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THE SURVEILLANCE OF HIGH-RISK GROUPS EXPOSED TO ASBESTOS IN THE UNITED STATES

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PANEL:
Problems in the Care of the Injured Workman - II
Surveillance of High-Risk Groups

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I should like to define two of the items which appear in the title of this presentation, namely asbestos and risk. I would then like to discuss the need to keep persons exposed to asbestos under surveillance and conclude by attempting to outline the surveillance techniques available in the United States and their effectiveness.

There are two main types of asbestos in commercial use. Chrysotile asbestos, usually white in color, is the fibrous form of serpentine. The amphiboles are the fibrous varieties found in sedimentary banded ironstone containing ferruginous slate, quartzites and jaspers. The two most commonly used varieties of amphiboles are amosite and crocidolite (blue in color). The other amphiboles which are used less often and in smaller quantities are anthophyllite, tremolite and actinolite.

Amphibole and serpentine minerals are widely distributed in the earth's crust. Only a very small quantity of the amphibole and serpentine minerals occur as the asbestiform variety. Asbestos is therefore, by definition, a collective mineralogical term encompassing the asbestiform varieties of various minerals but the term is commonly used to describe an industrial product obtained by mining and processing primarily asbestiform minerals.[1]

Because of the wide distribution of amphiboles and serpentine in the earth's crust, it is not surprising to find asbestiform minerals in the general atmosphere. It is thus reasonable to assume that man has always been exposed to small amounts of asbestiform minerals and that they pose no immediate threat to health.

Asbestos exposure may occur as a result of an occupation and will be referred to subsequently as direct exposure, or it may occur at work through proximity to an occupation directly involved with asbestos. This exposure, in the vicinity of an asbestos worker, will subsequently be referred to as

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indirect exposure. A third type of exposure has been described due to domestic contact with asbestos workers and finally, many years ago when dust emission controls to the environment were virtually non-existent, exposure in the neighborhood of asbestos plants could occur.

Although it is not my purpose to define risk in this discussion on surveillance, it is essential for me to at least attempt to define my concept of what is meant by the term high-risk group. The word risk has different meanings to different people. To some it means a dangerous element or factor while to insurance companies it is synonymous with the chance of loss, the degree of probability of such loss, a person or thing that is a specified hazard to an insurer or a hazard from a specified cause or source such as war. To risk something may mean to expose to hazard or danger and something risky means that it is attended with risk or danger. All the foregoing definitions are according to Webster's New Collegiate Dictionary.[2] Pochin reminds us that risks are among the facts of life and we all accept daily risks.[3] He further points out that some risks are obvious, some are unsuspected and some we conceal from ourselves. It is, therefore, true to state that risk acceptance depends upon knowledge of risk and a reasoned judgment of its consequences, whether the judgment be individual in the case of an individual or societal in the case of an entire community. The decision whether to take a risk depends on making comparisons which allow an assessment of the degree of risk. If the danger appears slight the risk is thought to be low and if it is great, the risk is considered to be high. In order to assess risk, an agreed scale has to be developed for its measurement.

The subject of this Panel discussion is surveillance of high risk groups, and I have presumed that we will concern ourselves with asbestos exposed groups. Apart from the fact that the different varieties of asbestos may affect the

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ame of risk, measurement of risk is also dependent upon other variables such as life of industry, type of occupation age, latency, smoking habits, individual susceptibility, knowledge of actual exposure in terms of measured ncentrations of dust and finally, regulations and controls imposed at different periods of time in the light of social and economic trends.

At the present time, we have insufficient knowledge about the role of age, individual susceptibility and exposure levels in the aetiology of asbestos-related diseases although we do know that asbestosis is dose-related, that age of entry does not appear to be a factor and that in some countries where regulations have been in effect for many years and where they have been effectively enforced, this disease appears to be declining in incidence at last. However, irrespective of the section of industry in which exposure led to the development of asbestosis, persons with this lesion are probably more likely to develop lung cancer as a complication than similarly exposed individuals without clinical evidence of asbestosis. This is not a universally accepted point of view, and me authors do not draw any distinction between asbestosis cases and other exposed workers when attributing lung cancer to asbestos exposure. There are no adequately documented studies which resolve this point and, therefore, it is my opinion that the convention which attributes lung cancer in the presence of asbestosis to an occupational cause and lung cancer in the absence of asbestosis to "natural causes" is reasonable to obey until such time as published reports routinely examine the relationship between asbestosis and the occurrence of other asbestos-related diseases. By adopting this convention the task of selecting at least one of the high risk groups from among asbestos exposed populations is simplified. This raises the issue of the reasons for and objectives of surveillance of asbestos workers.

