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UNION CARBIDE CORPORATION OLD RIDGEBURY ROAD, DANBURY, CT 06817
Corporate Health, Safety and Environmental Affairs Department

May 23, 1984

Mr. Thomas P. Hall
OSHA Division of Consumer Affairs
Docket No. H-033-C, Room N-3662
United States Department of Labor
Third Street and Constitution Avenue, N.W.
Washington, D.C. 20210

Dear Mr. Hall:

Re: Informal Rulemaking Hearing on the Proposed Rule on Occupational Exposure to Asbestos, 29CFR, Parts 1910, Federal Register (1984) 49: 14116-14145

Please find enclosed herewith a brief outline of the verbal comments I propose to make at the informal rulemaking hearing which commences on June 19, 1984.

I also attach three published articles which I have authored or co-authored on the subject of medical surveillance of asbestos exposed persons. My curriculum vitae is also attached.

These items are in response to the request for submission of testimony and documentary evidence.

Yours faithfully,

Hilton C. Lewinsohn, MB. BCh.

Hilton C. Lewinsohn, MB. BCh., FCCP, MFOM, DHI
Assistant Corporate Medical Director

HCL:cms
enclosures

PLAINTIFF'S EXHIBIT UC-679C

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MEDICAL EXAMINATIONS REQUIRED FOR ASBESTOS WORKERS.

HILTON C. LEWINSOHN, MB BCh., MFOM., DIH., FOCP.
ASSISTANT CORPORATE MEDICAL DIRECTOR,
UNION CARBIDE CORPORATION,
DANBURY, CONNECTICUT.

THE PRE-PLACEMENT EXAMINATION.

* DETERMINE THE SUITABILITY OF AN INDIVIDUAL FOR THE JOB AND THE JOB FOR THE INDIVIDUAL
* ESTABLISH A MEDICAL DATA BASE FOR LONG TERM FOLLOW-UP
* PROVIDES AN IDEAL OPPORTUNITY FOR THE INDIVIDUAL TO BE TOLD OF THE HAZARDS OF EXPOSURE TO ASBESTOS AND TO BE REASSURED ABOUT MODERN CONDITIONS AND ENGINEERING CONTROLS APPLIED

THE PERIODIC EXAMINATION.

* REEVALUATE THE JOB AND THE INDIVIDUAL'S SUITABILITY TO CONTINUE IN THE SAME JOB
* COMPARE MEDICAL FINDINGS WITH PREVIOUS RECORDS
* MEDICAL DATA, INTENDED PRIMARILY FOR PREVENTIVE HEALTH PROGRAM CAN BE USED AT LITTLE EXTRA COST FOR EPIDEMIOLOGY STUDIES.

TERMINATION AND RETIREMENT.

* ONCE AN ASBESTOS WORKER, ALWAYS AN "ASBESTOS WORKER" !
* MEDICAL SURVEILLANCE SHOULD CONTINUE FOR LIFE.....
* RETIREES CAN BE CONTACTED BY QUESTIONNAIRE AND REMINDED PERIODICALLY TO HAVE A CHEST RADIOGRAPH TAKEN
* NON-RETIREES SHOULD BE GIVEN A CAREFULLY WORDED NOTICE AT THE TIME OF TERMINATION AS A REMINDER TO CONTINUE WITH PERIODIC MEDICAL CHECK-UPS AND X-RAYS. THEY SHOULD BE TOLD TO GIVE A COPY OF THE NOTICE TO THE FAMILY PHYSICIAN WITH THE INFORMATION THAT THE INDIVIDUAL HAD PREVIOUSLY BEEN KEPT UNDER SURVEILLANCE AND THAT MEDICAL RECORDS WERE BEING RETAINED IN ACCORDANCE WITH OSHA REGULATIONS.

THREE MAJOR DISEASES ASSOCIATED WITH ASBESTOS EXPOSURE:

A S B E S T O S I S

L U N G C A N C E R

M A L I G N A N T M E S O T H E L I O M A

- PLEURA

- PERITONEUM

LESS CLEAR-CUT CONDITIONS ASSOCIATED WITH ASBESTOS:

G I SYSTEM CANCERS

LARYNGEAL CARCINOMA

RENAL CARCINOMA

NON-HODGKINS GASTROINTESTINAL LYMPHOMA

OSHA STANDARD FOR OCCUPATIONAL EXPOSURE TO ASBESTOS....JUNE, 1972.

MEDICAL EXAMINATIONS REQUIRED FOR:

* PREPLACEMENT PURPOSES

* ANNUAL PERIODIC EXAMINATION

* TERMINATION OF EMPLOYMENT

MEDICAL RECORDS TO BE MAINTAINED AND RETAINED BY THE EMPLOYER IN ACCORDANCE WITH THE APPROPRIATE OSHA STANDARD.

MINIMUM OSHA REQUIREMENTS FOR MEDICAL EXAMINATIONS OF PERSONS EXPOSED TO ASBESTOS.

* POSTERIOR-ANTERIOR CHEST RADIOGRAPH, 14" X 17"

* HISTORY TO ELICIT SYMPTOMS OF RESPIRATORY ILLNESS

* PULMONARY FUNCTION TESTS : - FEV (1 second).
FVC

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DEFICIENCIES IN OSHA REQUIREMENTS FOR MEDICAL EXAMINATIONS OF PERSONS EXPOSED TO ASBESTOS.

* MEDICAL EXAMINATIONS: NO SPECIAL QUALIFICATIONS STIPULATED FOR EXAMINING PHYSICIAN; NO CHECK ON COMPETENCE.

* CHEST RADIOGRAPHY: RADIOGRAPHIC TECHNIQUE NOT SPECIFIED

TECHNIQUES FOR READING, INTERPRETING AND RECORDING RESULTS NOT SPECIFIED.

* RESPIRATORY SYMPTOMS: FORMAT NOT STIPULATED

* PULMONARY FUNCTION TESTS: PROCEDURES NOT STIPULATED

TRAINING REQUIREMENTS FOR TECHNICIANS NOT STIPULATED

CALIBRATION AND STANDARDIZATION OF INSTRUMENTS NOT STIPULATED.

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THE ROLE OF THE PHYSICIAN IS TO INSURE THAT THE INDUSTRY EMPLOYS PEOPLE WHO ARE SUITED TO THE TASKS REQUIRED OF THEM AND THAT THEY DO NOT SUFFER INJURY OR ILLNESS AS A RESULT OF THE WORK THEY ARE CALLED UPON TO DO.

