3. Síntesis de los conocimientos médicos y epidemiológicos.

A résumé of medical and epidemiological knowledge.
ASBESTOS: APPLYING DEVELOPED COUNTRIES
EXPERIENCE TO LATIN AMERICA

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There are several things I would like to cover. One is the history of the knowledge of asbestos-related diseases, because by reviewing the history we can learn some lessons from the past and hopefully not repeat errors in the future; I should like to review concretely the diseases that are related to asbestos, to make sure that everyone has an understanding of the health effects; and third I should like to go over the lessons we have learned in the United States in relation to the damage due to exposure to asbestos.

Let me begin by giving you a sense of the magnitude of the asbestos problem we presently face in the United States (Slide 1). Here are a few recent statistics or facts regarding the outcome of 100 years of asbestos use in my country. There are approximately 25,000 lawsuits pending trial in the courts brought by people or parties who feel they have suffered the harmful effects of asbestos exposure. This is not to say that all these people have, in fact, suffered the harmful effects, nor is this to say that they are the only people who have been harmed by asbestos. There are many more and probably less than 50% choose to pursue a lawsuit. Nonetheless, the courts are literally inundated by these cases, and no acceptable systematic method for resolving these disputes has yet been devised. Furthermore, these numbers are likely to continue to increase in the future, because it has been estimated by Dr. Nicholson and others at Mount Sinai, that 9,000 workers each year will die from cancer due to asbestos exposure from 1984 to the year 2000. This is based on exposure that workers have already had in the 1950’s and 1960’s. Estimates from the largest asbestos company in North America, the Johns-Manville, are somewhat lower, but they still expect a total of 50,000 deaths from lung cancer alone due to asbestos exposure during the same 16-20 year time period.

How widespread the use of asbestos has been, and hence, how many people are potentially exposed can be seen in the following statistics. Over 700,000 public buildings in the United States contain asbestos insulation, or other-asbestos material, including 31,000 public schools. Several million children attend those public schools, and it is estimated that several hundred million dollars were spent last year to remove or otherwise isolate asbestos from these buildings. So, even though our consumption has decreased tremendously in the last 10 years, we still have all the asbestos that was placed into the environment, and the lesson that we have learned is that it is still there, with all attendant hazards, since asbestos does not degrade naturally. Therefore, given these staggering numbers, it is not surprising that Johns-Manville, the above-mentioned asbestos company, with assets of 2.3 billion dollars, filed for bankruptcy in 1982.

Well,... how did we get into this predicament? Perhaps a review of the history of our use of asbestos will allow you in Latin America to design your future more
intelligently. First, let me just put up a list of the known health effects of asbestos to give you a general framework (Slide 2). They are listed in more or less the chronological order in which they were discovered. These are: asbestosis, or scarring of the lungs; lung cancer; pleural plaques, or scarring of the lining of the lungs; mesothelioma (cancer of the mesothelial lining of the abdomen or the lungs); and finally other cancers, principally those of the gastrointestinal system and the larynx. These have not been mentioned here so far, but an ample number of studies have shown increased risk of these cancers from asbestos exposure.

In 1906 (Slide 3), a British physician, Dr. Montague Murray, published the first recorded case of pulmonary fibrosis in an asbestos textile mill worker. Over the following 20 years, investigators in England, Italy, France and the U.S. reported case series of numerous deaths from lung scarring in asbestos textile workers. Although nowadays we would not consider this sufficient to prove cause and effect, especially since at that time tuberculosis was common, at least some parties were convinced by this evidence. By the early 1920's, North American insurance companies began to deny insurance policies to asbestos workers due to their hazardous work. This action was probably the first institutional policy, public or private, to address the hazards of asbestos in a theoretically preventive fashion.

The first work which might be considered epidemiological, though epidemiology had not been invented back then, occurred in 1930 when two British factory inspectors, Merewether and Price surveyed 363 asbestos workers. Let's look at their results (Slide 4). Even though it is a relatively primitive study, it illustrates certain truths about asbestos that remain important today. On the left hand side of the slide is the number of years employed, then the number of workers examined, and you can also see the cases and percentage of people with asbestosis. First they noted a gap in time between the onset of exposure and the occurrence of the disease, as illustrated by the fact that none of the workers employed for just 0-4 years had any disease as asbestosis. This gap in time, referred to as latency, is true for all asbestos-related diseases, and it is an utterly crucial notion that must be incorporated into epidemiologic studies in order to determine whether you have problems with asbestos in your country. Secondly, they discovered that the longer the duration of exposure, the higher the rates of pulmonary scarring. They also noticed that asbestosis was not a rare disease, in fact 81% of the people who had worked for more than 20 years had asbestosis. And finally, and this is not shown on this slide, they noted that a more intensive exposure led to a shorter latency period. This is true of asbestosis, or the more rapid development of more serious disease. Back in the 1930's it was not at all unusual for workers to die at the age 30 or 35 of asbestosis.

