WV-0076 #26

PLAINTIFF'S EXHIBIT

UC-3304

Dr. G. F. Johnson

Building 706-M

George: In accordance with our telephone conversation of this morning, I am enclosing several abstracts taken from current literature which ascribe carcinogenic properties to inhaled asbestos particles. Mr. B. J. Cottrell suggested that you review this information and then route it to him.

By copy of this note, I am requesting that Fred Williams get in touch with you to see if you need any further information.

N.H.K

N. H. Ketcham/dww
December 14, 1967

Attachments

cc: Mr. R. M. Berg
Mr. B. J. Cottrell
C. U. Dernehl, M. D.
Mr. Fred Williams

Called George - Jan. 2, 9:50 AM. - Said one of dust dealt with 200 grams - he is now alerted and will contact us if work is done with quantities in the future

Jan.

UCC 000447

947 Insects as Potential Source of Ingestant Allergens. H.S. Bernton and H. Brown. Ann. Allergy 25, 381-387 (July, 1967).

The dialyzed extracts of eight food-contaminating insects have been used in a series of cutaneous tests. The entire life cycle of these insects is confined to plant products. The incidence of positive cutaneous reactions in a group of 230 unselected allergic patients is 68% or 30%. The incidence of positive cutaneous reactions in a group of 194 "normal" non-allergic individuals is 50% or 25%. The allergen of four insect extracts is thermostable. Preliminary tests indicate the presence of skin-sensitizing antibodies and precipitins among the reactors of both the allergic and non-allergic. Insect-contaminated food is unavoidable. Twenty-eight per cent of our combined groups exhibit a skin sensitiveness. A more definite characterization of allergens and antibodies by the immunologist will help indentify those of clinical importance. The Indian meal moth heads the list of insects capable of provoking positive skin reactions.
-- J. Am. Med. Assn. References & Reviews

948 Teflon Embolism of Coronary Arteries. F. Gonzalez-Crussi, et al. J. Thoracic & Cardiovasc. Surg. 54, 53-59 (July, 1967).

A patient is described who developed coronary embolism of Teflon material from a Hufnagel prosthetic aortic cusp. Bacterial endocarditis appeared to have contributed significantly to development of the embolic phenomena. The case is unusual in that the clinical, bacteriological, and histopathological evidence indicated an eradication of the active bacterial endocarditis during life, and the patient succumbed to the effects of coronary Teflon embolism.
-- J. Am. Med. Assn. References & Reviews

949 Immunological Diagnosis of Type of Snake in Snake Bite. E.R. Trethewie and P.A. Rawlinson. Med. J. Austrialia 2, 111-113 (July 15, 1967).

Serum expressed from the region of simulated bite and actual snake bite in animals has been separated and has been shown to react specifically with a series of antivenenes. The technique employed for this analysis is double diffusion in agar, and while the reaction time has varied from two to five hours, it is expected to speed this up to one hour or less with certain modifications. In the first instance one should give antivenene according to the type of the snake, if this information is available, and taking into account the geographical distribution.
-- J. Am. Med. Assn. References & Reviews

950 Occupational Disability in Patients With Chronic Airway Obstruction. C.F. Diener and B. Burrows. Am. Rev. Resp. Dis. 96, 35-42 (July, 1967).

In a group of 99 emphysema-bronchitis patients who were not disability applicants, work status was closely related to the exertional demands of their usual occupations and to measurements of expiratory slowing. Electrocardiographic findings had some independent usefulness in predicting work status. Pulmonary function tests and other clinical and laboratory data did not further improve this prediction. As a rule, patients with a forced expiratory volume (one second) ($FEV_{1.0}$) of 1.0 liter or more continued to work unless their occupations were very demanding physically. The prognosis for continuted employment was poor when the $FEV_{1.0}$ was below 0.75 liter regardless of occupation. -- J. Am. Med. Assn. References & Reviews

951 Emphysema Produced in Dogs by Cigarette Smoking. O. Auerbach, et al. J. Am. Med. Assn. 199, 241-246 (Jan. 23, 1967).

Pulmonary fibrosis and emphysema, similar to those conditions in human beings, were found in dogs that had smoked cigarettes twice daily for more than 420 days. There are 9 references.
-- Public Health Eng. Absts.

