PLAINTIFF'S EXHIBIT

UC-4298

UNION CARBIDE

CORPORATE MEDICAL DEPARTMENT

BACKGROUND INFORMATION DOCUMENT

THE MEDICAL SURVEILLANCE OF PERSONS EXPOSED TO ASBESTOS

By: H. C. Lewinsohn, M.D.
Assistant Corporate Medical Director

Asbestosis, lung cancer and diffuse malignant mesothelioma of the pleura or peritoneum are the three major asbestos-related diseases which are associated with occupational exposure to asbestos. Less clear-cut associations have been documented for gastro-intestinal tract cancers, laryngeal cancers and non-Hodgkins lymphoma of the gastro-intestinal tract. It has been postulated that renal cancer and pancreatic cancer may be more prevalent among asbestos exposed populations but this association lacks epidemiologic verification. Asbestos exposed persons who smoke cigarettes have at least a 50 times greater chance of dying from lung cancer than non-smoking non-asbestos exposed persons.

Because of its increased and widespread use in the USA in many sectors of industry during the past 50 years and lasting up until very recent times, it has been estimated that millions of people have been exposed in various ways to the different commercial forms of asbestos. Most of these workers have experienced low levels of exposure in comparison to asbestos miners and millers, asbestos textile workers, asbestos cement workers and employees of the friction materials industry. Pleural plaques without evidence of other stigmata of asbestos exposure clinically, physiologically or radiographically, are probably an important index to these low level exposures.

Medical surveillance of asbestos workers attempts to provide a tool for the detection of the earliest and least harmful effects of exposure at a stage when cessation of such exposure may be of benefit to their continued health and well-being. The asbestos-related diseases are not readily amenable to therapy. The course of asbestosis may be steadily progressive but the physician can intervene and advise the person on ways and means to avoid chest infections and how to treat them effectively, if the condition is diagnosed in the early stages. The outlook for the person with lung cancer is poor and diffuse malignant mesothelioma of the pleura or peritoneum is invariably fatal within a short period of time after diagnosis.

The pre-placement medical evaluation is designed to determine the candidates suitability for the job and must also consider the suitability of the job for the individual concerned. This means that the physician must be

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completely familiar with the properties of the variety of asbestos in use, must understand the manufacturing processes in the plant and have a clear concept of the plant design and layout. Armed with this knowledge decisions can be made about prospective employees when contra-indications to asbestos exposure are present. Certain broadly defined conditions are regarded as contraindications to work with a potential for asbestos exposure. These include:

- a history of previous work in another industry with a recognized dust hazard such as coal mining or stone quarrying;
- an existing pulmonary impairment due to pneumoconiosis or other respiratory disease;
- chronic obstructive pulmonary disorders;
- organic heart disease.

Some more specific contraindications are:

- nasal obstruction or deformity of such a degree as to make the wearing of respiratory protection devices impossible;
- gross physical deformity of the chest such as scoliosis or kyphosis;
- chronic bronchitis, bronchiectasis or emphysema;
- gross hypertension with cardiac impairment;
- the presence of rheumatoid arthritis, because of the association of this condition with pneumoconiosis, an example being Caplan's Syndrome.

The pre-placement evaluation serves the purpose of establishing base-line data which will be useful in observing the exposed persons throughout their lifetime, noting changes in measured parameters, and providing data for epidemiologic studies.

The pre-placement evaluation affords the examining physician with an opportunity to counsel and advise the job applicant regarding the known facts about the effects of asbestos exposure. It is essential to emphasize the special risks the worker runs if he or she smokes cigarettes. This habit should be strongly discouraged.

Persons exposed to asbestos should be kept under medical surveillance. The object of periodic examinations is to detect early changes in the worker's physiologic status, radiologic appearances and work capacity. The findings are recorded systematically on an on-going basis to allow comparison from one evaluation to the next.

