A Health View of Asbestos
An Annotated Literature Collection - 1960-1974

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A Health View of Asbestos: An Annotated Literature Collection — 1960-1974*

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Introduction

Asbestos is everywhere! Possessing an enigmatic history of incalculable risks — and benefits — asbestos now reaches into our daily lives by myriad means. Long used in relatively small amounts for centuries asbestos uses and demands have gained momentously in our modern industrialized society. In the last 60 years, global use of asbestos has increased more than 100-fold — from 30,000 tons to four million tons. Asbestos is widely stated to be a constituent in at least 3,000 manufactured products. Industrial usefulness of asbestos stems particularly from its natural properties — nonflammability, flexibility, tensile strength, low density, resistance to acids and alkalis, and high electrical resistivity.

Resultantly, widespread dissemination in the total environment is revealed by asbestos fibers in the air we breathe, the food and beverages we consume, and the water we drink. Asbestos thus no longer represents singly an occupational hazard but a menacing and growing problem of environmental pollution threatening everyone.

Accordingly, interest in the health aspects of asbestos has gained both scientific and social momentum in recent years — two major national meetings have been convened on the adverse health hazards and ultimate consequences of asbestos: the first was held at the New York Academy of Sciences in 1964 [Ann. N.Y. Acad. Sci. 132(1): 1965] whereas the second took place ten years later at the National Institute of Environmental Health Sciences in 1974 (Environ. Health Perspect, No. 9: 1974).

Historically, significant asbestos literature, in addition to the above proceedings, include A. J. Lanza's Silicosis and Asbestosis, Oxford Univ. Press (1938), the National Academy of Sciences' Asbestos. The Need For and Feasibility of Air Pollution Controls (1971), and the National Institute for Occupational Safety and Health's Criteria for a Recommended Standard . . . Occupational Exposure to Asbestos (1972). The International Agency for Research on Cancer (IARC) published in 1973 a critical Monograph on Asbestos which permits an evaluation of the carcinogenic risk to man (IARC Monographs on the Evaluation of Carcinogenic Risk to Man: Some Inorganic and Organometallic Compounds. Volume 2). Geographical, mining, production, and use data are presented in the United States Mineral Resources Geological Survey Professional Paper 820 (1973) and the Bureau of Mines Bulletin 650 on Mineral Facts and Problems (1970). In 1972 P. Brodeur wrote a popular account of Asbestos and Enzymes (Ballantine Books). Recently C. Kenton prepared a National Library of Medicine Literature Search (No. 73-31) containing 363
keywored citations on Asbestos Toxicity. January 1970 through July 1973. The asbestos literature — as is most published literature — is scattered throughout the world in diverse sources. Recently the Biomedical Sciences Section began building a computerized data base on asbestos for the period 1960 into 1974 emphasizing hazards and clinical aspects. Entries were expediently selected to represent a cross section of the total asbestos literature and to complement this issue (No. 9) of Environmental Health Perspectives. These 549 records each consist of author(s), title, journal, citation, factual abstract, and keyterms. Author, keyterm, and permuted title indexes serve as entry ports into the record file. The listing is arranged by year — the most current year first — and alphabetically within each year by author. The number of references in our collection as categorized by year are:

Original papers were annotated whenever possible; some few were taken from abstract journals. Annotations reflect author's remarks and conclusions as they appeared in the literature. Our computerized asbestos collection will be updated on a routine basis, with periodic publication and dissemination.

Acknowledgements

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Abstracts

<1> Anonymous, Asbestos in the air., Environ. Act., May 11: 15 (1978).

The GAP Corporation plans to shut down its Lowell, Vermont asbestos mine in March, 1975 rather than meet the pollution control requirements of the Environmental Protection Agency. The Corporation cites cost of required pollution control devices as the reason. Company officials say they will sell the mine for a "salvage price" of 860,000. Local people are negotiating with the company for possible purchase.

ASBESTOS; OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION

<2> Anonymous, Asbestos in the water: Temporizing with cancer., Consumer Reports, 6: 438 (1974).

Asbestos-lile fibers have been found in the drinking-water of cities across the U.S. including Duluth, Boston, New York, Philadelphia, Atlantic, Chicago, Dallas, Kansas City, Denver, San Francisco, and Seattle. The presence of asbestos is certain in Duluth and San Francisco water only; however, the presence of asbestos is probably widespread in drinking-water due to leaching from asbestos-cement pipe used in water systems in addition to industrial contamination. The opinion is given that community water systems fail to respond to water contamination other than bacterial.

ASBESTOS; CANCER; ENVIRONMENTAL CONTAMINATION

<3> Anonymous, Asbestos, Food Chem. News, 16(7): 2 (1974).

The Food and Drug Administration (FDA) is expected to ask the Environmental Protection Agency (EPA) to clarify its decision prohibiting use of the Duluth, Minnesota water supply, since EPA lacked information about the asbestos content of other cities water supplies. The FDA noted that the water supply in San Francisco contains more asbestos naturally than does the water in Duluth.

ASBESTOS; ENVIRONMENTAL CONTAMINATION; STANDARDS

<4> Anonymous, Asbestos, Food Chem. News, 16(8): 50-51 (1974).

The Commissioner of the Food and Drug Administration (FDA) requested clarification of the ban by the Environmental Protection Agency (EPA) of the use of the Duluth water supply for human consumption. The Agency has been informed that the San Francisco water supply is naturally contaminated with asbestos fibers from serpentine rock and that the majority of asbestos fibers found in the water supply of Duluth, Minnesota is short (% in length), whereas fibers implicated in the development of malignancy are very long. The FDA is questioned about future plans to reclassify water supplies of other cities, since it is FDA's responsibility to enforce the ruling.

ASBESTOS; INGESTION; ENVIRONMENTAL CONTAMINATION; STANDARDS; HUMAN

<5> Anonymous, Asbestos, Food Chem. News, 16(9): 2 (1974).

No increase in cancer deaths was shown in review of death certificates by the MCI of Minnesota residents whose water supply was contaminated by asbestos fibers from a taconite mill. Researchers agree that it is to early to make a positive decision on the effects of asbestos fibers because of the long latency period (20-40 years) associated with asbestos diseases.

ASBESTOS; HUMAN; ENVIRONMENTAL CONTAMINATION; INGESTION; CANCER

<6> Anonymous, FDA optical test method criticized by USDI, environmental groups., Pest. Chem. News, 2(4): 22 (1974).

The Food and Drug Administration's proposed optical method of detecting asbestos was criticized by Malcolm Pons, the Environmental Defense Fund and the Center for Science in the Public Interest as being insufficient to identify small amounts of amphiboles and chrysotile in commercial talcs. Malcolm Pons recommended the following procedure: optical screening to identify coarse grained primary amphiboles and chrysotile if present; fibers longer than 10 µ; x-ray powder diffraction examination if the amount of asbestos present is greater than one weight percent; and electron microscopy, electron diffraction, and energy dispersive semi-quantitative chemical analysis to make an absolute mineralogical identification.

ASBESTOS; ANALYSIS; STANDARDS; CHRYSOTILE; ENVIRONMENTAL CONTAMINATION

<7> Anonymous, Asbestos, Food Chem. News, 16(2): 2 (1976).

The Asbestos Research Council stated in a report to the FDA that, according to research by TPA Industrial Products, Ltd., asbestos filters used for beer processing did not introduce "any additional asbestos fibers" in to the beer.

ASBESTOS; ASBESTOS FILTERS; FOOD CONTAMINATION

<8> Anonymous, FDA treatment of asbestos filters criticized; firms warn of substitute., Food Chem. News, 15(83): 30-31 (1974).

Even though the Food and Drug Administration placed no restrictions on the use of asbestos filters in the food and beverage processing industries, it should have made a strong, affirmative statement for the continued use of asbestos filters according to some firms. The firms noted that in some instances asbestos filters are being replaced by micro-glass filters which may prove to be even more dangerous.

ASBESTOS; STANDARDS; FOOD CONTAMINATION; ASBESTOS FILTERS
Anonymous, New asbestos detection alternatives submitted to FDA., Pest. Chem. News, 2(7): 8-9 (1974).

The Cosmetic, Toiletry and Fragrance Association (CTFA) called the FDA's proposed optical method for detecting asbestos in talc "premature" and suggested deferment until: (1) the standard deviation of the proposed test method is determined; (2) an evaluation is done to validate the assumption that a single milligram sample is statistically representative of the lot; (3) a re-evaluation of the cost and practicality of the test method is accomplished; and (4) and intensive search is made for a more reliable and practical test method. Alternative methods suggested to detect chrysotile and tremolite in talc were: optical microscopic methods, x-ray step scanning, x-ray scanning optical microscopy, x-ray scanning, differential thermal analysis, scanning electron microscopy and transmission electron microscopy electron diffraction.

ASBESTOS; ANALYSIS; STANDARDS; TALC

Breiling, J.L., Potential hazard from eating rice coated with glucose and talc., J. Amer. Med. Assoc., 228(4): 1 (1974).

Rice often is coated with glucose and talc to improve the appearance of the rice kernel. Due to the potentially carcinogenic nature of asbestos, the FDA requires that asbestos-free talc be used. The Rice Millers Association has urged the FDA to ban the coating of milled rice because it conceals the true nature of the rice kernel, adds to the cost of the rice and must be washed off before use, further reducing the nutritive value.

ASBESTOS; STANDARDS; CANCER; INGESTION; FOOD CONTAMINATION; HUMAN

Ellison, A.M., Progress in instrumentation and techniques for measurement of air pollutants., National Environmental Research Center; Office of Research and Development; Environmental Protection Agency, EPA-650/2-74-015: p. 12 (1974).

Adequate methods are available for measuring the emission of the hazardous air pollutants, mercury and beryllium. However, the electron microscope technique for determining asbestos in filtered ambient air samples is not rapid enough to support an emission standard. Work in progress to find an adequate technique for measuring source emissions of asbestos.

ASBESTOS; STANDARDS; ANALYSIS; ENVIRONMENTAL SAMPLING

Gibbs, G.W.; LaChance, M., Dust-fiber relationships in the Quebec chrysotile industry., Arch. Environ. Health, 23(2): 69-71 (1974).

Most routine measurements of airborne asbestos concentrations have been made by the sidet impinger method which has relatively low efficiency for fiber collection and primarily gives a particle (dust) count. Fiber concentration is probably more important with respect to disease and the membrane filter method is more efficient in determining fiber count. No correlation was found among 87 counts made by both the paired sidet impinger and membrane filter methods and no conversion factor between the two could be calculated. Until the relationships can be ascertained, safety standards should continue to be based on dust counts for which much epidemiological support exists, rather than fiber counts.

ASBESTOS; ANALYSIS; STANDARDS; ENVIRONMENTAL SAMPLING

Libshitz, N.I.; Worchha, M.S.; Atkinson, G.W.; Southard, M.E., Asbestososis and carcinomas of the larynx., J. Amer. Med. Assoc., 228(12): 1571-1572 (1974).

A possible association between asbestosis and carcinomas of the larynx is suggested in three case histories of men employed in the asbestos industry. All had chest x-rays consistent with asbestosis and had smoked at least a pack of cigarettes a day for a considerable length of time. All three are expected to have asbestoid carcinomas of the larynx. No precise causative role could be assigned to asbestos and a synergistic effect of cigarette smoking and asbestos exposure was possible.

ASBESTOS; ASBESTOSIS; CARCINOMA; CANCER; OCCUPATIONAL EXPOSURE; X-RAY

Mason, T.J.; McKay, F.W.; Miller, R.W., Asbestos-like fibers in Duluth water supply., J. Amer. Med. Assoc., 228(8): 1019-1020 (1974).

Because high concentrations of asbestos-like fibers were found in the drinking water of Duluth, MN 0 study was made to determine if the fibers were related to cancer mortality. Data were abstracted from death certificates of all persons who died of cancer in the U.S. from 1950 to 1969 and the number of deaths due to cancer in whites was tabulated according to age, sex, and five-year intervals. The age-adjusted cancer death rates for Duluth were also tabulated and a comparison made with those from the state of Minnesota and Hennepin County. Of 21 cancer sites in the study, only mortality rates from rectal cancer increased significantly (P < .05) with time and especially in the most recent five year period. Based on other studies from occupational exposure to asbestos the death rate from cancer of the esophagus and stomach should have increased to a greater degree than that for the rectum but did not. There were no significant excess deaths from cancer among persons under 20 years of age. A longer follow-up study is necessary to determine if a relationship exists between cancer and asbestos in the Duluth drinking water.

ASBESTOS; CANCER; CANCER MORTALITY; ENVIRONMENTAL CONTAMINATION; INGESTION; NON-OCCUPATIONAL EXPOSURE
Quebec, chrysotile dust exposure. A total dust exposure index for each worker was calculated based on time and extent of dust exposure. An examination of the mortality of the workers showed no cause of death (except pneumoniosis) with a rate above that of the general population. Excess death from respiratory causes, at most, 50% above expectation, based on age-specific rates for Quebec and the mining region. Breathlessness on exercise, diminished inspiratory capacity, parenchymal and pleural changes, and respiratory disease mortality were related to dust exposure and to each other. Safety standards for the asbestos industries should be based on dose-response relationships established by sound epidemiological studies.

Asbestos: Chrysotile; Occupational Exposure; Fibrosis: E-Ray; Mesothelioma; Standards; Pneumocystis; Ventilatory Defects; Human

Anonymous, Asbestos, Nat. Safety News, 108(3): 156-160 (1973).

The U.S. Bureau of Mines found the concentration of asbestos fibers in asbestos mines to be low, but well above a fiber/ml of air asbestos limit. The Bureau's report concluded that some operators are adversely controlling the amount of asbestos in the breathing zone of workers; however, many are using inadequate control measures and practices, which result in workers being exposed to asbestos fiber concentrations above 5 fibers/ml: "It is believed that the skills and methods should be able to meet a 'five fibers/ml of fibers greater than five um in length' standard" by following proper practices.

Asbestos: Standards; Occupational Exposure; Asbestos Mining

Anonymous, Rain gets request to ban asbestos cement water pipes., Pest. Chem. News, 2(2): 12, (1973).

The Center for Science in the Public Interest has petitioned the Environmental Protection Agency and 6 Congressmen to request a ban on the use of asbestos cement pipe in water systems. The Center said that "there is ample reason to believe that ingestion of the major varieties of asbestos leads to increased risk of gastrointestinal cancer."

Asbestos: Cancer; Standards; Environmental Contamination; Ingestion; Gastrointestinal

Anonymous, FDA's proposal of analysis for asbestos questioned., Pest. Chem. News, 2(3): 18 (1973).

Walter C. McCrone Associates, Inc. claims that asbestos analysis by the Food and Drug Administration's proposed optical method would be time consuming and expensive, and that a dispersion staining method would be more feasible. McCrone discussed alternative methods, concluding that the scanning electron microscope was an "overrated tool" and a polarizing light microscope was useless for very small asbestos fibers; a diffraction method must be used for detecting these small fibers. The firm stated that most laboratories lack the equipment or skilled analyst necessary for each method, and tend to use available tools and skills instead.

Asbestos: Analysis; Standards; Environmental Sampling

Anonymous, FDA detains lima beans contaminated with asbestos after accident., Food Chem. News, 14(27): 29-30 (1973).

The Food and Drug Administration detained 15,000 bags of dried lima beans that were contaminated with asbestos following a shipboard accident. The owners were unable to recondition the beans and shipped them to another country.

Asbestos: Non-Occupational Exposure; Food Contamination

Anonymous, EPA's Forp says asbestos in pesticides is not a health hazard., Pest. Chem. News, 1(52): 16 (1973).

After reviewing pertinent information, the Environmental Protection Agency informed the Food and Drug Administration that no great need for concern exists concerning asbestos contamination in pesticides. An EPA study showed the presence of tremolite but not chrysotile in the talc used in the 29 pesticides tested.

Asbestos: Environmental Contamination; Non-Occupational Exposure

Anonymous, Wastewater limits sought by EPA could close some asbestos plants., Chemecology, Dec.: 2 (1973).

The Environmental Protection Agency has proposed restrictions on total suspended nonfilterable solids, biochemical oxygen demand (5 days), and pH of wastewaters from asbestos plants that manufacture cement pipe, cement sheet, paper with starch binder, paper with elastomeric binder, sillboard, roofing materials, and floor tile products. Existing plants are expected to reach zero pollutant discharge by 1981. Plants whose construction began after Oct. 30, 1973 (except for those using cement pipe and paper with elastomeric binder) must meet zero discharge with present technologies. The wastes removed from wastewater must be contained to prevent environmental contamination.

Asbestos: Environmental Contamination; Standards; Environmental Sampling

Anonymous, Asbestos Lung Cancer - mesothelioma., Lancet, 1(7807): 814-816 (1973).

Lung fibrosis, primary lung cancer, and pleural mesothelioma are associated directly with the occupational inhalation of asbestos dust. Epidemiological studies indicate that 50% of mesotheliomas occur in people exposed to asbestos. The latent period between exposure and tumor development is long and exposure may be neither prolonged nor heavy. All types of asbestos induce mesothelioma in experimental animals.

Asbestos: Lung; Fibrosis; Mesothelioma; Cancer; Tumor; Occupational Exposure; Inhalation; Human
<23>
Anonymous, Health criteria and standards for the environment., WHO Chronicle, 27: 106-110 (1973).

At a 1972 meeting sponsored by the World Health Organization in Geneva, an international program was designated to develop environmental health criteria for 6 categories of substances, including asbestos. The fibrous mineral was included because of its carcinogenic properties and widespread commercial use.

ASBESTOS; HEALTH CRITERIA; STANDARDS

<24>
Anonymous, Excerpts from the criteria document: I. Recommendations for an asbestos standard. J. Occup. Med., 15(6): 375-376 (1973).

The proposed limits for occupational exposure to asbestos will prevent amiantosis and minimize cancer risks in asbestos workers. Recommendations include standards for work place exposure, for medical surveillance, for work practices, for warning labels, for personal protective equipment, and clothing, for monitoring, and for record keeping.

ASBESTOS; ASBESTOSIS; CANCER; OCCUPATIONAL EXPOSURE; STANDARDS; HUMAN

<25>
Anonymous, Asbestos as an industrial hazard., Med. J. Aust., 1: 92 (1974).

A statement by the International Agency for Research in Cancer summarizes the present knowledge of asbestos health hazards. There is a direct relationship between the inhalation of asbestos dust and cancers of the lung, pleura, and peritoneum. The carcinogenic risk and action are related to the size and shape of the fibers which are most dangerous when straight and fine. The greatest risk is among workers in asbestos industries; the general public usually is not at risk, even in urban areas. Infinitely greater cancer risk from occupational asbestos exposure is evident in heavy smokers. Unfortunately, 20-40 years may elapse between asbestos exposure and development of cancer.

ASBESTOS; INHALATION; CANCER; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; PLEURA; LUNG; PERITONEUM

<26>
Anonymous, FDA seeks to define issues regarding asbestos contamination, FDA Consumer, 7(9): 29 (1973).

The Food and Drug Administration took three actions relative to asbestos contamination in food and drugs: (1) a request for all information available on the effects of asbestos infection through drug use, (2) published for comment a petition from the Center for Science in the Public Interest and the Environmental Defense Fund to prohibit asbestos residues in food and drugs, and (3) presented plans to reduce asbestos residues in food and drugs to minimum detectable levels by present technology. The plans are to establish a more accurate standard test method for detecting asbestos fibers in food-grade talc and to require that no asbestos filter be used in the manufacture of injectable drugs unless no acceptable alternative is available.

ASBESTOS; ENVIRONMENTAL CONTAMINATION; STANDARDS; ASBESTOS FILTERS

<27>
Anonymous, Proposed methodology for asbestos determination is limited, firm says., Pest. Chem. News, 2(2): 5 (1973).

Inventories told the Food and Drug Administration that the limited resolving power of optical microscopes reduced the capability of detecting small asbestos fibers that occur in talc. The FDA-proposed optical method should be replaced by high resolution scanning electron microscopy (SEM), even though the SEM method could not "positively identify a fiber as being asbestos." In contrast, Engelhard Minerals & Chemicals said that the FDA's proposed method was "a technically sound and fundamentally applicable method for the optical identification of and discrimination between the listed amphibole minerals, chrysotile, and talc." However, the method is time consuming, costly, and beyond the capabilities of most field engineer personnel.

ASBESTOS; STANDARDS; ANALYSIS

<28>
Aponte, G.E., Some current concepts of the pneumonioses., Ann. Clin. Lab. Sci., 3(3): 219-223 (1973).

The risk of malignant neoplasia related to occupational asbestos exposure is high, even when no radiological evidence of pulmonary fibrosis exists. Exposure through environmental pollution and occupational sources can be significant as evidenced by the high incidence of asbestos bodies and fibers in the lungs of urban dwellers.

ASBESTOS; CANCER; LUNG; OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION; ASBESTOS BODIES; NEOPLASIA; NON-OCCUPATIONAL EXPOSURE

<29>
Bartosiewicz, L., Improved techniques of identification and determination of airborne asbestos., Amer. Ind. Hyg. Assoc. J., 34(6): 252-259 (1973).

The image analyzing microscope (IAM) method of identifying and quantifying airborne asbestos includes: (1) a modified sampling method for uniform and representative particle collecting; (2) ashing of the specimen to eliminate the collection filter and oxidizable particles which interfere in analysis; and (3) the use of a refractive index liquid to distinguish asbestos particles from other fibrous materials, thus enabling counts of asbestos only. Since 50 - 100 fields can be mapped and measured in a short time and since the total number of particles are counted in each field, this method minimizes both experimental time usage and error.

ASBESTOS; ANALYSIS; ENVIRONMENTAL SAMPLING; ENVIRONMENTAL CONTAMINATION

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Environmental Health Perspectives
Bleier, H.-F.; Arlon, R., Talc: A possible occupational and environmental carcinogen., J. Occup. Med., 15(2): 92-97 (1973).

Talcs for commercial or industrial uses are usually contaminated with asbestos minerals due to the similarity in their geological processes. Both talc and asbestos produce various fibrosing conditions; both asbestos and asbestos-contaminated talc are occupational. The British Occupational Hygiene Society Committee on Hygiene Standards determined occupational exposure standards for airborne asbestos dust., Am. J. Ind. Med., 16: 1-5 (1973). (132)

Using existing information concerning human exposure, the British Occupational Hygiene Society Committee on Hygiene Standards determined occupational exposure standards for airborne asbestos. The Committee recommended that accumulated exposure be limited to 100 fiber years per cubic cm (4 fibers/cm3 for 25 years or 10 fibers/cm3 for 10 yrs). Respiratory masks or protective equipment should be worn in high dust areas. Medical records should be maintained for all employees, with periodic medical examinations.

BRITISH OCCUPATIONAL HYGIENE SOCIETY COMMITTEE ON HYGIENE STANDARDS

Chew, P.K.; Chia, H.; Chew, S.F.; Supramaniam, J.N.J.; Chen, W.; Chew, C.H.; Kim, T.; Gandevia, B., Asbestos workers in Singapore. A clinical, functional, and radiological survey., Arch. Environ. Health, 26(6): 290-293 (1973).

A group of workers in a Singapore asbestos sheet and pipe factory were examined for evidence of radiological and clinical respiratory abnormalities. This group of 114 workers was especially useful for a study of "early" or "mild" asbestosis because of relatively young average age (32) and average exposure time (4 years). Chest x-rays were not helpful in identifying likely "asbestos" subjects. The presence of crepitations and a disproportionate reduction in forced vital capacity, but not forced expiratory volume at 1 second, were related to exposure time. Other clinical tests such as loehe cough together with the function tests were used to define three groups within the worker population: normal, presumptive diagnosis of chronic bronchitis, and presumptive diagnosis of mild abnormality consistent with "mild" or "early" asbestosis.

ASBESTOS: BROWCHITIS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS; RESPIRATORY DISEASE; DIAGNOSIS; HUMAN

Cohen, D., Ferromagnetic contamination in the lungs and other organs of the human body., Science, 180: 745-748 (1973).

The ferromagnetic nature of asbestos particles may possibly be useful in detecting and localizing them in the human body. Following the application of an external magnetic field to the body, the steady magnetic field generated by the magnetized particles can be mapped thus revealing the distribution of these particles in the body.

ASBESTOS: LUNG; HUMAN

Crally, L.J.; Lainhart, W.S., Are trace metals associated with asbestos fibers responsible for the biologic effects attributed to asbestos?, J. Occup. Med., 15: 262-266 (1973).

Trace metals associated with asbestos fibers have not been found responsible for the fibrogenic properties of asbestos. Trace metals may, however, modify biological responses to asbestos, and further research should elucidate more fully the mechanism of action.

ASBESTOS: TRACE METALS; FIBROSIS

Cunningham, H.M.; Ponteefract, R.D., Asbestos fibers in beverages, drinking water, and tissues: their passage through the intestinal wall and movement through the body., J. Assoc. Offic. Anal. Chem., 56(4): 474-481 (1973).

Asbestos fibers were detected in beer, sherry, port wine, vermouth and soft drinks in concentrations ranging from 1.1 to 12.2 million fibers per liter (mf/l). Filtered Ottawa water contained 2.0 mf/l, river water 8.1-9.5 mf/l, and melted snow 33.5 mf/l. Cryostate fibers injected into stomachs of rats were isolated from the blood, spleen, liver, kidney, muscle, lung, brain and omentum in small concentrations. Intravenously administered asbestos fibers were removed rapidly from the blood and deposited in tissues within 6 minutes; the highest levels were concentrated in the lung and liver.

ASBESTOS: ENVIRONMENTAL CONTAMINATION; CHRYSOTILE; TISSUE DISTRIBUTION; INGESTION; RAT; FOOD CONTAMINATION; LUNG

Duma, N.J., Particulate matter of particular interest., Ann. Intern. Med., 78(1): 146-147 (1973).

Certain intravenous preparations, especially antibiotic medications, contain excessive amounts of particulates—notably asbestos fibers. Contamination arises from asbestos filters that are used in the pharmaceutical industry to remove foreign material from the final preparations. Intravenous infusion of particles exceeding 7-12 &mu;g could result in pulmonary arteritis, microemboli, thrombosis, foreign body granulomas, and pulmonary hypertension; patients receiving medications intravenously for long periods of time are particularly prone to this health hazard.

ASBESTOS FILTERS; ASBESTOS; DRUG CONTAMINATION
The medical-legal investigation of death presumably caused by direct or indirect occupational exposure to asbestos should include the circumstances leading to death, a complete occupational history from the onset of exposure, locations of residence, clinical history including radiologic findings and smoking habits, complete autopsy with microscopic examination, and identification with quantification of asbestos bodies as well as fibers in lungs.

OCCUPATIONAL EXPOSURE; ASBESTOS; DIAGNOSIS; HUMAN

Enterline, P.F.; De Coufle, P.; Henderson, V., Respiratory cancer in relation to occupational exposures among retired asbestos workers., Brit. J. Ind. Med., 30(2): 162-166 (1973).

In 1386 men occupationally exposed to asbestos for an average of 25 years, mortality after age 65 was 14.7% higher than in the counterpart male population of the United States; the major cause of death was respiratory cancer and respiratory disease. Using time-weighted calculations of exposure, respiratory cancer rates ranged from 7.7 times the expected for men with less than 100 million particles per cubic foot (mppcf)-years exposure to 5.6 times the expected for men with 750 or more mppcf-years exposure.

ASBESTOS; OCCUPATIONAL EXPOSURE; CANCER; CANCER MORTALITY; HUMAN

Enterline, P.F.; Henderson, V., Type of asbestos and respiratory cancer in the asbestos industry., Arch. Environ. Health, 27: 312-317 (1973).

Among 1,304 men who retired from asbestos industries between 1941 and 1967, those exposed only to chrysotile had a respiratory cancer mortality rate of 2.4 times greater than expected; the cancer mortality rate in men exposed to both chrysotile and crocidolite was 5.3 times higher. The respiratory cancer risk for workers exposed to chrysotile was 1.4 times greater than expected, whereas the hazard related to both chrysotile and crocidolite asbestos exposure was 6.1 times higher.

CHRYSOtile; CROCIDOLITE; CANCER MORTALITY; CANCER; OCCUPATIONAL EXPOSURE; HUMAN

Evans, J.C.; Evans, R.J.; Holmes, A.; Homan, R.P.; Jones, D.H.; Morgan, A.; Walsh, M., Studies on the deposition of inhaled fibrous material in the respiratory tract of the rat and its subsequent clearance using radioactive tracer techniques., Environ. Res., 6: 180-201 (1973).

Albino rats were exposed to an aerosol containing 10 m sq crocidolite/l at a rate of 3 l/min for 42 or 90 minutes. Approximately 3% of the inhaled asbestos was deposited - initially, 50% of this accumulated in the lower respiratory tract, declining by 27% within 30 days following exposure. Dust deposited in the upper respiratory tract was removed rapidly via the esophagus within 30 minutes after exposure. Most of the asbestos traversing the gastrointestinal tract passed through the stomach in the small intestine within 1 hr of exposure.

CROCIDOLITE; TISSUE DISTRIBUTION; BIOLOGICAL ELIMINATION; RAT; INHALATION; LUNG; GASTROINTESTINAL

Gilson, J.C., Report of the Advisory Committee on Asbestos Cancers to the Director of the International Agency for Research on Cancer., Brit. J. Ind. Med., 30: 180-186 (1973).

A report by the Advisory Committee on Asbestos Cancer to the International Agency for Research on Cancer presents a general overview of asbestos hazards, and recommendations for further research. High priority areas of interest comprise epidemiology, pathology, morbid anatomy and histology, physics and chemistry, and clinical studies.

ASBESTOS; CANCER; HUMAN

Gilson, J.C., Asbestos cancer: past and future hazards., Proc. Roy. Soc. Med., 66(4): 395-403 (1973).

The Michael Williams Memorial Lecture concerning asbestosis reviewed the following topics: (1) historical aspects of the disease in Britain, industry; (2) factors influencing incidence of asbestosis cancer; (3) lung carcinomas (comparisons of recent surveys of asbestos workers, relation of carcinogenicity to length of exposure, to sex and to cofactors); (4) mesothelial tumors (link with asbestos exposure, type of fiber, dose of dust, duration of exposure, and sex, cofactors, and rising incidence of mesotheliomas in the United Kingdom); (5) pathogenesis; and (6) prevention of health problems caused by asbestos.

ASBESTOS; CANCER; MESOTHELIOMA; CARCINOMA; ANTHROPHYLLITE; CROCIDOLITE; CHRYSOtile

Gorson, R.O.; Lieberman, M.S., The prohibition of the use of asbestos spray in building construction., J. Occup. Med., 15(3): 260-261 (1973).

The Philadelphia Board of Health adopted the following regulations to protect construction workers and the public from potentially hazardous asbestos fibers: (1) prohibits use of asbestos spray; (2) limits exposure to inhalation of airborne fibers to 5 fibers/milliliter of air; (3) prohibits occupancy of any building if the concentration of fibers exceeds 0.5 fibers/milliliter of air averaged over any 8 hour period; and (4) compulsory monitoring for asbestos fibers. Presumably regulations were adopted because voluntary controls were not deemed effective.

ASBESTOS; STANDARDS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

Gross, P.; Davis, J.M.G.; Harley, R.A.; DeTreville, R.A., Lymphatic transport of fibrous dust from the lung., J. Occup. Med., 15(3): 186-189 (1973).

Chrysotile concentrations in the lungs of 9 fiber glass workers ranged from 1 to 85% of the total fiber content, with an average of 17%. Five of 8 non-occupationally exposed female residents had chrysotile lung concentrations of 3 to 12% with lymph node levels of 3 to 9% - both tissues averaged 8%. No relationship was observed between fiber concentrations in the lymph nodes and in the lungs.

CHRYSOtile; ENVIRONMENTAL CONTAMINATION; LUNG; OCCUPATIONAL EXPOSURE; HUMAN
When polyfibrillar asbestos fibers are converted to monofibrillar structures, either by heating to 1,000 C, by grinding to a fiber length less than 5u, or by chemically cementing the fibrils together, pathogenicity is reduced. Resultantly, the theoretical locus of pathogenicity of asbestos dust particles resides in the polyfibrillar structure.

ASBESTOS; FIBROSIS; LUNG; CHRYSO TILE

Gross, P.; Harley, R.J., The locus of pathogenicity of asbestos dust., Arch. Environ. Health, 27: 280-292 (1973).

Intrapleural injection of Canadian chrysotile, amosite and crocidolite produced a significant number of differentiated intrathoracic tumors in rats, and undifferentiated sarcomas in hamsters. Of 35 tumors in rats, 25 were fibrosarcomas, a mesotheloma, 3 rhabdomyosarcomas, 2 osteogenic sarcomas or fibrous sarcomas with bone formation, and 1 a fibroliposarcoma. Addition to or removal of trace metals from asbestos dust caused no difference in tumor production.

CHRYSO TILE; ANOSITE; CROCIDOLITE; TRACE METALS; CANCER; SARCOMA; MESOTHELIOMA; TUMOR; RABBIT

Ragerstrand, I.; Seifert, B., Asbestos bodies and pleural plaques in human lungs at necropy., Acta Pathol. Microbiol. Scand., Sect. A, 61: 457-460 (1973).

Examination of lung tissue from 97 inhabitants of a coastal town in south Sweden showed asbestos bodies in 47 and pleural plaques in 29. Sixteen of 32 men with asbestos bodies also had pleural plaques. More asbestos bodies were found by the tissue section technique than by smear.

ASBESTOS BODIES; LUNG; PLEURAL PLAQUES; HUMAN

Kenton, C., Asbestos toxicity, NLM Literature Search, No. 73-31

This bibliography of Asbestos Toxicity papers covers January 1970 through July 1973 and includes 363 citations.

ASBESTOS; BIBLIOGRAPHY

Kleinfeld, W.J., Biologic response to kind and amount of asbestos., J. Occup. Med., 15: 294-300 (1973).

Both the shape and size of asbestos fibers significantly affect their respirability, deposition, retention and clearance from the pulmonary tract. These physical properties, therefore, are important determinants for elucidating the site and nature of tissue response to asbestos exposure. Important cofactors which cannot be excluded as major determinants of asbestos pathogenicity are the type and intensity of exposure, the presence of metals and other toxic contaminants on asbestos fibers, and cigarette smoking.

ASBESTOS; FIBROGENIC TISSUE RESPONSE; CO-CARCINOGEN; SMOKING; HUMAN; TRACE METALS
Chest roentgenograms of 39 workers exposed to tremolite and anthophyllite in commercial talc dust revealed only 1 individual with evidence of pneumoconiosis; mean exposure time was 16.2 years with a range of 11 to 22 years. Increase in the occurrence and severity of dyspnea in the talc group was the only clinical finding that differed significantly from that of the control group. In another talc plant, 35 workers exposed to higher concentrations of dust for similar durations showed an increased prevalence of pneumoconioses.

ASSURISTS; ANTHOPHYLLITE; OCCUPATIONAL EXPOSURE; PNEUMOCONIOSIS; DYSPEEA; X-RAY

Pathological reviews of 119 cases reported as primary malignant mesotheliomas show a history of asbestos exposure in 99 histologically confirmed cases--using histology only, the panel of six pathologists was in favor of the diagnosis in 50%, uncertain in 14%, and against in 36%; adding clinical-pathologic information did not change the diagnosis. Forty-six percent of the tumors classified as mixed were associated with asbestos exposure, while 11% of the epithelial or mesenchymal tumors occurred in asbestos workers.

ASSURISTS; OCCUPATIONAL EXPOSURE; MESOTHELIOMA; CANCER; TUMOR

The cellular reaction in human lungs caused by the inhalation of asbestos dust was examined in biopsy specimens with an electron microscope. Smaller asbestos particles are phagocytosed by alveolar macrophages and deposited in cytoplasmic phagosomes. Larger particles, coated or uncoated, locate in the alveoli and in the connective tissue septa.

ASSURISTS; PHAGOCYTOSIS; INHALATION; HUMAN

Asbestos, glass, and aluminum oxide fibers measuring between 40-320u in length induce pleural mesothelium in rats and stimulate growth of fibroblast cells in culture. Fibers shorter than 20u caused neither growth in vitro nor mesothelium in vivo. Fibers above 40u probably lead to mesothelium by stimulating growth in anchorage dependent fibroblasts, whereas smaller particles are phagocytosed.

ASSURISTS; CANCER; MESOTHELIOMA; RAT; CELL CULTURE; PHAGOCYTOSIS; CYTOTOXICITY

Environmental Health Perspectives
Asbestos; chrysotile; crocidolite; amosite; anthophyllite; fibrosis; mesothelioma; cancer; non-occupational exposure

Otto, H., The risk of asbestosis from a pathological-anatomical viewpoint., Staub Reinhalte, Left, 33(2): 58-60 (1973).

Sclerotic fibrosis, bronchial cancer, and asbestosis are occupational diseases resulting from asbestos exposure. Detection of asbestosis is difficult because the condition produces no macroscopic lung effects, regardless of the severity of the case. Since effects of asbestos exposure may manifest 20 to 30 years after occupational exposure, the cause of bronchial cancer usually is not associated with asbestos. Detecting, with accuracy, small quantities of asbestos particles in lung tissue of occupationally exposed workers continues to be the major problem in diagnosing wild asbestosis and cancer risk.

Asbestos; occupational exposure; asbestosis; cancer; fibrosis; diagnosis

Postefract, R.D.; Cunningham, R.M., Penetration of asbestos through the digestive tract of rats., Nature, 245 (5306): 352-353 (1973).

Asbestos fibers injected into the stomachs of rats penetrated the gut and accumulated in the blood, spleen, heart, lung, and brain in significant concentrations. Asbestos elimination from the blood was rapid; other tissues showed longer retention. The esophagus which surrounds the small intestine accumulated the most asbestos.

Asbestos; tissue distribution; biological elimination; rat

Pooley, F.D., Asbestos fiber in the lung and mesothelioma: A re-examination of thealsa material., Acta Pathol. Microbiol. Scand., Sect. A, 81(4): 390-400 (1973).

An electron microscope search was made for asbestos bodies in lung tissue from 65 autopsy examinations which included 33 mesothelioma cases and 32 controls. Asbestos bodies were found in 22% of the mesothelioma cases and 53% of the controls. The positive controls contained fewer fibers than the positive mesothelioma cases. Amphibole fibers were more common in the mesothelioma group whereas chrysotile was the dominant fiber present in the controls.

Asbestos; amphibole; chrysotile; mesothelioma; human; asbestos bodies; lung

Richards, B.J.; Morris, T.G., Collagen and mucopolysaccharide production in growing lung fibroblasts exposed to chrysotile asbestos., Life Sci., 12(II): 441-451 (1973).

Rhodesian chrysotile dust induced pronounced fibrogenic responses in cultured rabbit lung fibroblasts, as evidenced by increased levels of cell wet collagen and altered ratios of hyaluronic acid/chondroitin sulfate in the culture medium. Control cells exhibited a slight transitory fibrogenic response.

Chrysotile; cell culture; fibrosis; lung; rabbit; fibroblast

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Nevratil, M.; Doblas, J., Development of pleural hyalnosis in long term studies of persons exposed to asbestos dust., Environ. Res., 6: 855-872 (1973).

Among 50 asbestos workers having signs of pleural hyalnosis, 25 had asbestosis with a mean exposure time of 22 years and mortality rate of 80%. Bronchogenic carcinoma was the main cause of death. Pleural hyalnosis developed in 2 stages: (1) hyalnosis simplex, involving progressive calcification of the pleura, and (2) hyalnosis complicata with acute exudative pachypleuritic reaction. Two cases of mesothelioma occurred in the complicated hyalnosis stage.

Asbestos; occupational exposure; asbestosis; mesothelioma; cancer; human; asbestos; lung

Newhouse, P.L., Asbestos in the work place and the community., Am. Occu. Hyg., 16: 97-102 (1973).

Asbestos dust adversely affects not only occupational workers but also persons residing in the vicinity of asbestos mines or industries. This is evidenced by the occurrence of mesothelial tumors, and presence of asbestos bodies or calcified asbestos pleural plaques in the general population. The importance of adequate control in all countries where asbestos is mined or manufactured is stressed.

Asbestos; crocidolite; chrysotile; mesothelioma; lung

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Trace metals concentrations considered potentially carcinogenic were determined in samples of amosite, crocidolite, and chrysotile by atomic absorption spectrometry. The metals determined were cobalt, nickel, chromium, manganese, and iron. Compared to reference standards, commercial material contained higher levels of nickel and chromium—presumably from enrichment during milling and chaffing disintegration.