This survey was widely cited in the medical literature, and was followed by others including one in 1931 by Dr. A. Lanza of the Metropolitan Life Insurance Company. At the request of a group of asbestos companies, he studied 126 people working in factories over 3 years and found chest X-ray evidence of asbestosis in over 50%.

This led certain public health-minded physicians to call for preventive measures (Slide 5). In fact, one of the leading British researchers at the time said that: "Prophylaxis is all-important and the only hope for the asbestos worker lies in the adoption of proper means of protection against the risk attendant on the inhalation of the fibers"... This was in 1931. How true it was 50 years ago and it remains true today.
The feeling was that if they reduced the dust levels, these diseases would disappear and in the mid-thirties dust levels were likely reduced, especially in Great Britain. Unfortunately, these studies and such warnings did not have much impact on the quantity of asbestos used in the United States or elsewhere (Slide 6). This slide shows the history of asbestos consumption in the U.S., and as you can see, the discovery of asbestosis around 1930, perhaps earlier, had no impact, in fact it just preceded the rapid escalation of asbestos use in the United States. In World War II, which was about 10 years after the real documentation of asbestosis, in ships like this one (Slide 7), 4.5 million Americans worked directly with or near asbestos, since the large pipes on deck were covered with this material. Actually this slide is a very good example of why the shipyard exposure was important. It was not just the people directly applying insulation material containing asbestos to the pipes that developed asbestos health-related problems because the asbestos was in the general environment of the ship.

In recent years, the largest group of asbestos workers studied has been that of the entire North American Insulation Workers’ Union, by Dr. Irving J. Selikoff and others at Mount Sinai (Slide 8). There were 17,800 workers in the union at the beginning of 1967, and what Dr. Selikoff did was to determine the causes of death in the following 10 years among this group. Observed deaths are in the third column: 2,271 in this group. The causes of death are enlisted on the left. The expected number of deaths that would have occurred in this group based on the white U.S. male population, is listed; had they not been exposed to asbestos, this is probably what they would have died of and at what rates they would have suffered these various causes of death. And then finally, in the right-hand column, is the ratio between the observed and the expected, the relative risk, to give you an idea of how much asbestos increased the risk of dying of these diseases. If you read down through the various forms of cancer to the bottom, you will see that 168 people, 8% of the workers, died of asbestosis from 1967 to 1976, from a probable exposure in the 40’s or the 50’s. Hence, 50 years after the discovery of asbestosis, U.S. workers were still dying of the disease.

Let us review a few characteristics of asbestosis before we move on to cancer (Slide 9). Here is a chest X-ray of someone with the lung scarring that typifies asbestosis, the heavy white streaking in the lower and mid lung fields is abnormal. This is a case of advanced disease. Viewed with a light microscope, normal lung tissue is seen on the left. It is fine and lacy and allows for adequate gas exchange. Compare this with the thickened bands of collagen seen in the asbestosis on the right. It is not hard to see why the lungs have difficulty inflating and exchange of oxygen and carbon dioxide is impaired. A few additional characteristics (Slide 10) of asbestosis are that:

1. It is associated with all commercial types of asbestos, including chrysotile.
2. It requires a fairly heavy exposure to asbestos.
3. It is frequently confused with other lung conditions by unsuspecting physicians. This is especially important for the physicians in your countries, since we have had a big problem with misdiagnosis of asbestosis for emphysema. Physicians who are not specifically trained in reading these X-rays frequently read them wrong and do not identify the disease correctly.
4. The latent period is clearly observed (Slide 11).
By 20 years after onset of exposure, you hardly see any deaths of asbestosis, but these deaths increase sharply thereafter.

However, there has been greater concern in recent years regarding the fact that asbestos causes various forms of cancer, especially lung cancer. The first case reports of lung cancer in workers with asbestosis appeared in the 1930’s (Slide 12); many physicians became convinced by autopsy studies in the 1940’s, but the last sceptics really yielded in 1955 when Doll, in England, published the first cohort mortality study of asbestos workers. Still, as late as 1961, Dr. Rutherford Johnstone, a prominent occupational medicine physician in the U.S., who published a text so popular that it was translated into Spanish, and I am sure some of you have seen it, wrote (Slide 13): “In the American literature there is no evidence that there is a relationship between asbestosis and lung cancer... There is no epidemiologic evidence of such among American workers.”

