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ASBESTOS: A PERSPECTIVE

I. An Overview

J. E. Huff

II. An Annotated Literature Collection 1960 - 1974

J. E. Huff, A. S. Hammons, C. Y. Dinger, B. W. Kline, and B. L. Whitfield

III. A Literature Compilation 1974 - 1977

S. A. Black

MARCH 1978

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Toxicology Information Response Center
Information Center Complex
Information Division

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ASBESTOS: A PERSPECTIVE

I. An Overview

J. E. Huff

You may wonder why asbestos workers walk backwards. They don't always walk backwards. It is only going upstairs. They are so short of breath that after two steps they have to sit down. It is easier to go up a flight of stairs backwards than walking up. It is a terrible way to die.

—I. J. Selikoff

Asbestos is everywhere! Possessing an enigmatic history of incalculable risks—and benefits—asbestos now reaches into our daily lives by myriad means. Used in relatively small amounts for centuries, asbestos uses and demands have grown momentously in our modern industrialized society. In this century, global use of asbestos has increased nearly 200-fold—from ~27 million kilograms to ~5200 million kilograms. The steady increase in asbestos production and use has declined slightly in recent years, but the growth curve continues upward. As a result, asbestos fibers are widely disseminated in the environment and are found in the air we breathe, the food and beverages we consume, and the water we drink. No longer does asbestos represent just an occupational hazard but one of vast environmental magnitude portending at least some exposure for us all.

Asbestos is a generic term covering several fibrous silicate minerals that are found in almost every country in the world. Industrial usefulness of asbestos stems particularly from its natural properties—nonflammability, flexibility, tensile strength, low density, resistance to acids and alkalies, and high electrical resistivity.

Available data are overwhelmingly conclusive—asbestos is indeed hazardous to human health! Asbestos exposure is pathogenic to humans, causing asbestosis, lung cancer, mesotheliomas, and pleural lesions; both experimental animal data and human clinical studies support these findings. Yet, one particular aspect—the potential harmfulness of asbestos ingestion—remains unresolved and argumentative. The overall problem awaits solution through the expanding experimental, epidemiological, and clinical investigations now being conducted.

This overview of the asbestos problem highlights historical developments, summarizes the reference literature, reviews physical and chemical properties, lists

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production amounts and uses, sketches biological aspects, examines environmental contamination, and presents conclusions based on assimilation of literature.

HISTORY

As can be imagined from Table 1, asbestos surely possesses an enigmatic history. Just for a moment, try to fathom what the ancients conjured as use after different use was chanced upon for this virtually indestructible material.

In 1938, the book *Silicosis and Asbestosis*, edited by Lanza, documented the medical history of asbestosis. Written by investigative pioneers, these authors blazed a trail for future scientists to follow. A few of the more notable advances about asbestos and associated events are listed chronologically in Table 1.

LITERATURE

The asbestos literature is no exception to the general axiom that most published literature—even that reporting on a single, well-defined subject area—appears scattered throughout the world in myriad sources. To reduce this seemingly endless and repeated exercise of periodically attacking the literature, a computerized annotated literature collection was created (Huff et al., 1974a). These initial 549 records listed in Part II represent a cross section of the total asbestos literature—emphasizing human health hazards and clinical aspects for the period 1960 to 1974. Supporting the years 1974 into 1977 are the 318 representative references selected from the more recent literature; this collection comprises Part III of this report.

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 health hazards and ultimate consequences of asbestos exposure: the first was held at the New York Academy of Sciences in 1964; the second took place ten years later at the National Institute of Environmental Health Sciences in 1974. Another example is the Third National Conference on the Physics and Chemistry of Asbestos Minerals which was held at Laval University, Quebec City, in 1975. The International Agency for Research on Cancer has convened three separate meetings on the carcinogenic risk of asbestos to humans—in 1972 (IARC, 1973), 1975, and 1976 (IARC, 1977).

References detailing asbestos research are abundant and are continuing to multiply. A few significant topical examples deal with air pollution (Air Pollution Control Office, 1971; National Academy of Sciences, 1971; Office of Air and Water Programs, 1973; Sullivan and Athanassiadis, 1969), geology (Brobst and Pratt, 1973; May and Lewis, 1970), occupational criteria (National Institute for Occupational Safety and Health, 1972; Ruby and Buchan, 1974; Occupational Safety and Health Administration, 1975), carcinogenic risk (International Agency for Research on Cancer, 1973, 1977), literature

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Table 1. Asbestos history

4000 years ago	Regarded as a treasure.
Centuries B.C.	Fire proof fabrics.
450 B.C.	Cremation cloth mentioned by Herodotus.
1st Century A.D.	Described in literature by Pliny and Plutarch.
1725	Benjamin Franklin gave the oldest known woven asbestos article – a small purse made of tremolite – to Sir Hans Sloan. On exhibit in the National History Museum.
1878	Commercial production in Quebec.
1900	Establishment of fabricating industry and markets in America.
1900	First reported death resulting from asbestos dust inhalation.
1907	Association between asbestos dust exposure and pulmonary disease in United Kingdom.
1910	Notable asbestos-mining facilities established in present-day leading centers.
1927	First complete descriptions of asbestosis from United Kingdom.
1930	First asbestosis cases reported in the United States.
1930	First investigation of the asbestos industry.
1935	Association between asbestosis and lung cancer in United States and United Kingdom.
1943-1953	Case reports of neoplasms involving pleural tumors associated with asbestos exposure.
1954	Peritoneal tumor in asbestos worker.
1960	Mesotheliomas in miners of crocidolite and in nonminers in region of the mines.
1963-1964	Lung tumors and mesotheliomas in asbestos workers.
1964	New York Academy of Sciences hosted national conference on asbestos.
1968	Smoking increases risk to lung cancer for asbestos workers.
1972	National Institute for Occupational Safety and Health recommended occupational exposure standard.
1973	International Agency for Research on Cancer evaluated carcinogenic risk to humans.
1973	Environmental Protection Agency served notice on Reserve Mining Co. to cease dumping taconite tailings into Lake Superior.
1974	National Institute of Environmental Health Sciences gathered world's experts on asbestos.
1975	National Institute for Occupational Safety and Health recommended stricter occupational exposure standards.
1975-1976	Support for hypothesis that excess bronchial carcinomas occur in persons exposed to asbestos without simultaneous radiological signs of lung asbestosis.
1977	International Agency for Research on Cancer published an updated monograph on the carcinogenic risk to humans.

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collection (Huff et al., 1974a; Kenton, 1973), a recent synopsis (Hammons and Huff, 1974; Huff et al., 1974b), conference proceedings (National Institute of Environmental Health Sciences, 1974; New York Academy of Sciences, 1965), and a popular account (Brodeur, 1972).

PROPERTIES, PRODUCTION, AND USES

Asbestos—that "magic mineral"—refers to a group of hydrated, silicate minerals which possess a fiber-like structure, capable of being woven like and into cloth. Widespread commercial use of asbestos stems particularly from its natural properties, such as flexibility and high tensile strength (Tables 2 and 3), which are imparted by the chemical composition and crystal structure of the fibers. Asbestos minerals consist of two main types (Table 4) as determined by their crystal structures: the *serpentine class* contains chrysotile, a pure magnesium silicate that comprises 90-95% of the world's asbestos production, whereas the *amphibole class* includes five varieties in which the magnesium component is partially or wholly replaced by other cations. Differences in the chemical composition and in the crystal morphology account for slight variations in physical properties among different types of asbestos (Table 5).

Table 2. Commercial uses of asbestos

Types	Use (%)	Favorable properties	Major uses	
Chrysotile	90-95	Flexibility	Asbestos-cement	70%
Crocidolite[a]	3-4	Length of fiber	Building materials	
Amosite[a]	2-3	Tensile strength	Asbestos-cement pipe	
		Chemical reactivity	Floor tile	10%
Anthophyllite	<1	Resistance to heat	Brake linings, gaskets, clutch facings, paints, insulations, steam-pipe coverings and others	20%
		Electrical conductance		
Tremolite	<1	Filtration characteristics		

[a]Possesses particular properties that would favor greater use if they occurred more universally and in larger amounts.

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Table 3. The uses of asbestos

Asbestos - cement industry

Shingles for roofing and siding
Wall sheets
Insulation board
Clapboard
Electric motor casings
Water and sewage pipes
Gas pipes
Rain gutters
Air ducts
Refuse chutes

Asbestos - textile industry

Fireproof theater curtains
Lagging
Other insulation wrapping
Conveyor belting
Safety clothing
Potholders
Ironing board covers
Draperies
Rugs
Motion picture screens
Gas filters in gas masks
Filters for processing fruit juices
Filters for processing acids
Filters for processing beer
Filters for processing medicine
Mailbags
Prison-cell padding
Airplane fittings
Stove and lamp wicks
Sparkplugs
Fire hoses

Friction materials

Brake linings
Clutch facings

Asbestos papers, felts, and millboard

Roofing
Piano padding
Stove and heater linings
Filing cabinet linings
Military helmet linings
Automobile hood mufflers
Boiler jackets
Radiator covers
Acoustical ceilings
Plasterboard
Fireproof wallboard
Electrical switch boxes
Safes
Table pads
Stove mats
Ovens
Dry kilns

Asbestos plastics

Flooring tiles (asphalt and vinyl binders)
Reinforcement and filler in plastics
Plastic products (frying-pan handles, rocket nose covers)

Miscellaneous

Ingredient of paints and sealants
Component of roof coating and road-building compounds
Putty, calk, and other crack fillers
Artificial snow
Spray insulation on structural steel
Undercoating on automobile bodies
Gaskets and packing materials
Insulation materials

Electrical equipment industry

Insulation tape

Source: Bruckman, 1973 (as cited in Environmental Protection Agency Report No. EPA-600/5-77-002, *Hazardous Wastes: A Risk-Benefit Framework Applied to Cadmium and Asbestos*, February 1977).

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Table 4. Asbestos nomenclature

Asbestos: A generic term for naturally fibrous silicates that are amenable to mechanical separation into fine filaments of considerable tensile strength and flexibility.

Asbestos

Serpentine	Amphibole
Chrysotile[a] (White asbestos)	Actinolite
	Amosite[a] (Brown asbestos)
	Anthophyllite[a]
	Crocidolite[a] (Blue asbestos)
	Tremolite

[a]Commercially important types.

Table 5. Asbestos properties

Compound	Composition	Chemical formula	Color	Length	Texture
Chrysotile (12001-29-5)[a]	Hydrous silicates of magnesia	$Mg_3Si_2O_5(OH)_4$	White, grey green, yellowish	Short to long	Soft to harsh, also silky
Amosite (12172-73-5)	Silicate of Fe and Mg	$(Fe^{2+}Mg)_7 \cdot Si_8O_2 \cdot (OH)_2$	Ash grey, greenish, or brown	Long	Coarse, somewhat pliable
Anthophyllite (17068-78-9)	Mg silicate with iron	$(MgFe^{2+})_7 \cdot Si_8O_{22}(OH)_2$	Greyish white, brown grey, or green	Short	Harsh
Crocidolite (12001-28-4)	Silicate of Na and Fe with water	$Na_2Fe_3^{2+}Fe_2^{3+} \cdot Si_8O_{22}(OH)_2$	Lavender, blue greenish	Short to long	Soft to harsh

[a]Chemical Abstracts Service Registry Number.

Source: International Agency for Research on Cancer, 1973, 1977.

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Because the industrial uses of asbestos depend on the physical characteristics of the fibers and because evidence indicates that harmful effects in the body are related to the dimensions of the fibrils, recent work has emphasized use of the electron microscope. For instance, chrysotile fibrils are usually hollow cylinders with varying amounts of an amorphous material on the inside and outside of the tubes—estimated diameters averaged 20-25 nm for the outside and 2-5 nm for the inside (Pundsack, 1961).

World production amounts are listed in Tables 6 and 7. The four-year trend shows relative growth stability; production giants include Canada > U.S.S.R. > South Africa > China. The top ten producers of asbestos remove from the earth's storehouse nearly 98% (4087 x 10^6 kg/4178 x 10^6 kg) of the total asbestos mined (Table 6); the U.S.S.R. and Canada remain the leading sources of asbestos (Table 7).

United States domestic production stems from four main areas (Table 8). California remains the overwhelming leader for mining asbestos—about 70% of the total—followed by Vermont, Arizona, and North Carolina.

In the last six decades, global use of asbestos has increased more than 200-fold: from 27 million kilograms to 5200 million kilograms in 1976. In 1972, the 100th year of commercial asbestos use in the United States, and in 1973, nearly 20% of the world's total production was consumed by the United States. Considering the thousands of known end uses, eight major categories account for 80-85% of the asbestos used in the United States, with the remaining 15-20% devoted to "other" uses during 1973 and 1972 (Table 9). A 10% increase in use occurred between 1972 and 1973.

BIOLOGICAL ASPECTS

In Vitro Studies

As summarized in the recent asbestos monograph by the International Agency for Research on Cancer (1977), several authors have demonstrated cytotoxicity of asbestos fibers in in vitro systems. Fiber interaction with plasma membranes most likely causes the untoward effects. Beck and Bruch (1974), Beck et al. (1971), and Beck, Holt, and Manojlovic (1972) found the effects of chrysotile and glass fibers on L-cells and peritoneal and alveolar macrophages in vitro to center on incomplete phagocytosis, disturbed permeability of cell membranes, and loss of enzyme activity with powdered chrysotile or glass fibers having more effect on the cells than did unpowdered fibers. Allison(1973) detected two types of cytotoxic effect: an early effect due to interaction with the plasma membrane and a late effect due to an interaction of ingested asbestos particles with the membranes around secondary lysosomes. Asbestos was found to be cytotoxic for malignant P388D1 cells, which have macrophage-like characteristics (Wade et al., 1976). The induction of interferon by influenza virus was depressed in asbestos-treated monkey kidney-cell monolayers (Hahon and Eckert, 1976), Sincock and Seabright (1975) reported that chrysotile and crocidolite asbestos dusts in concentrations of 0.01 mg/ml induced chromosomal aberrations in cultured Chinese hamster cells. Chromosomal aberrations were found in 30% of cells exposed to glass fibers of less than 2-μm diameter (Sincock, 1977).

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Table 6. Asbestos world production

(million kg)

	1970	1971	1972	1973
North America				
Canada[1]	1507.000	1483.00	1530.000	1791.000
Mexico	- -	- -	- -	0.015
United States[6]	113.000	119.00	119.000	136.000
	1621.000	1602.00	1649.000	1927.000
Latin America				
Argentina	0.035	0.39	0.910	1.000
Brazil	16.300	20.00	32.700	39.900
	16.340	20.39	33.610	40.900
Europe				
Bulgaria	3.000	2.99	1.500	2.990
Finland	13.600	10.40	6.390	10.900
France	0.500	0.71	0.710	0.710
Italy[5]	118.000	120.00	132.000	149.000
Portugal	0.200	0.13	0.008	0.130
U.S.S.R.[2]	1066.000	1152.00	1220.000	1280.000
Yugoslavia	12.100	15.40	11.000	9.390
	1213.000	1302.00	1372.000	1453.000
Africa				
Egypt, Arab Republic of	0.450	0.07	0.440	0.440
Mozambique	0.230	1.43	0.530	0.570
Rhodesia, Southern[7]	79.800	79.80	79.800	79.800
South Africa, Republic of[3]	290.000	322.00	323.000	334.000
Swaziland[9]	33.100	35.50	33.400	36.900
	403.600	438.80	437.200	451.700
Asia				
China, People's Republic of[4]	172.000	159.00	200.000	209.000
Cyprus	25.600	27.70	28.000	26.400
India	9.830	11.00	12.300	11.300
Japan	21.300	18.00	14.400	13.900
Korea, Republic of	1.370	- -	1.960	5.690
Philippines	1.210	- -	- -	- -
Taiwan	2.840	2.33	2.690	2.900
Turkey	3.270	3.89	4.920	4.720
	237.400	221.90	264.30u	273.900
Oceania				
Australia[10]	0.740	0.76	17.300	31.800
Total	3492.000	3586.00	3773.000	4178.000

Note: Superscript numbers following countries indicate rank order.

Source: Bureau of Mines, 1974, 1975.

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Table 7. Asbestos production: world, Canada, and U.S.S.R.

Year	World production (million kg)	Canada (percent)	U.S.S.R. (percent)
1960	2210	45	29
1970	3490	44	30
1973	4093	41	31
1974	4115	40	33
1975	4560	23	48
1976	5178	29	44

Source: IARC, 1977.

Table 8. United States domestic production

State and company	Name of mine	Type of asbestos
Arizona (3)		
Asbestos Manufacturing Co.	Phillips	Chrysotile
Jaquays Mining Corp.	Chrysotile	Chrysotile
Metate Asbestos Corp.	Lucky Seven	Chrysotile
California (1)		
Atlas Asbestos Corp.	Santa Cruz	Chrysotile
Coalinga Asbestos Co. Inc.	Christie (or Coalinga)	Chrysotile
Pacific Asbestos Corp.	Pacific Asbestos	Chrysotile
Union Carbide Corp.	Santa Rita (or Joe No. 5)	Chrysotile
North Carolina (4)		
Powhatan Mining Co.	Burnsville (or Hippy)	Anthophyllite
Powhatan Mining Co.	Boot Hill	Anthophyllite
Vermont (2)		
GAF Corp.	Lowell	Chrysotile

Note: Numbers following state indicates rank order.

Source: Bureau of Mines, 1974, 1975.

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Table 9. United States chrysotile asbestos consumption, 1972 and 1973

End uses	1972		1973	
	Million kilograms	Percentage	Million kilograms	Percentage
Construction	293.00	42.0	225.00	29.5
Floor tile	76.80	11.0	157.00	20.6
Paper	62.90	9.0	80.30	10.6
Friction products	69.90	10.0	62.30	8.2
Asphalt felts	41.90	6.0	40.70	5.3
Packing and gaskets	27.90	4.0	19.50	2.6
Insulation	14.00	2.0	10.70	1.4
Textiles	6.99	1.0	9.89	1.3
Other	105.00	15.0	156.00	20.5
Total	698.00	100.0	761.00	100.0

Source: Bureau of Mines, 1974, 1975.

Animals in Natural Habitat

Almost no data have been published on exposure of animals to asbestos in the natural environment as opposed to the large amount of data from experimental studies. Schuster (1931) reported a case of asbestosis in a dog that lived in an asbestos factory for ten years. No asbestos bodies were found in the lungs although the histology was typical of asbestosis. The dog was exposed to an unknown dose of white, blue, and brown asbestos and survived for eight years before symptoms appeared. Kiviluoto (1965) found anthophyllite asbestos fibers in the lungs of a cow living near an asbestos mine.

Interstitial fibrosis, asbestos fibers, and asbestos bodies were found in the lungs of a donkey that had worked ten years at an amosite mine and in the lungs of a baboon that lived near a crocidolite mill (Webster, 1963). Asbestosis was also found in field rats trapped around the same crocidolite mill.

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Animals in Experimental Climate

The primary goal of most animal research with asbestos centers on deciphering the reasons and mechanisms of the pathogenic effects. Unfortunately, existing information leads only to possible answers and hypotheses because corroborative data are absent or conflicting, and controversial and argumentative data abound.

An ideal summation of animal data would be a dose-response curve showing the dose of various types of asbestos plotted against the incidence of asbestosis and cancer in different experimental animals; hopefully, results could then be extrapolated to humans. Discouragingly, these investigative data do not yet exist. We can conclude from available data, however, that all commercially important types of asbestos have the potential to produce asbestosis and cancer in commonly used laboratory animals—including mice, rats, hamsters, and rabbits.

Species differ in the intensity and speed with which they respond to asbestos exposure. The fibrotic response in the rat usually is multifocal and nonprogressive unless a chronic infection is present. In guinea pigs, fibrosis is diffuse and progressive.

Considerable controversy exists concerning the relation between the fibrogenic potential of various asbestos types and their fiber sizes. For example, the fibrotic response in the guinea pig was greater following intratracheal injection of chrysotile fibers averaging 10 μ in length than to those averaging 5 μ. However, fibrosis has also been produced in the guinea pig lung by very fine particles of asbestos (1 μ or less). Chrysotile was more fibrogenic than amosite in rats, but the reverse was found to be true in guinea pigs, Vervet monkeys, and rabbits. The large number of physical and chemical variables which may influence the pathogenicity of asbestos makes firm conclusions about pathogenic mechanisms seemingly impossible.

A problem also exists when drawing conclusions about the carcinogenic potential of asbestos; neither mechanisms of action nor quantitative dose-response relationships have been defined. Lung cancer and mesothelioma induction are positively associated with asbestos exposure as shown in many epidemiological investigations of humans. Most mesotheliomas in humans are associated with crocidolite inhalation; however, in animal experiments, amosite, chrysotile, and crocidolite, as well as silica, will produce mesotheliomas when injected intrapleurally. Mesotheliomas have been induced following inhalation exposure of rats to amosite, anthophyllite, chrysotile, and crocidolite. Two recent investigations studied the effects of oral administration of asbestos to rats: Gibel et al. (1976) observed a significant increase ($P < 0.01$) of malignant tumors in rats given asbestos filter material in the diet over controls; and Wagner et al. (1977) found one gastric leiomyosarcoma in a rat fed chrysotile, one in a rat fed talc, and none in controls. Qualitatively, the data clearly show that asbestos exposure can lead to asbestosis, lung cancer, and mesothelioma in animals, but quantitative dose-response relationships are not yet available.

Humans in Occupational and Nonoccupational Environments

Asbestos inhalation causes several interrelated respiratory diseases in humans (Tables 10 and 11). The most prevalent is asbestosis—a chronic, progressive disease characterized by pleural lesions and interstitial pulmonary fibrosis with functional

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Table 10. Conditions caused by asbestos

Asbestosis	Lung fibrosis caused by inhalation of asbestos dust
Pleural calcification	Hardening of pleural tissue
Pleural plaques	A patch or small differentiated area on the surface of the pleura
Pleural and peritoneal mesothelioma	A rare neoplasm derived from the lining cells of the pleura and peritoneum
Lung cancer	Various types of malignant neoplasms, most of which invade surrounding tissues, that may metastasize to several sites

Table 11. Asbestos-related health problems

Signs and symptoms	
Cough	Reduced lung function
Dyspnea	Pulmonary fibrosis
Rales	Pleural effusion
Emphysema	Pleural thickening
Pleuritis	Finger clubbing
Altered serum protein concentrations	Pleural plaques

Diagnosis
History of exposure
Biopsy
X-ray
Asbestos bodies in sputum, tumor, or lung tissue

Treatment
Remove from exposure
Symptomatic

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impairment of the lungs; clinical signs include coughing, weight loss, and shortness of breath. No effective treatment has been formulated for asbestosis or its complications. Once asbestos fibers reach the deep lung passages, they induce diffuse fibrous degeneration, primarily in the lower lobes; this may develop as early as three to six years after initial exposure and continues to progress even after exposure has ceased. The gradual progression of fibrosis results in the distortion of terminal bronchioles and air spaces, leading eventually to severe pulmonary insufficiency and death.

Abnormalities of the pleural lining surrounding the lungs commonly accompany lung fibrosis caused by asbestos inhalation. The main pleural lesions involved are hyaline plaques, which are layers of hyalinized fibrous protein formed by the proliferation of connective tissue fibers. This fibrous response is attributed to the abrasive action of asbestos fibers that reach the pleura via penetration of lung tissue.

Dose-response relationships between asbestos inhalation and asbestosis are poorly defined for humans; nearly all of the positive evidence linking asbestos with human effects comes from epidemiological and clinical studies, most of which lack quantitative exposure histories. Although an association between human epidemiological data and environmental exposure has been established, definitive information concerning causal relationships still is lacking. Generally, the development of asbestosis appears to be closely related to the dose and duration of asbestos exposure as well as to the length of asbestos residence in the lungs; the incidence increases with increasing dose and duration. An incidence of 38% has been reported in 101 shipyard workers exposed to a relatively small dose of approximately five million particles per cubic foot of air for more than 20 years. These results suggest that prolonged exposure to rather low concentrations is hazardous; thus, the air content should be kept as low as feasible. The Occupational Safety and Health Administration proposed lowering the permissible exposure level of asbestos to 500,000 fibers per cubic meter for an 8-hr time-weighted average exposure, and likewise reducing the permissible ceiling exposure to five million asbestos fibers per cubic meter for any period not exceeding 15 min (Occupational Safety and Health Administration, 1975). The National Institute for Occupational Safety and Health now recommends that exposure to all types of asbestos be limited to an airborne concentration of 100,000 fibers over 5 μm in length per cubic meter on an 8-hr time-weighted average. Peak exposures should be restricted to 500,000 fibers per cubic meter of air based on 15-min sampling periods.

Several types of human cancer have been attributed to asbestos inhalation. One report estimates that 50% of the persons with asbestosis also develop lung cancer. Mesotheliomas of the pleural and peritoneal tissues are extremely rare primary tumors; yet, approximately 80% of such tumors occur in persons exposed to asbestos. Prognosis for mesothelioma in either site is poor; tumor progression may result in encasement of the entire thoracic cavity by pleural mesotheliomas or obliteration of the abdominal cavity by peritoneal mesotheliomas.

Asbestos inhalation and ingestion may enhance the risk of cancer of the stomach and colon. Persons with asbestosis demonstrate an increased incidence of gastrointestinal cancer. In fact, a detailed review of the literature led Schneiderman (1974) to the conclusion that "increased exposure to inhaled asbestos particles leads to increased digestive system cancer." Also, the unusually high rate of stomach cancer among the Japanese is considered by some experts to result from the ingestion of rice

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treated with asbestos-contaminated talc; however, some experts disagree and suspect that other carcinogenic agents are responsible. Asbestos contamination of drinking water in Duluth, Minnesota, has produced no discernible increases in cancer mortality within the surrounding population; asbestos-like fibers in industrial waste first entered this water supply in 1955. During the next 14 years, according to Masson, McKay, and Miller (1974), no carcinogenic effect was apparent in the patterns of cancer mortality among persons of all ages. Obviously this observation period is relatively short with respect to the latent period for occupationally induced cancer from asbestos. The findings are therefore inconclusive. Moreover, there is a significant paucity of experimental and epidemiological information concerning the effects of asbestos ingestion in humans.

Well-defined dose-response relationships between asbestos exposure and cancer induction cannot be readily derived from available data. The greatest risk occurs with long, heavy exposure—most likely occurring in industrial situations; an exception may be the development of carcinoma in one patient exposed to asbestos for only 12 months. Mesotheliomas have been reported in persons who were indirectly exposed to asbestos through contact with clothing of occupationally exposed relatives as well as in persons who live in the vicinity of asbestos industries.

There are definite differences in the carcinogenic potential of the various asbestos types. Most epidemiological studies indicate that crocidolite is more carcinogenic than other types of asbestos; it is associated with a higher incidence of mesothelioma and lung cancer than are chrysotile, amosite, and anthophyllite.

Cigarette smoking may represent a multiplicative factor in cancer induction by asbestos. Asbestos inhalation combined with cigarette smoking significantly increases lung cancer incidence over that caused by exposure to either factor alone.

Until 1969, diseases associated with asbestos exposure were considered only as occupational hazards. More recently, investigators have realized that exposure of the general population to environmental asbestos pollution also may be hazardous, particularly in urbanized areas. Asbestos bodies commonly are found in the lungs of urban residents, both in Europe and the United States. Data are insufficient to indicate the significance of the concentrations detected; no evidence suggests that the presence of asbestos bodies or fibers in the lungs of nonoccupationally exposed persons increases the risk of pulmonary disease. Nevertheless, reports of mesotheliomas and pleural lesions in persons who reside in the vicinity of asbestos industries indicate that pollution of the environment by asbestos may be a serious human health hazard. Further, an absolutely safe level of asbestos exposure has not been established for human populations.

ENVIRONMENTAL ASPECTS

One potential hazard stemming from the "mineral with thousands of uses" is widespread dissemination into the environment—leading to a distribution that reaches everywhere.

Asbestos particulates are released into water, air, and soil—during manufacture, transportation, use, and waste disposal—and are moved readily by wind or water.

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Contamination occurs also from nature, coming from processes such as erosion of asbestos outcrops, farming of asbestos-laden soils, and passage of water through asbestiform rocks. Asbestos fibers, easily disseminated by wind and water, are generally regarded as being persistent in the environment. Degradation rarely occurs except under extremes of heat, mechanical stress, or acidity. However, conditions severe enough to cause alteration of the mineral usually are not encountered in the normal human environment.

Because of technical difficulties in monitoring concentrations and distribution of asbestos types in the environment—collecting, identifying, and quantifying fibers in air, water, and soil—data are only now becoming available concerning types, amounts, and sizes of asbestos fibers that contaminate the environment. Ambient air concentrations in urban areas are considerably higher than for nonurban sites. Contamination of North American water resources is widespread; asbestos particles have been detected in drinking water samples from various cities in Canada and the United States. In addition, detectable asbestos has been found to contaminate beverages, foods, and drugs that are processed through asbestos filters during manufacture.

CONCLUSIONS

Although the general population is widely exposed to asbestos—both by inhalation and ingestion—the hazards of chronic, environmental exposure have not been determined. Reasons conflict but are attributed in part to a paucity of information on human dose response, effects of asbestos ingestion, ambient concentrations and distribution of asbestos in the environment, the environmental cycling of asbestos, and related biological interactions including transmission through food chains.

As distilled from the world's asbestos literature, conclusions representing a majority opinion are listed:

All asbestos types are pathogenic in animals and humans, causing asbestosis, lung cancer, mesotheliomas, and pleural lesions.

Due to the large number of variables which influence the effects of asbestos, the mechanisms of pathogenicity are poorly understood. Nevertheless, there is general agreement that fiber size is an important factor in asbestos-induced toxic manifestations.

Little is known about the clearance rates of asbestos from tissues, the transport of asbestos within the organism, or the metabolic alteration of asbestos in the body.

Animal models necessary to accurately predict the potential effects of asbestos in humans have not been developed.

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Quantitative dose-response relationships between asbestos inhalation and related diseases have not been determined for animals or humans, and minimal exposure levels required to cause disease are not known. Generally, however, the incidence of asbestosis and cancer among occupationally exposed persons increases with increasing dose and duration of exposure; the inhalation of high concentrations for short durations is as harmful as prolonged exposure to low concentrations.

Malignancies arise primarily after long-term occupational exposure of 20 years or more; however, they also reportedly occur after nonoccupational exposure in the vicinity of asbestos industries.

Causal relationship between gastrointestinal cancer and asbestos ingestion has not been established unequivocally. The potential effects of ingested asbestos—either directly into the gastrointestinal tract or indirectly via lung clearance mechanisms—are only scantily (often peripherally and speculatively) mentioned in a limited number of reports.

Tobacco smoking undeniably increases the incidence of asbestosis and lung cancer among asbestos workers.

Available data indicate that asbestos is a widespread environmental pollutant in air, water, soil, food, drugs, and beverages; the latter three from asbestos filters. However, efficient methods for quantitatively identifying the concentrations, size distributions, and types of asbestos fibers in the environment have not been developed adequately with uniform scientific acceptance.

The human health hazards of chronic environmental exposure to asbestos are not known. This is due to the paucity of information concerning human dose responses, ambient concentrations and distribution of asbestos in the environment, transmission of asbestos through food chains, and effects of asbestos ingestion.

Because any asbestos standard ideally must be based on accurate knowledge of environmental and biological data, the presently existing recommendations may need revisions as more facts become available through future research. Evidence clearly indicates, however, that personal health protection—both for asbestos workers and for the general population—demands continuing attention for safe mining, processing, utilization, and waste disposal of asbestos as well as establishment of strict preliminary standards.

