "I don't know." Because 20 years ago when she began work in this textile factory, no dust counts were done. Now, the dilemma that he faced is still very much with us at this time because the disease that we are now seeing is the result of exposures at a time when we were not alerted and environmental measurements were not made. We find this a great difficulty in our own work and perhaps it may be well demonstrated by the first slide which I will read to you in view of the circumstances.

This is a slide of the x-ray results in 1,000 employee workers in the New York area examined by us and it demonstrates that out of 725 people with less than 20 years from onset of exposure, most had normal x-rays. When they were abnormal, they tended to be minimally so. On the other hand, more than 20 years from

onset of exposure, of the over 300 men so examined, few had normal x-rays; and when they were abnormal, not infrequently, the fibrosis was extensive. So the 20 year rule which was found in 1924 is present with us today. The description of lung cancer, 1935, and subsequently of pleural mesothelioma in 1954 and afterwards, in 1955 of peritoneal mesothelioma and subsequently of other tumors, has done nothing to resolve this question because they too have had this difficulty which we still face. We have found it so in our studies.

For example, in the New York area, we have been following 632 members of the Asbestos Workers Union; these are the insulation workers, who were on the union rolls on January 1, 1943. You will see in this slide that for the first 10 years from 1943 to 1947 and 1948 to 1952, the total number of deaths was almost exactly what was expected. It was not until after this 10 year period had passed that we began to see the extraordinary mortality patterns that are still with us. We found, for example, that after 20 years whereas there should have been 6 or 7 deaths of cancer in the lungs and pleura, mesothelioma, there were 45. There should have been 9 or 10 deaths of cancer of the stomach, colon and rectum. There were three times as many, 29, and, of course, there were 12 deaths of asbestosis where none had been expected. Yet, as we go longer with this group - we have followed them now through December 31, 1971 (and these are unpublished data; I thought you'd find

them interesting) - we have found that of the survivors of this 1943 group, there should have been another 85 deaths, 168 have occurred. There should have been 4 or 5 deaths of lung cancer. There were 42. There should have been no deaths of mesothelioma, which almost never occurs in the general population. There were 25. There was the small increase, 3 or 4 times increase, in gastro-intestinal cancer and the asbestosis deaths, so that the longer we go from onset of exposure, the more evident the risk appears.

We have, in order to further study this question, undertaken a second study and these are the first reports of this second study, not yet published.

On January 1, 1967, we registered every single union insulation worker in the United States. There were 17,800 members of this union on that date, and Dr. Hammond and I have followed them from January 1, 1967 through December 31, 1971. These are the results found in that study.

Whereas there should have been 805 deaths among them, given their ages, there actually were almost 1,100. And, once again, the lung cancer death rate was extraordinarily increased. Whereas there should have been 44 expected, 213 bronchogenic carcinomas actually occurred. There should have been no deaths of mesothelioma; there were 77. There should have been a small number of gastro-intestinal deaths; there were 3 times as many as expected. And,

of course, there should have been no deaths of asbestosis, which doesn't occur in the general population, and there were 78.

When we analyze these deaths by duration from onset of work, among these 17,800 men, we found that in the group less than 15 years from onset of exposure, there was no significant increase in either lung cancer or mesothelioma. We did not see one mesothelioma in less than 15 years from onset of work, although we were observing almost 10,000 men in this category. On the other hand, once the 15 years passed, we found that the ratio of expected to observed deaths was 5, 6 and 7 times, and now the mesothelioma deaths began to be seen.

We have also looked to see whether this were so in an asbestos products factory making insulation, making many other products, and to study this, we made a list of every single production worker in this plant on January 1, 1959 who had on that date worked at least 20 years. We have followed this group, 689 people, through December 31, 1971. And, once again, we have found that whereas there should have been 8 or 9 deaths of respiratory cancer, there were 35; of which 27 were lung cancers, 8 were pleural mesotheliomas, 7 were peritoneal mesotheliomas; the same increase, modest increase, in gastro-intestinal cancer and asbestosis. Finally, to try to get some sense out of the duration from onset versus the actual exposure, because most of the men in the three

