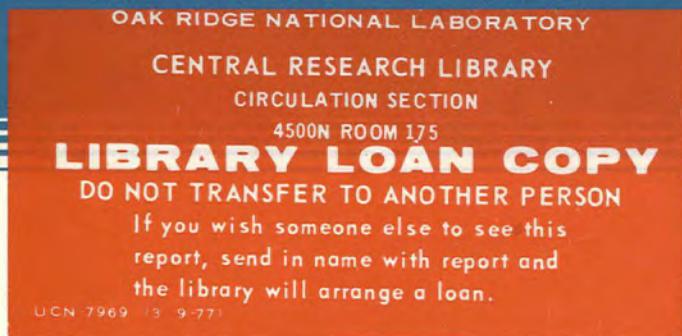


OAK RIDGE NATIONAL LABORATORY  
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ORNL/TIRC-77/5

## 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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March 1978

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**CONTENTS**

Acknowledgments .....	v
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**I. An Overview**

History .....	2
Literature.....	2
Properties, Production, and Uses .....	4
Biological Aspects .....	7
Environmental Aspects .....	14
Conclusions.....	15
References .....	17

**II. An Annotated Literature Collection**

Introduction .....	22
Bibliography.....	23
Author Index .....	99
Permuted Title Index.....	107
Keyterm Index.....	145
Simple Title Index .....	151
Journal Index.....	163
Publication Date Index.....	169

**III. A Literature Compilation**

Abbreviations.....	174
Bibliography.....	175
Permuted Title Index.....	187

\* \* \* \*

Toxicology Information Response Center Description .....	213
Publication List.....	214



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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

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

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
Crocidolite <sup>a</sup>	3-4	Length of fiber	Building materials
Amosite <sup>a</sup>	2-3	Tensile strength	Asbestos-cement pipe
		Chemical reactivity	Floor tile
Anthophyllite	<1	Resistance to heat	Brake linings,
		Electrical conductance	gaskets, clutch
			facings, paints,
			insulations, steam-
Tremolite	<1	Filtration characteristics	pipe coverings and
			others

<sup>a</sup>Possesses particular properties that would favor greater use if they occurred more universally and in larger amounts.

**Table 3. The uses of asbestos**

<b>Asbestos - cement industry</b>	<b>Asbestos papers, felts, and millboard</b>
Shingles for roofing and siding	Roofing
Wall sheets	Piano padding
Insulation board	Stove and heater linings
Clapboard	Filing cabinet linings
Electric motor casings	Military helmet linings
Water and sewage pipes	Automobile hood mufflers
Gas pipes	Boiler jackets
Rain gutters	Radiator covers
Air ducts	Acoustical ceilings
Refuse chutes	Plasterboard
<b>Asbestos - textile industry</b>	Fireproof wallboard
Fireproof theater curtains	Electrical switch boxes
Lagging	Safes
Other insulation wrapping	Table pads
Conveyor belting	Stove mats
Safety clothing	Ovens
Potholders	Dry kilns
Ironing board covers	<b>Asbestos plastics</b>
Draperys	Flooring tiles (asphalt and vinyl binders)
Rugs	Reinforcement and filler in plastics
Motion picture screens	Plastic products (frying-pan handles, rocket nose covers)
Gas filters in gas masks	<b>Miscellaneous</b>
Filters for processing fruit juices	Ingredient of paints and sealants
Filters for processing acids	Component of roof coating and road-building compounds
Filters for processing beer	Putty, caulk, and other crack fillers
Filters for processing medicine	Artificial snow
Mailbags	Spray insulation on structural steel
Prison-cell padding	Undercoating on automobile bodies
Airplane fittings	Gaskets and packing materials
Stove and lamp wicks	Insulation materials
Sparkplugs	
Fire hoses	
<b>Friction materials</b>	<b>Electrical equipment industry</b>
Brake linings	
Clutch facings	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).

**Table 4. Asbestos nomenclature**


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Asbestos: A generic term for naturally fibrous silicates that are amenable to mechanical separation into fine filaments of considerable tensile strength and flexibility.	
<b>Asbestos</b>	
<b>Serpentine</b>	<b>Amphibole</b>
Chrysotile <sup>a</sup> (White asbestos)	Actinolite
	Amosite <sup>a</sup> (Brown asbestos)
	Anthophyllite <sup>a</sup>
	Crocidolite <sup>a</sup> (Blue asbestos)
	Tremolite

---

<sup>a</sup>Commercially important types.

**Table 5. Asbestos properties**

Compound	Composition	Chemical formula	Color	Length	Texture
Chrysotile (12001-29-5) <sup>a</sup>	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	$(Fe^{2+}Mg)_7 \cdot Si_8O_{22}(OH)_2$	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

<sup>a</sup>Chemical Abstracts Service Registry Number.

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

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% ( $4087 \times 10^6$  kg/ $4178 \times 10^6$  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- $\mu$ m diameter (Sincock, 1977).

**Table 6. Asbestos world production**  
(million kg)

	1970	1971	1972	1973
North America				
Canada <sup>(1)</sup>	1507.000	1483.00	1530.000	1791.000
Mexico	--	--	--	0.015
United States <sup>(6)</sup>	<u>113.000</u>	<u>119.00</u>	<u>119.000</u>	<u>136.000</u>
	1621.000	1602.00	1649.000	1927.000
Latin America				
Argentina	0.035	0.39	0.910	1.000
Brazil	<u>16.300</u>	<u>20.00</u>	<u>32.700</u>	<u>39.900</u>
	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 <sup>(5)</sup>	118.000	120.00	132.000	149.000
Portugal	0.200	0.13	0.008	0.130
U.S.S.R. <sup>(2)</sup>	1066.000	1152.00	1220.000	1280.000
Yugoslavia	<u>12.100</u>	<u>15.40</u>	<u>11.000</u>	<u>9.390</u>
	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 <sup>(7)</sup>	79.800	79.80	79.800	79.800
South Africa, Republic of <sup>(3)</sup>	290.000	322.00	323.000	334.000
Swaziland <sup>(9)</sup>	<u>33.100</u>	<u>35.50</u>	<u>33.400</u>	<u>36.900</u>
	403.600	438.80	437.200	451.700
Asia				
China, People's Republic of <sup>(4)</sup>	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	<u>3.270</u>	<u>3.89</u>	<u>4.920</u>	<u>4.720</u>
	237.400	221.90	264.300	273.900
Oceania				
Australia <sup>(10)</sup>	<u>0.740</u>	<u>0.76</u>	<u>17.300</u>	<u>31.800</u>
Total	3492.000	3586.00	3773.000	4178.000

Note: Superscript numbers following countries indicate rank order.

Source: Bureau of Mines, 1974, 1975.

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.

**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.

### 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  $\mu$  in length than to those averaging 5  $\mu$ . However, fibrosis has also been produced in the guinea pig lung by very fine particles of asbestos (1  $\mu$  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

**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**

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

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

<u>Treatment</u>	
Remove from exposure	
Symptomatic	

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  $\mu\text{m}$  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

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.

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.

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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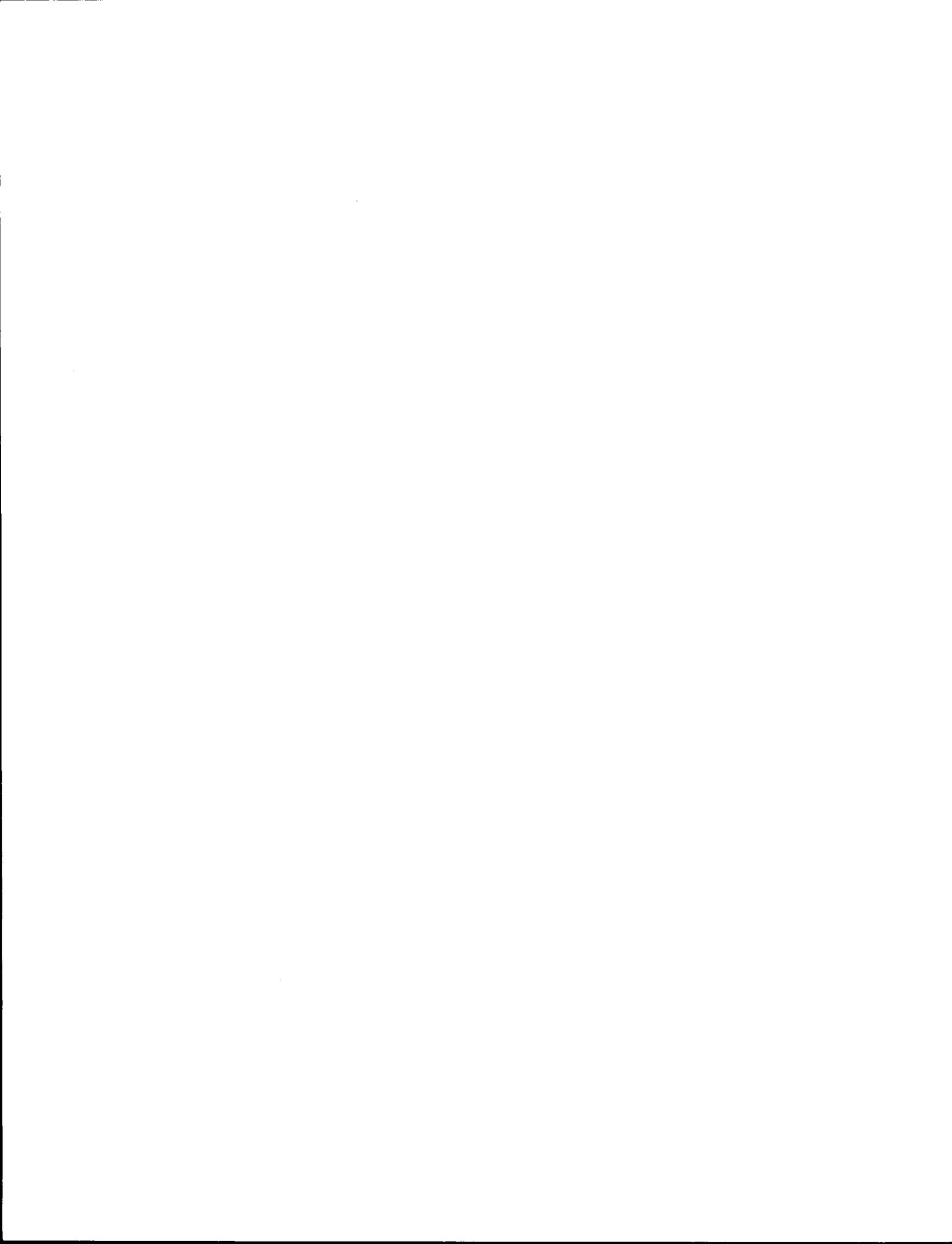
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**II. An Annotated Literature Collection**