Persons working in potentially hazardous dust areas should have thorough physical examinations routinely; new employees should be examined at the start of employment and periodically thereafter.

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II. An Annotated Literature Collection

1960 - 1974

J. E. Huff, A. S. Hammons, C. Y. Dinger,
B. W. Kline, and B. L. Whitfield

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INTRODUCTION

The asbestos literature—as is most published literature—is scattered in diverse sources. A computerized data base on asbestos for the period 1960 into 1974 was begun by the Biomedical Sciences Section, Information Center Complex, Oak Ridge National Laboratory emphasizing hazards and clinical aspects. Entries were expediently selected to represent a cross section of the total asbestos literature. 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:

15/1974	73/1973	49/1972	96/1971
83/1970	36/1969	41/1968	29/1967
13/1966	59/1965	23/1964	6/1963
11/1962	9/1961	6/1960	

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.

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<1>
Anonymous, Asbestos in the air., Environ. Act., May 11: 15 (1974)

The GAF 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 $650,000. 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-like 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 system 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 (5u in length), whereas fibers implicated in the development of malignancy are very long. The EPA 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(6): 22 (1974).

The Food and Drug Administration's proposed optical method of detecting asbestos was critized by Malcolm Ross, 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 Ross recommended the following procedure: optical screening to identify coarse grained primary amphiboles and chrysotile if present as fibers longer than 10 u; 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 (1974).

The Asbestos Research Council stated in a report to the FDA that, according to research by TRA 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(43): 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

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<9>

<9>
Anonymous, New asbestos detection alternatives suggested 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

<10>
Breeling, J.L., Potential hazard from eating rice coated with glucose and talc., J. Amer. Med. Assoc., 228(1): 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 ashestos, 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 kernal, 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

<11>
Ellison, A.H., 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 determing asbestos in filtered ambient air samples is not rapid enough to support an emission standard. Work is in progress to find an adequate technique for measuring source emissions of asbestos.

ASBESTOS; STANDARDS; ANALYSIS; ENVIRONMENTAL SAMPLING

<12>
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 midget 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 midget 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

<13>
Libshitz, H.I.; Wershba, M.S.; Atkinson, G.W.; Southard, M.E., Asbestosis and carcinoma of the larynx, J. Amer. Med. Assoc., 228(12): 1571-1572 (1974)

A possible association between asbestosis and carcinoma 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 were found to have epidermoid 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

<14>
Masson, 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, Minn. a 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 signficantly ($P < .01$) with time and especially in the most recent 5 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

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<15>
McDonald, J.C.; Becklake, M.R.; Gibbs, G.W.; McDonald, A.D.; Rossiter, C.E., The health of chrysotile asbestos mine and mill workers of Quebec., Arch. Environ. Health, 28(2): 61-68 (1974).

Studies of respiratory symptoms and function, roentgenographic changes, and mortality were made in relation to dust exposure in the Quebec chrysotile industry. 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 cancers was, at most, 50% above expectation, based on age-specific rates for Quebec and the mining region. Breathlessness on exercise, diminshed inspiratory capacity, parenchymal and pleural changes, and respiratory disease mortality were related to dust exposure and to each other. Saftey standards for the asbestos industries should be based on dose-response relationships established by sound epidemiological studies.

ASBESTOS; CHRYSOTILE; OCCUPATIONAL EXPOSURE; FIBROSIS; X-RAY; MESOTHELIOMA; STANDARDS; PNEUMOCONIOSIS; VENTILATORY DEFECTS; HUMAN

<16>
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 5 fibers/ml of air in asbestos mills. The Bureau's report concluded that "some operators are adequately controlling the amount of asbestos in the breathing zone of workmen; however, many are using inadequate control measures and practices, which result in workmen being exposed to asbestos fiber concentrations above 5 fibers/ml"; "it is believed that operators of most mills and mines 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

<17>
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 varities of asbestos leads to increased risk of gastrointestinal cancer."

ASBESTOS; CANCER; STANDARDS; ENVIRONMENTAL CONTAMINATION; INGESTION; GASTROINTESTINAL

<18>
Anonymous, FDA's proposed method of analysis for asbestos questioned., Pest. Chem. News, 2(3): 14 (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 analysts necessary for each method, and tend to use available tools and skills instead.

ASBESTOS; ANALYSIS; STANDARDS; ENVIRONMENTAL SAMPLING

<19>
Anonymous, FDA detains lima beans contaminated with ashestos after accident., Food Chem. News, 15(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

<20>
Anonymous, EPA's Korp says asbestos in pesticides is not a health hazard., Pest. Chem. News, 1(52): 14 (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

<21>
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, millboard, roofing materials, and floor tile products. Existing plants are expected to reach zero pollutant discharge by 1983. Plants whose construction began after Oct. 30, 1973 (except for those making 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

<22>
Anonymous, Asbestos - lung cancer - mesothelioma., Lancet, 1(7807): 815-816 (1973).

Lung fibrosis, primary lung cancer, and pleural mesothelioma are associated directly with the occupational inhalation of asbestos dust. Epidemiological studies indicate that 80% 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 mesotheliomas in experimental animals.

ASBESTOS; LUNG; FIBROSIS; MESOTHELIOMA; CANCER; TUMOR; OCCUPATIONAL EXPOSURE; INHALATION; HUMAN

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<23>

<23>
Anonymous, Health criteria and standards for the environment., WHO Chronicle, 27: 108-110 (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(4): 375-376 (1973).

The proposed limits for occupational exposure to asbestos will prevent asbestosis 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 (1973).

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 injection 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): 6 (1973).

EMventions 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 identificiation 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 pneumoconioses., 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 other non-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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<30>
Blejer, H.P.; 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 occupationally associated with excess cancer mortality. No scientific evidence of carcinogenicity of talc has been documented; however, talc particles have been found in normal tissue of women with carcinomas but with no occupational exposure to talc or asbestos. Since talcs are used in a multitude of ways which can lead to widespread inhalation, ingestion and other exposures, controlled experimental animals studies are recommended to ascertain the carcinogenicity of pure talc. The definitions and composition of talc, toxic effects, hygienic standards and uses of talc are discussed.

ASBESTOS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; HUMAN; INGESTION; INHALATION; TALC; CANCER; ASBESTOSIS; TALCOSIS; STANDARDS; DRUG CONTAMINATION

<31>
British Occupational Hygiene Society Committee on Hygiene Standards, Hygiene standards for airborne amosite asbestos dust., Ann. Occup. Hyg., 16: 1-5 (1973).

Using existing information concerning human exposure, the British Occupational Hygiene Society Committee on Hygiene Standards determined occupational exposure standards for airborne amosite. 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.

AMOSITE; OCCUPATIONAL EXPOSURE; STANDARDS

<32>
Chew, P.K.; Chia, M.; Chew, S.F.; Supramaniam, J.M.J.; Chan, W.; Chew, C.H.; Kim, Y.; 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 "asbestotic" 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 loose 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 respiratory abnormality consistent with "mild" or "early" asbestosis.

ASBESTOS; BRONCHITIS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS; RESPIRATORY DISEASE; DIAGNOSIS; HUMAN

<33>
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

<34>
Cralley, 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

<35>
Cunningham, H.M.; Pontefract, 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): 976-981 (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. Crysotile 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

<36>
Duma, R.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 um 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

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<37>
Ehrenreich, T.; Mackler, A.D.; Langer, A.M.; Selikoff, I.J., Asbestos fibers in human lungs: forensic significance in environmental disease., Arch. Mal. Prof. Med. Trav. Secur. Sociale, 34(4-5): 189-204 (1973).

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

<38>
Enterline, P.E.; 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 1348 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 1.7 times the expected for men with less than 125 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

<39>
Enterline, P.E.; Henderson, V., Type of asbestos and respiratory cancer in the asbestos industry., Arch. Environ. Health, 27: 312-317 (1973).

Among 1,348 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

<40>
Evans, J.C.; Evans, P.J.; Holmes, A.; Hounam, R.F.; Jones, D.M.; 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 mg crocidolite/l at a rate of 3 l/min for 42 or 90 minutes. Approximately 35% 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 esophogus within 30 minutes after exposure. Most of the asbestos traversing the gastrointestinal tract passed through the stomach to the small intestine within 1 hr of exposure.

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

<41>
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

<42>
Gilson, J.C., Asbestos cancer: past and future hazards., Proc. Roy. Soc. Med., 66(4): 395-403 (1973).

The Michael Williams Memorial Lecture concerning asbestos reviewed the following topics: (1) historical aspects and processes within the industry; (2) factors influencing incidence of asbestos 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; ANTHOPHYLLITE; CROCIDOLITE; CHRYSOTILE

<43>
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/milliter 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

<44>
Gross, P.; Davis, J.M.G.; Harley, R.A.; DeTreville, R.T.P., Lymphatic transport of fibrous dust from the lung., J. Occup. Med., 15(3): 186-189 (1973).

Crysotile concentrations in the lungs of 9 fiber glass workers ranged from 1 to 45% 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 6%. No relationship was observed between fiber concentrations in the lymph nodes and in the lungs.

CHRYSOTILE; ENVIRONMENTAL CONTAMINATION; LUNG; OCCUPATIONAL EXPOSURE; HUMAN

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<45>
Gross, P.; Harley, R.A., The locus of pathogenicity of asbestos dust., Arch. Environ. Health, 27: 240-242 (1973).

When polyfilamentous asbestos fibers are converted to monofilamentous 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 polyfilamentous structure.

ASBESTOS; FIBROSIS; LUNG; CHRYSOTILE

<46>
Gross, P.; Harley, R.A., Asbestos-induced intrathoracic tissue reactions., Arch. Pathol., 96(4): 245-250 (1973).

Intrapleural injection of Canadian crysotile, 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, 4 mesotheliomas, 3 rhabdomyosarcomas, 2 osteogenic sarcomas or fibrosarcomas with bone formation, and 1 a fibroliposarcoma. Addition to or removal of trace metals from asbestos dust caused no difference in tumor production.

CHRYSOTILE; AMOSITE; CROCIDOLITE; TRACE METALS; CANCER; SARCOMA; MESOTHELIOMA; TUMOR; HAMSTER; RAT

<47>
Hagerstrand, I.; Seifert, B., Asbestos bodies and pleural plaques in human lungs at necropsy., Acta Pathol. Microbiol. Scand., Sect. A, 81: 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 smears.

ASBESTOS BODIES; LUNG; PLEURAL PLAQUES; HUMAN

<48>
Hain, E.; Rohlig, H.; Klosterkotter, W.; Schutz, A.; Woitowitz, H.J., Asbestos: health hazards, limiting values, prevention., Staub Reinhalt. Luft, 33(2): 51-57 (1973).

The IN VITRO biological effects of asbestos on guinea pig peritoneal macrophages vary with the type and state of asbestos used. Cell damage as measured by oxygen respiration or nigrosine staining was greatest with chrysotile B (98% of cells damaged) and decreased through the series chrysotile A greater than anthophyllite greater than crocidolite greater than amosite (38% of cells damaged). Dry grinding of the asbestos dust to reduce fiber length reduced the toxicity of crocidolite and amosite only. Heating chrysotile A to a temperature of 600 degrees C rearranges the crystal structure and increases the cytotoxicity with respect to oxygen evolution. The physical nature of the fibers may be responsible for their IN VIVO effect, with the rigid, dense crocidolite fibers penetrating to the pleura more easily than the curly fibers of other asbestos types, particularly chrysotile. The increased use of asbestos with its potential health hazard demands a more strenuous search for substitutes, especially for crocidolite, to reduce environmental contamination.

ASBESTOS; ASBESTOSIS; LUNG; CANCER; STANDARDS; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; CYTOTOXICITY

<49>
Holt, P.F.; Young, D.K., Asbestos fibres in the air of towns., Atmos. Environ., 7: 481-483 (1973).

Air samples collected from nine international cities contained small concentrations of asbestos fibers; most occurred as single fibers, but some were in agglomerates containing many fibers. The pathological significance of these fibers is unknown; but contamination of city air with asbestos fibers may explain the presence of asbestos bodies in lungs of city residents not occupationally exposed to asbestos.

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

<50>
Hunter, B.; Thompson, C., Evaluation of the tumorigenic potential of vermiculite by intrapleural injection in rats., Brit. J. Ind. Med., 30: 167-173 (1973).

Rhodesian chrysotile asbestos induced mesothelioma in 48% of rats receiving a single 25 mg intrapleural injection. Corresponding injection of vermiculite, which contains many of the same components as asbestos, induced no tumor formation. The carcinogenic properties of asbestos may be due to the chemical and physical properties of the fibers and/or the chemical composition of organic materials associated with asbestos.

CHRYSOTILE; CANCER; MESOTHELIOMA; TUMOR; RAT

<51>
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

<52>
Kleinfeld, M.J., Biologic response to kind and amount of asbestos., J. Occup. Med., 15: 296-300 (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

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Kleinfeld, M.J.; Messite, J.; Langer, A.M., A study of workers exposed to asbestiform minerals in commercial talc manufacture., Environ. Res., 6: 132-143 (1973).

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.

TREMOLITE; ANTHOPHYLLITE; OCCUPATIONAL EXPOSURE; PNEUMOCONIOSIS; DYSPNEA; X-RAY

<54>
Lal, M.M.; Kidwai, M.M.; Zaidi, S.H., Chemical aspects of Indian varieties of asbestos dust., Chemosphere, 2: 73-76 (1973).

Analyses revealed diverse chemical compositions among Indian varieties of asbestos which differ from South African and American varieties. Detailed toxicological studies based largely on chemical nature are needed to ascertain the mining and industrial hazards of asbestos in India as well as in other countries.

ASBESTOS; ANALYSIS; OCCUPATIONAL EXPOSURE; ASBESTOS MINING; CHEMICAL COMPOSITION

<55>
Langer, A.M., Identification of asbestos in human tissues., J. Occup. Med., 15: 287-295 (1973).

Techniques for identifying asbestos in human tissues which are reviewed and discussed include: x-ray diffractometry, infrared spectroscopy, differential thermal analysis, light microscopy, and electron beam analysis.

ASBESTOS; CROCIDOLITE; CHRYSOTILE; AMOSITE; TREMOLITE; ANTHOPHYLLITE; LUNG; SILICOSIS; AMPHIBOLE; PNEUMOCONIOSIS; HUMAN

<56>
Lesobre, P.; Hadengue, A.; Legrand, M., Pleural manifestations of asbestosis., Nouv. Presse Med., 2: 1491-1494 (1973).

The main pleural lesions observed in asbestosis are hyaline pleural plagues which develop primarily on the parietal pleura and the lung bases, and which may completely surround the lower lobes. Lesion development continues even after exposure to asbestos dust has ceased.

ASBESTOS; PLEURAL PLAQUES; LUNG; HUMAN; ASBESTOSIS

<57>
Maroudas, N.G.; O'Neill, C.H,; Stanton, M.F., Fibroblast anchorage in carcinogenesis by fibres., Lancet, 1(1807): 807-809 (1973).

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

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

<58>
McDonald, A.D.; Wagner, D.; Eyssen, G., Primary malignant mesothelial tumors in Canada., Cancer, 31(4): 869-876 (1973).

Pathological reviews of 119 cases reported as primary malignant mesothelial tumors 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 clinocopathologic 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.

ASBESTOS; OCCUPATIONAL EXPOSURE; MESOTHELIOMA; CANCER; TUMOR

<59>
Morgenroth, K., Cellular reaction in the human lung caused by inhalation of asbestos dust over long periods., Beitr. Path. Bd., 148: 199-210 (1973).

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 phagocytized by alveolar macrophages and deposited in cytoplasmic phagosomes. Larger particles, coated or uncoated, locate in the alveoli and in the connective tissue septa.

LUNG; ASBESTOS; PHAGOCYTOSIS; INHALATION; HUMAN

<60>
Murphy, R.L.H., Chest auscultation in the diagnosis of pulmonary asbestosis., J. Occup. Med., 15(3): 272-276 (1973).

Pipe coverers employed in a New England shipyard, along with an equal number of controls, were examined for respiratory disease. The initial examination included: medical history, respiratory disease questionnaire, physical examination of the chest, chest roentgenography, and ventilatory studies. Rales were more common in the pipe coverers - both in total numbers and in the number of positive sites per person.

FIBROSIS; LUNG; DYSPNEA; FINGER CLUBBING; ASBESTOSIS; X-RAY; OCCUPATIONAL EXPOSURE; SHIPYARDS; PIPE COVERERS; HUMAN

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<61>
Myers, J.L., Osha standards and the safe use of asbestos., Technical Papers, pp. 28-35 (1973).

Most of the news media treatment of the asbestos problem has been distorted with failure to place asbestos toxicity into a logical perspective. Asbestos can cause disabling lung disease as do many other foreign bodies. Asbestos inhalation is statistically related to an excess occurrence of asbestosis and bronchogenic carcinoma in cases of long term exposure. There is some evidence to suggest a co-carcinogenic relationship between asbestos and cigarette smoking. Although the general public is in no danger from asbestos fibers in the urban air there is evidence that crocidolite and amosite industrial air emissions should be more strictly controlled than chrysotile; the evidence linking development of mesotheliomas from exposure to these two asbestos forms is statistically strong. Approximately 200,000 employees are under health risk in the asbestos industries (insulation, shipbuilding, construction, etc.). A new standard for exposure to asbestos dust was published in the Federal Register v. 37(110) Wed. June 7, 1972. The basic exposure standard is an 8 hr (TWA) limit of 5 fibers longer than 5 micrometers/cc of air; this fiber limit will be reduced to 2 on July 1, 1976. A peak concentration of 10 fibers/cc is not to be exceeded. All places of employment where asbestos fibers are released were to be monitored within 6 months. Caution labels are required on products containing asbestos except as modified by bonding agents or other agents to prevent dusting. There is little information available on the release of respirable asbestos from brake linings, however, a PHS study showed that less than 1% remains as free fiber after wearing. Most of the 40-50% used in linings is thermally converted to a non-toxic material, fosterite. Asbestos also is used in reinforcing, heat stabilization and flow control in the plastics industry.

STANDARDS; ASBESTOS; LUNG; ASBESTOSIS; CARCINOMA; SMOKING; INHALATION; CHRYSOTILE; CROCIDOLITE; AMOSITE; ANTHOPHYLLITE; TREMOLITE; ACTINOLITE

<62>
Navratil, M.; Doblas, J., Development of pleural hyalinosis in long term studies of persons exposed to asbestos dust., Environ. Res., 6: 455-472 (1973).

Among 50 asbestos workers having signs of pleural hyalinosis, 25 had asbestosis with a mean exposure time of 22.4 years and mortality rate of 40%. Bronchogenic carcinoma was the main cause of death. Pleural hyalinosis developed in 2 stages: (1) hyalinosis simplex, involving progressive calcification of the pleura and (2) hyalinosis complicata with acute exudative pachypleuritic reaction. Two cases of mesothelioma occurred in the complicated hyalinosis stage.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; CARCINOMA; CANCER; MESOTHELIOMA; LUNG; HUMAN

<63>
Newhouse, M.L., Asbestos in the work place and the community., Ann. Occup. 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; CHRYSOTILE; CROCIDOLITE; AMOSITE; ANTHOPHYLLITE; FIBROSIS; MESOTHELIOMA; CARCINOMA; CANCER; NON-OCCUPATIONAL EXPOSURE

<64>
Otto, H., The risk of asbestosis from a pathological-anatomical viewpoint., Staub Reinhalt. Luft, 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 mild asbestosis and cancer risk.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; CANCER; FIBROSIS; DIAGNOSIS

<65>
Pontefract, R.D.; Cunningham, H.M., Penetration of asbestos through the digestive tract of rats., Nature, 243 (5406): 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 omentum which surrounds the small intestine accumulated the most asbestos.

ASBESTOS; TISSUE DISTRIBUTION; BIOLOGICAL ELIMINATION; RAT

<66>
Pooley, F.D., Asbestos fiber in the lung and mesothelioma: A re-examination of the malmo 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 82% 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

<67>
Richards, R.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 mat collagen and altered ratios of hyaluronic acid/chondroitan sulfate in the culture medium. Control cells exhibited a slight transitory fibrogenic response.

CHRYSOTILE; CELL CULTURE; FIBROSIS; LUNG; RABBIT; FIBROBLAST

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<68>

<68>
Roy-Chowdhury, A.K.; Mooney, T.F. Jr.; Reeves, A.L., Trace metals in asbestos carcinogenesis., Arch. Environ. Health, 26(5): 253-255 (1973).

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 chamber dissemination.

TRACE METALS; AMOSITE; CROCIDOLITE; CHRYSOTILE; CANCER; MESOTHELIOMA; ASBESTOS; CHEMICAL COMPOSITION

<69>
Sanders, C.L., Cocarcinogenesis of 239PuO2 with chrysotile asbestos or benzpyrene in the rat abdominal cavity., Radionuclide Carcinogenesis, United States Atomic Energy Commission Symposium Series; C.L. Sanders, R.H. Busch, J.E. Ballou, and D.D. Mahlum (Editors). U.S. Atomic Energy Commission, Oak Ridge, TN., 29: 139-153 (1973).

Rats were injected i.p. with 239PuO2 at several doses and with combinations of 239PuO2 with 3,4-benzypyrene (BP) or chrysotile asbestos. Both abdominal sarcomas and mesotheliomas were induced by 239PuO2 or asbestos. Mesotheliomas were not found in rats given BP only. Asbestos and 239PuO2 acted synergistically in inducing mesotheliomas; the combination of BP and 239PuO2 increased the incidence of abdominal sarcomas.

CHRYSOTILE; CO-CARCINOGEN; ASBESTOS; LUNG; SARCOMA; MESOTHELIOMA; TUMOR; RAT; CANCER

<70>
Scheuer, E.; Huth, F.; Pott, F., Investigations concerning morphology of tumors induced in rats by i.p. injection of asbestos dusts., Arch. Geschwulstforsch., 41(2): 120-136 (1973).

Amosite, anthophyllite, chrysotile A, or crocidolite asbestos induced extended, generally multicentric and malignant abdominal tumors in 215 of the 420 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.

AMOSITE; ANTHOPHYLLITE; CHRYSOTILE; CROCIDOLITE; CANCER; TUMOR; SARCOMA; RAT

<71>
Schmidt, A.M., Asbestos particles in food and drugs., Fed. Regist., 38(188): 27076-27081 (1973).

The Commissioner of Food and Drugs has received a petition requesting promulgation of regulations under the Federal Food, Drug and Cosmetic Act to ban the use of asbestos filters for processing foods and drugs; to prohibit the use of asbestos-contaminated talc in drugs or drug components; and to establish a zero tolerance for asbestos particles in talc that is used as a food additive. The Commissioner proposed precautions to reduce the quantity of asbestos in food and drugs to the minimum feasible level.

ASBESTOS FILTERS; ASBESTOS; STANDARDS; DRUG CONTAMINATION; FOOD CONTAMINATION

<72>
Sethi, S.; Hilscher, W.; Plasbeck, R., Tissue response to a single intraperitoneal injection of various substances in rats., Zentralbl. Bakteriol. Parasitenk., 157 (2-3): 131-148 (1973).

Intraperitoneal injection of crocidolite asbestos in rats produced an early fibrogenic tissue reaction in the omentum within 8 days and produced foamy cells in the lymph nodes.

CROCIDOLITE; FIBROGENIC TISSUE RESPONSE; RAT; ASBESTOS

<73>
Shin, M.L.; Firminger, H.I., Acute and chronic effects of intraperitoneal injection of two types of asbestos in rats with a study of the histopathogenesis and ultrastructure of resulting mesotheliomas., Amer. J. Pathol., 70(3): 291-314 (1973).

Malignant mesotheliomas were induced in the peritoneum of Wistar rats following a single intraperitoneal injection of 50 mg of chrysotile or crocidolite fibers. Approximately 80% of the rats died of acute peritonitis within 8 days. Morphology and histology were examined using electron microscopy.

MESOTHELIOMA; CHRYSOTILE; CROCIDOLITE; ASBESTOS; GRANULOMA; CANCER; RAT; PERITONEUM

<74>
Shride, A.E., Asbestos., United States Mineral Resources, D.A. Brabst and W.P. Pratt (Editors). Geological Survey Professional Paper 820, United States Government Printing Office, Washington, D.C., N74-15222: 63-73 (1973).

The United States is the world's principal fabricator and consumer of asbestos products and imports 85% of the needed raw asbestos. Chrysotile asbestos constitutes 93%, crocidolite 3 1/2%, and amosite 2 1/2% of world asbestos trade. Anthophyllite, tremolite, and actinolite comprise less than 1% of the total. Domestic sources of anthophyllite and tremolite apparently are adequate for U.S. needs.

ASBESTOS; CHRYSOTILE; CROCIDOLITE; AMOSITE; ANTHOPHYLLITE; TREMOLITE; ACTINOLITE

<75>
Stell, P.M.; McGill, T., Asbestos and laryngeal carcinoma., Lancet, 2: 416-417 (1973).

Thirty-one out of 100 male patients with squamous carcinoma of the larynx experienced previous occupational exposure to asbestos, compared with 3 of 100 control patients having nonmalignant diseases. For asbestos workers, the average duration of exposure was 27 years; the latent period between first exposure and the development of laryngeal cancer ranged from 1 to 54 years. Maximum incidence in asbestos workers occurred in the 51 to 60 age group whereas the maximum incidence of unexposed individuals resided in the 61 to 70 age group. The patients' smoking habits were similar, irrespective of their exposure to asbestos.

ASBESTOS; OCCUPATIONAL EXPOSURE; CANCER; CARCINOMA; HUMAN

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<76>

<76>
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

<77>
Suzuki, Y.; Kannerstein, M.; Churg, J., Ultrastructure of human mesothelioma., Amer. J. Pathol., 70(2): 7A (1973) Abstract No. 12.

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

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

<78>
Taskinen, E.; Ahlman, K.; Wiikeri, M., 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 molder -- employed for 41 years in iron foundries -- showed heavy mixed-dust pneumoconiosis. Black linear streaks in the parietal pleura were microscopically interpreted as periarterial lymphangitis 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 causing pleural plagues may be transported by the same mechanism.

PNEUMOCONIOSIS; FIBROSIS; ASBESTOS; PLEURAL PLAQUES; EMPHYSEMA; LUNG; SILICOSIS; HUMAN

<79>
Viswanathan, P.N.; Anand, M.; Rahman, Q.; Beg, M.U.; Zaidi, S.H., Biochemical changes in serum of guinea pigs in experimental asbestosis., Chemosphere, 3: 119-124 (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 concomittantly. The alkaline and acid phosphatase, glutamic-oxaloacetic transaminase, and glutamic-pyruvic transaminase activities were not altered significantly.

AMOSITE; BIOCHEMICAL EFFECTS; GUINEA PIG

<80>
Viswanathan, P.N.; Dogra, R.K.S.; Shanker, R.; Zaidi, S.H., 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 30u 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 with stray collagen 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

<81>
Viswanathan, P.N.; Rahman, Q.; Beg, M.U.; Zaidi, S.H., Pulmonary lysosomal enzymes in experimental asbestosis in guinea pigs., Environ. Physiol. Biochem., 3: 120-126 (1973).

Amosite fibers (below 30u 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 catalase. Intratracheal injection of amosite which initiated phagocytosis in the lung of guinea pigs also initiated a gradual release of lysosomal enzymes from their latent state. As asbestotic lesions progressed, hydrolytic enzymes became capable of degrading DNA and RNA and proteins. Acid phosphatase possibly deprived cells of vital phosphate esters, thereby hampering metabolism. The membraneous structures of pulmonary cells excluding lysosomes also were affected by asbestosis. 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

<82>
Wagner, J.C.; Berry, G.; Timbrell, V., Mesotheliomata in rats after inoculation with asbestos and other materials., Brit. J. Cancer, 28: 173-185 (1973).

Wistar rats inoculated intrapleurally with various types and doses of asbestos exhibited high incidence of mesothelioma 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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<83>
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 (Crocidolite)- 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.

MESOTHELIOMA; ASBESTOS; AMOSITE; BLUE ASBESTOS; ASBESTOSIS; CARCINOMA; CROCIDOLITE; CHRYSOTILE; PNEUMOCONIOSIS; ASBESTOS MINING; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

<84>
Wegman, D.H.; Theriault, G.P.; Peters, J.M., Worker-sponsored survey for asbestosis., Arch. Environ. Health, 27: 105-109 (1973).

Fifty-seven workers in a wall board manufacturing operation were examined by questionnaire, pulmonary function tests, and limited physical examinations. Statistically excessive pulmonary disease surfaced in this population. The prevalent respiratory syndrome diagnosis was compatible with asbestosis and directly related to duration of asbestos exposure. No evidence occurred to implicate smoking or other external environmental factors.

ASBESTOSIS; ASBESTOS; OCCUPATIONAL EXPOSURE; RESPIRATORY DISEASE; HUMAN

<85>
Weill, H.; Waggenspack, C.; Bailey, W.; Ziskind, M.; Possiter, C.E., Radiographic and physiologic patterns among workers engaged in manufacture of asbestos cement products: a preliminary report., J. Occup. Med., 15(3): 248-252 (1973).

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 volumn and reduced pulmonary diffusing capacity than those with rounded opacties. 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

<86>
Witt, L., "Each glass is another moment of truth"., Today's Health, 51(10): 44-49 (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

<87>
Zaidi, S.H.; Shanker, R.; Dogra, R.K.S., Experimental infective pneumoconiosis: effect of asbestos dust and CANDIDA ALBICANS 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 ALBICANS, a facultative pathogen commonly found in the human respiratory tract. Combined intratracheal inoculation with amosite and C. ALBICANS produced extensive collagenous fibrosis at 330 days. Amosite dust alone induced reticular fibrosis and moderate interstitial fibrosis. The C. ALBICANS infection alone initially caused acute inflammatory reaction which declined to normal within 330 days.

AMOSITE; FIBROSIS; MONKEY

<88>
Zeedijk, H.B., Investigation of asbestos bodies and asbestos fibers found in the lungs of a mesothelioma patient by electron microscopy., Mikrochim. Acta, 6: 977-988 (1973).

Electron microscopic examination of lungs from a mesothelioma patient showed the presence of normal asbestos bodies with amphibole - asbestos fibers as kernals. The free asbestos fibers mainly were crysotile asbestos.

CHRYSOTILE; ASBESTOS BODIES; MESOTHELIOMA; HUMAN

<89>
Aaronson, 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, Galt Instant Papier Mache, contained no detectable asbestos.

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

<90>
Adelman, H.; Berkson, P.; Sackler, J.P., Partial intestinal obstruction due to peritoneal mesothelioma in chronic asbestos exposure., N.Y. State J. Med., 72(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 tumefaction and/or obstruction of varying degrees.

ASBESTOS; OCCUPATIONAL EXPOSURE; INSULATION WORKERS; MESOTHELIOMA; PLEURAL CALCIFICATION; ASBESTOSIS; HUMAN; PERITONEUM; DIAGNOSIS

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<91>
Anonymous, Mainly good news about asbestos., Food Cosmet. Toxicol., 10:574-577 (1972).

Health hazards of asbestos can be minimized by maintaining stringent safety precautions. Safety aspects of working with asbestos are discussed as are asbestos bodies, mesothelioma, mechanism of pathological action, and asbestos in the diet.

ASBESTOS; ASBESTOSIS; CANCER; FOOD CONTAMINATION; GRANULOMA; HUMAN; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; TUMOR; ASBESTOS BODIES; GASTROINTESTINAL

<92>
Anonymous, Part 191 - Hazardous substances: Definitions and procedural and interpretative regulations., Fed. Regist., 37(144): 14872-14873 (1972).