OSHA requires that every employer shall provide, or make available, at least annually, comprehensive medical examinations to each employee engaged in

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an occupation exposed to airborne concentrations of asbestos fibers. The minimum requirement is for

"a chest roentgenogram (posterior-anterior 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 ($FEV_{1.0}$)."

Early effects of exposure may be discovered as the result of periodic medical surveillance examinations. They may occur at a stage when removal from further occupational exposure to asbestos could possibly arrest or significantly delay the progress of asbestosis, or the occurrence of other asbestos-related conditions. As mentioned previously, the physician can help the asbestotic patient prevent serious complications from respiratory infections and counsel the individual about the increased risks from cigarette smoking.

Table 1 lists the minimum requirements of a satisfactory medical surveillance program for asbestos exposed persons to satisfy OSHA's Asbestos Standard.. It is generally agreed that OSHA's present requirement for annual examinations may not be necessary in the light of present conditions in industry but they are still in force. When the current asbestos standard is revised, it is expected that the frequency and periodicity of the components listed in Table 1 will change.

The medical examiner should concentrate on eliciting the symptoms and signs of pulmonary fibrosis. The findings include progressive effort dyspnoea, finger-clubbing and bilateral end-respiratory fine crackles on auscultation of the chest. In the case of the more heavily exposed employees, in those with long service and in those who are cigarette smokers, the possibility of lung cancer must always be borne in mind.

Transient plueral effusions, often asymptomatic, can occur in asbestos workers. Pleural lesions are often the first indicator of exposure effects. Pleural plaques, with or without calcification, not usually producing any physiological impairment, may be the most frequently identified radiologic abnormality. Diffuse pleural thickening is sometimes seen and in rare cases can lead to impairment of lung function. Pleural plaques must not be called asbestosis, a term reserved for the pulmonary fibrosis characteristic of this disease. They are an index to exposure and no more. Pleural plaques should be recorded as such on OSHA Form 200 and must not be called asbestosis. Asbestosis may occur in cases with plaques and both conditions should then be recorded in the log.

Radiographic lesions in the lung parenchyma are often subtle in the early stages and skilled x-ray reading techniques should be employed which are based on the ILO U/C Classification of Radiographs for the Pneumoconioses.

The earliest effects of exposure may be those detected by lung function tests. The measurement of the timed components of the vital capacity is valuable in demonstrating the development of the characteristic restriction of

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lung function which occurs with pulmonary fibrosis. Where facilities exist for more complete lung function studies, the single-breath carbon monoxide diffusing capacity should be done.

The value of sputum cytology in the periodic follow-up of asbestos workers has not yet been adequately quantified. Computed tomography may be of value as a diagnostic tool to differentiate pleural tumors from plaques and to detect early asbestosis. This is not a procedure which is suitable for routine periodic medical surveillance.

Persons who have been exposed to asbestos should be kept under surveillance even though exposure has ceased. The long lapsed period between first exposure and observation of any of the biological effects mandates careful follow-up for many years. In some cases this could lead to the early detection of lung cancer and possible life prolonging or pain relieving treatment.

The prevention of asbestos-related diseases depends on good engineering technology and dust control. The technique of medical surveillance is merely one cog in the wheel which comprises the total effort required to safeguard employee health.

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TABLE I

* Complete, Detailed, Occupational History Since Obtaining First Job

* Family History

* Smoking History

* Social History (Drugs. Alcohol, Etc.)

* Previous Illnesses of Note, Especially Respiratory Ailments

* Detailed Respiratory Symptoms History (Respiratory Questionnaire - Table II)

* Complete Physical Examination

* 17" x 14" Postero-Anterior Chest X-ray*
  Interpreted by a Radiologist/"B-Reader"

* Measurement of Lung Function (FVC, FEV_1, FEV_1/FVC)

* Optional - Lateral and oblique x-rays of the chest may occasionally be required to clarify abnormalities. Computerized Axial Tomography may be used to investigate puzzling lesions.

  - Sputum cytology in smokers over age 40, if indicated and feasible.