This may have been partly true but it illustrates a recurrent theme in the history of the discovery of asbestos-related diseases—the reluctance of some to accept evidence presented in studies in other countries— as relevant to one’s own country. While it is true that working conditions, fiber types, etc., have varied among countries, this hesitation has resulted in an unnecessary delay in recognition of disease and hence, in opportunities to prevent disease. The diseases produced by asbestos are biological events independent of nationality and social and political context. This comment, I think has some relevance for your countries.

Now, returning to Dr. Selikoff’s study of the insulation workers, for a more recent depiction of lung cancer (Slide 14), we can see that 986 workers died of lung cancer when in fact only 106 were expected to die had they not worked with asbestos. And the risk ratio there is 4.6, that is almost 5 times as many died as would have died had they not worked with asbestos.

1. (Slide 15) It is important to realize that the lung cancer caused by asbestos is identical, clinically and pathologically to lung cancer which occurs in the general population. Hence, physicians will not identify lung cancer as being associated with asbestos unless they take occupational histories from their patients, which they usually do not, and therefore cannot routinely identify asbestos etiology or causation in lung cancer.

2. Again, a latency period is observed of at least 20 years or more, between onset of exposure and appearance of lung cancer.

3. Relatively brief but intense exposures can cause lung cancer (Slide 16). This slide is not of the insulation workers but of the amosite asbestos factory; on the horizontal axis is the relative risk, and on the vertical axis, the length of time worked in the factory. We can see that workers who worked less than a month in the factory, many of them, as summer jobs or whatever, experienced three times the rate of lung cancer they would have experienced had they not spent those four weeks or less in the asbestos factory. A short intense exposure can definitely cause an increase in lung cancer.

4. Furthermore, lung cancer is associated with all four commercial types of asbestos, including chrysotile.

And now I want to refer specifically to what has been hinted at so far, which is the multiplicative interaction between asbestos and cigarette smoking (Slide 17).
Dr. Selikoff and Dr. Hammond demonstrated that in these insulation workers the combination of the two exposures astronomically increase the risk of lung cancer. In this slide, we arbitrarily assign a risk of 1 to nonsmokers who do not work with asbestos, then nonsmoking asbestos workers get five times the rate of lung cancer of the nonasbestos workers. In other words, in the absence of cigarette smoking, asbestos workers are still at high risk of getting lung cancer. Now, as you can see in the slide, smoking cigarettes, without being exposed to asbestos increases the risk of getting lung cancer by almost 11 times; but when you put the two exposures together, you just multiply the risks of each individual exposure and you come up with about 50-53 times the risk of the nonsmoking, nonasbestos worker. One of the implications of this relationship is for workers who have already worked with asbestos. Convincing them to stop smoking is one of the few beneficial things that can be made on their behalf. Also, in countries in which the consumption of cigarettes is increasing, asbestos exposure potently increases the risk of lung cancer.

Asbestos has the dubious distinction of creating a deadly disease that barely existed before in history, and this is called mesothelioma (Slide 18). Average survival after discovery of this cancer is less than a year. There are a few people who do actually live with mesothelioma for a few years, and one of the things that we are doing at Mount Sinai is that we are creating immunological profiles of people with mesothelioma to try to identify those who will live for several years, either to spare them the chemotherapy or at least give them a better sense of prognosis. Nevertheless, there is a relatively small number of workers with mesothelioma who live more than a year. In fact, survival is less than with lung cancer.

You can see from Dr. Selikoff’s cohort just how many workers got mesothelioma (Slide 19). 112 cases were peritoneal, 63 pleural mesothelioma, making a total of 175, about 8% of the insulators. Now, the stars in the expected column have to do with the fact that mesothelioma is so rare that we really do not expect to see it in the general population or in the absence of asbestos exposure.

Now (Slide 20), like the other diseases mentioned so far, the three major commercial varieties of asbestos cause mesothelioma. This includes chrysotile which is or seems to be less potently associated with mesothelioma than amosite or crocidolite. The latency period for mesothelioma is longer than for the other diseases, 30-35 years. In addition, smoking cigarettes does not make the rate of mesothelioma worse, in fact, it does not help to try to convince workers not to smoke in order to reduce the risk of mesothelioma.