The FDA regulation banning all asbestos-containing garments was ammended so that garments necessary for personal protection against thermal injuries and constructed so that asbestos fibers will not become airborne would be excluded. The legality of the order is discussed.

ASBESTOS; CANCER; FIBROSIS; MESOTHELIOMA; STANDARDS

<93>
Anonymous, Ban of asbestos fibers for clothing proposed after FDA study of hazards., FDA Papers, 6(1): 32 (1972).

A regulation proposed by the FDA bans the use of asbestos fibers in cloth used for general purpose garments; its use would be permitted for garments intended for firefighting purposes. A simulated wearer test of a women's coat (manufactured from fabric containing 8% asbestos) was conducted by the National Institute for Occupational Saftey and Health; the results were evaluated by a committee of experts on asbestos hazards who concluded that no real danger existed but that future use of asbestos in garments for the general public was undesirable.

ASBESTOS; STANDARDS; INHALATION; NON-OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION

<94>
Beck, E.G.; Holt, P.F.; Manojlovic, N., Comparison of effects on macrophage cultures of glass fibre, glass powder, and chrysotile asbestos., Brit. J. Ind. Med., 29(3): 280-286 (1972).

Guinea pig alveolar and peritoneal macrophages were exposed to either glass fibre, glass powder, or chrysotile asbestos in vitro. Two basic effects were produced by dusts: (1) a toxic effect which alters metabolic rates, and (2) increased cell membrane permeability.

CHRYSOTILE; GUINEA PIG; MACROPHAGE; PHAGOCYTOSIS

<95>
Becklake, M.R.; Fournier-Massey, G.G.; Rossiter, C.E.; 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

<96>
Berry, G.; Newhouse, M.L.; Turok, M.E., Combined effect of asbestos exposure and smoking on mortality from lung cancer in factory workers., Lancet, 2(7775): 476-479 (1972).

The smoking habits and lung cancer mortality rates of 1300 male and 480 female asbestos factory workers were examined over a ten year period. Factory workers who smoked and were heavily exposed to asbestos had a significantly higher incidence of death from lung cancer than expected. Increased mortality did not result in workers with low to moderate exposure.

ASBESTOS; LUNG; CANCER; TUMOR; CARCINOMA; OCCUPATIONAL EXPOSURE; CANCER MORTALITY

<97>
Boiteau, H.L.; Robin, M.; Gelot, S., Polycyclic hydrocarbons in various materials containing asbestos., Arch. Mal. Prof. Med. Trav. Secur. Sociale, 33(6): 271-286 (1972).

Several hypotheses are presented to explain the carcinogenic potentialities of asbestos. Analyses of 12 chrysotile-containing materials revealed that a third of the samples contained three carcinogenic compounds - benzo(a)pyrene, benzo(a)anthracene, and dibenzo(a,h)anthrance. Since unprocessed chrysotile contains no polycyclic hydrocarbons, these contaminants probably attach during transport and industrial treatment. Asbestos fibers naturally contain nickel and chromium, two trace metals which inhibit benzopyrene-hydroxylase in the lungs and thus retard the metabolic degradation of the carcinogenic hydrocarbons.

ANALYSIS; ASBESTOS; CHRYSOTILE; CO-CARCINOGEN; TRACE METALS

<98>
Botham, S.K.; Holt, P.F., The effects of inhaled crocidolites from Transvaal and North-west Cape mines on the lungs of rats and guinea pigs., Brit. J. Exp. Pathol., 53(6): 612-620 (1972).

Guinea pigs and rats were exposed for 400 hours to an atmosphere containing a high concentration of Northwest Cape crocidolite fibers. Another group of guinea pigs was equally exposed to Transvaal crocidolite. Alveolar space was reduced in all the lungs due to cellular proliferation of the septa. In guinea pigs, giant cells were common with development of asbestos bodies, whereas in rats giant cells were rare and only a few atypical asbestos bodies were seen. Northwest Cape crocidolite produced greater disruption of the respiratory surfaces.

CROCIDOLITE; GUINEA PIG; INHALATION; LUNG; ASBESTOS BODIES; RAT

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Boucot, K.R.; Weiss, W.; Seidman, H.; Carnaham, W.J.; Cooper, D.A., The Philadelphia Pulmonary Neoplasm Research Project: Basic risk factors of lung cancer in older men., Amer. J. Epidemiol., 95(1): 4-16 (1972).

A 10-year study focusing on the basic risk factors of lung cancer in older men revealed that 121 new lung cancers developed among 6136 men aged 45 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; NEOPLASM; SMOKING; HUMAN

<100>
British Thoracic and Tuberculosis Association; Medical Research Council Pneumoconiosis Unit., A survey of pleural thickening: its relation to asbestos exposure and previous pleural disease., Environ. Res., 5(2): 142-151 (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; PLEURAL PLAQUES; X-RAY

<101>
Burilkov, 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; PLEURAL CALCIFICATION; TREMOLITE; HUMAN; NON-OCCUPATIONAL EXPOSURE

<102>
Corrin, B.; Price, A.B., Electron microscopic studies in desquamative interstital pneumonia associated with asbestos., Thorax, 27(3): 324-331 (1972).

Electron miscroscopic 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

<103>
Elder, J.L., A study of 16 cases of pleurisy with effusions in ex-miners from Wittenoom Gorge., Aust. N.Z. J. Med., 2(1-4): 328-329 (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 mesothelioma 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 at the time of the first effusion. Thirteen of the 16 cases of pleurisy were attributed to asbestos exposure.

ASBESTOS; CANCER; PLEURAL PLAQUES; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; CROCIDOLITE; ASBESTOS MINING; HUMAN

<104>
Engelbrecht, F.M.; Thiart, B.P., The effect of small amounts of aluminum, carbon and carborundum on the development of silicosis and asbestosis., S. Afr. Med. J., 46(16): 462-464 (1972).

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

CROCIDOLITE; LUNG; RAT; RESPIRATORY DISEASE

<105>
Finkelberg, F.I.; Genina, O.D.; Savvaitova, N.I., 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 143 patients and workers exposed to several silicate dusts including asbestos, clay, and chamotte. Pneumoconiosis is produced by clay and chamotte 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

<106>
Ford, J.E., The effect of pulmonary macrophage suppression in developing asbestosis., Dissertation Absts. Intern., (B): 32 (1972).

Rabbits were exposed to either chrysotile, amosite, or crocidolite asbestos dust at a dose of 50 mg/Cu m for 4 days/week/4 hours/day for 1 year. One half also received the immunosuppressant drug "Imuran" brand Azathioprine 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 no significant role in protection against development of asbestosis. No observable differences were found between the two groups upon pathological examination.

ASBESTOSIS; ASBESTOS; MACROPHAGE; INHALATION

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<107>
Gibbs, G.W.; LaChance, M., Dust exposure in the chrysotile asbestos mines and mills of Quebec., Arch. Environ. Health, 24: 189-197 (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

<108>
Goff, A.M.; Gaensler, E.A., Asbestosis following brief exposure in cigarette filter manufacture., Respiration, 29(1): 83-93 (1972).

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 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; FIBROSIS; VENTILATORY DEFECTS; HUMAN

<109>
Governa, M.; Rosanda, C., A histochemical study of the asbestos body coating., Brit. J. Ind. Med., 29(3): 158-159 (1972).

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

<110>
Governa, M.; Vadala, C.R., Histochemical demonstration of hematoidin in the innermost layers of human asbestos body coating., Int. Arch. Arbeitsmed., 30: 273-282 (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 forms when hyaluronic acid is laid around the first layer and other ferric iron particles impregnate the hyaluronic acid molecules.

ASBESTOSIS; ASBESTOS BODIES; HUMAN; LUNG

<111>
Grundy, G.W.; Miller, R.W., Malignant mesothelioma in childhood: Report of 13 cases., Cancer, 30(5): 1216-1218 (1972).

Thirty-one cases of mesothelioma were recorded in 42,597 death certificates of children who died of cancer in the U.S. from 1960 - 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; MESOTHELIOMA; LUNG; TUMOR; HUMAN; NON-OCCUPATIONAL EXPOSURE

<112>
Harries, P.G.; Mackenzie, F.A.F.; Sheers, G.; Kemp, J.H.; Oliver, T.P.; Wright, D.S., Radiological survey of men exposed to asbestos in naval dockyards., Brit. J. Ind. Med., 29(31): 278-279 (1972).

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 freguently than parenchymal disease. At Devonport Dockyard 37 men have developed mesothelioma since 1965. There was no evidence that smoking increased the incidence of asbestos abnormalities.

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

<113>
Holmes, S., Safe use of asbestos plastics., Composites, 3(2): 60-61 (1972).

The 1969 Asbestos Regulations are summarized. Particularly emphasized is 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; CHRYSOTILE; AMOSITE; ANTHOPHYLLITE; CROCIDOLITE; STANDARDS

<114>
Jacobson, G.; Gilson, J.C., Present status of the UICC/Cincinnati Classification of radiographic appearances of the pneumoconioses: Report of meeting held at Pneumoconiosis Research Unit, Cardiff, Wales, April 13-15, 1971., Ann. N.Y. Acad. Sci., 200: 552-569 (1972).

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 presently recommendations for combining the ILO 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

<115>
Kannerstein, M.; Churg, J., Pathology of carcinoma of the lung associated with asbestos exposure., Cancer, 30(1): 14-21 (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

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<116>

<116>
Kogan, F.M.; Gusel'nikova, N.A.; Gulevskaya, M.P., 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 is 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 than in women with no occupational exposure to asbestos.

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

<117>
McDonald, J.C.; Becklake, M.R.; Fournier-Massey, G.G.; Rossiter, C.E., Respiratory symptoms in chrysotile asbestos mine and mill workers of Quebec., Arch. Environ. Health, 24: 358-363 (1972).

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

CHRYSOTILE; OCCUPATIONAL EXPOSURE; SMOKING; RESPIRATORY DISEASE; HUMAN

<118>
Miller, K.; Harington, 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; AMOSITE; ASBESTOS; MACROPHAGE; HAMSTER

<119>
Murphy, R.L.H.; Gaensler, E.A.; Redding, R.A.; Belleau, R.; Keelan, P.J.; Smith, A.A.; Goff, A.M.; Ferris, B.G., Low exposure to asbestos., Arch. Environ. Health, 25: 253-264 (1972).

A follow-up survey on New England shipyard pipe coverers focused on asbestos-induced physiologic abnormalities. Compared to controls, the pipe coverers exhibited significantly reduced vital capacity (FVC) as well as reduced single breath (DLSB) and exercise steady state diffusing capacity (DLSS-R). 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; EMPHYSEMA; X-RAY; SHIPYARDS; PIPE COVERERS; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS

<120>
Navratil, M.; Trippe, E., 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, family, 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

<121>
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: 134-141 (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 lung 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; MESOTHELIOMA; TUMOR; CANCER MORTALITY; SMOKING; LUNG; PLEURA; RESPIRATORY DISEASE; HUMAN

<122>
Nicholson, W.J.; Maggiore, C.J.; Selikoff, I.J., Asbestos contamination of parenteral drugs., Science, 177: 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 routes of adminstration 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

<123>
Nurminen, 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 1968. The minimum exposure to asbestos was three months.

ANTHOPHYLLITE; OCCUPATIONAL EXPOSURE; ASBESTOSIS; CANCER; LUNG; HUMAN; RESPIRATORY DISEASE

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<124>
Orfila, J.; Lepinay, A.; Vasseur, M.; Bouffant, L.L.; Martin, J.C.; Daniel-Moussard, H., Effect of quartz, coal, titanium oxide, and asbestos dusts on experimental CHLAMYDIA PSITTACI infection in mice., Compt. Rend., Ser. D (Paris), 274(9): 1430-1437 (1972).

When injected into mice, the infectious agent CHLAMYDIA PSITTACI, induces ornithosis; this was aggravated by pretreatment of the animals with i.p. injections of agueous suspensions containing 20 mg chrysotile, coal, quartz or titanium oxide.

ASBESTOS; MOUSE; CHRYSOTILE

<125>
Ose, H.; Bittersohl, G., On the epidemiology of asbestosis of the pleura., Z. Erkr. Atmungsorgane, 136(2): 165-178 (1972).

In Hereburg, East Germany, pleural plagues 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; 45% experienced indirect exposure. The mean latent period was 20 to 30 years.

ASBESTOS; HUMAN; PLEURAL PLAQUES; OCCUPATIONAL EXPOSURE

<126>
Pooley, F.D., Asbestos bodies, their formation, composition and character., Environ. Res., 5: 363-379 (1972).

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 um. Asbestos bodies were found to contain a major crystalline component structurally similar to extracts of ferritin (produced from animal and human organs).

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

<127>
Pott, F.; Huth, F.; Friedrichs, K.H., Tumors of rats after i.p. injection of powdered chrysotile and benzo(a)pyrene., Zentrabl. Bakteriol. Parasitenk, 155(5-6): 463-469 (1972).

Tumor incidence in rats was about 40% after intraperitoneal injection of either 100 mg U.I.C.C.--a standard chrysotile (fiber length is less than 5 um)--or 100 mg of powdered chrysotile (fiber length is less than 3 um). However, the latent period between exposure and tumor development was longer with powdered chrysotile. Addition of 1.25 mg 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

<128>
Rajan, K.T.; Wagner, J.C.; Evans, P.H., The response of human pleura in organ culture to asbestos., Nature, 238(5363): 346-347 (1972).

Human parietal pleurae 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; MESOTHELIOMA; BLUE ASBESTOS; ORGAN CULTURE; HUMAN

<129>
Reitze, W.R.; Nicholson, W.J.; Holaday, D.A.; Selikoff, I.J., Application of sprayed inorganic fiber containing 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 spraying area and 45 fibers/cc at seventy-five feet away. Consequently, nearby workers are exposed indirectly to asbestos.

OCCUPATIONAL EXPOSURE; ASBESTOSIS; INSULATION WORKERS; ASBESTOS

<130>
Robinson, J., Pleural plagues 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

<131>
Rossiter, C.E., Evidence of dose-response relation in pneumoconiosis (1)., 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 coalminers 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; ASBESTOS MINING; CHRYSOTILE; HUMAN; DIAGNOSIS; FIBROSIS; PNEUMOCONIOSIS; X-RAY

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<132>

<132>
Ruttner, J.R.; Spycher, M.A.; Sticher, H., Diffuse 'asbestosis-like' interstitial fibrosis of the lung., Pathol. Microbiol., 38(4): 250-257 (1972).

Comprehensive chemical, mineralogical, and electron microscopical analyses of lung dust from a case of diffuse pulmonary fibrosis which morphologically resembled asbestosis 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

<133>
Sanders, C.L., Production of abdominal mesotheliomas in rats with Pu 239 and chrysotile asbestos., Health Phys., 23(3): 418 Abstract P/71 (1972).

Mesotheliomas and sarcomas were induced in rats by the intra-abdominal injection of plutonium-239, chrysotile asbestos, or the combination of both. The incidence of mesotheliomas in rats given 15 mg chrysotile was 17%; in conjunction with Pu 239 (720 nCi), the incidence increased to 43%. Asbestos appears to act in a synergistically with Pu 239, and the pathogenesis of the mesotheliomas is similar to that seen with Pu 239 alone. Survival rate was significantly reduced in rats given both asbestos and Pu 239.

ASBESTOS; CHRYSOTILE; MESOTHELIOMA; SARCOMA; RAT

<134>
Schneider, T., Asbestos dust levels during work with cloths made from liquid dispersed chrysotile., Ann. Occup. Hyg., 15: 425-426 (1972).

Chrysotile asbestos fabrics manufactured by a liquid dispersion method produce considerably less dust during handling than does conventional asbestos cloth. Using these cloths, much less dust was generated while manufacturing mattresses and pipe insulation.

ASBESTOS; CHRYSOTILE; DUST CONTROLS; OCCUPATIONAL EXPOSURE; HUMAN

<135>
Schnitzer, R.J.; Bunescu, G.; Baden, V., Interactions of mineral fiber surfaces with cells in vitro., Ann. N.Y. 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 ethylenediaminetetracetic 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 polyanions inhibited the activity of amosite and crocidolite.

CHRYSOTILE; ANTHOPHYLLITE; AMOSITE; CROCIDOLITE; ASBESTOS; CELL CULTURE; HUMAN; SHEEP; HORSE; CYTOTOXICITY

<136>
Suzuki, Y., Phagocytic activity of the alveolar epithelial cells in pulmonary asbestosis., Amer. J. Pathol., 3: 373-379 (1972).

Intratracheal 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 with length of exposure. The condition is accompanied by cell transformation into hypertrophic structures exhibiting properties of the macrophage, including the ability to convert asbestos fibers into asbestos bodies and to develop into multinucleated giant cells.

CHRYSOTILE; HAMSTER; PHAGOCYTOSIS; ASBESTOS BODIES; MACROPHAGE

<137>
Wagner, J.C.; Bogovski, P.; Higginson, J., The role of international research in occupational cancer., 63(5-6): 213-220 (1972).

During the last two decades, increasing interest in environmental problems has grown - especially with respect to asbestos-related cancer. Hazards associated with asbestos apparently were 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.

AMOSITE; ASBESTOS; CANCER; CHRYSOTILE; CROCIDOLITE; HUMAN; MESOTHELIOMA; NEOPLASIA; OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION

<138>
Allison, A.C., Effects of silica and asbestos on cells in culture., Inhaled Particles III: Proceedings of an International Symposium, (London, 1970). W.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England., pp. 437-445 (1971).

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 pyridinio-acetic acid. Asbestos, especially chrysotile, when added to macrophages or mesothelial cells in the absence of serum, lyses 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.

ASBESTOS; CHRYSOTILE; CELL CULTURE; MACROPHAGE; HEMOLYSIS; CYTOTOXICITY

<139>
Allison, A.C., Lysosomes 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; LYSOSOME

<140>
Anonymous, Asbestos (all forms)., Documentation of the Threshold Limit Values for Substances in Workroom Air. American Conference of Governmental Industrial Hygienists, Cincinatti, 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 5u) for asbestos.

ASBESTOS; STANDARDS; CHRYSOTILE; AMOSITE; CROCIDOLITE; TREMOLITE; ANTHOPHYLLITE; ACTINOLITE; PNEUMOCONIOSIS; ASBESTOSIS; OCCUPATIONAL EXPOSURE

<141>
Anonymous, Talc (non-asbestiform and fibrous)., Documentation of the Threshold Limit Values of Substances in Workroom 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 mppcf is recommended for non-fibrous talc; 5 fibers per milliliter of air for those exceeding 5 microns 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

<142>
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; NEOPLASM; HUMAN; MESOTHELIOMA; RAT; ASBESTOSIS; ASBESTOS BODIES; AMOSITE; CHRYSOTILE; CROCIDOLITE

<143>
Badr, F.M.; 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, silica 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 IgG, IgM, and IgA 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

<144>
Beck, E.G.; Bruch, J.; Friedrichs, K.H.; Hilscher, W.; Pott, F., 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 UICC 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. The permeability of cultured 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; ANTHOPHYLLITE; ASBESTOSIS; GRANULOMA; RAT; PHAGOCYTOSIS; CELL CULTURE; TISSUE DISTRIBUTION; ASBESTOS

<145>
Beck, E.G.; Holt, P.F.; Nasrallah, E.T., Effects of chrysotile and acid-treated chrysotile on macrophage cultures., Brit. J. Ind. Med., 28(2): 179-185 (1971).

Altered permeability of cell membranes by cytotoxic substances can be estimated several ways by cell culture techniques: eosin - y 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-y uptake and lactic dehydrogenase activity after 20 hrs; at the same time, however, there was an increase in lactic 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 membrane 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; CYTOTOXICITY

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<146>
Beritic, T.; Dimov, D.; Bunarevic, A.; Sondic, M.; Sirec, A., Asbestos and ferruginous bodies., Arh. Hig. Rada, 22(4): 317-322 (1971).

Ferruginous bodies were found in 18% of the lung smears taken from 450 necropsies. 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

<147>
Bey, E.; Harington, J.S., Cytotoxic effects of some mineral dusts on Syrian hamster peritoneal macrophages., J. Exp. Med., 133(5): 1149-1169 (1971).

Hamster peritoneal macrophage cell cultures were inoculated with various mineral dusts to study cytotoxic effects. Cells phagocytosing amosite and crocidolite showed no specific damaging effect; however, some loss of cells occured in the cultures within 3 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 with tryptose phosphate broth accelerated but did not increase the intensity of the cytotoxic effect. The results with silica dusts are discussed also.

ASBESTOS; CELL CULTURE; CYTOTOXICITY; HAMSTER; MACROPHAGE

<148>
Botham, S.K.; Holt, P.F., Asbestos-body formation in the lungs of rats and guinea-pigs after inhalation of anthophyllite., J. Pathol., 107: 245-252 (1971).

Rats and guinea pigs were exposed to Finnish anthophyllite in a dusting tunnel. Within a month after inhalation of anthophyllite some asbestos bodies developed in the guinea pig lungs but were rarely found in the rats, even after 18 months. In the rat, both the dust and the ferruginous material are removed by macrophages that seldom fuse, whereas in the guinea pig, formation of giant cells is common.

ANTHOPHYLLITE; INHALATION; RAT; GUINEA PIG; INHALATION; ASBESTOS BODIES; MACROPHAGE; LUNG

<149>
Bowden, 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

<150>
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.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England., 1: 209-225 (1971).

A lung washing technique was used to estimate the number of free cells (alveolar macrophages) produced in rats and hamsters by the intrapleural injection of coal dust, carbon, chrysotile, iron oxide, and barium 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 pentrating fixed lung tissue.

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

<151>
Brouet, G.; Bignon, J.; Bonnaud, G.; Goni, J., Effect on public health of air pollution with asbestos and other fibrous dust particles., Rev. Tuberc. (Paris), 35(5):461-478 (1971).

The role of asbestosis in the rising frequency of pleural and peritoneal mesothelioma and of broncho-pulmonary cancer is discussed in the light of published epidemologic 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 30 years, air pollution from these fibers may have become a problem for the population at large.

ASBESTOS; ASBESTOSIS; CANCER; MESOTHELIOMA; FIBROSIS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION

<152>
Browne, R.C., Health in power stations., Proc. Roy. Soc. Med., 64(10): 1075-1077 (1971).

One of the industrial health hazards in electrical power stations is the handling of asbestos insulation, or lagging. Recent changes in methods of removing old lagging have practically eliminated this problem.

OCCUPATIONAL EXPOSURE; ASBESTOS; INSULATION WORKERS

<153>
Bryks, S.; Bertalanffy, F.D., Cytodynamic reactivity of the mesothelium., Arch. Environ. Health, 23(66): 469-472 (1971).

The tritiated thymidine technique was used to examine the cytodynamic reactivity of the pleural mesothelium in rats following the intratracheal injection of synthetic or natural chrysotile. Within 5 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 thymidine 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; PLEURA

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<154>
Busser, E.; Dorschner, F.; Buhlmann, A.A., Early diagnosis of asbestosis., Schweiz. Med. Wochensch., 101: 1687-1692 (1971).

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 ashestos 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; X-RAY; VENTILATORY DEFECTS

<155>
Caves, P.K.; Jacques, J., Primary intrapulmonary neurogenic sarcoma with 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

<156>
Conning, D.M.; Hayes, M.J.; Styles, J.A.; Nicholas, J.A., Comparison between IN VITRO toxicity of dusts of certain polymers and minerals and their fibrogenicity., Inhaled Particles III: Proceedings of an International Symposium, (London, 1970). W.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England., pp. 449-506 (1971).

Cell culture and In Vivo studies of asbestos, polyurethane, polyethylene terephthalate (PEP) 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 cytotoxic dust, as indicated by the mortality incidence of cells which had phagocytosed dust particles. Ashestos 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.

RAT; CELL CULTURE; ASBESTOS; PHAGOCYTOSIS; CYTOTOXICITY

<157>
Cralley, L.J., Electromotive phenomenon in metal and mineral particulate exposures: relevance to exposure to asbestos and occurrence of cancer., Amer. Ind. Hyg. Assoc. J., 3232(10): 653-661 (1971).

Data and hypotheses presented relate the biological activity of asbestos to the electromotive interaction between trace metals and minerals associated with the fibers. The trace metals consist mainly of nickel, chromium, manganese, and iron. In lung tissue, the electromotive 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; HAMSTER; RAT; TRACE METALS

<158>
Cralley, L.J., Identification and control of asbestos exposures., Amer. Ind. Hyg. Assoc. J., 32(2): 82-85 (1971).

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

ASBESTOS; STANDARDS; ANALYSIS; OCCUPATIONAL EXPOSURE

<159>
Cralley, L.J.; Ayer, H.E.; Amoudru, C.; Gibbs, G.W.; Holmes, S.; Occella, E.; DuToit, R.S.J., Evaluation of asbestos exposures in the working environment. Recommendation of Sub-Committee on Asbestosis of the Permanent Commission and International Association on Occupational Health, Work, Environment, Health, 8(3): 71-73 (1971).

In an effort to simplify the comparison of asbestos exposure data from various countries and studies, the Sub-Committee on Asbestosis 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 5.0 u 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; AMOSITE; CROCIDOLITE; TRACE METALS; ENVIRONMENTAL SAMPLING

<160>
Cunningham, H.M.; Pontefract, R.D., Asbestos fibres in beverages and drinking water., Nature, 232:332-333 (1971).

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

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<161>

<161>
Davis, H.V.; Reeves, A.L., Collagen biosynthesis in rat lungs during exposure to asbestos., Amer. Ind. Hyg. Assoc. J., 32(9): 599-602 (1971).

The rate of collagen protein synthesis in animals is directly related to the rate of proline hydroxylation to form the amino acid hydroxyproline; proline hydroxylase catalizes this reaction. In rats receiving intratracheal or inhaled doses of amosite, crocidolite and chrysotile, the effects of asbestos on proline hydroxylase activity in lung tissue was measured as a hydroxyline: 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 was depressed in animals exposed by inhalation; the lungs of these animals had developed massive fibrotic lesions with heavily collagenized parenchyma.

ASBESTOS; RAT; FIBROSIS; COLLAGEN; LUNG; BIOCHEMICAL EFFECTS

<162>
Davis, J.M.G., The calcification of fibrous pleural lesions produced in guinea-pigs by the injection of chrysotile asbestos dust., Brit. J. Exp. Pathol., 52(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 collagenous 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 (30-40) 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, coated dust, and lamellar bodies in a solid mass of calcification.

CHRYSOTILE; ASBESTOS; GUINEA PIG; PLEURAL CALCIFICATION; FIBROSIS; GRANULOMA; GIANT CELL

<163>
Drysdale, R.S., Safety - asbestos., Occup. Health, 23(3): 97 (1971).

The aim of the Ashestos Regulations is to keep dust out of the air of work places by requiring safe methods of asbestos handling in all industries. Potentially, 140 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

<164>
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 IgA in 66% of the samples, of IgG in 63%, and of IgM in 50%. 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

<165>
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 is 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

<166>
Elmes, P.C.; Simpson, M.J.C., Insulation workers in Belfast. 3. Mortality 1940-66., Brit. J. Ind. Med., 28(3): 226-236 (1971).

The fate of 165 insulation workers in Belfast with known occupational exposure to asbestos is presented. Between 1940-1966 total deaths in this group was 98 compared to 37 normally expected; the increase became statistically significant after 1950. 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 high among insulation workers. Seven cases of mesothelioma were confirmed. The ratio of observed over expected deaths was 2.6 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; PIPE COVERERS; INSULATION WORKERS; SHIPYARDS; CANCER MORTALITY; GASTROINTESTINAL

<167>
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; CROCIDOLITE; FOOD CONTAMINATION

<168>
Ferris, B.G.; Ranadive, M.V.; Peters, J.M.; Murphy, R.L.H.; Burgess, W.A.; Pendergrass, H.P., Prevalence of chronic respiratory disease; asbestosis in ship repair workers., Arch. Environ. Health, 23(3): 220-255 (1971).

In a comparative study of shipyard workers, pipe fitters, pipe coverers, and welders, pipe coverers had more marked changes in their lungs. Pulmonary diffusing capcity was slightly lower, and calcifications and rales in two or more sites were significantly more common among pipe coverers. These findings reemphasize the need for continued control of exposure to asbestos and careful medical surveillance of workers.

PIPE COVERERS; LUNG; ASBESTOS; SMOKING; PLEURAL CALCIFICATION; OCCUPATIONAL EXPOSURE; SHIPYARDS; HUMAN

<169>
Finlayson, A.; McEwen, J.; Hair, A., Home interviews with relatives of deceased persons: A means of obtaining histories of exposure to a hazardous substance., Scot. Med. J., 16: 509-512 (1971).

Associations between development of mesothelioma and exposure to asbestos dust were investigated by questioning relatives of deceased persons. Compared to controls, patients who died of mesothelioma had significantly greater occupational exposure to asbestos.

HUMAN; MESOTHELIOMA; CANCER; OCCUPATIONAL EXPOSURE; ASBESTOS

<170>
Fletcher, D.E., Asbestos-related chest disease in joiners., Proc. Roy. Soc. Med., 64(8): 837-838 (1971).

In England a,223 sets of x-ray films from workers in a shipbuilding industry were examined and classified according to occupation and the incidence of pleural plaques noted. Calcified or noncalcified plaques were observed in 5.5% of the workmen over the age of 24; the incidence was 33% in joiners, 17.5% in laggers, 21% in caulkers, burners, and drillers, 13.8% in sheet metal workers, and 1.2 - 11.5% in other occupations. The results were attributed to varying asbestos exposure.

X-RAY; PLEURAL PLAQUES; ASBESTOS; HUMAN; LUNG; OCCUPATIONAL EXPOSURE; CANCER; MESOTHELIOMA; FIBROSIS; SHIPYARDS; INSULATION WORKERS; PLEURAL CALCIFICATION

<171>
Friedrichs, K.H., Preparation of asbestos fibres for animal experiments., Int. Arch. Arbeitsmed., 28: 62-70 (1971).

Asbestos fibers for use in animal experiments can be collected from dust samples in mines or factories, or can be prepared by cutting with a microtome from bundles; each method has advantages and disadvantages. A brief summary of the physical characteristics of different kinds of asbestos is given.

ASBESTOS; EXPERIMENTAL PREPARATION

<172>
Friedrichs, K.H.; Hilscher, W.; Sethi, S., Study of tissue reaction and fibers distribution in abdominal granulomas and lymph nodes of the rat following intraperitoneal administration of various amphiboles., Int. Arch. Arbeitsmed., 28: 341-354 (1971).

When administered intraperitoneally to Wistar rats, amosite, anthophyllite and crocidolite asbestos fibers were distributed in adominal 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 um and increases with decreasing fiber length.

AMPHIBOLE; ANTHOPHYLLITE; AMOSITE; ASBESTOS; CROCIDOLITE; FIBROSIS; GRANULOMA; RAT; TISSUE DISTRIBUTION

<173>
Gee, B.; Bouhuys, 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 harmless asbestos substitutes; and (4) improved monitoring of both the workers and their environment.

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

<174>
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). Unwin Brothers Limited, Gresham 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 fiber components and sources also influence disease patterns. Some of the qualitative aspects of asbestos chemistry include organic constituents, trace metals, processing and naturally occurring contaminants, radioactivity, and chemical and physical characteristics.

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

<175>
Gold, C., Asbestos in tumors., J. Clin. Pathol., 24: 481 (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 KOH extraction method is useful for separation of the dust for detailed morphological studies.

ASBESTOS; CANCER; TUMOR; MESOTHELIOMA; HUMAN; ANALYSIS; LUNG; CARCINOMA; PLEURA; PERITONEUM

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<176>

<176>
Gross, P.; Tuma, J.; DeTreville, R.T.P., Unusual ferruginous bodies - their formation from nonfibrous particulates and from carbonaceous fibrous particles., Arch. Environ. Health, 22(5): 534-537 (1971).