* Oblique Chest X-rays, and occasionally lateral views, may be required to clarify pleural abnormalities. Computerized Axial Tomography may be used to investigate puzzling lesions, but it not yet a practicable surveillance technique.

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TABLE II
RESPIRATORY QUESTIONNAIRE

CHEST COLDS AND CHEST ILLNESSES

If you get a cold, does it usually go to your chest? (Usually means more than 1/2 the time.)	1. Yes_____ 2. No_____ 3. Don't get colds____
During the past 3 years, have you had any chest illnesses that have kept you off work, indoors at home, or in bed?	1. Yes_____ 2. No_____
IF YES Did you produce phlegm with any of these chest illnesses?	1. Yes_____ 2. No.____
In the last 3 years, how many such illnesses with (increased) phlegm, did you have which lasted a week or more?	____Number of illnesses ____No such illnesses
Did you have any lung trouble before the age of 16?	1. Yes_____ 2. No_____

Have you ever had any of the following?

° Attacks of bronchitis?	1. Yes_____ 2. No_____
IF YES Was it confirmed by a doctor?	1. Yes_____ 2. No_____
At what age was your first attack?	_____Age in years
° Pneumonia (include bronchopneumonia)?	1. Yes_____ 2. No_____
IF YES Was it confirmed by a doctor?	1. Yes_____ 2. No_____
At what age did you first have it?	_____Age in years

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- Hay fever? 1. Yes_____ 2. No_____

IF YES
Was it confirmed by a doctor? 1. Yes_____ 2. No_____

At what age did it start? _____Age in years

- Have you ever had chronic bronchitis? 1. Yes_____ 2. No_____

IF YES
Do you still have it? 1. Yes _____ 2. No_____

Was it confirmed by a doctor? 1. Yes _____ 2. No_____

At what age did it start? _____Age in years

- Have you ever had emphysema? 1. Yes_____ 2. No_____

IF YES
Do you still have it? 1. Yes_____ 2. No_____

Was it confirmed by a doctor? 1. Yes _____ 2. No_____

At what age did it start? _____Age in years

- Have you ever had asthma? 1. Yes_____ 2. No_____

IF YES
Do you still have it? 1. Yes_____ 2. No_____

Was it confirmed by a doctor? 1. Yes_____ 2. No_____

At what age did it start? _____Age in years

If you no longer have it, at what age did it stop? _____Age stopped

COUGH

Do you usually have a cough (Count a cough with first smoke or on first going out-of-doors. Exclude clearing of throat.) [If No, skip to questions on PHLEGM.] 1. Yes_____ 2. No_____

Do you usually cough as much as 4 to 6 times a day, 4 or more days out of the week? 1. Yes_____ 2. No_____

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Do you usually cough at all on getting up, or first thing in the morning? 1. Yes_____ 2. No_____

Do you usually cough at all during the rest of day or at night? 1. Yes_____ 2. No_____

IF YES

Do you usually cough like this on most days for 5 consecutive months or more during the year? 1. Yes_____ 2. No_____

For how many years have you had this cough? _____ Number of Years

PHLEGM

Do you usually bring up phlegm from your chest? 1. Yes_____ 2. No_____
(Count phlegm with the first smoke or on first going out-of-doors. Exclude phlegm from the nose. Count swallowed phlegm.)

(If No, skip to questions on BREATHLESSNESS.)

Do you usually bring up phlegm like this as much as twice a day, 4 or more days out of the week? 1. Yes_____ 2. No_____

Do you usually bring up phlegm at all on getting up, or first thing in the morning? 1. Yes_____ 2. No_____

BREATHLESSNESS

If disabled from walking by any condition other than heart or lung disease, please describe and proceed to next question.