PHYSICIANS MUST BE ACTIVELY INVOLVED WITH WORKERS AND MANAGEMENT,

MUST BE COMPLETELY FAMILIAR WITH THE PROPERTIES OF ASBESTOS IN USE,

MUST UNDERSTAND THE MANUFACTURING PROCESS IN THE PLANT

MUST HAVE A CLEAR CONCEPT OF THE PLANT DESIGN AND LAYOUT,

MUST HAVE A THOROUGH WORKING KNOWLEDGE OF THE ETIOLOGY, PATHOGENESIS, EPIDEMIOLOGY AND THERAPY OF WORK-RELATED DISEASES, AND

MUST ACQUIRE A WORKING KNOWLEDGE AND APPRECIATION OF THE THEORY AND PRACTICE OF INDUSTRIAL HYGIENE, INCLUDING UNDERSTANDING OF SAMPLING AND MONITORING PROCEDURES.

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MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS:

PRE EMPLOYMENT OR PRE-ASSIGNMENT

- MEDICAL HISTORY - RESPIRATORY SYMPTOMS QUESTIONNAIRE
- PHYSICAL EXAMINATION
- CHEST X-RAY (PA VIEW 14" x 17")
- PULMONARY FUNCTION TESTS (FEV_1, FVC, $FEV_1/FVC\%$)
- SPUTUM CYTOLOGY IF INDICATED AND FEASIBLE

THE PHYSICIAN SHOULD TAKE THE OPPORTUNITY WHICH THE PRE-PLACEMENT EVALUATION AFFORDS TO COUNSEL AND ADVISE THE JOB APPLICANT REGARDING THE KNOWN FACTS ABOUT ASBESTOS-RELATED DISEASES.

IT IS ESSENTIAL TO EMPHASIZE THE SPECIAL RISKS THE PERSON WILL RUN IF HE OR SHE SMOKES CIGARETTES AND EVERY EFFORT SHOULD BE MADE TO DISCOURAGE THE HABIT.

PRE-PLACEMENT EVALUATION:

CONTRA-INDICATIONS TO EMPLOYMENT IN ASBESTOS AREAS:

1. HISTORY OF PREVIOUS DUST EXPOSURE, EG. COAL MINES
2. EXISTING PULMONARY DISABILITY DUE TO PNEUMOCONIOSIS OR FROM ANY OTHER CAUSE
3. PRESENCE OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE, WITH OR WITHOUT EMPHYSEMA
4. ASTHMA
5. ORGANIC HEART DISEASE

OTHER CONTRA-INDICATIONS SUGGESTED ARE:

1. NASAL OBSTRUCTION OR DEFORMITY OF SUCH SEVERITY AS TO MAKE THE WEARING OF A RESPIRATOR IMPOSSIBLE,
2. GROSS PHYSICAL DEFORMITY OF THE CHEST WHICH IMPAIRS LUNG FUNCTION,
3. CHRONIC BRONCHITIS, BRONCHIECTASIS OR EMPHYSEMA,
4. GROSS HYPERTENSION WITH CARDIAC IMPAIRMENT,
5. RHEUMATOID ARTHRITIS.

PERIODIC MEDICAL EVALUATION

OBJECTIVE: KEEP EXPOSED WORKERS UNDER OBSERVATION TO DETERMINE

- CHANGES IN PHYSICAL STATUS
- " " PHYSIOLOGICAL STATUS
- " IN CHEST X-RAYS

THE WORKPLACE SHOULD BE RE-EVALUATED WITH THE SAME CARE AND FREQUENCY BY THE PHYSICIAN TO ENABLE A DECISION TO BE MADE WITH REGARD TO THE EMPLOYEE'S SUITABILITY TO CONTINUE DOING THE SAME JOB.

MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS:

PERIODIC EVALUATION : < 35 YEARS OF AGE OR < 5 YEARS EXPOSURE

- MEDICAL HISTORY - RESPIRATORY SYMPTOMS QUESTIONNAIRE: ANNUALLY
- CHEST X-RAY - (PA VIEW 14" x 17")
- PHYSICAL EXAMINATION
- PULMONARY FUNCTION TESTS (FEV_1, FVC, $FEV_1/FVC\%$)

} EVERY 5 YEARS

- SPUTUM CYTOLOGY - NOT INDICATED

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MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS:

PERIODIC EVALUATION : AGES 35-45 YEARS OR 5-10 YEARS EXPOSURE

- MEDICAL HISTORY - RESPIRATORY SYMPTOMS QUESTIONNAIRE: ANNUALLY
- PHYSICAL EXAMINATION
- CHEST X-RAY - (PA VIEW 14" x 17") } EVERY 2 YEARS
- PULMONARY FUNCTION TESTS (FEV_1, FVC, $FEV_1/FVC\%$) }
- SPUTUM CYTOLOGY - IF INDICATED BY SMOKING HISTORY OR OVER AGE 40 YEARS

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MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS:

PERIODIC EVALUATION : >45 YEARS OF AGE OR >10 YEARS EXPOSURE

- MEDICAL HISTORY - RESPIRATORY SYMPTOMS QUESTIONNAIRE: ANNUALLY
- PHYSICAL EXAMINATION: ANNUALLY
- CHEST X-RAY - (PA VIEW 14" x 17"): ANNUALLY
- PULMONARY FUNCTION TESTS (FEV_1, FVC, $FEV_1/FVC\%$): ANNUALLY
- SPUTUM CYTOLOGY - IF FEASIBLE ANNUALLY

3843B

BASIS FOR REMOVAL FROM EXPOSURE:

DEFINITE RADIOGRAPHIC EVIDENCE OF DIFFUSE PULMONARY FIBROSIS;

WHEN ONLY PLEURAL STIGMATA ARE PRESENT ON A CHEST X-RAY, JOB TRANSFER NOT INDICATED BUT CONTINUED MEDICAL SURVEILLANCE IS.

[redacted]

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PLEURAL PLAQUES.

PLEURAL CHANGES RELATED TO LENGTH OF EXPOSURE IRRESPECTIVE OF DOSE.

PROBABLY AN IMPORTANT RADIOLOGIC SIGN FOUND IN LOW GRADE EXPOSURE GROUPS WHERE PARENCHYMAL EFFECTS ARE LESS LIKELY TO BE SEEN.

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INDICATIONS FOR COMPUTED TOMOGRAPHY OF THE THORAX.