One especially interesting aspect of mesothelioma is that its unique relationship with asbestos means that whenever this disease occurs, a history of asbestos exposure can and should be sought. For the most part this is possible, though not always. We did find through this that not all people who got mesothelioma worked directly with asbestos. And this was one of the first solid clues that nonoccupational exposure to asbestos could cause disease. In other words, we learned that one did not need to have direct, intimate contact with high levels of asbestos in order to get mesothelioma. This is true for lung cancer as well, but because of the unique relationship between asbestos and mesothelioma, this was easier to identify.

In fact, in the first major study of mesothelioma in 1960 in South Africa, close
to half of the victims did not work in the asbestos mines but simply lived near them. Furthermore, a few years later in England, Newhouse and Berry found 9 cases of nonoccupational mesothelioma in women who lived with asbestos workers or within one-half mile of asbestos factories. Other studies have since corroborated these results. At Mount Sinai over the years, numerous spouses and children of asbestos workers have been seen with mesothelioma. Workers used to bring the dust home on their clothes, and often not even take them off immediately. They might play with their 2 or 3 year old child, who after the expected latency period, at the age of 30, would develop mesothelioma. It is not surprising then, that mesothelioma has been a large part of the debate about the hazards of low-level asbestos exposure.

I might add that in a more systematic study at Mount Sinai, among the wives and children of asbestos workers, a significant number had developed (here I am not talking about death, I am talking about chest X-ray findings), parenchymal asbestosis, although it was usually mild. And even more, I think about 50%, had developed pleural plaques which are fairly unique to asbestos exposure.

Now, in this list of cancers here, we have made our way down to gastrointestinal cancer, and you can partly see, except for some distraction there, that the relative risk is 1.67 (Slide 21). That is to say, it is much lower than the other diseases. Nonetheless, 40 people who otherwise would have survived, died from gastrointestinal cancer. These includes cancer of the esophagus, stomach and colon, and again physicians will not recognize this as being related to asbestos exposure. In addition, in this particular study and other studies, not all of them but some, it has also been found an increased risk of cancer of the larynx, and in this particular one, an increased risk of cancer of the kidney.

What is the status of asbestos in the United States today (Slide 22)? Some of this has been covered, but I just wanted to show this slide to give you the numbers: from the peak asbestos use in 1974 it has gone down to about 1/3, this is up to 1982. We are now developing asbestos-free brakes, and other friction products. Asbestos insulation is no longer applied, and few asbestos textiles are produced or imported. At least 6 asbestos cement pipe manufacturing plants in North America have been closed in recent years.

Still, as I mentioned before, we have millions of tons of asbestos insulation material in many buildings, and much of it is deteriorating. Indeed, in the last few years we have seen a new industry, the asbestos removal industry. I found this advertisement in the New York Times about a week ago (Slide 23); it reads:

**Jobs**

Earn $45,000-$60,000 plus yearly. Join a new $20 billion dollar industry.

It is not clear who makes this quantity of money, except the contractors. We have had a number of asbestos rip-out workers at our Occupational Medicine Clinic recently, and their income is the routine for unionized construction trades -$25,000-$35,000 per year. No extra money is paid because the nature of the work is hazardous.

We have tried to create and enforce a proper method of asbestos removal. As you can see from these slides (Slides 24-26), this is a complex task. Workers wear these spacesuits with fresh air respirators to avoid contamination. They undress
and shower in special decontamination chambers. The asbestos is soaked with water prior to removal in order to reduce dust levels, packed in special bags and hauled off to designated dumpsters. Are these workers safe if they follow the appropriate procedures? I have been involved in teaching some classes for these workers and have often been asked this question. Unfortunately, we do not know the exact conditions under which asbestos can be used safely. That is to say, there is no established threshold below which workers can be reasonably certain that they will not contract any asbestos-related disease. Dr. Nicholson is addressing this issue in greater depth in his presentation.

How have the developed countries gained some measure of control over the conditions under which asbestos is handled? (Slide 27). The traditional way is a special bag with sleeves in it. The bag is wrapped around the insulation material in an attempt to isolate the asbestos. You take off the material, keep it in the bag, the worker manipulates the material through those sleeves. So have we gained some measure of control? First, it must be recognized that insofar as industry directly determines working conditions and, hence, to what degree workers are exposed to asbestos, it is the inherent responsibility of industry to provide a healthy and safe workplace. In the U.S., courtroom litigation involving billions of dollars from disease claims has been instrumental in reinforcing the notion of corporate responsibility. In addition, government regulations have a natural and vital role in working with industry to ensure the elimination of hazardous working conditions.