cohorts that I have just reported to you had worked continuously in one group, we were able to find a very significant difference in the amounts of work. This was a factory which opened in June 1941, to make insulation for the U.S. Navy. Nine hundred thirty-three men were employed for the first time, from '41 to '45. The factory closed in 1954. Some 11 men worked for only 1 day. They didn't like it. Some worked until the plant closed in '54. Following this group of 933 people (it was a darn good plant - they got their Navy-Army "E"), we have found that in these 933 men there should have been 300 deaths by the end of '71; there actually were 484. And, once again - it's almost monotonous - the same 7 times increase in lung cancer, pleural mesothelioma, peritoneal mesothelioma, gastro-intestinal cancer and asbestosis. But, of these men, approximately one-third worked for less than 3 months. One-third worked from 3 to 11 months, one-third worked for more than a year, and we have found that although the group with more than a year of exposure had a very significantly greater ratio of expected to observed deaths, 11 times as many lung cancers as expected, still even less than 3 months of work was enough to give a 3 or 4 times increase in bronchogenic carcinoma provided they lived long enough, and provided you looked at them 30 years later. Now all of these data indicate that what we are seeing now, the current mortality experience, is the result of the inadequately controlled exposures of the past. However, the

problem is with this long latent period, how do you find out what the exposures of the past were to relate them to the epidemiological evidence of disease at the present time. Unfortunately, in the United States we are at a loss for this. There are no sets of dust counts and resulting disease observations from the first case reported in the United States in 1930, to permit judgment here of acceptable levels. There are two approaches. Both have been used. First of all, if there were measured dust levels 20 years ago, and if we could identify the populations who were exposed to those levels 20 years ago, we could make some correlations. One, of course, would be asbestosis.

The other approach has been to take dust measurements now and get some sense of how these measurements now related to what existed in practice 20, 30 and 40 years ago. This has been done but there are significant differences with this technique. First of all, in the past very few dust counts were done. The current techniques, membrane filter methods, phase microscopy, etc. were not used at that time. For example, the Dreesen study. Also at that time all particles were counted rather than only fibers, and as we try to convert particles per cubic foot to fibers per cc, the results are unfortunately uncertain. We have, on the other hand, had some measurements of what exists today in the construction industry with the use of insulation material, and we have found that using fibers per cc, that in general, somewhere around 5 to 10 fibers

per cc exists in these environments. Now we don't really know whether this was true 20 years ago. There are 4 studies that provide evidence. First, there is the original study of Dr. Fleischer and his colleagues in the U.S. Navy shipyards, published in '46 and done in '44, '45. A different instrument was used and a time weighted average of 25 fibers per cc could be obtained, but other glass fibers and so forth were included. Murphy and Ferris and their colleagues have looked at shipyard data published in '68 and '71. They came to somewhere around 10 fibers per cc. Balzer and Cooper, in San Francisco insulation workers, have come to around 6 fibers per cc. And in our laboratory, looking at construction work in shipyards throughout the United States, we have found exactly what Balzer and Cooper have found, somewhere around 6 fibers per cc. But this is reconstruction. And we don't really know that this existed 20 years ago. While this is the dilemma which we faced, we thought that 6 fibers per cc, somewhere around that, 10 fibers per cc, existed in the past but we weren't sure. We know what the disease is; I've just shown it to you. Therefore, we were all very much impressed and greatful when the British Occupational Hygiene Society gave us the answer.

In 1968, the British Occupational Hygiene Society published a report stating that 4 fibers per cc or 2 fibers per cc would likely be safe. The basis for their report was the report of their subcommittee on asbestos published in the Annals of Occupational Hygiene

In 1968, and it read, "The results of recent work, the study of John F. Knox and Stephen Holmes, have been made available to the Committee by the asbestos industry and it is on these recent results that the new standard is primarily based." What they came to that it would be safe to have 100 fiber years, such as 2 fibers per cc for 50 years or 4 fibers per cc for 25 years. The work of Dr. Knox and Dr. Holmes (they were both members of this committee) were valid. Dr. Knox was Chief Medical Officer of Turner Brothers Asbestos Company in Rochdale and Dr. Holmes was their Industrial Hygiene Scientist.