EARLY PLEURAL PLAQUES CAN BE MORE RELIABLY DIAGNOSED:

PLEURAL PLAQUES AND THICKENING CAN BE DISTINGUISHED FROM " COMPANION " SHADOWS ADJACENT TO RIBS ;

FINE INTERSTITIAL PARENCHYMAL DISEASE CAN BE DETECTED WHEN NOT VISIBLE ON CHEST RADIOGRAPHS;

USEFUL IN THE DIAGNOSIS OF MESOTHELIOMA.

(The finding of pleural effusion,
rib destruction,
pleural plaques or calcifications,
intrapulmonary nodules and thickening of pleura, pleural fissures and paramediastinal structures, especially at the bases and posteriorly,
should suggest the presence of mesothelioma).

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ASBESTOSIS; DIAGNOSTIC CRITERIA.

1. HISTORY OF "ADEQUATE" EXPOSURE,
2. ELICITING FINE END-INSPIRATORY CRACKLES AT THE LUNG BASES ON AUSCULTATION,
3. FINGER CLUBBING (MAY BE ABSENT),
4. PROGRESSIVE CHEST X-RAY CHANGES OF PULMONARY FIBROSIS,
5. RESTRICTIVE PULMONARY FUNCTION PATTERN AND IMPAIRMENT OF GAS EXCHANGE. (AIRWAYS OBSTRUCTION IS NOT USUALLY A FEATURE OF ASBESTOSIS, BUT HAS BEEN REPORTED IN SOME STUDIES.)

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MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS:

PERIODIC EVALUATION : TERMINATION

MEDICAL HISTORY

PHYSICAL EXAMINATION

CHEST X-RAY

PULMONARY FUNCTION TEST

SPUTUM CYTOLOGY

3843B

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MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS:

PERIODIC EVALUATION : RETIREES

- BY MAIL ONLY
- REMINDER: HAVE REGULAR MEDICAL CHECKS
- HEALTH STATUS QUESTIONNAIRE - COMPLETE AND RETURN
- RELY UPON PERSONAL PHYSICIAN

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MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS:

PERIODIC EVALUATION : POST-EMPLOYMENT - OTHER THAN RETIREES

- ADVISORY LETTER AT TERMINATION: "CONTINUE MEDICAL CHECKS"
- CONSULT PERSONAL PHYSICIAN TO ARRANGE PERIODIC FOLLOW-UP

[redacted]

MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS: PERIODICITY

TYPE OF PROCEDURE	PRE-EMPLOYMENT OR PRE-ASSIGNMENT	PERIODIC						TERMINATION	POST-EMPLOYMENT	
		AGE			EXPOSURE				RETIREES	OTHERS
Medical History (Respiratory Symptoms Questionnaire	Obligatory	35 ANNUAL	35-45 ANNUAL	45 ANNUAL	5 ANNUAL	5-10 ANNUAL	10 ANNUAL	Obligatory as in Preplacement Examination	BY MAIL ONLY Annual 1) Reminder to continue with medical checks. 2) Questionnaire	Advisory Letter at Termination - Continue Medical Checks
Physical Examination	Obligatory To include examination of Respiratory System and Digestive System	Every 5 Years	Every 2 Years	ANNUAL	Every 5 Years	Every 2 Years	ANNUAL	Obligatory as in Preplacement Examination	Voluntary By Own Physician	•
Chest Radiology (PA view 14" x 17")	Obligatory (Not required if recent film available, i.e., within preceding 12 months)	Every 5 Years	Every 2 Years	ANNUAL	Every 5 Years	Every 2 Years	ANNUAL	Obligatory as in Preplacement Examination	Voluntary By Own Physician	•
Pulmonary Function (FEV_1, FVC, FEV_1/FVC %)	Obligatory	Every 5 Years	Every 2 Years	ANNUAL	Every 5 Years	Every 2 Years	ANNUAL	Obligatory as in Preplacement Examination	Voluntary By Own Physician	•
Other				AN			AN			•

Union Carbide trial exhibit Union Carbide 679C: Hilton C. Lewinsohn to Thomas P. Hall (OSHA) Submitting Outline...
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Int Arch Occup Environ Health (1982) 49: 397–412

International Archives of
and
Springer-Verlag 1982

Criteria for the Diagnosis of Asbestosis and Considerations in the Attribution of Lung Cancer and Mesothelioma to Asbestos Exposure

Prepared by the Medical Advisory Panel to the Asbestos International Association*

Section I – Asbestosis

Definition

Asbestosis is a diffuse fibrosis of the parenchyma of the lung caused by exposure to respirable airborne asbestos fibres. The fibrosis is irreversible and in some persons progresses even after exposure has ceased.

Criteria for Diagnosis

1.1. History. There should be evidence of substantial occupational exposure (or substantial para-occupational exposure) to asbestos fibres.

1.2. Clinical Signs and Symptoms. Persistent basal inspiratory crepitations characteristic of interstitial pulmonary fibrosis may be heard but are not invariably present. Breathlessness and finger clubbing occur but are not specific signs in themselves.

1.2.1. Crepitations (Crackles). These are fine basal inspiratory crepitations, usually bilateral which occur late in inspiration and persist after coughing or hyperpnoea. They are characteristically heard with each inspiration and on each occasion present very much the same pattern of sound. They are not essential to the diagnosis any more than they are pathognomonic of the disease. However, when not accounted for by another cause and when heard on at least two occasions a few months apart, given a history of exposure and radiological evidence of dust disease, they do provide valuable confirmation of the diagnosis. In the presence of

* S. T. McCullagh, Chairman (Australia); G. Aresini (Italy); K. Browne (UK); B. Kiersgaard (Denmark); J. Lepoutre (Belgium); M. Lesage (Canada); H. C. Lewinsohn (USA); J. Manson (Lebanon); M. C. Mills (UK); W. R. Paul (USA); C. Raffaelli (France); W. J. Smither (UK); R. B. K. Tucker (South Africa); R. Murray, Convenor (UK); C. Lois (France)

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equivocal radiological changes. Basal crepitations as here defined are a strong indication for the diagnosis of asbestosis.

1.2.2 Dyspnoea/Breathlessness. This occurring initially on exertion is a symptom of asbestosis. There are, of course, many other causes of breathlessness and these must be excluded. In those under routine medical surveillance a provisional diagnosis would probably have been made before disabling dyspnoea occurs.