Scheuer, E.; Ruth, F.; Pott, F., Investigations concerning morphology of tumors induced in rats by i.p. injection of asbestos dusts., Arch. Geschwulsforsch., 41(4): 120-136 (1973).

Amosite, anthophyllite, chrysotile A, or crocidolite asbestos induced extended, generally multicentric and malignant abdominal tumors in 21% of the 450 treated rats. Combined injection of a different asbestos with benzo(a)pyrene caused a tumor induction rate of 50%, while benzo(a)pyrene alone induced only 3 sarcomas in 30 rats. The specific carcinogenicity of each asbestos type could not be determined.

ASHFORD, A.; POTT, F.; RUTH, F., Response of rats to single intraperitoneal injection of various asbestos products., Environ. Health Perspect., 20(4): 157-164 (1973).

Amosite, crocidolite, and chrysotile asbestos induced a variety of tumors in rats, including mesothelioma, peritoneal carcinomatosis, and pulmonary tumors. The tumors were generally associated with asbestos fibers longer than 6 micrometers.

Steff, W.; Mooney, T.F., Jr., Response to single intraperitoneal injection of various asbestos products., Arch. Environ. Health, 26(4): 253-257 (1973).

Asbestos filters; asbestos; standards; drug contamination; food contamination.
Stell, P.M.; McGill, T., Asbestos and cancer of head and neck., Lancet, 1(7804): 678 (1973).

Of 100 male patients with carcinoma of the head and neck, 22 had been exposed occupationally to asbestos. In a control group of 100 patients having non-malignant diseases, only 2 had been occupationally exposed. The mean latent period between initial exposure and development of carcinoma was 31 years, with an average exposure duration of 24 years. Laryngeal carcinomas occurred with the highest frequency.

ASBESTOS; OCCUPATIONAL EXPOSURE; CANCER; CARCINOMA; TUMOR; HUMAN

Suzuki, T.; Kanematsu, M.; Churg, J., Ultrastructure of human mesothelioma., Amer. J. Pathol., 70(2): 74 (1973) abstract No. 12.

Six of 10 patients with mesotheliomas had a history of asbestos exposure. Mesotheliomas examined by light microscopy in eight patients showed typical epithelial and stellate epithelial, and 1 was biphase, consisting of epithelial and mesenchymal elements. The typical epithelial, the stellate epithelial, and the mesenchymal tumor cells were connected by various transitional forms, indicating that mixed biphase patterns of mesotheliomas are derived from a single cell type originating from the mesothelium.

ASBESTOS; CANCER; MESOTHELIOMA; TUMOR; HUMAN; OCCUPATIONAL EXPOSURE

Taskinen, E.; Ahlman, K.; Wiikari, H., A current hypothesis of the lymphatic transport of inspired dust to the parietal pleura., Chest, 64(2): 193-196 (1973).

The autopsy of a 77-year-old male wader -- explored for 11 years in iron foundries -- showed heavy dust pneumonia. Black linear streaks in the parietal pleura were microscopically interpreted as pericardial interphagitis and fibrosis caused by the dust. It is hypothesized that the dust particles were transported from the lungs via the lymphatic vessels partly in retrogression. Small asbestos particles in pleural plaques may be transported by the same mechanism.

PNEUMOCEROSIS; FIBROSIS; ASBESTOS; PLEURAL PLAQUES; EPITHELIOMA; LUNG; SILICOSIS; HUMAN

Viswanathan, P.N.; Anand, M.; Rahman, O.; Beg, M.U.; Zaidi, S.N., Biochemical changes in serum of guinea pigs in experimental asbestosis., Chemosphere, 3: 119-12a (1973).

Intratracheal injection of amosite dust (50 mg) in guinea pigs consistently lowered the albumin/globulin ratio by decreasing albumin and increasing globulin levels in serum; after 120 days, the ratio was reduced to 1/2 of the normal level. A marked increase in lactic dehydrogenase occurred concurrently. The alkaline and acid phosphatase, glutamic-oxaloacetic transaminase, and glutamic-pyruvic transaminase activities were not altered significantly.

AMOSITE; BIOCHEMICAL EFFECTS; GUINEA PIG

Viswanathan, P.N.; Dogra, R.K.S.; Shanker, R.; Zaidi, S.N., Pulmonary fibrogenic response of guinea pigs to amosite dust., Int. Arch. Arbeitsmed., 31: 51-59 (1973).

Female guinea pigs were inoculated intratracheally with a sterilized dust suspension containing 75 mg of amosite (less than 300 fiber length). The lungs exhibited gradual development of reticulin fibrosis at 150 days after treatment. More diffuse fibrosis was evident at 300 days, and consisted of thick reticular fibers. The hydroxyproline and glycosamine content of the lungs slowly increased from 60 to 300 days after treatment, indicating a gradual formation of collagen protein from reticulin. The non-collagen protein in treated animals was 60% higher at 90 days than for control animals.

AMOSITE; FIBROSIS; LUNG; GUINEA PIG; ASBESTOS

Viswanathan, P.N.; Rahman, Q.; Beg, M.U.; Zaidi, S.N., Pulmonary lysosomal enzymes in experimental asbestosis in guinea pigs., Environ. Physiol. Biochem., 3: 120-126 (1973).

Asbestos fibers (below 70 μm in length) were suspended in physiological saline at a concentration of 50 mg/ml. Guinea pigs (300-325g) were given 1.5 ml of the sterilized suspension intratracheally. The controls received only sterile saline in the same manner. Enzyme assays were performed on homogenized lung tissue. The assays performed included acid phosphatase, ribonuclease, cathepsin, and hydrolytic enzymes. Intratracheal injection of amosite which initiated phagocytosis in the lung of guinea pigs also initiated a gradual decline of lysosomal enzymes from their latent state. Asbestos lesions were probably caused by amosite. Phagocytes were possibly deprived of vital lysosomal enzymes, thereby hampering metabolism. The membraneous structures of pulmonary cells excluding lysosomes also were affected by asbestos. This suggests that the mechanism of action of asbestos involves disruption of cell membranes with subsequent release of enzymes or increased permeability to substrates.

AMOSITE; GUINEA PIG; LUNG; ASBESTOSIS; SILICOSIS

Wagner, J.C.; Berry, G.; Timbrell, V., Mesotheliomatous rats after inoculation with asbestos and other materials., Brit. J. Cancer, 28: 173-185 (1973).

Winter rats inoculated intraperitoneally with various types and doses of asbestos exhibited high incidence of mesotheliomas from all types of asbestos regardless of chemical composition. The risk of mesothelioma development was proportional to the injected dose; carcinogenicity was not related to the trace metal content of asbestos. Crocidolite was the most carcinogenic asbestos among the standard samples tested.

ASBESTOS; CROCIDOLITE; TRACE METALS; MESOTHELIOMA; CANCER; RAT

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Webster, I., Asbestos and malignancy., S. Afr. Med. J., 47 (5): 165-171 (1973).

A survey including 232 cases of diffuse pleural mesothelioma in South Africa showed that in 32 cases there was no evidence of asbestos exposure; that nearly all of the miners in the group were exposed to Cape Blue Asbestos (Crociodolite)- 21 of these miners had a history of both asbestos and manganese mining; and that in 76 cases there was only environmental exposure. The causative relationship of asbestos to malignancy remains undetermined.

Mesothelium: Asbestos; Asbestos; Blue Asbestos; Asbestososis; Carcinoma; Crocidolite; Chrisotile; Pneumocystosis; Asbestososis: A comparative study of the health effects from asbestos and silica dust exposure in 908 asbestos cement workers was evaluated using an occupational questionnaire, chest x-ray, and pulmonary function tests. Five exposure indices were calculated according to total dust exposure and duration of employment for each worker. Chest x-rays revealed small rounded and also irregular or linear opacities; the frequency of both types increased as the cumulative dust exposure increased. Diffuse radiological changes correlated better with total dust exposure than with total duration of employment in the industry. Individuals with a moderately advanced profusion of irregular opacities tended to have lower lung volumes and reduced pulmonary diffusing capacity than those with rounded opacities. Hyperinflation was associated with rounded nodular changes. The results suggested that small rounded opacities primarily were due to silica exposure, and irregular opacities to asbestos exposure.

Asbestos; Crocidolite; X-ray; Occupational Exposure; Respiratory Disease; Ventilatory Defects; Human

Witt, L., "Each glass is another moment of truth", Today's Health, 51(10): 88-93 (Oct. 1973).

Asbestos contamination of Lake Superior - Duluth, Minnesota's drinking water supply - caused marked citizen alarm. Circumstances surrounding the chronic incidents are described emphasizing the Environmental Protection Agency's lawsuit against the Reserve Mining Company to cease dumping iron tailings into the lake.

Asbestos; Cancer; Environmental Contamination; Ingestion

Zaidi, S. H.; Shanker, P.; Dogra, V. K. S., Experimental infection of ascites mice with asbestos dust and Candida Albinicas infection on the lungs of Rhesus Monkeys. Environ. Res., 6: 274-286 (1973).

The induction of extensive pulmonary fibrosis in monkeys exposed to asbestos was related to a low grade infection produced by Candida Albinicas, a facultative pathogen commonly found in the human respiratory tract. Combined intrathoracic infection with asbestos and C. Albinicas produced extensive collagenous fibrosis at 330 days. Asbestos dust alone induced reticular fibrosis and moderate interstitial fibrosis. The C. Albinicas infection alone initially caused acute inflammatory reaction which declined to normal within 330 days.

Asbestos; Fibrosis; Monkey

Zealik, H. M., Investigation of asbestos bodies and asbestos fibers found in the lungs of a mesothelioma patient by electron microscopy., Microchim. Acta, 6: 477-486 (1973).

Electron microscopic examination of lungs from a mesothelioma patient showed an association of normal asbestos bodies with amphirole - asbestos fibers as kermals. The free asbestos fibers mainly were chrysotile asbestos.

Chrysotile; Asbestos Bodies; Mesothelioma; Human

Arosanion, T.; Kohl, G., Paper mache products widely used in elementary schools contain large proportions of asbestos., Environment, 14(10): 25-26 (1972).

The New York City Department of Air Resources found that asbestos constituted 50% or more of some samples of dry, powdery paper mache mix tested. Quick Set Paper Mache mix and Instant Fibrous Mache (sold as Modelling Mache) were the offenders. An English product, Walt Instant Paper Mache, contained no detectable asbestos.

Asbestos; Environmental Contamination; Inhalation; Human; Non-Occupational Exposure

Adelaan, H.; Berksen, P.; Sackler, J. P., Partial intestinal obstruction due to peritoneal mesothelioma in chronic asbestos exposure., W. T. State J. Med., 27(18): 2332-2334 (1972).

A case of peritoneal mesothelioma in a long term (30 years) insulation worker is described. A preoperative diagnosis is feasible if one is alert to: (1) bilateral pleural thickening and calcification, (2) basal pulmonary parenchymal changes, and (3) abdominal pain, vomiting, and distention with x-ray evidence of intra-abdominal tasefaction and/or obstruction of varying degrees.

Asbestos; Occupational Exposure; Insulation Workers; Mesothelioma; Pleural Calcification; Asbestososis; Human; Peritonitis; Diagnosis

Environmental Health Perspectives
C.!.; CHRYSTOTILE; EXPOSED INDUSTRY

Becklake, R.; Fournier-Weasay, G.C.; Rossiter, C.R.; McDonald, J.C., Lung function in chrysotile asbestos mine and mill workers of Quebec, Arch. Environ. Health, 24 (6), 401-409 (1972).

Lung function tests on an age-stratified random sample of 1,015 Quebec asbestos workers show that lung function deteriorated progressively with increasing dust exposure both in nonsmokers and smokers. Work history and available dust levels in industry were used to estimate worker exposure.

ASBESTOS; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS; ASBESTOS MINING

Becklake, R.L.; Manollovic, W., Macrophage proliferation and megalocyte in guinea pig lungs and asbestos-contaminated air. Arch. Environ. Health, 29 (11), 911-917 (1974).

A comparison of asbestos and crocidolite samples with different contents of benzo(a)pyrene, benzo(a)pyrene, dibenz(a,h)anthracene, and dibenzofuran suggests that asbestos fibers have less potential for carcinogenicity than crocidolite.

ASBESTOS; CHRYSTOTILE; CROCIDOLITE; CARCINOGENICITY; HUMAN MECHANISMS

December 1974

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A 10-year study focusing on the basic risk factors of lung cancer in older men revealed that 121 new lung cancers developed among 613 men aged 65 and over. Risk increased considerably with age; was highest in nonwhites, and had a positive dose-response relationship to cigarette smoking. Exposure to asbestos was the greatest occupational hazard.

ASBESTOS; LUNG; CANCER; OCCUPATIONAL EXPOSURE; NEOPLASMS; SMOKING; HUMAN

A survey of pleural thickening: its relation to asbestos exposure and previous pleural disease, Environ. Res., 8 (1972). A survey of patients having pleural abnormalities and attending chest clinics in the United Kingdom showed no evidence that exposure to asbestos was more common in the group with abnormalities than in a matched control. A greater proportion of those with pleural abnormalities had a history of previous pleural inflammation and injury.

ASBESTOS; RESPIRATORY DISEASE; HUMAN; LUNG; ASBESTOSIS; PLURAL PLACQUES; X-RAY

Burlakov, T.; Michailova, L., Sepiolite content of the soil in regions with endemic pleural calcifications, Int. Arch. Arbeitsmed., 29: 95-101 (1972). Bilateral pleural calcifications occur endemically in asbestos-containing regions which have not been economically exploited. Mineralogical studies revealed the presence of anthophyllite and tremolite in soil taken from properties of pleural plaques carriers. Soil from the field of a family with three plaques carriers contained sepiolite (up to 5%), whereas anthophyllite and tremolite were scarce. Mineralogic findings suggest a possible participation of sepiolite in the formation of endemic pleural plaques.

ANALYSIS; ANTHOPHYLLITE; ASBESTOS; PLURAL CALCIFICATION; TROMOLITE; HUMAN; NON-OCCUPATIONAL EXPOSURE

Electron microscopic studies in desquamative interstitial pneumonia associated with asbestos., Thorax, 27 (3): 324-331 (1972). Electron microscopic examination of a lung biopsy specimen from a case of desquamative interstitial pneumonia (DIP) revealed that the alveolar cells lining the alveolar walls are granular pneumocytes; free cells in the lumen, however, were alveolar macrophages. In this instance asbestos bodies were present in the lung, suggesting that DIP is not a specific disease entity.

MACROPHAGE; ASBESTOS BODIES; LUNG; DYSPNEA; FINGER CLUBBING; HUMAN

Felder, J.L., A study of 16 cases of pleurisy with effusions in ex-miners from Wittenoom Gorge., Aust. J. Med., 2(1-2): 320-329 (1972). In a follow-up study of 10 cases of bilateral and six cases of unilateral pleural effusion in ex-miners from a crocidolite asbestos mine, an association was established between asbestosis, lung cancer, pleural plaques metasthesis and pleural effusion; there was, however, insufficient evidence to prove that benign asbestos pleurisy is an entity. In some cases, pleurisy preceded the disease; however, in three of the 6 cases of asbestosis, radiological evidence of asbestosis was present or as the time of the first effusion. Thirteen of the 16 cases of pleurisy were attributed to asbestos exposure.

ASBESTOS; CANCER; PLURAL PLACQUES; MESOTHELIA; OCCUPATIONAL EXPOSURE; CROCIDOLITE; ASBESTOS HTMNG; HUMAN

Intratracheal injection of rats with crocidolite asbestos, with or in admixture with other substances, induced metaplasia of the bronchial epithelium with excessive mucus secretion. Extensive hyperplasia of lymphoid tissue was common. More frequent infection occurred in lungs infected with asbestos than with quartz.

CROCIDOLITE; LUNG; RAT; RESPIRATORY DISEASE

Finkelberg, E.I.; Genina, O.D.; Sarvatova, W.T., Clinical picture of dust-induced pulmonary disease following exposure to some types of the silicate dust., Gig. Tr. Prof. Zabol., 16 (10): 8-11 (1972). The type of occupational exposure determines the kind of dust-induced pulmonary disease as indicated by observations of 193 patients and workers exposed to several silicate dusts including asbestos, clay, and chamosite. Pneumoconiosis is produced by clay and chamosite dusts and is characterized by a relatively benign course, whereas asbestosis manifests as a progressive pulmonary insufficiency. The functional state of the respiratory system should be considered when determining the work load of patients.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; PNEUMOCONIOSIS; HUMAN

Ford, J.P., The effect of pulmonary macrophage suppression in developing asbestosis., Dissertation thesis, Intern., (M): 32 (1972). Rabbits were exposed to either chrysotile, amosite, or crocidolite asbestos dust at a dose of 50 mg/Cm2 for 4 days/week/4 hours/day for 1 year. One half also received the immunosuppressant drug "Turan" brand immunoprone while the other half was untreated. Pulmonary function tests were given before, during and after exposure and no significant differences were found in the two groups. Pulmonary macrophages evidently play a significant role in protection against development of asbestosis. No observable differences were found between the two groups upon pathological examination.

ASBESTOSIS; ASBESTOS; MACROPHAGE; INHALATION
Thirty-one characterized chrysotile cancer cases, 42,597 conditions, Gibbs, G.M.; LeChance, M., Dust exposure in the chrysotile asbestos mines and mills of Quebec., Arch. Environ. Health, 28: 169-197 (1972).

Chrysotile mining and milling environmental conditions, both past and present, and methods used to establish exposure indices for epidemiological studies are described. The average number of dust particles per cubic foot steadily declined between 1948 and 1968. Dust levels within the industry fluctuated widely and the fiber content varied considerably.

CHRYSOTILE; OCCUPATIONAL EXPOSURE; HUMAN; ASBESTOS MINING; DUST CONTROLS

A lung biopsy revealed asbestosis in a 47-year-old woolen mill worker 16 years after he was exposed to Cape Blue asbestos. He had been exposed for only 9 months. Cigarette filters he made contained a mixture of Cape Blue asbestos and acetate. Pulmonary insufficiency progressed over a 2-year period to total disability.

ASBESTOS; BLUE ASBESTOS; ASBESTOSIS; LUNG; DYSPNEA; OCCUPATIONAL EXPOSURE; PULMONARY DEFECTS; HUMAN

Results of a histochemical examination suggest that the coating of most asbestos bodies contains acid mucopolysaccharides. During asbestos body formation the mucopolysaccharides may act as a matrix for iron deposition.

ASBESTOS BODIES; CHEMICAL COMPOSITION

A histological demonstration of hematoidin in the innermost layers of human body coating., Brit. J. Ind. Med., 29(3): 154-159 (1972).

Histochemical studies of microscopic sections of human lungs with asbestotic lesions and asbestos bodies suggest that the body coating consists of two basic layers - the first consists of proteins, hematoidin, and ferric iron deposited over the fibers. The second stage form when hyaluronic acid is laid around the first layer and other ferric iron particles impregnate the hyaluronic acid molecules.

ASBESTOSIS; ASBESTOS BODIES; HUMAN; LUNG

Thirty-one cases of mesothelioma were recorded in 42,597 death certificates of children who died of cancer in the U.S. from 1940-1968. Hospital records confirmed 13 cases. Illness was characterized by acute pleural effusion and tumor encasement of the lung, usually with less than 6 months survival. Case histories had no information concerning environmental exposure to asbestos.

ASBESTOS; ENVIRONMENTAL CONTAMINATION; MESOTHELIONA; LUNG; TUMOR; HUMAN; NON-OCCUPATIONAL EXPOSURE

Radiological surveys of a 10% sample population of men exposed to asbestos in naval dockyards showed a prevalence of asbestos related abnormalities. Pleural abnormalities were found 10 times more frequently than parenchymal disease. At Devonport Dockyard 37 men have developed mesothelioma since 1968. There was no increase in the incidence of asbestos abnormalities.

ASBESTOS; OCCUPATIONAL EXPOSURE; SHIPYARDS; RESPIRATORY DISEASE; MIESOTHELIONA; CANCER; HUMAN

The 1969 Asbestos Regulations are summarized. Particularly emphasized in the need for regulations, provisions of the regulations, dust standards and precautions in processing the plastics. The handling and manipulation of asbestos-reinforced plastics composites do not present a serious health hazard, and reasonable precautions will ensure complete safety.

ASBESTOS; CHRYSTOTILE; AMosite; ANTHAFFYLLITE; CROCIDOLITE; STANDARDS

A review of international experiences with the UICC/Cincinnati Classification indicates that its basic goals have been accomplished. Although some of its features have presented difficulties, its 12 point scoring system and the concept of involvement have simplified the decision-making-process. Several periodical changes have been made to improve the system and present recommendations for combining the V1O and U/C Classification of Radiographs are being considered. The following aspects of the system are discussed: (1) profusion of small opacities, (2) extent of small opacities, (3) large opacities, and (4) pleural thickening.

ASBESTOS; ASBESTOSIS; PNEUMOCONIOSIS; SILICOSIS; STANDARDS

Kannerstein, R.; Churg, J., Pathology of carcinoma of the lung associated with asbestos exposure., Cancer, 30(1): 10-21 (1972).

Tumor distribution was the only significant difference in lung carcinoma in 50 patients occupationally exposed to asbestos compared with 50 matched control cases. Similarities support investigations implicating asbestos as a co-carcinogen.

ASBESTOS; OCCUPATIONAL EXPOSURE; LUNG; CARCINOMA; CANCER; CO-CARCINOGEN; TUMOR; HUMAN

December 1974
The cancer mortality rate among asbestos industry workers in the Urals., Gig. Sanit., (7): 29-32 (1972).

Results from a 20-year study show that the mortality rate due to cancer in higher among asbestos workers than the general population. A higher incidence of cancer was also noted in the elderly. Cancer of the lungs and stomach was less prevalent in female asbestos workers than in male workers, but significantly higher in women with no occupational exposure to asbestos.

ASBESTOS: CANCER MORTALITY; OCCUPATIONAL EXPOSURE; LUNG; GASTROINTESTINAL; HUMAN; CANCER

McDonald, J.C.; Beeklae, M.R.; Fournier-Kassae, G.G.; Rossiter, C.E.; Respiratory symptoms in chrysotile asbestos mine and mill workers of Quebec., Arch. Environ. Health, 24: 358-363 (1972).

Questionnaire results from 1,015 males employed in chrysotile asbestos mines and mills indicate that prevalance of persistent cough and phlegm (bronchitis) was primarily determined by age and smoking habits. Since smoking was the main determinant of symptoms, the effect of dust exposure was evident only in non-smokers.

CHrysotile: OCCUPATIONAL EXPOSURE; SMOKING; RESPIRATORY DISEASE; HUMAN

Miller, K.; Harrington, J.S., Some biochemical effects of asbestos on macrophages., Brit. J. Exp. Pathol., 53: 397-405 (1972).

IN VITRO exposure of hamster peritoneal macrophages to asbestos (chrysotile, crocidolite and amosite) silica, and rutile dust showed that chrysotile and silica were equally toxic, whereas crocidolite, amosite, and the control dust, rutile, were inactive. The effects were assessed by estimating the release of acid phosphatase into the culture medium and by changes in the composition of phospholipids in the cells.

Chrysotile: CROCIDOLITE; ASBESTOS; MACROPHAGE; HAMSTER

Murphy, R.L.; Gaensler, E.A.; Redding, R.A.; Bellman, R.; Keelan, P.J.; Smith, A.A.; Goff, A.M.; Ferris, R.G., Low exposure to asbestos., Arch. Environ. Health, 25: 253-262 (1972).

A follow-up survey on New England shipyard pipe coversers focused on asbestos-induced physiologic abnormalities. Compared to controls, the pipe coversers exhibited significantly reduced vital capacity (FVC) as well as reduced single breath (DLB) and exercise steady diffusion capacity (DLSS). Workers with clinical "asbestosis" had severely reduced diffusing capacity (DL) and fraction carbon monoxide removed. Three years later, DL in exposed workers had deteriorated more rapidly than FVC; some with initially isolated reduction of DL had developed other signs of disease.

ASBESTOS: ASBESTOSIS; LUNG; FINGER CLUBBING; NEUTROPHILIA; I-AT; SHENTAPIDS; PIPE COVERSERS; OCCUPATIONAL EXPOSURE; PERITONITARY DEFECTS

Navratil, M.; Trippe, F., Prevalence of pleural calcification in persons exposed to asbestos dust, and in the general population in the same district., Environ. Res., 2: 210-216 (1972).

Prevalence of pleural calcification in humans was closely related to asbestos dust exposure directly or indirectly by occupational, familial, or neighborhood contact. Asbestos appears to be primarily responsible for pleural findings, although other unknown factors may be the cause of some pleural disease.

ASBESTOS: OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; PLEURAL CALCIFICATION

Newhouse, M.L.; Berry, G.; Wagner, J.C.; Turok, M.E., A study of the mortality of female asbestos workers., Brit. J. Ind. Med., 29: 130-141 (1972).

Increased mortality was found in a group of more than 900 women employed at an asbestos textile and insulation manufacturing plant. Those exposed to low and moderate levels had increased cancer deaths whereas severe exposure for less than two years caused cancer of the lung and pleura; in those severely exposed for more than two years, excess deaths were from cancer of the lungs and pleura, other cancers, and from respiratory diseases. The mortality was compared with national levels. The proportion of smokers was higher than the national rate, which could account for some of the excess mortality. Age at first exposure was not a contributing factor.

ASBESTOS: OCCUPATIONAL EXPOSURE; CANCER; RESPIRATORY ILLNESS; TUMOR; CANCER MORTALITY; SMOKING; LUNG; PLEURA; RESPIRATORY DISEASE; HUMAN

Nicholson, W.J.; Maggiore, C.J.; Selikoff, I.J., Asbestos contamination of parenteral drugs., Science, 172: 171-173 (1972).

Asbestos filters are widely used by the pharmaceutical industry. In the U.S., measurable amounts of asbestos have been found in parenteral solutions used for therapy. Whether asbestos causes human disease by route of administration other than inhalation is still unknown. However, ingestion of asbestos is suspected of being hazardous due to increased incidences of gastrointestinal cancer among asbestos workers.

ASBESTOS: ASBESTOS FILTERS; INGESTION; INHALATION; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; CANCER; GASTROINTESTINAL

Norrinen, M., A study of the mortality of workers in an anthophyllite asbestos factory in Finland., Work. Environ., Health, 9(3): 112-118 (1972).

Results of a mortality study on workers in an asbestos factory in Finland indicated the following hazards of exposure to anthophyllite asbestos dust: (1) Overall mortality from cancer of the lung, bronchus, and trachea, from respiratory tuberculosis, and from other respiratory diseases was excessive. (2) Every fifth deceased member of the survey had asbestosis recorded on the death certificate as an underlying or contributing cause of death. (3) In certain age groups with a minimum exposure of more than three months, mortality from lung cancer was more than three times the expected number. The survey period was from 1936 to 1966 with mortality analysis up to the end of 1964. The minimum exposure to asbestos was three months.

ANTHOPHYLLITE; OCCUPATIONAL EXPOSURE; ASCBESTOS; CANCER; LUNG; HUMAN; RESPIRATORY DISEASE
When injected into mice, the infectious agent CHLAMYDIA PSITTACI induces orchitis; this was aggravated by pretreatment of the animals with i.p. injections of aqueous suspensions containing 20 mg chrysotile, coal, quartz or titanium oxide.

ASBESTOS; MOUSE; CHrysOTILE

Ooo, H.: Bitterkohl, G., On the epidemiology of asbestosis of the pleura., Z. Erkr. Atmungsorgane, 136(2): 165-174 (1972).

In Meineburg, East Germany, pleural plaques were found in 458 workers by x-ray analysis in 1970. Although most worked in the chemical industry, the majority of patients had been exposed to asbestos prior to 1945; 85% experienced indirect exposure. The mean latent period was 20 to 30 years.

ASBESTOS; HUMAN; PLEURAL PLAQUES; OCCUPATIONAL EXPOSURE

Pooley, P.D., Asbestos bodies, their formation, composition and character., Environ. Res., 5: 363-379 (1977).

Electron microscopic examination of asbestos bodies extracted from human lungs exposed to crocidolite, amosite, anthrophyllite, and chrysotile presented no evidence to suggest stepwise formation of asbestos bodies. They were nearly always formed on straight fibers longer than 10 μm. Asbestos bodies were found to contain a major crystalline component structurally similar to extracts of ferritin (produced from animal and human organs).

CROCIDOLITE; AMOSITE; ANTHROPHYLLITE; CHRYSOTILE; HUMAN; LUNG; ASBESTOS BODIES; CHRYSOTILE

Wott, F.; Ruth, F.; Friedrichs, K.H., Tumors of rats after i.p. injection of powdered chrysotile and benzo(a)pyrene., Zentralbl. Bakteriol. Parasitk. 155(5-6): 463-469 (1972).

Tumor incidence in rats was about 80% after intraperitoneal injection of either 100 μg U.J.C.C.—a standard chrysotile (fiber length is less than 5 μm)—or 100 μg of powdered chrysotile (fiber length is less than 3 μm). However, the latent period between exposure and tumor development was longer with powdered chrysotile. Addition of 1.25 μg of benzo(a)pyrene did not significantly influence tumor incidence, but without chrysotile, benzo(a)pyrene induced tumors in 10% of the animals.

ASBESTOS; CHRYSOTILE; TUMOR; RAT; CO-CARCINOGEN

Parham, K.T.: Wagner, J.C.; Evans, P.R., The response of human pleura in organ culture to asbestos., Nature, 238(5363): 366-347 (1972).

Human parietal pleura maintained in organ culture and exposed to blue asbestos showed marked proliferation of mesothelial cells. Some cells had larger nuclei and invaded underlying tissue. The amount of collagen was increased in the underlying tissue. Since tissues in organ culture respond to asbestos fibers in a relatively short period, the system should be useful for investigating the effects of other fibers, chemicals and carcinogens.

ASBESTOS; HUMAN; PLEURAL PLAQUES; OCcupATIONAL EXPOSURE

Selikoff, I.J., Anthrophyllite, crocidolite and amosite asbestos: occupational health hazards., Amer. Ind. Hyg. Assoc. J., 33(3): 178-191 (1972).

Spray application of insulating materials containing asbestos produces serious contamination of the working environment. Asbestos fiber concentrations of 70 fibers/cc have been detected at ten feet from the sprayer and 45 fibers/cc at seventy-five feet away. Consequently, nearby workers are exposed indirectly to asbestos.

OCCUPATIONAL EXPOSURE; ASBESTOSIS; INSULATION WORKERS; ASBESTOS

Robinson, J., Pleural plaques and splenic capsular sclerosis in adult male autopsies., Arch. Pathol., 93: 118-122 (1972).

In 2,516 autopsies on chiefly adult males in a Florida Veterans Administration Hospital, a similar incidence of pleural plaques was observed in both whites and negroes, but splenic capsular sclerosis occurred primarily in whites and at a later age. Pleural plaques were not associated with asbestos bodies or mesothelial neoplasia, indicating that they should not be considered as evidence of asbestosis.

ASBESTOS BODIES; ASBESTOSIS; PLEURAL PLAQUES; HUMAN

Rossiter, C.R., Evidence of dose-response relation in pneumoconiosis (I.), Trans. Soc. Occup. Med., 22: 83-87 (1972).

A technique for determining the severity of simple pneumoconiosis has been developed using a continuous scale for scoring radiographs based on the profusion of small round lung opacities. Using this technique, a direct relation between radiographic change and dust content of the lungs was evident in coal miners. Since asbestos is a biologically active dust, radiographic changes reflect pathological changes rather than the amount of asbestos in the lungs. The differences between the biological activities of the dusts inhaled by coal miners and asbestos workers are seen in relatively poor relations to mortality, pathology and lung function in the former and better relation for dockyard and chrysotile asbestos workers.

ASBESTOS; NEWS; CHRYSOTILE; HUMAN; DIAGNOSIS; PNEUMOCONIOSIS; X-RAY
Comprehensive chemical, mineralogical, and electron microscopic analyses of lung dust from a case of diffuse pulmonary fibrosis which morphologically resembled asbestos-revealed platy silicates but no asbestos fibers. Mica, kaolinite, and feldspar are, as in asbestos, less transportable in the interstitial lymph spaces than are small quartz crystals. Therefore they do not accumulate to the same extent in peribronchial and perivascular sites; thus a diffuse rather than a nodular type of pneumoconiotic fibrosis results.

**ANALYSIS; ASBESTOS; ASBESTOSIS; SILICOSIS; FIBROSIS; LUNG; HUMAN**

**<132>**

Hutterer, J.B.; Spricher, H.A.; Sticher, R., Diffuse 'asbestos-like' interstitial fibrosis of the lung., Pathol. Microbiol., 38(4): 250-257 (1972).

Intact and whole body instillation of chrysotile asbestos into hamsters demonstrated that, under suitable conditions, the alveolar epithelium is capable of ingesting particulate matter. Asbestos-containing epithelial cells increase in length of exposure. The condition is accompanied by cell transformation into hyperplastic structures exhibiting properties of the macrophage, including the ability to convert asbestos fibers into ameboid bodies and to develop into multinucleated giant cells.

**<136>**

Schnitzer, W., Phagocytic activity of the alveolar epithelial cells in pulmonary asbestos., Hinter. J. Pathol., 3: 373-379 (1972).

During the last two decades, increasing interest in environmental problems has grown - especially with respect to asbestos-related cancer. Hazards associated with asbestos appear to be limited at first to occupational exposures and now affect a large segment of society. The following aspects of asbestos are discussed: properties and uses of asbestos; types of asbestos; and related health hazards. However, specific attention is focused on the problem of neoplasia and asbestos exposure and international collaboration in an effort to solve the problem.

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Wagner, J.C.; Bogovski, P.; Higginson, J., The role of international research in occupational cancer., 63(5-6): 213-220 (1972).

Evidence suggests that silica particles do not damage plasma membranes of macrophages but are ingested into secondary lysosomes. Protection of lysosomal membranes against silica is achieved by polymers such as polyvinyl pyrrolidone-acetic acid. Asbestos, especially chrysotile, when added to macrophages or asbestos cells in the absence of serum, lysed the cells by interaction with the plasma membrane. In the presence of serum the asbestos particles are much less damaging than silica, whether or not they are ingested into the lysosomal system.

**<138>**

Allison, A.C., Effects of silica and asbestos on cells in culture., Inhaled Particles III: Proceedings of an International Symposium, (London, 1970). W.W. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England, pp. 437-445 (1971).

**<139>**

Schnitzer, P.J.; Kunenw, G.; Baden, F., Interactions of mineral fiber surfaces with cells in vitro., Ann. W.T. Acad. Sci., 172(23): 759-772 (1972).

The surface of asbestos and other mineral fibers showed marked interaction with cell membranes in vitro. Chrysotile was lytic for human, sheep, and horse red blood cells (RBC) with a 50% hemolytic concentration (HC50) of 0.2 mg/ml or less. The lytic activity was inhibited by ethylene diaminetetraacetic acid (EDTA) or by anionic polymers. Amphibole fibers were lytic when RBC exposure took place in a shallow layer with gentle agitation. Human RBC's were more sensitive than sheep RBC's; the HC50 was 10 mg/ml for amosite, 3.0-7.0 mg/ml for crocidolite and 1.0-3.0 mg/ml for anthophyllite. Anionic and nonionic polymers inhibited the lytic activity of anthophyllite while polyamions inhibited the activity of amosite and crocidolite.

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Schnitzer, P.J.; Kunenw, G.; Baden, F., Interactions of mineral fiber surfaces with cells in vitro., Ann. W.T. Acad. Sci., 172(23): 759-772 (1972).

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Allison, A.C., Lymphomes and the toxicity of particulate pollutants., Arch. Intern. Med., 128(1): 131-139 (1971).

In Vitro laboratory studies indicate that some inhaled particles, especially silica and asbestos, react with macrophage cells differently than do inert particles such as carbon. Silica and asbestos act as hydrogen bonding agents that alter the secondary lysosomal membrane; this causes loss of the lysosomal enzymes, destruction of the macrophage, and the release of unknown factors that induce fibrotic tissue response.

ASBESTOS; MACROPHAGE; FIBROSIS; LYMPHOMAS

Anonymous, Asbestos (all forms),. Documentation of the Threshold Limit Values for Substances in Workrooms Air. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (Third Edition), pp. 17-19 (1971).

A resume is given for the studies which lead to the adoption of the TLV of 5 fibers/ml (longer than 5μm) for asbestos.

ASBESTOS; STANDARDS; CHRYSOTILE; AMosite; CROCIDOLITE; TENEROLITE; ANTHROPHYLLITE; ACTINOLITE; PNEUMOCYTOSIS; ASBESTOSIS; OCCUPATIONAL EXPOSURE

Anonymous, Talc (non-asbestosiform and fibrous),. Documentation of the Threshold Limit Values of Substances in Workrooms Air. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio., pp. 242-243 (1971).

Since the physiological activity of talc apparently is related to the asbestos fiber content, the threshold limit values (TLV) recommended for work areas differs for non-fibrous and fibrous types. A value of 20 aspcf is recommended for non-fibrous talc; 5 fibers per million of air for those exceeding 2 μm in length is the limit for fibrous talc due to the similarity in the fibrotic reaction produced by talc and asbestos.

ASBESTOS; FIBROSIS; HUMAN; STANDARDS; OCCUPATIONAL EXPOSURE

Anonymous, Asbestos, questions still unanswered, Food Cosmet. Toxicol., 9: 281-284 (1971).

A brief review is given of the sometimes contradictory evidence relating asbestos exposure with asbestosis, lung tumors, and mesotheliomas of the pleura or peritoneum. Both experimental and epidemiological studies are cited. There are obvious differences in the effect of various types of asbestos.

ASBESTOS; OCCUPATIONAL EXPOSURE; NEUMOPLASM; HUMAN; MESOTHELIOMA; RAT; ASBESTOSIS; ASBESTOS BODIES; AMOSITE; CHRYSOTILE; CROCIDOLITE

Badr, R.N.; El-Sewefy, A.Z., The association between asbestosis and A B O blood groups., Ann. Occup. Hyg., 14: 35-40 (1971).

Clinical and radiological examinations of workers intermittently exposed to asbestos, silicas and cement dusts in a cement pipe factory in Egypt have shown that the incidence of asbestosis usually is directly related to the duration of exposure. However, approximately 20% of the workers never develop clinical or radiological signs of asbestosis regardless of the duration of exposure. The resistance implied may be attributed to inherent genetic mechanisms or to developing defense mechanisms induced by specific extrinsic factors. Increase of globulin fractions β2, α1, and α2 in diseased workers indicates an immune response. In workers showing clinical and radiological signs of asbestosis there is an increased frequency of the blood group O compared with workers from control groups. The genetical aspects of asbestosis susceptibility warrants further investigation.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; CANCER; BIOCHEMICAL EFFECTS; HUMAN

Beck, R.G.; Bruch, J.; Friedrichs, K.M.; Hilscher, W.; Pott, V., Fibrous silicates in animal experiments and cell-culture., Inhaled Particles III: Proceedings of an International Symposium, (London, 1970). W.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England., pp. 477-487 (1971).

In rats injected intraperitoneally with chrysotile and crocidolite fibers, the severity of asbestosis varied directly with the fiber length used. Granulomas produced by the i.p. injection of UCIC amosite, crocidolite, and anthophyllite in rats contained a higher percentage of long fibers than did the original dust; mostly short fibers were deposited in the lymph nodes, indicating that the short fibers are readily transported by the lymphatic system. Since the frequency of the L-cells was increased to a greater extent by long chrysotile and glass fibers than by short fibers, due to incomplete or prolonged phagocytosis of the fibers by the cells.

CHRYSOTILE; CROCIDOLITE; AMosite; ANTHROPHYLLITE; ASBESTOSIS; GRANULOMA; RAT; PHAGOCYTOSIS; CELL CULTURE; TISSUE DISTRIBUTION; ASBESTOS

Beck, R.G.; Holt, P.P.; Mahallah, K.T., Effects of chrysotile and acid-treated chrysotile on macrophage cultures., Br. J. Ind. Med., 28(2): 174-185 (1971).

Altered permeability of cell membranes by cytotoxic substances can be estimated several ways by cell culture techniques: eosin- α stains damaged cells, enzymes such as lactic dehydrogenase leak from cells into the supernatant fluid, and metabolic activity such as lactate synthesis is reduced. The addition of chrysotile to monolayer cultures of peritoneal and alveolar macrophages increased eosin- α uptake and lactic dehydrogenase activity after 20 hrs; at the same time, however, there was an increase in lactate synthesis indicating that the permeability increase occurs during phagocytosis of fibers and does not result from cell damage. Chrysotile treated with acid was cytotoxic, causing a larger increase in mesoaur permeability with a reduction in lactate synthesis. Effects of chrysotile coated with poly(2-vinyl-pyridine-1-oxide) on permeability did not differ significantly from untreated chrysotile.