952 Asbestosis and Malignancy. N. G. Demy and H. Adler Am. J. Roentgenol. 100. 597-602 (July, 1967).

History reveals a relationship between asbestosis and malignancy. A study based on 20 years' experience with asbestosis in an industrial community shows a correlation between malignancy and long-term exposures varying from 15 to more than 25 years. Of 47 patients studied, 36 had carcinoma, one had fibrosarcoma, and 10 had mesothelioma. All of these 47 patients had previous long exposure to asbestos products and processing.
-- J. Am. Med. Assn. References & Reviews

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occurrence in the asbestos workers was attributed to the greater carcinogenicity and possibly to exposure to asbestos dust of greater concentration as compared to commercial talc. Carcinoma of the gastrointestinal tract and peritoneum showed no significant difference in the talc and control populations. However, in the asbestos workers gastrointestinal and peritoneal malignancies were elevated significantly. Death due to pneumoconiosis or its complications, or both, was recorded in 28 individuals, 19 of whom died from cor pulmonale. The cause of death in the remaining nine was tuberculosis (5) or bronchopneumonia (4). The lapsed time from first talc exposure to death from pneumoconiosis or complications, or both, averaged 25.9 years, with a range from 15 to 39 years. Excluding cor pulmonale, there were 25 cardiac deaths, 19 of which were due to coronary artery disease, three to hypertensive heart disease, and three to rheumatic heart disease. Of the 91 death cases, data on environmental exposure were available in 80. The mean duration of exposure for this group was 24.7 years with a range of 15 to 47 years. Previous studies have indicated that cor pulmonale was a major cause of death among talc miners and millers. This was also found in the present study. However, what has not been previously brought out is the increase in observed incidence of carcinoma of the lung among these workers as demonstrated in this study. There are 9 references. -- Authors' summary

866 Health Hazards of Asbestos. Recent Studies on its Biological Effects. Wyers Memorial Lecture, 1965. J.C. Gilson. Trans. Soc. Occ. Med. 16, 62-74 (July, 1966).

The author discusses the subject under the following headings: Types of fiber and production recent animal experimental work with asbestos; inhalation of fibers; experimental asbestosis; experimental carcinogenesis; health hazards of asbestos; asbestosis-present position in the U.K.; asbestos exposure and cancer; bronchial tumors; diffuse mesothelial tumors; and outstanding problems.

867 Danger of Asbestos for General Population. J. Cuthbert. Munch. med. Wochschr. 109, 1369-1372 (June 23, 1967).

Formation of asbestos bodies and the development of interstitial pulmonary fibrosis are possible sequelae of the inhalation of asbestos. The increase in pulmonary carcinoma can be traced back to extensive contact with asbestos and to asbestosis. Heavy air pollution with asbestos dust leads to the classical form of asbestosis. A decrease in asbestos dust possibly provides the time necessary for the development of the carcinogenic effect of asbestos. Cases are presented in which endotheliomas have formed many years after a short contact with asbestos. Increased import and use of asbestos increase the danger connected with it. Carpenters who manufacture asbestos plates or persons who live in the neighborhood of asbestos factories, are especially exposed. -- J. Am. Med. Assn. References & Reviews

868 Looking at Foundry Air Pollution Problems. M. Sterling. Foundry 95, 136-138 (March, 1967).

The need to control emissions associated with sand handling and preparation, shakeout, grinding, chipping, cleaning, control of cupola emission, and similar activities are discussed. Degrees of code severity associated with estimated cupola and collector performance requirement and levels currently specified in several major urban areas are shown in tables. The approach to control dust and fumes was to install a water spray system utilizing a wetted cone baffle or similar configuration. Venturi scrubbers and other devices have been installed. Control codes, systems, future cupola control, and specific needs are discussed.

-- APCA Absts.

869 Measurement of the Projected Area of Dust Samples. G. B. Rodgers. J. Sci. Instr. 44, 217-218 (March, 1967).

A diffraction instrument for determining the size distribution and respirable surface area of dust samples is described. The dust sample is collected on a glass slide which is aluminized so that each dust particle is imaged as an aperture of the projected area in the aluminum film. Stability and a logarithmic scale are obtained by placing the photovoltaic detector in the feedback loop of an operational amplifier using a logarithmic diode as the feedback element. Absolute calibration is done by using a number of artifical samples consisting of one or more circular apertures of 50 millimicron diameter punched in aluminum foil.

-- APCA Absts.