Lung 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

<177>
Harington, J.S.; Gilson, J.C.; Wagner, J.C., Asbestos and mesothelioma in man., Nature, 232: 54-55 (1971).

Occurrence of mesotheliomas in rats inoculated intrapleurally with two forms of asbestos was slightly greater for Cape crocidolite than for Transvaal amosite. Amosite apparently can produce tumors in the pleural cavity, but less readily than crocidolite and after a longer interval.

CROCIDOLITE; AMOSITE; RAT; CANCER; MESOTHELIOMA; TUMOR

<178>
Harington, J.S.; Miller, K.; MacNab, G., Hemolysis by asbestos., Environ. Res., 4: 95-117 (1971).

Chrysotile asbestos hemolyzed sheep erythrocytes (in vitro) within 10 min over a pH range of 4-11. Other asbestos forms caused varying degrees of hemolysis which related to the magnesium: silicon 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 preventive agent. Poly-2-vinylpyridine -1-oxide had little effect on hemolysis by chrysotile. Magnesium appeared to be the principal agent of hemolysis by asbestos.

CHRYSOTILE; AMOSITE; CROCIDOLITE; ACTINOLITE; HEMOLYSIS

<179>
Harries, P.G., A comparison of mass and fibre concentrations of asbestos dust in shipyard processes., Ann. Occup. Hyg., 14: 235-240 (1971).

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

<180>
Holmes, A.; Morgan, A.; Sandalls, F.J., Determination of iron, chromium, cobalt, nickel, and scandium in asbestos by neutron activation analysis., Amer. Ind. Hyg. Assoc. J., 32(5): 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; CHRYSOTILE; CROCIDOLITE; TRACE METALS; ANALYSIS

<181>
Hounam, R.F., The konimiser--a dispenser for the continuous generation of dust clouds from milligram quantities of asbestos., Ann. Occup. Hyg., 14: 329-335 (1971).

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

<182>
Hurlburt, J.F.; Schulson, M.G., Study of asbestos workers in British Columbia., Brit. Columbia Med. J., 13(3): 66-68 (1971).

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 plagues 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, 19 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; BRONCHITIS; CANCER; INSULATION WORKERS; PLEURAL PLAQUES; RESPIRATORY DISEASE; X-RAY; HUMAN

<183>
Janower, M.L.; Blennerhassett, J.B., Case records of the Massachusetts General Hospital., New Engl. J. Med., 284(14): 778-786 (1971).

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; FIBROSIS; LUNG; ASBESTOS BODIES

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<184>
Jodoin, G.; Gibbs, G.W.; Macklem, P.T.; McDonald, J.C.; Becklake, M.R., Early effects of asbestos exposure on lung function., Amer. Rev. Resp. Dis., 104: 525-535 (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 peribronchiolar rather than alveolar obstructive restriction.

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

<185>
Langer, A.M.; Baden, V.; Hammond, E.C.; Selikoff, I.J., Inorganic fibers, including chrysotile, in lungs at autopsy: preliminary report., Inhaled Particles III: Proceedings of an International Symposium (London, 1970). W.H. Walton (Editor). Unwin Brothers 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; CHRYSOTILE; HUMAN; ASBESTOSIS; ASBESTOS BODIES; ELECTRON MICROSCOPY; NON-OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION

<186>
Langer, A.M.; Selikoff, I.J., Chrysotile asbestos in lungs of residents of New York City., Proceedings of the Second International Clean Air Congress, H. M. Englund and W.T. Berry (Editors). Academic Press, New York 1971., pp. 161-165 (1971).

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

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

<187>
Langer, A.M.; Selikoff, I.J.; Sastre, 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; CHRYSOTILE; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE; HUMAN; LUNG; INHALATION; ASBESTOS BODIES; CHRYSOTILE; ASBESTOSIS

<188>
Langlands, J.H.M.; Wallace, W.F.M.; Simpson, M.J.C., Insulation workers in Belfast. 2. Morbidity in men still at work., Brit. J. Ind. Med., 28(3): 217-225 (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 age 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 pleural 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 rales 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

<189>
Lawther, P.J., Asbestos: some nonradiological aspects., Proc. Roy. Soc. Med., 64(8): 833-834 (1971).

A brief overview of asbestos and asbestos-related-diseases, asbestosis, cancer, and mesothelioma is presented. Although greatest 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; MESOTHELIOMA; ASBESTOSIS; CHRYSOTILE; WHITE ASBESTOS; FIBROSIS; ENVIRONMENTAL CONTAMINATION; GASTROINTESTINAL; PLEURA; LUNG

<190>
Lemonde, J.; Tremblay, A.; Massey, D.G., Asbestos and cancer growth., Clin. Res., 19(4): 797 (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

<191>
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.

CHRYSOTILE; ANALYSIS; SERPENTINE

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<192>
Lulenski, G.C., Rapid growth of a pleural mesothelioma, Chest, 59(2): 230-232 (1971).

A case report of a patient exposed to asbestos as an oil drum packer demonstrates the extremely rapid growth of a diffuse pleural mesothelioma. The disease was fatal three weeks from the onset of symptoms. However, chest roentgenograms taken three months prior to the onset of symptoms revealed no noticeable tumor.

ASBESTOS; HUMAN; OCCUPATIONAL EXPOSURE; X-RAY; MESOTHELIOMA

<193>
Lumley, K.P.S., Asbestos dust levels inside firefighting helmets with chrysotile asbestos 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 um 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/cm(3); old helmet with unlined asbestos cloth cover - 1.38 fibers/cm(3); helmet with aluminised asbestos cover - 0.0 fibers/cm(3). The fire protection provided outweighed the small risk from asbestos dust inhalation. Aluminised asbestos cloth covered helmets were recommended.

ASBESTOS; OCCUPATIONAL EXPOSURE; INHALATION; HUMAN

<194>
Lumley, K.P.S.; Harries, P.G.; O'Kelly, P.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 11.89 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

<195>
Luxon, S.G., 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 Kingdon, 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 attained 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

<196>
Mackenzie, P.A.P., The radiological investigation of the early manifestations of exposure to asbestos dust., Proc. Roy. Soc. Med., 64(8): 834-837 (1971).

Early signs of pulmonary fibrosis have been detected in 100 mm x-ray films of British shipyard workers. Radiological survey at Devonport Dockyard in 1970 showed 500 workers with evidence of asbestos pleural abnormalities and 35 cases of mesothelioma; 106 patients were receiving compensation for asbestosis.

ASBESTOS; ASBESTOSIS; MESOTHELIOMA; X-RAY; SHIPYARDS; OCCUPATIONAL EXPOSURE; PLEURAL PLAQUES

<197>
McCallum, R.I., 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 is 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

<198>
McDonald, J.C.; McDonald, A.D.; Gibbs, G.W.; Siemiatycki, J.; Rossiter, 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

<199>
Merliss, R.R., 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

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<200>
Merliss, R.R., Talc-treated rice and Japanese stomach cancer., Science, 173: 1141-1142 (1971).

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

<201>
Milne, J.E.H., Developmental changes in asbestos bodies and their significance., Trans. Soc. Occup. Med., 21(4): 118-121 (1971).

Inhaled fibers become coated with an iron-protein envelope and are called ferruginous bodies. 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 phagocytosis. Difficulty in recognizing these bodies, especially in later stages, may result in failure to establish a relationship between asbestos and mesothelioma.

ASBESTOS; ASBESTOS BODIES; FERRUGINOUS BODIES; ASBESTOSIS; HUMAN; MESOTHELIOMA; INHALATION

<202>
Morgan, A.; Holmes, A.; Gold, C., Studies of the solubility of constituents of chrysotile asbestos in vivo using radioactive tracer techniques., Environ. Res., 4: 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 intrapleurally in rats and traced to follow the dissolution of the trace metals and migration of asbestos. For chrysotiles in which cobalt substitutes magnesium in the brucite layer, the cumulative excretion of cobalt radioisotope was used as an index of magnesium dissolution; results showed that 25-35% of the structural magnesium in chrysotile dissolves in one month. Cobalt leached more rapidly than chromium which was detected in the liver and carcass at death. Leached iron was 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, diaphram and chest wall; however, in one case, a significant portion of the fibers had migrated to the liver via adjacent diaphramatic lesions.

ASBESTOS; CHRYSOTILE; TRACE METALS; TISSUE DISTRIBUTION; RAT

<203>
Mountain, J.T.; Dixon, J.R.; Lowe, A.E.; Moffitt, Jr.; Groth, D.H., 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

<204>
Murphy, R.L.H.; Ferris, B.G.; Burgess, W.A.; Worcester, J.; Gaensler, E.A., Clinical, environmental, radiologic and epidemiologic observations in shipyard pipe coverers and controls., New Engl. J. Med., 285(23): 1271-1278 (1971).

A high incidence of asbestosis (38% after 20 years exposure) was found in pipe coverers 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, asbestosis was 11 times more common among pipe coverers. Dust exposure had been near the recommended threshold-limit value of 5 mppcf. 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; PIPE COVERERS; OCCUPATIONAL EXPOSURE; SHIPYARDS; HUMAN

<205>
Navratil, M., Pleural calcifications due to asbestos exposure compared with relevant findings in the non-exposed population., Inhaled Particles III: Proceedings of an International Symposium. (London, 1970). W.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England, 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 24 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 activity, and higher levels of gamma globulin in calcification cases than in control.

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

<206>
Plavenac, P.; Pikula, B.; Kahvic, M.; Markovic, Z.; Selak, I.; Zeger-Vidovic, Z., Incidence of "asbestos" bodies in basal lung smear., Acta Med. Iugoslav., 25(4): 325-332 (1971).

In Sarajevo, Yugoslavia, four smears were made from the cut surface of the bases of the lower lobes of fresh unfixed lungs in each of 100 consecutive autopsies. Asbestos bodies were identified by optical microscopy and pseudoasbestos bodies were ignored. Smears from 38 of the 100 autopsies contained asbestos bodies, being positive in 52.7% of the males and 20% 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; FERRUGINOUS BODIES; LUNG; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE; HUMAN

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<207>

<207>
Reeves, A.L.; Puro, H.E.; Smith, R.G.; Vorwald, A.J., Experimental asbestos carcinogenesis., Environ. Res., 4(6): 496-511 (1971).

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 5 mesotheliomas in rats, and crocidolite caused 6 in rats and rabbits.

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

<208>
Regan, G.M.; Tagg, B.; Walford, J.; Thomson, M.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 aim 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 membrane diffusing capacity are the most important measures of lung disease. For discriminating between asbestosis and ventilatory disease, the forced expiratory volume/vital capacity (FEV/VC), phlegm, 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

<209>
Reitze, W.B.; Holaday, D.A.; Romer, H.; Fenner, E.M., Control of asbestos fiber emissions from industrial and commercial sources., Proceedings of the Second International Clean Air Congress. H.M. Englund 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

<210>
Richards, A.L.; Badami, D.V., Chrysotile asbestos in urban air., Nature, 234(5324): 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 ug per cubic meter. A more sensitive procedure is being developed.

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

<211>
Richards, R.J.; Wusteman, F.S.; Dodgson, K.S., The direct effects of dusts on lung fibroblasts grown in vitro., Life Sci., 10(20): (Part 1) 1149-1159 (1971).

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

<212>
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

<213>
Robock, K.; 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.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England., 1: 465-475 (1971).

The exposure of peritoneal macrophages (guinea pig) to the UICC 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 (nigrosine 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; ANTHOPHYLLITE; GUINEA PIG; CYTOTOXICITY

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<214>
Ruckelshaus, W.D., List of hazardous air pollutants., Fed. Regist., 36(62): 5931 (1971).

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

<215>
Scott, J.K.; Hodge, H.C., Nonabsorbable dusts., Drill'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 coughing--occur 10 to 25 years after initial exposure. Pleural or peritoneal mesotheliomas and gastrointestinal malignancies have been associated with exposure to asbestos. The role contaminates may play in the carcinogenicity of asbestos is not known.

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

<216>
Selikoff, I.J.; Hammond, E.C.; Churg, J., Neoplasia risk associated with occupational exposure to airborne inorganic fibers., Oncology: Proceedings of the 10th International Cancer Congress (1970); R.L. Clark (Editor). Chicago, Illinois., Vol. 5: 55-62 (1971).

A review is given of the incidence of lung cancer, pleural mesothelioma, peritoneal mesothelioma, 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.

AMOSITE; ANTHOPHYLLITE; ASBESTOSIS; CANCER; CHRYSOTILE; CROCIDOLITE; HUMAN; INSULATION WORKERS; LUNG; MESOTHELIOMA; NEOPLASM; NON-OCCUPATIONAL EXPOSURE; SMOKING; OCCUPATIONAL EXPOSURE; ASBESTOS

<217>
Selikoff, I.J.; Hammond, E.C.; Heimann, H., Critical evaluation of disease hazards associated with community asbestos air pollution., Proceedings of the Second International Clean Air Congress, H. M. 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 ambient air, 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; ASBESTOSIS; INHALATION; LUNG; CANCER; MESOTHELIOMA; CHRYSOTILE; PLEURAL PLAQUES; PLEURAL CALCIFICATION

<218>
Skikne, M.I.; Talbot, J.H.; Rendall, R.E.G., Electron diffraction patterns of U.I.C.C. asbestos samples., Environ. Res., 4(2); 101-105 (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.

AMOSITE; ANTHOPHYLLITE; CROCIDOLITE; CHRYSOTILE; AMPHIBOLE; ASBESTOS; ANALYSIS

<219>
Smith, B.A.; Davis, J.M.G., The association of phagocytosed asbestos dust with lysosome enzymes., J. Pathol., 105(3): 153-157 (1971).

Histochemical staining and electron microscopy were used to investigate the presence of acid phosphatase in guinea pig granulomas formed by the intrapleural 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 particle, 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; GRANULOMA; LYSOSOME; MACROPHAGE; GIANT CELL; PHAGOCYTOSIS; GUINEA PIG; FIBROBLAST; CHRYSOTILE; BIOCHEMICAL EFFECTS

<220>
Smither, W.J., Asbestos and health., Occup. Health, 23(6): (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 1938, 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 is summarized concisely.

ASBESTOS; HUMAN; LUNG; INHALATION; OCCUPATIONAL EXPOSURE; FIBROSIS; ASBESTOSIS; MESOTHELIOMA; CANCER; RESPIRATORY DISEASE

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<221>
Solomon, A.; Goldstein, B.; Webster, I.; Sluis-Cremer, G.K., Massive fibrosis in asbestosis., Environ. Res., 4: 430-439 (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; and (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 MINING; HUMAN; OCCUPATIONAL EXPOSURE; FIBROSIS; LUNG

<222>
Stossel, H.G.; Dalguen, P.; Carstens, U., Pleural mesotheliomas in dockers., Fortschr. Geb. Rontgenstr. Nuklearmed., 116(1): 41-45 (1972).

Between 1963 and 1969, 28 cases of malignant pleural mesothelioma were observed in dock workers in the Wilhelmshaven 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

<223>
Stumphius, 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 25 cases between 1962 and 1968, 22 had been employed in the shipyard.

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

<224>
Thompson, P.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 (1971).

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 ug/cu m at a point source, 0.5-15 ng/cu m at urban sites, and 0.1 ng/cu m at non-urban sites.

ASBESTOS; ENVIRONMENTAL CONTAMINATION; ANALYSIS; ENVIRONMENTAL SAMPLING

<225>
Timbrell, 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 diamter is 0.073 um for Northwest Cape crocidolite, 0.212 um for Transvaal crocidolite, and 0.243 um 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

<226>
Turnock, A.C.; Bryks, S.; Bertalanffy, F.D., The synthesis of tritium-labeled asbestos for use in biological research., Environ. Res., 4: 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 formed 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 dust was used to accurately localize the material in lung tissues by radioautography. Lung clearance of the dust could be quantified by scintillation counting.

ASBESTOS; CHRYSOTILE; LUNG

<227>
Ulrich, P., Pathological anatomy of hyaline pleural plaques., Pneumonologie, 146(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; PLEURAL PLAQUES; HUMAN; DIAGNOSIS; X-RAY

<228>
Um, 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

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<229>
Wagner, J.C., Induction of experimental tumors of the pleura by fibers (asbestos)., Oncology: Proceedings of the 10th International Cancer Congress (1970); P. L. Clark (Editor). Chicago, Illinois., 2: 446-51 (1971).

Various factors involved in the induction of tumors by asbestos were investigated in rats. All asbestos varieties, including samples purified by the removal of oils, produced mesotheliomas when intrapleurally injected. Finely ground samples produced the highest incidence. The inhalation of asbestos produced an excess of lung adenomas in rats; apparently, inhaled dust did not penetrate to the mesothelial surface.

ASBESTOS; RAT; PLEURA; MESOTHELIOMA; INHALATION; TUMOR; ADENOMA; CANCER; AMOSITE; CROCIDOLITE; CHRYSOTILE

<230>
Wallace, W.F.M.; Langlands, J.H.M., Insulation workers in Belfast. 1. Comparison of a random sample with a control population., Brit. J. Ind. Med., 28(31): 211-216 (1971).

In comparison with the control group, significantly more asbestos insulation workers in Belfast showed symptoms and signs of chest disease: dyspnea, sputum, rales, cough, and finger clubbing. Twenty-one of the 50 insulation workers had abnormal x-rays compared to 1 of the controls; 18 workers showed evidence of fibrosis and one of pleural calcification. Lung function tests showed a decrease in static lung volume, reduced arterial oxygen tension, and increased alveolar-arterial oxygen difference, but no obsturction of the airways. Asbestos bodies were observed in nine of the 42 insulation workers examined. The controls closely matched the insulators in age, height, and smoking habits.

ASBESTOS; INSULATION WORKERS; HUMAN; ASBESTOSIS; OCCUPATIONAL EXPOSURE; X-RAY; FINGER CLUBBING; PLEURAL CALCIFICATION; FIBROSIS

<231>
Warwick, M.; Haslam, P.; Weeks, J., Antibodies in some chronic fibrosing lung diseases., Clin. Allergy, 1: 209-219 (1971).

It is possible that immune-complex deposition may be related to the immuno-pathogenesis in some cases of fibrosing alveolitis. In 33 cases of fibrosing alveolitis, immunofluorescence gave evidence of antibody formation in plasma cells. In 7 cases macrophages contained both immunoglobulin and complement. In 6 cases antibody and complement were deposited in alveolar capillaries. These findings were compared with those found in cases of entrinsic allergid alveolitis, asbestosis, and other chronic lung diseases.

ASBESTOS; ASBESTOSIS; MACROPHAGE; FIBROSIS

<232>
Weiss, W., Cigarette smoking, asbestos, and pulmonary fibrosis., Amer. Rev. Resp. Dis., 104: 223-227 (1971).

A statistical analysis was made of 100 textile workers for which data on years of exposure to asbestos, duration and amount of cigarette smoking, and radiological evidence of pulmonary fibrosis was known. The results clearly indicate that both asbestos exposure and cigarette smoking are 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

<233>
Whitwell, F.; Rawcliffe, R.M., Diffuse malignant pleural mesothelioma and asbestos exposure., Thorax, 26: 6-22 (1971).

Between 1955 and 1970, 52 cases of pleural mesothelioma were diagnosed in patients at three hospitals in Merseyside, England. In 60% of the cases, diagnoses were made from histological findings before death. The tumors were classified as tubulo-papillary (20 cases), sarcomatous (11 cases), undifferentiated polygonal (3 cases), and mixed (18 cases). Occupational exposure to asbestos was established in 80% of the cases, with the most common employments being shipbuilding and repairs for men and sackware repairing for women. The average time between exposure and onset of mesothelioma was 42 years. Autopsied lungs from 30 mesothelioma patients revealed the presence of basal asbestosis in 17% and excessive asbestos bodies in almost all. A survey of smoking habits in 28 of the patients showed that 18 were regular smokers.

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

<234>
Allison, A.C., Effects of particles on lysosomes., Adv. Sci., 27: 137-140 (1970).

Silica and asbestos are toxic to cells because they damage lysosomal membranes by hydrogen bond interactions. Thus, the basic mechanisms of fibrogenic tissue reactions in silicosis and asbestosis 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

<235>
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 1931 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 asbestosis or mesothelioma. Better control of industrial asbestos dust between 1924 and 1963 has delayed deaths from asbestosis and allowed time for various lung tumors to develop; this probably accounts for the recent increased mortality from lung cancer and mesothelioma 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 smokers 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

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<236>
Ashcroft, T.; Heppleston, A.G., Mesothelioma and asbestos on Tyneside - a pathological and social study., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 177-179 (1970).

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 nonmalignant diseases. In additional comparisons, lung smears from 310 routine necropsies revealed a 20% incidence of asbestos bodies, compared with a 91% incidence in mesothelioma patients. In most cases, the presence of asbestos bodies was related to industrial asbestos exposure.

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

<237>
Avril, J.; Champeix, J., Results of asbestos exposure in France., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 187-189 (1970).

A survey of occupational respiratory disease in France shows a high incidence of asbestosis due to large asbestos production increase after the war and unsatisfactory working conditions in textile industries. In 1962, 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 disease, 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

<238>
Bader, M.E.; Bader, R.A.; Tierstein, A.S.; Miller, A.; Selikoff, I.J., Pulmonary function and radiographic changes in 598 workers with varying duration of exposure to asbestos., Mt. Sinai J. Med., 37(4): 492-500 (1970).

Clinical, roentgenographic, and lung function studies were conducted on 598 asbestosis patients; 208 (35 percent) had reduced vital capacity; of these, 172 (29 percent) had functional abnormality 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 was approximately the same. 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; PLEURA

<239>
Becklake, M.R.; Fournier-Massey, G.G.; McDonald, J.C.; Siemiatycki, J.; Rossiter, C.E., Lung function in relation to radiographic changes in Quebec asbestos workers., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 233-236 (1970).

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. An 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

<240>
Pignon, J.; Goni, J.; Bonnaud, G.; Jaurand, M.C.; Dufour, G.; Pinchon, M.C., Incidence of pulmonary ferruginous bodies in France., Environ. Res., 3: 430-442 (1970).

Chemical digestion and microfiltration of lung tissue demonstrated ferrunginous bodies in the lungs of 100 French people who resided in urban and rural locations. The highest frequency and density of ferruginous bodies was 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

<241>
Bohlig, H., The problem of asbestosis in relation to the international classification of radiographs in pneumoconiosis., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.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 pneumoniconioses are still inadequate. Asbestosis can not be classed efficiently with the present ILO system; hence a call is made for an efficient, practical classification for epidemiologic reasons.

PNEUMOCONIOSIS; ASBESTOSIS; HUMAN; X-RAY

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<242>
Bohlig, H.; Bristol, L.J.; Cartier, P.H.; Felson, B.; Gilson, J.C.; Grainger, T.R.; Jacobson, G.; Kiviluoto, R.; Lainhart, W.S.; McDonald, J.C.; Pendergrass, E.P.; Rossiter, C.E.; Selikoff, I.J.; Sluis-Cremer, G.K.; Wright, G.W., Special Report - UICC/Cincinnati Classification of the radiographic appearances of pneumoconioses., Chest, 58(1): 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 sufficiently encouraging for the group to recommend publication of the scheme at the next meeting in April 1968.

PNEUMOCONIOSIS; UICC CLASSIFICATION; ASBESTOS

<243>
Bouhuys, A.; Peters, J.M., Control of environmental lung disease., New Engl. J. Med., 283(11): 573-581 (1970).

The difficulty in recognizing and preventing occupational lung diseases in the U.S. is due, in part, to the lack of systemized data concerning the prevalence of these diseases. In addition, the pathogenesis and mechanisms of lung disease agents are poorly understood. Asbestos is among the etiological agents briefly reviewed.

ASBESTOS; CANCER; MESOTHELIOMA; HUMAN; LUNG; RESPIRATORY DISEASE; OCCUPATIONAL EXPOSURE

<244>
Burger, E.F.; Engelbrecht, F.M., The biological effects of the international standard reference asbestos samples on the lungs of rats., S. Afr. Med. J., 44(44): 1268-1274 (1970).

Four groups of female albino Wistar rats (25 per group) were injected intratracheally with 50 mg of crocidolite, amosite, antophyllite, or chrysotile A and 16 animals with 25 mg chrysotile B. The asbestos forms were UICC 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 B group) were sacrificed at 60-day intervals. Fiber lengths (means) for all but chrysotile B were less than 3.4 um; for chrysotile B, mean length was 17.0 um. The biological responses of the four short-fiber groups showed no significant histopathological differences among one another. Foreign body reaction 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 group. 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; CROCIDOLITE; AMOSITE; CHRYSOTILE

<245>
Burilkov, T.; Michailova, L., Asbestos content of the soil and endemic pleural asbestosis., Environ. Res., 3: 443-451 (1970).

Analysis of soils from a Bulgarian agricultural region with dispersed asbestos outcroppings yielded fibrous minerals (anthophyllite, tremolite and sepiolite) in considerable quantities. Pleural plaques occur in the endemic human population. In areas devoid of outcroppings the farming population was free of pleural plaques, and soil samples were devoid of asbestiform minerals. Pleural plaques seem to be prevalent in two population groups: those with occupational or residential exposure i.e., manufacture or mining of asbestos, and agricultural populations endemic to areas having natural out-croppings of asbestos or soil containing the mineral fibers.

ANTHOPHYLLITE; TREMOLITE; ASBESTOSIS; PLEURAL PLAQUES; HUMAN; ENVIRONMENTAL CONTAMINATION

<246>
Churg, J.; Kannerstein, M., Occupational exposure and its relation to type of lung cancer., U.S. Atomic Energy Commission Symposium Series, No. 21: Morphology of experimental respiratory carcinogenesis; P. Nettesheim, M.G. Hanna, J.W. Deatherage (Editors). Atomic Energy Commission, Division of Technical Information, Springfield, Virginia, U.S.A., pp. 105-120 (1970).

Morphologic studies of occupational lung cancer demonstrate the existence of two forms: mesothelioma, which is rare and specifically induced by asbestos; and pulmonary carcinoma, which is frequent and induced by a variety of substances. The role of co-carcinogenesis in the etiology of pulmonary cancer is briefly discussed. Epidemiologic 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; CANCER; PLEURA

<247>
Cralley, L.J., Dust sampling instruments and dust standards in the United States of America for asbestos., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). E.A. Shapiro (Editor). Oxford University Press, New York., pp. 10-12 (1970).

Revised threshold limit values for airborne asbestos dust were 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 5 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

<248>
Dacre, J.C.; Tabershaw, I.R., Thiocyanate in saliva and sputum: relationship to smoking and industrial exposures., Arch. Environ. Health, 21: 47-49 (1970).

Saliva and "sputum" samples collected from asbestos and pesticide workers and from normal persons, both smokers and nonsmokers, showed approximate thiocyanate levels (micrograms per milliliter) as follows: asbestos workers, 32.0 (nonsmokers), 185.8 (smokers); pesticide workers, 38.8 (non smokers), 133.5 (smokers). True sputum was obtained by bronchoscopy from smokers and nonsmokers 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

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<249>
Dalquen, P.; Hinz, I.; Dabbert, A.P., Pleural plaques, asbestosis and exposure to asbestos: an epidemiological study from the Hamburg area., Pneumonologie, 143: 23-42 (1970).

A study in Hamburg, Germany revealed that exposure to asbestos was the main cause of pleural plaques; plaque formation depended on the latency period from the time of first exposure and on the initial dose of inhaled asbestos. The latency period was 40.2 years for pleural plaques, 36.1 years for asbestosis with plaques, and 27.1 for asbestosis without 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

<250>
Davis, J.M.G., Further observations on the ultrastructure and chemistry of the formation of asbestos bodies., Exp. Mol. Pathol., 13: 346-358 (1970).

Chrysotile 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 only 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 can not 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; MOUSE

<251>
Davis, J.M.G., The long term fibrogenic effects of chrysotile and crocidolite asbestos dust injected into the pleural cavity of experimental animals., Brit. J. Exp. Pathol., 51: 617-627 (1970).

Chrysotile 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; MOUSE; GUINEA PIG; GRANULOMA; CHRYSOTILE; CROCIDOLITE; PLEURA; LUNG; MACROPHAGE; GIANT CELL; FIBROBLAST

<252>
Davis, J.M.G.; Gross, P.; DeTreville, R.T.P., Ferruginous bodies in guinea pigs., Arch. Pathol., 89: 368-373 (1970).

Intrapleural injection of glassfibers, ceramic aluminum silicate, silicon carbide and elastin induced the formation of large granulomas in guinea pigs. Electron microscopic examination showed that ferruginous bodies produced by glass and aluminum silicate were similar, in all respects, to asbestos bodies produced by the intrapleural injection of chrysotile. Ferruginous bodies were intracellular and usually in giant cells; the body coat contained dense granules (probably ferretin) 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

<253>
Dixon, J.R.; 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 (ferrous), zinc, nickel and cobalt stimulated BP hydroxylase; higher concentrations of these metals depressed the enzyme activity. Berrylium, ferric iron, and chromium exerted no effect. However, the trace metals extracted from chrysotile (nickel, cobalt, chromium and manganese) reduced enzyme activity by 73%. Since unmetabolized BP in lung tissue is 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; CHRYSOTILE; RAT; LUNG; CO-CARCINOGEN

<254>
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

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DuToit, R.S.J., Dust in South African asbestos mines and fiberizing plants., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., 1969: 13-17 (1970).

Underground and surface dust surveys made in South African asbestos mines and fiberizing plants at various intervals during a 24-year period (1940-1966) show that dust concentrations of chrysotile and amphibole asbestos were excessively high before 1967, particularly due to increased production rates after 1963. Between 1964 and 1966 thermal precipitator samples representing 14,500 persons exposed to amphibole dust produced a mean count of 60-2000 particles per cubic cm (ppcc) per mine, and a total mean of 360 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 representing 1500 persons exposed to chrysotile dust averaged 750 fibers plus particles/cc and a mean range per mine of 120-2000 during 1964-1966; precipitator samples from 55% 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; CHRYSOTILE; AMPHIBOLE; ASBESTOS

<256>
El-Sewefy, A.Z.; Awad, S.; Abdel-Salam, M.S., Chest symptomatology in an Egyptian cement-asbestos pipe factory., J. Egypt. Med. Assoc., 53: 84-92 (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 (28%) showed positive physical signs, 207 (60%) had cough, 163 (47%) had cough and phlegm, 134 (39%) had wheeze, 237 (68%) had dyspnea; 11 (3%) had finger clubbing and 226 (65%) showed positive radiologiological results. The number of diseased workers increased proportionally with the duration of exposure.

ASBESTOS; FIBROSIS; OCCUPATIONAL EXPOSURE; HUMAN; EMPHYSEMA; CARCINOMA; RESPIRATORY DISEASE; DYSPNEA; FINGER CLUBBING

<257>
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 484 men with signs of asbestosis acquired in shipyards and engineering workshops at Barrow-in-Furness was conducted to determine the earliest diagnosable lesions. Results indicate that pulmonary fibrosis is an early sign of asbestosis in heavily exposed men, but is difficult to diagnose because early changes merely are exagerations of normal lung markings; diffuse pleural thickening is a non-specific sign attributed to asbestosis only by excluding other diseases. Although pleural calcification is the most striking and characteristic lesion in 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 asbestos-related disease.

ASBESTOSIS; FIBROSIS; PLEURA; PLEURAL CALCIFICATION; CARCINOMA; MESOTHELIOMA; HUMAN; ASBESTOS; OCCUPATIONAL EXPOSURE

<258>
Gelfand, M.; Morton, S.A., Asbestosis in Rhodesia., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 204-208 (1970).