1.2.3 Clubbing. This is a sign seen in many lung and other diseases including asbestosis where it may be of late occurrence. It develops slowly but the rapid development of finger clubbing, particularly if painful, in a person with asbestosis suggests lung cancer.

1.2.4 Dry Cough and Ill-defined Chest Pain or Discomfort. These can occur in asbestosis, but are transient and then only late in the progression of the disease. They are not specific and [illegible] diagnostic significance.

1.3 Radiography. The term Radiographic Asbestosis is predominantly basal diffuse interstitial fibrosis is the characteristic change seen.

1.3.1 So that films are comparative they must be of good technical quality and of full size (approximately 350mm × 430mm) and to include both costophrenic angles. Ideally inspiration should be such as to have brought the diaphragm below the fifth rib anteriorly and the tenth rib posteriorly.

1.3.2 The recording of pulmonary changes on the radiograph follows the system used in the ILO Classification. This system describes irregular or linear opacities as follows:

(i) Small (s) — width up to about 1.5mm.

(ii) Medium (m) — width over 1.5mm and under 3mm.

(iii) Large (l) — width over 3mm and up to 10mm.

The changes may be of such profusion as to obscure the normally clear margins of the bronchovascular structures. Small (p), medium (q), or rarely, large (r) rounded opacities may also be present. In advanced disease the sharpness of the cardiac and diaphragmatic borders are sometimes obscured.

1.3.3 Pleural changes are commonly present and are often the first radiological indication of exposure to asbestos. Diffuse or localised pleural thickening or circumscribed pleural plaques, with or without calcification, may occur and need not be associated with parenchymal fibrosis. Transient pleural effusions have been reported. The pleural abnormalities can be sufficiently extensive to obscure the lung fields and may in rare cases lead to impairment of lung function.

1.3.4 In individual cases a narrative report by the reader of the radiograph as well as an interpretation of the relationship between the observed appearances and the occupational history is helpful.

1.3.5 Where possible comparison of the most recent film with earlier films is highly desirable.

1 The ILO International Classification of Radiographs of Pneumoconioses (1980) is designed to ensure international comparability of radiological data. This classification is purely descriptive and was specifically designed for epidemiological purposes and not for evaluating an individual. Sets of films are available from the ILO Publications, International Labour Office, CH-1211 Geneva 22, Switzerland.

1.3.6. A dose response relationship has been demonstrated between the extent of asbestos exposure and the radiological parenchymal changes. Parenchymal change correlates in general with an adverse effect on the long-term prognosis of an individual. However, in the absence of mesothelioma, there is no adverse prognostic significance associated with pleural changes unless they are unusually severe.

1.3.7. Since pleural changes may occur in the absence of parenchymal fibrosis, the use of the term "pleural asbestosis" is undesirable.

1.3.8. Other causes of radiological changes must be carefully excluded prior to making the diagnosis of asbestosis. This is important in the early stages of the disease when the radiological changes are slight.

1.4. Other Investigations. 1.4.1. Asbestos (Ferruginous) Bodies. When a productive cough is present asbestos fibres or ferruginous bodies in the sputum are evidence of exposure to asbestos but are not diagnostic of asbestosis.

1.4.2. Biopsy is very seldom justified as a diagnostic procedure for asbestosis. The effects of exposure should already have been recognised on the grounds outlined in the foregoing criteria. Biopsy is justified if it is thought that an asbestos-exposed patient may be suffering from some other potentially treatable lung disease. Any surgeon about to conduct a thoracic operation on a person known to have been exposed to asbestos should be asked to obtain a specimen of lung tissue for histological examination.

1.5. Lung Function Abnormalities. The characteristic abnormalities are those of restrictive lung disease.

1.5.1. It is recommended that the FVC, FEV$_1$ and FEV$_1$/FVC ratio be recorded routinely in standard fashion. A comparison of periodic lung function testing over a number of years is much better than a single observation compared to the standard "normal" values. In assessing the results, allowance must be made for certain ethnic differences and the effects of smoking habits.

1.5.2. While a restrictive pattern is consistent with the diagnosis of asbestosis, it is not specific to this disease. Asbestosis may develop with little or no detectable restrictive defect in the early stages. A predominantly obstructive picture is uncommon in the absence of a smoking history.

1.5.3. More sophisticated measurements in the assessment of restrictive lung disease (e.g. the measurement of transfer factor and lung compliance) are diagnostically helpful, but are not essential to the routine medical surveillance of a group of asbestos-exposed workers.

1.6. Differential Diagnosis. When there are clinical, radiological, or lung function abnormalities in asbestos workers, the exclusion of simulative disease is necessary for the correct management of the individual. This is increasingly important as, with improving occupational hygiene standards, asbestosis becomes less common.

1.7. Comment. The art of diagnosis, always a matter of weighing probabilities and looking at the total evidence, demands expert judgement based on the interpretation of the above criteria. Each of them is on a scale of severity and it is possible to find high values in some, low values in others, or any permutation or

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combination of criteria in the individual cases. According to the circumstances, the elements of the decision and action will vary.

Section 2 — Mesothelioma

2.1. Diffuse malignant mesothelioma of the pleura or peritoneum is a rare primary tumour in the general population. When attributable to asbestos the latent period between initial asbestos exposure and onset of the disease is usually 20 to 40 years or longer.

2.2. It must be emphasized that the definitive diagnosis of mesothelioma is not easy. In asbestos workers it may be associated with asbestosis though the level of fibrosis can be minimal. In some cases there is no evidence of fibrosis even at necropsy. Mesothelioma may occur after relatively brief but intense asbestos exposure. While pleural abnormalities are common in asbestos workers, there is no conclusive evidence that of themselves they predispose to mesothelioma. Early suspicion of the presence of pleural mesothelioma arises when pleural effusion or chest pain occurs in an asbestos worker. The tumour may completely encase the lung. Peritoneal mesothelioma may occupy a large amount of the abdominal cavity and produce ascites with or without abdominal pain. Metastases, although rare, can affect other organs, but local spread is the usual mode of progression. Hitherto no treatment has been successful, the outcome being invariably fatal.

2.3. Ideally, the diagnosis will be based on careful necropsy in which particular attention is given to excluding the possibility of a primary cancer at some distant site. Furthermore, the tumour tissue should be referred to one of the established mesothelioma reference panels so that histopathologists especially skilled in the diagnosis of this tumour may give their opinion. Such panels now exist in many countries.