There are many ways of sub-dividing "the asbestos industry" and

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therefore, for simplicity sake, I have used the following broad categories:

1. Mining and milling
2. Manufacturing
3. Insulation
4. Construction

There is no clear-cut distinction between certain user industries and the insulation and construction industries. In shipyards insulation workers abound and many other workers can be exposed to the dust created. Buildings are continuously being constructed, repaired, altered, extended and even totally demolished thus exposing many people to asbestos and other dusts.

To determine which persons constitute a high-risk group in an industry, or rather industries, with such a diversity of conditions as can be encountered when asbestos is used, requires knowledge of the processes used, the dust controls used and the actual levels of exposure. Most industrial population can be empirically subdivided into office staff who never enter a plant, plant management and supervision, production employees, maintenance and engineering personnel and research and development staff.

As far as I am aware, no large-scale epidemiological study has been undertaken in any section of industry, designed to quantify the degree of risk attached to exposure in the varying levels encountered by these different and differently exposed groups of workers. The populations studied have usually been workers in the areas where exposure to the highest dust levels occur. Little is known about the effects on the health of persons exposed to dust levels below those routinely monitored in industry and no determinations are yet possible for those groups only recently exposed to the levels laid down by regulations developed since the British Occupational Hygiene Society first recommended its standard for chrysotile asbestos in 1968.[4]

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Based upon current knowledge, limited by the inadequacy of information available regarding exposure levels, fiber types used, baseline medical data and criteria for diagnosis of disease, and lack of verification of causes of death when this information is available from death certificates, certain groups of workers appear to be more at risk than others.

In 1965, McVittie indicated that in the United Kingdom 41.0% of new cases of asbestosis diagnosed by four Pneumoconiosis Medical Panels in the years 1955 through 1963, arose in the insulation industry.[5] The next largest group of cases, 21%, occurred in textile workers. At the same time, Selikoff et al in the U.S.A. confirmed that among the asbestos insulation workers examined by them, pulmonary asbestosis was present in almost 50%.[6] The incidence of cases in the asbestos cement industry in McVittie's series was 8% and in the manufacture of brake linings it was 2%. A group which McVittie classes as miscellaneous and which included maintenance workers, accounted for 11% of new cases in the period studied.

Tables 1-6 are based upon a review of some of the published studies in the period 1965-1978 relating to mortality from cancer and from asbestosis in three sections of the asbestos industry and Table 7 represents an attempt to summarize the data. The trend in table 7 may indicate that the worst health experience is in the insulation industry. These tables are presented with the object of illustrating the point that the definition of high-risk must take into account the way in which the risk is incurred, i.e., the industry and the job, as well as the substance responsible for the hazard.[7-18]

Many surveillance programs have been devised for occupational groups, but few have been able to achieve the ultimate need for combining surveillance of workers, surveillance of the work environment and surveillance of the raw materials and final products. Surveillance programs must be the responsibility

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many people including medical men, industrial hygienists, government inspectors, personnel managers and workers representatives. In the United States of America the current Occupational Safety and Health Administration standard for asbestos (June 7, 1972), requires the employer to provide or make available at his cost preplacement, annual, and termination medical examinations.[19] These medical examinations must include as a minimum a chest roentgenogram (posterior-anterior 14" x 17"), a respiratory symptoms history and lung function tests which include forced vital capacity (FVC) and forced expiratory volume at one second ($FEV_{1.0}$). This requirement must be fulfilled for any person in "an occupation exposed to airborne concentrations of asbestos fibers." In view of this requirement, no room is left for judgment in deciding which persons are at risk and need to be kept under surveillance and the role of the occupational health physician is merely to do as he is told!