**1960 - 1974**

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B. W. Kline, and B. L. Whitfield

## 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.

<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 (5μ 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 NCI 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 criticized 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 μ; x-ray powder diffraction examination if the amount of asbestos present is greater than one weight percent; and electron microscopy, electron diffraction, and energy dispersive semi-quantitative chemical analysis to make an absolute mineralogical identification.

ASBESTOS; ANALYSIS; STANDARDS; CHRYSOTILE; ENVIRONMENTAL CONTAMINATION

<7>  
Anonymous, Asbestos, Food Chem. News, 16(2): 2 (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(83): 30-31 (1974).

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

ASBESTOS; STANDARDS; FOOD CONTAMINATION; ASBESTOS FILTERS

&lt;9&gt;

**<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 deferral 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) an 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

&lt;10&gt;

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

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

&lt;11&gt;

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 determining 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

&lt;13&gt;

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

&lt;14&gt;

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 significantly ( $P < .01$ ) 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

&lt;15&gt;

**<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, diminished inspiratory capacity, parenchymal and pleural changes, and respiratory disease mortality were related to dust exposure and to each other. Safety standards for the asbestos industries should be based on dose-response relationships established by sound epidemiological studies.

ASBESTOS; CHRYSOTILE; OCCUPATIONAL EXPOSURE; FIBROSIS; 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 varieties 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): 16 (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

&lt;19&gt;

Anonymous, FDA detains lima beans contaminated with asbestos 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

&lt;20&gt;

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

&lt;21&gt;

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

&lt;22&gt;

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

&lt;23&gt;

<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

&lt;24&gt;

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

&lt;25&gt;

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

&lt;26&gt;

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

&lt;27&gt;

Anonymous, Proposed methodology for asbestos determination is limited, firm says., Pest. Chem. News, 2(2): 6 (1973).

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

ASBESTOS; STANDARDS; ANALYSIS

&lt;28&gt;

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

&lt;29&gt;

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

&lt;30&gt;

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/cm<sup>3</sup> for 25 years or 10 fibers/cm<sup>3</sup> 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.P.; 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 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>  
Crailley, 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. Chrysotile 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  $\mu$ m 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

&lt;37&gt;

Ehrenreich, T.; Mackler, A.D.; Langer, A.M.; Selikoff, I.J., Asbestos fibers in human lungs: forensic significance in environmental disease., Arch. Mal. Prof. 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

&lt;38&gt;

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

&lt;39&gt;

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.

CHRYSTOILE; CROCIDOLITE; CANCER MORTALITY; CANCER; OCCUPATIONAL EXPOSURE; HUMAN

&lt;40&gt;

Evans, J.C.; Evans, P.J.; Holmes, A.; Hounam, R.P.; 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 60 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 esophagus 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

&lt;41&gt;

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

&lt;42&gt;

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; ANTHROPHYLLITE; CROCIDOLITE; CHRYSTOILE

&lt;43&gt;

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

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

ASBESTOS; STANDARDS; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE

&lt;44&gt;

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

Chrysotile concentrations in the lungs of 9 fiber glass workers ranged from 1 to 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.

CHRYSTOILE; ENVIRONMENTAL CONTAMINATION; LUNG; OCCUPATIONAL EXPOSURE; HUMAN

&lt;45&gt;

<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 5 $\mu$ , 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 chrysotile, amosite and crocidolite produced a significant number of differentiated intrathoracic tumors in rats, and undifferentiated sarcomas in hamsters. Of 35 tumors in rats, 25 were fibrosarcomas, 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, P.; 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.P.; 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.

ASRESTOS; 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>  
 Kleinfield, 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

&lt;53&gt;

&lt;53&gt;

Kleinfield, M.J.; Messite, J.; Langer, A.M., A study of workers exposed to asbestos 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, 36 workers exposed to higher concentrations of dust for similar durations showed an increased prevalence of pneumoconioses.

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

&lt;54&gt;

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

&lt;55&gt;

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

&lt;56&gt;

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 plaques 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

&lt;57&gt;

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

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

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

&lt;58&gt;

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 clinopathologic 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

&lt;59&gt;

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

&lt;60&gt;

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

&lt;61&gt;

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

&lt;62&gt;

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

&lt;63&gt;

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

&lt;64&gt;

Otto, H., The risk of asbestosis from a pathological-anatomical viewpoint., Staub Reinhardt. 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

&lt;65&gt;

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

&lt;66&gt;

Pooley, P.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

&lt;67&gt;

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

&lt;68&gt;

<68>  
 Roy-Chowdhury, A.K.; Mooney, T.P. 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

&lt;69&gt;

Sanders, C.L., Cocarcinogenesis of  $^{239}\text{PuO}_2$  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  $^{239}\text{PuO}_2$  at several doses and with combinations of  $^{239}\text{PuO}_2$  with 3,4-benzpyrene (BP) or chrysotile asbestos. Both abdominal sarcomas and mesotheliomas were induced by  $^{239}\text{PuO}_2$  or asbestos. Mesotheliomas were not found in rats given BP only. Asbestos and  $^{239}\text{PuO}_2$  acted synergistically in inducing mesotheliomas; the combination of BP and  $^{239}\text{PuO}_2$  increased the incidence of abdominal sarcomas.

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

&lt;70&gt;

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

&lt;71&gt;

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

&lt;72&gt;

Sethi, S.; Hilscher, W.; Flasbeck, R., Tissue response to a single intraperitoneal injection of various substances in rats., Zentralbl. Bakteriol. Parasitenk., 157 (2-3): 131-140 (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

&lt;73&gt;

Shin, M.L.; Firninger, 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

&lt;74&gt;

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

&lt;75&gt;

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

<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, P.; Ahlman, K.; Wiikari, 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 plaques 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: 119-128 (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 concomitantly. 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 30μ 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 30μ 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 membranous 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., Mesothelioma 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

&lt;83&gt;

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

&lt;84&gt;

Regman, 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

&lt;85&gt;

Weill, H.; Waggoner, C.; Bailey, W.; Ziskind, M.; Fossiter, C.P., 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 volume and reduced pulmonary diffusing capacity than those with rounded opacities. Hyperinflation was associated with rounded nodular changes. The results suggested that small rounded opacities primarily were due to silica exposure, and irregular opacities to asbestos exposure.

ASBESTOS; CROCIDOLITE; X-RAY; OCCUPATIONAL EXPOSURE; RESPIRATORY DISEASE; VENTILATORY DEFECTS; HUMAN

&lt;86&gt;

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

&lt;87&gt;

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

&lt;88&gt;

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 amphiphile - asbestos fibers as kernels. The free asbestos fibers mainly were chrysotile asbestos.

CHRYSOTILE; ASBESTOS BODIES; MESOTHELIOMA; HUMAN

&lt;89&gt;

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

&lt;90&gt;

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

&lt;91&gt;

&lt;91&gt;

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

&lt;92&gt;

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 amended 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; FIBROSTS; MESOTHELIOMA; STANDARDS

&lt;93&gt;

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 Safety 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

&lt;94&gt;

Beck, E.G.; Holt, P.F.; Manojlovic, W., 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.