ASBESTOS; CHRYSOTILE; GUINEA PIG; MACROPHAGE; PHAGOCYTOSIS; CELL CULTURE; CYTOTOXITY

December 1974
Ferruginous bodies were found in 10% of the lungs of autopsies. An attempt to differentiate between ferruginous bodies of asbestotic origin and those of non-asbestotic origin by their iron-staining characteristics failed to produce discernable differences. Prussian blue stains were used. No occupational histories were established.

**ASBESTOS; ASBESTOS BODIES; FERRUGINOUS BODIES; HUMAN**

**ASBESTOS; ASBESTOS BODIES; MACROPHAGE**

Beritic, T.; Dimov, D.; Musarevic, A.; Sondic, M.; Sirec, A., Asbestos and ferruginous bodies, Arh. Hig. Rada, 22(4): 317-322 (1971).

Ferruginous bodies were found in 10% of the lungs of autopsies. An attempt to differentiate between ferruginous bodies of asbestotic origin and those of non-asbestotic origin by their iron-staining characteristics failed to produce discernable differences. Prussian blue stains were used. No occupational histories were established.

**ASBESTOS; ASBESTOS BODIES; FERRUGINOUS BODIES; HUMAN**

Boy, E.; Harrington, J.S., Cytotoxic effects of some mineral dusts on Syrian hamster peritoneal macrophages, J. Exp. Med., 113(5): 1169-1169 (1971).

Hamster peritoneal macrophage cell cultures were inoculated with various mineral dusts to study cytotoxic effects. Cells phagocytosing asbestos and crocidolite showed no specific damaging effect; however, some loss of cells occurred in the cultures within 2 days due to over-ingestion of particles. In contrast, chrysotile was highly cytotoxic, causing vacuolization of the cytoplasm, collapse of ruffled membranes, and the appearance of large numbers of pyknotic cells. A comparison of two chrysotile preparations which differed in surface area showed that weight rather than surface area of the fiber determines toxicity. Pretreatment of chrysotile in the presence of proteolytic enzymes, rather than acetone, protected dusts but did not increase the intensity of the cytotoxic effect. The results with silica dusts are discussed also.

**ASBESTOS; CELL CULTURE; CYTOTOXICITY; HAMSTER; MACROPHAGE**

Bodman, D.H., The alveolar macrophage, Curr. Top. Pathol., 55(1): 1-36 (1971).

The origin of alveolar macrophages and their responses to particulate materials are discussed in detail. Two features distinguish the alveolar macrophage response to asbestos from the reaction to silica: giant cell transformation and the formation of asbestos bodies. The latter process may serve to neutralize the toxic action of the asbestos particles.

**ASBESTOS; ASBESTOS BODIES; MACROPHAGE; GIANT CELL; SILICOSIS**

Brain, J.D., The effects of increased particles on the number of alveolar macrophages, Inhaled Particles III: Proceedings of an International Symposium, (London, 1970). W.R. Walton (Editor). Davin Brothers Limited, Graham Press, Surrey, England., 1: 209-224 (1971).

A lung washing technique was used to estimate the number of free cells (alveolar macrophages) produced in rats and hamsters by the intratracheal injection of coal dust, carbon, chrysotile, iron oxide, and barite sulfate particles. The lungs were excised, gas freed, cannulated and washed 12 times at 4 hrs., 1 day and 3 days following injection. All materials increased the rate of macrophage production; this, in turn, increases the probability that the particles will be phagocytosed and will remain on the alveolar surface rather than penetrating fixed lung tissue.

**ASBESTOS; CHRYSOTILE; RAT; HAMSTER; MACROPHAGE; PHAGOCYTOSIS; LUNG**

Brown, G.; Bigon, J.; Bonnard, G.; Goff, J., Effect on public health of air pollution with asbestos and other fibrous dust particles, Rev. Tuberc. (Paris), 3(5): 491-478 (1971).

The role of asbestos in the rising frequency of pleural and peritoneal mesothelioses and of broncho-pulmonary cancer is discussed in the light of published epidemiologic and experimental studies. Pulmonary fibrosis is becoming less frequent, probably due to increased protection in the asbestos industry. Since world production has increased eightfold in the past 10 years, air pollution from these fibers may have become a problem for the population at large.

**ASBESTOS; ASBESTOSIS; CANCER; MESOTHELIOMA; PNEUMOSIS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION**

Bryks, S.; Bertalanffy, P.D., Cytodynamic reactivity of the mesothelium, Arch. Environ. Health, 23(66): 469-472 (1971).

The tritiated thyidine technique was used to examine the cytodynamic reactivity of the pleural mesothelium in rats following the intratracheal injection of synthetic or natural chrysotile. Within 4 days, natural chrysotile had produced a significant increase in the labeling index of mesothelial cells; in addition, the loss of label from this group after the administration of tritiated thyidine at time of treatment occurred more rapidly than in control rats or those treated with synthetic chrysotile. Synthetic chrysotile also failed to produce a comparable increase in the labeling index. These observations indicate that the pleural mesothelium displays a high degree of sensitivity to natural chrysotile.

**ASBESTOS; CHRYSOTILE; RAT; PLATEAUX**
Asbestos workers were studied regularly for several years by chest X-ray, vital capacity, 1-second vital capacity, and lung compliance, diagnostic procedures. Intensive contact with asbestos dust resulted in decreased vital capacity and lung compliance although radiological changes developed slowly. Dyspnea frequency was related to decreased vital capacity. These changes indicated an early phase of asbestosis.

**ASBESTOS; OCCUPATIONAL EXPOSURE; LUNG; ASBESTOSIS; T-Y-RAY; VENTILATORY DEFECTS**

A case of rare primary intrapulmonary neurogenic sarcoma with accompanying hypertrophic pulmonary osteoarthropathy and asbestosis, Thorax, 26: 212-218 (1971).

A case of rare primary intrapulmonary neurogenic sarcoma with accompanying hypertrophic pulmonary osteoarthropathy and asbestosis is presented and 5 previously documented cases are reviewed. The patient, a non-smoker, had been occupationally exposed to asbestos for 20 years. After surgical removal, the tumor recurred in six months causing death within 16 months. Histological features of the tumor are discussed.

**ASBESTOS; ASBESTOSIS; HUMAN; OCCUPATIONAL EXPOSURE; SARCOMA; TUMOR**

Cell culture and in vivo studies of asbestos, polyurethane, polyethylene terephthalate (PET) and acicular calcium carbonate indicate that a direct relationship exists between the fibrogenic and cytotoxic effects of dust. In cell suspensions of peritoneal or alveolar macrophages asbestos was the most toxic dust, as indicated by the mortality incidence of cells which had phagocytosed dust particles. Asbestos also was the most fibrogenic dust in rats inoculated intratracheally or intraperitoneally. The cytotoxic-fibrogenic effects were unrelated to the shape, size, or concentration of the dust particles, or to the phagocytosing potential of the macrophages.

**HAT; CELL CULTURE; ASBESTOS; PHAGOCYTOSIS; CYTODYNAMICITY**

Data and hypotheses presented relate the biological activity of asbestos to the electroneumorphic interaction between trace metals and minerals associated with the fibers. The trace metals consist mainly of nickel, chromium, magnesium, and iron. In lung tissue, the electroneumorphic phenomenon results in the concentration of biologically active metals at localized tissue sites, and increased residence time at these sites. This may explain the exacerbations of diseases, sensitization reactions, carcinogenicity, latency period and other responses of tissue to asbestos.

**ASBESTOS; CANCER; CHEMICAL COMPOSITION; ANALYSIS; ENVIRONMENTAL CONTAMINATION; HUMAN; HAN...**

Asbestos can be safely used in industry if proper precautions are taken. All available analytical procedures must be used to determine asbestos and other fibers, including neutron activation, electron microprobe, and atomic absorption spectrometry. Recommendations for control are given.

**ASBESTOS; STANDARDS; ANALYSIS; OCCUPATIONAL EXPOSURE**

In an effort to simplify the comparison of asbestos exposure data from various countries and studies, the Sub-Committee on Asbestos of the Permanent Commission and International Association on Occupational Health recommended standardization of the procedures used for enumerating and characterizing exposure to respirable asbestos fibers. The Sub-Committee recommended the membrane filter technique for collecting airborne asbestos fibers and suggested that the samples be taken in the breathing zone of the workers and at fixed sites for evaluation of the effectiveness of safety equipment and procedures. Short but frequent sampling times should be used for determining maximum exposures while longer sample times should be used for weighted average exposure determinations. Fiber counts should be expressed in number of fibers per cubic centimeter, counting only fibers 0.6 μm or more in length with a ratio of length to diameter of at least 3 to 1. The type of asbestos, trace metal content, free silica content, and organic contaminants should also be determined. Other procedures should be tried; however, concurrent data should be obtained by the recommended procedures.

**ASBESTOS; STANDARDS; ANALYSIS; OCCUPATIONAL EXPOSURE; CHRYSOTILE; ANOSITE; CROCIDOLITE; TRACE METALS; ENVIRONMENTAL SAMPLING**

Various beverages and 8 samples of tap water from three major cities in Canada were examined by electron microscopy for asbestos fibers. All samples contained asbestos fibers, either chrysotile or amphibole; filtered water contained less asbestos fibers than unfiltered water. It is noted that the hazard from ingested asbestos has not been resolved.

**ASBESTOS; INGESTION; CHRYSOTILE; NON-OCCUPATIONAL EXPOSURE; AMPHIBOLE; HUMAN; ENVIRONMENTAL CONTAMINATION**

December 1974
The rate of collagen protein synthesis in animals is directly related to the rate of proline hydroxylation. In rats, the ratio of these collagenous tissue responses was measured for a hydroxyproline: proline ratio. The ratio was significantly increased in animals injected intratracheally with asbestos, indicating that the early stage of fibrotic tissue response is characterized by an increased rate of collagen biosynthesis. The ratio of calcium and potassium ions in the serum was normal in the diseased workers. No correlation was found between the amino acid pattern and the extent of radiological changes in asbestosis.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; HUMAN; BIOCHEMICAL EFFECTS

Davis, J. W. G., The calcification of fibrous pleural lesions produced in guinea pigs by the injection of chrysotile asbestos dust., Brit. J. Exp. Pathol., 23(3): 238-243 (1971).

Intrapleural injection of chrysotile in guinea pigs induced rapid development of granulomas; initially, these consisted mainly of giant cells which were largely replaced by calcified fibrous tissue within 18 months. Calcification of the fibrous tissue began at 12-15 months by the formation of calcium (apatite) crystals and laminated bodies (30-60) containing asbestos cores. Mucopolysaccharide was removed from collagen fibers and deposited around remaining free dust in the fibrous area. The apatite crystals accumulated on surface layers of mucopolysaccharide, quickly filling tissue spaces and enclosing the collagen, covered dust and lamellar bodies in a solid mass of calcification.

CHrysotILE; ASBESTOS; GUINEA PIG; PLURAL CALCIFICATION; FIBROSIS; GRANULOMA; GIANT CELL

Drysdale, P. S., Safety - asbestos., Occup. Health, 23(3): 97 (1971).

The aim of the Asbestos Regulations is to keep dust out of the air of work places by requiring safe methods of asbestos handling in all industries. Potentially, 160 fatalities per year could occur in the total population of about 50,000 working with asbestos. Many industries will face problems in meeting these regulations to protect workers.

ASBESTOS; STANDARDS; OCCUPATIONAL EXPOSURE; HUMAN

El-Sewefy, A. Z.; Hassan, F., Immunoelectrophoretic pattern changes in asbestosis., Ann. Occup. Hyg., 14: 25-28 (1971).

Serum samples from 33 male workers in an Egyptian asbestos cement pipe factory were examined for immunoelectrophoretic pattern changes. The workers were exposed to silica, asbestos and cement dust for 10 to 23 years, and all showed clinical and radiological signs of asbestosis. Albumin levels in 63% of the samples were significantly decreased. Changes in immunoglobulins were evidenced by high levels of IgG in 66% of the samples, of IgA in 63%, and of IgM in 54%. The increase in IgG and IgM is a characteristic response to chronic inflammatory disease; the IgA increase may reflect an auto-immune response. These changes were not related to the duration of exposure or to the degree of asbestosis.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; HUMAN; BIOCHEMICAL EFFECTS

El-Sewefy, A. Z.; Hegazi, S. M., Serum proteins and amino acids in asbestosis., Ann. Occup. Hyg., 14: 29-33 (1971).

More free and total amino acids were found in serum from workers showing signs of asbestos than from healthy controls. The serum protein change suggests that the introduction (inhalation) of asbestos into the body results in a disruption of protein metabolism. The concentrations of sodium and potassium ions in the serum were normal in the diseased workers. No correlation was found between the amino acid pattern and the extent of radiological changes in asbestosis.

ASBESTOS; PNEUMOCONIOSIS; HUMAN; OCCUPATIONAL EXPOSURE; ASBESTOSIS; BIOCHEMICAL EFFECTS

Elvan, P. C.; Elvan, W. J. C., Insulation workers in Belfast., Proc. Inst. Lond., 28(3): 226-236 (1971).

The fate of 165 insulation workers in Belfast with known occupational exposure to asbestos is presented. Between 1940-1964 total deaths in this group was 98 compared to 37 normally expected; the increase became statistically significant after 1960. Cancer deaths were nearly eight times more frequent than expected. Twenty-eight of the 45 deaths were from cancer of the larynx, lung or pleura; mortality from cancer of the gastrointestinal tract and from fibrotic lung lesions also was higher in insulation workers. Seven cases of mesothelioma were confirmed. The ratio of observed over expected deaths was 7.6 for all causes, 3.9 for all cancers, and 17.6 for cancers of the lower respiratory tract and pleura. No correlation was established between age at first exposure, duration of exposure, smoking, and the excessive mortality.

ASBESTOS; CANCER; MESOTHELIOMA; HUMAN; PIP COVERERS; INSULATION WORKERS; SHIPYARDS; CANCER MORTALITY; GASTROINTESTINAL

FAO/WHO, Safety of food additives and solvents., World Health Organ. Chron., 25(9): 409-411 (1971).

A brief paragraph discusses the danger of asbestos fibers in foodstuffs. A recommendation is made that filter media other than asbestos be used, when possible, in the processing of foods.

ASBESTOS; ASBESTOS FILTERS; CROCIOLITOL; FOOD CONTAMINATION

Environmental Health Perspectives
When administered intraperitoneally to P388 rats, amosite, anthophyllite and crocidolite asbestos fibers were distributed in abdominal granulomas and related lymph nodes; in granulomas short fibers were mostly intracellular whereas the longer ones were seldom incorporated. Short fibers were found in lymph nodes without evidence of fibrosis. It was concluded that the transport of asbestos from the site of administration depends upon the fiber length: it begins with fibers less than 20 μm and increases with decreasing fiber length.

ASPHEROLITE; ANTHROPHYLITE; AMOSITE; ASBESTOS; CROCIDOLITE; PLEUROSIS; GRANULOMA; RAT; TISSUE DISTRIBUTION

Gee, B.; Bouhys, A., Action on asbestos., New Engl. J. Med., 285(23): 1317–1318 (1971).

The widespread contamination of air, water and beverages by asbestos, and the presence of asbestos in the lungs of people having no industrial exposure is quite disturbing in view of the serious pulmonary diseases related to occupational asbestos exposure. Since asbestos is relatively resistant to destruction and asbestos diseases have a long latency period, there is an urgent need for sweeping decisions on the control of asbestos emissions. The following recommendations are made: (1) lowering of threshold limit values for occupational exposure, (2) sophisticated dust controls, (3) better and more precise asbestos substitutes; and (4) larger monitoring of both the workers and their environment.

ASBESTOS; OCCUPATIONAL EXPOSURE; STANDARDS; HUMAN; CHrysotile; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE

Gibbs, G.W., Qualitative aspects of dust exposure in the Quebec asbestos mining and milling industry., Inhaled Particles III: Proceedings of an International Symposium (London, 1970). W.H. Walton (Editor). Univ. Brothers Limited, Grahas Press, Surrey, England. Vol. 2: 783-799 (1971)

Epidemiological studies relate adverse health patterns to asbestos dust exposure. Both the quantity and quality of the dust varies from mine to mine, mill to mill, and within any one plant. Differences in asbestos sources and usage also influence disease patterns. Some of the qualitative aspects of asbestos chemistry include organic constituents, trace metals, processing and naturally occurring contaminants, reactivity, and chemical and physical characteristics.

ANALYSIS; ASBESTOS; ASBESTOSIS; CANCER MORTALITY; OCCUPATIONAL EXPOSURE; HUMAN; CO-CARCINOGEN; TRACE METALS

Gold, C., Asbestos in tumors., J. Clin. Pathol., 24: 881 (1971).

The four main types of asbestos are not equally implicated as carcinogenic agents in humans. The type and source of the asbestos, fiber characteristics, deposition site, cellular reactions, and total dose all may play a part. The K0 extraction method is useful for separation of the dust for detailed morphological studies.

ASBESTOS; CANCER; TUMOR; MESOTHELIONA; HUMAN; ANALYSIS; LUNG; CARCINOMA; PLEURA; PHRTYMOEUN
concentrations resulted from nonfibrous particulates and from carbonaceous fibrous particles. Arch. Environ. Health, 22(9): 538-537 (1971).

Long tissue from people not occupationally exposed to asbestos dust was found to contain ferruginous bodies with unusual morphology. Some of these cores are transparent and some are opaque whereas others have nonfibrous cores. Those with black, fibrous cores are believed to originate from inhaled smoke particles.

FERRUGINOUS BODIES: ASBESTOS BODIES: PSEUDO-ASBESTOS BODIES: ASBESTOS: ANALYSIS: SMOKING: LUNG: HUMAN

Occurrence of mesotheliomas in rats inoculated intraperitoneally with two forms of asbestos was slightly greater for Cape crocidolite than for Transvaal amosite. Asbestos apparently can produce tumors in the pleural cavity, but less readily than crocidolite and after a longer interval. CROCIDOLITE: ANOSITE: RAT: CANCER: MESOTHELIOMA: TUMOR

Chrysotile asbestos hemolysed sheep erythrocytes (in vitro) with a pH range of 8-11. Other asbestos forms caused varying degrees of hemolysis which related to the magnesium: silic acid ratio. Longer erythrocyte exposure time to asbestos resulted in greater hemolysis. Ethylenediaminetetraacetic acid (EDTA) prevented hemolysis by asbestos and other materials containing magnesium. Sialic acid was a more effective protective agent. Poly-2-vinylpyridine-1-oxide had little effect on hemolysis by chrysotile. Magnesium appeared to be the principal agent of hemolysis by asbestos.

CHRYSTOTILE: ANOSITE: CROCIDOLITE: ACTINOMOLITE: HEMOLYSIS

Dust measurements indicate that gravimetric methods for monitoring respirable asbestos dust concentration in naval dockyard insulating operations are not adequate. It is recommended that a membrane filter technique be used. In the removal of pipe lagging there appears to be dust mass and fiber concentration at high dust levels, but not at low levels. CROCIDOLITE: SHIPYARDS: OCCUPATIONAL EXPOSURE: ANALYSIS: ASBESTOS: ENVIRONMENTAL SAMPLING: HUMAN

Determinated iron, chromium, cobalt, nickel, and scandium in asbestos by neutron activation analysis, Amer. Ind. Hyg. Assoc. J., 32(9): 281-286 (1971).

The iron, chromium, cobalt, nickel, and scandium content of five International Union Against Cancer (UICC) standard reference samples of asbestos were determined by neutron activation analysis. Individual samples of Canadian chrysotiles and South African crocidolites were also analyzed. As determined by high resolution gamma-ray spectrometry, milling caused no significant change in elemental composition of the UICC standards. ASBESTOS: CHRYSTOTILE: CROCIDOLITE: TRACE METALS: ANALYSIS

Animal inhalation experiments using asbestos demand uniform particle release and distribution. The design, construction, and performance of a dust dispenser suitable for dispersing small quantities of "respirable" radioactive asbestos dust for animal inhalation experiments is discussed. ASBESTOS: INHALATION

Thirty-three asbestos insulation workers were examined to assess the incidence of asbestos-related pulmonary diseases. Results from x-rays and lung function tests revealed no cases of asbestosis, pleural plaques or malignancy. Eight men had chronic bronchitis and three others were asthmatic; asbestos bodies were observed in sputum smears from five men. Of these 33 men, 29 had been regular cigarette smokers; however, 18 had stopped smoking, predominantly within the last five years. Despite the negative findings, it is recommended that every person appreciably exposed to asbestos have an annual examination. ASBESTOS: ASBESTOSIS: BROCHITIS: CANCER: INSULATION WORKERS: PLEURAL PLAQUES: RESPIRATORY DISEASE: X-RAY: HUMAN

A 64 year old man was hospitalized with progressive dyspnea and chronic lung disease; he was a heavy smoker, and had been occupationally exposed to asbestos dust for 45 years. Clinical examination showed pleural effusion, mild finger clubbing, and severely depressed pulmonary function. The patient's condition deteriorated rapidly, followed by sudden death. Autopsy revealed pulmonary asbestosis with pleural mesothelioma and asbestos bodies in the lung tissue. ASBESTOS: OCCUPATIONAL EXPOSURE: HUMAN: ASBESTOSIS: MESOTHELIOMA: PLEURA: FINGER CLUBBING: DYSPNEA: RESPIRATORY DISEASE: PLEURITIS: LUNG: ASBESTOS BODIES
Jodoin, G.; Gibbs, G.W.; Hackett, P.T.; McDonald, J.C.; Becklake, M.R., Early effects of asbestos exposure on lung function, J. Aerosol Sci., 104: 255-535 (1971).

An attempt to find early symptoms of lung damage due to asbestos exposure involved a detailed study of pulmonary function in 24 mine workers with normal chest X-rays and exposure ranging from 6 months to 24 years. Workers with the greatest exposure time showed changes consistent with restrictive lung disease, including increase in static recoil, reduced vital capacity and larger maximal mid-expiratory flow; decreased peak flow in these men indicated increased upstream resistance. As in animal studies, the results suggest a peribronchial rather than alveolar obstructive restriction.

ASBESTOS; OCCUPATIONAL EXPOSURE; LUNG; VENTILATORY DEFECTS; RESPIRATORY DISEASE; HUMAN

Langer, A.M.; Baden, V.; Hammond, R.C.; Sellkoff, I.J., Inorganic fibers, including chrysotile, in lungs at autopsy: preliminary report, Inhal. Contam. Particles III: Proceedings of an International Symposium London, 1970, W.H. Walton (Editor). Oneworld Printers Limited, Gresham Press, Surrey England, pp. 683-694 (1971).

Inorganic fibers, some smaller than 1 um diameter, were found in the lung tissue of 1038 out of 3000 consecutive autopsies in New York City. Electron microscopy is necessary to identify chrysotile fibers. Use of this technique indicated that asbestos fibers are commonly present in the lungs of urban residents.

ASBESTOS; ANALYSIS; CHRYSTOTILE; HUMAN; ASBESTOSIS; ASBESTOS BODIES; ELECTRON MICROSCOPY; NON-OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION

Langer, A.M.; Sellkoff, I.J., Chrysotile asbestos in lungs of residents of New York City, Proceedings of the Second International Clean Air Congress, R. N. England and W.T. Berry (Editors). Academic Press, New York 1971, pp. 161-165 (1971).

Electron microscopic examination of lung tissue revealed the presence of chrysotile asbestos fibers in 24 of 28 randomly selected autopsies in New York City; only in some cases were positive for asbestos bodies by light microscopy. The unique morphology of chrysotile made positive identification possible. The epidemiological significance of these observations is not known and occupational histories were not established.

ASBESTOS; ANALYSIS; ASBESTOS BODIES; CHRYSTOTILE; LUNG; HUMAN; ENVIRONMENTAL CONTAMINATION; INHALATION; NON-OCCUPATIONAL EXPOSURE

Langer, A.M.; Sellkoff, I.J.; Saetre, A., Chrysotile asbestos in the lungs of persons in New York City, Arch. Environ. Health, 22: 348-361 (1971).

Because of several interrelated technical problems, identification of chrysotile asbestos fibers in human lung tissue is difficult. Using electron microscopy, chrysotile was found in 24 of 28 consecutive autopsy cases in New York City. These fibers were 200 to 400 Angstroms in diameter.

ASBESTOS; CHRYSTOTILE; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE; HUMAN; LUNG; INHALATION

Langlands, J.H.M.; Wallace, W.P.M.; Simpson, W.J.C., Insulation workers in Belfast. 2. Morbidity in men still at work, Brit. J. Ind. Med., 28(3): 217-275 (1971).

Chest X-rays, questionnaires, and clinical and pulmonary function tests were used to assess the effects of asbestos in 251 insulation workers in Belfast. The proportion of men with abnormal chest X-rays increased with time and with the number of years in the industry. Two-thirds of the men with lung field abnormalities (abnormal reticulation, linear shadows or fine nodulation) had plural fibrosis or calcification; evidence suggests that some men had pleural abnormalities due to asbestos exposure in childhood. Among men with lung field abnormalities, 61% had rad and 11% had finger clubbing. Lung function factors most impaired by lung field abnormalities were forced vital capacity and carbon monoxide transfer factor. There was considerable impairment of lung function in smokers compared to nonsmokers.

INSULATION WORKERS; X-RAY; PLEURAL CALCIFICATION; FIBROSIS; ASBESTOS; RALES; FINGER CLUBBING; ASBESTOSIS; HUMAN; SMOKING; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS

Lavender, P.J., Asbestos: some nonradiological aspects, Proc. Roy. Soc. Med., 64(8): 833-83a (1971).

A brief overview of asbestos and asbestos-related-diseases, asbestosis, cancer, and fibrosing lung disease in previous and present exposure to asbestos is likely to occur during industrial processing, asbestos is also an environmental pollutant. Research is in progress to determine the mechanism of asbestos carcinogenicity.

HUMAN; ANALYSIS; ASBESTOS; ASBESTOS BODIES; CANCER; RESPIRATORY; ASBESTOSIS; CHRYSTOTILE; WHITE ASBESTOS; FIBROSIS; ENVIRONMENTAL CONTAMINATION; GASTRIC/INTESTINAL; PLEURA; LUNG

Leduc, J.; Tremblay, A.; MacKay, R.G., Asbestos and cancer growth, Clin. Res., 19(4): 707 (1971).

Rats were injected intraperitoneally with asbestos and the tumor of Walker in a leg muscle. Controls received either the asbestos, the tumor, or a saline solution. At autopsy, the tumor in animals which had received both asbestos and tumor was significantly larger and more ulcerated than in the controls. Splenomegaly was found in this group also, but not in the controls. The reticulo-endothelial system may have participated in increased growth of the tumor.

ASBESTOS; RAT; TUMOR

Luce, R.W., Identification of serpentine varieties by infrared absorption, U.S. Geol. Survey Prof. Paper, 750-B:B199-B201 (1971).

Infrared absorption was used to differentiate between different serpentine minerals—chrysotile, lizardite, and antigorite. When combined with X-ray diffraction, the method is very useful, but certain mixtures cannot be identified by this procedure alone.

CHRYSTOTILE; ANALYSIS; SERPENTINE
Concentrations to respirators

Respirator fibers/cc

Asbestos dust disturbed.

In England.

Covered standards

Protection cover asbestos helmet

Be

Crocidolite

Buildings made covers.

Ann. Occup. Hyg., 14: 285-286 (1971).

Dust levels inside asbestos-covered firefighting helmets were determined by collecting samples in the breathing zone of the wearer on 0.8 mm pore size Millipore membrane filters. The fiber count was made using phase contrast light microscopy at 400X magnification with the following results: new helmet with unlined asbestos cloth cover - 2.30 fibers/cm²(3); old helmet with unlined asbestos cloth cover - 1.36 fibers/cm²(3); helmet with unlined asbestos cover - 0.0 fibers/cm²(3). The fiber protection provided outweighed the small risk from asbestos dust inhalation. Aluminised asbestos cloth covered helmets were recommended.

Asbestos; occupational exposure; inhalation; human

Cowley, K.P.S.; Marries, P.G.; O’Kelly, F.J., Buildings insulated with sprayed asbestos: a potential hazard., Ann. Occup. Hyg., 14: 255-257 (1971).

Crocidolite and amosite asbestos have been used as insulation on the walls and underside of the roofing of many storehouses attached to the Naval Dockyards in England. The sprayed-on asbestos insulation was easily damaged and much asbestos debris was present. Fiber counts made by the Millipore membrane filter technique increased with increasing activity in the building and were in excess of the accepted standards of 0.2 fibers/cubic cm for crocidolite. Crocidolite values ranged from a mean of 0.26 fibers/cubic cm in little used buildings to a mean of 11.69 fibers/cubic cm when the fallen debris was disturbed. It was recommended that the insulation be sealed to minimize human hazards.

Asbestos; crocidolite; standards; occupational exposure; shipyards; human

Laxen, S.C., The use of dust respirators against asbestos dust hazards in the United Kingdom., Amer. Ind. Hyg. Assoc. J., 32(11): 723-725 (1971).

In the United Kingdom, the use of simple dust respirators against asbestos inhalation is limited to concentrations not exceeding 40 fibers/cc of air for chrysotile and amosite or 4 fibers/cc for crocidolite. Higher degrees of protection can be obtained by using (1) the positive-pressure dust respirator in concentrations not exceeding 200 fibers/cc of air for chrysotile and amosite or 20 fibers/cc of air for crocidolite; (2) ultra-high-efficiency dust respirator in concentrations less than 800 fibers/cc of air for chrysotile and amosite and 80 fiber/cc of air for crocidolite. At dust levels above this, only a positive-pressure airline respirator provides adequate protection.

Asbestos; chrysotile; amosite; crocidolite; dust controls; standards; occupational exposure; textile industry

H. C. T., The radiological investigation of the early manifestations of exposure to asbestos dust., Proc. Roy. Soc. Med., 64(8): 838-837 (1971).

Early signs of pulmonary fibrosis have been detected in 100 ma x-ray films of British shipyard workers. Radiological survey at Devonport Dockyard in 1970 showed 500 workers with evidence of asbestos pleural abnormalities and 36 cases of asbestosis; 104 patients were receiving compensation for asbestosis.

Asbestos; asbestosis; mesothelioma; X-ray; shipyards; occupational exposure; pleural plaques

McCallum, R.T., Pollution at work: dusty work in the 1970’s., Roy. Soc. Health J., 91(5): 246-250 (1971).

The inhalation of dust of any kind is potentially dangerous to the lungs. Experiments indicate that the most severe problems are caused by particles which are invisible to the naked eye. One industrial source of harmful dust lies in the processing and installation of asbestos; in Great Britain the asbestos Regulations of 1969 deal with this problem specifically. Limits for common asbestos are set at 2 fibers/cc or 0.1 mg/cubic meter; these may be altered as more information becomes available. Sampling instruments for measuring respirable dust in work areas are briefly discussed.

Asbestos; occupational exposure; standards; environmental sampling; human; respiratory disease

McDonald, J.C.; McDonald, A.D.; Gibbs, G.W.; Sleisenger, J.T.; Bousiener, C.E., Mortality in the chrysotile asbestos mines and mills of Quebec., Arch. Environ. Health, 22: 677-686 (1971).

More than 88% of the employees in the Quebec chrysotile mining industry over 50 years of age were surveyed and rated by an exposure index. Overall mortality was lower than normal, but in those exposed to highest dust concentrations the rate was 20% higher. Respiratory, cardiovascular, and malignant diseases accounted for the excess.

Asbestos; occupational exposure; human; respiratory disease; cancer; mesothelioma; asbestos mining; cancer mortality

Hermis, N.B., Talc and asbestos contamination of rice., J. Amer. Med. Assoc., 216(13): 2144 (1971).

Talc, which may contain asbestos as a natural contaminant, is added to rice exported to Japan. Research has shown that ingestion of asbestos can increase the incidence of cancer of the gastrointestinal tract. It is possible that this factor contributes to the high incidence of stomach cancer among the Japanese.

Asbestos; food contamination; cancer; human; ingestion; gastrointestinal
Evidence both epidemiologic and analytical is presented to support the hypothesis that the high incidence of stomach cancer in Japan is due to the asbestos content of the talc which is used to coat the rice in the diet.

**ASBESTOS; TALC; CANCER; HUMAN; INGESTION; GASTROINTESTINAL**

Financial Support:

Milne, J.E.H., Developmental changes in asbestos bodies and their significance., Trans. Soc. Occup. Med., 21(4): 110-121 (1971).

Inhaled fibers become coated with an iron-protein envelope and are called ferriaggregates. If the core fibers are identified as asbestos, they are called asbestos bodies. The asbestos body begins as a thin yellow beaded object and matures to a shorter thicker dark brown segmented shape. The coating becomes granulated, followed by fragmentation, and shaggyosis. Difficulty in recognizing these bodies, especially in later stages, may result in failure to establish a relationship between asbestos and mesothelioma.

**ASBESTOS; ASBESTOS BODIES; FERROUS BODIES; ASBESTOSIS; HUMAN; MYELOHYPOMA; INHALATION**

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Morvan, A.; Holmen, A.; Gold, C., Studies of the solubility of constituents of chrysotile asbestos in vivo using radioactive tracer techniques., Environ. Res., 8: 558-570 (1971).

Minor constituents of chrysotile asbestos fibers (iron, chromium, cobalt, and scandium) were made radioactive by exposing the fibers to neutron irradiation. The fibers were injected intraperitoneally in rats and traced to follow the dissolution of the trace metals and migration of the asbestos. For chrysotiles in which cobalt substitutes magnesium in the brucite layer, the cumulative excretion of cobalt radiom samo is measured as an index of magnesium dissolution; results showed that 75-25% of the structural magnesities in chrysotile dissolves in one month. Cobalt leached more rapidly than chromium which was detected in the liver and spleen. Lead and cobalt were distributed in the liver, spleen, gut, blood and carcass, and scandium was found in all tissues except the blood. Chrysotile was distributed mainly in the heart, lungs, diaphragm and chest wall; however, in one case, a significant portion of the fibers had migrated to the liver via adjacent diaphragmatic lesions.

**ASBESTOS; CHRYSOTILE; TRACE METALS; TISSUE DISTRIBUTION; RAT**

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Mountain, J.T.; Dixon, J.R.; Love, A.E.; Moffitt, Jr.; Groth, D.R., Effects of chrysotile asbestos on trace metals, hydroxyproline, and aryl hydrocarbon hydroxylase in the hamster lung., Toxicol. Appl. Pharmacol., 19(2): 380 (1971).

In Vivo studies support the findings of In Vitro studies which relate asbestos cancer to the trace metals present (chromium, copper, and nickel). Asbestos was injected intratracheally into hamsters. Final autopsies, compared with controls, showed increased hydroxyproline in 25% of the animals, and a 35% decrease in aryl hydrocarbon hydroxylase; 15% of the nickel and 30% of the chromium injected remained. Persistence of chromium and nickel may favor carcinogenesis.

**ASBESTOS; HAMSTER; LUNG; TRACE METALS; CANCER; CO-CARCINOGEN; FIBROSIS; BIOCHEMICAL EFFECTS**

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Murphy, R.L.H.; Perrin, D.R.; Burgess, W.A.; Worcester, J.; Gaensler, E.A., Clinical, environmental, radiologic and epidemiologic observations in shipyard pipe workers and controls., New Engl. J. Med., 283(23): 1271-1278 (1971).

A high incidence of asbestososis (3% after 20 years exposure) was found in pipe workers exposed to low concentrations of asbestos during the construction of ships; the earliest case was found after 13 years of employment. When compared to a comparable, non-exposed control group, asbestososis was 11 times more common among pipe workers. Dust exposure had been near the recommended threshold-limit value of 5 mpcf. These results indicate that prolonged exposure to low concentrations of asbestos is hazardous and support the need to lower the threshold-limit values. Clinical and roentgenologic findings are presented.

**ASBESTOS; STANDARDS; ASBESTOSIS; PTPP COVERERS; OCCUPATIONAL EXPOSURE; SHIPYARDS; HUMAN**

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Navratil, M., Pleural calcifications due to asbestos exposure compared with asbestososis in the non-exposed population., Inhaled Particles III: Proceedings of an International Symposium. (London, 1970), W.N. Walton (Editor). Unwin Brothers Limited, London, pp. 695-703 (1971).

X-ray examinations of workers exposed to asbestos dust for 10 years or more in a Czechoslovakian factory revealed a 5.2% incidence of pleural calcification compared to 4.5% in relatives living in the vicinity of the factory. The occurrence of pleural calcification in 1.17% of the general population living 2 to 20 km from the factory indicates that asbestos exposure is only one of the possible causes. Research on mineral metabolism and serum proteins showed increased acid phosphatase activities and higher rates of carbon dioxide in calcification cases than in control.

**ASBESTOS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; HUMAN; PLEURAL CALCIFICATION; BIOCHEMICAL EFFECTS**

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Plamenac, P.; Pikula, B.; Rahvic, A.; Markovic, P.; Selak, I.; Zeger-Vidovic, Z., Incidence of "asbestos" bodies in basal lung smear., Acta Med. Jugoslav., 25(4): 325-332 (1979).

In Sarajevo, Yugoslavia, four smears were made from the surface area of the base lung lobes of fresh unixed lungs in each of 100 consecutive autopsies. Asbestos bodies were identified by optical microscopy and pseudomembranous bodies were ignored. Smears from 30 of the 100 autopsies contained asbestos bodies, being positive in 32.7% of the males and 20.4% of the females. Asbestos bodies were found more frequently in older age groups of both sexes. One-hundred percent of males over 80 had asbestos bodies in their lungs.

**ASBESTOS; ASBESTOS BODIES; FERROUS BODIES; LUNG; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE; HUMAN**
Guinea pigs, hamsters, and rats were exposed to asbestos dusts by inhalation, or by intratracheal, intrapleural, or intraperitoneal injection. For all three animals, a fibrotic reaction was produced by amosite, crocidolite, and chrysotile. Amosite produced the strongest reaction, especially in guinea pigs. Two pulmonary cancers developed in rats exposed to crocidolite. In the injection experiments, amosite produced no tumors, while chrysotile caused 4 mesotheliomas in rats, and crocidolite caused 6 in rats and rabbits.

**INHALATION:** AMOSITE; ASBESTOS; CANCER; CHRYSOTILE; CROCIDOLITE; GUINEA PIG; HAMSTER; RAT; MESOTHELIOMA; TUMOR

**REVIEW**

Regan, G.R.; Tagg, B.; Walford, J.; Thomson, R.L., The relative importance of clinical, radiological and pulmonary function variables in evaluating asbestosis and chronic obstructive airway disease in asbestos workers., Clin. Sci., 41(6): 569-582 (1971).

Sixteen clinical, radiological and pulmonary function variables for evaluating asbestosis and chronic ventilatory disease have been assessed by principal component analysis of data from a survey of 201 asbestos workers. The results of this analytical technique is to condense the data by finding those factors that represent independent attributes of lung disease. The carbon monoxide transfer factor, vital capacity, age, and lung and chest wall diffusing capacity are the most important measures of lung disease. For discriminating between asbestosis and ventilatory disease, the forced expiratory volume/vital capacity (FEV/VCO), pleural, pleural thickening, cough and finger clubbing in that order are important diagnostic indicators; high values for pleural thickening and finger clubbing indicate asbestosis.

**ASBESTOS; ASBESTOSIS; HUMAN; FINGER CLUBBING; PLEURA; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS; RESPIRATORY DISEASE**

**REVIEW**

Reitz, W.B.; Holaday, D.A.; Roser, H.; Fenner, E.M., Control of asbestos fiber emissions from industrial and commercial sources., Proceedings of the Second International Clean Air Congress., N.M. England and W.T. Berry (Editors). Academic Press, New York., pp. 100-103 (1971).

Asbestos is not only extremely useful but essential in some areas of modern industrial living. However, like so many other industrial products, it can produce adverse health effects if improperly handled. A general outline of asbestos emission sources and controls is presented.

**ASBESTOS; DUST CONTROLS; OCCUPATIONAL EXPOSURE; STANDARDS**

**REVIEW**

Richards, A.L.; Badani, D.V., Chrysotile asbestos in urban air., Nature, 234(5326): 93-94 (1971).

A new procedure for measuring chrysotile asbestos in air samples by x-ray diffraction was developed. Air samples taken near an asbestos textile factory indicated an asbestos content below the limit of detection, less than 0.1 µg per cubic meter. A more sensitive procedure is being developed.