As part of the OSHA requirements, medical records have to be maintained by employers for at least 20 years and the contents are available to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National Institute for Occupational Safety and Health (NIOSH), to authorized physicians and medical consultants of either of them, and, upon the request of any employee or former employee, to his physician. The employer is also entitled to receive from "any physician who conducts a medical examination" as stipulated, "all the information specifically required ... and any other medical information related to occupational exposure to asbestos fibers." Employees who are found by an examining physician to be unable "to function normally wearing a respirator" or who will impair the safety or health of themselves or other employees by "use of a respirator" may not be assigned to tasks requiring the use of respirators.

Certain additional requirements were proposed in 1975 but the proposed

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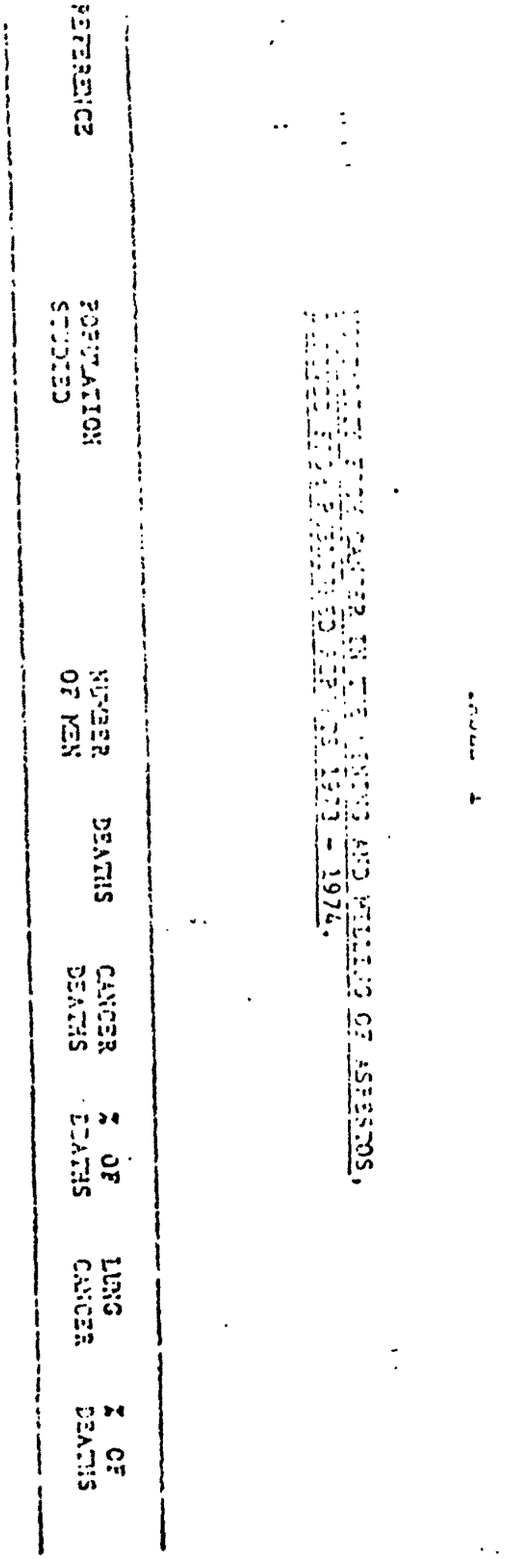
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new standard has not yet even been considered under the required rulemaking procedures and, therefore, cannot go into effect.[20] One of these requirements is that for employees with "10 or more years of exposure to airborne concentrations of asbestos fibers or who are 45 years of age or older, a sputum cytology examination shall be made available." Other changes deal with recording when employees refuse to be examined, the provision to the employer by the examining physician of his "opinion as to whether the examined employee has any medical conditions which would place the employee at increased risk of material impairment of his or her health from exposure to asbestos fibers, or which would, directly or indirectly, be aggravated by such exposure, ..." and "any recommended limitations upon the employee's exposure to asbestos fibers, or upon the use of protective clothing and equipment, such as a respirator, ..." The physician has to issue to the employee a statement informing him of "any medical conditions which require further examination or treatment." It is proposed that records be maintained for at least 40 years or for the duration of employment plus 20 years, whichever period is longer.