2.4. While cases of mesothelioma may arise in the general population with no obvious cause, the majority of mesothelioma cases are related to asbestos exposure. The proportion of cases attributable to asbestos exposure varies; it is greatest in the more highly industrialised communities, especially those with a large shipbuilding or ship repairing industry. In industrial populations generally, most mesothelioma cases may be ascribed to asbestos although even in these communities no relationship with asbestos can be established in a proportion varying from 10% to over 30%. In other groups which have been adequately studied, the proportion of mesothelioma cases associated with asbestos exposure is lower but variable. Not all mesotheliomata are due to asbestos; e.g. endemic mesothelioma in some areas of Turkey is believed to be due to a fibrous form of zeolite.

2.5. Smoking habit plays no part in the genesis of mesothelioma as far as can be determined at the present time.

2.6. This tumour is relatively uncommon even among those who have had substantial asbestos exposure. Many believe that the risk of developing mesothelioma is greatest with crocidolite, less with amosite, and apparently less with chrysotile, while anthophyllite appears never to have caused mesothelioma in

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humans. This opinion, however, does not enjoy unanimous support and some authorities hold that there is no justification yet for differentiating between the various kinds of asbestos and their biological effects.

2.2 There is epidemiological and pathological evidence of an exposure-response relationship between inhaled asbestos and tumour formation. Recent work does not support the often stated idea that any slight, casual or brief asbestos exposure may lead to mesothelioma.

2.3 The long latency period between asbestos exposure and the development of the tumour makes elucidation of a dose response relationship difficult. Thus, the effects of good dust control on the incidence of mesothelioma will only be determined in the future.

Section 3 — Lung Cancer

3.1 Cancer of the lung is the most common form of cancer in males in industrialised countries, and the primary cause is cigarette smoking. In asbestos workers who smoke, it is many times more common than in members of the general population who are not exposed to asbestos and who do not smoke.

3.2 Epidemiological studies have shown that the risk of bronchogenic cancer is greater at higher levels of asbestos exposure. Non-smoking asbestos workers under the conditions of past exposure appear to be at greater risk than non-smokers in the general population. Even so, these non-smoking asbestos workers are at less risk of bronchogenic cancer than cigarette smokers who have not been exposed to asbestos in the general population. There is also epidemiological evidence that the lower levels of past exposure to asbestos do not pose a detectable excess risk of bronchogenic cancer.

3.3 There are no specific pathological features by which an individual case of lung cancer can be attributed solely to asbestos exposure.

3.4 An adeno-carcinoma situated peripherally and particularly in a lower zone, is the type of tumour more likely to occur in a worker exposed to asbestos more than fifteen years previously. This is especially so in the presence of asbestosis.

Section 4 — Cancer of Other Sites

4.1 The evidence relating asbestos to cancer of other sites is equivocal and further data are awaited.

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IV. B/2

MEDICAL SURVEILLANCE OF ASBESTOS WORKERS

H. C. Lewinsohn (*)

INTRODUCTION

There is no cure for asbestosis, the outlook for the patient with lung cancer is very poor and diffuse malignant mesothelioma of the pleura or peritoneum is invariably fatal within a short period of time after diagnosis. In view of this gloomy future for the affected worker, what can the physician now working in industry do to intervene or prevent undue suffering on the part of currently exposed individuals?

(*) MB., BCh., D.I.H., MFOM., Corporate Medical Director, Raybestos-Manhattan, Inc., 100 Oakview Drive, Trumbull, Ct. 06611, U.S.A.

The physician can be actively involved, become thoroughly familiar with the physical and chemical properties of asbestos, know the manufacturing details and study the plant layout in depth. Having insight into the manufacturing process and working conditions in the plant the doctor should be well equipped to deal with the problems which arise in the management of the health of people at work. Practical experience gained from working in industry is of little avail unless linked to a thorough knowledge of the etiology, pathogenesis, epidemiology and therapy of the diseases involved. The physician should acquire a working knowledge and appreciation of the theory and practice of industrial hygiene, including an understanding of sampling and monitoring procedures. Fortified by this experience and knowledge, the course to be charted should become clear and his grip will not falter in the many roles in its plant.

It stands to reason that industry wants to employ people who are suited to the tasks required of them and that they do not suffer injury or illness as a result of the work they are called upon to do. This paper will be limited the subject of medical intervention and its role in the prevention of

asbestos-related diseases. A logical sequence will be followed starting with pre-placement examinations and concluding with post-retirement or post-severance examinations. The methods to be employed will not be described in detail, only the purpose and objectives of each type of examination.

PRE-PLACEMENT MEDICAL EXAMINATION OF ASBESTOS WORKERS

The purpose of the pre-placement medical examination is to determine the suitability of a job for an individual and the suitability of the prospective for the job. Various medical [illegible]

The findings of such an examination are used to establish a [illegible] for long-term follow-up, provide guidance to management and employees [illegible] to job suitability based upon defined selection criteria, and to inform the job applicant regarding his suitability or otherwise for employment in an asbestos-exposed occupation.

The data base for long-term [illegible] of job suitability includes identification characteristics and initial medical examination findings (Tables 1. and 2.).

Guidance is provided to management and the employee relative to job suitability based upon defined selection criteria, namely:

(1) Contra-indications to employment in any job where asbestos is used are: a history of chronic chest complaint and significant exposure in other hazardous dusty jobs in the past.

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In accordance with the above comments and recommendations may be made that an employee in whom a medical examination reveals no physical, physiological or pathological abnormalities, and if the dust levels in the area are at or below currently accepted standard permissible exposure levels. This is a purely arbitrary judgment and there is currently no known safe threshold for a given person such as asbestos. If the individual is still under a program of observation and/or is being treated for a medical disease from an occupational exposure, these individuals should be referred, from the risk of any, will be further reduced.

The [illegible] of the time of the first examination of the medical department employee has been fully informed of the medical surveillance, deficiencies with regard to, and notification of the employee that [illegible] and factors in the workplace [illegible] should be fully [illegible] notification the employee should be [illegible] of the risks in making statements to [illegible].

The pre-employment medical examination is an essential part of the medical supervision of asbestos workers because it establishes the principles on which future management will be based. It gives the prospective employee an insight into the requirements of the industry and enables the physician to recommend suitability, limited suitability or total unsuitability of the individual for the job. The opportunity which pre-placement physical examination provides for the medical staff to counsel the individual and establish rapport is unique and should

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not be missed. This period in the career of the job applicant provides the best opportunity for the recording of identification details and verifying them, in order to establish the data base for long-term follow-up. The format of the examination and recording instruments should be such that it is suitable for storage and retrieval by electronic data processing equipment, thus making it more amenable to epidemiological study and analysis.