**ASBESTOS; ENVIRONMENTAL SAMPLING; TEXTILE INDUSTRY; ANALYSIS; CHRYSOTILE; OCCUPATIONAL EXPOSURE; X-RAY; STANDARDS**

Glass, anthracite, and bituminous coal have few harmful effects on rabbit lung fibroblasts in vitro. In cultures containing chrysotile, death of a large proportion of cells is pronounced, and the time for recovery and expansive growth is more prolonged when compared with cultures treated with silica. Chrysotile stimulates the release of mucopolysaccharide into the medium and increases collagen synthesis; all dusts reduced the protein and tyrosine levels.

**ASBESTOS; CHRYSOTILE; RABBIT; BIOCHEMICAL EFFECTS; CELL CULTURE; CYTOTOXICITY**

Roberts, G.H., The pathology of parietal pleural plaques., J. Clin. Pathol., 24(4): 348-353 (1971).

Relationships of hyaline pleural plaques to asbestos exposure were studied. Plaques were found in 12.3% of 334 necropsies; of these, 85.3% contained asbestos bodies in the lungs. The distribution of the plaques indicated that a mechanical factor plays a role in their location. Histological examination contributed little understanding of the mechanism. Suggested mechanisms of plaque formation are discussed.

**ASBESTOS; PLEURAL PLAQUES; ASBESTOS BODIES; HUMAN; LUNG**

Robock, E.; Klosterkotter, W., Biological action of different asbestos dusts with special respect to fibre length and semiconductor properties., Inhaled Particles III: Proceedings of an International Symposium (London, 1970). W.R. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England., 1: 865-875 (1971).

The exposure of peritoneal macrophages (guinea pig) to the OCC standard reference asbestos samples produced cytotoxic effects as evidenced by a reduction of 2,3,5-triphenyl tetrazol chloride in the cell ( TTC method), permeability disturbance of the cell membrane (magnesium method) and reduced cell oxygen consumption (polarographic method). Chrysotile was the most cytotoxic asbestos variety, and crocidolite was considerably weaker.

Luminescence studies indicated that grinding asbestos produces significant structural changes, shifting the activation energies of electron traps of the samples; the relationship between this shift and resultant cytotoxic effects should be investigated further.

**ASBESTOS; CHRYSOTILE; AMOSITE; CROCIDOLITE; CELL CULTURE; ANTHROPHILITE; GUINEA PIG; CYTOTOXICITY**
Asbestos, beryllium, and mercury were added to the Environmental Protection Agency's list of hazardous air pollutants. Air pollutants on the list are ones which may cause, or contribute to, an increase in mortality, serious irreversible illness, or incapacitating reversible illness, and to which no national ambient air quality standard is applicable.

ASBESTOS; STANDARDS; ENVIRONMENTAL CONTAMINATION

Scott, J.K.; Hodge, M.C., Nonabsorbable dusts., Hill's Pharmacology in Medicine, J. R. DiPalma (Editor), 4th Edition. McGraw-Hill Book Company, New York, pp. 1249-1255, (1971).

A brief description of pulmonary diseases, including asbestosis is presented. The principal clinical symptoms of asbestosis--dyspnea, loss of weight and cough--occur 10 to 25 years after initial exposure. Pleural or peritoneal mesotheliomas and gastrointestinal malignancies have been associated with exposure to asbestos. The role contaminants may play in the carcinogenicity of asbestos is not known.

ASBESTOS; ASBESTOSIS; SILICOSIS; FIBROSIS; DIAGNOSIS; NEoplastoma; GASTROINTESTINAL; TRACE METALS; INHALATION

Selikoff, I.J.; Hammond, E.C.; Chung, J., Neoplasia risk associated with occupational exposure to airborne inorganic fibers., Oncology: Proceedings of the 10th International Cancer Congress (1976); R.L. Clark (Editor). Chicago, Illinois, Vol. 5: 55-62 (1971).

A review is given of the incidence of lung cancer, pleural mesothelioma, peritoneal mesotheliomas, other neoplasms, and asbestosis in asbestos insulation workers; lung cancer was more prevalent among workers who smoked. Although data are not sufficient, tumors of the hematopoietic and gastrointestinal systems may be associated with asbestos exposure. It appears that increased exposure increases the neoplastic risk; therefore it is hoped that appropriate industrial hygiene and environmental controls will minimize or eliminate these risks.

NEOPlASTIC; ANThOPHYLLITE; ASBESTOSIS; CANCER; CHRYSTOSIL; CRnCodiLLITE; HUMAN; INSULATION WORKERS; LUNG; NEPlOTHPlOMA; NEPlOSPlASIA; NON-OCcUPATIONAL EXPOSURE; SMOKING; OCCUPATIONAL EXPOSURE; ASBESTOS

Selikoff, I.J.; Hammond, E.C.; Heilman, H., Critical evaluation of disease hazards associated with community asbestos air pollution., Proceedings of the Second International Clean Air Congress, N. Y., Englund and W. T. Beery (Editors), Academic Press, New York, pp. 165-171 (1971).

Adverse health effects due to inhalation of asbestos fibers was once thought to be restricted to asbestos workers. In the past several years much evidence has accumulated to indicate that the asbestos, especially in urban areas, may contain enough fibers to be of concern. The use of new techniques, such as electron microscopy, to detect fibers in lung sections has revealed much higher levels present in city dwellers than was previously suspected.

Resolution of this question is hampered by the long lapse between asbestos exposure and appearance of related respiratory disease.

ASBESTOS; NON-OCcUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION; HUMAN; INHALATION; RESPIRATORY DISEASE; OCCUPATIONAL EXPOSURE; NEoplASTIC; INHALATION; LUNG; CANCER; NEPlOTHPlOMA; CHrySTOSIL; PLEURAL PLANNES; PLEURAL CALCIFICATION

Sk вне. W.I.: Talbot, J.R.; Rendall, R.G., Electron diffraction patterns of asbestos samples., Envir. Res., 4(2): 141-145 (1972).

Five standard samples of different types of asbestos fibers were analyzed by electron diffraction. The patterns obtained were specific enough to identify each type, though the Rhodesian and Canadian chrysotiles apparently were identical. Fiber orientation did not have a significant effect on diffraction patterns.

NEOPlASTIC; ANThOPHYLLITE; CRnCodiLLITE; CRnSTOSIL; AMPlNOPLase; ASBESTOS; ANALYSIS

Smith, B.A.: Davis, J.W., The association of phagocytosed asbestos dust with lysosome enzymes., J. Pathol., 105(3): 153-157 (1971).

Histochernical staining and electron microscopy were used to investigate the presence of acid phosphatase in quinea pig granulomas formed by the intraperitoneal injection of asbestos dust. The majority of granuloma cells consisted of macrophages and giant cells that phagocytosed large amounts of dust; a few were fibroblasts containing only small numbers of dust particles. The acid phosphatase reaction was confined to the lysosome organelles of these cells; but in the macrophages and giant cells, fewer than 50% of the primary lysosomes and 10% of the phagosomes were positive for acid phosphatase. Fibroblasts, however, contained the enzyme in both primary lysosomes and phagosomes in most cases. It was concluded that since macrophages and giant cells phagocytose large numbers of particles, phagosomes outnumber the lysosomes so that only a small portion of phagosomes can contain lysosome enzymes. Fibroblasts take up little dust so that lysosomes outnumber phagosomes and acid phosphatase occurs in most of the phagosomes.

ASBESTOS; GRANIOMA; LYSOSOME; MACrophAGE; GIANT CELL; PHAGOCYTOSIS; GRENA PIC; FIBROBLAST; CHYSTOSIL; BIOCHEMICAL EFFECTS

Selikoff, I.J.; Hammond, E.C.; Heilman, H., Critical evaluation of disease hazards associated with community asbestos air pollution., Proceedings of the Second International Clean Air Congress, N. Y., Englund and W. T. Beery (Editors), Academic Press, New York, pp. 165-171 (1971).

The first case of lung fibrosis resulting from exposure to asbestos dust was reported in 1907. However, the relationship between asbestos inhalation and fibrotic lung disease was not established until the late 1920's. The association between asbestosis and cancer was first suggested in 1931, but the relation between asbestos exposure and mesothelioma was not determined until 1960. Preventive legislation for controlling dust exposure is the only known solution to these health problems since no treatment has been developed. The present knowledge of asbestos related diseases in summarized concisely.

ASBESTOS; HUMAN; LUNG; INHALATION; OCCUPATIONAL EXPOSURE; FIBROSIS; ASBESTOSIS; NEPlOTHPlOMA; CANCER; RESPIRATORY DISEASE
Thompson, A.; Goldstein, B.; Webster, J.; Sluis-Cremer, G.K., Massive fibrosis in asbestosis., Environ. Res., 8: 830-839 (1971).

A study of asbestosis in 4 South African asbestos miners revealed several pathological patterns corresponding to fibrotic lesions seen in X-rays: (1) diffuse hyaline fibrosis with elastosis and areas of concentric fibrosis; (2) diffuse hyaline fibrosis with areas of concentric fibrosis; (3) diffuse hyaline fibrosis with areas of concentric fibrosis, necrosis, and calcification. All of the miners were exposed to high dust concentrations for more than 10 years. The etiologic role of many factors remains unsolved.

ASBESTOS; ASBESTOSIS; ASBESTOS MINE; HUMAN; OCCUPATIONAL EXPOSURE; FIBROSIS; LUNG

Stoschel, H.G.; Dalguen, P.; Caretens, D., Pleural mesotheliomas in dockers., Fortschr. Geb. Rontgenstr. Nuklearmed., 116(1): 41-65 (1972).

Between 1963 and 1969, 28 cases of malignant pleural mesotheliomas were observed in dock workers in the VilhelmsHAVen area. A majority of the workers had been occupationally exposed to asbestos on the old docks, thus suggesting a possible relationship between asbestos and mesothelioma.

ASBESTOS; HUMAN; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; TUMOR; CANCER; SHIPYARDS

Stefavins, J., Epidemiology of mesothelioma on Walcheren Island., Brit. J. Ind. Med., 28: 59-66 (1971).

Asbestos bodies were found in 60% of the sputum samples from 277 shipyard workers who did not handle asbestos continuously. Sputum from workers who had discontinued exposure use 5 to 10 years previously still contained asbestos bodies. Mesothelioma cases were more prevalent among shipyard workers than in the normal population; out of 32 cases between 1962 and 1968, 22 had been employed in the shipyard.

ASBESTOS; ASBESTOS BODIES; HUMAN; LUNG; MESOTHELIOMA; SHIPYARDS; OCCUPATIONAL EXPOSURE

Thompson, R.J.; Morgan, G.B., Determination of asbestos in ambient air., International Symposium on Identification and Measurement of Environmental Pollutants (Ontario, Canada); B. Westley (Editor.), pp. 154-155 (1977).

A method for measuring ambient concentrations of airborne asbestos involves the reduction of fibers to fibrils by ultrasonication with subsequent identification and quantification by electron microscopy. Preliminary air analyses by this method indicate that asbestos levels are approximately 2 ng/cm² at a point source, 0.5-15 ng/cm² at urban sites, and 0.1 ng/cm² at non-urban sites.

ASBESTOS; ENVIRONMENTAL CONTAMINATION; ANALYSIS; ENVIRONMENTAL SAMPLING

Tibbrell, V.; Griffiths, D.M.; Pooley, F.D., Possible biological importance of fibre diameters of South African amphiboles., Nature, 232: 55-56 (1971).

Differences in fiber diameter among various asbestos types affect the free-falling speed and ease of penetration to the lung and pleural tissues. As determined by electron microscopy, the mean diameter is 0.077 μm for Northwest Cape crocidolite, 0.212 μm for Transvaal crocidolite, and 0.283 μm for Transvaal amosite. The fiber length in all varieties was proportional to the diameter. Because of their greater aerodynamic size, more Transvaal fibers can be deposited in the larger airways by gravitational settling and inertial impact, but due to interception in smaller airways, penetrate the periphery of the lung less efficiently than shorter Northwest Cape fibers.

ASBESTOS; INHALATION; ANALYSIS; LUNG; HUMAN

Ternock, A.C.; Bryks, S.; Bertalanffy, P.D., The synthesis of tritium-labeled asbestos for use in biological research., Environ. Res., 8: 86-94 (1971).

Two series of experiments resulted in preparation of chrysotile asbestos fibers labeled with tritium. Preparation of a synthetic material from MgO, SiO₂, and tritiated water forced a partly non-acicular product. Natural fibers were maintained in the presence of tritiated water for 20 days at 300 degrees. Well-labeled acicular material was produced. This labeled acicular material was labeled with radioautography. Lung clearance of the dust could be quantified by scintillation counting.

ASBESTOS; CHRYSOTILE; LUNG

Ulrich, P., Pathological anatomy of hyaline pleural plaques., Pneumonologie, 106(3): 159-177 (1971).

Histological study of 10 cases of pleural plaques showed no asbestos fibers. Plaques consist of hyalinized fibrin layers covered by mesothelium and are difficult to recognize in an ordinary X-ray examination.

ASBESTOS; LUNG; PLURAL PLAQUES; HUMAN; DIAGNOSIS; X-RAY

Uo, C.-H., Study of the secular trend in asbestos bodies in lungs in London 1936-66., Brit. Med. J., 2: 248-252 (1971).

A search for asbestos bodies in lung tissue from 100 necropsies in a London hospital revealed a progressive increase in the incidence from 0% in 1936, to 3% in 1946, 14% in 1956 and 20% in 1966. This rate of increase was correlated with a model which assumes that exposure is proportional to the total amount of asbestos imported into the area after 1936.

ASBESTOS; ASBESTOS BODIES; LUNG; HUMAN
orkers and asbestos, causative factors of fibrosis, the incidence was significantly higher in workers who were heavy smokers. The sample population was too small to determine if the effects were simply additive or were synergistic. No significance could be attached to sex or age in this study.

ASBESTOS; FIBROSIS; SMOKING; HUMAN; INHALATION; CO-CARCINOGEN

Between 1955 and 1970, 52 cases of pleural mesothelioma were diagnosed in patients at three hospitals in Merseyside, England. In 60% of the cases, diagnosis was made in microscopic examination of sputum, and 42% of those cases were confirmed by histology or by peritoneal mesothelioma. Thus, the diagnosis was established in 62% of the cases before death. In the 21 cases with malignant pleural mesothelioma, 20 were smokers who had asbestos exposure. The average time between exposure and onset of mesothelioma was 42 years. Autopsied lungs from 30 mesothelioma patients revealed the presence of asbestos or fibrosis in 97% and excessive asbestos bodies in almost all. A survey of smoking habits in 20 of the patients showed that 16 were regular smokers.

ASBESTOS; ASBESTOS BODIES; ASBESTOSIS; HUMAN; MESOTHELIOMA; NON-OCCUPATIONAL EXPOSURE; OCCUPATIONAL EXPOSURE; SMOKING

Silica and asbestos are toxic to cells because they damage lysosomal membranes by hydrogen bond interactions. Thus, the basic mechanisms of fibrogenic tissue reactions and the fibrinoid material in asbestos appear to be similar. The study of effects of particles on lysosomes is providing information on several types of human diseases.

ASBESTOS; ASBESTOSIS; LYSOSOME; HUMAN; FIBROSIS; LUNG

Anonymous, Keen surveillance of asbestos still necessary., Food Cosmet. Toxicol., 8: 207-210 (1970).

Asbestos workers of today are not under the health risk of previous times. In the United Kingdom, improvements in factory conditions in 1933 probably reduced the risks somewhat. However, asbestos was not recognized as a carcinogenic agent until 1955; since then, it has been established as a cause of peritoneal and pleural mesotheliomas. The presence of asbestos bodies in lungs cannot be regarded as a prelude to asbestososis or mesotheliomas. Better control of industrial asbestos dust between 1924 and 1963 has delayed deaths from asbestososis and allowed time for various lung tumors to develop. This probably accounts for the recent increased mortality from lung cancer and mesotheliomas in asbestos workers. Cigarette smoking may contribute significantly to the cancer incidence among asbestos workers. The risk of asbestos worker-smokers dying from lung cancer is eight times greater than for workers who are not exposed to asbestos. Contaminants in asbestos, such as trace metals and oils may be co-carcinogens and should be investigated further. The present state of knowledge concerning the pathogenesis of asbestos is discussed.

ASBESTOS; ASBESTOSIS; HAMSTER; HUMAN; LUNG; MESOTHELIOMA; OCCUPATIONAL EXPOSURE
Twenty-three cases of diffuse mesothelioma have been observed in a major shipbuilding area in Britain. Twenty (91%) of the 22 patients with known histories had probable or definite exposure to asbestos, compared with only 41% in matched control patients having nonsmall cell lung cancers. In additional comparisons, lung roentgenograms from 310 routine necropsies revealed a 20% incidence of asbestos bodies, compared with a 9% incidence in mesothelioma patients. In most cases, the presence of asbestos bodies was related to industrial asbestos exposure.

MESOTHELIONA: MESOTHELIOMA; ASBESTOS; HUMAN; OCCUPATIONAL EXPOSURE

A survey of occupational respiratory disease in France shows a high incidence of exposure due to large asbestos production and use. In 1972, a total of 94 textile workers in the entire country received compensation for asbestosis; by 1969, 89 workers out of 600 from one plant alone were pensioned. Since French law does not recognize lung carcinoma, pleural mesothelioma, or tuberculosis as occupational diseases, the incidence of these disorders generally has not been investigated in the 14,000 workers employed in all asbestos industries. Random incidents reported include 6 cases of lung carcinoma in textile workers exposed to asbestos for 30 years, and some cases of mesothelioma. No asbestos bodies were found in basal lung smears from 138 urban inhabitants.

ASBESTOSIS: TEXTILE INDUSTRY; CARCINOMA; LUNG; PLEURAL PLAQUES; ASBESTOS BODIES; HUMAN

Clinical, roentgenographic, and lung function studies were conducted on 598 asbestos patients: 208 (35 percent) had reduced vital capacity; of these, 172 (29 percent) had functional abnormally suggestive of interstitial pulmonary disease. 100 workers (17 percent) had abnormal chest roentgenograms (grades 2 or 3). Parenchymal fibrosis was present in 45, pleural lesions in 37, and both of these were found in 18 subjects. Reduction of vital capacity preceded grade 2 or 3 roentgen abnormality by 10-15 years. Grade 2 or 3 roentgen abnormality usually developed after 20 years of exposure. With 30 years exposure the incidence of functional and radiographic abnormalities increased to the same degree. In 16.8 percent of workers with grade 2 or 3 parenchymal fibrosis there was no decrease in vital capacity.

ASBESTOSIS; ASBESTOS; VENTILATORY DEFECTS; X-RAY; HUMAN; LUNG; PLEUWA

An epidemiological study of 1069 asbestos workers in Quebec relates lung function and the radiological development of asbestosis. The function measurements which most closely paralleled radiological changes were vital capacity (VC) and exercise ventilation. In increasing profusion of irregular opacities correlated closely with increased deterioration of lung function. Decrease in VC was associated with a reduction in the diffusing surface area in the lung; increase in exercise minute ventilation indicated impaired gas exchange.

ASBESTOS; ASBESTOSIS; LUNG; X-RAY; VENTILATORY DEFECTS; HUMAN; OCCUPATIONAL EXPOSURE

Chemical digestion and microfiltration of lung tissue demonstrated ferruginous bodies in the lungs of 100 French people who resided in urban and rural locations. The highest frequency and density of ferruginous bodies were found in urban residents. Occupational histories were established for 62 cases; 53 had no known exposure to asbestos. Ferruginous bodies occurred most frequently in cases with primary lung cancer; 90% of the patients were smokers. The frequency was not related to sex. Scanning electron microscopy is discussed as a new method to identify ferruginous body cores; it gives the x-ray image of core elements, permitting chemical analysis at a resolution of 200 A.

FERRUGINOUS BODIES; ASBESTOS; ANALYSIS; ASBESTOS BODIES; LUNG; HUMAN; ENVIRONMENTAL CONTAMINATION

Bohlig, H., The problem of asbestosis in relation to the international classification of radiographs in pneumoconiosis, Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969), R.A. Shapiro (Editor). Oxford University Press, New York., pp. 248-252 (1970).

Many shortcomings of the old silicosis classification remain in the International Labour Office's (ILO) revised (1958) classification, and the possibilities for recording other non-silicotic pneumoconioses are still inadequate. Asbestosis cannot be classified efficiently with the present ILO system; hence a call is made for an efficient, practical classification for epidemiologic reasons.

PNEUMOCONIOSIS: ASBESTOSIS; HUMAN; X-RAY
The International Union against Cancer has developed an international classification for radiographic abnormalities in the chest films of asbestos-exposed workers. Subsequent tests of practicability and intra- or inter-observer variations in observations were insufficient, prompting the group to recommend publication of the scheme at the next meeting in April 1968.

PHENOCONOSIS; UTC/CLASSIFICATION; ASBESTOS

Bouhays, A.; Peters, J.M., Control of environmental lung disease, New Engl. J. Med., 283(11): 573-581 (1970).

Four groups of female albino Wistar rats (25 per group) were injected intra-tracheally with 50 mg of crocidolite, amosite, anthophyllite, or chrysotile A and 14 animals with 25 mg chrysotile B. The asbestos forms were UTC Standard Reference asbestos samples and were sterile when administered to the animals. Duration of the experiment was 240 days and 5 rats (4 from chrysotile A group) were sacrificed at 60-day intervals. Fiber length means for all but chrysotile B were less than 3.8 mm; for chrysotile B, mean length was 17.0 mm. The biological response of the four short-fiber groups showed no significant histopathological differences among one another. Foreign body reactions appeared to be more severe with chrysotile B than short-fiber asbestos types. The incidence of infection and chronic inflammation was much higher in the long fiber groups. From these observations it is apparent that relative length of fibers is of primary importance in inducing asbestosis in lungs of rats.

ASBESTOSIS; RAT; ASBESTOS; CROCIDOYLTE; AMOSITE; CHRYSTOTILE

Borch, B.P.; Engelbrecht, F.R., The biological effects of the international standard reference asbestos fibers in rats, S. Afr. Med. J., 44(4): 1268-1274 (1970).

Asbestos plaques, pleural membrane and serosa. Lesions have been observed in workers of plants utilizing asbestos. Metastases from pleural mesotheliomas, which is rare and specifically induced by asbestos, and pulmonary carcinoma, which is frequent among asbestos workers, have been observed. The role of co-carcinogenesis in the etiology of pulmonary cancer is briefly discussed. Epidemiological information and similarities of histologic pattern to that of tobacco cancer indicate that cigarette smoke may be a co-carcinogenic factor in occupational lung cancer.

CO-CARCINOGEN; SMOKING; MESOTHELIOMA; ASBESTOS; HUMAN; LUNG; OCCUPATIONAL EXPOSURE

Borlank, H.; Bristol, L.J.; Cartier, P.R.; Pelson, R.; Gilson, J.C.; Grainger, T.R.; Jacobson, G.; Kiviolo-To, P.; Latshart, W.S.; McDonald, J.C.; Pendergrass, P.P.; Beuléiter, C.E.; Sellhoff, I.J.; Slus-Charem, G.K.; Wright, G.N., Special Report-UTC/Cincinnati Classification of the radiographic appearances of pneumoconioses, Chest, 58(11): 57-67 (1970).

The International Union against Cancer has developed an international classification for radiographic abnormalities in the chest films of asbestos-exposed workers. Subsequent tests of practicability and intra- or inter-observer variations in observations were insufficient, prompting the group to recommend publication of the scheme at the next meeting in April 1968.

PHENOCONOSIS; UTC/CLASSIFICATION; ASBESTOS

Crayfie, L.J., Dust sampling instruments and dust standards in the United States of America for asbestos, Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). R.A. Shapiro (Editor), Oregon University Press, New York, pp. 10-12 (1970).

Asbestos dust was established by the American Conference of Governmental Industrial Hygienists in 1968 as a time weighted average fiber count limit of 12 fibers per ml for lengths greater than 6 microns or 2 million particles per cubic foot for total particulates. These standards should reduce the risk of occupational disease in asbestos workers. The standards also require air sample collection with membrane filters and the use of counting procedures which employ phase contrast illumination at 430x magnification.

STANDARDS; ASBESTOS; OCCUPATIONAL EXPOSURE; ENVIRONMENTAL SAMPLING

Decree, J.C.; Tabershaw, I.K., Thiocyanate in saliva and sputum: relationship to smoking and industrial exposures, Arch. Environ. Health, 21: 87-89 (1970).

Saliva and "sputum" samples collected from asbestos and pesticide workers and from normal persons, both smokers and non-smokers, showed approximate thiocyanate levels (micrograms per milliliter) as follows: asbestos workers, 32.0 (non-smokers), 165.0 (smokers); pesticide workers, 38.8 (non-smokers), 133.5 (smokers). True sputum was obtained by bronchoscopy from smokers and non-smokers and was shown to be free of thiocyanate. The higher level of thiocyanate in the saliva of smokers is due to the presence of cyanide compounds in tobacco and methyl cyanide and other nitriles in tobacco smoke. Cyanide is converted to thiocyanate by enzymes in the saliva.

ASBESTOS; HUMAN; OCCUPATIONAL EXPOSURE; SMOKING
Pneumonologie, (249> to cond of plaques. The degree of asbestos fibrosis was influenced by duration of exposure. Pleural plaques and mesotheliomas could co-exist with and without fibrosis and apparently were caused by similar dust conditions.

ASBESTOS; ASBESTOSIS; PLEURAL PLAQUES; OCCUPATIONAL EXPOSURE; HUMAN; NON-OCCUPATIONAL EXPOSURE; FIBROSIS

Davis, J.W.G., Further observations on the ultrastructure and chemistry of the formation of asbestos bodies., Exp. Mol. Pathol., 13: 346-348 (1970).

Chrysolite dust injected intrapleurally into guinea pigs (25 mg), rats (25 mg), and mice (10 mg) produced large intrapleural granulomas. Examination of these granulomas disclosed additional information about asbestos body formation. Macrophages and giant cells secrete acid mucopolysaccharide which is adsorbed by asbestos fibers, forming a thick coat; the coating subsequently becomes impregnated with ferruginous granules from the surrounding cytoplasm. Although mucopolysaccharide is actively secreted in young granulomas, free dust fibers are not coated; this occurs when a fiber is partially surrounded by a single macrophage or by partially fused macrophages during giant cell formation. Once cell fusion is complete, the asbestos body is completely intracellular, and mucopolysaccharide secretion ceases. Giant cells readily form and surround dust fibers in guinea pigs, and less readily in mice. Since few giant cells form in rat granulomas, dust fibers cannot be surrounded, so that asbestos bodies do not form. Thus, species differences in the ability to produce asbestos bodies may be due to differing cell behavior in asbestos granulomas.

ASBESTOS BODIES; ASBESTOS; GRANULOMA; MACROPHAGE; PHAGOCYTOSIS; GUINEA PIG; RAT; HOUSE

Davis, J.W.G., The long term fibrogenic effects of chrysolite and crocidolite asbestos dust injected into the pleural cavity of experimental animals., Brit. J. Exp. Pathol., 51: 617-627 (1970).

Chrysolite and crocidolite dusts injected intrapleurally produced large granulomas in mice, rats, and guinea pigs; however, histological patterns of the lesions varied. In all cases, granulomas were eventually replaced by fibrotic tissue. Electron microscopic evidence indicates that pleural granulomas induced by asbestos dust constitute the same tissue response and cell types involved in lung tissue reaction to asbestos. Individual macrophages, giant cells, and fibroblasts are identical, structurally and behaviorally, to those in lung granulomas.

RAT; HOUSE; GUINEA PIG; GRANULOMA; CHERSSOTILE; CROCIDOLITE; PLEURA; LUNG; MACROPHAGE; GIANT CELL; FIBROBLAST

Davis, J.R.G.; Gross, P.; DeTreville, R.T.P., Ferruginous bodies in guinea pigs., Arch. Pathol., 91: 368-373 (1970).

Intrapleural injection of glassfibers, ceramic silicate, mica, mica silicate, silicate carbide, and asbestos induced the formation of large granulomas in guinea pigs. Electron microscopic examination showed that ferruginous bodies were more common in glass fibers than in silicate. Ferruginous bodies were intracellular and usually in giant cells; the body coat contained dense granules (probably ferritin) which usually were deposited in a single layer. In many cases the bodies were separated from the giant cell cytoplasm by a distinct membrane, which was not present in older bodies.

FERRUGINOUS BODIES; GUINEA PIG; ASBESTOS BODIES

Davis, J.R.G.; Lowe, D.B.; Richards, D.E.; Cralley, L.J.; Stokinger, H.E., The Role of trace metals in chemical carcinogenesis., Cancer Res., 30: 1068-1074 (1970).

Trace amounts of metals can inhibit or stimulate the activity of benzpyrene (BP) hydroxylase in the microsomal fraction of rat lung homogenates. Low concentrations of copper, magnesium, iron (ferroas), zinc, nickel, and cobalt stimulated hydroxylase; higher concentrations of these metals depressed the enzyme activity. Beryllium, ferric iron, and chromium exerted no effect. During metals extracted from chrysotile (nickel, cobalt, chromium, and manganese) reduced enzyme activity by 73%. Since unmetabolized BP in lung tissue in carcinogenic, trace metal inactivation of the BP hydroxylase enzyme slows BP metabolism and increases the carcinogenic risk. These results support the hypothesis that asbestos-related cancer actually may be induced by associated trace metals that interfere with BP detoxification.

TRACE METALS; ASBESTOS; BIOCHEMICAL EFFECTS; CHERSSOTILE; RAT; LUNG; CO-CARCINOGEN

Doll, R.S., Practical steps towards the prevention of bronchial carcinoma., Scot. Med. J., 15: 433-447 (1970).

Bronchial carcinoma causes the death of one out of 12 men in this country. Agents capable of inducing bronchial carcinoma- particles of chrome and nickel ore, mustard gas, arsenic, asbestos, coal tar, ionizing radiations (radon, x-rays), and cigarette smoke - are reviewed. Bronchial carcinoma is no more preventable in the full sense of the word than any other type of cancer; however, it is possible to reduce the risk of developing the disease. Preventive methods and the possible interaction of agents are discussed.

ASBESTOS; CARCINOMA; CANCER; HUMAN; TRACE METALS; SMOKING; X-RAY
Underground and surface dust surveys made in South African asbestos mines and fiberizing plants at various intervals during a 29-year period (1940-1969) show that dust concentrations of chrysotile and amphibole asbestos were excessively high before 1967, particularly due to increased production rates after 1963. Between 1968 and 1966, the highest precipitator samples representing 14,500 persons exposed to amphibole dust produced a mean count of 60,000 particles per cubic cm (ppcm) per mine, and a total mean of 350 particles and fibers pcc. During 1968 to 1969, 84 samples taken from 90% of the exposed persons produced a mean count of 237 fibers plus particles/cc with a mean range per mine of 72-320. Thirty-four thermal precipitator samples represented 1500 persons exposed to chrysotile dust averaged 750 fibers plus particles/cc and a mean range per mine of 120-2000 during 1969-1966; precipitator samples from 5% of exposed persons from 1968-1969 averaged 370 fibers plus particles/cc with a range per mine of 97-500 fibers plus particles/cc.

ASBESTOS MINING; OCCUPATIONAL EXPOSURE; DUST CONTROLS; CHRYSTOILE; AMPHIBOLE; ASBESTOS

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Pletcher, G.W., Asbestosis in Rhodesia: Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). A.A. Shapiro (Editor). Oxford University Press, New York., 1969: 13-17 (1970).

Out of 97 pneumoconiosis cases attributed to occupational exposure in Rhodesian chrysotile mines from 1961-1967, 39 cases were diagnosed as asbestosis; 48 showed radiological evidence of tuberculosis, with or without asbestosis. Asbestos lesions appeared mainly in the middle and lower parts of the lung, whereas tuberculosis lesions developed in upper lung areas. In tuberculous patients, the disease became manifest before 15 years of employment. Asbestosis developed after a longer duration of exposure. Radiological tests showed the frequent presence of nodules and ground glass appearance of the lung tissue, but these were not specific for asbestosis. Papysias occurred in 2 asbestotic patients. The "shaggy heart" appearance was found in only 2 cases, and pleural thickening with or without calcification, occurred in 2 cases. No lung cancer or pleural mesothelioma was observed. The standard permissible dust levels in Rhodesian mines is a maximum of 100 particles/cc, including particles no longer than 5 microns and fibers no longer than 80 microns.

ASBESTOS; ASBESTOSIS; CHROCIDOLITE; AMosite; CHRYSTOILE; LUNG; CARCINOMA; OCCUPATIONAL EXPOSURE; HUMAN; TUBERCULOSIS; CANCER; HUMAN

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El-Sweify, A.: Awd, S.; Abdel-Salam, M.S., Chest symptomatology in an Egyptian cement-asbestos pipe factory., J. Egypt. Med. Assoc., 53: 88-92 (1970).

Clinical, radiological, and sputum examinations were performed on 347 workers from a plant that manufactured asbestos-concrete pipes. The high incidence of respiratory abnormalities was attributed to high dust exposure in the plant. Ninety-six (24%) showed positive physical signs, 207 (60%) had cough, 163 (47%) had cough and phlegm, 134 (39%) had phlegm, 237 (68%) had dyspnea, 11 (3%) had finger clubbing and 226 (65%) showed positive radiological results. The number of diseased workers increased proportionally with the duration of exposure.

ASBESTOS; PNEUMOSIS; OCCUPATIONAL EXPOSURE; HUMAN; EMPHYSEMA; CARCINOMA; RESPIRATORY DISEASE; DYSPEMA; FINGER CLUBBING

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Fletcher, D.E.; Edge, J.R., The early radiological changes in pulmonary and pleural asbestosis., Clin. Radiol., 21: 355-365 (1970).

A radiological study of 886 men with signs of asbestosis acquired in shipyards and engineering workshops at Barrow-in-Furness was conducted to determine the earliest diagnostically useful results. Asbestos indicates that pulmonary fibrosis is an early sign of asbestosis in heavily exposed men, but in difficult to diagnose because early changes were rare. Symptoms of normal lung markings; diffuse pleural thickening is a non-specific sign attributed to asbestosis only by excluding other diseases. Although pleural calcification is of practical use, pleural calcification is not a specific sign of asbestosis, it usually requires at least 20 years to develop. The earliest appearance of fibrous pleural plaques can be detected by careful radiologic study, and is diagnostically reliable in the early detection of asbestosis-related disease.

ASBESTOSIS; PNEUMOSIS; PLEURA; PLEURAL CALCIFICATION; CARCINOMA; MESOTHELIONA; HUMAN; ASBESTOS; OCCUPATIONAL EXPOSURE

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Gelfand, M.; Norton, S.A., Asbestosis in Rhodesia: Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). A.A. Shapiro (Editor). Oxford University Press, New York., pp. 204-208 (1970).

December 1974
Preliminary evidence from in vitro studies with hamster fibroblasts indicates that collagen production increases when supernatant solutions from quiescent macrophages were added to fibroblasts. It is felt that this experimental approach may prove valuable in further studies of the fibrillogenic effects of asbestos in the lung.

**HAMSTER; FIBROBLAST; COLLAGEN; ASBESTOS; MACROPHAGE**

Heller, R.W.; Janower, R.L.; Weber, A.L., The radiological manifestations of pleural mesothelioma., Amer. J. Roentgenol. Radiat. Ther. Nucl. Med., 108(1): 53-59 (1970).

Pleural mesothelioma occurs frequently enough to be considered in the differential diagnosis of chest tumors. Correct diagnosis is difficult to establish, and often is determined by needle biopsy or open thoracotomy. A history of asbestos exposure should be suspect. The significant radiologic signs are (1) pleural effusion, (2) irregular, nodular, pleural thickening, and (3) mass lesions frequently located in the periphery of the lung. Treatment consists of surgery and/or radiation treatment, but prognosis is poor.

**MESOTHELIOMA; TUMOR; ASBESTOS; OCCUPATIONAL EXPOSURE; DIAGNOSIS; TREATMENT; PLEURA; HUMAN**

Mitchcock, H.T., Mesothelioma of the pleura., Irish J. Med. Sci., 3(10): 653-656 (1970).

Pleural mesothelioma has been diagnosed much more frequently in the last ten years than previously; most tumors have occurred in 40-60 year old males with a history of asbestos exposure. Asbestos exposure must be long (at least 9 or 19 years) and the fiber size must be small enough to be respirable for mesothelioma to occur and even then it occurs rarely. Cigarette smoking also may be required. Three case histories of pleural mesotheliomas were reported, none of which had any known asbestos exposure. Radiotherapy is the best treatment for pleural mesothelioma at present but at best merely delays the fatal outcome.

**ASBESTOS; CANCER; MESOTHELIOMA; X-RAY; DIAGNOSIS; TREATMENT**

Horal, T.; Kaneda, M.; Michizawa, T.; Fasahara, S.; Sugimoto, T.; Okuyama, T., A radioautographic study on the incorporation of 3H-methionine and 3H-glycine in the experimental silicopneumoconiosis and asbestopneumoconiosis, Acta Histochem. Cytochem., 3(8): 197-198 (1970).

Silicosis or asbestosis was induced in rats by pertracheal infusion of free silica or blue asbestos suspension. After 2, 8, or 16 weeks 3H-methionine or 3H-glycine was injected intra-pericardially. One hour following injection animals were sacrificed and radioautograms obtained of lung tissue. 3H-methionine was found in the extracellular space around nodules of the lungs with somewhat less uptake in the case of silicosis. 3H-glycine was taken up to a small extent 2 weeks after infusion and then uptake increased. More 3H-glycine was taken up in lungs with asbestososis than with silicosis.

**ASBESTOS; ASBESTOSIS; SILICOSIS; RAT**
Chest analysis

The exposed of the lungs, pleura, peritoneum (4), and other sites (6), and others (4). The main hazards of exposure to other asbestos dusts are pulmonary asbestosis, lung cancer, and pleural or peritoneal mesotheliomas.

ASBESTOS; ANTHOPHYLLITE; ASBESTOSIS; LUNG; OCCUPATIONAL EXPOSURE; CANCER; PLEURA; PERITONEUM; CARCINOMA; CANCER MORTALITY; MESOTHELIONA; GASTROINTESTINAL; ASBESTOS MING; HUMAN

Kiviluoto, K., Asbestosis: aspects of its radiological features. Pneumoconioses: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 253-255 (1970).

Cheet x-ray films for anthophyllite mining workers revealed 180 radiologically normal results and 230 with pleural and/or pulmonary pathology. Further analysis of the 230 showed 56 cases of pleural changes without pulmonary pathology, 116 cases of pleural and pulmonary pathology, and 58 cases of pulmonary pathology without pleural changes.

ASBESTOS; ASBESTOSIS; CARCINOMA; CANCER; ANTHOPHYLLITE; OCCUPATIONAL EXPOSURE; ASBESTOS MING; X-RAY; HUMAN

Kiviluoto, P.; Neuman, L.O., Results of asbestos exposure in Finland, Pneumoconioses: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 190-191 (1970).

The mortality epidemiology of anthophyllite asbestos miners was followed in Finland from 1936-1967; the study included more than 1000 people who were exposed for durations ranging from 3 months to more than 20 years. Causes of death for 33 cases with exposure longer than 10 years were carcinoma of the lung (8), gastrointestinal carcinoma (2), asbestosis and cor pulmonale (5), asbestosis (6), cerebral (6), and others (4). The main hazards of exposure to other asbestos dusts are pulmonary asbestosis, lung cancer, and pleural or peritoneal mesotheliomas.

ASBESTOS; ANTHOPHYLLITE; ASBESTOSIS; LUNG; OCCUPATIONAL EXPOSURE; CANCER; PLEURA; PERITONEUM; CARCINOMA; CANCER MORTALITY; MESOTHELIONA; GASTROINTESTINAL; ASBESTOS MING; HUMAN
Langer, A.M., Electron microprobe analysis, Laboratory Diagnosis of Diseases Caused by Toxic Agents. P.W. Sunderman and P.W. Sunderman, Jr., (Editors). Warren E. Green, Inc., St. Louis, Missouri, U.S.A., pp. 126-136 (1970).

Preliminary results indicate that the electron microprobe may be used to identify and characterize asbestos fibers and bodies in human lung tissue. It enables analysis of material in the area of large particles to gain information concerning biological interaction. From this technique it is possible to establish presence of specific asbestos materials for long periods after exposure.

CHrysotile; aMosite; Anthophyllite; Tremolite; crocidolite; analyses; Lung

Langer, A.M., Rubbi, T.; Selikoff, I.J., Electron microprobe analysis of asbestos bodies., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 57-69 (1970).