The bases for these data were then published by the British Occupational Hygiene Society. Dr. Knox had x-rayed all production workers at Turner Brothers Asbestos Company in Rochdale as of June 30, 1966. There were 931 workers in this plant, of whom a large number had been more than 10 years in their employ. They had done dust counts, very good dust counts, from 1951 on, and therefore we had a population, for the first time, where dust counts could be related to clinical evidence of disease. In the departments where the dust counts were 10 to 15 fibers per cc, of the large number of workers there employed, 7 showed some x-ray abnormality which could have been asbestosis. On the other hand, of 70 or 80 people working at 3 to 4 fibers per cc, only one was reported to have an abnormal x-ray. This being so, the subcommittee, which itself did not review the data but which reviewed the numbers

submitted to it, the subcommittee reviewed the data given it and decided that since only one worker exposed for 20 years or more at 4 fibers per cc showed evidence of asbestosis; half that level, 2 fibers per cc, would be prudent and safe. And if I were on that committee, I would have come to exactly the same conclusion.

When these data, and this conclusion and this recommendation reached the United States, it did, as I say, impress all of us. So much so that on February 28, 1969, Howard Ayer sent the following letter, containing this statement, to 28 asbestos companies and 50 state health departments - Quote: "From these standards (that is, the British Occupational Hygiene Society recommended standard), one would gather that concentration below 2 fibers per cc are probably safe." -- fair statement. Indeed when the criteria document was submitted by NIOSH last year, 1972, it stated, "The development of a standard for asbestos dust in Great Britain and the evaluation made by the British Occupational Hygiene Society Subcommittee on Hygiene Standards for Asbestos, which considered data to reduce the risk of asbestosis, was given great weight in the development of this asbestos standard." That is the origin of the 2 fiber per cc standard. Two fibers per cc obviously is 2 million fibers per cubic meter. A working man inhales somewhere around 8 to 10 cubic meters of air in an eight-hour working day, which means that we have told him that he can safely inhale with an uncertain, unmeasured retention, safety inhale somewhere around 20 million fibers in an eight-hour day longer than 5 microns.

As Mr. Dement has just told us, anywhere from 20 to 99% of fibers are smaller than 5 microns, and therefore the total number of fibers of all sizes is somewhere around 20 to 40 billion.

Now some new data has recently appeared which I thought might be of interest to you. In 1968, Dr. Knox retired as Chief Medical Officer of Turner Brothers and was replaced by a young South African, Dr. Hilton Lewinsohn. Dr. Lewinsohn has re-x-rayed all of the workers at Rochdale in December 1970. The populations, however, were not entirely identical. Dr. Knox had examined only men in the scheduled areas - that is, the production areas, 913 - whereas Dr. Lewinsohn included all employees, including the office personnel, and had therefore a larger number. To some extent you could say that this diluted the population, but I think it was a wise thing to do. Also, some of the people working there in 1966 were no longer employed; obviously they had retired or died and some new workers had been added. The very large majority, of course, were in both surveys. Dr. Lewinsohn reported the results of his December 1970 re-x-ray of the Rochdale personnel in the Royal Society of Health Journal in 1972. Dr. Lewinsohn's data are on this slide.

It demonstrates that of those with, let's say, 20 to 29 years from onset of exposure, of 114 x-rayed, 51 had abnormal x-rays. All together, total abnormalities were 55% of all people who had

reached 20 to 29 years from onset, and of these, actual pulmonary fibrosis was seen in 21 out of 114. Of those who had reached 30 to 39 years from onset, 78% had abnormal x-rays, and 17 out of the 42 had actual pulmonary fibrosis. Of those 40 to 49 years, there were too small a number to show.

When we put these two sets of data together, we can find that as of let's say 400 fiber years, Dr. Knox had found, in reading the films, that somewhere around 7 or 8 % had abnormal x-rays, whereas in the same population a different film reader had found that somewhere between 40 and 50% had abnormal x-rays. There is obviously a considerable discrepancy in the two sets of film readings. Now when these discrepancies were discussed with our British Colleagues, last Fall in Lyon, France, in October, Dr. Holmes made the following statement: "Thus, the information, although the best available at the time, was, to say the least, scanty for the purpose. And some of us who were associated with it have become increasingly concerned with the authority with which it has become invested in the international field (meaning the United States). The time has therefore probably arrived for an up-to-date reappraisal of the original data." I have communicated with Dr. Lewinsohn in the last three weeks and am informed that there are definite plans to undertake this review in the future. It has not yet been done.