CHRYSTOTILE; GUINEA PIG; MACROPHAGE; PHAGOCYTOSIS

&lt;95&gt;

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

&lt;96&gt;

Berry, G.; Newhouse, M.L.; Turok, M.B., 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

&lt;97&gt;

Boiteau, H.L.; Robin, M.; Gelot, S., Polycyclic hydrocarbons in various materials containing asbestos., *Arch. Mal. Prof. 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 dibenz(a,h)anthracene. 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 benzo(a)pyrene-hydroxylase in the lungs and thus retard the metabolic degradation of the carcinogenic hydrocarbons.

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

&lt;98&gt;

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

&lt;99&gt;

&lt;99&gt;

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

&lt;100&gt;

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

&lt;101&gt;

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

&lt;102&gt;

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

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

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

&lt;103&gt;

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

&lt;104&gt;

Engelbrecht, P.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 frequent infection occurred in lungs injected with asbestos than with quartz.

CROCIDOLITE; LUNG; RAT; RESPIRATORY DISEASE

&lt;105&gt;

Finkelberg, E.I.; Genina, O.N.; 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 chamosite. Pneumoconiosis is produced by clay and chamosite dusts and is characterized by a relatively benign course, whereas asbestosis manifests as a progressive pulmonary insufficiency. The functional state of the respiratory system should be considered when determining the work load of patients.

ASBESTOS; ASBESTOSIS; OCCUPATIONAL EXPOSURE; PNEUMOCONIOSIS; HUMAN

&lt;106&gt;

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 for 4 days/week/4 hours/day for 1 year. One half also received the immunosuppressant drug "Imuran" brand Azath ioprine 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

<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.

CHRYSTOTILE; 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 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): 154-159 (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 hematoxylin 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, hematoxylin, 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, P.A.P.; 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 frequently 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; CHRYSTOTILE; 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 Pneumoconioses 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 carcinomas 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

&lt;116&gt;

**<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.P., Respiratory symptoms in chrysotile asbestos mine and mill workers of Quebec., *Arch. Environ. Health*, 24: 358-363 (1972).

Questionnaire results from 1,015 males employed in chrysotile asbestos mines and mills indicate that 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.

CHRYSTOTILE; OCCUPATIONAL EXPOSURE; SMOKING; RESPIRATORY DISEASE; HUMAN

**<118>**  
 Miller, K.; Harrington, J.S., Some biochemical effects of asbestos on macrophages., *Brit. J. Exp. Pathol.*, 53: 397-405 (1972).

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

CHRYSTOTILE; CROCIDOLITE; AMOSITE; ASBESTOS; MACROPHAGE; HAMSTER

**<119>**  
 Murphy, P.L.H.; Gaensler, E.A.; Redding, R.A.; Belleau, R.; Keelan, P.J.; Smith, A.A.; Goff, A.M.; Perris, R.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 (DLB) 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.; Trippel, 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.P., 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 administration other than inhalation is still unknown. However, ingestion of asbestos is suspected of being hazardous due to increased incidences of gastrointestinal cancer among asbestos workers.

ASBESTOS; ASBESTOS FILTEPS; 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

&lt;124&gt;

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. B (Paris), 274(9): 1434-1437 (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 aqueous suspensions containing 20 mg chrysotile, coal, quartz or titanium oxide.

ASBESTOS; MOUSE; CHRYSOTILE

&lt;125&gt;

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

In Mereburg, East Germany, pleural plaques were found in 458 workers by x-ray analysis in 1970. Although most worked in the chemical industry, the majority of patients had been exposed to asbestos prior to 1945; 45% experienced indirect exposure. The mean latent period was 20 to 30 years.

ASBESTOS; HUMAN; PLEURAL PLAQUES; OCCUPATIONAL EXPOSURE

&lt;126&gt;

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

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

&lt;127&gt;

Pott, F.; Ruth, F.; Friedrichs, K.H., Tumors of rats after i.p. injection of powdered chrysotile and benzo(a) pyrene., Zentralbl. 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  $\mu$ m)--or 100 mg of powdered chrysotile (fiber length is less than 3  $\mu$ m). 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

&lt;128&gt;

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

&lt;129&gt;

Reitz, W.B.; 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

&lt;130&gt;

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

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

ASBESTOS BODIES; ASBESTOSIS; PLEURAL PLAQUES; HUMAN

&lt;131&gt;

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

&lt;132&gt;

Rutten, 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

&lt;133&gt;

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

&lt;134&gt;

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

&lt;135&gt;

Schnitzer, F.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 ethylenediaminetetraacetic 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

&lt;136&gt;

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

&lt;137&gt;

Wagner, J.C.; Bogowski, 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

&lt;138&gt;

Allison, I.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

&lt;139&gt;

&lt;139&gt;

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

&lt;140&gt;

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

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

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

&lt;141&gt;

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

&lt;142&gt;

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

&lt;143&gt;

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

&lt;144&gt;

Beck, E.G.; Bruch, J.; Friedrichs, K.H.; Hilscher, W.; Pott, P., 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

&lt;145&gt;

Beck, E.G.; Holt, P.F.; Mastrallah, 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

&lt;146&gt;

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 asbestos origin and those of non-asbestos 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

&lt;147&gt;

Rey, E.; Harrington, 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 occurred 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

&lt;148&gt;

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

&lt;149&gt;

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

&lt;150&gt;

Brain, J.D., The effects of increased particles on the number of alveolar macrophages., *Inhaled Particles III: Proceedings of an International Symposium*, (London, 1970). V.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 penetrating fixed lung tissue.

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

&lt;151&gt;

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 epidemiologic and experimental studies. Pulmonary fibrosis is becoming less frequent, probably due to increased protection in the asbestos industry. Since world production has increased eightfold in the past 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

&lt;152&gt;

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

&lt;153&gt;

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

&lt;154&gt;

**<154>**  
Busser, E.; Dorschner, P.; 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 asbestos dust resulted in decreased vital capacity and lung compliance although radiological changes developed slowly. Dyspnea frequency was related to decreased vital capacity. These changes indicated an early phase of asbestosis.

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

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.*, 32(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.; Aver, 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  $\mu$  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

&lt;161&gt;

&lt;161&gt;

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 catalyzes 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

&lt;162&gt;

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.

CHRYSTOTILE; ASBESTOS; GUNNEA PIG; PLEURAL CALCIFICATION; FIBROSIS; GRANULOMA; GIANT CELL

&lt;163&gt;

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

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

&lt;164&gt;

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 54%. The increase in IgG and IgM is a characteristic response to chronic inflammatory disease; the IgA increase may reflect an auto-immune response. These changes were not related to the duration of exposure or to the degree of asbestosis.

ASBESTOS; OCCUPATIONAL EXPOSURE; ASBESTOSIS; HUMAN; BIOCHEMICAL EFFECTS

&lt;165&gt;

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

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

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

&lt;166&gt;

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

&lt;167&gt;

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

&lt;168&gt;

<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): 220-225 (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 capacity was slightly lower, and calcifications and reles 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 4,223 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 abdominal granulomas and related lymph nodes; in granulomas short fibers were mostly intracellular whereas the longer ones were seldom incorporated. Short fibers were found in lymph nodes without evidence of fibrosis. It was concluded that the transport of asbestos from the site of administration depends upon the fiber length: it begins with fibers less than 20  $\mu$ m and increases with decreasing fiber length.

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

<173>  
 Gee, B.; Bonhuys, 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). V.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

&lt;176&gt;

&lt;176&gt;

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

&lt;177&gt;

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

&lt;178&gt;

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. Pthlenediaminetetraacetic 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.

CHRYSTOILE; AMOSITE; CROCIDOLITE; ACTINOLITE; HEMOLYSIS

&lt;179&gt;

Harries, P.G., A comparison of mass and fibre concentrations of asbestos dust in shipyard processes., *Ann. Occup. Hyg.*, 14: 235-260 (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

&lt;180&gt;

Holmes, A.; Morgan, A.; Sandalls, P.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

&lt;181&gt;

Hounam, R.P., 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

&lt;182&gt;

Hurlburt, J.P.; Schulson, W.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 plaques or malignancy. Eight men had chronic bronchitis and three others were asthmatic; asbestos bodies were observed in sputum smears from five men. Of these 33 men, 29 had been regular cigarette smokers; however, 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

&lt;183&gt;

Jancower, 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

&lt;184&gt;

<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  $\mu$ m 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 microscopic 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 significance 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.; Sastry, 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.P.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

&lt;192&gt;

<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

&lt;193&gt;

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  $\mu$ m 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<sup>3</sup>; old helmet with unlined asbestos cloth cover - 1.38 fibers/cm<sup>3</sup>; helmet with aluminised asbestos cover - 0.0 fibers/cm<sup>3</sup>. The fire protection provided outweighed the small risk from asbestos dust inhalation. Aluminised asbestos cloth covered helmets were recommended.