Electron microprobe analysis is a valuable technique for identifying all types of asbestos fibers in asbestos bodies. It combines the use of scanning electron microscopy and x-ray spectrometry to detect x-ray emissions which reflect the characteristic bulk Fe-Mg-Si-Na-Ca content of each asbestos type. The method provided unequivocal identification of amosite asbestos cores in asbestos bodies from workers exposed to amosite. The data show that amosite fibers remained chemically unaltered and intact after at least 10 years of residence in the lungs. Transmission microanalyses were obtained for exposed fibers and thin-coated linear bodies which produced characteristic amosite emissions. Curvilinear and thick-coated bodies yielded high Fe emission values which obscured the chemistry of the fiber core. The analysis of chrysotile bodies from the lungs of chrysotile workers was more difficult because of changes in fiber chemistry (depletion of magnesium and addition of iron) which probably result from biochemical interactions in the lung, and the tendency of chrysotile to split into fine fibrils not visible by optical microscopy. The most accurate detection was made with thin bodies having little or no coating.

Asbestos; chrysotile; amosite; analysis; asbestos bodies; X-ray; human

Litterst, C.L.; Lichtenstein, E.P., Toxicity of Hela cell growth medium after passage through asbestos filters., Lab. Pract., 19: 1221-1223 (1970).

Hela cell monolayers grown in culture normally replicate within 24 hours. When grown in medium that had been filtered through an asbestos pad (0.16 in a Seitz apparatus the replication time was significantly increased.

Asbestos; cell culture; cytotoxicity

Mackenzie, F.A.P.; Harries, P.G., Changing attitudes to the diagnosis of asbestos disease., J. Roy. Nav. Med. Serv., 56: 116-123 (1970).

Pleural abnormalities have been found in many dockyard workers in Plymouth, England. These include fibrosis, hyaline plaques, diffuse pleural thickening, linear pleural thickening, pleural calcification, effusion, and pleural mesothelioma. Young men with about 15 years exposure to asbestos have the most extensive pleural reactions sometimes accompanied by effusion. A modified radiological technique to detect pleural abnormalities is described. The progress of the pleural changes will be followed over a period of years.

Asbestos; shipyards; cancer; fibrosis; mesothelioma; occupational exposure; pleural calcification; pleural malignant

McDonald, A.D.; Harper, A.; El Attar, O.A.; McDonald, J.C., Epidemiology of primary malignant mesothelial tumors in Canada., Cancer, 26: 914-919 (1970).

The incidence of fatal malignant mesothelial tumors was approximately 1 per million per year between 1949 and 1968 in Canada, with a total of 165 cases. An association with definite or probable occupational exposure to asbestos was clearly demonstrated in only 20% of the male cases and 1 of the female cases; the occupations associated most frequently with these cases involved textile manufacture, installation of brake linings, and insulating, rather than mining or milling. No association was found with residential exposure in asbestos mining areas.

Mesothelioma; asbestos; occupational exposure; human

McEwen, J.; Finlayson, A.; Muir, A.; Gibson, A.A.M., Pneumoconiosis in Scotland., Brit. Med. J., 4 (5755): 675-678 (1970).

In a retrospective study of the incidence of mesotheliomas in Scotland from 1950-1967, 80 cases were traced from pathology reports and biopsy material of malignant peritoneal and pleural tumors. Occupational and residential patterns were recorded, as well as the degree of asbestos exposure. More than twice as many mesothelioma cases reported residential and occupational exposure to asbestos than did not. Asbestos exposure usually originated in the shipbuilding industry.

Asbestos; Mesothelioma; pleura; peritonum; shipyards; occupational exposure; non-occupational exposure; cancer; human

McNulty, J.C., Asbestos exposure in Australia., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 201-203 (1970).

Between 1958 and 1967, 103 asbestos workers from a crocidolite mining area in Australia developed pneumoconiosis. The length of exposure before the development of disease was 1-18 years for mill workers and 3-12 years for underground workers. Silicosis was prevalent in miners, while asbestosis with massive lung fibrosis, asbestos bodies, finger clubbing and nasal crepitations was more common in mill workers, although both diseases occurred in each group. No pleural plaques were observed; 6 workers developed bilateral pleural effusions. The incidence of death and disability related to occupational pneumoconiosis and cancer was higher in mill workers than in miners.

Asbestos mining; asbestosis; lung; carcinoma; pleural plaques; occupational exposure; human; crocidolite; asbestos; pneumoconiosis
The mean age of 50 lung cancer cases and their control pairs was 63 years. None of the men in the asbestos groups had smoked, whereas 52% of the control men had. Statistical analyses were done to determine if there was a significant association between the presence of asbestos bodies and the development of lung cancer. The results showed that there was no significant association between the presence of asbestos bodies and the development of lung cancer. The study concluded that there was no significant association between the presence of asbestos bodies and the development of lung cancer.
Following intratracheal treatment of hamsters with labeled benz(a)pyrene (BP) or combinations of BP with asbestos or carbon black, radioactivity was eliminated rapidly from the lungs during the first 2 weeks, regardless of treatment. After 21 days, however, lung tissue of hamsters treated with asbestos or carbon black and BP retained the most radioactivity. Levels of radioactivity in other organs were similar in all groups.

ASBESTOS; HAMSTER; TISSUE DISTRIBUTION; LUNG

<290>
Roberts, G.H., Diffuse pleural mesothelioma, a clinical and pathological study, Brit. J. Dis. Chest. 66(9): 2-16 (1970).

Twenty cases of diffuse pleural mesothelioma were found in 606 adult necropsies (0.3%) between 1950-1967 at a hospital in Glasgow, Scotland. Shipyard work was the main occupation in the urban area served by the hospital. Fifteen of the cases were found in the second 9 year period. 51% of the men and 10% were middle aged or older. Pleural effusion was the most common finding at the first examination. The tumors only rarely materialized but commonly invaded surrounding structures. Eleven of the 20 tumors were epithelial, 6 were of mesenchymal type and 3 mixed. Asbestos bodies were found in the lungs of 18 of the cases and histological evidence of asbestos was found in 13 cases.

ASBESTOS; MESOTHELIOMA; OCCUATATIONAL EXPOSURE; X-RAY; SHIPYARDS; ASBESTOS BODIES

<291>
Roberts, G.H.; Irvine, R.W., Peritoneal mesothelioma: A report of 4 cases, Brit. J. Surg., 57(9): 645-650 (1970).

Four cases of peritoneal mesothelioma were reported in 1 British hospital in the same year. Evidence of exposure to asbestos was found in 3 of the cases. Clinical descriptions are presented.

ASBESTOS; PLURA; PERITONEUM; MESOTHELIOMA; HUMAN; OCCUPATIONAL EXPOSURE

<292>
Boss, V.; Studeny, J., Aetiology of pleural plaques, Thorax, 25: 270-284 (1970).

Pleural plaques were observed in 684 (6.6%) out of 9,760 photofluorograms taken in 1965 in a sparsely populated Czechoslovakian district. The highest incidence occurred between the ages of 66-70 years. The disorder was found mainly in farmers, and familial incidence was common. The etiologic agent of the disease is unknown; geological surveys of the region show no evidence of naturally occurring asbestos, and there are no asbestos industries located within 100 km. This appears to be an endemic disorder caused by an unknown agent which is carried to the pleura through the lymph and blood.

ASBESTOS; HUMAN; PLEURAL PLAQUES

<293>
Schlitzer, R.J.; Bunescu, G., Polymers as selective antagonists of hemolytic asbestos fibers, Arch. Environ. Health, 20: 481-482 (1970).

The exposure of chrysotile at high temperature (1000 degree C) alters the structure, converting it to a dehydroxylated magnesium silicate product. Although both heated and unheated chrysotile possess hemolytic properties, their lytic activities differ since they are antagonized by the selective action of different polymers: polyvinylpyridine-N-oxide inhibits hemolysis of sheep RBC's by heated chrysotile, whereas crocidolite antagonizes the hemolytic effect of unheated chrysotile. This suggests that heated asbestos may produce different pathological effects than the unheated form.

CHRYSOTILE; HEMOLYSIS; ASBESTOS; SHEEP; CYTOTOXICITY

<294>
Schlitzer, R.J.; Pundack, F.L., Asbestos hemolysis, Environ. Res., 3: 1-3 (1970).

Asbestos fibers, principally chrysotile, caused marked hemolytic activity on sheep red blood cells (RBCs); however, amphibole asbestos fibers such as crocidolite, amosite, tremolite, and anthophyllite were hemolytic to a negligible degree. These results suggest that the chemical nature of the fiber surface, and consequently, the surface area of the fiber, determine the hemolytic capacities of asbestos. The minimal concentration of chrysotile necessary to cause at least 50% hemolysis decreased with increase in surface area. Hemolysis was inhibited by substances that were strongly adsorbed by the fibers. EDTA inhibited hemolysis by chrysotile, but other chaleting and complexing agents did not. Repeated contact of chrysotile with red cells also elicited hemolytic activity, possibly due to the adsorption of some cell components on the fibers.

ASBESTOS; HEMOLYSIS; CHRYSOTILE; CROCIDOLITE; AMOSITE; TERRORLITE; ANTHOPHYLLITE; SHEEP; CYTOTOXICITY

<295>
Selkoff, I.J.; Hammond, E.C.; Churg, J., Mortality experiences of asbestos insulation workers, 1943-1968, Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969), 3:15-186 (1970).

An epidemiological study of 450 deaths among 1522 members of the Asbestos Workers Union in the New York area demonstrates the health risks associated with occupational asbestos exposure. Among 632 men who became members by 1962, 380 died by 1969; the causes of death in 188 cases were lung cancer (72), pleural mesothelioma (16), peritoneal mesothelioma (16), gastrointetinal cancer (37), pancreatic cancer (3), oropharynx larynx cancer (5), other neoplasms (19) and asbestosis (30). Every death due to mesothelioma occurred in workers who began work before 1930; the time lapse between initial exposure and death was 24.8 years for pleural mesothelioma and 33.3 years for peritoneal mesothelioma. Mesothelioma and cancer death rates were much lower among 890 men entering the union after 1942, because insufficient time has elapsed since the onset of exposure. There appears to be an important influence of cigarette smoking on the incidence of lung cancer in asbestos workers.

ASBESTOS; MESOTHELIOMA; CARCINOMA; ASBESTOS; INSULATION WORKERS; NEOPLASMS; OCCUPATIONAL EXPOSURE; HUMAN; PLURA; PERITONEUM
Clinical and epidemiological investigations in South Africa between 1956 and 1968 revealed a high incidence of mesothelioma and carcinoma in North West Cape inhabitants (181 cases, including 111 cases of mesothelioma). In addition, there was a marked association of tuberculosis with mesothelioma in family groups of all races. It is suggested that air pollution by asbestos may synergistically affect MYCOBACTERIUM TUBERCULOSIS, thereby inducing mesothelioma and carcinoma. The dry climate of the area may produce a variety of dusts which contribute to the pulmonary disease problems.

CANCER; MESOTHELIOMA; TUBERCLOSIS; ASPBESTOS; ASBESTOSIS; NON-OCCUPATIONAL EXPOSURE; HUMAN; ENVIRONMENTAL CONTAMINATION; OCCUPATIONAL EXPOSURE

The duration of asbestos exposure and the length of asbestos fibers in the lung are important factors determining the onset and incidence of asbestosis. A 1970 study of South African asbestos miners employed between 1954 and 1958 showed a higher incidence of asbestosis with shorter exposure periods, but no bronchial carcinomas or mesotheliomas. Pleural plaques did not occur in workers employed less than 20 years.

ASBESTOSIS; CROCIDOLITE; ANOSITE; ASPBESTOS MINING; PNEUMOCONIOSIS; PLEURAL PLAQUES; OCCUPATIONAL EXPOSURE

Salther, W.J., Some observations on asbestosis in a factory population. Pneumoniosis: Proceedings of the International Conference (Johannesburg, 1969). M.A. Shapiro (Editor). Oxford University Press, New York., pp. 154-157 (1970).

Clinical experience gained in the United Kingdom factories that manufacture asbestos products indicates that early diagnosis of asbestosis in workers requires accurate history of exposure, serial x-rays at intervals of 1-2 years followed by investigation of abnormal findings, and surveillance of clinical findings, physiologic lung function, and sickness absence records. There are no clear-cut signs or symptoms of physiological abnormality in early stages of asbestosis.

ASBESTOSIS; ASBESTOSIS; HUMAN; OCCUPATIONAL EXPOSURE; DIAGNOSIS

Solomon, A., Radiological features of diffuse mesothelioma. Pneumoniosis: Proceedings of the International Conference (Johannesburg, 1969). M.A. Shapiro (Editor). Oxford University Press, New York., pp. 261-265 (1970).

In 23 cases of pleural mesothelioma confirmed by the Asbestos Tumor Reference Panel of South Africa, radiological evidence showed pleural effusion in 12 cases, lobular pleural tumor without pleural effusion in 4, moderate pericardial fibrotic lung changes in 5, pleural calcification in 2, hydropneumothorax in 1, hilar masses in 6, and satellite lung lesions in 2 cases. Nineteen of the patients had a known history of asbestos exposure (occupational or non-occupational).

ASBESTOS; PLEURAL MESOTHELIOMA; RETROPERITONEAL X-RAY; HUMAN; ASBESTOSIS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

Solomon, A., Radiological features of diffuse mesothelioma. Environ. Res., 3: 334-338 (1970).

A retrospective radiological study of 23 pleural mesothelioma cases in South Africa showed 7 cases with signs of asbestosis, 5 with parenchymal lung changes, 7 with noncalcified pleural changes, 2 with pleural calcification, 14 with pleural effusion, 15 with lobular pleural tumors, and hilar mass associated with pleural tumor in 6 cases. All patients were engaged in asbestos mining, or lived in a mining and milling area. Compared with previously reported cases, there were no significant age or sex differences.

PNEUMOCONIOSIS; MESOTHELIOMA; LUNG; ASBESTOSIS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; ASBESTOS MINING; HUMAN

Solomon, A., Radiology of asbestosis. Pneumoniosis: Proceedings of the International Conference (Johannesburg, 1969). M.A. Shapiro (Editor). Oxford University Press, New York., pp. 190-192 (1970)

A retrospective study was done on 43 cases of deceased asbestos workers who had received chest x-rays during their working lifetime. Presented briefly are clinical observations of pleural changes, calcified plaques, and radiological changes associated with asbestotic fibrosis (pneumonic, coarse, and massive fibrosis).

ASBESTOS; OCCUPATIONAL EXPOSURE; X-RAY; PLEURAL PLAQUES; FIBROSIS; LUNG; RESPIRATORY DISEASE; HUMAN

Szymczykiewicz, E., Some aspects of pathogenesis of asbestosis. Bull. Pol. Med. Sci. Hist., 13(3): 115-119 (1970).

The fibrogenic effects of asbestos and other dusts may be determined by the length and crystalline structure of the fibers or particles. Clinical observations confirm that asbestosis is more common in workers employed in the spinning and weaving of asbestos than in other processing procedures. Although total particle densities may be higher in other asbestos occupations, the density of long fibers used in weaving and spinning is greater. In guinea pigs treated interbrochrally with 60 mg of chrysotile fibers (5 or 10 microns long), fibrotic changes predominated in the bronchi and parabronchial tissues and were more extensive in animals treated with long fibers. Following the administration of crystalline (fibrous) or amorphous chrysotile to guinea pigs, only the crystalline form induced pulmonary changes indicative of asbestosis. Oxygen demand and consumption in lung sections from mice were increased by crystalline chrysotile, amorphous chrysotile and crystalline quartz, but not by fiber glass or fine glass. Intravenous administration of crystalline chrysotile and quartz in rabbits produced an increase in serum gamma globulin; amorphous dusts of chrysotile and coal did not.

ASBESTOSIS; ASBESTOS; RABBIT; MOUSE; GUINEA PIG; FIBROSIS; LUNG

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PLAQUES: correlated with downward sensitivity to gravity in pleural tissues. Thomson, posterior pleural plaques in asbestos workers develop by slow proliferation of fibroblasts and fibrocytes in connective tissue; pleural mesothelial cells are not involved in the formation, so that pleural adhesions are not developed in association with the plaques. Calcification is dystrophic, occurring in the center of older plaques where collagen is degenerated and devoid of nuclei. Though asbestos fibers are found in pleural plaques, the fibrotic response is not correlated with the number of fibers present, indicating that plaque formation may involve a sensitivity reaction.

ASBESTOSIS: PNEUMOCONIOSIS; ASBESTOSIS; PLEURAL PLAQUES; PLEURA; RUMEN; FIBROSIS; PERITONEUM; MESOTHERLIMA

303
Tabeshaw, T.M.; Cooper, W.C.; Bamber, J.L., A labor-management research program on asbestosis in a construction industry. Arch. Environ. Health, 21(6): 788-788 (1970).

In the San Francisco area, lung cancer mortality rate is 8 times higher than expected among insulation workers with more than 20 years of occupational asbestos exposure. In 1966, union and management organized an occupational health program of medical surveillance and industrial hygiene for asbestos workers to develop guides for hygienic work practices, to promote early diagnosis of health problems, and to counsel workers on health-related matters. The plan encompasses 13 Western U.S. states, and hopefully will minimize the incidence of asbestos-related diseases.

ASBESTOSIS; LUNG; CANCER; CARCINOMA; INSULATION WORKERS; CANCER MORTALITY; HUMAN

304
Taylor, D.C.: Wenadic, C.W.: Crable, J.V., Infrared spectra for mineral identification. Amer. Ind. Hyg. Assoc. J., 31(2): 100-108 (1970).

Pulmonary occupational diseases are associated directly or indirectly with exposure to industrial dusts, powders, and minerals. The use of solid infrared spectroscopy greatly augments the use of x-ray diffraction spectra for identifying particulate matter. Qualitative infrared spectra are presented for asbestosis, amosite, anthophyllite, chrysotile, tremolite, talc, crocidolite, and other minerals.

ASBESTOSIS: CROCIDOLITE; TUMOLITE; CHRYSOTILE; ANTHOPHYLLITE; LUNG; ASBESTOSIS; ANALYSIS

305
Thomson, J.G., The pathogenesis of pleural plaques, Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 138-141 (1970).

Gravity and constant motion of the lung can induce a downward lateral movement of inhaled asbestos fibers which are too long to be phagocytosed; eventually, the fiber may penetrate soft lung tissue to posterior and lateral sites in the pleura and peritoneum. This hypothesis may explain the localization of asbestos fibers and pleural plaques at these sites. Pleural plaques develop by slow proliferation of fibroblasts and fibrocytes in connective tissue; pleural mesothelial cells are not involved in the formation, so that pleural adhesions are not developed in association with the plaques. Calcification is dystrophic, occurring in the center of older plaques where collagen is degenerated and devoid of nuclei. Though asbestos fibers are found in pleural plaques, the fibrotic response is not correlated with the number of fibers present, indicating that plaque formation may involve a sensitivity reaction.

ASBESTOSIS: PNEUMOCONIOSIS; ASBESTOSIS; PLEURAL PLAQUES; PLEURA; RUMEN; FIBROSIS; PERITONEUM; MESOTHERLIMA

306
Timbrell, V., Characteristics of the International Union Against Cancer standard reference samples of asbestos. Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 28-36 (1970).

Composition of the asbestos samples was determined by the following methods:

- X-ray diffraction
- Electron microscopy
- Chemical analysis
- Infrared spectroscopy
- Differential thermal analysis

The asbestos samples were found to be predominantly of the serpentine type, with minor amounts of the amphibole type.

ASBESTOSIS: CHRYSOTILE; AMOSITE; CROCIDOLITE; ANTHOPHYLLITE; LUNG; CANCER; PNEUMOCONIOSIS; CHEMICAL COMPOSITION

307
Timbrell, V., The inhalation of fibres, Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 3-9 (1970).

The size and shape of asbestos fibers affect their deposition in the lung, and thereby determine the extent of penetration. The retention and penetration of straight fibers with small diameters (amosite, anthophyllite and crocidolite) is significantly greater than for long, curved fibers such as chrysotile. Curvature of the fibers decreases the efficiency of penetration, especially in narrow passages where they are intercepted high in the respiratory tract. However, the chrysotile fiber consists of bundles which tend to divide into numerous fibrils with small diameters; these can penetrate more deeply into lung tissue. The intercept mechanism also concentrates long fibers in narrow airways. Gravitational settling and inertial impact cause shallow deposition of fibers with diameters of 3 microns or more; only fibers with smaller diameters succeed in penetrating pulmonary air sacs. Diffusion is a significant deposition mechanism for fibers smaller than 0.5 microns in diameter.

ASBESTOSIS: CHRYSOTILE; AMPHIBOLE; INHALATION; HUMAN; LUNG
Adverse biologic effects of asbestos fibers are closely associated with their physical characteristics. Comparative studies of aerodynamic behavior of asbestos fibers reveal that the size and rates of deposition and retention in the lung are related to the fiber type. Asbestos fibers thicker than 3 μm are readily deposited in the upper respiratory tract and are unlikely to penetrate to the alveoli; however, thicker fibers of chrysotile may penetrate if they are fluffy and have low sedimentation rates. Deposition of a fiber by sedimentation depends mainly on the diameter; deposition by interception depends almost entirely on the length of the fiber. Because of their physical characteristics, chrysotile fibers are less likely than amphiboles to penetrate to subpleural regions; amphibole fibers are more favorably orientated by aerodynamic forces for penetration into the lung. This could explain the large difference in the risk of mesotheliomas in the asbestos mining areas of South Africa; in the crocidolite mines in the North West Cape Province there is a high incidence of mesotheliomas, compared to a very low rate in the Transvaal, where both amosite and crocidolite are mined. Different studies are reviewed to support the conclusions.

ASBESTOS; AMOSITE; CROCIDOLITE; CHRYSOTILE; MESOTHELIOMA; ASBESTOS MINING; LUNG; INHALATION

Both optical and electron microscopy were used to examine the size characteristics and distribution of respirable asbestos in human and rat lung tissue. A chrysotile fiber is long and curved with an approximate diameter of 0.025 μm. Amphibole fibers are straight with minimum diameters of 0.6 μm for crocidolite, 0.15 μm for amosite; and 0.2 μm for anthophyllite. Diameter distribution of the fibers in lung tissue may aid in identification of the asbestos type; studies of human lung sections from exposed individuals indicate that amphibole fibers from a given geographical location exhibit a characteristic diameter distribution (Cape Province crocidolite, Transvaal amosite, and anthophyllite from Finland). Fiber length affected deposition in a rat exposed to amosite; the fibers penetrating the terminal air sacs generally were shorter than those in air ducts. Interception is an efficient deposition mechanism for long fibers in small airways, and increases with decreasing airway diameter; therefore fibers in air ducts are longer than those which penetrate more deeply. Since the falling speed of a fiber depends more on diameter than length, long fibers may penetrate deeply in some cases.

AMOSITE; CROCIDOLITE; ANTHOPHYLLITE; CHRYSOTILE; ASBESTOS; INHALATION; HUMAN; RAT

The inhalation of asbestos dust is associated with the development of pleural and peritoneal mesotheliomas in man. Experiments have shown that analogous conditions can be induced in rats. Results of experimental injection of chrysotile and crocidolite dust produced a high rate of tumors and extraction of the oil from the crocidolite had no effect; fewer neoplasms occurred with amosite. Chrysotile samples from different locations were compared. All dusts produced tumors. Silica used as a control dust was studied, and a summary of findings is included. A mathematical model for predicting times of occurrence of mesothelioma in rats is described.

CHRYSOTILE; AMOSITE; PLEURA; MESOTHELIOMA; HUMAN; RAT
Wagner, J.C.; Berry, G.; Timbrell, V., Mesotheliomas in rats following the intra-pleural inoculation of asbestos. Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). N.A. Shapiro (Editor). Oxford University Press, New York., pp. 216-219 (1970).

In SPF and Standard rats injected intrapleurally with 20 mg of asbestos dust, mesothelioma incidence was 30% and 80% for amosite, 6% and 69% for chrysotile, 59 and 68% for crocidolite; amosite produced fewer mesotheliomas due to a longer initial period prior to tumor induction. In rats injected with 0.5, 1.0, 2.0, 4.0 or 8.0 mg of chrysotile or crocidolite, the incidence of mesothelioma was proportional to the dose injected, with chrysotile causing the highest incidence. In a third experiment, intrapleural injection of chrysotile samples from seven Canadian mines produced mesotheliomas. Mathematical models were used to calculate expected mortality and survival curves.

CROCIDOLITE; ASBESTOS; AMOSITE; CHRYSO TILE; RAT; NOSOTHELIONA; PLEURA

Wagner, R., What in pneumoconiosis should be compensated? Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). N.A. Shapiro (Editor). Oxford University Press, New York., pp. 529-530 (1970).

Various occupational pneumoconioses are compensated for in the Federal Republic of Germany. Asbestos represents barely 1% of the total number of cases when compared to those of other occupational pneumoconioses. Cases include 32% with asbestosis and 27% with asbestosis and carcinoma of the lung.

ASBESTOS; ASBESTOSIS; CARCINOMA; LUNG; MESOTHELIONA; OCCUPATIONAL EXPOSURE; CANCER; HUMAN; PNEUMOCONIOSIS

Warwick, M.; Parkes, W.R., Circulating rheumatoid and antinuclear factors in asbestos workers., Brit. Med. J., 3: 692-693 (1970).

Immunological analyses detected antinuclear and/or rheumatoid factors in 47.5% of 80 patients who had a history of asbestos exposure; this represents a four-fold increase over the incidence in random populations. While the pathogenic role of these tissue antibodies is unknown, they appear to correlate with severe, progressive, radiologic lung changes rather than duration of exposure. Further study may determine the incidence of tissue antibodies in asbestos workers with or without lung disease.

ASBESTOS; RHENMATOID FACTOR; ANTINUCLEAR FACTOR; HUMAN; RESPIRATORY DISEASE

Webster, I., Asbestos exposure in South Africa., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). N.A. Shapiro (Editor). Oxford University Press, New York., pp. 209-212 (1970).

In South Africa, 179 cases of pleural mesothelioma were diagnosed as "definite mesothelioma" by 1969. In 61 mesothelioma cases confirmed by autopsy, asbestosis was found in 24; histological examinations showed 14 cases with no evidence of asbestosis or asbestos bodies, and 7 cases with asbestos bodies but no evidence of interstitial fibrosis. In 148 cases of known occupational histories, 28 had not been exposed to asbestos. Results of the survey suggest that there may be no direct relationship between asbestos exposure and pleural mesothelioma. The direct carcinogenic cause may consist of more than 1 agent.

ASBESTOSIS; CHRYSO TILE; AMOSITE; CROCIDOLITE; ASBESTOS; ASBESTOS MINING; MESOTHELIONA; HUMAN; PLEURA

Arnald, A.; Lebrelal, G.; Ranshul, R.; Payan, H.; Mongin, R.; Charpin, J., Pleuroperitoneal mesotheliomas and malignant pleuro-peritoneal mesotheliomas., J. R. Med. Cir. Thorac., 23(1): 8-18 (1969).

A pleural mesothelioma was discovered radiologically in a 64-year old man who had a history of asbestos exposure. Postmortem examination showed the pleuro-peritoneal tumor and its visceral metastases; asbestos bodies were found in the lung and tumor.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOS BODIES; MESOTHELIONA; CANCER; HUMAN; LUNG

Newcom, J.C.; Rodman, A.A.; Holmes, S., A dust survey carried out in buildings incorporating asbestos-based material in their construction., Ann. Occup. Hyg., 12: 141-145 (1969).

The membrane filter method was used to collect dust samples from 73 different locations in more than 60 buildings constructed with asbestos or asbestos products. Fibers 5-100 u in length with a length/diameter ratio of at least 3:1 were counted. Asbestos dust concentrations in over 90% of the locations sampled did not exceed one-tenth of the maximum accepted occupational exposure level. Forty-six percent of the samples tested contained asbestos levels similar to those found in buildings where no asbestos had been used in construction.

ASBESTOS; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE; ENVIRONMENTAL SAMPLING

Dicke, T.E.; Naylor, R., Prevalence of "asbestos" bodies in human lungs at necropsy., Dis. Chest, 56(2): 122-125 (1969).

Asbestos bodies were found in lung or hilar lymph node scrapings in 1% of 100 necropsies of Michigan residents. In one case, asbestos bodies were found only in the hilar lymph node and in 1 cases, in both the lung and hilar lymph node. In contrast, asbestos bodies were found in lung sections from only 4 of the 19 positive cases. The maximum number of positive results were found when the upper and lower lobes of both lungs were scraped. None of the subjects manifested pulmonary asbestosis during life and, in general, did not have a history of asbestos exposure. There was no recognizable geographical distribution pattern for the positive cases.

ASBESTOS BODIES; LUNG; FERRUGENOS BODIES; NON-OCCUPATIONAL EXPOSURE; HUMAN
Chest X-rays of 372 workers in a cement-asbestos pipe factory showed a high incidence of asbestosis, silicosis, or mixed dust pneumoconiosis. The number of positive cases and the varieties of radiological findings per case increased with duration of exposure, with 84% positive in workers with 5 years exposure and 81% positive in the 20 year exposure group. This factory had high dust concentrations and inadequate safety measures in the work areas.

ASBESTOSIS; SILICOSIS; PNEUMOCONIOSIS; X-RAY; OCCUPATIONAL EXPOSURE; ASBESTOS; PNEUMOSIS; DUST CONTROLS

Electrocardiograms of 29 patients with asbestosis showed left axis deviation in 9 cases (31%), and abnormalities in ventricular conduction in 16 cases (55%) due to complete or partial bundle blockage related to asbestosis cardiopathy. Radiological irregularities in cardiac outline were associated with abnormalities in ventricular conduction. Anymetrical radiological findings in the left side of the chest were consistent with left axis deviations observed in electrocardiograms.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; DIAGNOSIS; X-RAY; ELECTROCARDIOGRAM; HUMAN

Asbestos is mentioned briefly in this review because it contains iron, nickel, and chromium. Nickel is the best documented metal carcinogen; more lung cancer is found among workers in nickel mines or refineries than in the general population. The same result was found for British chromium workers. To a lesser degree, iron has been suggested as a possible carcinogenic agent due to the higher incidence of lung cancer in hematite miners than in the general population.

ASBESTOS; SPACE METALS; CANCER; TUMOR; HUMAN

Gibbs, G.W., Some problems associated with the storage of asbestos in polyethylene bags, Amer. Ind. Hyg. Assoc. J., 30 (1): 458-464 (1969).

The common practice of collecting and storing asbestos samples in polyethylene bags results in greater quantities of oils in the asbestos than in samples stored in glass jars. A bright yellow component, identified as 3,3', 5,5'- tetratertiary butyl diphenoxine, was found in the oils extracted from all asbestos samples collected in polyethylene bags. This compound presumably forms by some reaction between the asbestos and the polyethylene since it is not present in extracts of the polyethylene bags alone.

ASBESTOS; CHRYSOTILE; ANALYSIS; CHEMICAL COMPOSITION

Gold, C., Asbestos levels in human lungs., J. Clin. Pathol., 22:507 (1969).

Between 1965 and 1969, 620 extracts from lung biopsies, lobectomies, pneumonectomies, and postmortem lungs were examined by the potassium hydroxide method. Asbestos was detected in 336 samples; 292 of these were quantitated and contained 0 - 13,000,000 asbestos fibers per gram of dried lung tissue. The severity of lung disease was related to the asbestos count. Asbestos concentrations in all lung tissue extracts from malignant tumor cases were abnormally high; however, counts from actual tumor tissue were low for pleural and peritoneal mesotheliomas and high in bronchial carcinomas.

ASBESTOS; LUNG; RESPIRATORY DISEASE; CANCER; TUMOR; HUMAN

Goodhead, K.; Martindale, R.W., The determination of amosite and chrysotile in airborne dusts by an X-ray diffraction method., Analyst, 94: 985-988 (1969).

X-ray diffraction with photographic recording was used to determine both asbestos type and concentration in airborne dusts. In the asbestos concentration range of 15 to 100 percent, the coefficient of variation for the determination varied between 5 and 10 percent of the value using a 3% eq sample size. Smaller sample size resulted in lower accuracy.

AMOSITE; CHRYSOTILE; ANALYSIS; ENVIRONMENTAL SAMPLING

Gross, P.; DeTreville, P.T.P.; Haller, W.S., Pulmonary ferruginous bodies in city dwellers: a study of their central fibers., Arch. Environ. Health, 19(2): 186-188 (1969).

Core of ferruginous bodies isolated from lungs of 28 urban dwellers not occupationally exposed to asbestos did not show the characteristic electron diffraction pattern given by chrysotile. The absence of this pattern excluded chrysotile as a causative agent in the formation of the ferruginous bodies. This is a significant finding because chrysotile comprises more than 90 percent of the asbestos used in the U.S.

FERRUGINOUS BODIES; ASBESTOS; CHRYSOTILE; LUNG; NON-OCCUPATIONAL EXPOSURE; HUMAN

Harington, J.S., The Second International Conference on the Biological Effects of Asbestos. Report on a visit to East Germany and England., 5. Afr. Cancer Bull., 13(2): 60-70 (1969).

Impressions gained from the conference are the following: (1) so-called "asbestos bodies" are not specific indicators of asbestos exposure and have been found after exposure to talc, glass, graphite, and carbones; (2) subcutaneous implantation in animals, asbestos bodies are present; (3) asbestos accumulates in phagocytes of macrophages after phagocytosis and may escape into the cytoplasm after forcing rupture of these vacuoles; (4) the hemolytic activity of different forms of asbestos is related in a linear fashion to the magnesium:silicon ratio of the fibers; (5) longer fibers are more fibrogenic than shorter fibers; (6) following subcutaneous implantation in animals, asbestos bodies are present; and (7) a co-carcinogenic relationship exists between smoking and asbestos inhalation.

ASBESTOS; ASBESTOS BODIES; ASBESTOSIS; CANCER; STANDARDS; MESOTHELIOMA; HUMAN

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Katiharova, V. N.; Ol'shvang, B. A.; Rogen, F. N., Changes in certain organs after experimental intraperitoneal injection of asbestos-containing dust, Bull. Wksp. Biol. Med., 67: 117-120 (1969).

Rats injected intraperitoneally with 50 μg of crocidolite, actinolite, tremolite, or brucite dust developed a fibrogenic response in the mesentary as evidenced by the formation of cell nodules consisting of dust macrophages surrounded by collagen fibers. Crocidolite and brucite dust induced the strongest fibrogenic response. Though some particles migrated to lung tissues and alveolar cells, fibrotic action of the dust was manifested mainly at the injection site.

CHRYSOTILE; ACTINOLITE; TREMOLITE; FIBROGENIC TISSUE RESPONSE; LUNG; RAT

<329>
Lebouffant, L.; Daniel-Houssard, H.; Durif, S.; Martin, J. C.; Normand, C.; Policard, A., Research and characterization of asbestos particles in pleural mesotheliomas, Câmp. Med., 264: 2269-2274 (1969).

Detection of asbestos particles in histologic samples of mesotheliomas requires incineration of the sample, treatment with concentrated HCl, evaporation, washing, filtering, microscopic examination, and electronic microdiffraction analysis. Additional samples must be incinerated and analyzed by x-ray diffraction to detect asbestos forms, such as chrysotile, which partially react with HCl.

ASBESTOS; CANCER; MESOTHELIOMA; ANALYSIS

<330>
Longley, E. O., The many faces of asbestos disease., Med. J. Aust., 56-2(21): 1963-1966 (1969).

An asbestos body may vary in length from 20 μ to more than 200 μ; it contains an asbestos fiber coated with a protein gel which is impregnated with ferric compounds. Asbestos bodies generally appear to be innocuous but can cause pulmonary fibrosis when the coating is disintegrated by some means. While the presence of asbestos bodies indicates exposure to asbestos, it does not in itself indicate the presence of asbestosis. Asbestosis development depends on the concentration and duration of exposure to asbestos. X-ray examination is commonly used to detect asbestosis before any symptoms have developed. In some cases, carcinomas have occurred in occupationally exposed workers, even though asbestosis could not be confirmed by x-ray examination. Usually a long time (30-40 years) elapses between initial asbestos exposure and the appearance of a tumor. Most asbestos-related mesotheliomas have occurred after exposure to crocidolite and not to actinolite or chrysotile.

ASBESTOS; ASBESTOSIS; ASBESTOS BODIES; MESOTHELIOMA; CANCER; TUMOR; OCCUPATIONAL EXPOSURE; CARCINOMA; X-RAY; DIAGNOSIS

<331>
MacPherson, F.; Davidson, J. K., Correlation between lung asbestos count at necropsy and radiological appearances., Brit. Med. J., 1: 355-357 (1969).

A correlation was made between asbestos counts in lung tissue and evidence of asbestosis on chest x-ray; among 100 cases examined, radiological features of asbestosis were observed in 8 of 9 cases where the asbestos count at necropsy exceeded 40. Radiographic abnormalities such as calcified and non-calcified pleural plaques are more likely to be associated with higher asbestos counts.

ASBESTOSIS; ASBESTOS BODIES; LUNG; X-RAY; PLEURAL PLAQUES

<332>
Milne, J. E. H., Fifteen cases of pleural mesothelioma associated with occupational exposure to asbestos in Victoria., Med. J. Aust., 56-2(14): 669-673 (1969).

Case histories of 15 persons with pleural mesothelioma in Australia revealed heavy occupational exposure to asbestos in 9 cases, probable asbestos exposure in 4 cases, and no evidence of asbestos exposure in 2 cases. Crocidolite appeared to be particularly potent in mesothelioma induction.

MESOTHELIOMA; ASBESTOS BODIES; LUNG; OCCUPATIONAL EXPOSURE; CROCIDOLITE; BLUE ASBESTOS; TUMOR

<333>
Newhouse, M. L., A study of the mortality of workers in an asbestos factory., Brit. J. Ind. Med., 26: 293-301 (1969).

An analysis of mortality in 1160 males employed in an asbestos factory between April 1, 1933 and May 1, 1964 revealed no significant difference between the number of deaths in the factory population and in national figures, until an interval of 16 years or longer had elapsed from first exposure to the factory. Men in low or moderate exposure jobs showed no excess mortality, but those in heavy exposure jobs showed a significant excess of death from cancer of the lung, pleura or other sites, whether employed for less than 2 years or longer. Only workers with long service and heavy exposure showed excess mortality from respiratory disease.

ASBESTOS; INSULATION WORKERS; OCCUPATIONAL EXPOSURE; CANCER; HUMAN; CANCER MORTALITY

<334>
Newhouse, M. L.; Wagner, J. C., Validation of death certificates in asbestos workers., Brit. J. Ind. Med., 26: 302-307 (1969).

An attempt was made to validate the certified cause of death for 301 deceased workers in an asbestos factory by reviewing necropsy reports for 52% of the group and histological material for 28%. Eight additional cases of bronchial carcinoma were diagnosed from necropsy and histological reports. Endotheliomas or mesothelioma was the certified cause of death in 4 cases, and 15 additional mesotheliomas were identified; 5 were in patients whose certified cause of death was carcinoma of the lung or pleura and 10 occurred in patients whose death had been attributed to carcinoma with no mention of a primary tumor or to cancer of the gastrointestinal tract. Some degree of asbestosis was found in all but 7 of 67 lung section reviewed. Moderate or severe asbestosis was found in all confirmed cases of lung carcinoma.

ASBESTOS; CARCINOMA; MESOTHELIOMA; TUMOR; ASBESTOSIS; OCCUPATIONAL EXPOSURE
Peacock, P. R.; Biancifiori, C.; Bucciarelli, E., Retrospective search for asbestos bodies in necropsies and biopsies on cases of primary malignant disease of the lung., Europ. J. Cancer, 5(2): 147-153 (1969).

No asbestos bodies were found in 23 autopsy specimens, 10 surgical specimens, and 15 bronchial biopsy specimens of primary lung carcinomas. No definite association was established between the tumors and any causative factors. All patients came from the Perugia area of Italy which has little industry and abundant clear air.

LUNG; ASBESTOS BODIES; CARCINOMA; TUMOR; NON-OCCUPATIONAL EXPOSURE; HUMAN

Peacock, P. R.; Biancifiori, C.; Bucciarelli, E., Examination of lung smears for asbestos bodies in 109 consecutive necropsies in Perugia., Europ. J. Cancer, 5:144-158 (1969).

No case of mesothelioma has yet been reported from the pathology center at the University of Perugia, Italy, though primary tumors of the lung are seen as frequently as in other comparable departments of pathology. The area is almost free from atmospheric pollution and is not an industrial city. At autopsy, 109 consecutive cases were examined; a low incidence (less than 1%) of asbestos bodies is reported.