Nature of condition(s): _____

Are you troubled by shortness of breath when hurrying on the level or walking up a slight hill? 1. Yes_____ 2. No_____

IF YES

B. Do you have to walk slower than people of your age on the level because of breathlessness? 1. Yes_____ 2. No_____

C. Do you ever have to stop for breath when walking at your own pace on the level? 1. Yes_____ 2. No_____

UCC 011255

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D. Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on the level? 1. Yes_____ 2. No_____

E. Are you too breathless to leave the house or breathless on dressing or undressing? 1. Yes_____ 2. No_____

TOBACCO SMOKING

Have you ever smoked cigarettes? (No means less than 20 packs of cigarettes or 12 oz. of tobacco in a lifetime or less than 1 cigarette a day for 1 year. 1. Yes_____ 2. No_____

IF YES

Do you now smoke cigarettes (as of 1 month ago)? 1. Yes_____ 2. No_____

How old were you when you first started regular cigarette smoking? _____Age in years

If you have stopped smoking cigarettes completely, how old were you when you stopped? _____Age stopped
Check if still Smoking _____

How many cigarettes do you smoke per day now? _____Cigarettes per day

On the average of the entire time you smoked, how many cigarettes did you smoke per day? _____Cigarettes per day

Do or did you inhale the cigarette smoke?
Not at all_____
Slightly _____
Moderately_____
Deeply _____

NOTE: These questions are derived from the "Epidemiology Standardization Project" (Benjamin G. Ferris, M.D., Principal Investigator) published by the American Thoracic Society in American Review of Respiratory Disease, (1978) Vo., 118(6).

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To: General Occupational Health Committee

B. L. Barton - Electrode Systems Division - Parma - Loc. 742
N. E. Bolton - Linde - Danbury R-4651
R. L. Bujalski - Tarrytown - Loc. 323
J. M. Cleverdon - Catalysts & Process Systems Division - Danbury - Q1633
T. L. Collins - Engineering & Technology Services - S. Charleston - Loc. 511
R. W. Cope - HS&EA - Danbury - P2608
J. M. Cwikla - HS&EA - Danbury P-2
V. D. Dutcher - UCAR Emulsion Systems - 410 Gregson Drive - Cary, NC 27511
W. S. Everett - Films-Packaging - Chicago-Summit - Loc. 358
T. A. Gagner - Home & Automotive - East Hartford - Loc. 329
N. W. Gaines - HS&EA - Danbury - P-2606
W. F. Gorham - Specialty Chemicals Division - Bound Brook - Bldg 200
D. A. Gosselin - Silicone & Urethane Intermediates - So. Chas. - 511
J. P. Gracie - UCCL Toronto - Loc. 440
R. E. Graebert - Polyolefins Div/Unipol Systems - Danbury - K-2
T. J. Hall - UC Europe/South Africa - Danbury P-4624
A. J. Hart - Medical & Industrial Services, Indianapolis, IN
S. E. Hine - Linde Division - Danbury, CT R4
J. C. Hovious/D. T. Watters - Engineering & Technology Services
South Charleston - Loc 511
E. K. Jensen - Linde - Danbury - R4656
V. H. Johnkoski - Ethylene Oxide/Glycol - So. Chas. - Loc. 511
J. M. Kettmann - UCAME - Danbury P-4
R. P. Lawlor - Law Department - Danbury - E-2282
R. M. Lawton - UCC Canada - Toronto - Loc 440
J. A. Leonard - Agricultural Products Co. Inc. - Loc. 985
D. Liebeskind - Silicone & Urethane Intermediates - Danbury - L-1494
T. A. Lincoln - HS&EA - Danbury - P-2594
W. H. Long - Carbon Products - Parma - Loc. 742
D. E. MacNab - UC Pan America, Inc., Danbury - P - 4
D. Pearson - Safety & Health - Rickmansworth, England
R. E. Plevan - Specialty Polymers and Composites - Danbury - M-1548
R. R. Rankin - HS&EA - Danbury - P-2605
H. B. Rhodes - Metals Division - Grand Junction, CO 81502 - P.O. 1029 - Loc. 250
J. F. Rooney - Battery Products - Rocky River - Loc. 781
H. D. Smilie - Electronics Division - Greenville, S.C.
E. D. Southard - Specialty Chemicals - Bldg. 98-208 - Bound Brook, NJ
J. L. Stahl - Union Carbide Eastern, Inc. - Hong Kong
W. R. van der Hoeven - Ethylene Oxide/Glycol - Danbury - M-3536
R. Van Mynen - HS&EA - Danbury - P-2607
K. W. Weinzheimer - UC Southern Africa - Johannesburg - Loc. 4435
B. L. White - Law Department - Danbury - E-2281
R. C. Wise - Solvents & Coatings Materials - Danbury - K-3
R. F. Wolff - Corporate Benefits - Danbury B3-159