PERIODIC MEDICAL EXAMINATION

The purpose of the periodic medical examination is to reevaluate the [illegible] and the individual's suitability to continue [illegible] findings can be recorded in an ongoing basis and allow comparison from one year to the next. Changes in physical condition, psychological status or pathological impairment, which may or may not be work related are typically detected at an early stage when intervention will result in withdrawal from further exposure if indicated or provision of necessary therapy. Findings can be subsequently used for epidemiological and statistical analysis to determine exposure-response relationships and will thereby provide the basis for industrial hygiene findings to protect exposed persons. The physician can utilize the knowledge gained from the periodic medical examination of employees to provide guidance to the worker and to management regarding the possible effects of exposure in a specific job.

Records of medical findings should be relatively simple to maintain

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provided that a standardized system is used which allows an from year

to year. The essential requirements for the periodic medical surveil-

lance of asbestos workers are as follows:

1. Occupational history in detail, i.e., changes, changes

of departments, etc.

2. Exposure details (i.e., fiber types, product, etc.) and

exposure levels.

3. Respiratory symptoms (chest, sputum).

4. Pulmonary function test results.

5. Chest roentgenograms, comparing recent and past films.

6. Record of smoking habits and other social habits, drugs, etc.

Physical examination should concentrate on detecting signs of pulmonary

dysfunction or extrapulmonary manifestations of the lung

disease, inspection and palpation. There would be special

attention to any chest complaints since the previous examination

with particular attention to pleural thickening which might be a result of the

pleurisy as suggestive.

In the interest of achieving the maximum benefit from periodic

medical examinations, reliable, inexpensive, reliable equipment. The

guidelines published by the American Thoracic Society for the performance

of these tests, if adhered to, should ensure calibration of instruments,

training of technicians and reproducibility of results.

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where facilities exist for more complete studies they should at least include measurement of lung volumes and the gas transfer factor for carbon monoxide as measured by the single-breath method. Exercise tolerance should be measured under the supervision of a physician.

The aim of radiological surveillance of asbestos workers should be to detect early changes, such as the development of pleural thickening, pleural calcification and pulmonary fibrosis so that the employee can be advised and early removal from further exposure take place. Asbestos workers are a high risk group for the development of lung cancer, especially if they are also cigarette smokers, and particular attention should be paid to this risk when reviewing their chest X-rays.

The ILO/UC 1971 International Classification of Radiographs of the Pneumoconioses is recommended for use in epidemiological studies of asbestos workers. It is necessary, however, in the clinical management of employees, to rely upon an interpretive narrative, rather than a coded system, for the direct day-to-day decisions that have to be made.

Chest radiography is probably the most useful surveillance tool we have, but it is also one of the most difficult to utilize.

Medical surveillance systems must be so designed as to allow for record linkage to industrial hygiene control programs. A discussion

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on this subject is outside the scope of this paper, but is referred to for the sake of completeness. Epidemiological studies which do not have exposure data incorporated in their design, provide little help in ultimately pronouncing on the adequacy, or otherwise, of dust control measures which have been adopted.

Each worker examined must be given the results of his or her examination, must acknowledge receipt of the information and must signify it has been understood. If a job change is indicated, the reasons for it should be precisely stated, but the decision as to whether this advice is accepted or not must be left to the employee.

Management must always be informed, with the consent of the employee, when an adverse medical opinion is expressed. The disposition of the case, in the light of the medical advice which management receives, must hinge upon agreement reached between employer and employee, trusting that both parties have a full understanding of the facts and of the consequences. Management must also be advised of the employees continued suitability to perform current duties if no adverse health effects are found.

The value of the periodic medical examination depends upon the manner and thoroughness with which it is conducted. It will only serve its purpose as an aid to early diagnosis if the format is standardized as much as is possible, if the strictest attention is paid to the detail of techniques

employed in radiology and pulmonary function testing, and if it is borne in mind that the employee's attitude to periodic check-up is different from the attitude he or she had towards the preplacement medical examination.

In the sections above, dealing with the medical examination parameters, mention was not made of sputum cytology. It has been proposed in the United States that this should be performed routinely on persons with 10 or more years of exposure to airborne concentrations of asbestos fibers or who are 45 years of age or older.(4.) According to the authors of Section IV of the American Thoracic Society's Epidemiology Standardization Project, "Early data from studies of smoking men at high risk of lung cancer indicate that only one fourth of asymptomatic lung cancers are detected by sputum cytology and the remainder are detected by chest radiography".(5.)

POST RETIREMENT OR POST SEVERANCE EXAMINATIONS

The surveillance of the asbestos worker should ideally not cease when he or she leaves employment, for whatever reason, but every effort should be made to continue the process of follow-up for the rest of the individual's lifetime.

The follow-up of retirees should be administratively easier than that of employees whose term of employment is severed prior to retirement, because the former will probably qualify for retirement pensions and remain in

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touch with the company, whereas contact with the latter will probably be lost.

The follow-up of retirees should preferably take the form of a health questionnaire only, with an annual reminder to each one to see a physician and have a chest X-ray. The aim is to detect lung cancer as early as possible in the hope that therapy might be available to prolong life and alleviate suffering.

With regard to other employees, whose employment terminated prior to retirement, a system should be devised whereby each one, on leaving, is given a carefully worded notice as a reminder to continue with annual examinations and designed to be given to a family physician with the information that the individual had previously been under surveillance at an asbestos factory.

CONCLUDING REMARKS

The prevention of asbestos-related diseases depends upon engineering technology and dust control. The physician however is ideally placed to intervene at the interface between the worker and his work. The medical examination program is merely one part of the total effort required to safeguard employee health and without the collaboration of management and the exposed workers, cannot achieve significance. As long as the program is built upon mutual trust and no attempt is made to keep either

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employer or employee in ignorance of the facts, it will succeed in providing an individual service as well as monitoring the overall effects of exposure on the health of the work force.

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TABLE 1.

Identification characteristics required to establish a data base for long term follow-up of asbestos workers.

A. 1. Name (include maiden name for married women)
2. Identification number (social security number, etc.)
3. Date of birth
4. Place of birth
5. Address

B. 1. Name of spouse
2. Identification number of spouse (social security number, etc.)
3. Spouse's date of birth

C. 1. Names, dates of birth, addresses and identification numbers of children

D. 1. Employee's company I.D. number (clock no., etc.)*
2. Employee's occupation (job description, including raw materials handled)
3. Latest dust levels in job and department

*The employee I.D. number should never change and should be reallocated to the same employee upon rehiring after termination of employment.