ASBESTOS; OCCUPATIONAL EXPOSURE; INHALATION; HUMAN

&lt;194&gt;

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

&lt;195&gt;

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 Kingdom, the use of simple dust respirators against asbestos inhalation is limited to concentrations not exceeding 40 fibers/cc of air for chrysotile and amosite or 4 fibers/cc for crocidolite. Higher degrees of protection can be 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

&lt;196&gt;

Mackenzie, F.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

&lt;197&gt;

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

&lt;198&gt;

McDonald, J.C.; McDonald, A.D.; Gibbs, G.W.; Sieniawcyk, 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

&lt;199&gt;

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

<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, diaphragm and chest wall; however, in one case, a significant portion of the fibers had migrated to the liver via adjacent diaphragmatic lesions.

ASBESTOS; CHRYSOTILE; TRACE METALS; TISSUE DISTRIBUTION; RAT

<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 4 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>  
Plamenac, P.; Pikula, B.; Kahvic, M.; Markovic, Z.; Selak, I.; Zeger-Vidovic, Z., Incidence of "asbestos" bodies in basal lung smear., *Acta Med. Jugoslav.*, 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

&lt;207&gt;

<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.; Rower, H.; Fenner, F.M., Control of asbestos fiber emissions from industrial and commercial sources., Proceedings of the Second International Clean Air Congress. H.M. England and W.T. Berry (Editors). Academic Press, New York., pp. 100-103 (1971).

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

ASBESTOS; DUST CONTROLS; OCCUPATIONAL EXPOSURE; STANDARDS

<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, P.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(9): 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 (MTT 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

&lt;214&gt;

<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.J.; Talbot, J.H.; Rendall, R.E.G., Electron diffraction patterns of U.I.C.C. asbestos samples., Environ. Res., 4(2): 141-145 (1972).

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

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>  
Smith, 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 1934, 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

&lt;221&gt;

<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>  
 Stomphius, 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, P.D., Possible biological importance of fibre diameters of South African amphiboles., *Nature*, 232: 55-56 (1971).

Differences in fiber diameter among various asbestos types affect the free-falling speed and ease of penetration to the lung and pleural tissues. As determined by electron microscopy, the mean diameter is 0.073 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, SiO<sub>2</sub>, 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

<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.P.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 obstruction 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 extrinsic allergic 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

&lt;236&gt;

**<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 4% 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 9% 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

&lt;237&gt;

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

&lt;238&gt;

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

&lt;240&gt;

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 ferruginous 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 Å.

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

&lt;241&gt;

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 pneumoconioses 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

<242>  
 Bohlig, H.; Bristol, L.J.; Cartier, P.H.; Pelson, B.; Gilson, J.C.; Grainger, T.R.; Jacobson, G.; Kiviluoto, R.; Lainhart, W.S.; McDonald, J.C.; Pendergrass, F.P.; Rossiter, C.E.; Selikoff, I.J.; Sluis-Cremer, G.K.; Wright, G.W., Special Report - UIICC/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, B.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, anthophyllite, or chrysotile A and 16 animals with 25 mg chrysotile B. The asbestos forms were UIICC 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 3.6  $\mu$ m; for chrysotile B, mean length was 17.0  $\mu$ m. 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 asbestos 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). R.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

&lt;249&gt;

**<249>**  
 Dalquen, P.; Hinz, I.; Dahbert, A.F., Pleural plaques, asbestosis and exposure to asbestos: an epidemiological study from the Hamburg area., *Pneumonologie*, 103: 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.; Love, 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 benzo(a)pyrene (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. Beryllium, 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

<255>  
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 1968 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 radiological 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 exaggerations 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, T.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 cumulative 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

&lt;261&gt;

<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

&lt;262&gt;

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 chrysotile evokes a reaction analogous to that of a biologically inert dust.

ASBESTOSIS; ASBESTOS; LUNG; FIBROSTS; RESPIRATORY DISEASE; INGESTION

&lt;263&gt;

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. 220-224 (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

&lt;264&gt;

Harington, J.S.; Bey, R.; 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

&lt;265&gt;

Heller, R.M.; Janover, M.L.; Weber, A.L., The radiological manifestations of malignant pleural mesothelioma., *Amer. J. Roentgenol. Radium Ther. Nucl. Med.*, 109(1): 53-59 (1970).

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

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

&lt;266&gt;

Hitchcock, H.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; DIAGNOSTS; TREATMENT

&lt;267&gt;

Horai, Z.; Kaneda, M.; Michizawa, T.; Kasahara, S.; Sugimoto, T.; Okuyama, T., A radioautographic study on the incorporation of S<sup>35</sup>-methionine and R<sup>3</sup>-glycine in the experimental silicopneumoconiosis and asbestospneumoconiosis., *Acta Pistochem.* Cytochem., 3(4): 197-198 (1970).

Silicosis or asbestosis was induced in rats by pertracheal infusion of free silica or blue asbestos suspension. After 2, 4, 8 or 16 weeks S<sup>35</sup>-methionine or R<sup>3</sup>-glycine was injected intraperitoneally. One hour following injection animals were sacrificed and radioautograms obtained of lung tissue. S<sup>35</sup>-methionine was found in the extracellular space around nodules of the lungs with somewhat less uptake in the case of silicosis. R<sup>3</sup>-glycine was taken up to a small extent 2 weeks after infusion and then uptake increased. More R<sup>3</sup>-glycine was taken up in lungs with asbestosis than with silicosis.

ASBESTOS; ASBESTOSIS; SILICOSIS; RAT

<268>  
Kanazawa, K.; Birbeck, M.S.C.; Carter, R.L.; Roe, P.J.C., Migration of asbestos 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 haematoxylin and eosin staining combined with microincineration.

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

<269>  
Kellermeyer, P.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 inflammation. While all foreign substances produce inflammation 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>  
Kleinfield, 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; PLEURISY; BROWCHITIS; EMPHYSEMA; OCCUPATIONAL EXPOSURE

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

Ashbozurite 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 ashbozurite 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 bronchi, 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. Ashbozurite is more fibrogenic than sovelite. Based on clinical and experimental evidence, the proposed maximum permissible concentrations of ashbozurite 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.W., 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

&lt;275&gt;

<275>  
 Langer, A.M., Electron microprobe analysis., Laboratory Diagnosis of Diseases Caused by Toxic Agents. P.W. Sunderman and P.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 asbestos 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 unequivocal identification of amosite asbestos cores in asbestos bodies from workers exposed to amosite. The data show that amosite fibers remained chemically unaltered and intact after at least 10 years of residence in the 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.; Barries, 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

&lt;282&gt;

<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. 504-507 (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, N.; 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  $\gamma$ -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

&lt;286&gt;

Park, J.P.; Howard, E.B.; Stuart, B.O.; Wehner, A.; Dillie, 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

&lt;287&gt;

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 (30 $\mu$ ) 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

&lt;288&gt;

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

&lt;289&gt;

<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): 61-64 (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

&lt;290&gt;

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 6006 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 10 were middle aged or older. Pleural effusion was the most common finding at the first examination. The tumors only rarely materialized but commonly invaded surrounding structures. Eleven of the 20 tumors were epithelial, 6 were of mesenchymal type and 3 mixed. Asbestos bodies were found in the lungs of 18 of the cases and histological evidence of asbestosis was found in 13 cases.

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

&lt;291&gt;

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

&lt;292&gt;

Pous, 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 sparsely populated Czechoslovakian district. The highest incidence occurred between the ages of 65-70 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

&lt;293&gt;

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.

CHRYSTOTILE; HEMOLYSIS; ASBESTOS; SHEEP; CYTOTOXICITY

&lt;294&gt;

Schnitzer, R.J.; Pundsack, P.L., Asbestos hemolysis., *Environ. Res.*, 3: 1-3 (1970).

Asbestos fibers, principally chrysotile, caused marked hemolytic activity on sheep red blood cells (RBCs); however, amphibole asbestos fibers such as crocidolite, amosite, tremolite, and anthophyllite were hemolytic to a negligible degree. These results suggest that the chemical nature of the fiber surface, and consequently, the surface area of the fiber, determine the hemolytic capacities of asbestos. The minimal concentration of chrysotile necessary to cause at least 50% hemolysis decreased with increase in surface area. Hemolysis was inhibited by substances that were strongly adsorbed by the fibers. EDTA inhibited hemolysis by chrysotile, but other 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; CHRYSTOTILE; CROCIDOLITE; AMOSITE; TREMOLITE; ANTHOPHYLLITE; SHEEP; CYTOTOXICITY

&lt;295&gt;

Selikoff, I.J.; Hammond, F.C.; Churg, J., Mortality experiences of asbestos insulation 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.

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

<296>  
 Slegg, 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 *MYCOTUBERCULOSIS*, 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 higher incidence of asbestosis with increase in exposure time, but no bronchial carcinomas or mesotheliomas. Pleural plaques 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 plaques, 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 50 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 chrysotile to guinea pigs, only the crystalline form induced pulmonary changes indicative of asbestosis. Oxygen demand and consumption in lung sections from mice were increased by crystalline chrysotile, amorphous chrysotile and crystalline quartz, but not by fiber glass or fine glass. Intravenous administration of crystalline chrysotile and quartz in rabbits produced an increase in serum gammaglobulin; amorphous dusts of chrysotile and coal did not.