 UCC 000449

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482 Simplified Method for Determining Cascade Impactor Stage Efficiencies. J. C. Couchman and H. M. Moseley. Am. Ind. Hyg. Assn. J. 28, 62-67 (Jan.-Feb. 1967).

A direct method has been devised for measuring cascade impactor stage efficiencies. The method makes use of a special two-stage configuration of the sampler being calibrated. To employ the method, it is necessary only to measure the unnormalized density function of the source and the unnormalized density function of the particles collected on the second of two identical impactor stages. With this method, an impactor stage can be calibrated in a few hours. - Authors' abst.

483 The Mineral Content of Bituminous Coal Miners' Lungs. J. V. Crable, et al. Am. Ind. Hyg. Assn. J. 28, 8-12 (Jan.-Feb. 1967).

Lung samples from 30 bituminous coal miners have been analyzed for coal and noncoal dust. The latter has also been analyzed for quartz, other crystalline substances, and metallic constituents. Initially, the sample is freeze dried, and ground in a mullite ball mill, and suitable aliquots are then digested by the King and Gilchrist procedure. Following the destruction of the lung matrix, the total dust is determined gravimetrically. The loss obtained on igniting the total mineral residue at 380°C represents the weight of the coal fraction. The resulting noncoal residue is then aliquoted for the determination of quartz and for the identification of other crystalline substances by x-ray diffraction. The analysis for the metallic constituents is accomplished by emission spectrography. Particle size analysis of the noncoal fraction is conducted by an electron microscopic procedure. Seven references are given. - Authors' abst.

484 On the Carcinogenic Effect of Asbestos Dust. F. M. Kogan, et al. Gigiena i Sanit. 31, No. 8, 28-33 (1966). Russian.

When the death rate from lung cancer between 1953 and 1962 was compared among asbestos workers, the town population, and the Sverdlovsk region population, the rate among workers was three times that of town dwellers and the rate of the town dwellers was two times that of the general population of the region. The possible causes of increased mortality among those inhaling asbestos dust are discussed. There are 27 references. -- Public Health Eng. Abstr.

PHYSICAL ASPECTS OF THE ENVIRONMENT

485 Content and Turnover of Water in Bantu Miners Acclimatizing to Humid Heat. W. V. MacFarlane, et al. J. Appl. Physiol. 21, 978-984 (May, 1966).

Water content averaged 77% of body weight initially. This fell while average weight increased during exposure to heat. There was no general increase in water turnover during acclimatization. Those subjects in whom body temperature was well controlled, increased water turnover, whereas those with oral temperatures frequently above 101°F during work, decreased turnover by 11%. There are 19 references. -- Public Health Eng. Abstr.

486 A Test of the Effectiveness of Acclimatization Procedures in the Gold Mining Industry. C. H. Wyndham, et al. J. Appl. Physiol. 21, 1586-1588 (Sept. 1966).

The test comprises a 4-hour exposure at 90°F (with the air almost saturated with water vapor) at an air velocity of 80 ft/min, and oxygen consumption of 1 liter/min (5 cal/min). A statistical technique, based upon the standard deviations of rectal temperatures, heart rates, and sweat rates, is presented for judging the results. The test has been applied where laborers are acclimatized for service in the gold mining industry, and the results indicate its effectiveness for this purpose. There are 6 references. -- Public Health Eng. Abstr.

487 Absolute Thresholds of Human Hearing. E. R. Hermann and B. R. Holzman. Am. Ind. Hyg. Assn. J. 28, 13-20 (Jan.-Feb. 1967).

Data obtained from high school students indicate that distributions of hearing thresholds determined by puretone audiometry are log-normal. A graphically simplified mathematical method for determining the loci of absolute thresholds of human hearing is presented. Sound pressure levels at which the best ear in a population first responds to stimulation are some 25 to 30 db less than median values. An elegantly simple equation is derived for determining the point of origin of a log-normal frequency distribution. The statistical method developed for this

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182 Rheumatoid Factor in Serum of Individuals Exposed to Asbestos. B. Pernis, et al. Ann. N.Y. Acad. Sci. 132, 112-120 (Dec. 31, 1965).