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TABLE 2.

Minimum requirements to be recorded to establish a data base for long term follow-up of asbestos workers.

Complete, detailed, occupational history since leaving school

Family history

Smoking history

Social history (drugs, alcohol, etc.)

Previous illnesses of note, especially respiratory ailments

Detailed respiratory symptoms history (MRC or ATS Respiratory Symptoms Questionnaire.

Vital and physical signs

Special investigations: 14" X 17" Posteroanterior chest roentgenogram*

Measurement of lung function (ventilatory capacity, lung volumes, gas transfer, etc.)

Sputum cytology (value not proven in screening)

Measurement of angle between nail and cuticle to document appearance of clubbing of fingers.

*Oblique views, and occasionally lateral views, may be required to clarify pleural abnormalities.

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The Medical Surveillance of Persons Exposed to Asbestos

HILTON C. LEWINSOHN, M.B.

ABSTRACT — This paper will briefly review the techniques which allow persons exposed to asbestos to be kept under surveillance.

The pre-placement evaluation procedure and its usefulness is discussed.

The periodic medical evaluation is described and an outline of the essential requirements is given. The role of radiological surveillance is briefly discussed.

The point is made that both the exposed persons and their management place reliance upon the physician to inform them of adverse findings so that the problem of alternative employment and future protection can be dealt with in a sound and equitable manner.

Medical surveillance should continue for the lifetime of the individual once exposure has been documented and post-retirement or post severance examinations should be provided whenever practicable.

Asbestos-related diseases can be preveneted by good industrial hygiene practices and engineering controls. The physician is able to intervene at the interface between worker and work and hopefully alter the final outcome to the good.

Introduction

Exposure to asbestos in various industries and occupations has been associated with three major lesions involving the intrathoracic organs. Asbestosis, first recognized at the beginning of this century, is a form of interstitial pulmonary fibrosis which has been shown to be related to the dust levels in the workplace and to be dependent upon the duration of such exposure. Lung cancer in heavily exposed workers in industries such as insulation, construction, ship-building and asbestos textiles manufacture, has been adequately documented and related to asbestos exposure. Asbestos exposed persons who smoke cigarettes appear to have a 90 times greater chance of dying from lung cancer than a non-smoking non-asbestos exposed persons. The third condition to be associated with exposure to asbestos is diffuse mesothelial mes-

HILTON C. LEWINSOHN, M.B., Formerly Director Occupational Safety and Health Programs, Union Carbide Corp.; Lecturer, Department of Epidemiology, Yale University School of Medicine; Clinical Associate, Department of Laboratories Medicine, University of Connecticut School of Medicine

Reprint requests to: Health, Safety and Environmental Affairs Dept., Union Carbide Corp., Old Ridgebury Rd., Danbury, CT 06817 (Dr. Lewinsohn)

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[redacted]

thelioma of the pleura or peritoneum. Unlike asbestosis and lung cancer, this rare tumor has been more difficult to characterize in terms of dose response and pathologic features.

Less clear-cut associations have been described by some observers between asbestos exposure and cancers involving the gastrointestinal tract and cancers in other organs such as the larynx or renal organs. Cancer of the ovary in women has been ascribed to asbestos exposure. It is suggested that the cases described were actually of peritoneal origin and due to malignant mesothelioma of the peritoneum. It may be difficult to distinguish ovarian carcinoma from peritoneal mesothelioma.

Because of its increasing and widespread use in the U.S.A. in many industries during the past 50 years, lasting up until very recent times, it has been estimated that millions of people have been exposed in various ways to various varieties of asbestos.

The asbestos related diseases are not readily amenable to therapy. As exposure is always progressive, the outlook for the person with lung cancer is very poor and diffuse malignant mesothelioma of the pleura or peritoneum is invariably fatal within a short period of time after diagnosis. The prevention of the industrial environment associated with a hazardous asbestos exposure must always be the objective of present and future efforts [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Pre-Placement Medical Evaluation of Persons Exposed to Asbestos

The pre-placement medical examination is designed to determine the suitability of the employee for the job and the suitability of the particular job for the individual concerned. When asbestos exposure is likely the workplace conditions must be known before decisions can be made about a prospective employee with medical contra-indications to such employment. As the result of experience already gained in the development of medical surveillance programs, the suitability of prospective employees for the specific tasks in question may be assessed and based upon defined selection criteria. Persons should be appropriately counseled regarding their fitness or otherwise for employment in an asbestos exposed occupation and if any restrictions need to be imposed on medical grounds they should be indicated to the employee and the employer prior to placement in the job. There are certain broadly defined conditions which should contraindicate employment: a history of previous asbestos or another industry with a recognized dust hazard such as coal mining or stone quarrying, an existing pneumoconiosis disability due to pneumoconiosis or from any other source, the presence of obstructive airways disease with or without emphysema, asthma, and organic heart disease. Other contraindications to employment in a job which have been recommended are: (1) Nasal deformity or deformity of such a degree as to make the use of a dust mask difficult or impossible. (2) Gross deformity of the chest such as scoliosis or kyphosis as a result of thoracic surgery, pneumothorax, bronchiectasis or emphysema. (3) Gross hypertension or cardiac impairment and (4) the presence of [redacted] growths.

[redacted]

[redacted]

The physician should take the opportunity at the pre-placement examination afforded by contact with the job applicant to advise him regarding the known facts of asbestos related diseases. It is essential to emphasize what risks the person will run if he or she smokes and every effort should be made to discourage

[redacted]

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Table 2

Minimum requirements to be recorded for establishing a data base for long term follow up of asbestos workers

Complete detailed occupational history including hobbies
Family history
Smoking history
Social history (drugs, alcohol, etc.)
Previous illnesses of note, especially respiratory ailments
Detailed respiratory symptoms history (MRC or ATS Respiratory Symptoms Questionnaire)
Vital and physical signs
Special investigations: 1. 14 x 17 Posteroanterior chest roentgenogram*
Measurement of lung function (ventilatory capacity, lung volumes, gas transfer, etc.)
Sputum cytology examination for malignant cells
Measurement of clubbing of fingers

*Oblique views and/or occasionally lateral views may be required to clarify pleural abnormalities

It has previously been pointed out that the pre placement medical evaluation "is an essential tool for use in the medical supervision of asbestos workers because it establishes the principles upon which future management will be based. It gives the prospective applicant an insight into the seriousness of the problem and enables the physician to recommend suitability, limited suitability or total unsuitability of the individual for the job. The opportunity which the pre placement physical examination provides for the medical staff to counsel the individual and establish rapport is unique and should not be missed. This period in the career of the job applicant provides the best opportunity for the recording of identification details and obtaining them in order to establish the data base for long term follow up."