I should say that no serious scientist in the U.S. believes that the 2 f/cc standard is protective against cancer, though it was historically established to attempt to prevent asbestosis, and even after 1969-1970, when this standard was set up, it became clear that it did not provide protection against asbestosis; and it was never intended to protect against cancer.

Asbestos-related disease, like most occupational diseases, has few unique clinical features that distinguish it from disease not produced by asbestos. Hence, unless special medical surveillance programs are established to determine the prevalence of disease among workers, the burden of illness caused by asbestos will remain invisible, except for perhaps, mesothelioma which is a distinctive disease. Similarly, asbestos air sampling in the workplace is crucial. Otherwise, elaborate discussions about legal standards and permissible exposure levels are farcical. Environmental sampling requires a sufficient number of inspectors who are properly trained, who have the appropriate equipment and people in laboratories to accurately identify asbestos.

Experience in the United States and elsewhere has shown that professional expertise and training are prerequisites for the recognition of asbestos-related disease. I am referring here to the specific instruction that clinical physicians require to read the chest X-ray changes which characterize asbestosis. Most physicians have a difficult time identifying pleural plaques and many have trouble identifying the scarring that typifies mild asbestosis. Even radiologists have a difficult time unless they are specially trained to read pneumoconiosis X-rays. Pathologists require special training to identify the distinctive histology of mesothelioma and, to a lesser extent, asbestosis; and, finally, industrial hygienists and engineers need the proper training to identify and quantify asbestos fibers in the environment.

Finally, I want to say that worker education should not be ignored. Although
management establishes the working conditions in a factory, mine or other work-
sites, it is labor that participates in these working conditions and ultimately suffers
the harm of asbestos-related disease. Management sometimes forgets that a safe
workplace requires the active participation of workers, who in turn, must be prop-
erly educated about the dangers of the materials they work with.

This has been a very tough issue in the United States in the past five years.
Many individual states have passed so-called "Right-to-Know" laws requiring that
employers inform workers about the nature of hazards in the workplace. Indeed,
this activity has produced a national consensus shared by industry, government,
labor and the general public about the need for a uniform federal regulation pro-
moting the "Right-to-Know" or hazard communication.

Furthermore, if workers are to be educated, it is best to communicate in plain,
truthful terms. This is a slide (Slide 28) of the British industry-approved label for
materials that contain asbestos. My objection to the "A" we have seen in the
previous slides is that for workers who cannot read, it does not transmit any in-
trinsic information about the hazards of asbestos compared to this poster (Slide
29), made by a community group in Puerto Rico. This may be overly dramatic for
some in particular, but it has several virtues and one is that the skull and cross-
bones for illiterate workers means something. Secondly, the word cancer is men-
tioned at the bottom and I think this is an important word because this is what
asbestos can produce, and this word means more to people than simply saying that
asbestos can damage health.

Let me finish on an optimistic note. You, in Latin America, have a great op-
portunity to learn from our costly errors and to prevent considerable disease and
death. For the developed countries, only after many people have died or become
disabled, have we been able to achieve some control over asbestos through regula-
tion, education, litigation and the cooperation of industry. Since you are con-
cerned about economic development and have not yet suffered the effects of as-
bestos exposure, or have not yet identified them, the historic forces and social
momentum to control this carcinogen may not yet exist in your countries. At-
ttempting to protect people's health may make your job more difficult, but I be-
lieve that through collective will and action, you can break the legacy of asbesto-
related disease.

I want to show this last slide (Slide 30), it is a comment made by Dr. Thomas
Legge in 1934 in his book "Industrial Maladies"; he had worked with Dr. Murray
in 1906 to identify the first case of asbestosis and in 1934, he looked back on that
time and he said: "Looking back in the light of present knowledge, it is impossible
to feel that opportunities for discovery and prevention were badly missed", and I
plead that we do not repeat this experience.
DISCUSION/DISCUSSION

Cedeño (ECUADOR)