LUNG; ASBESTOS BODIES; MESOTHELIOMA; ENVIRONMENTAL CONTAMINATION; CANCER; TUMOR; HUMAN

Pelzer, A. M.; Thomson, H. L., Body plethysmographic measurements of airway conductance in obstructive pulmonary disease., Amer. Rev. Resp. Dis., 99(2): 194-204, (1969).

Both airway conductance and specific airway conductance were measured in 22 subjects with severe bronchitis, in 10 subjects with suspected mild bronchitis, and in 6 subjects with bronchial asthma. Measurements made using the body plethysmograph were compared for 32 normal individuals and 12 asbestososis patients. High correlations existed between conductance tests, peak flow, and one-second time vital capacity. Obstructive disease was more prevalent in asbestososis patients. Generally, normal subjects had a greater individual conductance-lung volume slope than patients with bronchitis and a smaller slope than patients with asbestososis.

BRONCHITIS; ASBESTOSIS; RESPIRATORY DISEASE; VENTILATORY DEFECTS; DIAGNOSIS; HUMAN

Pyle, L. H.; Roe, P. J. C.; Warwick, G. P., Elimination of radioactivity after intratracheal instillation of tritiated 3,4-benzopyrene in hamsters, Brit. J. Cancer, 23(1): 103-115 (1969).

Hamsters injected intratracheally with either tritium-labelled 3,4-benzopyrene (BP) or labelled BP and asbestos, or labelled BP and carbon black eliminated, via the lungs, 90% of the radioactivity during the first 3 weeks after injection. Following this rapid excretion period, both asbestos and carbon black significantly increased the retention of residual radioactivity. More macrophages were recovered from the lungs after administration of BP plus carbon black or BP plus asbestos than after administration of BP alone; but the radioactivity per macrophage was higher in hamsters treated with BP alone. Radioactivity levels in liver, kidney, blood and urine were similar for all groups. The results indicate that inhalation of insoluble particulate matter, from cigarette smoke for example, may enhance the carcinogenic effects of inhaled asbestos in humans.

ASBESTOSIS; CANCER; HAMSTER; INHALATION

Pelacchi, R., Mesotelioma del peritoneo., Lavori Ist. Anat. Istol. Patol., Univ. Studi Perugia, 29: 1-27 (1969).

No asbestos was found in the primary or secondary tumoral tissue (diffuse, mixed-type mesothelioma of the peritoneum) of an 80 year old man who had worked in a lignite mine for 10 years and in a construction company for 14 years. Asbestos bodies were found only once in 109 autopsy examinations carried out at the Perugia Institute and not found in any of 48 primary lung tumors. The incidence of mesothelioma of the peritoneum was 0.1% of all consecutive autopsy cases for malignant tumors and 1.23% of all primary and secondary tumors of the peritoneum.

ASBESTOSIS; TUMOR; ASBESTOS BODIES; MESOTHELIOMA; HUMAN

Sano, T., Relationship between pneumoconiosis and lung cancer., J. Sci. Labor, 65(7): 383-396 (1969).

Pneumoconiosis cases associated with cancer in Japan include asbestosis, silicosis, pyropyllite pneumoconiosis, aluminia lung, welder's lung and activated carbon lung. In asbestosis patients, cancers may arise from abnormal tissue proliferation (hyperplasia, squamous cell metaplasia) on the bronchial or alveolar wall due to asbestos inhalation and chronic bronchilitis. Since tissue damage or change may lead to lung cancer, steps should be taken to prevent infection in pneumoconiosis cases.

ASBESTOSIS; LUNG; ASBESTOSIS; CANCER; PNEUMOCONIOSIS; HUMAN; CANCER

Smith, W. E.; Tazdi, F., Induction of carcinomas from mouse lung transplanted with asbestos., Proc. Amer. Assoc. Cancer Res., 10: 84; Abstract 31 (1969).

Lungs removed from BALB/C mouse embryos were minced and implanted into thigh muscles at 44 sites in adult males of the same strain. Seventeen sites that received only lung tissue developed small growths resembling alveoli and bronchioles. Lung tissue implanted along with 2 mg chrysotile at 27 sites developed fibrosis, adenomatoid changes, squamous metaplasia, and occasional lesions with gross and histological characteristics of sarcomas or carcinomas.

CHRYSTOTILE; PIBROSIS; CANCER; SARCOMA; CANCER; HUMAN; MOUSE; TUMOR

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Pleural effusions, non-specific pleural reaction, accentuation of the fissures, lamellar pleural thickening and non-calcified pleural plaques are significant diagnostic changes in patients with a history of asbestos exposure. Combined pleural and parenchymal radiological lesions are common signs of asbestosis but generally are rare in uncomplicated pneumoconioses. Massive fibrosis is common as a basal lesion in asbestosis and unusual in pneumoconioses associated with gold- and coal-mining. Radiological changes relate directly to the degree of fibrosis in the lung but do not always correlate with the histological changes.

ASBESTOS; ASBESTOSIS; FIBROSIS; PNEUMOCONIOSIS; X-RAY; PLEURAL PLAQUES; ASBESTOS BODIES

To more fully understand the biologic effects and structure-activity relationships of asbestiform minerals, the experimental biological evidence must be related to the variations in physical and chemical properties of each individual asbestos variety. This review discusses the occurrence, crystal structure, chemical composition, surface characteristics, biological characteristics, synthesis, physical properties, identification, and sources of the various asbestiform minerals.

ASBESTOS; CHRYSOTILE; AMosite; ANTHOPRYSITE; TREPOMITE; ACTINOMITE; CHEMICAL COMPOSITION

A thin coat of asbestos-saturated glass fibers applied to the pleura and pericardium of Osborne-Mendel rats induced extensive and progressive fibrosis in all animals, and neoplasms in 74% of the animals. The neoplasms appeared to arise from the fibrotic membranous response, suggesting that reactive proliferation may be a primary neoplastic development. Healing infarcts or implanted wax pellets caused no carcinogenic response in pulmonary epithelium or pleura. Fibrous glass alone produced only slight initial tissue reaction, followed by complete healing.

ASBESTOS; FIBROSIS; CANCER; NEOPLASM; PLEURA; PERITONEUM; RAT

Since 1965 asbestos has been implicated as a cause of mesothelioma in humans. It is not known if asbestos is the actual etiologic agent of tumor formation - the interaction of asbestos with associated trace metals or with polyyclic aromatic hydrocarbons may be essential to initiate mesothelial development. The degree of asbestos exposure necessary to produce tumors in humans is unknown.

ASBESTOS; CANCER; MESOTHELIOMA; ENVIRONMENTAL CONTAMINATION; HUMAN; OCCUPATIONAL EXPOSURE

Suzuki, Y.; Churg, J., Formation of the asbestos body., Environ. Res., 3: 107-118 (1969).

In hamsters receiving intratracheal doses of soft chrysotile (1 mg), harsh chrysotile (1,000 mg) and amosite (2.5 mg/month for 10 months), the formation of asbestos bodies was similar for all asbestos types. The lung tissue of all animals showed marked increase of intraalveolar cells comprised mainly of alveolar macrophages. Uncoated fibers occurred in alveolar spaces, within alveolar septa, and in the cytoplasm of phagocytic cells. The fibers were phagocytosed by macrophages and incorporated into phagosomes. Hemosiderin granules accumulated in the cytoplasm, transferred into phagosomes and surrounded the fibers in a loose-walled arrangement to form an immature body. The body matured with the accumulation of tightly packed micelles within an enclosed membrane. Asbestos body formation appears to be a continuous process, with uncoated fibers being converted to bodies months or years after asbestos inhalation.

CHRYSOTILE; ASBESTOS BODIES; HAMSTER; PHAGOCYTOSIS; AMOSITE; LUNG; MACROPHAGE; HEMOSIDERIN

Suzuki, Y.; Churg, J., Structure and development of the asbestos body., Amer. J. Pathol., 65(4):179-91 (1969).

Following the intratracheal administration of 1 mg soft chrysotile to male hamsters, asbestos bodies formed in the cytoplasm of alveolar macrophages, alveolar epithelial cells, and septal cells in the lung. The process involved the phagocytosis and incorporation of short fiber fragments into the cell cytoplasm; the appearance of hemosiderin granules in the cell cytoplasm; intracellular transport of iron micelles from the hemosiderin into the phagocytic cells; and progressive accretion of the iron micelles around the fiber. The resultant asbestos body consisted of the central asbestos fiber, the peripheral coat of iron, and the surrounding membrane of the phagosome.

CHRYSOTILE; ASBESTOS BODIES; PHAGOCYTOSIS; HEMOSIDERIN; HAMSTER; MACROPHAGE

Thomson, M.L.; Short, M.D., Mucociliary function in health, chronic obstructive airway disease, and asbestosis., J. Appl. Physiol., 26(5):535-539 (1969).

A comparative study of mucociliary function among 5 normal subjects, 6 with chronic obstructive airway disease, and 4 with asbestosis showed no significant difference in the clearance rate of inhaled plastic particles (%u) from the lungs. Clearance during this phase was greatest in subjects having obstructive disease because most of the dust was deposited higher in the bronchial tree with less penetration below the ciliated airways than in normal subjects. Chronic tobacco smoking had no adverse effect on ciliary function.

ASBESTOSIS; LUNG; INHALATION; HUMAN; SMOKING

Environmental Health Perspectives
Of 586 persons compensated for asbestosis in Italy from 1964-1966, the majority (500) worked in one of the following: the asbestos and refractory material trade, the dockyard and shipbuilding trade, or the textiles and friction material trade. Carefully analyzing the causes of death for 307 persons compensated for asbestosis between 1958-1969 revealed asbestosis (32%), lung cancer incidence (30%), asbestos mesothelomias (8%), or other causes (38.4%). In a group of 232 chrysotile mine workers who had claimed compensation, pleural plaques were found in 3.8%. Lung cancer caused 3% of the 97 reported deaths, and no mesothelomias were found. No significant differences in the incidence of lung tumors were observed between compensated and non-compensated workers.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; PLEURAL PLAQUES; TEXTILE INDUSTRY; ASBESTOS MINING; CANCER; TUMOR; LUNG

Wagner, J.C.: Mercy, G., Mesothelomias in rats following inoculation with asbestos., Brit. J. Cancer, 23(3):567-581 (1969).

Wistar specific pathogen-free and Standard rats were infected intrapleurally with 20 mg of amosite, crocidolite, or chrysotile. More than 50% of the animals given chrysotile or crocidolite developed pleural mesothelomias. Asbestite produced fewer mesothelomias and exhibited a longer initial latent period between inoculation and tumor development. No malignancies developed in the saline control groups. A lung fibrous tumor occurred in a small number of animals in which the dust did not reach the pleural cavity.

Asbestos; Crocidolite; Chrysotile; Mesothelomias; Rat; Tumor; Pleura

Wright, G.W.: Asbestos and health in 1969., Amer. Rev. Resp. Dis., 100: 467-479 (1969).

Heavy exposure to asbestos fibers can occur in certain industries and in the immediate surrounding areas; however, the concentration of airborne asbestos fibers can be controlled by implementation of proper safety measures. Maintaining asbestos concentrations at accepted standards minimizes the risk of pulmonary fibrosis and malignancy.

Asbestos; Standards; Fibrosis; Cancer; Occupational Exposure; Non-Occupational Exposure; Mesothelomias; Crocidolite; Ferrogignous Bodies; Chrysotile; Tshipolite

Ardalan, P.: Lung function tests and electrocardiographic changes in pulmonary fibrosis., Praxis Pneumol., 22(12): 780-792 (1968).

A comparative study of lung function and electrocardiographic tests for 93 cases of pulmonary fibrosis comprised 21 cases of silicosis, 9 cases of silicocytuberculosis, 22 cases of asbestosis, and 31 of fibrosis of unknown origin. Compatible with normal values (0.078 plus or minus 0.028), specific compliance was reduced to 0.058 plus or minus 0.026 in asbestosis, to 0.062 in asbestosis, to 0.062 plus or minus 0.017 in silicosis, and to 0.05% plus or minus 0.030 in fibrosis of unknown etiology. Comparison of these data with arterial oxygen tension during work showed that values below 0.065 were usually accompanied by a reduction in PO2. During work experiments, considerable variations in arterial oxygen tension were seen in patients with asbestosis. No major electrocardiographic changes were observed in any of the cases.

Analysis; Asbestos; Fibrosis; Respiratory Disease; Ventilatory Defects; Human; Electrocardiogram
which beer., Asbestos the chemical structure <359> various satisfactory findings left MESOTHELIOIA; ASBESTOS; <358> microscopy, The analysis of the 54-year-old male revealed slight reduction of vital capacity and diminished diffusing capacity. Seven years later the patient was rehospitalized because of paroxysmal cough accompanied by severe pain in the right chest. Dyspnea progressed rapidly as sero-sanguinous fluid accumulated. The admission roentgenogram showed a right-sided pleural effusion whereas the left lung was more diffusely infiltrated and appeared honeycombed in many areas. Uninvolved areas showed signs of asbestosis. The disease had its usual rapid fatal course. The pathological findings at autopsy are presented.

ASBESTOS, ASBESTOSIS, DIAGNOSIS, DYSPEA, MESOTHELIOMA, FINGER CLUBBING, CHRYSOTILE, OCCUPATIONAL EXPOSURE, HUMAN

Belleau, P.; Gaemmler, E.A., Mesothelioma and asbestosis, Respiration, 25(1): 67-79 (1968).

The onset of diffuse mesothelioma is usually insidious, as evident in a case report of an asbestos sheet-stacker with asbestosis. Earlier examinations of the 54-year-old male revealed slight reduction of vital capacity and diminished diffusing capacity. Seven years later the patient was rehospitalized because of paroxysmal cough accompanied by severe pain in the right chest. Dyspnea progressed rapidly as sero-sanguinous fluid accumulated. The admission roentgenogram showed a right-sided pleural effusion whereas the left lung was more diffusely infiltrated and appeared honeycombed in many areas. Uninvolved areas showed signs of asbestosis. The disease had its usual rapid fatal course. The pathological findings at autopsy are presented.

ASBESTOS, ASBESTOSIS, DIAGNOSIS, DYSPEA, MESOTHELIOMA, FINGER CLUBBING, CHRYSOTILE, OCCUPATIONAL EXPOSURE, HUMAN

Bkerley, C.; Langer, A.M.; Baden, V., Instrumental analysis of inspired fibrous pulmonary particulates, Trans. N.Y. Acad. Sci., Series II, 30: 331-350 (1967-1968).

Various techniques are evaluated for identifying fibrous microscopic particulates in tissue sections. Standard techniques for mineral separation from tissue are generally unsuitable for asbestos. Harsh chemical and physical analyses give less satisfactory results than other methods. Combinations of electron diffraction, transmission microscopy, and microprobe chemical analyses provide information concerning morphology, chemistry, and structure of the particle examined.

ASBESTOS, ANALYSIS, CHEMICAL COMPOSITION

Blenner, R.; Paerarr, T.B., Examination of fibres in beer., Nature, 219(5169): 93-94 (1968).

Asbestos pads are frequently used for filtration in the beverage industry. A method has been devised by which water and formulated drinks may be scanned for asbestos fibers by electron microscopic examination. Following removal of extraneous particles, electron diffraction of fibers obtained from beer confirmed that some definitely were chrysotile.

ASBESTOS, INHALATION, ANTHROPHYLLITE, GUINEA PIG, PHAGOCYTOSIS, MACROPHAGE, HEMOSIDERIN

Desbordes, J.; Manouvrier, F.; Tayot, J.; Ernoult, J.L.; Botteau, M.; Dousset, G.; Dauty, A., Bronchopulmonary cancer after asbestosis, J. Fr. Med. Chir. Thorac., 27(7): 809-821 (1968).

Thirty years after initial exposure to asbestos, an epidemic of bronchial carcinoma was detected in a woman who did not smoke and who had been employed as an asbestos worker for 13 years. At autopsy, histological examination revealed asbestos bodies (previously not found in the sputum) in the intra-alveolar fibers of the lungs. Systematic bronchial endoscopy is recommended for all individuals exposed to asbestos for 20 years.

ASBESTOS, ASBESTOS BODY, CANCER, CARCINOMA, DIAGNOSIS, LUNG, OCCUPATIONAL EXPOSURE, HUMAN

DeTheville, R.P.; Gros, P.; Davis, J.M., Asbestos bodies and their bioeffects, J. Amer. Med. Assoc., 203(13): 1142-1143 (1968).

A letter to the editor details briefly a chronological review of asbestos bodies from discovery, through a period of little clinical significance, to the present position as one of the greatest industrial medical problems. Accurate identification of "true" asbestos bodies continues to be a major problem.

ASBESTOS, ASBESTOS BODY, CHROMIDOLITE, ASBESTOSIS, ANOSITE, CHROMIDOLITE, ANTHROPHYLLITE

Dousset, G.; Desbordes, J.; Tayot, J.; Duvois, E.; Ernoult, J.L.; Manouvrier, F.; Veret, J., The special characteristics of bronchial cancer in patients with asbestosis (three new cases), Pousoir Coeur, 24(5): 583-606 (1968).

Three new observations of bronchial cancer and 2 previously published cases in patients exhibiting asbestosis are described in detail.

ASBESTOSIS, CANCER, HUMAN
A technique of transbronchial biopsy, using instruments inserted through a catheter under fluoroscopic control, is employed when routine techniques fail to establish the diagnosis of a pulmonary lesion. Brushes with nylon bristles are used if there is some distance between the tip of the catheter and the lesion, whereas brushes with steel bristles are used when the disease process is diffuse. A positive cytologic or pathologic diagnosis was established in the majority of cases (66%) with primary pulmonary tumors, but the method has proved less accurate in diagnosing metastatic carcinomas and pulmonary tumors. More vigorous use of the biopsy forceps will improve the diagnostic yield of this technique.

**DIAGNOSIS; TUMOR; CANCER; CARCINOMA; RESPIRATORY DISEASE; HUMAN**

**Godwin, W.C.; Jagatic, J., Asbestos and mesotheliomas., J. Amer. Med. Assoc., 204(11): 1009 (1968).**

Inhalation exposure to asbestos fibers in any of its forms – crocidolite, chrysotile, amosite, or tremolite – carries a risk to man and animals; in many cases, mesotheliomas have been observed in asbestos workers after a latent period of several years.

**ANOSTEF; ASBESTOS; CHRYSOTILE; CROCIDOLITE; HAMSTER; HUMAN; MOUSE; OCCUPATIONAL EXPOSURE; THERMOLT**

**Hagerstrand, I.; Neuman, L.C.; Odland, B., Asbestos bodies in the lungs and mesotheliomas. A retrospective analysis of 177-193 autopsy material., Acta Pathol. Microbiol. Scand., 72(2): 177-191 (1968).**

During one decade (1957 through 1966), 3% cases of mesotheliomas were found in 12,763 autopsies; at the same time 36 mesothelioma cases were re-examined for the presence of asbestos bodies in the lungs. Asbestos bodies were found in 18 cases in the mesothelioma group and in 12 cases in the control population (15 autopsy cases). For a correlation between the presence of asbestos bodies and mesotheliomas to be proven, asbestos bodies must be abundantly present in the cases of mesotheliomas.

**ASBESTOS; ASBESTOS MESOTHELIOMA; HUMAN**

**Harries, P.G., Asbestos hazards in naval dockyards., Ann. Occup. Hyg., 11: 135-145 (1968).**

Asbestos materials are used extensively in shipbuilding and ship repairing. Although numerous preventive methods have been instituted, problems still exist as to occupational exposure, compensation, and improved methods of diagnosing asbestos-associated diseases.

**ANOSTEF; ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; CROCIDOLITE; HUMAN; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; SHIPYARDS**

**Kleinfield, N.J., Asbestososis and mesothelioma., Med. Hist., 96(12): 1223-1229 (1968).**

Public interest has been aroused by the direct association between asbestos and pulmonary fibrosis, various malignancies, and more recently, the demonstration of asbestos or mineral-fiber bodies in populations having no industrial exposure. Clinical and radiological aspects are discussed along with two major criteria for the diagnosis of asbestosis: history of the inhalation of significant amounts of asbestos dust over an extended period of time and a consistent chest roentgenogram.

**ASBESTOS; FIBROSIOS; ASBESTOSTIS; DIAGNOSIS; CANCER; WTOSPLASTIS; HUMAN; X-RAY**

**Knox, J.F.; Holman, S.; Doll, R.S.; Hill, I.D., Mortality from lung cancer and other causes among workers in an asbestos textile factory., Brit. J. Ind. Med., 25(4): 193-303 (1968).**

The causes of death for persons working in an asbestos factory were examined for a 50-year period (1816-1966). The beginning date for workers employed under improved working conditions was January 1, 1933, after the introduction of the asbestos industry regulations in 1931. Death rates have been recorded for 256 men employed for at least 20 years and for 536 men and 220 women employed for at least 10 years since 1931. Results show a substantially increased mortality for men exposed 10 or more years before 1933 (48 deaths from all causes compared to 17.1 expected). Men employed before 1933, but for less than 10 years, showed an increased mortality from lung cancer (5 deaths against 4.6 expected), but no significant increase from other causes. Men and women who were exposed since January 1933 had a mortality comparable to the national average. Statistical analysis of the trends indicated a significant reduction of the occupational hazards of asbestos since 1932 (at least with respect to bronchial carcinoma). Chrysotile was the predominant asbestos type used in the factory, but small amounts of crocidolite also were processed.

**ASBESTOS; CHRYSOTILE; CROCIDOLITE; OCCUPATIONAL EXPOSURE; HUMAN; CANCER; CANCER MORTALITY**

**Lynch, J.R., Brake lining decomposition products., J. Air Pollut. Contr. Assoc., 18(1): 824-826 (1968).**

Only a small proportion of the asbestos worn from brake linings is released into the atmosphere as free fibers. The remainder is compacted into a different nonfibrous mineral resulting from thermal metamorphosis of asbestos. A significant release of fibers occurred only under conditions extreme enough to produce brake failure.

**ASBESTOS; ENVIRONMENTAL CONTAMINATION**

**Meurman, L.O., Pleural fibrocalcite plaques and asbestos exposure., Environ. Res., 2: 30-46 (1968).**

Slight inhalation of asbestos, often 20 or 30 years previously, has been associated with benign pleural plaques or malignant diffuse mesotheliomas. Direct relationship between asbestos exposure and pleural plaques remains obscure, however. As yet, only an association has been demonstrated, not an obvious causal relationship. Other still unidentified pathogenetic factors have to be considered, either as a contributory or sole cause of these lesions. Further, occurrence of bilateral calcific plaques can not be considered prima facie evidence for asbestos pneumoconiosis.

**ASBESTOS; PLEURAL PLAQUES; CANCER; MESOTHELIOMA; PLEURAL CALCIFICATION; HUMAN**
Complications

FIBROSIS; asbestosis in comprises reduced by chest, pleural plaques, pleural calcification, and pleural thickening that suggested mesothelioma. Necropsies at death confirmed pleural mesothelioma and the presence of asbestos bodies in both patients; the neoplasms differed histologically. Asbestos exposure in both was minimal, neither had significant lung fibrosis, and both patients had smoked tobacco for 2% to 40 years. These cases are among the first to be reported in Australian literature.

ASBESTOS; MESOTHELIOMA; TUMORS; PLEURAL CALCIFFICATION; OCCUPATIONAL EXPOSURE; HUMAN; FIBROSIS; PLEURAL PLAQUES; CANCER; ASBESTOS BODIES; SMOKING; PIGMENT CLUMPING

When introduced into the pleural cavity of dogs, a penicillin-asbestos paste effectively destroys the mesothelial lining by abrasion. The mesothelial layer is completely replaced by a thick layer of vascular granulomatous tissue which obliterated the pleural cavity. The asbestos powder blots the pleural surface, continues the irritation initiated by the penicillin crystals, and leads to the production of granulomas and dense adhesions.

ASBESTOS; DOG; PLEURODESIS; PLEURA; GRANULOMA

Asbestos may occur with or without the usual symptoms. Six cases are presented which confirm the presence of lesions in radiographs of patients with asbestos. Because complications of asbestosis can be fatal, asbestosis should be considered in the differential diagnosis of patients with nodular lung lesions who have been exposed to asbestos. Complications of asbestosis include pulmonary fibrosis, pulmonary insufficiency, bronchogenic carcinoma, malignant mesothelioma, and abdominal tumors.

ASBESTOS; ASBESTOSIS; ASBESTOS BODIES; DIAGNOSIS; FIBROSIS; HUMAN; INHALATION; OCCUPATIONAL EXPOSURE; TELITARY DEFECTS; CANCER; CARCINOMA; MESOTHELIOMA; TUMOR

Asbestos bodies were reported in basal lung smears from 26 out of 100 consecutive autopsies in Jerusalem. The clinical pathology study revealed that 29.1% of the males and 22.2% of the females showed a presence of asbestos bodies. This incidence of asbestosis as well as pleural and peritoneal mesothelioma can be expected to increase with the increasing use of asbestos, particularly in urban settings. Ashkenazi Jews had a drastically higher incidence of asbestos bodies than other Jews. Asbestos exposure was not due to occupational exposure. Differences in asbestos bodies and pseudoasbestos bodies are described.

ASBESTOS; ASBESTOSIS; MESOTHELIOMA; ASBESTOS BODIES; ENVIRONMENTAL CONTAMINATION; HUMAN; NON-OCCUPATIONAL EXPOSURE

Emphasis has shifted from occupational asbestosis to merely casual asbestos exposure as the cause of malignancy. Asbestos may be a true carcinogen or a co-carcinogen giving rise to an increased incidence of tumors. Demonstration of asbestos bodies in large numbers of urban dwellers lends support for the condemnation of asbestos. Inspection of causal concept reveals potential problems. Cigarette smoking and atmospheric pollutants other than asbestos induce bronchogenic carcinomas; mesothelioma may not exist as a distinct entity. The association between asbestos and neoplasia needs reevaluation to halt the risk of assumption and to carefully reappraise the situation by all available methods.

ASBESTOS; ASBESTOSIS; CANCER; ENVIRONMENTAL CONTAMINATION; HUMAN; MESOTHELIOMA; NEOPLASMA; GASTROINTESTINAL; CO-CARCINOGEN; SMOKING
Recently there has been an increasing risk of lung cancer in persons occupationally exposed to asbestos. The latent period for most lung cancers is well in excess of 20 years. The use of effective dust controls in work areas has delayed death from asbestosis and mesothelioma but the latest figures indicate that more than 50% of persons with asbestosis will develop lung cancer. Since 1950, pleural and peritoneal mesotheliomas has been associated with asbestos exposure; in many patients who develop this rare tumor, the extent of exposure is insufficient to cause asbestosis.

**References**

| Reference | Title | Year |
|-----------|-------|------|
| Roe, F.J.C. | Experimental asbestos carcinogenesis | 1968 |
| Royal, R. | The health of the public and asbestos usage | 1968 |

December 1974
Peritoneal mesotheliomas are often indistinguishable from carcinomas of the peritoneum because of the similarity in tumor growth. One must establish an accurate history of past known asbestos exposure. Two cases of peritoneal mesothelioma are presented along with a review of 10 clinical cases. One case involves a 55-year-old man who had worked in a shipyard because of an increase in asbestos fibers in his lungs. The other case involves a 68-year-old man who had worked as a boilermaker for 36 years. Additional studies are needed to clarify the role of asbestos exposure in the development of peritoneal mesothelioma.

ASBESTOS; ASBESTOS BIODES; ASBESTOSIS; DIAGNOSIS; HUMAN; OCCUPATIONAL EXPOSURE; PERITONEUM; MESOTHELIOMA; INSULATION WORKERS

Stumpf, J.; Reever, P.B., Asbestos bodies and mesotheliomas, Am. J. Occup. Med., 11: 283-293 (1968).

Of the 21 cases of mesotheliomas reported in the Province of Zealand in the Netherlands during a three-year period, 17 cases occurred in former employees of the same shipyard. Only slight exposure to asbestos occurred to these workers but nearly all had an exposure to high concentrations of iron dioxide. Autopsy examinations of lung tissue revealed objects similar to asbestos bodies but no trace of asbestos. Electron diffraction showed that the body was a complex body, related to amphibole type, thus proving that they were not pseudomorphs. Simultaneous exposure to low concentrations of asbestos and high concentrations of iron oxide raised suspicion that iron oxide might be an important cofactor in the genesis of mesotheliomas in shipyard workers.

HUMAN; ASBESTOS; ASBESTOS BODIES; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; AMPHIBOLE; SHIPYARDS; CO-CARCINOGEN; CANCER; LUNG

Suzuki, Y.; Churg, J.; Smith, W.P., Phagocytosis of asbestos fibers by epithelial cells, Lab. Invest., 18: 335 (1968).

Hamster lungs were examined at various intervals after intratracheal injection of 1 mg of chrysotile. Phagocytosed fibers became located by aeration of alveolar macrophages and also within vacuoles of alveolar epithelial cells and were terminal bronchiolar cells. Asbestos fibers had little effect on the structure of bronchiolar cells in type A. However, type B cells tended to lose microvilli and other epithelial functions and develop lymphocytes.

ASBESTOS; CHERYSOTILE; HAMSTER; PHAGOCYTEOSIS; MACROPHAGE; LUNG

Tibbrell, V.; Gibbon, J.C.; Webster, L., BICC standard reference samples of asbestos, Int. J. Cancer, 7: 306-308 (1968).

Difficulties in interpreting and comparing biological effects of asbestos in animal and human lung tissue have necessitated preparation of standard reference samples of asbestos. These samples contain fibers up to 150-200 microns long. Homogeneity of samples can be assured by an intermediate mixing stage using a mechanical blender. Other uniformity suggested by the Committee on Asbestos and Cancer include preparation of samples, use of material, and distribution to various experimental laboratories.
The CALCIFICATIOWN of asbestos was first described by Viqliani, works. His study revealed higher than asbestos content in the lungs of asbestos workers compared to controls. In a subsequent study, many workers were exposed to asbestos dust, leading to increased calcifications in their lungs. The incidence of lung cancer among these workers was twice as high as that of the general population in Milan and Turin, and eight times higher than that of silicotic patients who died in the same period. Miners exposed only to chrysotile had the lowest incidence of lung tumors.

ASBESTOS; ASBESTOSIS; CANCER; CHRYSTOLITE; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; ASBESTOS MINING; INSULATION WORKERS; NEOPLASIA; HUMAN

Walton, R.; Skeoch, T., Diagnosis of asbestosis by needle lung biopsy, Thorax, 23: 556-562 (1968).

Seventy-six cases of asbestosis were verified by needle biopsy. A significant advantage in diagnosis has been made by use of the needle in lung biopsy; the technique enables precise histologic diagnosis. Detailed case histories are presented along with the advantages of the procedure.

HUMAN; ASBESTOSIS; DIAGNOSIS; INHALATION; OCCUPATIONAL EXPOSURE

Brouet, G.; Bignon, J.; Bonnard, G.; Godi, J.; Christie, J.; Pariente, R., Pleural calcifications associated with an asbestos colonia measured by examination of microscopica with the polarizing microscope, J. Pr. Med. Chir. Thorac., 21(2): 181-196 (1967).

Bilateral pleural calcifications were radiologically detected in two men. Both, aged 61 and 56, were asbestos workers. Routine histology was inconclusive; mineralogy with polarizing microscopy of visceral pleura and bronchial wall tissue specimens revealed translite asbestos and crystals. Because asbestos bodies in dust are nonspecific and variable, testicular methodology as described in both precise and specific for asbestos body detection in animal tissues.

ASBESTOS; OCCUPATIONAL EXPOSURE; PLEURAL CALCIFICATION; ASBESTOS BODIES; ANALYSIS; DIAGNOSIS; HUMAN

Collins, T.P.B., Asbestos-the lethal dust, S. Afr. Med. J., 41(26): 639-646 (1967).

The history of asbestos, its production and its various properties are discussed, along with the hazards of asbestos exposure in relation to health. Studies of occupational and non-occupational exposure and the resulting pathological conditions are reviewed.

ASBESTOS; AMPHIBOLE; CHROMIDIOLE; ANOSITE; TROHOLITE; ANTHOPHILLITE; ACTINOLITE; CHRYSTOLITE; ASBESTOS MINING; OCCUPATIONAL EXPOSURE; TEXTILE INDUSTRY; OCCUPATIONAL EXPOSURE; ASBESTOSIS; MESOTHELIOMA; FIBROSIS; CANCER; HUMAN

Cooper, W.C., Asbestos as a hazard to health, Arch. Environ. Health, 15: 285-289 (1967).

The world production of asbestos in 1965 was more than 3.5 million tons (50% consists of chrysotile). The increasing use and indispensability of asbestos requires the further contribution to the Rilan. The occurrence of asbestos dust in 25-50% of many urban populations indicates an urgent need to positively identify the causative fibers. Coefficients such as cigarette smoke, metal contaminants and oils in asbestos may act synergistically with asbestos in producing malignancies of the pleura and peritoneum.

ASBESTOS; FERRUGINOUS BODIES; CO-CARCINOGEN; TRACE METALS; SMOKING; ASBESTOS BODIES; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE; CANCER; HUMAN

Cralley, L.J.; Keenan, P.G.; Lynch, J.P., Exposure to metals in the manufacture of asbestos textile products, Am. Ind. Hyg. Assoc. J., 28(7): 452-461 (1967).

Asbestos textile workers in the past were exposed to airborne dust containing significant amounts of nickel, chromium, manganese and other metals, due to poor dust controls in the textile plants. In addition, the naturally occurring metal content of asbestos ore and fibers, the abrasive action of asbestos on metal equipment used for milling and the presence of the resultant asbestos product. Further study should determine the etiologic role of trace metals in pulmonary disease related to asbestos exposure.

OCCUPATIONAL EXPOSURE; ASBESTOS; TEXTILE INDUSTRY; TRACE METALS; HUMAN; RESPIRATORY DISEASE; CHRYSTOLITE; ASBESTOS MINING

Davis, J.N.G., The effects of chrysotile asbestos dust on lung macrophages maintained in organ culture, Brit. Exp. Pathol., 48(4): 379-385 (1967).

Small sections of adult guinea pig lung were injected with chrysotile dust and maintained in organ culture for 10 to 18 days. Dust was incorporated in phagosomes by some of the lung macrophages within two hours; dust was not found in any other cells. Usually, the dust was liberated into the macrophage cytoplasms due to phagosome rupture, or walled up in dense residual bodies. However, some of the macrophages eventually were converted to fibroblasts, with the dust remaining in the cytoplasm.

CHRYSTOLITE; ASBESTOS; MACROPHAGE; GUTNIA PIG; LUNG; ORGAN CULTURE

Delord, M.; Dunserre, P.; Michiels, R.; Portier, A., Pulmonary asbestosis and peritoneal mesothelioma, J. Pr. Med. Chir. Thorac., 21(6): 439-448 (1967).

A male pensioner who worked in an asbestos factory for 36 years died of typical peritoneal mesothelioma following a long history of asbestos pulmonary fibrosis. Paraneoplastic pseudomyelomatosis hematologic syndrome was present also.

ASBESTOS; OCCUPATIONAL EXPOSURE; FIBROSIS; MESOTHELIOMA; CANCER; PERITONEUM
Amosites and Asbestos with Silicosis. The occurrence of asbestosis in wild baboons, donkeys and rats near mining areas in South Africa supports evidence that asbestos pollution may be contributing to the declining quality of urban health near asbestos mines and factories.

Asbestos; Occupational Exposure; Environmental Contamination; Non-Occupational Exposure; Asbestos; Pleura; Mesothelioma; Human (c) 398

<004>
Graham, J.; Graham, R., Ovarian cancer and asbestos., Environ. Res., 1: 115-128 (1967).

Human ovarian cancer morphologically resembles mesotheliomas, and clinically has been reported in association with asbestos. To determine the effects of asbestos on ovaries, tremolite (2.5% in tap water) was injected intraperitoneally into Swiss mice (0.1 cc), hamsters (0.2 cc), guinea pigs (0.5 cc) and butch rabbits (1.0 cc). The injection was repeated once a week from week 10 through 18 of the experiment. No abnormalities were found in the hamsters, mice, or controls; in these species a peritoneum layer protects the ovaries from contact with asbestos. At weeks 7 and 17, 2 of 16 guinea pigs had developed ovarian epithelial abnormalities which were similar to those seen in early ovarian lesions in humans.

Asbestos; Mesothelioma; Asbestos; Guinea Pig; Rabbit; Mouse; Tremolite; Cancer; Human; Ovary (c) 398

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Gross, P.; Cralley, L.J.; De Travis, R.P., "Asbestos" bodies: their nonspecificity., Amer. Ind. Hyg. Assoc. J., 28(1): 461-462 (1967).

"Asbestos" bodies formed in the lungs of hamsters injected intratracheally with filamentous respirable particles of aluminum silicate. These bodies develop in the lung as a pulmonary response to foreign substances and, unless identified unequivocally, some confusion might exist by calling them asbestos bodies. The term "ferruginous body" is suggested for the iron-containing body which forms in response to nonasbestos dust in the lungs.

Asbestos Bodies; Hamster; Lung; Ferruginous Bodies (c) 398

Environmental Health Perspectives
Gross, P.; DeTreville, R.T.P., Experimental asbestosis: Studies on the Progressiveness of the pulmonary fibrosis caused by chrysotile dust., Arch. Environ. Health, 15: 618-649 (1967).

Guinea pigs, rats, and hamsters were exposed to various burdens of chrysotile dust by inhalation and by intratracheal injection. Asbestosis in rats is nonprogressive; asbestotic lesions heal in the absence of asbestos bodies and in the presence of chrysotile fibers which become entrapped in scar tissue. There was considerable reduction in the amount of dust in lung sections one year after exposure compared to directly after exposure. In hamsters, alveolar and progressive and/or not healable demonstrable amounts of asbestos dust in lung sections diffuse; distributed. In guinea pigs, the early asbestotic lesion is similar to that of rats but further study is needed.

RAT; HAMSTER; GUINEA PIG; INHALATION; PULMONARY FIBROSIS; CHRYSO Tile; ASBESTOS BODIES; ASBESTOSIS; LUNG

Gross, P.; DeTreville, R.T.P.; Tolker, E.B.; Kaschak, R.; Babyn, W.A., Experimental asbestosis: the development of lung cancer in rats with pulmonary deposits of chrysotile asbestos dust., Arch. Environ. Health, 15: 343-355 (1967).

One hundred thirty-one rats were exposed to finely milled chrysotile at air concentrations of 82 to 116 mg/cubic meter for 6 hrs. a day, 5 days a week, for a period of 62 weeks. Half of the rats also were exposed to sodium hydroxide (NaOH) to reduce lung clearance, thereby maximizing dust retention and pathogenesis. Primary malignant lung tumors developed in 31% of those surviving 16 months or more; tumor incidence in NaOH-treated rats was 78% -- twice as high as the progressive and/or not healable asbestosis. Cancer induction also may involve trace metals (nickel, chromium, cobalt) introduced by the hamster milling of asbestos.

ASBESTOSIS; PAT; CHRYSTOTILE; CARCINOMA; SARCOMA; ASBESTOS; CANCER; TUMOR; TRACE METALS; LUNG; CO-CANCER

Weilman, N., Status of air pollution health research, 1966., Arch. Environ. Health, 14: 488-503 (1967).

A brief historical review captures the potential and real health hazards of asbestos air pollution. Inhalation of asbestos poses serious health risks.

ASBESTOS; ENVIRONMENTAL CONTAMINATION; INHALATION

Holmes, A.; Morgan, A., Leaching of constituents of chrysotile asbestos in vivo., Nature, 215: 441-442 (1967).

Radioactive chrysotile fibers, suspended in physiologic saline, were injected intraperitoneally (3 mc) in two 3-month-old rats. Small amounts of the radionuclides (scandium, chromium, iron, and cobalt) were found in the feces and in all tissues. However, at 8 and 50 days after treatment, 50% of the radioactivity remained in the pleural cavity and lungs, indicating that translocation of asbestos fibers from the lung area is a slow process.

CHRYSTOTILE; TISSUE DISTRIBUTION; RAT; LUNG; PLURA

Jagatic, J.; Rubnitz, M.E.; Godwin, N.C.; Weiskopf, E.S., Tissue response to intraperitoneal asbestos with preliminary report of acute toxicity of heat-treated asbestos in mice., Arch. Environ. Res., 1: 217-220 (1967).

Mice injected intraperitoneally with chrysotile asbestos demonstrated an extensive fibrous tissue reaction which was proliferative, granulomatous, and invasive. Intraperitoneal injection of asbestos that was subjected to heat (1000°C for 3 hours) produced acute toxic reactions; death occurred in 26 of 56 mice within 36 hours, and 2 more died after 48 hours. Survivors recovered well and were alive 7 months later.