Periodic Medical Evaluation

Persons exposed to asbestos should be kept under medical surveillance. The object of periodic examinations is not only to determine changes in the physical condition, physiological status or radiological appearances of the exposed person but also to re evaluate the workplace conditions and the individual's suitability to continue doing the same job. Medical findings can be recorded on an ongoing basis to allow comparison from one examination to the next. The periodicity of the evaluation process will depend upon demonstrated need and available man power as well as regulatory requirements. The Occupational Safety and Health Administration promulgated the Asbestos Standard (CFR 1910.1001) in July 1972. Section 1001(j)(3) requires that every employer shall provide, or make available, at least annually comprehensive medical examinations to each employee engaged in an occupation exposed to airborne concentrations of asbestos fibers. The minimum requirement is for "a chest roentgenogram (posteroanterior, 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV 1.0)."

Periodic medical evaluation is designed to detect the biological effects of inhalation of asbestos as early as possible and hopefully at a stage when removal from further occupational exposure to asbestos may arrest or significantly delay the progress of asbestosis or the occurrence of other asbestos related conditions. Epidemiologic evidence of the value of this procedure is not yet available and the changing environmental conditions in the workplace throughout the asbestos industry over the past fifty years only serves to confuse the issue when attempting to assess the value of early diagnosis.

The periodic evaluation should include a physical examination even though the OSHA standard does not specify it. The examiner should concentrate on the physical signs associated with pulmonary fibrosis such as bilateral end-inspiratory fine crackles at the lung bases, finger clubbing and breathlessness. In the case of long service employees, especially heavy smokers, the possibility of lung cancer should always be borne in mind. Transient pleural effusions occur in asbestos workers.

The aim of radiologic surveillance of asbestos workers is to compare serial roentgenograms taken at [illegible] exposure period at regular intervals in order to detect the earliest changes which would result in deciding whether the individual should be advised to consider alternative employment. Radiographic evidence of predominantly diffuse interstitial fibrosis [illegible] charge seen. The Medical Advisory Panel [illegible] Asbestos International Association has prepared a document entitled "Criteria for the Diagnosis of Asbestosis and Considerations in the Attribution of Lung Cancer [illegible] Mesothelioma to Asbestos Exposure" which will [illegible] available in early 1978. The MAP recommend that to ensure comparability of radiographs they must be of good technical quality [illegible] positive aspects of pneumoconiosis should be such as to have enough the diaphragm [illegible] the fifth rib anteriorly and the fourth rib posteriorly. The recording of changes on the radiograph should be in accordance with the ILO International Classification of Radiographs of Pneumoconioses (1980).

Pleural lesions are often the first evidence [illegible] of exposure to asbestos. These changes may consist of diffuse or localized pleural thickening or asbestos pleural plaques with or without calcification. They usually and need not be associated with obvious parenchymal fibrosis. The pleural abnormalities can be so extensive to obscure the lung fields and [illegible] cases, lead to impairment of lung function.

It has been shown that [illegible] radiographic patterns change in relationship to [illegible] tions experienced over the years of [illegible] are related to length of exposure. Irrespective of dose. Pleural changes probably represent an important radiologic sign which is part of a [illegible] observed in low grade exposure groups where parenchymal effects are less likely to be [illegible]

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Weill [illegible] has attempted to [illegible] the basis for clinical decision making by the physician [illegible] evaluating patients who have had occupational exposure [illegible] asbestos. In an asbestos worker, definite radiographic [illegible] evidence of diffuse pulmonary fibrosis, even if it is minimal in profusion or extent, should be an indication to advise the individual that further exposure to asbestos dust may increase the probability that the condition will progress with time. The greater the past cumulative dust exposure, the higher the probability of progressive pulmonary fibrosis according to Weill. Cessation of exposure is only likely to minimize the degree of progression of fibrosis and, because the excess risk for development of respiratory cancer has been shown to be dose related, this should also be minimized by not adding further to the dust dose of individuals with radiographic signs of asbestosis.

Pleural thickening and pleural plaques are apparently related to length of exposure and time since first exposure but not to dose, and are not likely to be influenced by modest additional exposure. Weill believes that when only pleural stigmata of asbestos exposure are present, continued medical surveillance and periodic evaluation is indicated [illegible]

[illegible]

posure. The measurement of the timed vital capacity [illegible] components, namely, forced vital capacity (FVC), forced expiratory volume in the first second of expiration (FEV₁) and the ratio of these (FEV₁/FVC) should be routinely recorded. A restrictive pattern is consistent with the development of pulmonary fibrosis (asbestosis) [illegible] other causes should first be ruled out. A predominantly obstructive pattern is uncommon in the absence [illegible] smoking history. A comparison of periodic lung function test results over a number of years is of much greater value in the follow-up of an individual than a single observation where comparisons can only be made to the predicted normal value. Where facilities exist for more complete studies they should at least include measurement of lung volumes and the single breath carbon monoxide diffusing capacity.

No mention has been made thus far of the role of sputum examination for exfoliative cytology. A proposal has been made in the United States that this should be performed routinely on persons with 10 or more years of exposure to airborne concentrations of asbestos fibers and who are 45 years of age or older. [illegible]

[illegible] are detected by sputum cytology and the remainder are detected by chest radiography.

The value of the periodic medical examination depends upon the manner and thoroughness with which it is [illegible]. The standardization of the [illegible] capabilities. The [illegible]

[illegible]

Life-Long Surveillance

Persons who are exposed to asbestos should be kept under surveillance [illegible]

Retirees who receive pensions from employers [illegible]

[illegible]

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taken. In some cases this could lead to the early detection of lung cancer and therapy which could prolong life and alleviate suffering.

Comments

The prevention of asbestos related diseases depends upon engineering technology and dust control. The role of the physician is the prevention of ill suited job placement and intervention at the interface between worker and work. The technique of medical surveillance is merely one cog in the wheel which comprises the total effort required to safeguard employee health. The active collaboration of employer and employee in the surveillance program allows us to achieve significant results of benefit to both.

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