The defficiencies in this approach are numerous, but their remedies are unfortunately not always available and will have to emerge through trial and error. No criteria have been laid down for the qualifications required by examining physicians to enable them to comply with the law and reasonably interpret their findings in the light of it. No central record-keeping system has been devised to enable the storage and retrieval of linked records relating to exposure, fiber type, occupation, industry, medical data, production data and many other variables such as smoking habits. No provision has been made for transfer of affected persons to other jobs and the term "an occupation exposed to airborne concentrations of asbestos fibers" has not been defined in terms of liability of such concentrations to be hazardous to health.

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p persons exposed to asbestos under surveillance
sk. Knowledge of fiber type and the section of the
ccount in assessing risk, as these appear to be
ice does not simply mean medical examination and
t inspection of the workplace and work-practices,
posure levels, a vigorous approach to counselling
and retraining of selected persons, medical and
hazards and disease with a view to proposing



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MORTALITY FROM CANCER IN THE MANUFACTURING OF ASBESTOS PRODUCTS, REVIEWED FROM PUBLISHED REPORTS 1967 - 1977.

REFERENCE	POPULATION STUDIED	NUMBER OF MEN	DEATHS	CANCER DEATHS	% OF DEATHS	LUNG CANCER	% OF DEATHS
MANCUSO 1967	ASBESTOS FACTORY WORKERS, U.S.	1,265	330	84	25.5%	35	10.6%
NEWHOUSE 1969	TEXTILE & INSULATION MFG., ENGLAND	2,657	121	34	28.1%	12	9.9%
SELIKOFF 1973	AMOSITE INSULATION MFG., U.S.	933	484	143	29.6%	73	15.0%
ENTERLINE 1973	RETIRED ASBESTOS WORKERS, U.S.	1,348	754	167	22.2%	58	7.7%
PETO 1977	ASBESTOS TEXTILE WORKERS, ENGLAND	1,106	317	91	28.7%	61	19.2%
WEISS 1977	ASBESTOS PAPER & MILLBOARD MFG., U.S.	264	66	13	19.7%	4	6.1%
TOTALS		7,573	2,072	532		243	
% DEATHS IN TOTAL POPULATION		100%	27.4%	7.0%		3.2%	
% ALL DEATHS DUE TO CANCER			100%	25.7%		11.7%	
% CANCER DEATHS DUE TO LUNG CANCER				100%		45.7%	

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MORTALITY FROM CANCER IN [illegible] OF ASBESTOS INSULATION, [illegible] 1976.

REFERENCE	POPULATION STUDIED	NUMBER OF MEN	DEATHS	CANCER DEATHS	% OF DEATHS	LUNG CANCER	% OF DEATHS
SELIKOFF 1976	INSULATION WORKERS, NEW YORK	370	198	105	53.0%	47	23.7%
ELMES 1977	INSULATION WORKERS, BELFAST	162	122	66	54.1%	35	28.7%
SELIKOFF 1978	INSULATION WORKERS, U.S. & CANADA	17,800	2,270	994	43.8%	485	21.4%
TOTALS		18,332	2,590	1,165		567	
% DEATHS IN TOTAL POPULATION		100%	14.1%	6.4%		3.1%	
% ALL DEATHS DUE TO CANCER			100%	45.0%		21.9%	
% CANCER DEATHS DUE TO LUNG CANCER				100%		48.7%	

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TABLE 4

MORTALITY FROM ASBESTOSIS IN ASBESTOS MINING AND MILLING OF ASBESTOS, AS FOUND IN 4 PUBLISHED PAPERS 1973 - 1974.

REFERENCE	POPULATION STUDIED	NUMBER OF MEN	DEATHS	ASBESTOSIS DEATHS	% OF DEATHS
AHLMAN 1973	ANTHOPHYLLITE MINERS, FINLAND	1,249	222	24	10.8%
MCDONALD 1973	CHRYSOTILE MINERS & MILLERS, QUEBEC	10,120	3,270	34	1.0%
NEUMAN 1974	ANTHOPHYLLITE MINERS, FINLAND	1,092	248	13	5.2%
TOTALS		12,461	3,740	71	
% DEATHS IN TOTAL POPULATION		100%	30.0%	0.6%	
% ALL DEATHS DUE TO ASBESTOSIS			100%	1.9%	

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MORTALITY FROM ASBESTOSIS IN THE MANUFACTURE OF ASBESTOS PRODUCTS, SELECTED PEER REVIEWED STUDIES 1967 - 1977.