Out of 97 pneumoconiosis cases attributed to occupational exposure in Rhodesian chrysotile mines from 1963-1967, 39 cases were diagnosed as asbestosis; 48 showed radiological evidence of tuberculosis, with or without asbestosis. Asbestosis lesions appeared mainly in the middle and lower parts of the lung, whereas tuberculin lesions developed in upper lung areas. In tuberculosis patients, the disease became manifest before 16.5 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. Emphysema occurred in 2 asbestotic patients. The "shaggy heart" appearance was found in only 2 cases, and pleural thickening with or without calcification, occurred in 4 cases. No lung cancer or pleural mesothelioma was observed. The standard permissible dust levels in Rhodesian mines is a maximum of 300 particles/cc, including particles no longer than 5 microns and fibers no longer than 40 microns.

ASBESTOS; ASBESTOSIS; CROCIDOLITE; AMOSITE; CHRYSOTILE; LUNG; CARCINOMA; OCCUPATIONAL EXPOSURE; HUMAN; TUBERCULOSIS; CANCER; HUMAN

<259>
Gerber, M.A., Asbestosis and neoplastic disorders of the hematopoietic system., Amer. J. Clin. Pathol., 53: 204-208 (1970).

Autopsy findings in 35 asbestosis cases revealed the association of five cases with tumors of the hematopoietic system. The incidence of this association is significantly higher than the overall incidence of such disorders in the corresponding age group of patients without asbestosis.

HEMATOPOIETIC EFFECTS; ASBESTOSIS; TUMOR; ASBESTOS; HUMAN

<260>
Gilson, J.C., Asbestos health hazards (recent observations in the United Kingdom)., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 173-176 (1970).

This interim report describes current progress in data collection efforts concerning the incidence of asbestos-related diseases in the United Kingdom. Since 1966, mesothelioma of the pleura or peritoneum has been recognized as a prescribed Industrial Disease. The Register of Mesotheliomas, established in accordance with the International Union Against Cancer, recorded an increase in the cummulative total of mesothelioma cases from 4 in 1962 to 550 by 1968. A 10% sample of 1504 asbestos workers in Devonport Dockyard revealed a 4.5% incidence of pulmonary changes related to asbestos exposure; in most cases the effects were limited to pleural thickening. A study of 3,860 chest clinic patients certified 187 cases of pleural thickening; among 113 of these, 22 had histories of occupational exposure.

MESOTHELIOMA; ASBESTOS; ASBESTOSIS; SHIPYARDS; HUMAN

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<261>
Godwin, M.C.; Jagatic, J., Asbestos and mesotheliomas., Environ. Res., 3: 391-416 (1970).

An intensive postmortem study was conducted on 7 mesothelioma patients with pulmonary asbestos bodies. The common occurrence of asbestos bodies, fragments, particles and dust in the hilar node, mediastinal node, pleural lymphatics, spleen, abdomen, and intestinal mucosa indicates that asbestos is transported in macrophages through lymphatic channels and blood, and is widely distributed in the body. Asbestos is irritating, mechanically and chemically, causing fibrosis and malignancy. This may be due to the effects of iron compounds, such as hemosiderin or ferretin, in the asbestos body coating.

PLEURA; PERITONEUM; MESOTHELIOMA; ASBESTOS; ASBESTOS BODIES; HUMAN; TISSUE DISTRIBUTION

<262>
Gross, P.; DeTreville, R.T.P., Problems in the pathology of asbestosis., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 126-132 (1970).

The authors examine the various theories concerning the pathogenesis of asbestos. The authors also describe feeding experiments in which rats were fed 5% asbestos by weight of food. After 21 months, asbestos-fed animals were not significantly different in weight than control animals fed on same diet without asbestos. They question previous results which report transportation of fibers within the body. Synthetic chrysolite evokes a reaction analagous to that of a biologically inert dust.

ASBESTOSIS; ASBESTOS; LUNG; FIBROSIS; RESPIRATORY DISEASE; INGESTION

<263>
Gross, P.; DeTreville, R.T.P.; Cralley, L.J., Studies on the carcinogenic effects of asbestos dust., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro, (Editor). Oxford University Press, New York., pp. 220-228 (1970).

Lung cancer developed in 25 (35%) of 72 rats that survived 16 months of chrysotile exposure for 6 hrs a day, 5 days a week, at concentrations of approximately 86 mg per cubic meter. Adenocarcinomas (71%), squamous cell carcinomas (14%) and fibrosarcomas (25%) were the tumor types found. Lung cancer did not develop in hamsters and guinea pigs exposed simultaneously. Prior to dust exposure, 31 out of 72 rats had received intratracheal applications of 5% sodium hydroxide to impede the lung clearance of dust; lung cancer incidence was significantly higher in this group (48%) than in the remaining 41 rats (24%). Intratracheal injection of an additional 64 rats resulted in the survival of 19 of which 3 (16%) developed cancer.

RAT; GUINEA PIG; HAMSTER; ASBESTOS; LUNG; CANCER; TUMOR; INHALATION; CHRYSOTILE

<264>
Harington, J.S.; Bey, E.; King, P.C.; Richardson, B.D., The synthesis of collagen by newborn hamster fibroblasts., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 135-137 (1970).

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

HAMSTER; FIBROBLAST; COLLAGEN; ASBESTOS; MACROPHAGE

<265>
Heller, R.M.; Janower, M.L.; Weber, A.L., The radiological manifestations of malignant pleural mesothelioma., Amer. J. Roentgenol. Radium 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, nodudular, 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

<266>
Hitchcock, M.T., Mesothelioma of the pleura., Irish J. Med. Sci., 3(10): 453-456 (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. Basically, asbestos exposure must be long (at least 9 or 19 years) and the fiber size must be small enough to be respirable for mesotheliomas to occur and even then it occurs only 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

<267>
Horai, Z.; Kaneda, M.; Michizawa, T.; Kasahara, S.; Sugimoto, T.; Okuyama, T., A radioautographic study on the incorporation of S35-methionine and H3-glycine in the experimental silicopneumoconiosis and asbestospneumoconiosis., Acta Histochem. Cytochem., 3(4); 197-198 (1970).

Silicosis or asbestosis was induced in rats by pertracheal infusion of free silica or blue ashestos suspension. After 2,4,8 or 16 weeks S35-methionine or H3-glycine was injected intraperitoneally. One hour following injection animals were sacrificed and radioautograms obtained of lung tissue. S35-methionine was found in the extracellular space around nodules of the lungs with somewhat less uptake in the case of silicosis. H3-glycine was taken up to a small extent 2 weeks after infusion and then uptake increased. More H3-glycine was taken up in lungs with asbestosis than with silicosis.

ASBESTOS; ASBESTOSIS; SILICOSIS; RAT

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<268>
Kanazawa, K.; Birbeck, M.S.C.; Carter, R.L.; Roe, F.J.C., Migration of ashestos fibres from subcutaneous injection sites in mice., Brit. J. Cancer, 24(1): 96-106 (1970).

Following the subcutaneous injection of female mice (95 CBA/Lac) with crocidolite in saline solution, examination of lymphoid and non-lymphoid tissues showed some migration of the fibers from the site of injection. The lymphatic vessels provided the principal route of dissemination; in lymphoid tissue, asbestos accumulated mainly in axillary nodes, and to a lesser extent in the inguinal, mediastinal and mesenteric nodes. Generally, the fibers were enclosed in macrophage phagosomes, although long fibers remained extracellular. A small number of fibers reached liver, kidneys, and brain, suggesting that some migration occurs through the blood stream. The most accurate, reliable method used in the study to identify asbestos in tissues (other than the lungs) consisted of haemotoxylin and eosin staining combined with microincineration.

ASBESTOS; CROCIDOLITE; MOUSE; MESOTHELIOMA; TISSUE DISTRIBUTION; PLEURAL PLAQUES

<269>
Kellermeyer, R.W.; Warren, K.S., The role of chemical mediators in the inflammatory response induced by foreign bodies: comparison with the schistosome egg granuloma., J. Exp. Med., 131: 21-38 (1970).

Granulomas are inflammatory reactions classified as infectious (hypersensitivity) or foreign body types. Unlike the infectious reaction, foreign body response develops rapidly, is rarely accelerated by repeated exposure, and is a non-immunological reaction induced by the activation of chemical mediators of inflamation. While all foreign substances produce inflamation response, the severity of the reaction depends on the surface characteristics, chemical composition and particle size of the substance. Asbestos (magnesium silicate) particles induce significant foreign body response in lung tissue.

ASBESTOS; GRANULOMA; LUNG

<270>
Kiviluoto, R., Asbestosis: aspects of its radiological features., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 253-255 (1970).

Chest 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 MINING; X-RAY; HUMAN

<271>
Kiviluoto, R.; Meurman, L.O., Results of asbestos exposure in Finland., Pneumoconiosis: 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 (2), cardiac (8), cerebral (4), and others (4). The main hazards of exposure to other asbestos dusts are pulmonary asbestosis, lung cancer, and pleural or peritoneal mesothelioma.

ASBESTOS; ANTHOPHYLLITE; ASBESTOSIS; LUNG; OCCUPATIONAL EXPOSURE; CANCER; PLEURA; PERITONEUM; CARCINOMA; CANCER MORTALITY; MESOTHELIOMA; GASTROINTESTINAL; ASBESTOS MINING; HUMAN

<272>
Kleinfeld, M.J., Industrial pulmonary disease: clinical and experimental observations., Trans. N.Y. Acad Sci., 32(1): 107-26 (1970).

A variety of industrial substances, including asbestos, are potential agents of occupational pulmonary disease. Asbestosis is a pneumoconiosis characterized by fibrosis, pleural thickening and/or pleural calcification, reduced pulmonary function, and symptoms of dyspnea and cough. Emphysema, bronchitis and lung carcinoma are associated with asbestosis.

RESPIRATORY DISEASE; ASBESTOS; CARCINOMA; FIBROSIS; BRONCHITIS; EMPHYSEMA; OCCUPATIONAL EXPOSURE

<273>
Kogan, F.M.; Svirskii, E.L.; Pochashev, F.N., Data for hygienic evaluation of asbestos containing "asbozurite" and "sovelite" dusts., Hyg. Sanit., 35(1-3): 339-343 (1970).

Asbozurite and sovelite are widely used thermo-insulating materials containing 15% asbestos. Clinical examinations of 158 factory workers exposed to these materials for more than 6 years revealed only 9 cases of pneumoconiosis; these workers had been exposed for 13-22 years. Intratracheal administration of 50 mg asbozurite in 0.5 mg physiological saline to rats produced lung nodules after 3 months; the nodules were surrounded by collagen fibers and resembled an early stage of silicosis. 50 mg sovelite dust produced hyperplasia of lymphoid apparatus, desquamation of bronchial epithelium moderate sclerosis around the bronchii, but no fibrosis. The dusts of bozurite and sovelite are less fibrogenic than dusts of chrysotile asbestos due in part to their low asbestos content. Asbozurite is more fibrogenic than sovelite. Based on clinical and experimental evidence, the proposed maximum permissible concentrations of asbozurite and sovelite in factory air are 5 mg/cu m and 8 mg/cu m. The evaluation of hazards from asbestos-containing materials should not be made solely on the basis of the asbestos content.

ASBESTOS; RAT; OCCUPATIONAL EXPOSURE; HUMAN

<274>
Kuyper, L.N., Dust problems in the mining, milling and packaging of asbestos., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 42-49 (1970).

A review of occupational hazards of dust in asbestos industries emphasizes the need for improved methods in the following aspects of milling: hand-sorting of asbestos ores; extraction of fibers from ores; dust filtering methods in work areas; disposal of mill tailings in the environment; packaging procedures and materials.

ASBESTOS; ASBESTOS MINING; CHRYSOTILE; AMPHIBOLE; OCCUPATIONAL EXPOSURE; HUMAN; MESOTHELIOMA

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<275>

<275>
Langer, A.M., Electron microprobe analysis., Laboratory Diagnosis of Diseases Caused by Toxic Agents. P.W. Sunderman and F.W. Sunderman, Jr., (Editors). Warren H. 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 asbestiform materials for long periods after exposure.

CHRYSOTILE; AMOSITE; ANTHOPHYLLITE; TREMOLITE; CROCIDOLITE; ANALYSIS; LUNG

<276>
Langer, A.M.; Rubin, I.; 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 unequivocable 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 lung. The most accurate analyses 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

<277>
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 (0.1u) in a Seitz apparatus the replication time was significantly increased.

ASBESTOS; CELL CULTURE; CYTOTOXICITY

<278>
Mackenzie, F.A.F.; 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 HYALINOSIS

<279>
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 1959 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

<280>
McEwen, J.; Finlayson, A.; Mair, A.; Gibson, A.A.M., Mesothelioma in Scotland., Brit. Med. J., 4(5735): 575-578 (1970).

In a retrospective study of the incidence of mesothelioma 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; PERITONEUM; SHIPYARDS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; CANCER; HUMAN

<281>
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 1-14 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 basal 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

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<282>
Meurman, L.O.; Hormia, M.; Isomaki, M.; Sutinen, S., Asbestos bodies in the lungs of a series of Finnish lung cancer patients., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 404-407 (1970).

The mean age of 50 lung cancer cases and their control pairs was 63 years. There were 46 men and 4 women in each group. Asbestos bodies were found in the lungs of 40 (80%) lung cancer patients and 32(64%) of the control group. Statistical analyses showed no significant association between the statistical analyses showed no occurrence of asbestos bodies in the lungs and cancer of the lung.

ASBESTOS; ASBESTOSIS; LUNG; CANCER; SMOKING; ASBESTOS BODIES; HUMAN

<283>
Moreschi, M.; Farina, G.; Cardani, A., Pleural calcifications in asbestosis and in tuberculosis: elements of differential diagnosis., Med. Lavoro, 61(3): 141-153 (1970).

Clinical observations at the University of Milan revealed that the incidence of pleural calcification was 1.41% in 43 subjects with tuberculosis, and 19.2% in 43 patients with asbestosis. In asbestotic patients with pleural calcification, the duration of exposure to asbestos and the latent period from initial exposure to the development of calcification was at least 15 years. Most asbestotic calcifications were bilateral, multiple, diffuse, small, homogenous structures with distinct, sinuous outlines. Tubercular pleural calcifications were monolateral, localized to the costal pleura, large with granular structure, markedly opaque and irregular in outline.

ASBESTOSIS; HUMAN; PLEURAL CALCIFICATION; DIAGNOSIS

<284>
Morgan, A.; Holmes, A., Neutron activation techniques in investigations of the composition and biological effects of asbestos., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 52-55 (1970).

Neutron activation techniques can be applied effectively in both IN VITRO and IN VIVO investigations of the composition and biological effects of asbestos. During the irradiation of asbestos with neutrons, most of the constituents become radioactive; the use of high resolution γ-spectrometry enables accurate, sensitive determination of each radioactive constituent, studies of constituent solubility, and studies of lung clearance following intratracheal administration of asbestos.

ASBESTOS; ANALYSIS; AMOSITE; CROCIDOLITE; CHRYSOTILE; TRACE METALS; CHEMICAL COMPOSITION

<285>
Newhouse, M.L., The mortality of asbestos factory workers., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 158-164 (1970).

A cohort study of asbestos workers in a London factory showed that an excess of observed over expected deaths did not occur until at least 16 years had elapsed since initial asbestos exposure. A statistically significant excess of deaths from pleural and peritoneal mesothelioma and carcinoma was observed among mortalities occurring between 1913 and 1968.

MESOTHELIOMA; ASBESTOS; ASBESTOSIS; HUMAN; OCCUPATIONAL EXPOSURE; CANCER; TUMOR; PLEURA; PERITONEUM

<286>
Park, J.F.; Howard, E.B.; Stuart, B.O.; Wehner, A.; Dilley, J.V., Cocarcinogenic studies in pulmonary carcinogenesis., Morphology of Experimental Respiratory Carcinogenesis, USAEC Symposium Series, No. 21. U.S. Atomic Energy Commission, Division of Technical Information, Springfield, Virginia., pp. 417-436 (1970).

Current studies concerning the induction of pulmonary neoplasia are investigating the co-carcinogenicity of cigarette smoke and industrial air pollutants such as asbestos in hamsters.

CARCINOMA; CANCER; HAMSTER; NEOPLASIA; CO-CARCINOGEN; ASBESTOS; ENVIRONMENTAL CONTAMINATION; SMOKING

<287>
Penman, H.G.; Thomson, K.J., Pulmonary asbestos in Dunedin, New Zealand, assessed by two methods., Pathology, 2(3): 175-182 (1970).

A search for asbestos bodies was made in lung tissue from 100 autopsies in Dunedin, New Zealand, a town without heavy industry. Only 3% gave positive results when sections (30u) from the basal part of the lung were examined by optical microscopy; however, following KOH digestion of 1 cubic cm tissue blocks, 95% of the first 50 cases were positive for asbestos bodies. One subject of the 100 had associated pleural plaques. No pulmonary carcinomas or mesotheliomas were found. Uniformity of technique was stressed to facilitate comparison of various asbestos exposure studies.

ASBESTOS; ASBESTOS BODIES; ANALYSIS; LUNG; PLEURAL PLAQUES; HUMAN; NON-OCCUPATIONAL EXPOSURE; MESOTHELIOMA

<288>
Pooley, F.D.; Oldham, P.D.; Um, C-H.; Wagner, J.C., The detection of asbestos in tissues., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 108-116 (1970).

This article describes three integrated clinical studies which attempt to establish the incidence of asbestos in the lungs of the general population in England, Ireland, Northern Europe and Finland. Results show a significant increase in the incidence of asbestos bodies over the last 40 years. Investigation of methods for detecting asbestos bodies and fibers in lung tissue indicate that the potassium hydroxide digestive technique was the most efficient, reliable extraction process, whether the extract was examined optically or by electron microscopy.

ASBESTOS; ASBESTOSIS; ASBESTOS BODIES; LUNG

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<289>
Pylev, L.N.; Roe, F.J.C.; Vorvik, D., Study of the distribution and isolation of (3H)benz(a)pyrene from the animal organism after its intratracheal injection with asbestos and carbon black., Vop. Onkol., 16(3): 61-69 (1970).

Following intratracheal treatment of hamsters with labelled 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(4): 2-14 (1970).

Twenty cases of diffuse pleural mesothelioma were found in 6406 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. Sixteen were men and 19 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 asbestosis was found in 13 cases.

ASBESTOS; MESOTHELIOMA; OCCUPATIONAL 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; PLEURA; PERITONEUM; MESOTHELIOMA; HUMAN; OCCUPATIONAL EXPOSURE

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

Pleural plaques were observed in 644 (6.6%) out of 9,760 photofluorograms taken in 1965 in a sparcely 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>
Schnitzer, R.J.; Bunescu, G., Polymers as selective antagonists of hemolytic asbestos fibers., Arch. Environ. Health, 20: 481-482 (1970).

The exposure of chrysotile to 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 carboxymethyl 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>
Schnitzer, R.J.; Pundsack, 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 asbestiform 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 chelating and complexing agents did not. Repeated contact of chrysotile with red cells also eliminated hemolytic activity, possibly due to the adsorption of some cell components on the fibers.

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

<295>
Selikoff, I.J.; Hammond, E.C.; Churg, J., Mortality experiences of asbestos insultation workers, 1943-1968., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 180-186 (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 1942, 380 died by 1969; the causes of death in 188 cases were lung cancer (72), pleural mesothelioma (6), peritoneal mesothelioma (16), gastrointestinal 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 34.8 years for pleural mesothelioma and 43.0 years for peritoneal mesothelioma. Neoplastic death rates were much lower among 890 men entering the union after 1942, because insufficient time has lapsed since the onset of exposure. There appears to be an important influence of cigarette smoking on the incidence of lung cancer in asbestos workers.

ASBESTOSIS; MESOTHELIOMA; CARCINOMA; ASBESTOS; INSULATION WORKERS; NEOPLASM; OCCUPATIONAL EXPOSURE; HUMAN; PLEURA; PERITONEUM

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<296>
Sleggs, C.A., Mesothelioma, including peripheral lung malignancy and tuberculosis in the North West Cape., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 225-232 (1970).

Clinical and epidemiological investigations in South Africa between 1956 and 1968 revealed a high incidence of mesothelioma and carcinoma in North West Cape inhabitants (141 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.

CARCINOMA; MESOTHELIOMA; TUBERCULOSIS; ASBESTOS; ASBESTOSIS; NON-OCCUPATIONAL EXPOSURE; HUMAN; ENVIRONMENTAL CONTAMINATION; OCCUPATIONAL EXPOSURE

<297>
Sluis-Cremer, G.K., Asbestosis in South African asbestos miners., Environ. Res., 3: 310-319 (1970).

The duration of asbestos exposure and the length of asbestos fiber residence in the lung are important factors determining the onset and incidence of asbestosis. A 1970 study of South African amosite miners employed between 1954 and 1958 showed a higer incidence of asbestosis with increase in exposure time, but no bronchial carcinomas or mesotheliomas. Pleural plagues did not occur in workers employed less than 20 years.

ASBESTOSIS; CROCIDOLITE; AMOSITE; ASBESTOS MINING; PNEUMOCONIOSIS; PLEURAL PLAQUES; OCCUPATIONAL EXPOSURE

<298>
Smither, W.J., Some observations on asbestosis in a factory population., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 155-157 (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.

ASBESTOS; ASBESTOSIS; HUMAN; OCCUPATIONAL EXPOSURE; DIAGNOSIS

<299>
Solomon, A., Radiological features of diffuse mesothelioma., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.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 14 cases, lobular pleural tumor without pleural effusion in 6, moderate parenchymal 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; PLEURA; MESOTHELIOMA; PERITONEUM; X-RAY; HUMAN; ASBESTOSIS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

<300>
Solomon, A., Radiological features of diffuse mesothelioma., Environ. Res., 3: 338-338 (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

<301>
Solomon, A., Radiology of asbestosis., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.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 and non-calcified pleural plagues, and radiological changes associated with asbestotic fibrosis (pneumonitic, coarse, and massive fibrosis).

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

<302>
Szymczykiewicz, K., 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 interbronchially with 60 mg of chrysotile fibers (5 or 10 microns long), fibrotic changes predominated in the bronchi and parabronchial tissues and were most extensive in animals treated with long fibers. Following the administration of crystalline (fibrous) or amorphous chrysolite 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 chrysolite, amorphous chrysolite and crystalline quartz, but not by fiber glass or fine glass. Intravenous administration of crystalline chrysolite and quartz in rabbits produced an increase in serum gammaglobulin; amorphous dusts of chrysolite and coal did not.

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

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Tabershaw, I.R.; Cooper, W.C.; Balzer, J.L., A labor-management occupational health service in a construction industry., Arch. Environ. Health, 21(6): 784-788 (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.G.; Wenadic, C.M.; Crable, J.V., Infrared spectra for mineral identification., Amer. Ind. Hyg. Assoc. J., 31(1): 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 actinolite, amosite, anthophyllite, crocidolite, tremolite, talc, chrysotile, and other minerals.

ASBESTOS; CROCIDOLITE; TREMOLITE; 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.

ASBESTOS; PNEUMOCONIOSIS; ASBESTOSIS; PLEURAL PLAQUES; PLEURA; HUMAN; FIBROSIS; PERITONEUM; MESOTHELIOMA

<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).

Compositional analysis of major constituents in IUCC standard reference samples of asbestos show that crocidolite contains the highest concentration of iron (15.1%); the highest magnesium content was found in chrysotile (31-32%), and anthophyllite (24%). Amosite and anthophyllite contained the most silicon and silica dioxide. Chromium, manganese and nickel comprised the predominant trace constituents. Rhodesian chrysotile had the highest chromium concentrations (1390 ppm) and the lowest manganese content (approx. 800 ppm). The highest manganese concentration was found in amosite (15,000 ppm). Trace amounts of antimony were detected in amosite, crocidolite and chrysotile (less than 5 ppm), and the highest level of scandium occurred in crocidolite (less than 6 ppm). Other physical and chemical characteristics discussed include oil content, fiber length distribution, and electron diffraction patterns.

ASBESTOS; CHRYSOTILE; AMOSITE; CROCIDOLITE; ANTHOPHYLLITE; ANALYSIS; 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 settlement 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.

ASBESTOS; CHRYSOTILE; AMPHIBOLE; INHALATION; HUMAN; LUNG

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<308>
Timbrell, V., Inhalation and Biological Effects of Asbestos, Assessment of Airborne Particles: Third Rochester International Conference on Environmental Toxicity; T.T. Mercer, P.E. Morrow, and W. Stober (Editors). Charles C. Thomas, Publisher, Springfield, Illinois., pp. 429-445, (1970).

Adverse biologic effects of asbestos fibers are closely associated with their physical characteristics. Comparative studies of aerodynamic behavior of asbestos fibers reveal that the sites and rates of deposition and retention in the lung are related to the fiber type. Asbestos fibers thicker than 3um 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 the subpleural regions; amphibole fibers are a more favorably orientated by aerodynamic forces for penetration into the lung. This could explain the large difference in the risk of mesothelioma in the asbestos mining areas of South Africa; in the crocidolite mines in the North West Cape Province there is a high incidence of mesothelioma, 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

<309>
Timbrell, V.; Pooley, F.D.; Wagner, J.C., Characteristics of respirable asbestos fibers., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 120-125 (1970).

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 um. Amphibole fibers are straight with minimum diameters of 0.6 um for crocidolite, 0.15 um for amosite; and 0.25 um 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 exhibits 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

<310>
Troitskii, S.Yu.; Kuz'minykh, A.N.; Andreeva, T.D.; Bunimovich, G.I., Hygienic characteristics of working conditions in the manufacture of phenoplasts with asbestos filler., Hyg. Sanit., 35(7-9): 456-458 (1970).

Asbestos molding compounds are used in the manufacture of phenoplasts for the hot molding of household and technical articles. They consist of phenol formaldehyde resin, asbestos filler and special additives. Inhalation of dusts, phenol and formaldehyde vapors in work areas presents a significant health hazard in the manufacture of molding compounds and phenoplasts; recent surveys show extremely high concentrations of these in various factories. There is a serious need to reduce the concentrations of injurious dusts (asbestos) and vapors by redesigning ventilation and exhaust systems, by improving manufacturing equipment and by mechanizing various aspects of the handling and transport of materials such as asbestos to minimize worker contact and air pollution in the factory.

ASBESTOS; DUST CONTROLS; STANDARDS; OCCUPATIONAL EXPOSURE

<311>
Vigliani, E.C., Asbestos exposure and its results in Italy., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 192-196 (1970).

Between 1964 and 1966, 586 new cases of asbestosis were compensated in Italy; 65% of the cases originated in Piedmont, Lombardy, and 20% in Liguria. The cement-asbestos and refractory industry accounted for 342 cases, while 101 cases represented dockyard and shipbuilding trades. Only 20% of the cases were moderate or advanced stages of asbestosis. By 1969, a total of 1226 workers were receiving compensation in Piedmont and Liguria. The main causes of death in compensated workers are asbestosis and cancer of the lung and pleura.

ASBESTOS; LUNG; CANCER; PLEURA; MESOTHELIOMA; HUMAN; OCCUPATIONAL EXPOSURE

<312>
Wagner, J.C., The pathogenesis of tumors following the intrapleural injection of asbestos and silica., Morphology of Experimental Respiratory Carcinogenesis U.S.A.E.C. Symposium Series, No. 21. U.S. Atomic Energy Commission, Division of Technical Information, Springfield, Virginia., pp. 347-359 (1970).

The inhalation of asbestos dust is associated with the development of pleural and peritoneal mesotheliomas in man. Experiments have shown that analagous 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

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<313>
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). H.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, 64 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; CHRYSOTILE; RAT; MESOTHELIOMA; PLEURA

<314>
Wagner, R., What in pneumoconiosis should be compensated?, Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York., pp. 529-530 (1970).

Various occupational pneumoconioses are compensated for in the Federal Republic of Germany. Asbestosis represents a small number of medical pensions when compared to those of other occupational penumoconioses. Cases include 324 with asbestosis and 27 with asbestosis and carcinoma of the lung.

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

<315>
Warwick, M.; Parkes, W.R., Circulating rheumatoid and antinuclear factors in asbestos workers., Brit. Med. J., 3: 492-493 (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 to duration of exposure. Further study may determine the incidence of tissue antibodies in asbestos workers with or without lung disease.

ASBESTOS; RHEUMATOID FACTOR; ANTINUCLEAR FACTOR; HUMAN; RESPIRATORY DISEASE

<316>
Webster, I., Asbestos exposure in South Africa., Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.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 25; 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, 24 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; CHRYSOTILE; AMOSITE; CROCIDOLITE; ASBESTOS; ASBESTOS MINING; MESOTHELIOMA; HUMAN; PLEURA

<317>
Arnaud, A.; Lebreuil, G.; Raphael, B.; Payan, H.; Mongin, M.; Charpin, J., Pleuro-pulmonary asbestosis and malignant pleuro-peritoneal mesothelioma., J. Fr. Med. Chir. Thorac., 23(1):85-94 (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; MESOTHELIOMA; CANCER; HUMAN; LUNG

<318>
Byrom, J.C.; Hodgson, A.A.; Holmes, S., A dust survey carried out in buildings incorporating asbestos-based materials 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

<319>
Dicke, T.E.; Naylor, B., 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 19 of 100 necropsies of Michigan residents. In one case, asbestos bodies were found only in the hilar lymph node and in 3 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; FERRUGINOUS BODIES; NON-OCCUPATIONAL EXPOSURE; HUMAN

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<320>
El-Sewefy, A.Z., Radiological findings in a cement-asbestos pipe factory., J. Egypt. Med. Assoc., 52: 836-844 (1969).

Chest x-rays of 347 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 44% 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; FIBROSIS; DUST CONTROLS

<321>
Emara, A.; El-Ghawabi, S., Correlation between the electrocardiogram and radiological picture in 29 cases., J. Egypt. Med. Assoc., 52: 561-570 (1969).

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. Asymmetrical 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

<322>
Furst, A.; Haro, R.T., A survey of metal carcinogenesis., Progr. Exp. Tumor Res., 12: 102-133 (1969).

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; TRACE METALS; CANCER; TUMOR; HUMAN

<323>
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 diphenoquinone, 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

<324>
Gold, C., Asbestos levels in human lungs., J. Clin. Pathol., 22:507 (1969).

Between 1965 and 1969, 620 extracts from lung biopses, 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 forms 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

<325>
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 35 mg sample size. Smaller sample size resulted in lower accuracy.

AMOSITE; CHRYSOTILE; ANALYSIS; ENVIRONMENTAL SAMPLING

<326>
Gross, P.; DeTreville, R.T.P.; Haller, M.W., Pulmonary ferruginous bodies in city dwellers: a study of their central fiber., Arch. Environ. Health, 19(2): 186-188 (1969).

Cores 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

<327>
Harington, J.S., The Second International Conference on the Biological Effects of Asbestos. Report on a visit to East Germany and England., S. 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 carborundum; (2) a single lung section will show asbestos bodies because of uniform distribution; (3) asbestos accumulates in phagosomes 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 migrates through the lymphatics to the pleura and the peritoneum where it induces mesotheliomas; (7) quantitative examination of serous fluid for hyaluronic acid is valuable for confirming mesothelioma; (8) mesotheliomas are associated with asbestos and occur more often than in the past; (9) a co-carcinogenic relationship exists between smoking and asbestos inhalation.