FIBROGENIC TISSUE RESPONSE; ASBESTOS; MOUSE; FIBROSIS; MESOTHELIONA; Pleura; PNEUMOCONIOSIS; CHRYSTOTILE

Kennedy, M.C.S.; Routledge, R., Investigation of a minor asbestos hazard., Brit. J. Ind. Med., 24: 232-239 (1967).

Examination of 12 workers who experienced minimal asbestos exposure included: occupational history; symptomatology; clinical examination; and physiological tests (spirometry). Out of 10 transformer workers who used asbestos, two showed minor radiological and physiological pulmonary changes correlated with early asbestosis. Two insulation workers who engaged in wooling and grinding asbestos shing (5 and 23 years exposure) showed similar but more progressive signs and symptoms due to higher asbestos exposure levels.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; DIAGNOSIS; INSULATION WORKERS; RESPIRATORY DISEASE; HUMAN

Lieben, J.; Pistiakos, H., Mesotheliona and asbestos exposure., Arch. Environ. Health, 14: 559-563 (1967).

Retrospective histories were recorded for 82 cases of mesothelioma to correlate the malignancy with exposure to asbestos. Ten patients worked in asbestos plants, 8 lived or worked close to asbestos plants, 3 were family members of asbestos workers. Asbestos exposure was affirmed in an additional 10 cases, and the remaining 11 had no history of asbestos exposure.

MESOTHELIONA; ASBESTOS; PLEURA; PNEUMOCONIOSIS; ASBESTOS BODIES; LUNG; CANCER; OCCUPATIONAL EXPOSURE; HUMAN

MacNab, G.; Harington, J.S., Haemolsytic activity of asbestos and other mineral dusts., Nature, 218: 523-23 (1967).

Significant haemolysitic activity in washed sheep RBCs was found for: (1) chrysotile; (2) serpentine, crystalline and amorphous silica; (3) millic acid powder and (4) silica gel. Asbestos, anthophyllite, and crocidolite gave negative results.

ASBESTOS; HEMOLYSIS; CHRYSTOTILE; ANORTHYTE; ANTHOPHYLLITE; CROCIDOLITE; CELLCULTURE

December 1974 399
Asbestos is the generic name for varieties of fibrous mineral silicate consisting mainly of crocidolite, amosite, chrysotile, and anthophyllite. The resistance of asbestos to heat, friction, and acid combined with its tensile strength and flexibility have made it useful in more than 1000 applications. World consumption is more than 1 million tons per year; chrysotile, a magnesium silicate, comprises 4% of the output. Approximately 25% of the asbestos produced is used in cement products. High incidences of health disorders such as asbestosis, bronchial carcinoma, mesothelioma, and gastric tumors occur among exposed workers, particularly in asbestos mining, milling, textile, cement, insulation and lagging occupations. However, occupational hazards can be minimized by engineering methods of dust control, continual monitoring of dust concentrations in work areas, and strict codes of practice for the workers. Domestic exposure to dust on the clothes of relatives in asbestos occupations, and residential exposure in areas near factories and mines also cause asbestos related diseases.

NOMOTHILEMA; ASBESTOS; CROCIDOLITE; AMOSITE; ANTHOPHYLLITE; OCCUPATIONAL EXPOSURE; TUMOR; ASBESTOSIS; CARCINOMA

Norwood, W.D.; Furgus, P.A., Asbestos—an environmental health hazard., Northwest Med., 66(9): 821-828 (1967).

Both occupational and non-occupational asbestos exposure has been found to be more hazardous as multiple adverse biological effects are being recognized. Diseases and biological effects recognized of the fibrositae, asbestosis, chronic pneumonitis, emphysema, chronic pneumonitis, pleural plaques, parenchymal, carcinoma of the lung, diffuse mesothelial tumors of the pleura and peritoneum, gastroesophageal tumors and possibly, ovarian tumors. The latent period between last asbestos exposure and disease signs and symptoms may extend 30 to 40 years. Four selected cases noodles demonstrate asbestosis with pulmonary emphysema and parenchymal, asbestosis with lung cancer, mesothelioma, and rectal carcinoma in workers exposed to asbestos.

ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; ENVIRONMENTAL CONTAMINATION; HUMAN; MESOTHILEMA; OCCUPATIONAL EXPOSURE; GASTROINTESTINAL

Pennarola, P.; Elmeo, V., Cytologic morphology of the spumus in asbestosis of the lung., Polia Medica, 50(1): 1-12 (1967).

Sputum from 30 asbestos patients was examined using the Papanicolaou and Sirtori techniques. Asbestos particles were found along with cell metaplasia and changes in nuclear structure with diomorphic trace.

ASBESTOS; ASBESTOSIS; CANCER; HUMAN

Sputum was removed from 30 asbestos patients and examined using the Papanicolaou and Sirtori techniques. Asbestos particles were found along with cell metaplasia and changes in nuclear structure with diomorphic trace.

ASBESTOS; ASBESTOSIS; CANCER; HUMAN

Newhouse, J.L., The medical risks of exposure to asbestos., Practitioner, 199: 285-293 (1967).

ASBESTOS; ASBESTOSIS; CANCER; HUMAN

Sputum was removed from 30 asbestos patients and examined using the Papanicolaou and Sirtori techniques. Asbestos particles were found along with cell metaplasia and changes in nuclear structure with diomorphic trace.

ASBESTOS; ASBESTOSIS; CANCER; HUMAN

Roberts, G.M., Asbestos bodies in lungs at necropsy., J. Clin. Pathol., 20: 570-573 (1967).

The incidence of asbestos bodies in 100 consecutive adult necropsies was investigated in Glasgow, Scotland, near an industrial shipbuilding area. Asbestos bodies were found in 23% of 62 males, and none of 38 females. Among cases showing asbestos bodies, 11 had hyaline pleural plaques, 9 had asbestosis and 3 had bronchial carcinoma. The occupational histories were not known.

ASBESTOS BODIES; PLURAL PLAQUES; SHIPYARDS; ASBESTOSIS; CARCINOMA; HUMAN; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

Poe, F.J.C.; Carter, B.L.; Walters, N.A.; Warington, J.J., The pathological effects of subcutaneous injections of asbestos fibres in mice: migration of fibres to submesothelial tissues and induction of mesothelioma., Int. J. Cancer, 2: 626-636 (1967).

Asbestos, when injected subcutaneously in female mice, is widely but small quantities inhaled and accumulates in serosal membranes of the thorax and abdomen. The resultant presence of asbestos evokes a varied and vigorous cellular response, sometimes leading to mesotheliomas. These observations are equally applicable to amosite, crocidolite, and chrysotile—all three induced in injection-site tumors and distant mesothelial changes. Removal of mineral oils from asbestos may reduce carcinogenicity.

MOUSE; ASBESTOS; MESOTHILEMA; CROCIDOLITE; AMOSITE; CHRYSTOTILE; TUMOR; CANCER

Selikoff, I.J.; Bader, W.A.; Bader, W.F.; Churg, J.; Hammond, E.C., Asbestosis and neoplasia., Lancet, 2: 487-489 (1967).

This editorial broadly outlines some of the present and future problems of an industrialized society which heavily depends on asbestos; emphasizes the increased probability of asbestosis becoming a greater hazard. Because of the long latent period between initial asbestos exposure and related disease manifestation (3 yrs.) it is difficult to assess the significance of asbestos contaminated air; the effects of current environmental releases of asbestos may not manifest in the general population until the 1980's. The incidence of asbestos-induced lung cancer may equal cigarette-induced cancer in the next few decades.

ASBESTOSIS; ASBESTOS BODIES; PNEUMONEOPLASIA; ENVIRONMENTAL CONTAMINATION; CANCER; INHALATION; HUMAN

Wells, B.; Boettner, F.A., Commercial talc and talcosis., Arch. Environ. Health, 14: 300-308 (1967).

Talcosis, a pneumoconiosis found in some talc miners and in workers in related industries, is probably caused by tremolite present in the talc. Of the two types of talc deposits most economically important, the type formed from carbonate rocks and containing talc, tremolite and often anthophyllite presents the greater industrial hazard.

PNEUMONEOPLASIA; TREMOLITE; OCCUPATIONAL EXPOSURE; ANTHOPHYLLITE; FIBROSIS
In rural Pulba, fluorographic examination of 1,325 people living within 10 km of an asbestos mine revealed 15% cases of pleural asbestososis; 132 had no occupational contact with asbestos (66 men and 66 women). The majority (71.6%) were agricultural workers over 50 years of age, working in tobacco production. The cultivation of tobacco in stony ground is thought to be a contributing factor since the soil contains asbestos minerals.

**ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE**

Adamsley, C.G., Asbestos dust and its measurement, Ann. Occup. Hyg., 9: 73-82 (1966).

Asbestos dust characteristics and the requirements for detection are examined. Various methods and instruments for sampling and monitoring air in areas of asbestos dust exposure are delineated. A tyndallometric instrument has been developed in conjunction with a membrane filter apparatus for asbestos dust monitoring with excellent correlation between the two.

**ASBESTOS; ENVIRONMENTAL SAMPLING; ANALYSIS; DUST CONTROLS**

Blount, M.; Holt, P.F.; Leach, A.A., The protein coating of asbestos bodies, Biochem. J., 101: 208-207 (1966).

Amino acid analysis of asbestos bodies shows that they are not asbestos fibers coated with collagen deposited by fibroblasts: (1) hydroproline, glycine, leucine and phenylalanine contents are too low for collagen to be the main protein in the coating, (2) based on the hydroxyproline content, collagen could represent no more than 7% of the protein. The protein composition resembled that of general lung protein, supporting evidence that the coating is formed from the cytoplasm of an alveolar macrophage by the adsorption of a prefibrous iron-protein complex (ferritin) or by the separate adsorption of iron and protein.

**ASBESTOS BODIES; LUNG; ASBESTOS; PHAGOCYTOSIS; HUMAN**

Holt, P.F.; Mills, J.; Young, D.K., Experimental asbestososis in the guinea-pig. J. Pathol. Bacteriol., 92: 185-195 (1965).

Guinea pigs were placed in isolation chambers and dosed with four varieties of asbestos dust. Chrysotile asbestos dust (very fine particles) induced well-developed bronchiolitis after a few days, even when dust and fibers were absent from the lungs (microscopic inspection). Phagocytic cells were evident. After 10 weeks cell degeneration and fibrosis occurred along with polyoid growths in bronchioles. Later, asbestos bodies were numerous. Crocidolite, amosite, and anthophyllite produced similar lung damage.

**ASBESTOSIS; FIBROSIS; ASBESTOS; CHRYSTOTILE; ANTHOPHYLLITE; AMOSITE; CROCIDOLITE; ASBESTOS BODIES; GUINEA PIG**

Keane, W.T.; Zavon, M.R., Occupational hazards of pipe insulators., Arch. Environ. Health, 13: 171-184 (1966).

An evaluation of the substances handled by pipe insulation workers suggests that asbestos-containing materials present the most serious health hazards; the majority of substances were of minor concern as occupational hazards. Additional scientific data are needed to adequately define the health hazards of insulation occupations.

**ASBESTOS; OCCUPATIONAL EXPOSURE; INSULATION WORKERS; HUMAN**

Kleinfeld, M.J.; Nessite, J.; Shaprio, J., Clinical, radiological, and physiological findings in asbestosis., Arch. Intern. Med., 117: 813-819 (1966).

Clinical, electrocardiographic, and physiological observations were polytomography made during a length of exposure was 29.2 years and who showed asbestosis radiologically. Most had chronic symptoms indicative of long term exposure. When 16/21 of these persons were compared to a group of 20 with similar age and asbestos exposure but with negative radiological signs, no significant differences in the clinical findings were observed between the two groups; however, the group with positive radiological signs had lower vital capacity, total lung capacity, and diffusion capacity than the other group. Electrocardiographic findings were unremarkable.

**ASBESTOSIS; ASBESTOS; VENTILATORY DEFECTS; OCCUPATIONAL EXPOSURE; X-RAY; ELECTROCARDIOGRAPH; DIAGNOSIS**

Kogan, F.M.; Porinovskaya, A.P., Effect of asbestos and serpentine dusts on pulmonary tissue culture, Hyg. Sanit., 31(1,2,3): 37-81 (1966).

Serpentine and asbestos dust inhibited growth and migration of embryonic lung cells in culture, with asbestos dust having the more pronounced effect. The early stages of mitosis were inhibited to a greater extent by asbestos dust than by serpentine dust. While serpentine is less active than asbestos, it is not biologically inert and should be considered when present.

**ASBESTOS; CELL CULTURE; CYTOTOXICITY**

Lynch, J.R.; Ayer, H.R., Measurement of dust exposures in the asbestos textile industry., Amer. Ind. Hyg. Assoc. J., 27(1): 831-837 (1966).

In data obtained from environmental surveys of nine asbestos mills, a basic dust count is presented for the textile segment of the U.S. Public Health Service epidemiological study of asbestos processing industries. Variance ratio tests of different systems of dust measurement indicate that most variance is due to population variance and that none of the methods of counting exhibit any significant superiority in terms of lessened variance. Hygienic criteria should be relevant to the disease-producing mechanism; that, counts based on 'grains' should not dominate criteria which relate to the pathogenesis of 'fibers'.

**ASBESTOS; STANDARDS; OCCUPATIONAL EXPOSURE; HEALTH CRITERIA; TEXTILE INDUSTRY**
Mann, R.H.; Grosh, J.L.; O'Donnell, W.H., Mesothelioma associated with asbestosis., Cancer, 19 (1): 521-526 (1966).

Clinical observations of 54 asbestosis patients link occupational asbestos exposure to pleural and peritoneal mesotheliomas. In 2 of 3 mesothelioma cases, there was definite history of exposure to asbestos textile dusts for 20 and 34 years. The remaining patient had no known history of occupational exposure. The recent demonstration of asbestos bodies in the lungs of urban dwellers may have significant implications for cancer epidemiology in the future.

ASBESTOS; OCCUPATIONAL EXPOSURE; INHALATION; CANCER; MESOTHELIOMA; HUMAN; ASBESTOSIS; ASBESTOS BODIES; NON-OCCUPATIONAL EXPOSURE; TEXTILE INDUSTRY

O'Donnell, W.H.; Mann, R.H.; Grosh, J.L., Asbestos, an extrinsic factor in the pathogenesis of bronchogenic carcinomas and mesotheliomas., Cancer, 19 (8): 1143-1146 (1966).

In a clinical study of 54 asbestos textile workers with pathologically proven asbestosis, 28 malignant neoplasms are reported - 23 bronchogenic carcinomas and 5 mesotheliomas (pleural and peritoneal); 6/28 were exposed to asbestos prior to 1936. The interval between neoplasms diagnosis and initial exposure ranged from 20-40 years. The frequent association of pulmonary asbestos with bronchogenic carcinoma (42%) and mesothelioma (8%) implicates asbestos as a carcinogenic agent.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; CARCINOMA; MESOTHELIOMA; NEOPLASM; CANCER; PLEURA; PNEUMONIA; TEXTILE INDUSTRY; HUMAN

Poole, P.J.C.; Walters, M.A.; Harlington, J.S., Tumor initiation by natural and contaminating asbestos oils., Int. J. Cancer, 1: 491-495 (1966).

Topical applications of both croton and crocidolite oils on the denuded skin of rabbits initiated a significant tumor response when compared to control animals treated only with croton oil. Mice treated with asbestos and croton oils developed a high incidence of carcinoma. Though the asbestos oils induce weak tumor response compared to other agents, it is possible that both oils could play a significant role in cancer induction by asbestos.

ASBESTOS; CANCER; CARCINOMA; TUMOR; RABBIT; MOUSE

Smither, W.J., Asbestos, asbestosis and mesothelioma of the pleura., Proc. Roy. Soc. Med., 59: 57-59 (1966).

Asbestos is a general term describing several forms of fibrous minerals. Chrysotile is found in many areas of the world but is mined mostly in Russia, Canada, and Rhodesia. The chemical constituents and structure of the fibers differ for the various types. There are many varied uses for asbestos minerals. Although the history of asbestos is 6000 years old, the first case of asbestosis was not reported until 1907. A great rise in the production and use of asbestos has been accompanied by an increased incidence of asbestos-related disease.

ASBESTOS; ASBESTOSIS; MESOTHELIOMA; CHRYSOTILE; WHITE ASPHOS; CROCIDOLITE; BLUE ASPHOS; AMOSITE; ANTHROPHYLITE
Anonymous, The association of exposure to asbestos dust and cancer. A report from a working group of the International Union Against Cancer., Ann. Occup. Hyg., 8: 267-276 (1965).

Asbestos, anthophyllite, crocidolite, and tremolite are the asbestos minerals of interest to a working group of the Geographical Pathology Committee of the I.U.C.C. The tumors associated with exposure to asbestos are lung carcinomas, diffuse pleural and peritoneal mesotheliomas and possibly gastrointestinal carcinomas and ovarian tumors. A latent period of 20 years or more may occur; occupational and non-occupational onset of tumors. Trace amounts of metals such as nickel and chromium are found in some asbestos fibers; the role of these metals in the development of tumors is unclear.

Recommendations by the Committee relate to (1) dose-effect relationships; (2) epidemiological methods including surveys, clinical criteria, classification of chest radiographs, and lung function assessment; (3) histological pathological involvement of the diseases associated with asbestosis and the classification of asbestosis; (4) preparation of standard reference samples; and (5) identification of asbestos in tissues.

STANDARDS: OCCUPATIONAL EXPOSURE; ASBESTOS; CANCER; ANTIMONITE; ANTHOPHYLITTE; CRYSTALLITE; CROCIDOLITE; TROMOLITE; CARCINOMA; LUNG; MESOTHELIOMA; HUMAN

Anonymous, Asbestosis and malignant disease., New Engl. J. Med., 272 (11): 592-91 (1965).

Accumulating evidence indicates a demonstrable rise of bronchogenic carcinoma and pleural mesothelioma in workers exposed to asbestos. Most mesotheliomas have been associated with crocidolite and chrysotile inhalation. In instances of asbestos dust similar to cigarette smoking or inhalation of other dusts, industrial pollutants or trace metals associated with asbestos, although the production and use of asbestos in large and widespread, certain asbestos industries can minimize occupational health hazards by engineering dust controls.

ASBESTOSIS; CARCINOMA; MESOTHELIOMA; ASBESTOS; GASTROINTESTINAL; CANCER; CROCIDOLITE; CRYSTALLITE; ANTIMONITE; LUNG; HUMAN; OCCUPATIONAL EXPOSURE

Bader, W.F.; Bader, M.A.; Tierstein, A.S.; Selikoff, T.J., Pulmonary function in asbestosis: Serial tests in a long-term prospective study., Ann. N.Y. Acad. Sci., 132 (2): 391-405 (1965).

Serial observations of pulmonary function as related to clinical and radiological features were conducted on 17 asbestos workers who were exposed for 4-24 years, and subsequently were withdrawn from further exposure after developing alveolar capillary block syndrome. Initial investigations showed moderately reduced vital capacity in 1/2 of the patients, slightly increased residual volume in 6, hyperventilation at rest and exercise in the majority, well preserved maximum breathing capacity and normal ventilation-perfusion relationships in all cases. In a 10-yr follow-up study in 13 of the workers, vital capacity was the most sensitive index of progressive changes in the disease; in half of the cases, reduced vital capacity correlated well with radiological changes, whereas in the rest, vital capacity was reduced in the absence of progressing radiological signs. Arterial carbon dioxide tension and pH remained unchanged, and changes in arterial oxygen saturation followed no significant trend.

ASBESTOS; ASBESTOSIS; DIAGNOSIS; HUMAN; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS

Bohlig, H., Radiological classification of pleuropulmonary asbestosis., Ann. N.Y. Acad. Sci., 132 (1): 338-350 (1965).

Because of national differences in compensation rules for asbestosis, only a radiological classification is practical for international agreement. If expert agrees that radiological signs of pathological lung structures can be manifested only as disseminated or squared opacities, these two diagnoses: asbestosis, and pleural mesothelioma. A and B are used for beginning confluence and by "C" for opacities having a diameter larger than 6 cm. Additional symbols would be welcomed to accommodate international peculiarities.

ASBESTOSIS; DIAGNOSIS; HUMAN; X-RAY

Brown, P.; Cartwright, B.; Newman, J.P.E., Inhibition of virus growth by a toxic factor from asbestos pad and cellulose acetate membrane filters., Nature, 205: 370-371 (1965).

Filtration of either phosphate-low or Eagle's medium through a Salts or Ford's asbestos pad results in a considerable reduction of virus yield in both pig and hamster kidney cells that are grown in the medium. It has been established that the reductions were due to a toxic factor. However, the nature of the toxic factor or factors has not been examined.

ASBESTOS; ASBESTOS FILTRATS; CELL CULTURE; CYTOTOXICITY

Buchanan, W.D., Asbestosis and primary intrathoracic neoplasms., Ann. N.Y. Acad. Sci., 132: 407-418 (1965).

In Great Britain, there is a greater risk of dying from intrathoracic tumor in patients with asbestosis. From 1924 through 1943, 684 (392 males and 192 females) certified deaths involved asbestosis; the incidence of thoracic tumor continues to increase disproportionately with the total number of asbestos cases. Currently over 40% of males dying with asbestosis have a neoplasm. Data on the mean age at death from asbestosis over various periods of time indicate an improving prognosis for uncomplicated asbestosis but no significant improvement for cases complicated by cancer.

ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; HUMAN; LUNG; MESOTHELIOMA; NEOPLASM; TUMOR

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Caplan, A.; Gilson, J.C.; Hinson, K.F.W.; McVittie, J.C.; Wagner, J.C., Jr. A preliminary study of observer variation in the classification of radiographs of asbestos-exposed workers and the relation of pathology and x-ray appearances., Ann. N.Y. Acad. Sci., 132(1): 379-386 (1965).

The exchange of radiographic data between the United Kingdom and South Africa has established the workability of the proposed I.L.C. (International Labor Office) Classification for asbestosis; however, if widely used, a standard set of films should be made available demonstrating the various pathological changes.

ASBESTOS; ASBESTOSIS

Casula, D.; Totten, P.S.; Gross, P., Asbestos bodies in human lungs at autopsy., J. Amer. Med. Assoc., 192(5): 371-373 (1965).

The incidence of asbestos bodies in the lungs of 100 autopsies from Pittsburgh and its environs was 4%. Among men, the incidence of positive cases was higher (47%) than in women (39%). The highest relative incidence of positive cases was found in ages between 2% to 30 years; none were found up to age 20. Interstitial fibrosis was observed in three cases, but no case of asbestosis or mesothelioma was found. Out of two cases of lung carcinoma observed, asbestos bodies were present in only one.

ASBESTOS; ASBESTOSIS; ASBESTOS BODIES; CARCINOMA; FIBROSIS; HUMAN; ENVIRONMENTAL CONTAMINATION;
LUNG; MESOTHELIOMA; PLEURA

Churg, J.; Rosen, S.M.; Woolten, S., Histological characteristics of mesothelioma associated with asbestos., Ann. N.Y. Acad. Sci., 131(1): 616-622 (1965).

The histological and cytological features of 30 cases of mesothelioma (13 pleural and 17 peritoneal) were similar, with all conforming to the acceptable criteria for this type of tumor. Two types of tumor cells were observed: epithelial-like and mesenchymal. The histological patterns—papillary, tubular, tubulopapillary, solid nodular, and sheet-like—are determined by the distribution of epithelial-like cells. In the majority of the cases several patterns co-exist.

ASBESTOS; DIAGNOSIS; MESOTHELIOMA; PERITONEUM;
PLEURA; HUMAN; TUMOR; CANCER

Davis, J.M.G., Electron-microscope studies of asbestos in man and animals., Ann. N.Y. Acad. Sci., 132(1): 98-111 (1965).

The importance of very small particles of asbestos dust in the pathogenesis of asbestosis cannot be ignored, since the bulk of the dust observed in both human and guinea pig lungs is very small, much of it below 1um in length. Electron microscopic studies show that asbestos is basically an intracellular process directly involving only alveolar macrophages and their derivatives. If exposure is continuous, there will always be free dust in the alveoli, but results from animal experiments indicate that all dust will be phagocytosed within a few weeks after the cessation of dusting. This may be true in humans as well. Although all sizes of fiber can be coated, some particles remain in the lungs for long periods without becoming coated. In both human and guinea pig lung the asbestos body coating consisted of ferritin granules approximately 60 A in diameter.

ASBESTOS; ASBESTOS BODIES; ASBESTOSIS; CHRYSTOTILE; GIANT CELL; GUINEA PIG; HUMAN; MACROPHAGE

Dunn, F.R.; Carney, J.D., Asbestosis and pulmonary carcinoma., Arch. Environ. Health, 10(3): 416-423 (1965).

Asbestos often is not properly diagnosed because occupational exposure to asbestos is not established, and x-ray may not be diagnostic. Recently, the relationship between asbestosis and bronchogenic carcinoma has become more evident: this is based on the following observations: (1) approximately 13.8% of patients with asbestosis develop squamous cell carcinoma of the lung, and (2) the cancer is usually in one of the lower lobes where the number of asbestos fibers is greatest. Pleural mesothelioma is also observed in patients with asbestosis. Pathological, clinical and roentgenologic findings of asbestosis are discussed.

ASBESTOS; ASBESTOSIS; CARCINOMA; HUMAN; LUNG; MESOTHELIOMA; X-RAY

Elmes, R.B., Benson asbestosis pleurisy.,., J. Amer. Med. Assoc., 192(5): 819-821 (1965).

Benign asbestos pleurisy, unlike classical asbestosis, can occur in the absence of significant pulmonary disease and respiratory dysfunction, and due to its self-limiting character, it requires only symptomatic therapy. However, if pleurisy is prolonged, a pleurectomy is recommended to prevent malignancy. Any differential diagnosis of asbestos pleurisy must exclude tuberculosis and other pathological entities with similar clinical characteristics. A history of exposure to asbestos is diagnostically significant, but the final diagnosis is determined by presence of asbestos bodies in the lung. Your cases of benign pleurisy are presented; two cases involve malignant mesotheliomas.

ASBESTOS; PLEURITIS; HUMAN; ASBESTOS BODIES; DIAGNOSIS

Elnem, P.C.; McCaughhey, W.T.E.; Wade, O.L., Diffuse mesotheliomas of the pleura and asbestos., Brit. Med. J., 1(5831): 350-353 (1965).

Occupational exposure to asbestos was established in 31 of 42 cases of pleural mesothelioma in Belfast. The duration of exposure varied from 3 to 56 years and the interval between initial exposure and diagnosis of mesothelioma varied from 22 to 73 years. Asbestos bodies were found at necropsy in the lungs of 81 men aged 50 to 69 who died of diseases other than carcinoma or mesothelioma and in 28% of patients with carcinoma of the lung. They were found in more than 80% of men with mesothelioma. In three-quarters of these cases, occupational exposure to asbestos was confirmed.

ASBESTOS; CARCINOMA; HUMAN; LUNG; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; PLEURA
Eames, P.C.; Wade, O.L., Relationship between exposure to asbestos and pleural malignancy in Belfast., Ann. N.Y. Acad. Sci., 132(1): 549-557 (1965).

An association between mesothelioma and asbestos is established in 45 cases of pleural mesothelioma detected in Belfast. Three-fourths of the subjects studied had a history of asbestos exposure and asbestos bodies in the lung. Evidence indicates that a quarter of the male and a smaller proportion of the female population may have been exposed to asbestos concentrations sufficient to induce mesothelioma; asbestos exposure necessary to induce this tumor is not severe or prolonged. Among asbestos workers carcinoma of the lung is as frequent a cause of death as mesothelioma.

ASBESTOS; HUMAN; MESOTHELIONA; TUMOR; OCCUPATIONAL EXPOSURE; ASBESTOS BODIES

Enterline, P.R., Mortality among asbestos products workers in the United States., Ann. N.Y. Acad. Sci., 132(1): 156-165 (1965).

The mortality rate from all causes of death among 2,873 white men who worked in the asbestos industry during the period 1936-1948 was about 12% higher than that of the U.S. white male population, and contrasts sharply with the mortality rate in the cotton textile industry. The excess deaths among asbestos workers is significantly high for respiratory cancer, hypertensive heart disease, and diseases of the respiratory system. Death attributed to gastrointestinal cancer is not statistically significant. For all causes, the Standardized Mortality Ratios (SMR's) trend to rise with time. Including death due to cancer and asbestosis, SMR's for both asbestos and cotton textile workers are quite similar.

ASBESTOS; ASBESTOSIS; CANCER; CANCER MORTALITY; GASTROINTESTINAL; RESPIRATORY DISEASE; HUMAN; OCCUPATIONAL EXPOSURE; HUMAN

Giles, J.C., Problems and perspectives: the changing hazards of exposure to asbestos., Ann. N.Y. Acad. Sci., 132(1): 606-705 (1965).

The biological hazards associated with exposure to asbestos are reviewed. Some of the unsolved problems related to asbestos exposure are: (a) Is the type of fiber associated with specific risk? (b) Is there an excess risk of bronchial carcinoma in the absence of asbestosis? and (c) Is there a detectable stage of asbestosis at which progression ceases after removal from dust? Solutions to these questions require international agreement on techniques for diagnosing asbestosis and on the type of dust measurements used to monitor asbestos dust levels. Subsequently, progress can be made in the systematic prospective study of asbestos workers.

ASBESTOS; ASBESTOSIS; CARCINOMA; HUMAN; MESOTHELIONA; TUMOR; DIAGNOSIS; DUST CONTROLS

Gough, J., Differential diagnosis in the pathology of asbestosis., Ann. N.Y. Acad. Sci., 132(1): 368-372 (1965).

Asbestosis is diagnosed histologically by the association of asbestos bodies and asbestos fibers with fibrosis. The two anatomical forms are diffuse and solid fibrosis. Diffuse fibrosis leads to honeycomb (cystic) lung. However, fibrosis alone is not diagnostic because histologically it is similar to other diseases. Differential diagnosis is made between asbestosis and forms of honeycomb lung or fibrosis caused by other silicates. Neumdsediosis of elastic tissues (elastin bodies) may stain asbestos bodies. An association between rheumatoid disease and asbestosis has been documented in 2 cases.

ASBESTOS; ASBESTOSIS; DIAGNOSIS; FIBROSIS; HEPATOMESOTHELIONA; HUMAN; SILICOSIS

Hardy, H.L., Asbestos related disease., Amer. J. Med. Sci., 250(4): 381-389 (1965).

The potential hazards associated with occupational and non-occupational exposure to asbestos are well documented. Because health effects of asbestos are often delayed, a significant incidence of pulmonary disease, especially chest tumors, will be observed in the future. In addition new evidence indicates an association between abdominal tumors and asbestos. Four cases of asbestos related disease are presented.

ASBESTOS; OCCUPATIONAL EXPOSURE; HUMAN; RESPIRATORY DISEASE; TUMOR; CANCER; GASTROINTESTINAL; LUNG; NON-OCCUPATIONAL EXPOSURE

Harington, J.S., Chemical studies of asbestos., Ann. N.Y. Acad. Sci., 132: 31-47 (1965).

Extraction of finely milled crocidolite and amosite with different solvents yielded up to 0.3% of oils, waxes and other extractable materials. Evidence at present indicates that oils may become associated with asbestos naturally or by contamination during industrial mixing or milling processes. Up to 80% of the jute oil in jute bags used for storing asbestos may be absorbed by asbestos fibers. The etiologic significance of polycyclic hydrocarbons, metals and oils in asbestos is presently unknown. However, there is a possibility that iron, nickel and chromium constitutes contribute to the carcinogenicity of asbestos.

ANALYSIS; AMosite; ASBESTOS; CHROMITILE; CROCIDOLITE; TRACE METALS; CO-CARCINOGEN

Harington, J.S.; Poe, P.J.C., Studies of carcinogenesis of asbestos fibers and their natural oils., Ann. N.Y. Acad. Sci., 132(1): 439-450 (1965).

The possible role the metals or metal complexes and oils (primary and secondary oils) found in asbestos may play in the carcinogenic process are discussed, along with possible mechanisms of carcinogenesis and experimental methods of eliciting them. It is unlikely that asbestos carcinogenesis is an example of the Oppenheimer Effect.

AMosite; ASBESTOS; CANCER; CHROMITILE; CROCIDOLITE; MESOTHELIONA; TUMOR; TRACE METALS; CO-CARCINOGEN
Hendry, W. H., The geology, occurrences, and major uses of asbestos., Ann. W. Y. Acad. Sci., 132(1): 72-22 (1965).

Asbestos is a term embracing a number of fibrous mineral silicates that differ chemically and physically. They may be divided in two mineral groups: (1) pyroxenes--chrysotile, (2) amphiboles--crocidolite, amosite, tremolite, actinolite, and anthophyllite. The geology, occurrences, and major uses of asbestos are discussed.

ACTINOLITE; AMPHIBOLE; AMOSITE; ANTHOPHYLLITE; ASBESTOS; CHRYSOTILE; CROCIDOLITE; USE

Mills, D.W., Economics of dust control., Ann. W. Y. Acad. Sci., 132(1): 322-334 (1965).

The hazard of asbestos dust, current methods of dust control and the cost of dust control are discussed in detail. A brief historical description is given of dust conditions existing in the British asbestos textile industry in the 1920's.

ASBESTOS; DUST CONTROLS; STANDARDS; OCCUPATIONAL EXPOSURE

Holmes, S., Developments in dust sampling and counting techniques in the asbestos industry., Ann. W. Y. Acad. Sci., 132(1): 288-297 (1965).

The Membrane Filter Technique possesses certain advantages over previous dust sampling systems including the Thermal Precipitator Method and the Long Running Thermal Precipitator Method. The latter techniques operate on the principal of passing laden air past the slide or cover slip where the sample is collected. The advantages of the filter technique are: pore size adequate for trapping asbestos fibers in the length range of 5-100 μ; higher sampling rates; the sampling head is small enough to enable its incorporation in a personal sampler that can be carried by the operative to enable more representative assessment of the true hazards and exposure levels. A detailed description of the Membrane Filter Technique is presented.

ASBESTOS; DUST CONTROLS; ENVIRONMENTAL SAMPLING

Holt, P.P.; Mills, J.; Young, D.K., Experimental asbestosis with four types of fibers: Importance of small particles., Ann. W. Y. Acad. Sci., 132(1): 87-97 (1965).

Asbestosis is induced in the lungs of guinea pigs by the inhalation of chrysotile, amosite, crocidolite, or anthophyllite dust. In the later stages of the disease, there is an extension of the inflammatory reaction from the bronchioles into the surrounding lung, with progressive fibrosis of the lung, adenoid proliferation of the bronchial epithelium, and reticulonodular fibrosis of the tracheal lymph glands. Asbestos bodies are recognizable within seven days of exposure. These findings lead to the conclusion that dust particles are at least as lethal as long fibers.

AMOSITE; ANTHOPHYLLITE; ASBESTOS; ASBESTOS BODIES; ASBESTOSIS; CHRYSOTILE; CROCIDOLITE; FIBROSIS; GUINEA PIG; LUNG

Roepke, W.C., Occupational and non-occupational exposures to asbestos., Ann. W. Y. Acad. Sci., 132(1): 189-195 (1965).

Increased production and use of asbestos in the last 50 years has resulted in greater individual exposure of workers to asbestos. Asbestos-related cancers among various asbestos occupations in many countries. Epidemiological data concerning the incidence of these diseases is sketchy, particularly in the United States and Canada. Better legal protection through more uniform compensation laws is needed for asbestos workers internationally.

ASBESTOS; ASBESTOSIS; HUMAN; OCCUPATIONAL EXPOSURE; CANCER

Hunt, R., Routine lung function studies on 830 employees in an asbestos processing factory., Ann. W. Y. Acad. Sci., 132(1): 406-420 (1965).

Lung function studies are valuable for screening potential employees and for assessing the health of occupationally exposed asbestos workers. Asbestosis can be detected by lung function studies before the appearance of gross changes which are necessary for x-ray and/or clinical diagnosis. In advanced stages of asbestosis, results from lung function studies, x-ray and clinical tests can be correlated. There is evidence that men removed from exposure four to five years ago, when the signs of the disease were minimal, are maintaining a reasonable functional level unlike similar men who remained in exposed departments.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; DIAGNOSIS; HUMAN

Jacob, G.; Ansprech, M., Pulmonary neoplasia among Dresden asbestos workers., Ann. W. Y. Acad. Sci., 132(1): 536-548 (1965).

Data presented summarizes the results of observations made among 2,636 workers in the Dresden asbestos industry from 1952 to 1962, with particular reference to lung cancer and asbestosis. From the period 1951-1957, the incidence of lung cancer, with or without asbestosis, was not of statistical significance. However, for the period 1951-1962 a very sharp rise in the incidence of lung cancer and pleural tumors was observed; lung cancer replaced cor pulmonale as the leading cause of death. The shift in frequency of these two leading causes of death among Dresden asbestos workers can be attributed to two factors: (1) improved industrial hygiene measures and (2) more asbestos workers surviving long enough to develop lung cancer. In contrast to the general population, lung cancer occurred predominantly in the lower lobe of the lung in asbestos workers.

ASBESTOS; CANCER; CARCINOMA; HUMAN; LUNG; TUMOR; OCCUPATIONAL EXPOSURE

Environmental Health Perspectives
Before implementation of dust control regulations by Great Britain in 1931, occupational exposure to asbestos dust carried a greatly increased risk of lung cancer and other respiratory and cardiovascular diseases. Results from a study of the mortality expectancies of workers in the British textile industry show that these risks have been greatly reduced. Chrysotile is the predominant asbestos used.

ASBESTOS; CANCER; CHRYSTOTILE; CROCIDOLITE; DUST CONTROLS; HUMAN; OCCUPATIONAL EXPOSURE; RESPIRATORY DISEASE

Preliminary observations indicate that asbestos dust is disseminated from mining and milling areas rather extensively; the amount of asbestos deposited in surrounding areas depends upon geographical and meteorological conditions and the distance from the source.

ASBESTOS; DUST CONTROLS; ENVIRONMENTAL CONTAMINATION

This U.S. Department of the Interior, Bureau of Mines publication details the yearly position of asbestos with respect to government action, production, consumption and uses, prices, foreign trade, world review and technology.

ASBESTOS; CROCIDOLITE; AMOSITE; CHRYSTOTILE

McVittie, J.C., Asbestos in Great Britain., Ann. N.Y. Acad. Sci., 132(1): 128-138 (1965).

An increasing incidence of asbestosis has been recorded in Great Britain; in the period 1955-1963, 358 new cases were diagnosed by the Ministry's Pneumoconiosis Medical Panels. When grouped according to occupations, the insulating section of the asbestos industry accounted for 81% of the total. Data obtained indicate that age at entry into the industry was not a factor in the development of asbestosis and the disease could develop following exposures under 10 years. Criteria used in diagnosing asbestosis are presented, along with a follow-up on the cases.

ASBESTOS; ASBESTOSIS; CANCER; DIAGNOSIS; HUMAN; INSULATION WORKERS; MESOTHELIONA; OCCUPATIONAL EXPOSURE

Miller, L.; Smith, W.E.; Berliner, S.W., Tests for effect of asbestos on benzo (a) pyrene carcinogenesis in the respiratory tract., Ann. N.Y. Acad. Sci., 132(1): 849-50 (1965).

The ability of benzo (a) pyrene to produce papillomas and carcinomas in the respiratory tract of hamsters is increased when administered in conjunction with chrysotile asbestos; asbestos did not increase tumor induction by benzo (a) pyrene.

ASBESTOS; CANCER; CARCINOMA; HAMSTER; TUMOR; CO-CARCINOGEN

Norris, T.G.; Roberts, W.R.; Silverton, P.R.; Skidmore, J.L.; Wagner, J.C.; Cook, G.W., Comparison of dust retention in specific pathogen free and standard rats., Inhaled Particles and Vapours II. Proceedings of an International Symposium (Cambridge, England, 1965); C.R. Davies (Editor). Pergamon Press, London., pp. 205-212, (1965).

Effects of the inhalation and retention of dusts in the lungs of rats were examined following exposure to amosite, South African chrysotile, Canadian chrysotile or silica dust for 7 hr./day, 5 days a week, for 6 1/2 weeks. The dust concentration in each exposure chamber was approximately 2 mg/cubic meter as measured by gravimetric thermal precipitators. Histopathological examination of the lungs at 1, 28 and 56 days after the final exposure showed a more progressive and marked tissue reaction to amosite than to silica or chrysotile. South African chrysotile induced a reaction than Canadian chrysotile or silica; the interstitial reaction to both chrysotile forms was more pronounced at 28 days than at 56 days. Silica-treated rats demonstrated a typical granulomatous reaction. The tissue responses were similar in both SPC (specific pathogen free) and standard rats.