The presence and titer of rheumatoid factors in the sera of 315 asbestos insulation workers and of 103 controls were determined by conditioned hemagglutination with tanned red cells coated with aggregated human or rabbit gamma globulins. The asbestos workers were exposed to the dust for periods from 1 to 54 years, and most of them showed x-ray evidence of asbestosis that was graded into grades from one to three. A definite increase in frequency and titers of rheumatoid factors in the controls of same age and sex, was found in workers with asbestosis of grades in two and three. Similar serological abnormalities are found in cases of pulmonary fibrosis of different origin, idiopathic, silicosis, coal workers' pneumoconiosis, and sarcoidosis.

-- APCA Absts.

183 Occupational Hazards of Pipe Insulators. W. T. Keane and M. R. Zavon. Arch. Environmental Health 13, 171-184 (Aug. 1966).

In this survey the attempt has been made to investigate all of the substances with which insulators come in contact in the normal pursuit of their trade. In the present state of technology, and in the light of existing medical and toxicological data, the majority of the substances examined proved incapable of presenting a serious health hazard to insulators. The only insulating substance which justifies concern is asbestos. This report and other available scientific data at the present time are insufficient to provide an adequately based conclusion. The most convincing data are those of Selikoff. The further results of his and other investigations will be awaited and should contribute toward sound judgment of this matter. There are 155 references. -- Authors' summary

184 Malignancies in Asbestos Workers. J. Lieben. Arch. Environmental Health 13, 619-621 (Nov. 1966).

A study of 68 hospital admissions with asbestosis from an asbestos textile and friction materials plant included 21 malignancies—13 of these were carcinoma of the lung and eight carcinomas of other organs. Eighteen of the patients had exposures to asbestos in their occupational environment for a period of 10 to 36 years. Only three patients had their first exposure after 1940. Extensive dust control measures have been instituted by the plant. There are six references.

-- Author's summary

185 Exposure to Asbestos and Malignancy. Anonymous. London Clin. Med. J. 7, 10-11 (Jan. 1966).

Recent surveys have shown asbestos bodies to be present in many of the otherwise normal lungs of those living in clean, non-industrial communities, suggesting that environmental contamination with asbestos dust is widespread. Perhaps this is not altogether surprising considering the variety of domestic asbestos products that exist and their wide use in modern building. Present evidence suggests that there is a wide spectrum of pathological changes resulting from asbestos inhalation. Prominence was given recently to the relationship between asbestos exposure and mesothelioma. Possible widespread community contamination by asbestos clearly calls for a full assessment of its carcinogenic properties. Both crysotile and crocidolite have been associated with bronchial carcinoma and mesothelioma, but amosite has not. It follows that both qualitative and quantitative analyses of asbestos in tissues could be most helpful in the further elucidation of this problem. In addition the relationship between asbestos exposure, smoking, and neoplasia formation, requires analysis.

-- APCA Absts.

186 Pleural Calcification as a Sign of Silicatosis. M. Kleinfeld. Am. J. Med. Sci. 251, 215-224 (Feb. 1966).

Of the agents capable of producing a pneumoconiosis, only asbestos, talc, and mica (and rarely, free silica) have so far been incriminated in the production of pleural calcifications. Such calcifications following silicate exposure may vary from a few linear or circular plaques over the dome of either or both leaves of the diaphragm or the lateral chest wall to formation of an extensive shell over the whole lung field. The configuration may be bizarre, but the nature of the calcification usually is readily apparent on standard posteroanterior and lateral films. Pleural calcification is usually asymmetric. The plaques are most frequently located over the dome of the diaphragm rather than in other lung areas. Clinical and environmental evaluation was made of eight workers showing varying degrees of pleural calcification from exposure to talc, asbestos, or mica. The minimal duration of exposure was 23 years and the longest, 54 years. Respiratory symptoms, chiefly dyspnea, were present in six. Four of the six showed clubbing. In five,

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1006 Asbestos, An Intrinsic Factor in the Pathogenesis of Bronchogenic Carcinoma and Mesothelioma. W.M. O'Donnell, R.H. Mann, and J.L. Grosh. Cancer 19, 1143-1148 (Aug. 1966).