Creo que la intervención del Dr. Markowitz nos da algunas orientaciones, sin embargo, en lo que se refiere a nuestros países, el principal problema actual es la utilización del asbesto, fundamentalmente en láminas para techos y tuberías de asbesto-cemento. Esto ha originado ya una serie de controversias entre fabricantes, trabajadores y en particular entidades públicas, que son las que utilizan, en el caso de las tuberías, este producto, al menos en mi país, en forma masiva. Se están sustituyendo todas las tuberías de hierro por tuberías de asbesto-cemento. Nosotros no vemos el problema únicamente en el sitio mismo de trabajo porque hasta cierto punto, creemos que toda la tecnología de protección se ha transferido ya a las fábricas que se han instalado en los últimos 10 años. Desgraciadamente, vemos que ninguna de las investigaciones que ha hecho el Centro Médico Monte Sinai, se refiere a los posibles efectos a largo plazo de la utilización del asbesto, en tuberías por ejemplo. ¿Qué pasa después de 10-20-30 años, cuando este cemento aglomerado comienza a desmenuzarse? No hay una clarificación al respecto. Este es uno de los problemas que crea una tremenda preocupación en nuestros países. El otro que aquí también se ha mencionado es la utilización del asbesto-cemento, fundamentalmente en escuelas y habitaciones de los trabajadores rurales. La humedad y temperatura existentes en los climas tropicales hacen que este asbesto-cemento se deteriore más rápidamente que en otros países y peor aún cuando se mezcla con celulosa. ¿Qué es lo que sucede? ¿Se están haciendo investigaciones en este campo? En el campo de la salud de los trabajadores, las mismas estadísticas que se han presentado aquí, las hemos estado viendo desde hace unos 10 ó 12 años, y lamentablemente no se avanza. Sabemos que se han utilizado tuberías de asbesto-cemento en los Estados Unidos por ejemplo, en el área de Los Angeles, desde hace 30 años. ¿Se tiene información sobre los efectos en la salud de la población?

Markowitz (U. S. A.)

I have two comments: first, I am not convinced that there are no occupational problems with asbestos in Latin America, and I have not heard any evidence so far that good epidemiological studies have been done to prove that there has not been a problem with asbestos exposure in the workplace; neither am I convinced by seeing certain model factories and certain data on air fiber levels, that this is truly representative of a lot of the factories or plants that use or produce asbestos products in Latin America. Nonetheless, your main question seems to have to do with environmental exposure to asbestos and this is a problem which is puzzling us also. We have not found a great solution to it. Asbestos, say in drinking water, is a very difficult epidemiological problem to study. First of all, whenever you do an epidemiological study in which you try to match exposure with outcome like disease or death, you need to quantify exposure. Now, how do we quantify how much asbestos is in the drinking water available to people in certain areas? Take for example Los Angeles, some people in LA drink a lot of soda, and others drink a lot of water. Some people live in LA for two years and have drunk water for two years; some have lived there for 30 years or their entire lives. Furthermore, in LA
in particular I should say that the water supply is very unstable and that the water comes from different parts of California, in different years, having to do with just the natural variation and flow of water in that part of the country. So the problem of asbestos in drinking water or for that matter, the problem of any contaminant in drinking water, including chloroform (which we are also concerned about, because chloroform is produced by adding chlorine to water with some natural organic substances, and we know chloroform causes cancer) is a very difficult problem to solve. We need to identify how much exposure people have had, and then on the other hand, what diseases they have come down with. There has not been, to my knowledge, any mesothelioma identified with that kind of environmental exposure, but then again it is very difficult for the health care system to pick up an occasional case of mesothelioma and to relate it to the asbestos in the drinking water. We are trying to deal with this kind of environmental problem, but methodologically it is very difficult, and let me just leave it at that. It does raise the whole issue of dose-response in quantitative risk assessment and the next two presentations will address the problem.

**Dunnigan (CANADA)**

It is very hard for me to abstain from expressing my feeling that what we have just heard is standard, usual, ad nauseam repeated practice of some people at Mount Sinai. I could probably make as long a comment as Dr. Markowitz has done, but of course this is not the time, and with respect due, this is not a scientific meeting, it is a working group. Much of what Dr. Markowitz has said would not hold water in any standard scientific meeting, but what I find most appalling and concerns me is that Dr. Markowitz is using Dr. Selikoff’s study, of about 17,800 insulation workers in the U.S. and Canada. He did mention that there was some relationship with smoking, but I would like to directly quote from Dr. Selikoff, who said, and this was reported in the Federal Register, January 1980: “...that the analysis of the lung cancer deaths of the 17,800 men showed that increased risk of this type of cancer was limited to asbestos workers who also had a history of smoking. Among the 9,590 cigarette smokers there were 179 deaths; of the 2,066 men with no history of cigarette smoking, there were only two deaths”. I believe this was amplified by Dr. William Nicholson. Therefore, when on the same day, we have these predictions of, say 9,000 deaths per year, from the year 1984 to 2000, I have many questions, one would be: how many of those deaths would be due to smoking? And the other question may be: 9,000 deaths due to occupational exposure to asbestos, with or without smoking, out of a total of how many deaths due to occupational causes? So I think I will end my comment right now because in such a setup it is impossible to really go in depth and be very critical in the establishment of two things: risk assessment and risk management. We are all for risk management, but we should be all for a proper risk assessment and that is the whole point I am trying to make! Risk assessment has not been done properly.