ASBESTOS; CHRYSTOTILE; AMOSITE; RAT; INHALATION; LUNG; FIBROGENIC TISSUE RESPONSE

Wagenscheidt, G., Some observations of the dust content and composition in lungs with asbestosis, made during work on coal miners pneumoconiosis., Ann. N.Y. Acad. Sci., 132(1): 68-76 (1965).

In hopes of elucidating the cause of silicosis in miners, lungs of men with asbestosis were examined. Results indicate that over half the lungs contain only traces of asbestos, irrespective of the grade of fibrosis. Only amosite was identified in varying proportions. The most prevalent type of fibrosis observed was diffuse interstitial fibrosis.

AMOSITE; ANALYSIS; ASBESTOS; ASBESTOSIS; CHRYSTOTILE; CROCIDOLITE; FIBROSIS; HUMAN; LUNG
Newhouse, M. L.; Thompson, R., Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area., Brit. J. Ind. Med., 22: 261-269 (1965).

Occupational and domestic histories were established for 76 out of 83 patients with confirmed mesothelioma in the London Hospital. Forty (52.6%) had a history of asbestos exposure; 31 were occupationally exposed and 9 were exposed domestically through relatives who worked with asbestos. The 36 cases having neither occupational nor domestic exposure lived in the immediate vicinity of an asbestos factory; 11 of these resided within 1/2 mile of the factory. The duration of exposure ranged from 2 months to more than 50 years. This interval between initial exposure and death was 16 to 55 years with a mean of 29.4 years for factory workers, 38.8 yrs. for laggers and insulators, 37.9 for domestic exposure, and 48.5 years for residential exposure. The incidence of residential, occupational, and domestic exposure in the mesothelioma group was highly significant when compared to exposure histories of 76 control patients with other diseases. The results show that risk of mesothelioma may arise from both occupational and incidental exposure to asbestos.

ASBESTOS: OCCUPATIONAL EXPOSURE; HUMAN; NON-OCCUPATIONAL EXPOSURE; MESOTHELIOMA; PERITONEUM; PLEURA; INSULATION

Selikoff, I. J., The occurrence of pleural calcification among asbestos insulation workers., Ann. N.Y. Acad. Sci., 132(1): 139-155 (1965).

X-ray evidence of pleural calcification was found in 75 of the 1,177 asbestos insulation workers examined. Calcification rarely occurred in less than 20 years from onset of exposure. Both unilateral and bilateral calcifications were observed; approximately half were bilateral. Extensive pleural calcification tended to be bilateral. Although bilateral calcification is almost pathognomonic of asbestosis in the absence of traumatic or occupational pleural diseases, pleural calcification is almost as strongly diagnostic.

ASBESTOS: ASBESTOSIS; DIAGNOSIS; HUMAN; PLEURAL CALCIFICATION

Selikoff, I. J.; Churg, J.; Hammond, E. C., Relation between exposure to asbestos and mesothelioma., New Engl. J. Med., 272(11): 560-565 (1965).

Ten deaths from mesothelioma, 6 of the pleura and 6 of the peritoneum, were verified in a study of 307 consecutive deaths (1943-1964) among asbestos-insulation workers in New York and New Jersey. This incidence of more than 3% is remarkably high for such a rare a tumor. In a prospective study of the general population, only 3 deaths out of 31,652 were due to mesothelioma of the pleura. Mesothelioma was further associated with asbestos by the autopsy verification of 4 pleural and 3 peritoneal mesotheliomas among 26 asbestotic cases, and by the finding of asbestos bodies in lung sections from more than 25% of the mesothelioma cases. It is apparent that mesothelioma must be added to the list of neoplastic hazards associated with asbestos exposure.

ASBESTOS: ASBESTOSIS; CANCER; MESOTHELIOMA; HUMAN; LUNG; PERITONEUM; PLERA; INSULATION WORKERS

Schall, F. L., Present threshold limit value for asbestos dust: A critique., Ann. N.Y. Acad. Sci., 132(1): 316-321 (1965).

The present threshold limit value for asbestos in the United States is 5.0 mpcf for a daily eight hour exposure, 40 hours/week; this value was adopted several years ago. Present criticisms are: (1) the value relates to the prevention of asbestosis but not other asbestos-related diseases, (2) data was obtained from the textile industry only, (3) variations in the nature of the dust were not considered, (4) the value has been with dust counts of all particles, fibrons and particulates, asbestos or not, and (5) dust counts taken were averaged.

ASBESTOS: STANDARDS

Selikoff, I. J.; Hammond, E. C., Relationship between exposure to asbestos and lung cancer., Amer. Rev. Resp. Dis., 108(1): 1-9 (1973).

A number of studies have been made of the exposure-to-disease relationship among asbestos workers. Many studies have concluded that exposure to asbestos is not a major cause of lung cancer. Although the evidence is not conclusive, a moderate magnitude of risk for lung cancer has been found in some studies. The present study is based on an analysis of 5,847 cases of lung cancer in the industrial United States, 1940-1969. The results are consistent with the hypothesis that asbestos exposure is a significant cause of lung cancer among asbestos workers. The relative risk of lung cancer among asbestos workers is about 2.5 times that of the general population, and this is associated with an increased risk of mortality from lung cancer. The results are consistent with the hypothesis that asbestos exposure is a significant cause of lung cancer among asbestos workers.

ASBESTOS: ASBESTOSIS; LUNG; MESOTHELIOMA; PERITONEUM; PLERA; INSULATION WORKERS
Sluijs-Cremer, G.K., Smith, P.J. Asbestos in South Africa—certain geographical and environmental considerations., Ann. N.Y. Acad. Sci., 132(1): 215-238 (1965).

Reviewed are (1) the development and production of the Northwest Cape Province (NWC) crocidolite mine and the Transvaal (TVL) crocidolite and amosite asbestos field; (2) dust conditions in the asbestos mining industry—(a) dust levels in mines and mills, (b) constituents of ore and dust, and (c) pollution of areas in the neighborhood of asbestos mines; (3) medical observations in the NWC and TVL; (4) occurrence of asbestos bodies in the NWC and TVL; (5) occurrence of asbestos fibers in the sputum of the NWC; and TVL; (6) radiological observations; and (7) evidence derived from post-mortem observations.

AMOSITE: CROCIDOLITE; OCCUPATIONAL EXPOSURE; X-RAY; HUMAN

Sluijs-Cremer, G.K.; Theron, C.P., Radiological and pathological correlations in asbestosis in the Republic of South Africa and the United Kingdom. I. A proposed radiological classification of asbestosis., Ann. N.Y. Acad. Sci., 132(4): 337-378 (1965).

The International Classification of Pneumoconiosis was modified to facilitate diagnosis of asbestosis. All principal radiological features are described both qualitatively and quantitatively. The code letters "Lc" and "Lm" denote linear opacities; the quantitative assessment 1/3, 2/3, and 3/3 indicates the extent of lung involvement. Additional symbols are used for related complications.

ASBESTOS; ASBESTOSIS; DIAGNOSIS

Smith, W.E.; Miller, L.; Churg, J.; Selikoff, I.J., Mesotheliomas in hamsters following intraperitoneal injection of asbestos., J. Mt. Sinai Hosp. N.Y., 32(1): 1-8 (1965).

Oral and intrapleural administration of soft chrysotile, 'harsh' chrysotile or amosite in hamsters at a dose of 25 mg induced mesotheliomas resembling those found in man. Tumor cells, sometimes lining normal cells were found in visceral pleural mesotheliomas of hamsters that did not develop tumors. These islands are of interest because they may be precursors of tubular types of mesotheliomas.

AMOSITE; ASBESTOS; CHRYSOTILE; MESOTHELIOMA; HAMSTER; CANCER; TUMOR

Smith, W.E.; Miller, L.; Eismesser, R.F.; Hubert, D.D., Tests for carcinogenicity of asbestos., Ann. N.Y. Acad. Sci., 132: 656-677 (1965).

A single intrapleural injection of soft chrysotile, harsh chrysotile or amosite induced tumors initially induced granulomatous inflammation, pleural thickening, calcification, necrosis, and fibrosis. Pleural mesotheliomas developed after 200 days in 3 out of 15 animals given amosite, and after 200 days in 2 out of 15 receiving harsh chrysotile. No mesotheliomas were observed in hamsters treated with soft chrysotile, or in untreated control hamsters. In a current experiment, weekly intratracheal injections of the 3 asbestos types have produced pleural plaques and pulmonary lesions resembling asbestosis, but no tumors have been observed as long as 883 days after the first injection.

ASBESTOS; CHRYSOTILE; AMOSITE; FIBROSIS; PLEURAL CALCIFICATION; PLEURAL PLAQUES; MESOTHELIOMA; PLEURA; HAMSTER

Smith, W.E., Secular changes in asbestosis in an asbestos factory., Ann. N.Y. Acad. Sci., 132(1): 166-181 (1965).

One way to study secular changes in the incidence of asbestosis is to compare the average length of exposure before the onset of certifiable disability. Of 236 new cases certified since 1960, the average exposure was 17.5 years (range equals 4 to 35 years). Disability was only 10% in 21 of the 23 cases. Most (80%) were referred for physiological testing to confirm asbestosis. Spurts asbestos bodies are evidence of asbestos exposure only.

ASBESTOSIS; OCCUPATIONAL EXPOSURE; HUMAN; ASBESTOS; ASBESTOS BOARDS

Steel, S.J.; Boyd, J., Pleural calcification and mesotheliomas following exposure to asbestos., Brit. J. Dis. Chest., 59(3): 130-134 (1965).

Ten years after exposure to asbestos as a stonemason, a 63-year old man developed mesothelioma with pleural thickening and effusion of the left side. The patient was hospitalized with symptoms of progressive dyspnea and dysphagia; chest x-ray showed increased left pleural thickening and displacement of the mediastinum to the right. Histologic examination of the surgical specimen revealed the presence of mesothelioma of the pleura with an asbestos body present in the adjacent lung. The disease was fatal.

ASBESTOS; DIAGNOSIS; DYSPEA; MESOTHELIOMA; PLEURAL CALCIFICATION; HUMAN; OCCUPATIONAL EXPOSURE

December 1974

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Asbestosis. Length

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ASBESTOS; MESOTHELIA;

cancer

Turiaf, J.; Chabot, J.; Basset, M.F., Bronchial cancer and pleural mesotheliomas--were found in patients with asbestosis. Length of asbestos exposure was long-teris. Two points are stressed in connection with the cases: (1) the disease condition is often slight, long standing and ignored by the patient and (2) the presence of fibers in the pleura is significant.

ASBESTOS; OCCUPATIONAL EXPOSURE; TUMOR; CANCER; MESOTHELIOMA; PLEURA; ASBESTOSIS

Vigliani, F.C.; Rottura, G.; Maranzana, P., Association of pulmonary tumors with asbestosis in Piedmont and Lombardy, Ann. N.Y. Acad. Sci., 132 (1): 558-574 (1965).

From 1963 to 1968, 879 cases of asbestosis were certified in Piedmont (630) and Lombardy (49). So far, 172 have died, with lung carcinoma and mesothelioma. One lung carcinoma and two pleural mesotheliomas were found among the 707 living subjects.

TUMOR; ASBESTOSIS; PLEURA; HOLOPLASTIA; HUMAN; OCCUPATIONAL EXPOSURE; MESOTHELIOMA; LUNG

Wagner, J.C., The sequelae of exposure to asbestos dust, Ann. N.Y. Acad. Sci., 132 (1): 691-695 (1965).

This paper summarizes the salient features of asbestos exposure: (1) the dust, (2) problems of inhalation, (3) problems of retention, (4) asbestos bodies and fibers, (5) asbestos-human and experimental, (6) theories of pathogenesis, (7) migration of fibers, (8) malignancy and asbestos, and (9) cooperation among numerous scientific fields to investigate biological effects of asbestos.

ASBESTOS; ASBESTOS BODY; ASBESTOS; CANCER; LUNG; MESOTHELIOMA; PLEURA; PERITONEUM; TUMOR

Wagner, J.C., Epidemiology of diffuse mesothelial tumors: evidence of an association from studies in South Africa and the United Kingdom, Ann. N.Y. Acad. Sci., 132 (1): 575-578 (1965).

Of the 87 pleural and 2 peritoneal mesotheliomas diagnosed in South Africa only 2 cases were not related to a known history of asbestos dust exposure.

MESOTHELIOMA; TUMOR; OCCUPATIONAL EXPOSURE; PERITONEUM; HUMAN

Wagner, J.C., Skidmore, J.W., Asbestos dust deposition and retention in rats, Ann. N.Y. Acad. Sci., 132 (1): 77-86 (1965).

Rats were exposed to asbestos dust clouds for 7 1/2 hours per day, 5 days per week for 6 weeks. Dust accumulated in the alveoli arising directly from the respiratory bronchioles. The elimination rate of Rhodesian chrysotile was three times greater than for amosite and crocidolite, thereby offering an explanation for its reduced fibrogenicity.

CHRYSTOTILE; CROCIDOLITE; AMOSITE; ASBESTOS; RAT; INHALATION

Williams, W.J., Asbestos and lung cancer, Arch. Environ. Health, 10 (1): 44-45 (1965).

Ten cases of lung carcinoma from a group of 52 American asbestos cases histologically revealed 3 squamous tumors, 3 anaplastic tumors, 2 adenocarcinomas, 1 alveolar cell carcinoma, and mesothelioma of the pleura.

LUNG; CANCER; ASBESTOSIS; TUMOR; OCCUPATIONAL EXPOSURE; HUMAN; CARCINOMA; MESOTHELIOMA

Environmental Health Perspectives
Evidence is mounting that links lung cancer with asbestosis, and malignant neoplasms with asbestos dust. Many case reports are reviewed. Until we know the answers to some of the questions posed by the recent findings all exposure to asbestos dust should be considered as hazardous, and supervision should be extended to insulation workers who may be intermittently but nevertheless heavily exposed to asbestos dust.

CANCER; LUNG; ASBESTOS; NEOPLASMS; HUMAN; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

Buchanan, W.H., The association of certain cancers with asbestosis., Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963), Excerpta Medica Foundation, New York, Vol. II: 617-619 (1964).

British epidemiologic data on pulmonary and other cancers are updated to 1962. Asbestosis was present at autopsy in 589 cases from 1924 to 1962 - 364 males and 188 females. Death from lung cancer or mesothelioma of the pleura or the peritoneum is more likely if asbestosis is present; but no evidence exists that an increased risk prevails for those persons exposed that do not have asbestosis.

CANCER; ASBESTOS; OCCUPATIONAL EXPOSURE; LUNG; MESOTHELIOMA; HUMAN; PLEURA; PERITONEUM

Davis, J.M.G., An electron microscopic study of the effect of asbestos dust on the lung., Brit. J. Exp. Pathol., 48(4): 454-466 (1967).

Rats and guinea pigs were exposed to a high concentration of chrysotile dust for 95 and 77 days respectively. Pathological changes occurred in 3 stages (1) formation of small nodular giant cell lesions in walls of terminal bronchioles (2) fibrosing interstitial pneumonia (3) consolidation of lungs as exposure progressed. Realization of the consolidation was seen in rats which were removed from exposure, but this was not the case in guinea pigs. Chrysotile dust was seen only in alveolar macrophages; other cells apparently are unable to phagocytize this material. The dust which had been in lungs for some months showed signs of dissolution by body fluids. An aggregation of ferritin material around asbestos particles may be the start of asbestos body formation. Some capillary walls in dusted lungs were thicker than usual in the area of the blood-air interface. The basement membrane in these areas was uneven in outline and numerous invaginations in the cytoplasm of epithelial and endothelial cells were evident.

LUNG; ASBESTOS; CHRYSTILE; RAT; GUINEA PIG; MACROPHAGE; ASBESTOS BODIES; PHAGOCYTOSIS

Davis, J.M.G., The ultrastructure of asbestos bodies from human lung., Brit. J. Exp. Pathol., 45(6): 642-646 (1964).

The electron-microscope study of asbestos bodies from human lung is based on the results from guinea pig studies--embedding sites were the same, located intracellularly in macrophages and fibroblasts, or seared among the collagen fibers. The asbestos body coating consisted mainly of ferritin granules about 60 A in diameter. Segmentation of the asbestos body may result from its deposition as separate globules or by the splitting of a previously smooth coat. Irregularly shaped aggregates of ferritin contained scattered particles of asbestos dust as well as other foreign material.

ANALYSIS; LUNG; HUMAN; ASBESTOS BODIES; AMosite; GUINEA PIG

Davis, J.M.G., The ultrastructure of asbestos bodies from guinea-pig lungs., Brit. J. Exp. Pathol., 45(6): 638-641 (1964).

Guinea pigs were exposed to chrysotile dust for 18 hrs a day for 6 weeks. The first sign of asbestos body formation was the aggregation of dense granules, (probably ferritin) approximately 60 A in diameter around the asbestos fiber. Partly or completely formed asbestos bodies were found in 3 sites only -- in alveoli, in the connective-tissue near guinea pig fibroblasts, or embedded among collagen fibers in fibrotic areas. During the duration of the experiment, there was no evidence of the breakup of asbestos bodies in guinea pig lungs.

ASBESTOS; INHALATION; CHRYSTILE; GUINEA PIG; LUNG; ASBESTOS BODIES; FIBROSIOS; MACROPHAGE; FIBROBLAST

Dyson, B.C.; Trentalance, A.R., Resection of primary pulmonary sarcoma. Review of literature and report of a case associated with pulmonary asbestosis., J. Thorac Cardiovas. Surg., 47(5): 577-580 (1964).

Primary pulmonary sarcoma is clinically indistinguishable from carcinoma until diagnosis is made by biopsy at bronchoscopy or at thoracotomy. In a 54-year-old newspaperman with primary pulmonary sarcoma, anthracotic pigment and asbestos bodies were present within the tumor and within adjacent lung tissue. Occupational history revealed 16 years of asbestos exposure as a pipe insulator. This is the first reported case in which pulmonary asbestosis was associated with primary pulmonary sarcoma. A review of 66 published cases of primary sarcoma in the bronchus or peripheral lung is included.

SARCOMA; ASBESTOS; CANCER; ASBESTOSIS; LUNG; OCCUPATIONAL EXPOSURE; HUMAN
All workers employed in an asbestos factory for 6 months or longer between 1936 and 1962 were part of a follow-up study of workers from an asbestos factory. Brit. J. Ind. Med., 21: 304-307 (1964).

During the years 1958 to 1963, diffuse abdominal tumors were found in 3 men and 3 women—all worked in the same asbestos factory and were exposed to chrysotile, crocidolite, and amosite. Exposure ranged from 10 months to 32 years; survival time from first exposure spanned 20 to 46 years. Symptoms and signs in all cases included abdominal pain, dyspepsia, or ascites; one is still alive. Histology confirmed tumor diagnosis; minimal lung fibrosis was observed, and in 4 cases asbestos was not diagnosed during life.

All workers employed in an asbestos factory for 6 months or longer between 1936 and 1962 were part of a follow-up study of workers from an asbestos factory. Brit. J. Ind. Med., 21: 304-307 (1964).

Enticknap, J.E.; Seather, W.J., Peritoneal tumours in asbestos workers, Brit. J. Ind. Med., 21: 20-31 (1964).

During the years 1958 to 1963, diffuse abdominal tumors were found in 3 men and 3 women—all worked in the same asbestos factory and were exposed to chrysotile, crocidolite, and amosite. Exposure ranged from 10 months to 32 years; survival time from first exposure spanned 20 to 46 years. Symptoms and signs in all cases included abdominal pain, dyspepsia, or ascites; one is still alive. Histology confirmed tumor diagnosis; minimal lung fibrosis was observed, and in 4 cases asbestos was not diagnosed during life.

Rarington, J.S.; Smith, H., Studies of hydrocarbons on mineral dusts. The elution of 3,4-benzpyrene and oils from asbestos and coal dusts by serum. Arch. Environ. Health, 8(3): 453-458 (1964).

After 88 hours at 37 degrees C, 3,4-benzpyrene was adsorbed by chrysotile, 100%; by crocidolite, 40%; and by amosite, 10%. No biologic significance can be attached to these findings. Whether the oils containing 3,4-benzpyrene and related hydrocarbons are a factor in asbestos associated malignancy remains to be determined.

Holt, P.F.; Mills, J., Experimental asbestos in guinea pigs. Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Excerpta Medica Foundation, New York, Vol. II: 667-670 (1964).

Guinea pigs which were forced to inhale fine particles of asbestos exhibited numerous asbestos particles and mononuclear macrophages in the lungs. At various times, guinea pigs were killed to ascertain developmental episodes. Submicroscopic particles can produce severe lesions in the lung.

Guinea pig; Asbestos; Macrophage; Lung; Crocidolite; Inhalation

Holt, P.F.; Mills, J.; Young, D.K., The early effects of chrysotile asbestos dust on the rat lung. J. Pathol. Bacteriol., 87(1): 15-23 (1964).

Rat were exposed for 100 hours over 30 days to chrysotile dust at a rate of approximately 5000 particles per ml of air. At 14 days the rat lung showed little evidence of dust inhalation; lesions found, however, already had formed a delicate collagen capsule and a reticulum net. The rat lung reacted more rapidly to asbestos dust than to silica dust. No asbestos bodies were found.

Environmental Health Perspectives
<511>
Oosthuizen, S. P.; Therion, C.P.; Sluis-Cremer, G.K.,
Calcified pleural plaques in asbestosis: An
investigation into their significance., Med. Proc.
(Medische Hydro, 10(23): 496-501 (1964).

Out of 2383 radiologic examinations, 166 cases of
definite uncomplicated asbestosis were diagnosed; 59
showed calcified pleural plaques only. No true
correlation was discerned between plaque formation
and the factors which influence development.

Further, neither the period and type exposure nor
age could be related to the size or distribution of
plaques.

PLEURAL PLAQUES; HUMAN; ASBESTOSIS; X-RAY; ASBESTOS;
OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

<512>
Owen, W.G., Diffuse mesothelioma and exposure to
asbestos dust in the Merseyside area., Brit. Med.
J., 2: 214-218 (1964).

This series includes 17 cases of diffuse
mesothelioma -- 16 pleural and one peritoneal.
Strong positive evidence of exposure to asbestos
was obtained in 16 of the 17; asbestos bodies were
observed in 7 of 10 specimens of lung tissue
examined.

Mesorhelioma; Asbestos; Occupational Exposure;
HUMAN; Pleura; Lung; Asbestos Bodies

<513>
Selikoff, I.J.; Churg, J.; Hammond, E.C., Asbestos
exposure and neoplasms., J. Amer. Med. Assoc.,
188(1): 22-26 (1964).

Investigations centered on the 1922 insulation
workers of the Asbestos Workers Union in the New
York metropolitan area. Of the 632 who entered the
trade before 1953 and were traced through 1962, 85
died of lung or pleural cancer; only 5.6 were
expected. Four mesotheliomas in 255 deaths is an
extraordinarily high incidence of such a rare tumor.
Twenty-nine died from stomach, colon, or rectum
cancer compared with 0.8 expected; there may be an
etiological relationship between industrial asbestos
exposure and carcinoma of the gastrointestinal tract.

Pipe Covers; HUMAN; Cancer; Neoplasms; Insulation
Workers; Occupational Exposure; Tumor; Mesothelioma;
Gastrointestinal; Asbestos

<514>
Sluis-Cremer, G.K.; Wagner, J.C., A
pathological-radiological correlation in 108 cases
of asbestosis proved at post-mortem,., Proceedings
of the Fourteenth International Congress of
Occupational Health (Madrid, 1963). Excerpta Medica
Foundation, New York., Vol. II: 608-610 (1964).

Asbestosis may cause disablement without being
detectable radiologically. In 108 asbestotic
subjects studied, all had worked in crocidolite or
amosite mines; radiologically, at autopsy, there
were 47 cases of slight asbestosis, 42 moderate, and
19 marked.

Lung; Crocidolite; Amosite; X-Ray; Human; Asbestos
Mining

<515>
Smith, W.R.; Miller, Ll.; Churg, J.; Selikoff, I.J.,
Pleural reaction and mesothelioma in hamsters
injected with asbestos., Proc. Amer. Assoc. Cancer
Res., 5(1):59 Abstract 234 (1964).

Injection of 25 mg asbestos into the right pleural
cavity of 5 hamsters resulted in extensive
pleural reaction with granulomatous inflammation
and fibrous tissue overgrowth, causing lung lobes to
bind together, to chest wall, and to the diaphragm.
Results indicate that the Syrian hamster may be a
sensitive animal model for testing asbestos
materials.

Hamster; Mesothelioma; Pleura; Asbestos; Amosite;
Chrysotille; Granuloma; Tumor

<516>
Wagner, J.C., Asbestos dust exposure and malignancy
(diffuse mesotheliomas of the pleural),, Proceedings
of the Fourteenth International Congress of
Occupational Health (Madrid, 1963). Excerpta Medica
Foundation, New York., 3: 1966-1967 (1964).

Continuing investigations of cases of diffuse
pleural mesotheliomas in South Africa show that
110 out of the 120 cases recorded since 1956
were exposed to crocidolite (blue) asbestos.
Interestingly more than half the cases from the Cape
asbestos fields were not occupationally exposed. The
occupational group showed no correlation between
the severity of asbestosis and the presence of tumor.
Oils and waxes contain polycyclic aromatic
hydrocarbons on the crocidolite fibers may be
intimately involved in the carcinogenic effect of
crocidolite.

Asbestos; Mesothelioma; Tumor; Neoplasm; Chrysotille;
Amosite; Crocidolite; Occupational Exposure; Human;
Asbestos Mining; Non-Occupational Exposure

<517>
Webster, I., Asbestosis., S. Afr. Med. J., 38:
870-872 (1964).

This review summarizes the asbestosis problem in
South Africa -- the incidence, pathogenesis,
pathology, and malignancy. Analysis showed that 3
main problems remain unsolved: (a) The particular
property of the dust which causes fibrosis and how
it does this; (b) The length of exposure or dust
load necessary to produce such fibrosis; (c) The
reason for the increased incidence of pulmonary
malignancy in asbestosis.

Asbestosis; Lung; Asbestos Bodies; Mesothelioma;
Inhalation; Pneumocionosis

<518>
Leathart, G.L.; Sanderson, J.T., Some observations
on asbestosis., Ann. Occup. Hys., 6: 65-74 (1963).

For the years 1960 and 1961 nearly half the
certified cases of asbestosis occurred in
insulators. Most victims started work in the
asbestos industry before 1965. Massive industrial
expansion since then implies more cases in the
future. Insulators lag boilers and pipes with a
plaster consisting of 85% magnesia and 15% amosite;
laggers apply a coat of wet plaster by hand on cover
sections wired to the boiler.

Asbestosis; Amosite; Insulation Workers;
Occupational Exposure; Human
Following the injection of asbestos into the air sacs of White Leghorn chickens, tumors formed in two of the 30 which survived for 1 year or more. A mucous-secreting adenocarcinoma appeared about 1 year after the injection of commercial asbestos into the right air sac of one bird. The tumor involved the syrinx, the proventriculus, the lungs and the ovary. The second tumor appeared about 3 years after injection of crocidolite into the left air sac. This large, fleshy tumor formed at the site of injection and extended along the air sac into the humerus, thorax and left lung. Crystals similar to the original crocidolite were found in the tumor tissue.

ASBESTOS; CANCER; LUNG; CHICKEN; CROCIDOLITE; TUMOR; CARCINOMA

Lung swairs were examined from more than 500 consecutive autopsies in Cape Town, South Africa. Golden-yellow asbestos bodies were identified in 132 cases - 30% of the males and 20% of the females. This appeared to result from exposure to urban contaminated with asbestos, rather than to occupational exposure. Asbestos exposure rarely leads to pulmonary disease or disability but it is etiologically involved in mesothelioma of the pleura and peritoneum.

LUNG; MESOTHELIOMA; ASBESTOS; HUMAN; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE

For 8 hours per day, 5 days per week, guinea pigs, rabbits and monkeys were exposed to asbestos dusts: relatively pure chrysotile, pure asbestite, and crocidolite consisting of ironstone and silicates with only 10% asbestos fiber. Histological examinations at monthly intervals revealed: (1) chrysotile dust produced severe lesions in the lungs of guinea pigs, slight fibrosis in monkeys, and no effect in rabbits: (2) amosite dust induced marked lesions in all three species; and (3) impure crocidolite dust caused severe disease in guinea pigs and respiratory infections in these animals were more severe than for animals treated with pure dusts.

ASBESTOS; CROCIDOLITE; CHRYSOTILE; GUINEA PIG; RABBIT; MONKEY; PNEUMOSIS; ASBESTOS; INHALATION

Cordova, J. P.; Tesluk, R. K.; Knudtson, K. P., Asbestos and cancer of the lung., Cancer, 15: 1181-1187 (1962).

Lung carcinoma was associated with 11 cases of asbestos; seven had a history of known asbestos exposure. In all cases, asbestos bodies were found in the tumor area.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOS BODIES; LUNG; CANCER; CARCINOMA; ASBESTOS; HUMAN
asbestosis, the presence of numerous asbestos bodies in fibrotic lung tissue, silicosis and acute broncho-pneumonia. Although previous 10-year exposure to silica as a surface gold miner may have contributed to the silicosis, this condition rarely results from such a short period of exposure. This case suggests that mesothelioma can develop after transitory exposure to crocidolite in susceptible persons.

RESOLUBILIZATION; ASBESTOS; BLUE ASBESTOS; ASPEROSITY; SILICOSIS; PNEUMOCONIOSIS; CROCIDOLITE; X-RAY; ASBESTOS BODIES; PIGEON Clubbing; DPSMWA

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Pazanen, T., Effects of heparin and asbestos with corticotrophin on the mucosal mast cells and tissue eosinophils of rat stomach., Acta Endocrinol., 81: 337-340 (1962).

Rats received a single injection of asbestos and for 5 days, 2 to 8 ACTH-zinc per day. Heparin (1.0 mg) was injected (i.P.) 9 times at 12 hour intervals. Rats were killed 5 days after the asbestos injection. Glucocorticoids stimulated by ACTH presumably exert such an immediate effect on the function of the mucosal lamina cells that the known inhibitory effect of heparin and asbestos is counteracted.

ASBESTOS; RAT; BIOCHEMICAL EFFECTS; GASTROINTESTINAL

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Song, H.A.; Koprowska, I., Primary cytologic diagnosis of asbestosis associated with bronchogenic carcinoma., Acta. Cytol., 6(4): 391-398 (1962).

During routine examination of sputum smears, asbestosis was diagnosed in a male laborer with bronchogenic carcinoma. Although the association of asbestosis and bronchogenic carcinoma has been documented, this is the first cytologic diagnosis. The patient was a heavy smoker and had been exposed to asbestos for a period of 18 months almost 20 years ago. Forty-one cases of asbestosis associated with carcinoma of lung are reviewed.

ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; HUMAN; LUNG; SMOKING

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Thomson, J.G., Mesothelioma of pleura or peritoneum and limited basal asbestosis., S. Afr. Med. J., 36(36): 769-766 (1962).

Gravity and lung movements may determine the basal accumulation of inhaled asbestos fibers, which then become asbestos bodies that potentially attain locally carcinogenic concentrations. The enormous increase in world consumption of asbestos and its variety of uses increases the exposure of the general population. It is possible for an increasing number of people to have limited basal asbestosis without overtly manifesting radiological or clinical evidence. There is an increase in the rare tumors--pleural and peritoneal mesothelium in people whose occupations are not generally associated with asbestos.

ASBESTOS; ASBESTOS BODIES; CANCER; PLURA; MESOTHELION; PERITONEUM; HUMAN; NON-OCCUPATIONAL EXPOSURE
Pulmonary function tests of 17 asbestos factory employees showed relatively normal vital capacity in half of the workers and reduced capacity in the rest. Residual volume was slightly increased in 6 workers and unaltered in others. Maximum breathing capacity was well preserved in all cases. Pathological changes produced in asbestos are reviewed in relation to the alveolar capillary block syndrome.

ASBESTOS: CHRYSTOTILE; CROCIDOLITE; AMOSITE; EMPHYSEMA; HUMAN; OCCUPATIONAL EXPOSURE

A Massachusetts automobile mechanic who undercoated cars for 6 years prior to his illness presented with diffuse bilateral infiltration of the lungs by minute, discrete nodular densities and considerable accentuation of the peribronchial perivascular markings, particularly of the lower lobes. A resultant state-wide survey revealed problems caused from asbestos-asphalt type undercoating compound: pre-employment and periodic x-rays, rotation of workers, use of approved respiratory and eye protection devices and mechanical ventilation of the work area were recommended as protective measures.

ASBESTOS: PNEUMOCONIOsis; HUMAN; ASBESTOS BODIES; FIBROSIS; DysPnea; OCCUPATIONAL EXPOSURE; LUNG; RESPIRATORY DISEASE; STANDARDS

In 6 patients with asbestosis, 5 demonstrated a functional diffusing effect but no emphysema. However, there were dense pleural adhesions with thick cartilage-like plaques and variable degrees of pulmonary fibrosis. One patient demonstrated definite evidence of emphysema. Functional emphysema is rarely seen in asbestosis. The restrictive lung lesion in asbestosis was probably caused by pleural adhesions and plaques and lessened volume as result of fibrosis. Asbestos bodies were frequent in fibrotic as well as non-fibrotic areas of the lungs. Dense pleural adhesions were present in all 6 cases.

ASBESTOS: EMPHYSEMA; FIBROSIS; ASBESTOS BODIES; PLEURAL PLAQUES; HUMAN

South African asbestos workers with asbestosis were examined radiologically. Pleural changes were emphasized as radiological features of asbestosis because they are found more frequently than diffuse pulmonary fibrosis. Calcific pleural plaques manifest in the characteristic pattern of sclerotic pleurisy.

ASBESTOS: SILICOSIS; PNEUMOCONIOsis; PLEURAL PLAQUES; PLEURAL CALCIFICATION; MESOTHELIOMA; HUMAN; OCCUPATIONAL EXPOSURE

Mitchell, J., Health progress in an asbestos textile worker., Arch. Environ. Health, 3(1): 43-87 (1965).

An historical account details that past work conditions in asbestos textile factories were hazardous due to high dust levels; present dust controls have greatly reduced dust particle counts to minimize the hazards of silicosis and asbestosis; routine medical examinations and x-rays of all workers enable early detection of any lung disease.

ASBESTOS; OCCUPATIONAL EXPOSURE; TEXTILE INDUSTRY; DUST CONTROLS; STANDARDS; HUMAN

Siegls, C.A.; Marchand, P.; Wagner, J.C., Diffuse pleural mesotheliomas in South Africa., S. Afr. Med. J., 35(2): 28-34 (1961).

Of 14 patients with diffuse pleural mesotheliomas, 3 had a history of exposure to crocidolite mined in South Africa. Asbestos bodies were found in lung tissues of only 30% of the cases. Further epidemiological and laboratory studies should aid to determine causative and correlative factors, including the etiologic relationship of asbestos and other elements in geographical regions where mesotheliomas occur frequently.

ASBESTOS: CROCIDOLITE; OCCUPATIONAL EXPOSURE; ASBESTOS MURm; MESOTHELIOMA; HUMAN

Tellischi, M.: Pneumoniosis, Arch. Pathol., 72(3): 234-243 (1961).

Dyspnea and weight loss developed in an elderly plaster aisner who had worked for 12 years with dry powders containing asbestos. Subsequent necropsy revealed chronic pulmonary asbestosis, primary bronchogenic squamous-cell carcinomas, and multiple pulmonary adenomas. A primary adenocarcinoma of the stomach metastasized to the lungs.

ASBESTOSIS: CARCINOMA; LUNG; TUMOR; DysPnea; FIBROSIS; FINGER CLUBBINg; ASBESTOS BODIES; CANCER; OCCUPATIONAL EXPOSURE; HUMAN

Telleksen, W.G., Rheumatoid pneumoniosis in an asbestos worker., Thorax, 16: 372-377 (1961).

An Australian patient with a 5-year history of diabetes mellitus was diagnosed as having rheumatoid arthritis; further examination disclosed asbestosis in the absence of classical radiological changes which characterize the disease. The patient was employed for 1 year in a factory which manufactured asbestos-cement board using amosite, chrysotile, and crocidolite. Estimated exposure approximated an average density of 0.3 million particles per cubic foot; the total cumulative exposure was about 6 million particle-years per cubic foot. Accordingly, the man was exposed to low levels of asbestos dust.

ASBESTOS: OCCUPATIONAL EXPOSURE; AMOSII; CHRYSTOTILE; CROCIDOLITE; ASBESTOSIS
Thomson, N.L.; McGrath, R.M.; Slater, W.J.; Shepherd, J.M., Ossian amoelites in the measurement of pulmonary diffusion in asbestososis and chronic bronchitis with emphysema., Clin. Sci., 21: 1-13 (1961).

Certified disabled asbestos workers received lung function tests by the single breath carbon monoxide method; results were expressed as diffusing capacity and permeability. The normal results observed in many of the patients has prompted reconsideration of the method's usefulness in measuring pulmonary diffusion.

ASBESTOSIS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; VENTILATORY DEFECTS; DIAGNOSIS

Anderson, J.; Campagna, F.A., Asbestososis and carcinoma of the lung., Arch. Environ. Health, 1(1): 27-32 (1960).

A case history is presented of a male asbestos worker with asbestosis and associated carcinoma of the lung. The patient was a heavy smoker. Along with the association of lung carcinoma and asbestosis, smoking history should be given greater consideration. Oher correlation between asbestos and cancer may be open to question.

ASBESTOSIS; CANCEROMA; LUNG; PNEUMOCONIOSIS; ASBESTOSIS; FINGER CLYMBABING; SMOKING; CANCER; HUMAN

Anonymous, Complications of asbestososis., Brit. Med. J., 1: 1345-1352 (1960).

A man who worked in an English factory for 11 years developed asbestosis with fatal complications. Rheumatic fever at an early age was contributory. Several participants at a clinocopathological conference expressed belief, using knowledge from previous work, that asbestososis patients have a 10 times greater risk of having lung cancer than does the general population.

ASBESTOSIS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; LUNG; CANCER; HUMAN

Keal, E.F., Asbestososis and abdominal neoplasms., Lancet, 2: 1211-1216 (1960).

Approximately 40 cases of asbestososis (23 female and 19 male) are reviewed emphasizing types and durations of exposure and other disease relevancies. Of 10 deaths, 16 were associated with lung cancer (10 men, 6 women); high incidence for men may be due to selection. Nine women and one man died with ovarian or peritoneal cancers. This appears to be more than a chance occurrence. Metastasis from other carcinoma sites seems unlikely. Asbestos bodies were found in the sputa of one bronchial carcinoma patient and in one case of peritoneal cancer years after the last exposure.

ASBESTOSIS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; CANCER; CARCINOMA; GASTROINTESTINAL

Leathart, G.L., Clinical, bronchographic, radiological and physiological observations in ten cases of asbestosis., Brit. J. Ind. Med., 17: 213-225 (1960).

Low vital capacity most often accompanies fibrosis in the lungs of asbestos workers. Vital capacity of all exposed workers should therefore be measured periodically since progressive decline indicates disease. The possibility that asbestos dust may damage the lungs without causing fibrosis can be ascertained by measuring diffusing capacity. This report is an in-depth analysis of 10 asbestosis cases.

ASBESTOSIS; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS; FIBROSIS; LUNG; ASBESTOSIS; DIAGNOSIS; HUMAN

Schödt, K.G., Asbestos types, their optical investigations and their pathological action., Staub Luft, 20(6): 173-180 (1960).

Eleven types of asbestos dust are identifiable by phase-contrast microscopic techniques. All asbestos dust should be considered hazardous, especially chrysotile, amosite, and crocidolite, since they can enter the alveolar tracts more readily than some of the other types.

ASBESTOS; ANALYSIS; ASBESTOS; CHRYSOTILE; CROCIDOLITE

Wagner, J.C.; Sleggs, C.A.; Marchand, P., Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province., Brit. J. Ind. Med., 17: 260-271 (1960).

Primary malignant tumors of the pleura are rare. In thirty-three cases (22 males, 11 females) of diffuse pleural mesothelioma, all but one had been exposed to crocidolite asbestos. Mostly the exposure was in the asbestos hills in the Northwestern Cape Province in South Africa. Occupation and place of residence were significant in correlating asbestos with the tumors, since they rarely occur elsewhere in South Africa.

ASBESTOS; MESOTHELIOMA; CROCIDOLITE; ASBESTOS MING; OCCUPATIONAL EXPOSURE; HUMAN