In 55 asbestos textile workers who had pathologically proven asbestosis, 28 malignant neoplasms were found—23 bronchogenic carcinomas and five mesotheliomas of peritoneum or pleura. Of the 28 patients with neoplasms, 26 had been exposed to asbestos dust before 1936; the medium total occupational exposure was 20 years. The interval from initial exposure until the recognition of the neoplasms varied from 20 to 40 years. Thirteen of the individuals no longer were employed in the industry when evidence of the neoplasms appeared. The primary anatomical site of the carcinomas was in the lower lobes of the lungs in 22 patients and in one instance was multicentric in origin. In the morphologic classifications of the neoplasms, ten were of the squamous cell variety; seven were anaplastic; five were adenocarcinoma and one was bronchiolar. The frequent association of pulmonary asbestosis with bronchogenic carcinoma (42%) and mesothelioma (8%), as seen in this study, lends further support to the opinion that asbestos is a carcinogen in susceptible individuals after critical exposure in the textile phase of the industry.-- Authors' abst.

1007 Biological Action of Glass Dust. K. Szymdzykiewicz. Med. Pracy (Lodz) 16, (4) 263-277 (1965).

In experimental conditions the biological action of two kinds of dust has been examined. These were polygonal glass dust, its geometric mean of particle size distribution being 2.5 microns, and fibrous dust, its geometric mean being 10.5 microns. Several experiments were carried out. In the first, both kinds of dust were administered to rats of Wistar race in doses of 0.5 mg., 2.5 mg., and 5.0 mg. in the form of suspension in 0.02 ml. of 0.9% sodium chloride between mesentery laminae of the small intestine. The animals were called (sacrificed) after three months; the nodules formed in places of dust injection were weighed and examined histopathologically. The increase of nodule weight in relation to the mass of injected dust was considered to be the measure of dust aggressiveness. It was stated that the mean increase of nodules weight after polygonal glass administration amounted to 3.7% and after fibrous glass administration to 270.0%. In the nodules the development of collagenous fibers was observed. In further experiments both dusts (in the amount of 50 mg./animal) were given by means of intratracheal injection to rats of Wistar race and to guinea pigs. The lungs and mediastinum lymphatic glands of the rats were examined after ten months and those of guinea pigs after 22 months. The hydroxyproline in the lungs was determined with Neuman Logan's method, and the histopathological and histochemical examinations were made. In all animals, statisically significant collagen increases ($p < 0.01$) were found in comparison with animals of the control group; however, no difference was seen in the collagen level in the lungs of animals which were given polygonal and fibrous dusts. Results of histopathological examinations have shown in all animals atelectasis foci and emphysema, fine-celled infiltrations around dust deposits and the increase of acid and neutral mucopolysaccharides. In animals which lived over ten months the slight development of silver absorptive and collagenous fibers was observed. Emphysema foci and atelectasis were greater in animals which were given fibrous glass dust. In animals which received polygonal dust, the inflammatory changes were prevalent. In the mediastinum lymphatic glands, were observed catarrhal alterations in sinuses, dust deposits, and abortive gigant (sic) cells. Fibrous glass dust provokes more severe injury of the lungs than polygonal dust. There exists a great probability of the development of fibrous changes of pneumoconiosis-like type when the exposure to great concentration of glass dust is prolonged.
-- APCA Absts.

EDITOR'S NOTE: Assuming that the abstract accurately translates the author's findings, the following comments are pertinent: (1) Quantitation of morphologic changes such as those of inflammation in sections of lung is subjective and uncertain. When possible, chemical determination of hydroxyproline as a measure of connective tissue proliferation is a much more reliable indicator of degree of chronic inflammation. The author's findings indicate insignificant difference in hydroxyproline content of lungs exposed to filamentous glass versus those exposed to polygonal glass. The author's predictions of fibrous changes from glass dust exposure are not supported by his own findings or by work in our own laboratory. (2) As no mention is made of the Ciba Symposium[1] definition of emphysema, it is likely that the emphysema described may be an artefact. (3) Inflammatory changes observed in animal lungs at autopsy may be due to epizootic infection. As they are often found in control as well as exposed animals, the greatest caution and judgment is required to avoid erroneous interpretation. (4) Pulmonary pathological effects should not be predicted from connective tissue changes in the mesentery (or elsewhere), because of basic differences in tissues and also conditions of exposure (i.e. respirability of particles). --PG

[1] Ciba Guest Symposium Report: Symposium, Sept. 1958. Thorax 14:286, 1959.

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886 Cancer of the Lungs and Other Diseases After Exposure to Asbestos Dust. K. F. W. Hinson. Brit. J. Diseases Chest 59, 121-129 (July, 1965).