**Markowitz (U. S. A.)**

I do not really want to respond to the personal attack. There is no evidence that smoking affects mesothelioma or that it affects asbestosis in a significant way.
There were deaths among the insulators from asbestos exposure who did not smoke. If you remember the slide that shows the relative risks for the various categories, the non-smoking nonasbestos worker, the smoker who does not work with asbestos who is about 10 times at risk, then you take that smoker and expose him to asbestos, and that risk goes up to 50. Now, one might partly attribute that extra risk of 40 to asbestos, and I do not want to get into a discussion of whether smoking or asbestos is more to blame here; but it is undeniable that asbestos greatly multiplies the risk among smokers and causes types of disease among non-smokers.

Chevalier (CANADA)
I would like Dr. Markowitz to discard from the presentation the second to last slide, which is quite subjective, it does not show exactly what it means and does not represent the truth. I have never seen a house built with asbestos in form of textile or insulation, so this could be misleading for people living in houses built with asbestos-cement, and we will see later on during this meeting that it is not a danger for people living in houses of asbestos-cement.

Markowitz (U.S.A.)
I may have been misunderstood here. My main point was simply to say that I think that certain information should be transmitted to asbestos workers and this information includes the fact that asbestos can cause cancer and the word cancer should be used, and secondly that the use of the skull and cross-bones, although I do not necessarily endorse it, at least has some meaning for workers who do not read, and this is important. I did not mean to imply that asbestos-cement produced this type of hazard, but my point with this slide was not to refer to asbestos-cement, but to the communication of information.

Chevalier (CANADA)
It is written there that when somebody lives in a house built with asbestos, for me that means asbestos-cement, not anything else. I think that this type of document should not be in the proceedings of the conference, it does not belong.

Markowitz (U.S.A.)
Would you object to the use of that kind of sign in a building in which there was asbestos plate and insulation deterioration? You would not object.

Vega (MEXICO)
Yo quería regresar al problema de exposición al asbesto y mesotelioma; ahora me queda muy claro que el mesotelioma se puede desarrollar por exposición a cualquier tipo de asbesto, como aquí se ha discutido; que no existe una relación dosis-efecto, y que según el Dr. Markowitz, el mesotelioma se encontró principalmente en personas no trabajadoras que vivían cerca de lugares en donde se trabajaba el asbesto. Esto lo quiero además relacionar con los datos que daba el Dr. Demner acerca de las estadísticas de mesotelioma en Colombia, en donde él se refirió solamente a 5 casos en los cuales se pudo encontrar una relación directa entre exposición a asbesto y mesotelioma y él aseguraba que solamente un 30% de los mesoteliomas estaban asociados a exposición al asbesto. Mi pregunta al Dr.
Markowitz es: ¿se conoce algún otro agente causal del mesotelioma pleural o peritoneal?

Markowitz (U. S. A.)
You need not worry about erionite that produces mesothelioma in human beings. There is some concern from animal studies, about mesothelioma from a number of other fibers. However, to my knowledge, this has not been documented in humans. Regarding the 5 cases that were reported, they are too few to be able to draw any generalizations from them. For pathologists who are not used to seeing mesothelioma, this is not an easy type of cancer to identify. Therefore, the chances of misdiagnosis and underdiagnosis are great.

Jackson (U. S. A.)
I would like to respond to this gentleman’s question about A-C pipe and what information is available. Over the intervening 12 years somewhere between 15 and 40 million dollars have been spent in the United States alone, on the asbestos ingestion issue. I would be more than willing to provide you with the 2 feet of paperwork that has been generated, including a summary workshop on ingested asbestos which EPA held 2 years ago, and which appeared in Environmental Health Perspectives. Moreover, there are probably no more than 2 or 3 people in this meeting who know that EPA is going through a rule making under the Safe Drinking Water Act to revise the National Interim Primary Drinking Water Standards, and asbestos is included among the 60 materials that are being looked at. On October 11, 1985, I saw a press release stating that EPA is going to set a recommended maximum contaminant level for asbestos in water at 7,1 million fibers per liter of long fibers. We have not yet seen the documentation for the arrival at that. The important thing is that since asbestos is classified as a carcinogen, and all other carcinogens that have been treated by the Environmental Protection Agency have been set with recommended maximum contaminant levels of 0. I believe that in the statement of the EPA Science Advisory Board in November of last year and in October of this year, the consensus was that although they were concerned about the occupational cohorts and the gastrointestinal incidents, they could not establish a causal link between ingested asbestos and disease. I will provide you with this information.