cc: O. H. Cunningham - Solvents & Coatings Materials - Danbury K4
R. G. Hanlon - HS&EA - Danbury - P-2622
W. C. Kuryla - HS&EA - Danbury - P2
H. C. Lewinsohn - HS&EA - Danbury - P-2
O. P. Mukheja - HS&EA - Danbury - P-2
M. G. Ott - HS&EA - Danbury - P-2589

1529B
6/3/85

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WU-0097#95

To M.A. Patel

Phil Tate (x 4211) should be able to help you if it is a problem or analysis

Marty

TESTING AND RESEARCH SERVICE

UNION CARBIDE CORPORATION
P.O. BOX 8361, SOUTH CHARLESTON, WV 25303

March 20, 1985

Marty - There is a considerable interest in identifying asbestos in the insulation materials, ceiling tiles etc. Subsequent to identification, the monitoring of the ambient air may be required to establish any exposure condition. I would be interested in knowing if Corcom can do some work for us in identifying asbestos using electron microscopy. Currently we are using qualitative colorimetric test to identify asbestos in the insulation.

TO: R. A. Bleidt

FROM: M. W. Sue

cc: D. C. Best, 770-302
M. A. Patel, 701-330
L. K. Scholl, 740-4318
P. D. Sherman, 701-254
M. F. Stowers, 701-333
P. H. Tate, 770-124

Bob...

Thank you for the idea regarding the analysis of asbestos in ambient environments by TEM (attached). M.A. Patel

After checking a little on the subject I have found out the following:

- P. Tate has an old TEM, but it would need to be serviced before we could use it.
- SEM can be used in some cases, but according to Phil Tate, it also has some problems.
- L. Scholl of IH indicated that there was no regulation or push for ambient environmental monitoring. There is, however, a mandatory OSHA regulated, NIOSH method for personal monitoring for asbestos. The method, in brief, involves collecting air samples on a filter via a pump, then use of a phase contrast light microscope for counting. The work is done by M. Stowers at the Technical Center.

I think the identification of types of asbestos is something we could offer thru P. Tate's area if the need presents itself. The offering of asbestos analysis for personal monitoring could be checked out further as to UCC resources and market potential. Either service would open up a new clientel for T&RS.

I am asking, by way of this letter, for information by all copied regarding their knowledge of market need, size, etc. on either service.

Marty

Marty Sue

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2/22/85

RECEIVED
MAR 4 1985
MARTY SUE

To: Marty Sue ✓

MARTY...

Here is another idea for a service that could be marketed:

> 102: 88922q Accuracy of transmission electron microscopy for the analysis of asbestos in ambient environments. Steel, Eric B.; Small, John A. (Natl. Bur. Stand., Gaithersburg, MD 20899 USA). *Anal. Chem.* 1985, 57(1), 208-13 (Eng). Errors assocd. with the transmission electron microscopic (TEM) detn. of trace amts. of chrysotile asbestos in samples collected from ambient environments were investigated. The microscope can be the source of order-of-magnitude errors in the reported chrysotile concn. if the mech. stage, image quality, and electron diffraction capabilities do not meet the demanding requirements of asbestos detn. By use of a verified counting procedure, it was detd. that most operators of a TEM have less than 50% chance of finding and counting chrysotile fibers <1 μm long. However, accuracies >90% can be achieved on chrysotile fibers longer than 1 μm.

RAB

RABleidt

cc: D.C. Best
P.H. Tate

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