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

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<328>

<328>
Karacharova, V.N.; Ol'shvang, R.A.; Kogan, F.M., Changes in certain organs after experimental intraperitoneal injection of asbestos-containing dust., Biull. Eksp. Biol. Med., 67: 117-120 (1969).

Rats injected intraperitoneally with 50 mg. of chrysotile, 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. Chrysotile and brucite 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-Moussard, H.; Durif, S.; Martin, J.C.; Normand, C.; Policard, A., Research and characterization of asbestos particles in pleural mesotheliomas., Compt. Rend., Ser. D (Paris), 268: 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, P.O., The many faces of asbestos disease., Med. J. Aust., 56-2(21): 1063-1066 (1969).

An asbestos body may vary in length from 20 u to more than 200 u; 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, carcinoma has occurred in occupationally exposed workers, even though asbestosis could not be confirmed by x-ray examination. Usually a long time (30-50 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 amosite or chrysotile.

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

<331>
MacPherson, P.; 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: 298-301 (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 in 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 broncial carcinoma were diagnosed from necropsy and histological reports. Endothelioma or mesothelioma was the certified cause of death in 4 cases, but 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 carcinomatosis 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

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<335>
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 carcinoma. 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

<336>
Peacock, P.R.; Biancifiori, C.; Bucciarelli, E., Examination of lung smears for asbestos bodies in 109 consecutive necropsies in Perugia., Europ. J. Cancer, 5:155-158 (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

<337>
Pelzer, A.M.; Thomson, M.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 asbestosis patients. High correlations existed between conductance tests, peak flow, and one-second timed vital capacity in obstructive disease. Generally, normal subjects had a greater individual conductance-lung volume slope than patients with chronic bronchitis and a smaller slope than patients with asbestosis.

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

<338>
Pylev, L.N.; Roe, F.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), labelled BP and asbestos, or labelled BP and carbon black eliminated, via the lungs, 99% 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.

ASBESTOS; CANCER; HAMSTER; INHALATION

<339>
Ribacchi, R., Mesotelioma del peritoneo., Lavori Ist. Anat. Istol. Patol., Univ. Studi Perugia, 29: 15-27 (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.

ASBESTOS; TUMOR; ASBESTOS BODIES; MESOTHELIOMA; HUMAN

<340>
Sano, T., Relationship between pneumoconiosis and lung cancer., J. Sci. Labor, 45(7): 383-396 (1969).

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

ASBESTOSIS; LUNG; ASBESTOS; CARCINOMA; PNEUMOCONIOSIS; HUMAN; CANCER

<341>
Smith, W.E.; Yazdi, 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, adenomatiod changes, squamous metaplasia, and occasional lesions with gross and histological characteristics of sarcomas or carcinomas.

CHRYSOTILE; FIBROSIS; CANCER; SARCOMA; CARCINOMA; MOUSE; TUMOR

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<342>

<342>
Solomon, A., The radiology of asbestosis., S. Afr. Med. J., 43(27): 847-851 (1969).

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 coalmining. 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

<343>
Speil, S.; Leineweber, J.P., Asbestos minerals in modern technology., Environ. Res., 2: 166-208 (1969).

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, chemical characteristics, synthesis, physical properties, identification, and sources of the various asbestiform minerals.

ASBESTOS; CHRYSOTILE; AMOSITE; ANTHOPHYLLITE; TREMOLITE; ACTINOLITE; CHEMICAL COMPOSITION

<344>
Stanton, M.F.; Blackwell, R.; Miller, E., Experimental pulmonary carcinogenesis with asbestos., Amer. Ind. Hyg. Assoc. J., 30(3): 236-244 (1969).

A thin coat of asbestos-saturated glass fibers applied to the pleura and pericardium of Osborne-Mendal rats induced extensive and progressive fibrosis in all animals, and neoplasms in 74% of the animals. The neoplasms appeared to arise from the fibrotic mesothelial 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

<345>
Stokinger, H.E., The spectre of today's environmental pollution - USA brand: new perspectives from an old scout., Amer. Ind. Hyg. Assoc. J., 30(3):195-217 (1969).

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 polycyclic aromatic hydrocarbons may be essential to initiate mesothelioma development. The degree of asbestos exposure necessary to produce tumors in humans is unknown.

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

<346>
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 (1.5 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 loosely packed 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

<347>
Suzuki, Y.; Churg, J., Structure and development of the asbestos body., Amer. J. Pathol., 55(1):79-91 (1969).

Following the intratrachial administration of 1 mg soft chrysotile to male hamsters, asbestos bodies formed in the cytoplasm of alveolar macrophages, alveolar epithelial cells, and septum 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 resulting 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

<348>
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 5 with asbestosis showed no significant difference in the clearance rate of inhaled plastic particles (5u) 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

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<349>
Vigliani, E.C., Asbestos exposure and its results in Italy., Med. Lavoro, 60(5): 325-330 (1969).

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. Categorizing the causes of death for 307 persons compensated for asbestosis between 1954-1969 revealed asbestosis (31.6%), malignancies (22%), tuberculosis (8%), or other causes (38.4%). In a group of 232 chrysotile mine workers who had claimed compensation, pleural plaques were found in 3.4%. Lung cancer caused 3% of the 97 reported deaths, and no mesotheliomas 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; SHIPYARDS; TEXTILE INDUSTRY; ASBESTOS MINING; CANCER; TUMOR; LUNG

<350>
Wagner, J.C.; Berry, G., Mesotheliomas in rats following inoculation with asbestos., Brit. J. Cancer, 23(3):567-581 (1969).

Wistar specific pathogen-free and Standard rats were injected intrapleurally with 20 mg of amosite, crocidolite, or chrysotile. More than 50% of the animals given chrysotile or crocidolite developed pleural mesotheliomas. Amosite produced fewer mesotheliomas and exhibited a longer initial latent period between inoculation and tumor development. No malignancies developed in the saline control group. A high incidence of injection site tumors occurred in a small number of animals in which the dust did not reach the pleural cavity.

AMOSITE; CROCIDOLITE; CHRYSOTILE; MESOTHELIOMA; RAT; TUMOR; PLEURA

<351>
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; MESOTHELIOMA; CROCIDOLITE; FERRUGINOUS BODIES; CHRYSOTILE; TREMOLITE

<352>
Kipell, J.M.; Bhathal, P.S., Asbestos bodies in lungs: an Australian report., Pathology, 1(4): 327-330 (1969).

Asbestos bodies were found in alkaline digests of basal lung tissue of 44.2% of 138 males and 41.9% of 62 females autopsied in Melbourne, Australia. The incidence of asbestos bodies was age related, reaching 50% in the age group ranging from 51 to 80. The equal sex incidence suggests that asbestos exposure resulted from general atmospheric contamination rather than occupational exposure. The highest asbestos counts were found in one case of pleural mesothelioma and in one case of fibrous pleural plaques.

ASBESTOS BODIES; FERRUGINOUS BODIES; ASBESTOS; LUNG; PLEURAL PLAQUES; HUMAN; ENVIRONMENTAL CONTAMINATION; MESOTHELIOMA; NON-OCCUPATIONAL EXPOSURE

<353>
Anonymous, Getting to grips with asbestos., Food Cosmet. Toxicol., 6: 657-659 (1968).

Asbestos is a serious health hazard to those persons occupationally exposed, and to a lesser extent the general public. Diseases usually associated with asbestos are lung cancer, mesothelioma, and asbestosis. When diagnosing these diseases, the carcinogenic potential of asbestos contaminants cannot be excluded; positive identification of asbestos fibers should be made before reporting asbestos bodies in cases of mesothelioma and asbestosis. The question to be answered is whether lung cancer is a complication of asbestosis or develops in the absence of this condition. Progress has been made in reducing asbestos exposure levels but there is no room for complacency. Universal agreement must be reached on clinical, physiological, and radiological criteria for diagnosing asbestosis.

ACTINOLITE; AMOSITE; ANTHOPHYLLITE; ASBESTOS; ASBESTOSIS; CANCER; CHRYSOTILE; CROCIDOLITE; ENVIRONMENTAL CONTAMINATION; HUMAN; MESOTHELIOMA; OCCUPATIONAL EXPOSURE

<354>
Anonymous, Cancer and asbestos., Brit. Med. J., 3: 448-449 (1968).

Since 1965, investigators in many countries have confirmed the association between occupational asbestos exposure and cancer - particularly bronchial carcinoma and mesothelioma. The etiologic significance of asbestos fibers in the lungs is difficult to ascertain since other fibrous materials also induce the formation of structures similar to asbestos bodies; quantitative methods must show the presence of large numbers of asbestos fibers in the lung before any significant relationship can be determined.

AMOSITE; ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; CHRYSOTILE; CROCIDOLITE; MESOTHELIOMA

<355>
Ardalan, P., Lung function tests and electrocardiographic examinations in pulmonary fibrosis., Praxis Pneumol., 22(12): 780-792 (1968).

A comparative study of lung function and electrocardiogram tests for 83 cases of pulmonary fibrosis comprised 21 cases of silicosis, 9 cases of silicotuberculosis, 22 cases of asbestosis, and 31 of fibrosis of unknown orgin. Compared with normal values (0.074 plus or minus 0.024), 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 0.059 plus or minus 0.030 in fibrosis of unknown etiology. Comparison of these data with arterial oxygen tension during work showed that values below 0.045 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; ASBESTOSIS; FIBROSIS; RESPIRATORY DISEASE; VENTILATORY DEFECTS; HUMAN; ELECTROCARDIOGRAM

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<356>

<356>
Balzer, J.L.; Cooper, W.C., The work environment of insulating workers., Amer. Ind. Hyg. Assoc. J., 29(1): 222-227 (1968).

These authors, with the cooperation of the Asbestos Workers' Union and insulation contractors, are studying environmental exposures and the health of asbestos insulation workers in the Western United States. Surveys have been made in a number of work situations. This report summarizes preliminary environmental findings on materials used, methods of application, and dust counts for various components of the insulator's job - prefabrication, application, finishing, mixing, and removal of insulation. The study emphasizes exposures to asbestos-containing materials - fiber glass, cork, plastics, and adhesives.

ASBESTOS; INSULATION WORKERS; PNEUMOCONIOSIS; HUMAN; OCCUPATIONAL EXPOSURE; CHRYSOTILE; AMOSITE; STANDARDS; LUNG; CANCER; ASBESTOS; PNEUMOCONIOSIS

<357>
Belleau, R.; Gaensler, 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 massive 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 rapidly fatal course. The pathological findings at autopsy are presented.

ASBESTOS; ASBESTOSIS; DIAGNOSIS; DYSPNEA; MESOTHELIOMA; FINGER CLUBBING; CHRYSOTILE; OCCUPATIONAL EXPOSURE; HUMAN

<358>
Berkley, 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 analysis provide information concerning morphology, chemistry, and structure of the particle examined.

ASBESTOS; ANALYSIS; CHEMICAL COMPOSITION

<359>
Biles, B.; Emerson, T.R., Examination of fibres in beer., Nature, 219(5149): 93-94 (1968).

Asbestos pads frequently are 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.

ANALYSIS; ASBESTOS; ASBESTOS FILTERS; FOOD CONTAMINATION

<360>
Botham, S.K.; Holt, P.F., The mechanism of formation of asbestos bodies., J. Pathol. Bacteriol., 96(2): 443-453 (1968).

Three and 6 hours after inhalation exposure, anthophyllite fibers were observed in the terminal bronchioles and alveoli of guinea pigs. These fibers are phagocytosed by the alveolar macrophages. The first pathological effects observed were hemorrhage from alveolar capillaries, hemolysis of extravascular red cells, and formation of iron-containing granules. Macrophages contained hemosiderin granules together with a solubilized iron-containing product (possibly ferritin) diffusing throughout the cytoplasm. Asbestos bodies form when ferretin adsorbs onto asbestos fibers after they are ingested by the macrophages; only 1 fiber--usually the longest--becomes coated in each macrophage. After 4 weeks the coating thickens and the cell shrinks onto this structure. After ten weeks, asbestos bodies become finely beaded and may fragment.

ASBESTOS BODIES; INHALATION; ANTHOPHYLLITE; GUINEA PIG; PHAGOCYTOSIS; MACROPHAGE; HEMOSIDERIN

<361>
Desbordes, J.; Manouvrier, P.; Tayot, J.; Ernoult, J.L.; Boisseau, 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 epidermoid bronchial carinoma 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 BODIES; CANCER; CARCINOMA; DIAGNOSIS; LUNG; OCCUPATIONAL EXPOSURE; HUMAN

<362>
DeTreville, R.T.P.; Gross, P.; Davis, J.M.G., 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 BODIES; ASBESTOS; CROCIDOLITE; ASBESTOSIS; AMOSITE; CHRYSOLITE; ANTHOPHYLLITE

<363>
Dousset, G.; Desbordes, J.; Tayot, J.; Duwoos, H.; Ernoult, J.L.; Manouvrier, R.; Veret, J., The special characteristics of bronchial cancer in patients with asbestosis (three new cases)., Poumon 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

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<364>
Pennessy, J.J., Bronchial brushing and transbronchial forceps biopsy in the diagnosis of pulmonary lesions., Dis. Chest, 53(4): 377-389 (1968).

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 bristle are used if there is some distance between the tip of the catheter and the lesion, whereas brushes with steel bristle are used when the disease process is diffuse. A positive cytologic or pathologic diagnosis was established in the majority of cases (60%) with primary pulmonary tumors, but the method has proved less accurate in diagnosing metastatic carcinoma 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

<365>
Godwin, M.C.; Jagatic, J., Asbestos and mesothelioma., 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 numerous years.

AMOSITE; ASBESTOS; CHRYSOTILE; CROCIDOLITE; HAMSTER; HUMAN; MOUSE; OCCUPATIONAL EXPOSURE; TREMOLITE

<366>
Hagerstrand, I.; Heurman, L.O.; Odlund, B., Asbestos bodies in the lungs and mesothelioma. A retrospective examination of a ten-year-autopsy material., Acta Pathol. Microbiol. Scand., 72(2): 177-191 (1968).

During one decade (1957 through 1966), 35 cases of mesothelioma were found in 12,763 autopsies; at the same time 34 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 (34 autopsy cases). For a correlation between the presence of asbestos bodies and mesothelioma to be proven, asbestos bodies must be abundantly present in the cases of mesothelioma.

ASBESTOS; ASBESTOS BODIES; ASBESTOSIS; MESOTHELIOMA; HUMAN

<367>
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.

AMOSITE; ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; CROCIDOLITE; HUMAN; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; SHIPYARDS

<368>
Kleinfeld, M.J., Asbestosis and neoplasia., Med. Times, 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; FIBROSIS; ASBESTOSIS; DIAGNOSIS; CANCER; NEOPLASIA; HUMAN; X-RAY

<369>
Knox, J.F.; Holmes, 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 (1916-1966). 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 538 men and 220 women employed for at least 10 years since 1933. 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 2.6 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 predominate asbestos type used in the factory, but small amounts of crocidolite also were processed.

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

<370>
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 converted 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

<371>
Heurman, L.O., Pleural fibrocalcific 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 mesothelioma. 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 contributary 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

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<372>

<372>
Mortimer, R.H.; Campbell, C.B., Asbestos exposure and pleural mesotheliomas., Med. J. Aust., 55(11): 720-722 (1968).

Two asbestos workers, aged 62 and 47, developed dyspnea, chest pain and finger clubbing. Radiological examination showed lung fibrosis, 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 25 to 40 years. These cases are among the first to be reported in Australian literature.

ASBESTOS; MESOTHELIOMA; DYSPNEA; PLEURAL CALCIFICATION; OCCUPATIONAL EXPOSURE; HUMAN; FIBROSIS; PLEURAL PLAQUES; CANCER; ASBESTOS BODIES; SMOKING; FINGER CLUBBING

<373>
Motlagh, F.; Falor, W.H., Asbestos-penicillin induced pleurodesis: an experimental study., Dis. Chest, 53(1): 89-92 (1968).

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 obliterates the pleural cavity. The asbestos powder blankets the pleural surface, continues the irritation initiated by the penicillin crystals, and leads to the production of granulomata and dense adhesions.

ASBESTOS; DOG; PLEURODESIS; PLEURA; GRANULOMA

<374>
Nice, C.M.; Ostrolenk, D.G., Asbestosis and nodular lesions of the lung: a radiologic study., Dis. Chest, 54(3): 226-229 (1968).

Asbestosis may occur with or without the usual symptoms. Six cases are presented which confirm nodular lesions in radiographs of patients with asbestosis. 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; VENTILATORY DEFECTS; CANCER; CARCINOMA; MESOTHELIOMA; TUMOR

<375>
Moro, L., Occupational and "non-occupational" asbestosis in Finland., Amer. Ind. Hyg. Assoc. J., 29(3): 195-201 (1968).

Asbestos, like hundreds of other agents, is a dangerous material that may jeopardize workers' health if not properly controlled; the incidence of asbestosis in Finnish asbestos workers can be reduced by modern industrial hygiene. Anthophyllite comprises Finland's asbestos reserves. Too little is known about the danger of non-occupational exposure to the general population. The mortality rate from cancer and other malignancies in the immediate asbestos area is equal to other rural areas of the country, although in asbestos workers the frequency of lung cancer might be somewhat higher. There is enough evidence to kindle interest in this health problem; many questions are still unanswered.

ASBESTOS; ASBESTOSIS; CANCER; HUMAN; NON-OCCUPATIONAL EXPOSURE; OCCUPATIONAL EXPOSURE; ANTHOPHYLLITE

<376>
Parazzi, E.; Pernis, B.; Secchi, G.C.; Vigliani, E.C., Studies on IN VITRO cytotoxicity of asbestos dusts., Med. Lavoro, 59(10): 561-576 (1968).

When incubated with guinea pig macrophages, Balangero chrysotile and South African crocidolite dusts were cytotoxic. Results showed a decreased production of lactic acid, kinetic loss of fluorochromasia, and a rapid release of lactate dehydrogenase (LDH); release of lysosomal enzyme acid phosphate (APH) was only slightly greater than in the controls. The fibrous fraction of the dusts was more toxic than the particulate fraction. Pretreatment of chrysotile fibers with ethylenediaminetetraacetic acid and polyvinylpyrrolidone nitrate did not modify the release of LDH or APH, thus suggesting that the cytotoxic action resides in the physical properties of the dusts rather than the chemical composition.

CHRYSOTILE; CROCIDOLITE; CYTOTOXICITY; GUINEA PIG; BIOCHEMICAL EFFECTS

<377>
Polliack, A.; Sacks, M.I., Prevalence of asbestos bodies in basal lung smears., Israel J. Med. Sci., 4: 223-226 (1968).

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. Ashkenagi Jews had a statistically higher incidence of asbestos bodies than other Jews. Asbestos exposure was not due to occupational exposure. Differentiation between true asbestos bodies and pseudoasbestos bodies is described.

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

<378>
Redaksie, V.D., Asbestos and neoplasia., S. Afr. Med. J., 42(14): 325-326 (1968).

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 carcinoma; 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; NEOPLASM; GASTROINTESTINAL; CO-CARCINOGEN; SMOKING

<379>
Roe, F.J.C., Some recent developments in the field of cancer causation., The Veterinary Annual. XIX + 311p. Pool, W.A. (Editor), John Wright and Sons, Ltd.; Bristol, England., pp. 170-178 (1968).

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 25 years. The use of effective dust controls in work areas has delayed death from asbestosis and increased the time during which lung cancer may develop; the latest figures indicate that more than 50% of persons with asbestosis will develop lung cancer. Since 1960, pleural and peritoneal mesothelioma has been associated with asbestos exposure; in many patients who develop this rare tumor, the extent of exposure is insufficient to cause asbestosis.

ASBESTOS; ASBESTOSIS; CANCER; MESOTHELIOMA; HUMAN; OCCUPATIONAL EXPOSURE; LUNG

<380>
Roe, F.J.C., Experimental asbestos carcinogenesis., Food Cosmet. Toxicol., 6(5): 566-568 (1968).

Some months after six subcutaneous injections of asbestos fibers totaling 60 mg of crocidolite, amosite, extracted amosite or chrysotile, marked changes were observed in the mesothelial and submesothelial tissues of CBA mice. These changes consisted of the deposition of asbestos fibers, thickening and edema, inflammatory infiltration, and cellular proliferation. In ten animals changes were regarded as malignant mesotheliomas (four peritoneal, four pleural, and two involving both peritoneum and pleurae). The incidence of mesothelial changes was lower in response to extracted amosite and crocidolite than to crude fibers.

AMOSITE; CHRYSOTILE; CROCIDOLITE; MESOTHELIOMA; MOUSE

<381>
Royall, H.J., The health of the public and asbestos usage., J. Roy. Inst. Public Health, 31:126-146 (1968).

The relation of increasing asbestos use to public health is emphasized by describing: history, types, properties, production, uses, health risks, mesothelioma, diagnosis, pathology, histology, and latency period. Non-occupational mesothelioma cases due to both domestic and environmental exposure in London (45) and South Africa are reviewed. Crocidolite appears to be the most dangerous asbestos.

ACTINOLITE; AMOSITE; AMPHIBOLE; ANTHOPHYLLITE; ASBESTOS; ASBESTOS BODIES; ASBESTOS MINING; CHRYSOTILE; CROCIDOLITE; HUMAN; MESOTHELIOMA; NON-OCCUPATIONAL EXPOSURE; OCCUPATIONAL EXPOSURE

<382>
Rusby, M., Pleural manifestations following the inhalation of asbestos in relation to malignant change., J. Roy. Nav. Med. Serv., 54(2): 142-148 (1968).

Thickening of the pleura with horn-like plaques has been a long recognized feature of asbestosis, but only recently has holly-leaf calcification been associated with asbestos inhalation. It is possible that the less concentrated exposure encountered from environmental or domestic sources, as opposed to industrial exposure, may determine whether a person gets pleural manifestations rather than pulmonary fibrosis. Years pass for pleural calcification to manifest overtly; x-ray visualization is possible in 5 to 6 years. The relationship between serosal malignancy and the inhalation of asbestos also has been recently established.

INHALATION; PLEURAL CALCIFICATION; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; ASBESTOS; X-RAY

<383>
Secchi, G.C.; Rezzonico, A., Hemolytic activity of asbestos dusts., Med. Lavoro, 59(1): 1-5 (1968).

Using human erythrocytes IN VITRO, the hemolytic activity of crocidolite, amosite, chrysotile, and anthophyllite was determined. Chrysotile had potent hemolytic activity, whereas the other fibers were either inactive or weakly lytic. Chrysotile adsorbed two erythrocyte enzymatic proteins--acetylcholinesterase and lactate dehydrogenase. The hemolytic activity of chrysotile may relate to the adsorptive capacity of the dust for the erythrocyte membrane components.

AMOSITE; ANTHOPHYLLITE; ASBESTOS; CHRYSOTILE; CROCIDOLITE; HEMOLYSIS; CYTOTOXICITY; CELL CULTURE; HUMAN

<384>
Selikoff, I.J.; Hammond, E.C.; Churg, J., Asbestos exposure, smoking, and neoplasia., J. Amer. Med. Assoc., 204(2): 106-110 (1968).

The risk of death by bronchogenic carcinoma in asbestos insulation workers is about 7 or 8 times higher than expected. Over a 52-month period, 370 workmen were observed and followed medically - 283 were regular cigarette smokers, 87 were not. Bronchogenic carcinoma claimed the lives of 24 smokers--only 3 deaths from this cause were expected; no non-smokers died from this disease. Calculated results indicate that in asbestos workers who smoke, the risk of dying from bronchogenic carcinoma is about 92 times greater than for men who neither smoke cigarettes nor work with asbestos. Asbestos exposure should be minimized, asbestos workers who smoke should stop immediately, and those not smoking should never start.

ASBESTOS; CANCER; CARCINOMA; HUMAN; INSULATION WORKERS; NEOPLASM; OCCUPATIONAL EXPOSURE; SMOKING; CO-CARCINOGEN

<385>
Sheers, G.; Templeton, A.R., Effects of asbestos in dockyard workers., Brit. Med. J., 3: 574-579 (1968).

The prevalence of asbestos associated abnormalities and their relation to exposure were studied by means of a one-in-ten survey of 15,000 naval dockyard workers. Of the 94% examined, 3% had experienced continuous occupational exposure whereas nearly half the remainder had been exposed intermittently. Pleural fibrosis was more prevalent in continuously exposed workers (28%) than those with least exposure (1.9%). Pulmonary fibrosis occurred mostly in laggers and sprayers who had been continuously exposed for 15 to 20 years. In the last 3 years ten cases of pleural mesothelioma have occurred; a large number of workers appear to be potentially at risk.

ASBESTOS; FIBROSIS; HUMAN; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; SHIPYARDS

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<386>

<386>
Smith, P.G.; Higgins, P.; Park, W.D., Peritoneal mesothelioma presenting surgically., Brit. J. Surg., 55(9): 681-684 (1968).

Peritoneal mesothelioma often is indistinguishable from carcinomatosis peritonei because of the similarity in tumor growth. One must establish an accurate diagnosis to assess the risk associated with asbestos exposure. Two cases of peritoneal mesothelioma are presented along with a review of 10 clinical cases. One case involved a 54-year-old man who had applied asbestos linings to pipes for more than 15 years; the other man, 50 years old and the brother of case 1, irsulated pipes and boilers for 36 years.

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

<387>
Stumphius, J.; Meyer, P.B., Asbestos bodies and mesothelioma., Ann. Occup. Hyg., 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 been exposed to high concentrations of iron oxide. Autopsy examinations of lung tissue revealed objects similar to asbestos bodies but no trace of asbestosis. Electron diffraction studies showed that the cores contained asbestos of the amphibole type, thus proving that they were not pseudomorphic. Simultaneous exposure to low concentrations of asbestos and high concentrations of iron oxide raises suspicion that iron oxide might be an important cofactor in the genesis of mesothelioma in shipyard workers.

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

<388>
Suzuki, Y.; Churg, J.; Smith, W.E., 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 mostly in avelolar macrophages but also within vacuoles of both A and B type alveolar epithelial cells and 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 osmiophilic lamellar bodies and to develop lysosomes.

ASBESTOS; CHRYSOTILE; HAMSTER; PHAGOCYTOSIS; MACROPHAGE; LUNG

<389>
Timbrell, V.; Gibson, J.C.; Webster, I., UICC standard reference samples of asbestos., Int. J. Cancer, 3(3): 406-408 (1968).

Difficulties in interpreting and comparing biological effects of asbestos in animal and human lung tissue have necessitated preparation of standard reference samples of each asbestos type. Fineness of milling samples must be uniform so that each sample contains approximately equal proportions of respirable dust, is distinctly fibrous, and contains fibers up to 150-200 microns long. Homogeneity of samples can be assured by an intermediate mixing stage using a mechanical blender. Other uniformities suggested by the Committee on Asbestos and Cancer include preparation of samples, use of material, and distribution to various experimental laboratories.

ASBESTOS; STANDARDS; AMOSITE; ANTHOPHYLLITE; CHRYSOTILE; CROCIDOLITE

<390>
Otidjian, H.D.; Gross, P.; DeTreville, R.T.P., Ferruginous bodies in human lungs: prevalence at random autopsies., Arch. Environ. Health, 17(3): 327-333 (1968).

Ferruginous bodies with transparent or invisible central filaments were found in lung tissue from 97 of 100 random autopsies of city dwellers who had not been occupationally exposed to dust particles. No apparent association was evident between malignancies (32 cases) and the relative abundance of ferruginous bodies; rarely was pulmonary fibrosis or neoplasm associated with these bodies. Although two cases of primary lung cancer were diagnosed in men no mesothelioma or asbestosis was found. Epidemiologically, the significance of these findings must await identification of the central core of the ferruginous bodies.

ASBESTOS; ASBESTOS BODIES; CANCER; FERRUGINOUS BODIES; ASBESTOSIS; FIBROSIS; HUMAN; NEOPLASM; MESOTHELIOMA; NON-OCCUPATIONAL EXPOSURE

<391>
Vigliani, E.C., The fibrogenic response to asbestos., Med. Lavoro, 59(6-7): 401-410 (1968).

A half century of experience in clinical and pathological observations of human asbestosis indicates that all types of asbestos are fibrogenic if inhaled in sufficient amounts over a long period of time. The question that remains unanswered is whether one type of asbestos is more fibrogenic than others. The major fibrogenic pathways involve the direct stimulation of fibroblasts, conversion of macrophages and giant cells into fibroblasts, release of a fibrogenic factor from macrophages, and appearance of giant cells which release a fibrogenic factor. Three theories hypothesize the fibrotic action of asbestos: Mechanical Theory - irritation and microwounds are produced by fibers; Chemical Theory - fibers dissolve, liberating fibrogenic compounds; and Surface Theory - the surface and shape of asbestos lead to fibrogenesis.

AMOSITE; ANTHOPHYLLITE; ASBESTOS; CHRYSOTILE; CROCIDOLITE; FIBROGENIC TISSUE RESPONSE; HUMAN

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<392>
Vigliani, E.C.; Ghezzi, I.; Maranzana, P.; Pernis, B., Epidemiological study of asbestos workers in Northern Italy., Med. Lavoro, 59(8-9): 481-485 (1968).

From April 1943 to December 1967, 288 persons receiving disability compensation for asbestosis died in Italy (Piedmont, Lombardy, Liguria); 32 worked in asbestos mining, 161 in manufacturing, 60 in asbestos-cement production, and 35 in insulation works. Of these deaths, 28(10%) died from lung tumor or mesothelioma of the pleura, 36 from neoplasia at other sites, 93 from complicated cardio-respiratory disease, 22 from tuberculosis, 81 from other causes, and 28 from undetermined causes. The incidence of lung cancer among male asbestos 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; CHRYSOTILE; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; ASBESTOS MINING; INSULATION WORKERS; NEOPLASIA; HUMAN

<393>
Walton, W.; Skeoch, T., Diagnosis of asbestosis by needle lung biopsy., Thorax, 23: 556-562 (1968).

Seven of nine confirmed cases of asbestosis were verified by needle biopsy. A significant advance in diagnosis has been made by use of the Jack 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

<394>
Brouet, G.; Bignon, J.; Bonnaud, G.; Goni, J.; Chretien, J.; Pariente, R., Pleural calcifications associated with an asbestos coniosis detected by examination of microspecimens with the polarizing microscope., J. Fr. 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; mineralology with polarizing microscopy of visceral pleura and bronchial wall tissue specimens revealed tremolite asbestos and crystals. Because asbestos bodies in dust are nonspecific and variable, testing methodology as described is both precise and specific for asbestos body detection in animal tissues.

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

<395>
Collins, T.F.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; CROCIDOLITE; AMOSITE; TREMOLITE; ANTHOPHYLLITE; ACTINOLITE; CHRYSOTILE; ASBESTOS MINING; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; ASBESTOSIS; MESOTHELIOMA; FIBROSIS; CANCER; HUMAN

<396>
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 (90% consists of chrysotile). The increasing use and indespensibility of asbestos requires the reexamination of dust standards. The demonstration of ferruginous bodies in 25-50% of many urban populations indicates an urgent need to positively identify the causative fibers. Cofactors 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

<397>
Cralley, L.J.; Keenan, R.G.; Lynch, J.R., Exposure to metals in the manufacture of asbestos textile products., Amer. Ind. Hyg. Assoc. J., 28(1) 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 to the naturally occurring metal content of asbestos ore and fibers, the abrasive action of asbestos on metal equipment used for milling and processing the fibers contributes metals to 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; CHRYSOTILE; ASBESTOS MINING

<398>
Davis, J.M.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 14 days. Dust was incorporated in phagosomes by most of the lung macrophages within two hours; dust was not found in any other cells. Usually, the dust was liberated into the macrophage cytoplasm 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.