In conclusion, then, as a result of these new data from Turner Brothers Asbestos Company, we can say that if the 1972 report of

the Chief Medical Officer of Turner Brothers Asbestos Company correctly represents the disease incidence associated with prior levels of asbestos exposure in the company, then the asbestos standard of the Department of Labor places U.S. asbestos workers at serious risk of irreversible, often fatal disease, and in my opinion, it should immediately be reconsidered.

In conclusion then, unfortunately, I feel we are in the same dilemma still after 50 years that Dr. Cooke found himself in in 1923.

Thank you very much.

QUESTION AND ANSWER SESSION
FOLLOWING DR. SELIKOFF'S PRESENTATION

Q. In the asbestos products factory in which men employed for only three months were found to have a significant increase in lung cancer, were smoking histories obtained?

(Dr. Selikoff)

A. The answer is "Yes", and those data are now being analyzed, but I would be amazed if we found any lung cancers or any more than a trivial number among those who did not smoke cigarettes. We have failed to see any significant increase in the incidence of lung cancer among asbestos workers who do not smoke cigarettes. We have been following 2,066 non-smoking insulation workers from January 1967 through 1971 and we have only seen two lung cancers among them. On the other hand, of 9,590 cigarette smoking insulation workers, we have found 145 lung cancers whereas only some 30 were expected. Bronchogenic carcinoma is almost limited to cigarette smoking asbestos workers. This is not true of peritoneal mesothelioma; it is not true of asbestosis; and it is probably, although our data is too scant yet to be sure, it is probably not true of pleural mesothelioma. But of lung cancer - there is no question - this will not occur by and large among asbestos workers who do not smoke cigarettes.

Q. I would like to ask Dr. Selikoff if he thinks the new standard should include both a total dust count - if there is a new standard - both a total dust count and a per cent fiber count. At least in our experience, we seem to vary independently. A standard set on one rather than the other could be quite misleading.

A. Ray Murphy has asked me a very embarrassing question. He asked me to give an opinion where I can't give it even on fiber counts. He now asked me whether I would do it on total counts rather than just fibers. The answer is, "I don't know." But I'm not very impressed (if I can upstage Duncan Hol a bit who is going to review this tomorrow morning) - we're not very impressed with asbestos standards which rely upon dust counts being done. May I give you some data? Very depressing data, if you think these are depressing. On June 7, 1972, the asbestos standard came into effect. And it said that every company using asbestos had to do at least one dust count, one dust count, in the next six months. That is, by December 6. We, on December 7, did a survey of insulation workers in the United States and we now have some 5,000 odd replies. Each man was asked about

the dust counts that he personally had seen in the six months when every company was supposed to do a dust count. In the United States insulation industry, fewer than 3% of the insulation workers saw even one dust count done from June 7 to December 6, 1972. Obviously then, dependence upon dust counting as a means of control in this unusual industry has many deficiencies.

Q. It is really one question in two parts, perhaps. The fibers at the Turner Asbestos Company (Knox-Holmes study), what were these and could you comment, would you comment on the possible differences that you think may be between crocidolite and chrysotile and amosite?

A. The fibers in Turner Brothers, since it was a textile operation, were largely chrysotile. We can give you no information concerning crocidolite because none of the workers studied by us had any crocidolite exposure. They had chrysotile exposure and many of them had amosite exposure. Indeed, in the plants, in the factory making the Navy insulation, this was almost entirely amosite. So our data apply only to amosite and to chrysotile and, unfortunately, I can give you no information on the relative hazard of crocidolite. I would suggest, however, that if crocidolite is more dangerous than amosite or chrysotile, it is going to be almost as bad as bis-chloromethylether. (Laughter)

Q. Dr. Selikoff, are you aware of a particular type of asbestos fiber mined in Ontario called Headman? Fibers which have been found to be relatively inert, by Paul Gross and others?

A. I presume that you mean the fibers mined in Quebec, not Ontario. (No, mined in Headman Mine in Ontario.) No, I do not know these particular fibers and I would be delighted to know of an asbestos fiber which is comparatively inert.

Q. They claim - and Paul Gross and others have done experimental work - and they have found that this particular fiber which is chrysotile has been, in experimental work, found to be inert.

A. Well, I would be delighted to see those, indeed I'd be delighted to see those in industrial use.

Thank you, Dr. Selikoff.

PREVALENCE OF X-RAY EVIDENCE OF ASBESTOSIS
IN ASBESTOS TEXTILE WORKERS