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

&lt;303&gt;

<303>  
 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.

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

&lt;304&gt;

Taylor, D.G.; Menadic, 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

&lt;305&gt;

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; FIBROSTS; PERITONEUM; MESOTHELIOMA

&lt;306&gt;

<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. 400 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

&lt;307&gt;

<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

&lt;308&gt;

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 3  $\mu$ m 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

&lt;309&gt;

Timbrell, V.; Pooley, P.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  $\mu$ m. Amphibole fibers are straight with minimum diameters of 0.6  $\mu$ m for crocidolite, 0.15  $\mu$ m for amosite; and 0.25  $\mu$ m 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.; Buniavich, 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 302 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 1225 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

&lt;312&gt;

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

CHRYSOTILE; AMOSITE; PLEURA; MESOTHELIOMA; HUMAN; RAT

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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 SPP and Standard rats injected intrapleurally with 20 mg of asbestos dust, mesothelioma incidence was 30% and 50% 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

&lt;314&gt;

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 pneumoconioses. Cases include 32% with asbestosis and 27 with asbestosis and carcinoma of the lung.

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

&lt;315&gt;

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; ANTINUCLLEAR FACTOR; HUMAN; RESPIRATORY DISEASE

&lt;316&gt;

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

&lt;317&gt;

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

&lt;318&gt;

Byrom, J.C.; Hodgson, R.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  $\mu$  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

&lt;319&gt;

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 diphenoxquinone, 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 biopsies, lobectomies, pneumonectomies, and

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

ASBESTOS; LUNG; RESPIRATORY DISEASES; 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, H.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>  
 Harrington, 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 carbonium; (2) 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>  
 Karacharova, V.N.; Ol'shwang, 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.

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

&lt;329&gt;

LeBouffant, L.; Daniel-Moussard, H.; Durif, S.; Martin, J.C.; Normand, C.; Pollicard, 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 HC1, 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 HC1.

ASBESTOS; CANCER; MESOTHELIOMA; ANALYSIS

&lt;330&gt;

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  $\mu$  to more than 200  $\mu$ ; 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

&lt;331&gt;

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

&lt;332&gt;

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

&lt;333&gt;

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; RUMAN; CANCER MORTALITY

&lt;334&gt;

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

An attempt was made to validate the certified cause of death for 301 deceased workers in an asbestos factory by reviewing necropsy reports for 52% of the group and histological material for 28%. Eight additional cases of bronchial carcinoma were diagnosed from necropsy and histological reports. 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

<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.W.; 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, alusina 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, adenomatoid changes, squamous metaplasia, and occasional lesions with gross and histological characteristics of sarcomas or carcinomas.

CHRYSOTILE; FIBROSTS; CANCER; SARCOMA; CARCINOMA; MOUSE; TUMOR

&lt;342&gt;

<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-Mendel rats induced extensive and progressive fibrosis in all animals, and neoplasms in 74% of the animals. The neoplasms appeared to arise from the fibrotic 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 intratracheal 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 (5μ) 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

&lt;349&gt;

<349>  
Vigiliani, 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 1955-1969 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 ofamosite, crocidolite, or chrysotile. More than 50% of the animals given chrysotile or crocidolite developed pleural mesotheliomas. Amosite produced fewer mesotheliomas and exhibited 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; CRYSTOTILE; 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; PERRUGINOUS BODIES; CRYSTOTILE; TREMOLITE

<352>  
Xipell, 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; PERRUGINOUS 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; ANTRHOPHYLLITE; ASBESTOS; ASBESTOSIS; CANCER; CRYSTOTILE; 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; CRYSTOTILE; 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 origin. 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 silicosis, 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  $P_{O_2}$ . 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

&lt;356&gt;

<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

&lt;357&gt;

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

&lt;358&gt;

Berkley, C.; Langer, A.W.; 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

&lt;359&gt;

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

&lt;360&gt;

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 ferritin 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 headed and may fragment.

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

&lt;361&gt;

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

ASBESTOS; ASBESTOS BODIES; CANCER; CARCINOMA; DIAGNOSIS; LUNG; OCCUPATIONAL EXPOSURE; HUMAN

&lt;362&gt;

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

&lt;363&gt;

Dousset, G.; Desbordes, J.; Tayot, J.; Duwoos, R.; 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

&lt;364&gt;

<364>  
 Penney, 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.; Meurman, 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; CAPCINOMA; 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

&lt;369&gt;

Knox, J.P.; 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

&lt;370&gt;

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

&lt;371&gt;

Meurman, 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 contributory or sole cause of these lesions. Further, occurrence of bilateral calcific plaques can not be considered *prima facie* evidence for asbestos-pneumoconiosis.

ASBESTOS; PLEURAL PLAQUES; CANCER; MESOTHELIOMA; PLURAL CALCIFICATION; HUMAN

&lt;372&gt;

**<372>**  
 Mortimer, P.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, pleura 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, P.; 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; PLEBOSIS; HUMAN; INHALATION; OCCUPATIONAL EXPOSURE; VENTILATORY DEFECTS; CANCER; CARCINOMA; MESOTHELIOMA; TUMOR

**<375>**  
 Noro, 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>**  
 Pollack, 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. Ashkenazi 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

&lt;379&gt;

Roe, P.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, P.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

&lt;383&gt;

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

&lt;384&gt;

Seltkoff, 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

&lt;385&gt;

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 lagers 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

&lt;386&gt;

**<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, insulated pipes and boilers for 36 years.

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

&lt;387&gt;

Stumpfius, 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; AMPHIROLE; SHIPYARDS; CO-CARCINOGEN; CANCER; LUNG

&lt;388&gt;

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 alveolar 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 osmophilic 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

&lt;390&gt;

Midjian, M.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

&lt;391&gt;

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

&lt;392&gt;

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

&lt;393&gt;

Walton, M.; 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

&lt;394&gt;

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; mineralogy 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

&lt;395&gt;

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; ANTHROPHYLLITE; ACTINOLITE; CHRYSOTILE; ASBESTOS MINING; OCCUPATIONAL EXPOSURE; NON-OCCUPATIONAL EXPOSURE; ASBESTOSIS; MESOTHELIOMA; FIBROSIS; CANCER; HUMAN

&lt;396&gt;

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 indispensability 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

&lt;397&gt;

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

&lt;398&gt;

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

&lt;399&gt;

Delord, M.; Dusserre, P.; Michiels, R.; Portier, A., Pulmonary asbestosis and peritoneal mesothelioma following a long history of asbestos pulmonary fibrosis. Paraneoplastic pseudomyelomatous hematologic syndrome was present also.

ASBESTOS; OCCUPATIONAL EXPOSURE; PLEURSIS; MESOTHELIOMA; CANCER; PERITONEUM

&lt;400&gt;

<400>  
 Deny, 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 indiscriminate 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, P., 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 significantly 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, T.; 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, R., Ovarian cancer and asbestos., Environ. Res., 1: 115-128 (1967).

Human ovarian cancer morphologically resembles mesotheliomas, and clinically has been reported in association with 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.; Cralleve, 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 unequivocally, some confusion might exist by calling them asbestos bodies. The term "ferruginous body" is suggested for the iron containing body which forms in response to nonasbestos dust in the lungs.

ASBESTOS BODIES; HAMSTER; LUNG; FERRUGINOUS BODIES

&lt;407&gt;

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; asbestos 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 asbestos lesion is similar to that of rats, but further study is needed.

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

&lt;408&gt;

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 68% -- 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

&lt;409&gt;

Heimann, R., 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

&lt;410&gt;

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

&lt;411&gt;

Jagatic, J.; Rubnitz, M.E.; Godwin, M.C.; Weiskopf, P.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 RESPONSF; ASBESTOS; MOUSE; FIBROSIS; MESOTHELIOMA; PLEURA; PERITONEUM; CHRYSOTILE

&lt;412&gt;

Kennedy, M.C.S.; Routledge, R., Investigation of a minor asbestos hazard., Brit. J. Ind. Med., 24: 232-239 (1967).

Examination of 12 workers who experienced minimal asbestos exposure included: occupational history; symptomatology; clinical examination; and physiological tests (spirometry). Out of 10 transformer workers who used asbestos, two showed minor radiological and physiological pulmonary changes correlated with early asbestosis. Two insulation workers who engaged in milling and grinding asbestos sheet (5 and 23 years exposure) showed similar but more progressive signs and symptoms due to higher asbestos exposure levels.

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

&lt;413&gt;

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

Petroscopic 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

&lt;414&gt;

MacNab, G.; Harrington, 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

&lt;415&gt;

<415>  
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, particularly in asbestos mining, milling, textile, cement, insulation and lagging occupations. However, occupational hazards can be minimized by engineering methods of dust control, continual monitoring of dust concentrations in work areas, and strict codes of practice for the workers. Domestic exposure to dust on the clothes of relatives in asbestos occupations, and residential exposure in areas near factories and mines also cause asbestos related diseases.