REFERENCE	POPULATION STUDIED	NUMBER OF MEN	DEATHS	ASBESTOSIS DEATHS	% OF DEATHS
MANCUSO 1967	ASBESTOS FACTORY WORKERS, U.S.	1,265	330	31	9.4%
ENTERLINE 1973	RETIRED ASBESTOS WORKERS, U.S.	1,348	754	29	3.4%
SELIKOFF 1973	AMOSITE INSUALTION MFG., U.S.	933	484	27	5.6%
WEISS 1977	ASBESTOS PAPER & MILLBOARD MFG., U.S.	264	66	2	3.0%
TOTALS		3,810	1,634	89	
% DEATHS IN TOTAL POPULATION		100%	42.9%	2.3%	
% ALL DEATHS DUE TO ASBESTOSIS			100%	5.5%	

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TABLE 6

MORTALITY FROM ASBESTOSIS IN THE INSTALLING OF ASBESTOS INSULATION, DERIVED FROM PUBLISHED REPORTS 1976 - 1978.

REFERENCE	POPULATION STUDIED	NUMBER OF MEN	DEATHS	ASBESTOSIS DEATHS	% OF DEATHS
SELIKOFF 1976	INSULATION WORKERS, NEW YORK	370	198	25	12.6%
ELMES 1977	INSULATION WORKERS, BELFAST	162	122	16	13.1%
SELIKOFF 1978	INSULATION WORKERS, U.S. & CANADA	17,800	2,270	162	7.1%
TOTALS		18,332	2,590	203	
% DEATHS IN TOTAL POPULATION		100%	14.1%	1.1%	
% ALL DEATHS DUE TO ASBESTOSIS			100%	7.8%	

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TABLE 7

MORTALITY IN SAP DUS SECTIONS OF THE ASBESTOS INDUSTRY, DERIVED FROM COMBINED RECORDS 1967 - 1978.

SECTION OF THE ASBESTOS INDUSTRY	% OF DEATHS FROM CANCER	% OF DEATHS FROM LUNG CANCER	% OF DEATHS FROM ASBESTOSIS
MINING & MILLING	16.9%	4.5%	1.9%
MANUFACTURING	25.7%	11.7%	5.5%
INSULATING	45.0%	21.9%	7.6%

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TABLES

TABLE 1 MORTALITY FROM CANCER IN THE MINING AND MILLING OF ASBESTOS, DERIVED FROM PUBLISHED REPORTS 1973-1974. (See references #7 and #8 Vigliani quoted by McDonald)

TABLE 2 MORTALITY FROM CANCER IN THE MANUFACTURE OF ASBESTOS PRODUCTS, DERIVED FROM PUBLISHED REPORTS 1967-1977. (See references #9-14)

TABLE 3 MORTALITY FROM CANCER IN THE INSTALLING OF ASBESTOS INSULATION, DERIVED FROM PUBLISHED REPORTS 1976-1978. (See references #15, #16 and #17)

TABLE 4 MORTALITY FROM ASBESTOSIS IN THE MINING AND MILLING OF ASBESTOS, DERIVED FROM PUBLISHED REPORTS 1973-1974. (See references #7, #8 and #18)

TABLE 5 MORTALITY FROM ASBESTOSIS IN THE MANUFACTURE OF ASBESTOS PRODUCTS, DERIVED FROM PUBLISHED REPORTS 1967-1977. (See references #9, #11, #12 and #14)

TABLE 6 MORTALITY FROM ASBESTOSIS IN THE INSTALLING OF ASBESTOS INSULATION, DERIVED FROM PUBLISHED REPORTS 1976-1978. (See references #15, #16 and #17)

TABLE 7 MORTALITY IN VARIOUS SECTIONS OF THE ASBESTOS INDUSTRY, DERIVED FROM PUBLISHED REPORTS 1967-1978. (See references #7-18)

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