CHRYSOTILE; ASBESTOS; MACROPHAGE; GIANT CELL; FIBROBLAST; GUINEA PIG; LUNG; ORGAN CULTURE

<399>
Delord, M.; Dusserre, P.; Michiels, R.; Portier, A., Pulmonary asbestosis and peritoneal mesothelioma., J. Fr. Med. Chir. Thorac., 21(5): 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 pseudomyelomatus hematologic syndrome was present also.

ASBESTOS; OCCUPATIONAL EXPOSURE; FIBROSIS; MESOTHELIOMA; CANCER; PERITONEUM

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Demy, N.G.; Adler, H., Asbestosis and malignancy., Amer. J. Roentgenol. Radium Ther. Nucl. Med., 100(3): 597-602 (1967).

Asbestos industries have been negligent in accepting the responsibility for hazardous working conditions, excessive production of asbestos products for public use, and indescriminant pollution of the environment with asbestos wastes. Only mild, brief, asbestos exposure (occupational or non-occupational) is necessary to produce asbestosis and pleural mesothelioma. 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; ASBESTOSIS; PLEURA; MESOTHELIOMA; HUMAN

<401>
Elder, J.L., Asbestosis in Western Australia., 2(13): 579-583 (1967).

Thirty-one cases of asbestosis and asbestosis with silicosis have been studied in a hospital in Perth, Australia over a five year period. Twenty-eight of these worked at an asbestos mine-mill and 3 at an asbestos cement works. History of exposure, pulmonary function tests and radiological changes were used to diagnose asbestosis. Exposure for 1 1/2 to 12 years at the mine was sufficient to produce disease and death in 7 cases, while at the cement works a period of 17 to 27 years was necessary to produce disability and one death. Pulmonary infection seems to accelerate the progress of the disease. Once radiologically evident, the disease is well-advanced. Radiological exams can be of diagnostic benefit but are very difficult to interpret even by experts. Changes in vital capacity may be more reliable since they may occur before radiological changes. Steroids are to be avoided in treatment of asbestosis.

ASBESTOSIS; ASBESTOS; CHRYSOTILE; DIAGNOSIS; WHITE ASBESTOS; CROCIDOLITE; BLUE ASBESTOS; AMOSITE; SILICOSIS; X-RAY; OCCUPATIONAL EXPOSURE; FINGER CLUBBING; ASBESTOS MINING; HUMAN

<402>
Freundlich, I.M.; Greening, R.R., Asbestosis and associated medical problems., Radiology, 89(2): 224-229 (1967).

In 56 of 187 asbestos workers studied, pulmonary roentgenologic changes were evident. The most common finding was pleural thickening -- frequently associated with parenchymal fibrosis.

ASBESTOSIS; ASBESTOS; CHRYSOTILE; CROCIDOLITE; AMOSITE; PLEURA; RESPIRATORY DISEASE; OCCUPATIONAL EXPOSURE; X-RAY; FIBROSIS; HUMAN

<403>
Gandevia, B., Pulmonary function in asbestos workers: A three-year follow-up-study., J. Amer. Rev. Resp. Dis., 96(3): 420-427 (1967).

Ventilatory function was measured in 41 male workers engaged in the manufacture of asbestos. The twelve workers who were left in the 3 1/2 year interval between surveys were found to have a significanly lower vital capacity and a significantly higher ventilatory requirement during exercise than those who remained in this work, probably because, on the average, they were 9 years older and had 6 more years exposure in the asbestos industry. Compared to controls, the asbestos workers demonstrated a greater decrease in forced respiratory volume than expected with greater changes in vital capacity and ventilatory requirement. Functional abnormality is consistent with but not predictive of asbestosis.

ASBESTOS; OCCUPATIONAL EXPOSURE; HUMAN; VENTILATORY DEFECTS

<404>
Ghezzi, I.; Molteni, G.; Puccetti, U., Asbestos bodies in the lungs of inhabitants of Milan., Med. Lavoro, 58(3): 223-227 (1967).

Asbestos bodies were found in 51 of 100 subjects (64 men and 36 women) studied at autopsy. Of the 51 positive cases, 44% were women. Asbestos bodies were found more frequently in the older people and in those demonstrating pulmonary edema. A slight pulmonary fibrosis was found in one case but no asbestosis was demonstrated clearly. No pleural plaques or thickenings were found in the 65 subjects examined for these effects, although asbestos bodies were found in some. The age range of this non-occupationally exposed group was from 25 to 83 years.

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

<405>
Graham, J.; Graham, P., Ovarian cancer and asbestos., Environ. Res., 1: 115-128 (1967).

Human ovarian cancer morphologically resembles mesotheliomatas, and clinically has been reported in association with asbestosis. 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 Dutch 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 10 rabbits and 2 of 16 guinea pigs had developed ovarian epithelial abnormalities which were similar to those seen in early ovarian lesions in humans.

ASBESTOS; MESOTHELIOMA; ASBESTOSIS; GUINEA PIG; RABBIT; MOUSE; TREMOLITE; CANCER; HUMAN; OVARY

<406>
Gross, P.; Crallev, L.J.; DeTreville, R.T.P., "Asbestos" bodies: their nonspecificity., Amer. Ind. Hyg. Assoc. J., 28(1): 541-542 (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 unequivically, 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

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<407>
Gross, P.; DeTreville, R.T.P., Experimental asbestosis: studies on the progressiveness of the pulmonary fibrosis caused by chrysotile dust., Arch. Environ. Health, 15: 638-649 (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 is a considerable reduction in the amount of dust in lung sections one year after exposure compared to directly after exposure. In hamsters, lesions are progressive and do not heal; demonstrable amounts of asbestos dust in lung sections are diffusely distributed. In guinea pigs, the early asbestotic lesion is similar to that of rats, but further study is needed.

RAT; HAMSTER; GUINEA PIG; INHALATION; PNEUMOCONIOSIS; CHRYSOTILE; ASBESTOS BODIES; ASBESTOSIS; LUNG

<408>
Gross, P.; DeTreville, R.T.P.; Tolker, E.B.; Kaschak, M.; Babyak, M.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 42 to 146 mg/cubic meter for 6 hrs. a day, 5 days a week, for a maximum of 62 weeks. Half of the rats also were exposed to sodium hydroxide (NaOH) to reduce lung clearance, thereby maximizing dust retention and pathogenicity. Primary malignant lung tumors developed in 31% of those surviving 16 months or more; tumor incidence in NaOH-treated rats was 88% -- twice as high as in rats treated only with asbestos. Cancer induction also may involve trace metals (nickel, chromium, cobalt) introduced by the hammer milling of asbestos.

ASBESTOSIS; RAT; CHRYSOTILE; CARCINOMA; SARCOMA; ASBESTOS; CANCER; TUMOR; TRACE METALS; LUNG; CO-CARCINOGEN

<409>
Heimann, H., 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

<410>
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 intrapleurally (3 mg) 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, 90% of the radioactivity remained in the pleural cavity and lungs, indicating that translocation of asbestos fibers from the lung area is a slow process.

CHRYSOTILE; TISSUE DISTRIBUTION; RAT; LUNG; PLEURA

<411>
Jagatic, J.; Rubnitz, M.E.; Godwin, M.C.; Weiskopf, R.W., Tissue response to intraperitoneal asbestos with preliminary report of acute toxicity of heat-treated asbestos in mice., Environ. Res., 1: 217-230 (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 50 mice within 36 hours, and 4 more died after 48 hours. Survivors recovered well and were alive 7 months later.

FIBROGENIC TISSUE RESPONSE; ASBESTOS; MOUSE; FIBROSIS; MESOTHELIOMA; PLEURA; PERITONEUM; CHRYSOTILE

<412>
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; symptomology; 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 milling and grinding asbestos sheet (5 and 23 years exposure) showed similar but more progressive signs and symtoms due to higher asbestos exposure levels.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; DIAGNOSIS; INSULATION WORKERS; RESPIRATORY DISEASE; HUMAN

<413>
Lieben, J.; Pistawka, H., Mesothelioma and asbestos exposure., Arch. Environ. Health, 14: 559-563 (1967).

Retrospective histories were recorded for 42 cases of mesothelioma to correlate the malady 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.

MESOTHELIOMA; ASBESTOS; PLEURA; PERITONEUM; ASBESTOS BODIES; LUNG; CANCER; OCCUPATIONAL EXPOSURE; HUMAN

<414>
MacNab, G.; Harington, J.S., Haemolytic activity of asbestos and other mineral dusts., Nature, 214: 522-23 (1967).

Significant hemolytic activity in washed sheep RBCs was found for: (1) chrysotile; (2) serpentine, crystalline and amorphous silica; (3) silicic acid powder and (4) silica gel. Amosite, anthophyllite, and crocidolite gave negative results.

ASBESTOS; HEMOLYSIS; CHRYSOTILE; AMOSITE; ANTHOPHYLLITE; CROCIDOLITE; CELL CULTURE

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<4 15>

<4 15>
Newhouse, M.L., The medical risks of exposure to asbestos., Practitioner, 199: 285-293 (1967).

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 3 million tons per year; chrysotile, a magnesium silicate, comprises 93% of the output. Approximately 2/3 of the asbestos produced is used in cement products. High incidences of health disorders such as asbestosis, bronchial carcinoma, mesothelioma of the pleura or peritoneum, and gastrointestinal tumors occur among exposed workers, particulary 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.

MESOTHELIOMA; ASBESTOS; CROCIDOLITE; AMOSITE; ANTHOPHYLLITE; OCCUPATIONAL EXPOSURE; TUMOR; ASBESTOSIS; CARCINOMA

<4 16>
Norwood, W.D.; Fuqua, P.A., Asbestos--an environmental health hazard., Northwest Med., 66(9): 821-828 (1967).

Both occupational and non-occupational asbestos exposure are becoming increasingly more hazardous as multiple adverse biological effects are being recognized. Diseases and biological effects recognized are: bronchiectasis, asbestosis, chronic pneumonitis, emphysema, chronic pleuritis, pleural plaques, corpulmonale, carcinoma of the lung, diffuse mesothelial tumors of the pleura and peritoneum, gastrointestinal 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 case studies demonstrate asbestosis with pulmonary emphysema and corpulmonale, asbestosis with lung cancer, mesothelioma, and rectal carcinoma in workers exposed to asbestos.

ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; ENVIRONMENTAL CONTAMINATION; HUMAN; MESOTHELIOMA; OCCUPATIONAL EXPOSURE; GASTROINTESTINAL

<4 17>
Pennarola, R.; Eliseo, V., Cytologic morphology of the sputum in asbestosis of the lung., Folia Medica, 50(1): 1-12 (1967).

Sputum from 30 asbestosis patients was examined using the Papanicolau and Sirtori techniques. Asbestos particles were found along with cell metaplasia and changes in nuclear structure with dismorphic trace.

ASBESTOS; ASBESTOSIS; ASBESTOS BODIES; CANCER; HUMAN

<4 18>
Roberts, G.H., 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, 1 had asbestosis and 3 had bronchial carcinomas. The occupational histories were not known.

ASBESTOS BODIES; PLEURAL PLAQUES; SHIPYARDS; ASBESTOSIS; CARCINOMA; HUMAN; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

<4 19>
Roe, F.J.C.; Carter, R.L.; Walters, M.A.; Harington, J.S., The pathological effects of subcutaneous injections of asbestos fibres in mice: migration of fibres to submesothelial tissues and induction of mesotheliomata., Int. J. Cancer, 2: 628-638 (1967).

Asbestos, when injected subcutaneously in female mice, is widely but selectively disseminated 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 mesotheliomata. These observations are equally applicable to amosite, crocidolite, and chrysotile--all three induced both injection-site tumors and distant mesothelial changes. Removal of mineral oils from asbestos may reduce carcinogenicity.

MOUSE; ASBESTOS; MESOTHELIOMA; CROCIDOLITE; AMOSITE; CHRYSOTILE; TUMOR; CANCER

<4 20>
Selikoff, I.J.; Bader, R.A.; Bader, M.E.; Churg, J.; Hammond, E.C., Asbestosis and neoplasia., Amer. J. Med., 42(4): 487-496 (1967).

This editorial broadly outlines some of the present and future problems of an industrialized society which heavily depends on asbestos; emphasized is the increased probability of asbestos becoming a greater hazard. Because of the long latent period between initial asbestos exposure and related disease manifestation (35 yrs.) it is difficult to assess the significance of small quantities inhaled in asbestos contaminated air; the effects of current environmental releases of asbestos may not manifest in the general population until the 1990's. The incidence of asbestos-induced lung cancer may equal cigarette-induced cancer in the next few decades.

ASBESTOSIS; ASBESTOS BODIES; PNEUMOCONIOSIS; ENVIRONMENTAL CONTAMINATION; CANCER; INHALATION; HUMAN

<4 21>
Weiss, B.; Boettner, E.A., Commercial talc and talcosis., Arch. Environ. Health, 14: 304-308 (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.

PNEUMOCONIOSIS; TREMOLITE; OCCUPATIONAL EXPOSURE; ANTHOPHYLLITE; FIBROSIS

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<422>
Zolov, C.; Bourilkov, T.; Babadjov, L., Pleural asbestosis in agricultural workers., Environ. Res., 1: 287-292 (1967).

In rural Bulgaria, fluorographic examination of 3,325 people living within 10 km of an asbestos mine revealed 155 cases of pleural asbestosis; 132 had no occupational contact with asbestos (86 men and 46 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

<423>
Addingley, C.G., Asbestos dust and its measurements., 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 used in conjunction with a membrane filter apparatus for asbestos dust monitoring with excellent correlation between the two.

ASBESTOS; ENVIRONMENTAL SAMPLING; ANALYSIS; DUST CONTROLS

<424>
Blount, M.; Holt, P.F.; Leach, A.A., The protein coating of asbestos bodies., Biochem. J., 101: 204-207 (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 preformed iron-protein complex (ferritin) or by the separate adsorption of iron and protein.

ASBESTOS BODIES; LUNG; ASBESTOS; PHAGOCYTOSIS; HUMAN

<425>
Holt, P.F.; Mills, J.; Young, D.K., Experimental asbestosis in the guinea-pig., J. Pathol. Bacteriol., 92: 185-185 (1966).

Guinea pigs were placed in inhalation 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 30 weeks cell degeneration and fibrosis occurred along with polypoid growths in bronchioles. Later, asbestos bodies were numerous. Crocidolite, amosite, and anthophyllite produced similar lung damage.

ASBESTOSIS; FIBROSIS; ASBESTOS; CHRYSOTILE; ANTHOPHYLLITE; AMOSITE; CROCIDOLITE; ASBESTOS BODIES; GUINEA PIG

<426>
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

<427>
Kleinfeld, M.J.; Messite, J.; Shapiro, J., Clinical, radiological, and physiological findings in asbestosis., Arch. Intern. Med., 117: 813-819 (1966).

Clinical, electrocardiographic, and physiological observations were made of 21 asbestos workers whose 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; ELECTROCARDIOGRAM; DIAGNOSIS

<428>
Kogan, F.M.; Borinovskaya, A.P., Effect of asbestos and serpentine dusts on pulmonary tissue culture., Hyg. Sanit., 31(1,2,3): 37-41 (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

<429>
Lynch, J.R.; Ayer, H.E., Measurement of dust exposures in the asbestos textile industry., Amer. Ind. Hyg. Assoc. J., 27(1): 431-437 (1966).

In data obtained from environmental surveys of nine asbestos mills, a base line 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 mechanisms; that is, counts based on 'grains' should not dominate criteria which relate to the pathogenesis of 'fibers'.

ASBESTOS; STANDARDS; OCCUPATIONAL EXPOSURE; HEALTH CRITERIA; TEXTILE INDUSTRY

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<430>

<430>
Mann, R.H.; Grosh, J.L.; O'Donnell, W.M., Mesothelioma associated with asbestosis., Cancer, 19(1): 521-526 (1966).

Clinical observations of 54 asbestosis patients link occupational asbestos exposure to pleural and peritoneal mesothelioma. 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

<431>
O'Donnell, W.M.; Mann, R.H.; Grosh, J.L., Asbestos, an extrinsic factor in the pathogenesis of bronchogenic carcinoma and mesothelioma., Cancer, 19(8): 1103-1108 (1966).

In a clinical study of 55 asbestos textile workers with pathologically proven asbesotosis, 28 malignant neoplasms are reported - 23 bronchogenic carcinomas and 5 mesotheliomas (pleural and peritoneal); 26/28 were exposed to asbestos prior to 1936. The interval between neoplasm diagnosis and initial exposure ranged from 20-40 years. The frequent association of pulmonary asbestosis with bronchogenic carcinoma (42%) and mesothelioma (8%) implicates asebstos as a carcinogenic agent.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; CARCINOMA; MESOTHELIOMA; NEOPLASM; CANCER; PLEURA; PERITONEUM; TEXTILE INDUSTRY; HUMAN

<432>
Poe, F.J.C.; Walters, M.A.; Harington, J.S., Tumour 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 amosite 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

<433>
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 ASBESTOS; CROCIDOLITE; BLUE ASBESTOS; AMOSITE; ANTHOPHYLLITE

<434>
Thomson, J.G.; Graves, W.M., Asbestos as an urban air contaminant., Arch. Pathol., 81: 458-464 (1966).

Lung smears from autopsies of 500 people, 15 years of age and older, in Miami, Florida demonstrated asbestos bodies in 20% of the females and 30% of the males. In most, including all females examined, asbestos bodies were scanty and not indicative of pulmonary changes. In view of the increasing diverse use, and the indestructability of asbestos, it is anticipated that the frequency of malignancies of the lung will increase in the future.

ASBESTOS; ASBESTOS BODIES; LUNG; CANCER; HUMAN

<435>
Wiecking, D.K., Pulmonary asbestosis with metastatic mesothelioma: case report., Amer. Surg., 32(5): 308-312 (1966).

A male, age 61, employed 43 years as an insulation worker, was seen at a clinic because of dypsnea. An x-ray of the chest revealed a consolidation in the lower left lung lobe with pleural thickening. A lobectomy revealed a fibrous tumor mass 12 cm in diameter which occupied most of the lobe. No asbestos bodies were seen in the tumor mass, but many were evident in the adjacent lung tissue. The patient died from bronchopneumonia and heart failure 2 years after the initial visit. Autopsy revealed a widespread metastatic pleural mesothelioma associated with asbestos fibers in the lung.

ASBESTOSIS; MESOTHELIOMA; ASBESTOS; CARCINOMA; LUNG; TUMOR; X-RAY; OCCUPATIONAL EXPOSURE; HUMAN; MESOTHELIOMA; FIBROSIS

<436>
Anonymous, Asbestos and cancer., Can. Med. Assoc. J., 92: 1020-1024 (1965).

An international meeting on the biological effects of asbestos was sponsored by the New York Academy of Sciences in October 1964. Following the meeting a working group was formed to study the information presented with respect to asbestos and cancer. The aspects covered were epidemiology, pathology and experimental pathology, physics and chemistry. This special report records their findings and recommendations.

ASBESTOS; CANCER; ASBESTOSIS; CARCINOMA; AMOSITE; ANTHOPHYLLITE; CHRYSOTILE; CROCIDOLITE; TREMOLITE; MESOTHELIOMA; TUMOR

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<437>
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).

Amosite, anthophyllite, chrysotile, 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 carcinoma, diffuse pleural and peritoneal mesothelioma and possibly gastro-intestinal carcinoma and ovarian tumors. A latent period of 20 years or more may occur between initial exposure and the onset of tumors. Trace amounts of metals such as nickel and chromium are found in some asbestos fibers; the role of these 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) pathological problems involving the diagnosis of asbestos-related diseases and the classification of asbestosis; (4) preparation of standard reference samples; and (5) identification of asbestos in tissues.

STANDARDS; OCCUPATIONAL EXPOSURE; ASBESTOS; CANCER; AMOSITE; ANTHOPHYLLITE; CHRYSOTILE; CROCIDOLITE; TREMOLITE; CARCINOMA; LUNG; MESOTHELIOMA; HUMAN

<438>
Anonymous, Asbestosis and malignant disease., New Engl. J. Med., 272(11): 590-91 (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; however the additional influence of cigarette smoking or inhalation of other dusts, industrial pollutants or trace metals associated with asbestos is undetermined. Although the production and use asbestos is large and widespread, certain asbestos industries can minimize occupational health hazards by engineering dust controls.

ASBESTOSIS; CARCINOMA; MESOTHELIOMA; ASBESTOS; GASTROINTESTINAL; CANCER; CROCIDOLITE; CHRYSOTILE; AMOSITE; LUNG; HUMAN; OCCUPATIONAL EXPOSURE

<439>
Bader, M.E.; Bader, P.A.; Tierstein, A.S.; Selikoff, I.J., Pulmonary function in asbestosis: serial tests in a long-term prospective study., Ann. N.Y. Acad. Sci., 132(1): 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 half 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

<440>
Bohlig, H., Radiological classification of pulmonary asbestosis., Ann. N.Y. Acad. Sci., 132(1): 338-350 (1965).

Because of national differences in compensation rules for asbestosis, only a radiological classification of the disease is practical for international agreement. If experts agree that radiological signs of pathological lung structures can be manifested only as disseminated or sguared opacities, these two characteristics can serve as a basis for new classification. To intensify the reproducibility of the x-ray films it is suggested that the symbol "f" be used for linear patterns chiefly occurring in asbestosis instead of the unalterable "L", and be combined with quantitative categories for small opacities. Large opacities might be characterized by the symbol "A" for beginning confluence and by "B" and "C" for opacities having a diameter longer than 5 cm. Additional symbols would be welcomed to accomodate international peculiarities.

ASBESTOSIS; DIAGNOSIS; HUMAN; X-RAY

<441>
Brown, P.; Cartwright, B.; Newman, J.F.E., Inhibition of virus growth by a toxic factor from asbestos pad and cellulose acetate membrane filters., Nature, 205: 310-311 (1965).

Filtration of either phosphate-low or Eagle's medium through a Seitz or Pord'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 FILTERS; CELL CULTURE; CYTOTOXICITY

<442>
Buchanan, W.D., Asbestosis and primary intrathoracic neoplasms., Ann. N.Y. Acad. Sci., 132: 507-518 (1965).

In Great Britain, there is a greater risk of dying from intrathoracic tumor in patients with asbestosis. From 1924 through 1963, 584 (392 males and 192 females) certified deaths involved asbestosis; the incidence of thoracic tumor continues to increase disproportionately with the total number of asbestosis cases. Currently over 50% 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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<443>
Caplan, A.; Gilson, J.C.; Hinson, K.F.W.; McVittie, J.C.; Wagner, J.C., II. 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.O. (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

<444>
Cauna, D.; Totten, R.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 41%. Among males the incidence of positive cases was higher (47%) than in women (34%). The highest relative incidence of positive cases was found in ages between 25 to 34 years; none were found up to age 24. 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

<445>
Churg, J.; Rosen, S.H.; Moolten, S., Histological characteristics of mesothelioma associated with asbestos., Ann. N.Y. Acad. Sci., 131(1): 614-622 (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-existed.

ASBESTOS; DIAGNOSIS; MESOTHELIOMA; PERITONEUM; PLEURA; HUMAN; TUMOR; CANCER

<446>
Davis, J.M.G., Electron-microscope studies of asbestosis in man and animals., Ann. N.Y. Acad. Sci., 132(1): 98-111 (1965).

The importance of very small particles of asbestos dusts 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 1u in length. Electron microscopic studies show that asbestosis 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 lung 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; CHRYSOTILE; GIANT CELL; GUINEA PIG; HUMAN; MACROPHAGE

<447>
Dutra, F.R.; Carney, J.D., Asbestosis and pulmonary carcinoma., Arch. Environ. Health, 10(3): 416-423 (1965).

Asbestosis 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

<448>
Eisenstadt, H.B., Benign asbestos pleurisy., J. Amer. Med. Assoc., 192(5): 419-421 (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. Four cases of benign pleurisy are presented; two cases involve malignant mesothelioma.

ASBESTOS; PLEURISY; HUMAN; ASBESTOS BODIES; DIAGNOSIS

<449>
Elmes, P.C.; McCaughey, W.T.E.; Wade, O.L., Diffuse mesothelioma of the pleura and asbestos., Brit. Med. J., 1(5431): 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 41 men aged 50 to 69 who died of diseases other than carcinoma or mesothelioma and in 20% 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

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<450>
Elmes, 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-four 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; MESOTHELIOMA; TUMOR; OCCUPATIONAL EXPOSURE; ASBESTOS BODIES

<451>
Enterline, P.E., 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 2,833 white men who worked in the asbestos industry during the period 1948-1951 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) tend to rise with time. Excluding 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

<452>
Gilson, J.C., Problems and perspectives: the changing hazards of exposure to asbestos., Ann. N.Y. Acad. Sci., 132(1): 696-705 (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 a 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 propective study of asbestos workers.

ASBESTOS; ASBESTOSIS; CARCINOMA; HUMAN; MESOTHELIOMA; TUMOR; DIAGNOSIS; DUST CONTROLS

<453>
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 diagnoses are made between asbestosis and forms of honeycomb lung or fibrosis caused by other silicates. Hemosiderosis of elastic tissue (elastosis bodies) may mimic asbestos bodies. An association between rheumatoid disease and asbestosis has been documented in 2 cases.

ASBESTOS; ASBESTOSIS; DIAGNOSIS; FIBROSIS; HEMOSIDEROSIS; HUMAN; SILICOSIS

<454>
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

<455>
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 mining 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 constituents contribute to the carcinogenicity of asbestos.

ANALYSIS; AMOSITE; ASBESTOS; CHRYSOTILE; CROCIDOLITE; TRACE METALS; CO-CARCINOGEN

<456>
Harington, J.S.; Roe, F.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 that 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 elucidating them. It is unlikely that asbestos carcinogenesis is an example of the Oppenheimer Effect.

AMOSITE; ASBESTOS; CANCER; CHRYSOTILE; CROCIDOLITE; MESOTHELIOMA; TUMOR; TRACE METALS; CO-CARCINOGEN

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Hendry, N.W., The geology, occurrences, and major uses of asbestos., Ann. N.Y. Acad. Sci., 132(1): 12-22 (1965).

Asbestos is a term embracing a number of fibrous mineral silicates that differ chemically and physically. They may be divided into two mineral groups: (1) pyrcxenes--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

<458>
Hills, D.W., Economics of dust control., Ann. N.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

<459>
Holmes, S., Developments in dust sampling and counting techniques in the asbestos industry., Ann. N.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 u; 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

<460>
Holt, P.F.; Mills, J.; Young, D.K., Experimental asbestosis with four types of fibers: Importance of small particles., Ann. N.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 anthophylite 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 bronchiolar epithelium, and reticulinosis and 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

<461>
Hueper, W.C., Occupational and non-occupational exposures to asbestos., Ann. N.Y. Acad. Sci., 132(1): 184-195 (1965).

Increased production and use of asbestos in the last 50 years has resulted in greater individual exposure of workers to asbestos. This is reflected by growing reports of asbestosis and 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

<462>
Hunt, R., Routine lung function studies on 830 employees in an asbestos processing factory., Ann. N.Y. Acad. Sci., 132(1): 406-520 (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 diagnoses. 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

<463>
Jacob, G.; Anspach, M., Pulmonary neoplasia among Dresden asbestos workers., Ann. N.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 1964, 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 1958-1964 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.

ASBESTOSIS; CANCER; CARCINOMA; HUMAN; LUNG; TUMOR; OCCUPATIONAL EXPOSURE

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<464>
Knox, J.F.; Hill, I.D.; Doll, R.S., Cohort analysis of changes in incidence of bronchial carcinoma in a textile asbestos factory., Ann. N.Y. Acad. Sci., 132(1): 526-533 (1965).

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; CHRYSOTILE; CROCIDOLITE; DUST CONTROLS; HUMAN; OCCUPATIONAL EXPOSURE; RESPIRATORY DISEASE

<465>
Laamanen, A.; Noro, L.; Raunio, V., Observations on atmospheric air pollution caused by asbestos., Ann. N.Y. Acad. Sci., 132(1): 240-254 (1965).

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 on geographical and meteorological conditions and the distance from the source.

ASBESTOS; DUST CONTROLS; ENVIRONMENTAL CONTAMINATION

<466>
May, T.C., Asbestos., Minerals Yearbook: Metals and Minerals. U.S. Department of the Interior, Bureau of Mines., 1: 201-211 (1965).

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; CHRYSOTILE

<467>
McVittie, J.C., Asbestosis 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, 247 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 41% 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; MESOTHELIOMA; OCCUPATIONAL EXPOSURE

<468>
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): 489-500 (1965).

The ability of benzo (a) pyrene to produce papillomas and carcinomas in the respiratory tract of hamsters is increased when adminstered in conjunction with chrysotile asbestos; amosite did not increase tumor induction by benzo (a) pyrene.

ASBESTOS; CANCER; CARCINOMA; HAMSTER; TUMOR; CO-CARCINOGEN

<469>
Morris, T.G.; Roberts, W.H.; Silverton, R.E.; Skidmore, J.W.; Wagner, J.C.; Cook, G.W., Comparison of dust retention in specific pathogen free and standard rat., Inhaled Particles and Vapours II. Proceedings of an International Symposium (Cambridge, England, 1965); C.N. 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 25 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 greater 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; CHRYSOTILE; AMOSITE; RAT; INHALATION; LUNG; FIBROGENIC TISSUE RESPONSE

<470>
Nagelschmidt, 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): 64-76 (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; CHRYSOTILE; CROCIDOLITE; FIBROSIS; HUMAN; LUNG

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<471>

<471>
Newhouse, M.L.; Thompson, H., 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 industry. Durations of exposure ranged from 2 months to more than 50 years. The 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 48.6 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; INHALATION

<472>
Newhouse, M.L.; Thompson, H., Epidemiology of mesothelial tumors in the London area., Ann. N.Y. Acad. Sci., 132(1): 579-588 (1965).

The aim of this study was to establish the occupational histories and to trace any other exposure to asbestos in 83 patients with mesothelioma. Utilizing all available sources of information, it was determined that 52.6% of the patients with mesothelioma had been exposed to asbestos compared to 11.8% for the controls. Three main types of exposure are presented. Among the 36 patients with no positive occupational history, 11 lived within half a mile of an asbestos industry. A symptomatology of pleural and peritoneal mesothelioma is presented.

ASBESTOS; CROCIDOLITE; HUMAN; MESOTHELIOMA; NON-OCCUPATIONAL EXPOSURE; OCCUPATIONAL EXPOSURE; PERITONEUM; PLEURA; CANCER

<473>
Pernis, B.; Vigliani, E.C.; Selikoff, I.J., Rheumatoid factor in serum of individuals exposed to asbestos., Ann. N.Y. Acad. Sci., 132(1): 112-120 (1965).

The presence and titer of rheumatoid factors were determined in the sera of 315 asbestos insulation workers with occupational exposure varying from 1 to 54 years; most workers showed radiographic evidence of asbestosis that was graded from 1 to 3. A significant increase in rheumatoid factor was found only in patients with asbestosis of grade 2 or 3; among these patients the percentage of cases showing hemagglutination titer of 1:320 or more is 21.0% and 15.9%, respectively. The factor found reacts with human gamma globulins.

ASBESTOS; ASBESTOSIS; INSULATION WORKERS; OCCUPATIONAL EXPOSURE; RHEUMATOID FACTOR

<474>
Schall, F.L., Present threshold limit value in the U.S.A. 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 mppcf 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 is based upon dust counts of all particles, fibrous and particulate, asbestos or not, and (5) dust counts taken were averaged.

ASBESTOS; STANDARDS

<475>
Selikoff, I.J., The occurrence of pleural calcification among asbestos insulation workers., Ann. N.Y. Acad. Sci., 132(1): 351-367 (1965).