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

<416>  
Norwood, W.D.; Fuqua, P.A., Asbestos--an environmental health hazard., Northwest Med., 66(9): 921-928 (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, cor pulmonale, 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 cor pulmonale, asbestosis with lung cancer, mesothelioma, and rectal carcinoma in workers exposed to asbestos.

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

<417>  
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 Papanicolaou and Sirtori techniques. Asbestos particles were found along with cell metaplasia and changes in nuclear structure with dysmorphic trace.

ASBESTOS; ASBESTOSIS; ASBESTOS BODIES; CANCER; HUMAN

<418>  
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

<419>  
Roe, P.J.C.; Carter, R.L.; Walters, M.A.; Harrington, J.S., The pathological effects of subcutaneous injections of asbestos fibres in mice: migration of fibres to submesothelial tissues and induction of mesothelioma., Int. J. Cancer, 2: 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 mesothelioma. 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

<420>  
Selikoff, I.J.; Bader, R.A.; Bader, M.P.; 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

<421>  
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

&lt;422&gt;

&lt;422&gt;

Zolov, C.; Bourilkov, T.; Babadiov, 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

&lt;423&gt;

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

&lt;424&gt;

Blount, H.; 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) hydroxyproline, 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

&lt;425&gt;

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; FIBROSTS; ASBESTOS; CHRYSOTILE; ANTHOPHYLLITE; AMOSITE; CROCIDOLITE; ASBESTOS BODIES; GUINEA PIG

&lt;426&gt;

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

&lt;427&gt;

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

&lt;428&gt;

Kogan, F.M.; Dorinovskaya, 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

&lt;429&gt;

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

&lt;430&gt;

<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): 1183-1188 (1966).

In a clinical study of 55 asbestos textile workers with pathologically proven asbestosis, 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 asbestos 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.; Harrington, 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 asbestosis 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

&lt;434&gt;

Thomson, J.G.; Graves, W.M., Asbestos as an urban air contaminant., Arch. Pathol., 91: 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

&lt;435&gt;

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 dyspnea. 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

&lt;436&gt;

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

<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 of 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 squared 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 accommodate international peculiarities.

ASBESTOSIS; DIAGNOSIS; HUMAN; X-RAY

<441>  
Brown, P.; Cartwright, B.; Newman, J.P.E., Inhibition of virus growth by a toxic factor from asbestos pad and cellulose acetate membrane filters., Nature, 205: 310-311 (1965).

Filtration of either phosphate-low or Eagle's medium through a Seitz or Ford's asbestos pad results in a considerable reduction of virus yield in both pig and hamster kidney cells that are grown in the medium. It has been established that the reductions were due to a toxic factor. However, the nature of the toxic factor or factors has not been examined.

ASBESTOSIS; 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

&lt;443&gt;

&lt;443&gt;

Caplan, A.; Gilson, J.C.; Hinson, K.P.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

&lt;444&gt;

Caura, 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 81%. Among males the incidence of positive cases was higher (67%) 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

&lt;445&gt;

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

&lt;446&gt;

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 1μ 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 nm in diameter.

ASBESTOS; ASBESTOS BODIES; ASBESTOSIS; CHRYSOTILE; GIANT CELL; GUINEA PIG; HUMAN; MACROPHAGE

&lt;447&gt;

Outra, 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

&lt;448&gt;

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

&lt;449&gt;

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

&lt;450&gt;

**<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.P., 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 prospective 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, P.J.C., Studies of carcinogenesis of asbestos fibers and their natural oils., Ann. N.Y. Acad. Sci., 132(1): 439-450 (1965).

The possible role 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

&lt;457&gt;

<457>  
 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) pyroxenes--chrysotile, (2) amphiboles--crocidolite, amosite, tremolite, actinolite, and anthophyllite. The geology, occurrences, and major uses of asbestos are discussed.

ACTINOLITE; AMPHIBOLE; AMOSITE; ANTHOPHYLLITE; ASBESTOS; CHRYSOTILE; CROCIDOLITE; USE

&lt;458&gt;

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

&lt;459&gt;

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  $\mu$ ; 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

&lt;460&gt;

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 anthophyllite dust. In the later stages of the disease, there is an extension of the inflammatory reaction from the bronchioles into the surrounding lung, with progressive fibrosis of the lung, adenoid proliferation of the bronchiolar epithelium, and reticulosis 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

&lt;462&gt;

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

&lt;463&gt;

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 1954, 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

&lt;464&gt;

Knox, J.P.; 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

&lt;465&gt;

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

&lt;466&gt;

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

&lt;467&gt;

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

&lt;468&gt;

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 administered in conjunction with chrysotile asbestos; amosite did not increase tumor induction by benzo (a) pyrene.

ASBESTOS; CANCER; CARCINOMA; HAMSTER; TUMOR; CO-CARCINOGEN

&lt;469&gt;

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.W. 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

&lt;470&gt;

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

&lt;471&gt;

<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 liggers 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, P.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  $\text{mg}/\text{m}^3$  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).

Radiological 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 calcification 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 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

<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 mesotheliomas.

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: 456-487 (1965).

A single intrapleural injection of soft chrysotile, harsh chrysotile or amosite (25 mg) in hamsters initially induced granulomatous inflammation, pleural thickening, calcification, necrosis, and fibrosis. Pleural mesotheliomas developed after 200 days in 3 out of 15 animals given amosite, and after 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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**486**  
Thomson, J.G., Asbestos and the urban dweller., Ann. N.Y. Acad. Sci., 132(1): 196-210 (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

&lt;487&gt;

Thomson, M.L.; Pelzer, A.M.; Smith, W.J., The discriminant value of pulmonary function tests in asbestos., 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; PNEUMONIOTIS; OCCUPATIONAL EXPOSURE; HUMAN; FINGER CLUBBING; X-RAY

&lt;488&gt;

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

&lt;489&gt;

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--bronchial 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

&lt;490&gt;

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

&lt;491&gt;

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

&lt;492&gt;

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

&lt;493&gt;

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

&lt;494&gt;

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 asbestos cases histologically revealed 3 squamous tumors, 3 anaplastic tumors, 2 adenocarcinomas, 1 alveolar cell carcinoma, and mesothelioma of the pleura.

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

&lt;495&gt;

<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

&lt;496&gt;

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

&lt;497&gt;

Buchanan, W.D., The association of certain cancers with asbestosis., Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Excerpta Medica Foundation, New York., Vol. II: 617-619 (1964).

British epidemiologic data on pulmonary and other cancers are updated to 1962. Asbestosis was present at autopsy in 549 cases from 1924 to 1962 - 368 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; PERITONIUM

&lt;498&gt;

Davis, J.M.G., An electron microscopy study of the effect of asbestos dust on the lung., Brit. J. Exp. Pathol., 44(4): 454-464 (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

&lt;499&gt;

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 Å in diameter. Segmentation of the asbestos body may result from its deposition as separate globules or by the splitting of a previously smooth coat. Irregularly shaped aggregates of ferritin contained scattered particles of asbestos dust as well as other foreign material.

ANALYSIS; LUNG; HUMAN; ASBESTOS BODIES; AMOSITE; GUINEA PIG

&lt;500&gt;

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 ferritin) approximately 60 Å 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

&lt;501&gt;

Dyson, B.C.; Trentalance, A.E., Resection of primary pulmonary sarcoma. Review of literature and report of a case associated with pulmonary asbestosis., J. Thoracic Cardiovas. Surg., 47(5): 577-589 (1964).

Primary pulmonary sarcoma is clinically indistinguishable from carcinoma until diagnosis is made by biopsy at bronchoscopy or at thoracotomy. In a 54-year-old newspaperman with primary pulmonary sarcoma, anthracotic pigment and asbestos bodies were present within the tumor and within adjacent lung tissue. Occupational history revealed 16 years of asbestos exposure as a pipe insulator. This is the first reported case in which pulmonary asbestosis was associated with primary pulmonary sarcoma. A review of 66 published cases of primary sarcoma in the bronchus or peripheral lung is included.

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

&lt;502&gt;

<502>  
 Elwood, P.C.; Cochrane, A.L.; Benjamin, I.T.;  
 Syers-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.R.; Smith, 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>  
 Harrington, J.S.; Smith, M., Studies of hydrocarbons on mineral dusts. The elution of 3,4-benzopyrene 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-benzopyrene 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-benzopyrene 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). Excerpta Medica Foundation, New York., Vol. II: 667-670 (1964).

Guinea pigs which were forced to inhale fine particles of asbestos exhibited numerous asbestos particles and mononuclear macrophages in the lungs. At various times, guinea pigs were killed to ascertain developmental episodes. Submicroscopic particles can produce severe lesions in the lung.