Demner (COLOMBIA)
Antes de hacer una pregunta al Dr. Markowitz, quisiera hacer algunos comentarios. Primero, que me disculpen los señores que hablan sobre estudios epidemiológicos deficientes, yo creo que no tienen ninguna base para afirmar eso. Los pacientes nuestros y del Seguro Social están allí, les invito cordialmente para que vean que los estudios que se hacen son muy serios y como en cualquier otro hospital del mundo. Segundo, se habló de que es a veces difícil para el patólogo identificar los casos de mesotelioma, estoy de acuerdo. solamente que nuestros patólogos han sido preparados en su hospital y en otros de Estados Unidos y de Europa, realmente con un conocimiento sumamente bueno y dificilmente diría yo que no tienen suficientes antecedentes. Puede que a algunos se les haya pasado algo, pero sólo eso.

Dentro de estos términos, para contestar a la Dra. Vega que se refirió a estos casos, sabemos que si hay mesoteliomas producidos por otras sustancias. Todo el
mundo conoce la historia de lo que pasó en Turquía, donde hubo una epidemia de mesotelioma por zeolita, que no es asbesto; también sabemos que no todos los mesoteliomas tienen relación con el asbesto, y ya di una cifra hoy. Encontré un trabajo publicado en 1981 de los doctores Joseph Brenner y otros del Sloan Kettering de Nueva York, hospital muy serio; revisaron 123 casos de mesotelioma y encontraron que el asbesto era el único posible factor causal solamente en un 24%. Con esto yo quería aclarar que estoy de acuerdo con el Dr. Markowitz en que no se conoce la etiología, pero que hay otras sustancias que lo producen; que no hay una relación realmente de dosis, es muy posible que haya un factor inmunológico; que cierta longitud de las fibras estén produciéndolo, pero hay otras sustancias que lo producen. Con estas aclaraciones, quisiera preguntar al Dr. Markowitz ¿en qué se basan sus afirmaciones? Esta pregunta se le planteó al Dr. Selikoff en la Academia de Ciencias de Nueva York cuando afirmaba exactamente lo mismo y se refería a unas casas prefabricadas en Puerto Rico y de las cuales se habían vendido por lo menos 80 de 100. Se le preguntó si había datos estadísticos que demostraran que había un aumento en el nivel de exposición a fibras provenientes de las paredes de asbesto-cemento en casas prefabricadas y la respuesta que él dio muy honestamente decía que tanto un grupo de médicos de Puerto Rico, como un grupo de médicos del Monte Sinai estudiaron y llegaron a la conclusión de que no había un aumento de incidencia. Puede que los datos ahora hayan cambiado, le preguntó ¿es que han cambiado o sigue todavía la misma respuesta? Se dice que hay casas prefabricadas de asbesto-cemento, que hay que tirarlas, que son un peligro, pero ¿hay algún dato, una cifra que diga ciertamente, hay mayor cantidad de fibra de asbesto en el ambiente y hay que tirarlas porque son un peligro por eso, o simplemente por tener asbesto?

Markowitz (U. S. A.)

In order to answer the first part of your question I would welcome seeing any epidemiological studies that have been done in your country or other Latin American countries. I will refer the second part of your question about the houses in Puerto Rico, to Dr. Nicholson, who was active at that time in Puerto Rico, and knows more about indoor and outdoor measurements, I think he can address this question in a better fashion.

Nicholson (U.S.A.)

I will be discussing briefly the houses in Puerto Rico in my presentation. The houses were constructed completely of asbestos, as were some schools. We did find increased concentrations of asbestos in the schools and I will go into that. It came from the erosion of rain wash-off from the roof onto the walkway and from rain onto the walkway itself. This might have been solved with relatively simple painting that could have prevented that erosion. The choice I think was made to remove the schools. The problem, an identified one, required a solution and I am not at all agreeing with the solution that was taken.