Roentgenological evidence of pleural calcification was found in 150 of the 1,117 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 calification is almost pathognomonic of asbestosis in the absence of traumatic or infectious pleural disease, unilateral calcification is almost as strongly diagnostic.

ASBESTOS; ASBESTOSIS; DIAGNOSIS; HUMAN; PLEURAL CALCIFICATION

<476>
Selikoff, I.J.; Churg, J.; Hammond, E.C., The occurrence of asbestosis among insulation workers in the United States., Ann. N.Y. Acad. Sci., 132(1): 139-155 (1965).

Hazards associated with asbestos exposure were investigated in 1522 insulation workers in the New York - New Jersey area. Among the 392 workers with more than 20 years of exposure, 339 cases of asbestosis and 11 pleural cancer cases were observed. Neoplastic complications of asbestos exposure were studied among 307 consecutive deaths in this group of men. The incidence of lung cancer was seven times greater than expected and cancer of the gastrointestinal tract was three times greater than expected. Ten cases of mesothelioma were found. No cancers were observed in workers with less than 20 years work experience.

ASBESTOS; ASBESTOSIS; CANCER; CARCINOMA; HUMAN; INSULATION WORKERS; LUNG; MESOTHELIOMA

<477>
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 mesotheliomas, 4 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; ASBESTOS BODIES; ASBESTOSIS; CANCER; HUMAN; LUNG; MESOTHELIOMA; PERITONEUM; PLEURA; OCCUPATIONAL EXPOSURE; INSULATION WORKERS

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<478>
Sluis-Cremer, G.K., Asbestosis in South Africa - certain geographical and environmental considerations., Ann. N.Y. Acad. Sci., 132(1): 215-234 (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

<479>
Sluis-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(1): 373-378 (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 "Lf" 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

<480>
Smith, K.W., Trends in the health of the asbestos worker., Ann. N.Y. Acad. Sci., 132(1): 685-690 (1965).

A critique of the health hazards associated with asbestos is presented by an industrialist. An appeal is made for more accurate investigation and reporting of asbestos related hazards, and for classification of asbestos workers and asbestos products. Isolated studies may be interesting, but the true picture of the biological effects of asbestos will emerge only when there is a broad study conducted by an impartial agency on a nation-wide scale.

ASBESTOS; CANCER; OCCUPATIONAL EXPOSURE; RESPIRATORY DISEASE

<481>
Smith, W.E.; Elsasser, R.E., A transplantable mesothelioma induced by asbestos., Fed. Proc., 24(2): 555, Abstract 2328 (1965).

Intrapleural injection of asbestos in hamsters induced mesotheliomas; the neoplastic nature was demonstrated by serial transplantations in thigh muscle for 7 host generations. Solid tumors developed at transplantation sites within 25 days, leading to death. Lung metastases were found.

MESOTHELIOMA; ASBESTOS; TUMOR; LUNG; HAMSTER; NEOPLASM

<482>
Smith, W.E.; Miller, L.; Churg, J.; Selikoff, I.J., Mesotheliomas in hamsters following intrapleural 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. Islands of epithelial-like cells, sometimes lining narrow clefts, were found in pleural adhesions of hamsters that did not develop tumors. These islands are of interest because they may be precursors of tubular types of metheliomas.

AMOSITE; ASBESTOS; CHRYSOTILE; MESOTHELIOMA; HAMSTER; CANCER; TUMOR

<483>
Smith, W.E.; Miller, L.; Elsasser, R.E.; Hubert, D.D., Tests for carcinogenicity of asbestos., Ann. N.Y. Acad. Sci., 132: 456-187 (1965).

A single intrapleural injection of soft chrysotile, harsh chrysotile or amosite (25 mg) in hamsters initially induced granulomatous inflamation, pleural thickening, calcification, necrosis, and fibrosis. Pleural mesotheliomas developed after 200 days in 3 out of 15 animals given amosite, and after 400 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 483 days after the first injection.

ASBESTOS; CHRYSOTILE; AMOSITE; FIBROSIS; PLEURAL CALCIFICATION; PLEURAL PLAQUES; MESOTHELIOMA; PLEURA; HAMSTER

<484>
Smither, W.J., 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 26 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 26 cases. Most (88%) were referred for physiological testing to confirm asbestosis. Sputum asbestos bodies are evidence of asbestos exposure only.

ASBESTOSIS; OCCUPATIONAL EXPOSURE; HUMAN; ASBESTOS; ASBESTOS BODIES

<485>
Steel, S.J.; Boyd, J., Pleural calcification and mesothelioma following exposure to asbestos., Brit. J. Dis. Chest, 59(3): 130-138 (1965).

Ten years after exposure to asbestos as a storekeeper, a 63-year old man developed mesothelioma with pleural thickening and effusion of the left side. The patient was rehospitalized 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 biopsy specimen revealed the presence of mesothelioma of the pleura with an asbestos body present in the adjacent lung. The disease was fatal.

ASBESTOS; DIAGNOSIS; DYSPNEA; MESOTHELIOMA; PLEURAL CALCIFICATION; HUMAN; OCCUPATIONAL EXPOSURE

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<4486>

<4486>
Thomson, J.G., Asbestos and the urban dweller., Ann. N.Y. Acad. Sci., 132(1): 196-218 (1965).

Asbestos fiber inhalation by urban dwellers was investigated by counting asbestos bodies in lung base smears from 500 consecutive autopsies in Cape Town, South Africa and 500 in Miami, Florida. Results were similar; 30% males and 20% females showed asbestos bodies. This work draws attention to the widespread use of asbestos in cities, the necessity for comparable geographic studies, and the potential for adverse effects.

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

<4487>
Thomson, M.L.; Pelzer, A.M.; Smither, W.J., The discriminant value of pulmonary function tests in asbestosis., Ann. N.Y. Acad. Sci., 132(1): 421-436 (1965).

Of 28 workers with 14-year average asbestos dust exposure, 19 were certified asbestotic whereas 9 had been exposed but not certified. Radiological abnormality, dyspnea, rales, and finger clubbing were instrumental in certification. This study used 11 pulmonary function tests to discriminate between the certified and uncertified workers and substantiated the previous diagnoses.

ASBESTOSIS; PNEUMOCONIOSIS; OCCUPATIONAL EXPOSURE; HUMAN; FINGER CLUBBING; X-RAY

<4488>
Timbrell, V., The inhalation of fibrous dusts., Ann. N.Y. Acad. Sci., 132(1): 255-273 (1965).

Studied were the relationship between free-falling speeds of fibers and their dimensions, and the likely magnitude of fiber deposition purely by virtue of their elongated shape. Even though the largest compact particles found in lungs are about 10 microns in diameter, the presence of asbestos fibers 50 to 200 microns long can be explained because free-falling speed is determined predominantly by diameter and not length. Places where respiratory bronchioles branch are preferred deposition sites for long fibers.

INHALATION; AMOSITE; CHRYSOTILE; CROCIDOLITE; TISSUE DISTRIBUTION

<4489>
Turiaf, J.; Chabot, J.; Basset, M.F., Bronchial cancer and pleural mesothelioma in cases of asbestosis (two new observations)., Poumon Coeur, 24(5): 560-581 (1965).

Two new observations of tumors--brochial cancer and pleural mesothelioma--were found in patients with asbestosis. Length of asbestos exposure was long-term. 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

<4490>
Vigliani, E.C.; Mottura, G.; Maranzana, P., Association of pulmonary tumors with asbestosis in Piedmont and Lombardy., Ann. N.Y. Acad. Sci., 132(1): 558-574 (1965).

From 1943 to 1964, 879 cases of asbestosis were certified in Piedmont (830) and Lombardy (49). So far, 172 have died, 15 with lung carcinoma and 3 with pleural mesothelioma. One lung carcinoma and two pleural mesotheliomas were found among the 707 living subjects.

TUMOR; ASBESTOSIS; PLEURA; NEOPLASIA; HUMAN; OCCUPATIONAL EXPOSURE; MESOTHELIOMA; LUNG

<4491>
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--carcinoma of the lung, diffuse mesotheliomas of the pleural and peritoneum, and experimental tumors, and (9) cooperation among numerous scientific fields to investigate biological effects of asbestos.

ASBESTOS; ASBESTOS BODIES; ASBESTOSIS; CANCER; LUNG; MESOTHELIOMA; PLEURA; PERITONEUM; TUMOR

<4492>
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; NON-OCCUPATIONAL EXPOSURE; PERITONEUM; HUMAN

<4493>
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.

CHRYSOTILE; CROCIDOLITE; AMOSITE; ASBESTOS; RAT; INHALATION

<4494>
Williams, W.J., Asbestosis and lung cancer., Arch. Environ. Health, 10(1): 44-45 (1965).

Ten cases of lung carcinoma from a group of 52 American asbestosis 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

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<495>
Anonymous, Asbestos and malignancy., Brit. Med. J., 2: 202-203 (1964).

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; ASBESTOSIS; NEOPLASM; HUMAN; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

<496>
Bjure, J.; Soderholm, B.; Widimsky, J., Cardiopulmonary function studies in workers dealing with asbestos and glasswool., Thorax, 19: 22-27 (1964).

Because asbestos fibers reportedly are not transported by the pulmonary lymphatics, one single massive exposure might lead to the same stage of fibrosis as a chronic low level exposure. Men exposed to glasswool showed no detectable functional impairment; asbestos, however, caused marked restriction in diffusing capacity - 3 out of 8 asbestos workers exhibited pathologically raised pulmonary artery pressure.

ASBESTOS; HUMAN; OCCUPATIONAL EXPOSURE; RESPIRATORY DISEASE

<497>
Buchanan, W.D., The association of certain cancers with asbestosis., Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Exerpta 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 185 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; ASBESTOSIS; OCCUPATIONAL EXPOSURE; LUNG; MESOTHELIOMA; HUMAN; PLEURA; PERITONEUM

<498>
Davis, J.M.G., An electron microscopy study of the effect of asbestos dust on the lung., Brit. J. Exp. Pathol., 44(4): 450-464 (1964).

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. Remission 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; CHRYSOTILE; RAT; GUINEA PIG; MACROPHAGE; ASBESTOS BODIES; PHAGOCYTOSIS

<499>
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 mirrored the results from guinea pig studies--embedding sites were the same, located intracellularly in macrophages and fibroblasts, or seated among the collagen fibers. The asbestos body coating consisted mainly of ferritin granules about 60 A in diamter. 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

<500>
Davis, J.M.G., The ultrastructure of asbestos bodies from guinea-pig lungs., Brit. J. Exp. Pathol., 45(6): 634-641 (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 accumulation of dense granules, (probably ferretin) approximately 60 A in diameter around the asbestos fiber. Partly or completely formed asbestos bodies were found in 3 sites only -- in alveolar macrophages, in 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; CHRYSOTILE; GUINEA PIG; LUNG; ASBESTOS BODIES; FIBROSIS; MACROPHAGE; FIBROBLAST

<501>
Dyson, B.C.; Trentalance, A.E., Resection of primary pulmonary sarcoma. Review of literature and report of a case associated with pulmonary asbestosis., J. Thoraic Cardiovas. Surg., 47(5): 577-589 (1964).

Primary pulmonary sarcoma is clinically indistinguishable from carcinoma until diagnosis is made by biopsy at brochoscopy or at thoractomy. 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

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<502>

<502>
Elwood, P.C.; Cochrane, A.L.; Benjamin, I.T.; Seys-Prosser, D., A follow-up study of workers from an asbestos factory., Brit. J. Ind. Med., 21: 304-307 (1964).

All workers employed in an asbestos factory for 6 months or longer between 1936 and 1962 were part of a follow-up study: out of 1165 men and 268 women, 1024 (88%) and 237 (88%) were traced; 133 men (13%) and 11 women (5%) were dead. None died from diffuse abdominal neoplasm; 11 died from carcinoma of the lung or bronchus, and 1 died from pleural mesothelioma.

ASBESTOS; OCCUPATIONAL EXPOSURE; LUNG; CANCER; MESOTHELIOMA; TUMOR; CHRYSOTILE; GASTROINTESTINAL; HUMAN; PLEURA

<503>
Enticknap, J.B.; Smither, W.J., Peritoneal tumours in asbestosis., 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, discomfort, or ascites; one is still alive. Histology confirmed tumor diagnosis; minimal lung fibrosis was observed, and in 4 cases asbestosis was not diagnosed during life.

ASBESTOSIS; PERITONEUM; HUMAN; TUMOR; AMOSITE; OCCUPATIONAL EXPOSURE; CHRYSOTILE; CROCIDOLITE; FIBROSIS

<504>
Harington, J.S.; Smith, M., Studies of hydrocarbons on mineral dusts. The elution of 3,4-benzpyrene and oils from asbestos and coals dusts by serum., Arch. Environ. Health, 8(3): 453-458 (1964).

After 48 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-benzypyrene and related hydrocarbons are a factor in asbestos associated malignancy remains to be determined.

CROCIDOLITE; CHRYSOTILE; AMOSITE; ASBESTOS

<505>
Holt, P.F.; Mills, J., Experimental asbestosis in guinea pigs., Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Exerpta 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; ASBESTOSIS; MACROPHAGE; LUNG; CROCIDOLITE; INHALATION

<506>
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).

Rats 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.

CHRYSOTILE; RAT; LUNG; ASBESTOS; FIBROSIS; PHAGOCYTOSIS; INHALATION

<507>
Mourihane, D. O'B., The pathology of mesotheliomata and an analysis of their association with asbestos exposure., Thorax, 19: 268-278 (1964).

All cases from 1917 to 1962 recorded as primary diffuse tumors of the pleura or peritoneum (mesotheliomata) in the necropsy files at the London Hospital are reviewed. Pathology of 34 cases of primary tumors (mesotheliomata) associated with asbestos bodies in lung tissue showed these to be distinct and recognizable neoplasms.

CANCER; MESOTHELIOMA; ASBESTOS; TUMOR; ASBESTOS BODIES; PLEURA; PERITONEUM; NEOPLASM; HUMAN

<508>
House, W., Toxicity of cell culture medium due to filtration through asbestos pads., Nature, 201(4925): 1242 (1964).

The cell viability (cloning efficiency after 7 days) of hamster fibroblasts was reduced significantly when clones were grown in Eagle's medium or calf serum filtered through asbestos pads. Pads from 3 different manufacturers were toxic, but the nature of the toxic factor is unknown. Cellulose membrane filters were not toxic, and therefore should replace asbestos filters in all stages of tissue culture medium preparation.

ASBESTOS; CELL CULTURE; HAMSTER; CYTOTOXICITY

<509>
May, T.C., Asbestos., Minerals Yearbook 1963: Metals and Minerals. Bureau of Mines, U.S. Department of the Interior, 1: 251-265 (1964).

A detailed account of asbestos is given for the year 1963: legislation and government programs, domestic production, consumption and uses, stocks, prices, foreign trade, world review of asbestos production and use, and the technology of asbestos mining and processing.

ASBESTOS; ASBESTOS MINING; USE; PRODUCTION

<510>
Morgan, W.K.C., Rheumatoid pneumoconiosis in association with asbestosis., Thorax, 19: 433-435 (1964).

A lung biopsy from a 49-year-old arc-welder revealed iron, interstitial fibrosis, and numerous asbestos bodies in the lung parenchyma. A retrospective occupational history placed the patient in the interior of ships welding pipes being lagged simultaneously with asbestos. Even though the patient experienced no overt symptoms of rheumatoid arthritis, the final diagnosis was rheumatoid pneumoconiosis in association with asbestosis.

PNEUMOCONIOSIS; ASBESTOSIS; FINGER CLUBBING; LUNG; OCCUPATIONAL EXPOSURE; ASBESTOS; HUMAN

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<511>
Oosthuizen, S.P.; Theron, C.P.; Sluis-Cremer, G.K., Calcified pleural plaques in asbestosis: An investigation into their significance., Med. Proc. (Mediese Bydraes), 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 14 of the 17; asbestos bodies were observed in 7 of 10 specimens of lung tissue examined.

MESOTHELIOMA; ASBESTOS; OCCUPATIONAL EXPOSURE; HUMAN; PLEURA; PERITONEUM; LUNG; ASBESTOS BODIES

<513>
Selikoff, I.J.; Churg, J.; Hammond, E.C., Asbestos exposure and neoplasia., J. Amer. Med. Assoc., 188(1): 22-26 (1964).

Investigations centered on the 1522 insulation workers of the Asbestos Workers Union in the New York metropolitan area. Of the 632 who entered the trace before 1943 and were traced through 1962, 45 died of lung or pleural cancer; only 6.6 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 9.4 expected; there may be an etiological relationship between industrial asbestos exposure and carcinoma of the gastrointestinal tract.

PIPE COVERERS; HUMAN; CANCER; NEOPLASM; INSULATION WORKERS; OCCUPATIONAL EXPOSURE; TUMOR; MESOTHELIOMA; GASTROINTESTINAL; ASBESTOSIS

<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). Exerpta 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.E.; Miller, L.; 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 golden Syrian hamsters caused 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 asbestiform materials.

HAMSTER; MESOTHELIOMA; PLEURA; ASBESTOS; AMOSITE; CHRYSOTILE; GRANULOMA; TUMOR

<516>
Wagner, J.C., Asbestos dust exposure and malignancy (diffuse mesotheliomas of the pleura)., Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Exerpta Medica Foundation, New York., 3: 1066-1067 (1964).

Continuing investigations of cases of diffuse pleural mesotheliomas in South Africa have shown 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 containing polycyclic aromatic hydrocarbons on the crocidolite fibers may be intimately involved in the carcinogenic effect of crocidolite.

ASBESTOS; MESOTHELIOMA; TUMOR; NEOPLASM; CHRYSOTILE; 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; PNEUMOCONIOSIS

<518>
Leathart, G.L.; Sanderson, J.T., Some observations on asbestosis., Ann. Occup. Hyg., 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 1945. 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

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<519>

<519>
Peacock, A.; Peacock, P.R., Asbestos as a potential carcinogen for fowls., Brit. Empire Cancer Campaign; British Empire Cancer Campaign Research, London, S.W.I., Part 2: 534-535 (1963).

Following the injection of asbestos into the air sacs of White Leghorn chickens, tumors formed in two birds of the 30 which survived for 1 year or more. A mucus-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 proventiculus, the lungs and the ovary. The second tumor appeared about 3 years after injection of crocidolite into the left air sac. This large, firm 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

<520>
Thomson, J.G.; Kaschula, R.O.C.; MacDonald, R.R., Asbestos as a modern urban hazard., S. Afr. Med. J., 37(3): 77-81 (1963).

Lung smears were examined from more than 500 consecutive autopsies in Cape Town, South Africa. Golden-yellow asbestos bodies were identified from 132 cases - 30% of the males and 20% of the females. This appeared to result from exposure to urban air contaminated with asbestos, rather than to occupational exposure. Basal asbestosis rarely leads to pulmonary disease or disability but is etiologically involved in mesothelioma of the pleura and peritoneum.

LUNG; MESOTHELIOMA; ASBESTOS; HUMAN; ENVIRONMENTAL CONTAMINATION; NON-OCCUPATIONAL EXPOSURE

<521>
Wagner, J.C., Asbestosis in experimental animals., Brit. J. Ind. Med., 20: 1-12 (1963).

For 8 hours per day, 5 days per week, guinea pigs, rabbits and monkeys were exposed to asbestos dusts: relatively pure chrysotile, pure amosite, and crocidolite consisting of ironstone and silica 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 mammals; 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.

AMOSITE; CROCIDOLITE; CHRYSOTILE; GUINEA PIG; RABBIT; MONKEY; FIBROSIS; ASBESTOS; INHALATION

<522>
Walters, L.G., Industrial cancer in South Africa., Med. Proc. (Mediese Rydraes), 9(2): 24-30 (1963).

The South African view of industrial cancer is developed under section headings such as: historical outline of industrial development; industrial cancer; time factor; prevention; mining industry (silicosis, asbestosis and coal pneumoconiosis); non-mining industry (dusty trades and metal); natural environment; co-carcinogens and synergism; and atmospheric pollution.

HUMAN; OCCUPATIONAL EXPOSURE; ASBESTOSIS; ASBESTOS MINING

<523>
Webster, I., Asbestosis in non-experimental animals in South Africa., Nature, 197(4866): 506 (1963).

Examined at autopsy were one baboon from the hills near a crocidolite asbestos mill, 2 donkeys that worked on an amosite asbestos mine (one for 10 years), and 23 field rats trapped near an asbestos mill. Histology revealed interstitial fibrosis associated with asbestos bodies and fibers in the baboon and donkeys, and lung asbestosis involvement in 21 rats.

BABOON; MONKEY; RAT; FIBROSIS; LUNG; ASBESTOS; ASBESTOS MINING; NON-OCCUPATIONAL EXPOSURE; ENVIRONMENTAL CONTAMINATION

<524>
Blum, C.K., Radiology of some rarer dust diseases., Scot. Med. J., 7: 478-487 (1962).

Factors influencing the rate of massive fibrosis and the role of tuberculous infection in the development of progressive fibrosis are not fully known. Preventive measures against inhalation disease and in planning for treatment of the later stages of pneumoconiosis must be emphasized. Four cases of asbestosis in ashestos workers employed at a textile factory are depicted. Tables in this paper present a scheme for the international classification of mineral dust diseases.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; FIBROSIS; PNEUMOCONIOSIS

<525>
Cartier, P.H.; Gross, P., Nonoccupational diffuse pulmonary fibrosis., Arch. Environ. Health, 4(1): 79-86 (1962).

A worker exposed to asbestos dust for 38 years developed diffuse chronic interstitial fibrosis; chronic interstitial pneumonitis was evident for 32 years prior to death. Postmortem examination of a single section from each lung revealed no asbestos bodies, indicating that the disease was not related to asbestosis. Histological data implicated bronchopneumonia as the immediate cause of death. The case illustrates that the clinical diagnosis of pneumoconiosis cannot be based on presumptive evidence alone. Rather, diagnoses should include (1) knowledge of significant exposure to asbestos dust and (2) knowledge of the clinical progression of the disease.

FIBROSIS; ASBESTOS; ASBESTOSIS; CHRYSOTILE; DYSPNEA; PNEUMOCONIOSIS; ASBESTOS BODIES; OCCUPATIONAL EXPOSURE; ASBESTOS MINING; HUMAN

<526>
Cordova, J.F.; Tesluk, H.; Knudtson, K.P., Asbestosis and carcinoma of the lung., Cancer, 15: 1181-1187 (1962).

Lung carcinoma was associated with 11 cases of asbestosis; 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; ASBESTOSIS; HUMAN

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<527>
Eisenstadt, H.B., Pleural asbestosis., Amer. Pract., 13(9): 573-578 (1962).

The multiplicity of asbestos use produces an important health problem in curtailing the disease asbestosis. This type of pneumoconiosis is not readily or easily recognized without some history of exposure to asbestos as a clue. Only lung biopsies demonstrating asbestos bodies in the parenchyma can firmly establish the diagnosis, especially if the disease presents itself as an idiopathic pleurisy. Three clinical cases are reported.

ASBESTOS; ASBESTOSIS; ASBESTOS BODIES; PNEUMOCONIOSIS; LUNG; OCCUPATIONAL EXPOSURE

<528>
Harington, J.S., Natural occurrence of amino acids in virgin crocidolite asbestos and banded ironstone., Science, 138: 521-522 (1962).

Fluorescent oils containing polycyclic aromatic hydrocarbons and amino acids were found in crocidolite and amosite asbestos but not in chrysotile. The concentrations of amino acids in crocidolite is low (0.00027%) compared to 0.0026 to 0.03% in various fossils from Pliocene and Devonian periods.

CROCIDOLITE; ASBESTOS; AMOSITE; PNEUMOCONIOSIS; CHEMICAL COMPOSITION; CHRYSOTILE; ANALYSIS

<529>
Horai, Z.; Tsujimoto, T.; Ueshima, M.; Matsumura, K.; Fujimura, W.; Fukuoka, M.; Sano, H., Studies on the course of asbestosis patients., Jap. J. Med., 1(1): 157-158 (1962).

A brief summary of a symposium presents epidemiologic data for 116 cases of asbestosis in Japan. Radiographs of the chest were followed on a yearly basis for several years. Disturbances of lung function, subjective complaints, dry rales, moist rales, friction sound, and asbestos bodies in sputum generally increased in cases followed. Long term studies with periodic examination are useful in the investigation of progressive fibrosis in pneumoconoisis.

ASBESTOSIS; VENTILATORY DEFECTS; ASBESTOS BODIES; FIBROSIS; PNEUMOCONIOSIS; HUMAN; RALES

<530>
Legrand, P.P., Sputum examination in asbestosis., Pharm. Biol., 3(26): 181-187 (1962).

Microscopic observations are useful for verifying the presence of asbestos bodies in the lung; asbestos bodies result from the reaction of chrysotile fibers in the lungs and are indispensable in the diagnosis of asbestosis.

ASBESTOS; ASBESTOSIS; CHRYSOTILE; DIAGNOSIS; LUNG; HUMAN

<531>
McNulty, J.C., Malignant pleural mesothelioma in an asbestos worker., Med. J. Aust., 49(2): 953-954 (1962).

Pleural mesothelioma was diagnosed in an Australian male who had been employed as a mill worker in a crocidolite mine from 1948 to 1950. The latent period between initial exposure and tumor development was approximately 12 years. Autopsy confirmed the diagnosis and also revealed 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.

MESOTHELIOMA; ASBESTOS; BLUE ASBESTOS; ASBESTOSIS; SILICOSIS; PNEUMOCONIOSIS; CROCIDOLITE; X-RAY; ASBESTOS BODIES; FINGER CLUBBING; DYSPNEA

<532>
Rasanen, T., Effects of heparin and asbestos with corticotrophin on the mucosal mast cells and tissue eosinophils of rat stomach., Acta Endocrinol., 41: 437-440 (1962).

Rats received a single injection of asbestos and for 5 days, 2 IU 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

<533>
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

<534>
Thomson, J.G., Mesothelioma of pleura or peritoneum and limited basal asbestosis., S. Afr. Med. J., 36(36): 759-960 (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 mesotheliomas--in people whose occupations are not generally associated with asbestos.

ASBESTOS; ASBESTOS BODIES; CANCER; PLEURA; MESOTHELIOMA; PERITONEUM; HUMAN; NON-OCCUPATIONAL EXPOSURE

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<535>
Bader, M.E.; Bader, E.A.; Selikoff, I.J., Pulmonary function in asbestosis of the lung., Amer. J. Med., 30: 235-242 (1961).

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 asbestosis are reviewed in relation to the alveolar capillary block syndrome.

ASBESTOS; CHRYSOTILE; CROCIDOLITE; AMOSITE; EMPHYSEMA; HUMAN; OCCUPATIONAL EXPOSURE

<536>
Brugsch, H.G.; Bayley, H., Asbestosis in a worker engaged in automobile undercoating., New Engl. J. Med., 265(8): 379-381 (1961).

A Massachusetts automobile mechanic who undercoated cars for 5 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 corrected 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

<537>
Heard, B.E.; Williams, R., The pathology of asbestosis with reference to lung function., Thorax, 16: 264-281 (1961).

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 six cases.

ASBESTOSIS; EMPHYSEMA; FIBROSIS; ASBESTOS BODIES; PLEURAL PLAQUES; HUMAN

<538>
Hurwitz, M., Roentgenologic aspects of asbestosis., Amer. J. Roentgenol. Radium Ther. Nucl. Med., 85(2): 256-262 (1961).

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.

ASBESTOSIS; SILICOSIS; PNEUMOCONIOSIS; PLEURAL PLAQUES; PLEURAL CALCIFICATION; MESOTHELIOMA; HUMAN; OCCUPATIONAL EXPOSURE

<539>
Mitchell, J., Health progress in an asbestos textile works., Arch. Environ. Health, 3(1): 43-47 (1961).

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

<540>
Sleggs, C.A.; Marchand, P.; Wagner, J.C., Diffuse pleural mesotheliomas in South Africa., S. Afr. Med. J., 35(2): 28-34 (1961).

Of 34 patients with diffuse pleural mesothelioma, 33 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 help to determine causative and correlative factors, including the etiologic relationship of asbestos and other elements in geographical regions where mesothelioma occurs frequently.

ASBESTOS; CROCIDOLITE; OCCUPATIONAL EXPOSURE; ASBESTOS MINING; MESOTHELIOMA; HUMAN

<541>
Telischi, M.; Rubenstone, A.I., Pulmonary asbestosis., Arch. Pathol., 72(2): 234-243 (1961).

Dyspnea and weight loss developed in an elderly plaster mixer who had worked for 12 years with dry powders containing asbestos. Subsequent necropsy revealed chronic pulmonary asbestosis, primary bronchogenic squamous-cell carcinoma, 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

<542>
Tellesson, W.G., Rheumatoid pneumoconiosis 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 15 years 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 cummulative exposure was about 4 million particle-years per cubic foot. Accordingly, the man was exposed to low levels of asbestos dust.

ASBESTOS; OCCUPATIONAL EXPOSURE; AMOSITE; CHRYSOTILE; CROCIDOLITE; ASBESTOSIS

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<543>
Thomson, M.L.; McGrath, M.W.; Smither, W.J.; Shepherd, J.M., Some anomalies in the measurement of pulmonary diffusion in asbestosis 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.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; VENTILATORY DEFECTS; DIAGNOSIS

<544>
Anderson, J.; Campagna, F.A., Asbestosis 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. Otherwise, correlations between asbestos and cancer may be open to question.

ASBESTOSIS; CARCINOMA; LUNG; PNEUMOCONIOSIS; ASBESTOS; FINGER CLUBBING; SMOKING; CANCER; HUMAN

<545>
Anonymous, Complications of asbestosis., Brit. Med. J., 1: 1305-1352 (1960).

A man who worked in an English factory for 11 years developed asbestosis with fatal complications. Rheumatic fever at an early age was contibutory. Several participants at a clinocopathological conference expressed belief, using knowledge from previous work, that asbestos patients have a 10 times greater risk of having lung cancer than does the general population.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; LUNG; CANCER; HUMAN

<546>
Keal, E.E., Asbestosis and abdominal neoplasms., Lancet, 2: 1211-1216 (1960).

Approximatley 40 cases of asbestosis (23 female and 19 male) are reviewed emphasizing types and durations of exposure and other disease relevancies. Of 30 deaths, 14 were associated with lung cancer (10 men, 4 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. Metastisis from other carcinoma sites seems unlikely. Asbestos bodies were found in the sputum of one bronchial carcinoma patient and in one case of peritoneal cancer years after the last exposure.

ASBESTOS; OCCUPATIONAL EXPOSURE; LUNG; ASBESTOSIS; CANCER; CARCINOMA; GASTROINTESTINAL

<547>
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.

ASBESTOS; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS; FIBROSIS; LUNG; ASBESTOSIS; DIAGNOSIS; HUMAN

<548>
Schmidt, K.G., Asbestos types, their optical investigations and their pathological action., Staub Reinhalt. 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 alevolar tracts more readily than some of the other types.

AMOSITE; ANALYSIS; ASBESTOS; CHRYSOTILE; CROCIDOLITE

<549>
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 ashestos with the tumors, since they rarely occur elsewhere in South Africa.

ASBESTOS; MESOTHELIOMA; CROCIDOLITE; ASBESTOS MINING; OCCUPATIONAL EXPOSURE; HUMAN

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1974: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

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III. A Literature Compilation

1974 - 1977

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ABBREVIATIONS

BA.....Biological Abstracts

CA.....Chemical Abstracts

EM(GP)..... Excerpta Medica, General Pathology

EM(IM).....Excerpta Medica, Internal Medicine

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