GUINEA PIG; 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 reticular 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>  
 Hourihane, D. O'B., The pathology of mesothelioma 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 (mesothelioma) in the necropsy files at the London Hospital are reviewed. Pathology of 34 cases of primary tumors (mesothelioma) 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

&lt;511&gt;

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

&lt;512&gt;

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; PERITONIUM; LUNG; ASBESTOS BODIES

&lt;513&gt;

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 COVERS; HUMAN; CANCER; NEOPLASM; INSULATION WORKERS; OCCUPATIONAL EXPOSURE; TUMOR; MESOTHELIOMA; GASTROINTESTINAL; ASBESTOSIS

&lt;514&gt;

Sluis-Cremer, G.K.; Wagner, J.C., A pathological-radiological correlation in 108 cases of asbestosis proved at post-mortem., Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Excerpta Medica Foundation, New York., Vol. II: 608-610 (1964).

Asbestosis may cause disablement without being detectable radiologically. In 108 asbestotic subjects studied, all had worked in crocidolite or amosite mines; radiologically, at autopsy, there were 47 cases of slight asbestosis, 42 moderate, and 19 marked.

LUNG; CROCIDOLITE; AMOSITE; X-RAY; HUMAN; ASBESTOS MINING

&lt;515&gt;

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

&lt;516&gt;

Wagner, J.C., Asbestos dust exposure and malignancy (diffuse mesotheliomas of the pleura)., Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Excerpta 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

&lt;517&gt;

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

&lt;518&gt;

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; liggers apply a coat of wet plaster by hand on cover sections wired to the boiler.

ASBESTOSIS; AMOSITE; INSULATION WORKERS; OCCUPATIONAL EXPOSURE; HUMAN

&lt;519&gt;

<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.1., 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 proventriculus, 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 asbestososis 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; PIG; MONKEY; FIBROSIS; ASBESTOS; INHALATION

<522>  
 Walters, L.G., Industrial cancer in South Africa., Med. Proc. (Mediese Rydres), 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 asbestos 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

&lt;527&gt;

<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.; Pukuoka, M.; Sano, H., Studies on the course of asbestosis patients., Jap. J. Med., 1(1): 157-158 (1952).

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 pneumoconiosis.

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): 759-760 (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

&lt;535&gt;

<535>  
 Bader, M.P.; Bader, F.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

&lt;536&gt;

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

&lt;537&gt;

Heard, R.P.; 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

&lt;538&gt;

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

&lt;539&gt;

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

&lt;540&gt;

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

&lt;541&gt;

Telischki, W.; Rubenstein, 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

&lt;542&gt;

Tellessen, 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 cumulative 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

<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: 1345-1352 (1960).

A man who worked in an English factory for 11 years developed asbestosis with fatal complications. Rheumatic fever at an early age was contributory. Several participants at a clinopathological 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>  
Real, E.E., Asbestosis and abdominal neoplasms., *Lancet*, 2: 1211-1216 (1960).

Approximately 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. Metastasis from other carcinoma sites seem 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>  
Scheidt, 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

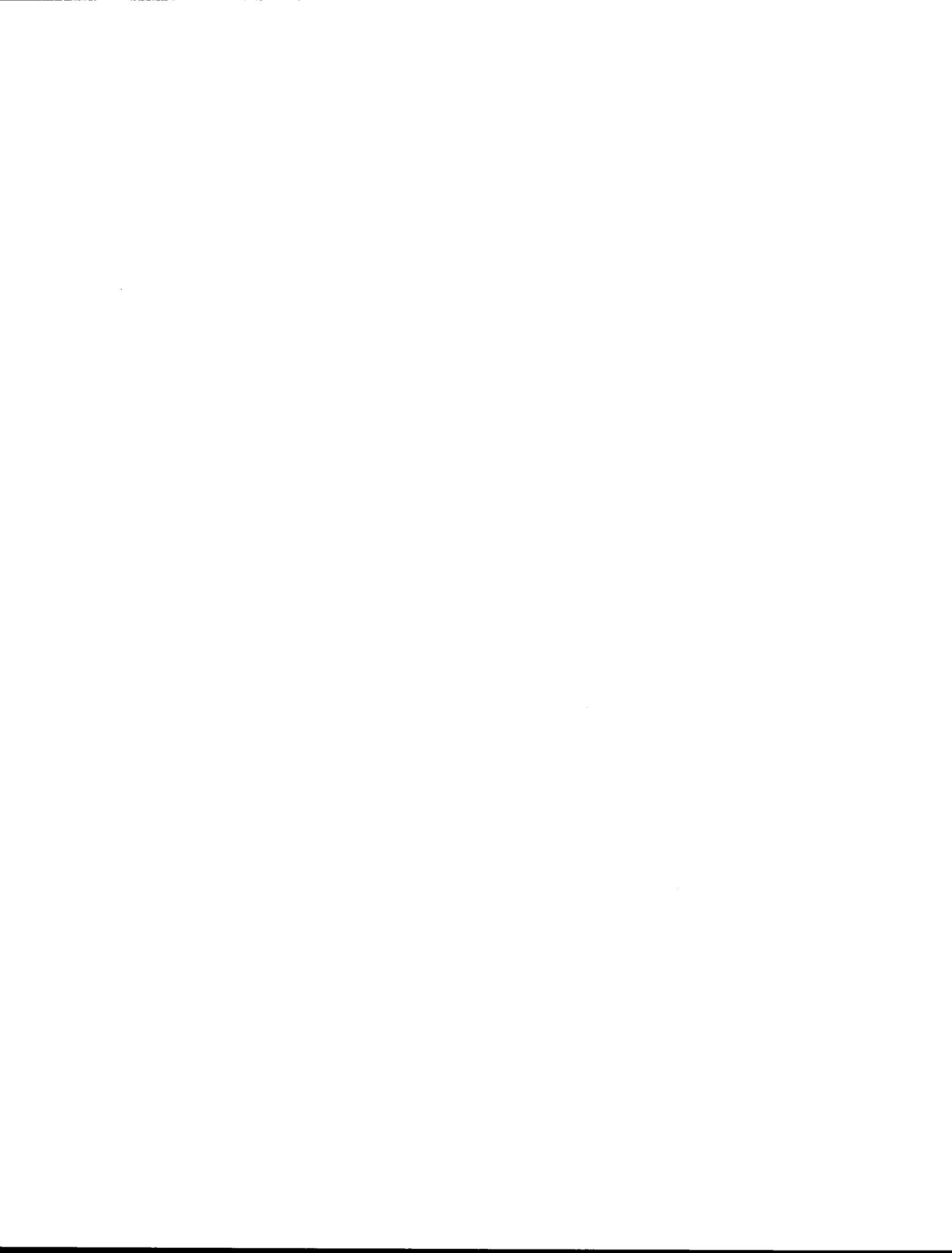
<549>  
Wagner, J.C.; Sleggs, C.A.; Marchand, P., Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province., *Brit. J. Ind. Med.*, 17: 260-271 (1960).

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 asbestos with the tumors, since they rarely occur elsewhere in South Africa.

ASBESTOS; MESOTHELIOMA; CROCIDOLITE; ASBESTOS MINING; OCCUPATIONAL EXPOSURE; HUMAN



## **AUTHOR INDEX**



## AUTHOR INDEX

Aaronson, T. 89

Abdel-Salam, M.S. 256

Addingley, C.G. 423

Adelman, H. 90

Adler, H. 400

Ahlman, K. 78

Allison, A.C. 138, 139, 234

Amoudru, C. 159

Anand, M. 79

Anderson, J. 564

Andreeva, T.D. 310

Anonymous 1, 2, 3, 4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 91, 92, 93, 140, 141, 142, 235, 353, 354, 436, 437, 438, 495, 545