That exposure to the fibers of asbestos may cause a disabling and fatal fibrosis of the lungs has been recognized for many years. That patients with an established fibrosis (asbestosis) have a high incidence of bronchial carcinoma is also known. During the last few years there has been an accumulation of evidence to suggest that certain pleural or peritoneal tumors may be associated with a slight, and therefore possibly unrecognized, exposure to these minerals. The world production of asbestos has been increasing rapidly since 1959 and its industrial uses are becoming more varied. Three varieties of asbestos are most often used industrially: chrysotile (white asbestos) crocidolite (blue asbestos), and amosite. In Great Britain, exposure to asbestos dust might be to any or all three of the above kinds of asbestos; on the North American Continent it would probably be to chrysotile because of the huge native deposits found in Canada. The author discusses briefly the pathogenesis of asbestos, but dwells much more on the possible relationship of asbestos exposure and pleural tumors and tumors of the peritoneum. He also reviews the literature concerning the probable association between asbestosis and carcinoma of the lungs. Mentioned are the findings of J. G. Thomson and his co-workers (Industrial Hygiene Digest, Abst. 663, July 1963) of the high incidence (26.4%) of asbestos bodies found in the lung fluid of 500 consecutive autopsy subjects in South Africa. One of the authors of the paper on those findings is said to consider that the incidence in Miami, Florida, would be even higher.

-- APCA Absts.

887 Asbestos Related Disease. H. L. Hardy. Am. J. Med. Sci. 250, 381-389 (Oct. 1965).

Four cases of asbestos related disease have been briefly described. Together with past and presently accumulating evidence, epidemiologic and experimental, these cases illustrate the potential hazard posed by asbestos exposure to both worker and neighbor. The purpose of this report is to interest clinicians in the harmful biologic effects of asbestos already documented. Evidence is impressive that asbestos exposure, often delayed in effect, will in the future be responsible for an important amount of pulmonary disease, especially chest tumors. In addition new evidence points to asbestos exposure as being significantly associated with abdominal tumors as well.

-- APCA Absts.

888 Chemical Studies of Asbestos. J. S. Harington. Ann. N. Y. Acad. Sci. 132, 31-47 (Dec. 31, 1965).

Further chemical studies of the three main types of asbestos, crocidolite, amosite, and chrysotile have been made. The origin of the primary oils associated with crocidolite and amosite has been discussed. By suitable methods 0.32% of extractable material can be removed from crocidolite and 0.28% from amosite. A sample of commercial amosite known to be carcinogenic yielded 0.76% of extractable material. Chemical investigations have been made of the oils from crocidolite and amosite by various techniques. Low levels of polycyclic aromatic hydrocarbons were detected. In addition to the primary oils, asbestos may contain secondary oils derived from contamination or from the intentional application of oil during processing in industry. Up to 80% of the jute oil in the jute bags used for storing asbestos may be absorbed by the asbestos fiber. This could explain why chrysotile, which apparently has no primary oils, may contain, after milling and other industrial treatment, yields of from 0.1 to 0.4%. Insulation materials also contain significant amounts of extractable material. Finally, studies have been made to assess wherever possible, the part which metals and metal complexes may play in the carcinogenic action. --APCA Absts.

889 Some Observations of the Dust Content and Composition in Lungs With Asbestosis, Made During Work on Coal Miner's Pneumoconiosis. G. Nagelschmidt. Ann. N. Y. Acad. Sci. 132, 64-76 (Dec. 31, 1965).

In the conclusion of this paper it is said that the most interesting result of this study of lung tissue from asbestosis sufferers, was that in over half the lung tissue samples from Great Britain and South Africa practically no asbestos at all was found irrespective of the grade of fibrosis. It is unlikely that this was due to faulty technique although further study of the technique of recovery of asbestos, especially of chrysotile, from lungs is undoubtedly required. It is likely that this effect—the disappearance of asbestos from the lungs—is real and needs to be explained. The most likely explanation is that asbestos does get dissolved in the lungs. The process of dissolution is likely to start with a removal of the cations, magnesium, sodium, iron, and aluminum, which would leave a skeleton of hydrated silica or polysilicic acid. On physiochemical and structural reasoning one would expect chrysotile to be most easily attacked, crocidolite to be intermediate, and amosite to be the most resistant form. The finding of amosite only in some of the lung residues would be in agreement with such reasoning. The most prevalent type of fibrosis seen in asbestos is a diffuse interstitial fibrosis, in contrast to focal or nodular lesions

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