Anspach, M. 463

Aponte, G.F. 28

Ardalan, P. 355

Arlon, R. 30

Arnaud, A. 317

Ashcroft, T. 236

Atkinson, G.W. 13

Avril, J. 237

Awad, S. 256

Ayer, H.E. 159, 429

Babadjov, L. 422

Babyak, M.A. 408

Badami, D.V. 210

Baden, V. 135, 185, 358

Bader, M.R. 238, 420, 439, 535

Bader, R.A. 238, 420, 439, 535

Badr, F.M. 143

Bailey, W. 85

Balzer, J.L. 303, 356

Bartosiewicz, L. 29

Basset, M.F. 489

Bavley, H. 536

Beck, E.G. 94, 144, 145

Becklake, M.R. 15, 95, 117, 184, 239

Beg, M.U. 79, 81

Belleau, P. 119, 357

Benjamin, J.T. 502

Bericic, T. 146

Berkley, C. 358

Berkson, P. 90

Berliner, S.W. 468

Berry, G. 82, 96, 121, 313, 350

Bertalanffy, P.D. 153, 226

Bey, P. 147, 264

Bhathal, P.S. 352

Biancifiori, C. 335, 336

Bignon, J. 151, 240, 394

Biles, B. 359

Birbeck, M.S.C. 268

Bittersohl, G. 125

Bjure, J. 496

Blackwell, R. 344

Blejer, H.P. 30

Blennerhassett, J.B. 183

Blount, M. 424

Blum, C.K. 524

Boettner, P.A. 421

Bogowski, P. 137

Bohlig, H. 48, 241, 242, 440

Boisseau, M. 361

Boiteau, H.L. 97

Bonnaud, G. 151, 240, 394

Botham, S.K. 98, 148, 360

Boucot, K.R. 99

Bouffant, L.L. 124

Bouhuys, A. 173, 243

Bourilkov, T. 422

Bowden, D.H. 189

Boyd, J. 485

Brain, J.D. 150

Breeling, J.L. 10

Bristol, L.J. 242

British Occupational Hygiene Society Committee on Hygiene Standards 31

British Thoracic and Tuberculosis Association 100

Brouet, G. 151, 394

Brown, P. 441

Browne, R.C. 152

Bruch, J. 144

Brusch, H.G. 536

Pryks, S. 153, 226

Bucciarelli, P. 335, 336

Buchanan, W.D. 442, 497

Buhmann, A.A. 154

Bunarevic, A. 146

Bunescu, G. 135, 293

Bunimovich, G.I. 310

Burger, B.F. 284

Burgess, W.A. 168, 204

Burilkov, T. 101, 245

Busser, E. 154

Byrom, J.C. 318

Campagna, F.A. 544

Campbell, C.B. 372

Caplan, A. 443

Cardani, A. 283

Carnahan, W.J. 99

Carney, J.D. 487

Carstens, U. 222

Carter, P.L. 268, 419

Cartier, P.H. 242, 525

Cartwright, R. 441

Cauna, D. 444

Caves, P.K. 155

Chabot, J. 489

Champeix, J. 237

Chan, W. 32

Charpin, J. 317

Chew, C.H. 32

Chew, P.K. 32

Chew, S.F. 32

Chia, M. 32

Chretien, J. 394

Churg, J. 77, 115, 216, 246, 295, 346, 347, 384, 388, 420, 445, 476, 477, 482, 513, 515

Cochrane, A.L. 502

Cohen, D. 33

## AUTHOR INDEX

Collins, T.P.R. 395  
 Conning, D.M. 156  
 Cook, G.W. 469  
 Cooper, D.A. 99  
 Cooper, W.C. 303, 356, 396  
 Cordova, J.P. 526  
 Corrin, B. 102  
 Crable, J.V. 304  
 Cralley, L.J. 34, 157, 158, 159, 247, 253, 263, 397, 406  
 Cunningham, R.M. 35, 65, 160  
 Dabbert, A.F. 289  
 Dacre, J.C. 248  
 Dalquen, P. 222, 249  
 Daniel-Moussard, H. 124, 329  
 Dautv, A. 361  
 Davidson, J.K. 331  
 Davis, H.V. 161  
 Davis, J.M.G. 44, 162, 219, 250, 251, 252, 362, 398, 446, 498, 499, 500  
 De Coufle, P. 38  
 Delord, M. 399  
 Desmy, N.G. 400  
 Desbordes, J. 361, 363  
 Detreville, R.T.P. 44, 176, 252, 262, 263, 326, 362, 390, 406, 407, 408  
 Dickey, T.P. 319  
 Dilliey, J.V. 286  
 Dimov, D. 146  
 Dixon, J.P. 203, 253  
 Doblas, J. 62  
 Dodgson, K.S. 211  
 Dogra, R.K.S. 80, 87  
 Doll, R.S. 254, 369, 464  
 Dorinovskaya, A.P. 428  
 Dorschner, F. 154  
 Dousset, G. 361, 363  
 Drysdale, F.S. 163  
 Dufour, G. 240  
 Duma, R.J. 36  
 Durif, S. 329  
 Dusserre, P. 399  
 DuToit, R.S.J. 159, 255  
 Dutra, F.R. 447  
 Duwoos, H. 363  
 Dyson, B.C. 501  
 Edge, J.R. 257  
 Ehrenreich, T. 37  
 Eisenstadt, H.B. 448, 527  
 El Attar, O.A. 279  
 El-Ghawabi, S. 321  
 El-Sevey, A.Z. 143, 164, 165, 256, 320  
 Elder, J.L. 103, 401  
 Eliseo, V. 417  
 Ellison, A.H. 11  
 Elmes, P.C. 166, 449, 450  
 Elsasser, R.E. 481, 483  
 Elwood, P.C. 502  
 Emara, A. 321  
 Emerson, T.R. 359  
 Engelbrecht, F.M. 104, 284  
 Enterline, P.E. 38, 39, 451  
 Enticknap, J.B. 503  
 Ernoult, J.L. 361, 363  
 Evans, J.C. 40  
 Evans, P.H. 128  
 Evans, R.J. 40  
 Eyssen, G. 58  
 Falor, W.H. 373  
 FAO/WHO 167  
 Farina, G. 283  
 Felson, B. 282  
 Penner, P.M. 209  
 Pennessy, J.J. 364  
 Ferris, B.G. 119, 168, 204  
 Finkelberg, E.I. 105  
 Finlayson, A. 169, 280  
 Firminger, H.I. 73  
 Flasbeck, R. 72  
 Fletcher, D.E. 170, 257  
 Ford, J.E. 106  
 Fournier-Massey, G.G. 95, 117, 239  
 Freundlich, I.M. 402  
 Friedrichs, K.H. 127, 144, 171, 172  
 Fujimura, W. 529  
 Fukuoka, M. 529  
 Fuqua, P.A. 416  
 Furst, A. 322  
 Gaensler, E.A. 108, 119, 204, 357  
 Gandevia, B. 32, 403  
 Gee, B. 173  
 Gelfand, M. 258  
 Gelot, S. 97  
 Genina, O.D. 105  
 Gerber, M.A. 259  
 Ghezzi, I. 392, 404  
 Gibbs, G.W. 12, 15, 107, 159, 174, 184, 198, 323  
 Gibson, A.A.M. 280  
 Gibson, J.C. 389  
 Gilson, J.C. 41, 42, 114, 177, 242, 260, 403, 452  
 Godwin, M.C. 261, 365, 411  
 Goff, A.M. 108, 119  
 Gold, C. 175, 202, 324  
 Goldstein, B. 221  
 Goni, J. 151, 240, 394  
 Goodhead, K. 325  
 Gorson, R.O. 43  
 Gough, J. 453  
 Governa, M. 109, 110  
 Graham, J. 405  
 Graham, R. 405  
 Grainger, T.R. 282  
 Graves, W.M. 434  
 Greening, R.R. 402  
 Griffiths, D.M. 225  
 Grosh, J.L. 430, 431  
 Gross, P. 44, 45, 46, 176, 252, 262, 263, 326, 362, 390, 406, 407, 408, 444, 525  
 Groth, D.H. 203  
 Grundy, G.W. 111

## AUTHOR INDEX

Gulevskaya, M.R. 116  
 Gusein'nikova, N.A. 116  
 Hadengue, A. 56  
 Hagerstrand, T. 47, 366  
 Hain, P. 48  
 Haller, M.W. 326  
 Hammond, E.C. 185, 216, 217, 295, 384, 420, 476, 477, 513  
 Hardy, H.L. 454  
 Harrington, J.S. 118, 147, 177, 178, 260, 327, 410, 410, 432, 455, 456, 504, 528  
 Harley, R.A. 44, 45, 46  
 Haro, R.T. 322  
 Harper, A. 279  
 Harries, P.G. 112, 179, 194, 278, 367  
 Haslam, P. 231  
 Hassan, F. 164  
 Hayes, M.J. 156  
 Heard, B.B. 537  
 Hegazi, S.M. 165  
 Heimann, R. 217, 409  
 Heller, R.W. 265  
 Henderson, V. 38, 39  
 Hendry, R.W. 457  
 Heppleston, E.G. 236  
 Higgins, P. 386  
 Higginson, J. 137  
 Hill, T.D. 369, 464  
 Hills, D.W. 458  
 Hilscher, W. 72, 144, 172  
 Hinson, K.P.W. 443  
 Hinz, I. 249  
 Hitchcock, H.T. 266  
 Hodge, H.C. 215  
 Hodgson, A.A. 318  
 Holaday, D.A. 129, 209  
 Holmes, A. 40, 180, 202, 284, 410  
 Holmes, S. 113, 159, 318, 369, 459  
 Holt, P.P. 49, 94, 98, 145, 148, 360, 424, 425, 460, 505, 506  
 Horai, Z. 267, 529  
 Hormia, M. 282  
 Hounam, R.P. 40, 181  
 Hourihane, D. O'B. 507  
 House, W. 508  
 Howard, E.B. 286  
 Hubert, D.D. 483  
 Hueper, W.C. 461  
 Hunt, R. 462  
 Hunter, B. 50  
 Burlburt, J.P. 182  
 Hurwitz, M. 538  
 Huth, F. 70, 127  
 Irvine, R.W. 291  
 Isomaki, M. 282  
 Jacob, G. 463  
 Jacobson, G. 114, 242  
 Jacques, J. 155  
 Jagatic, J. 261, 365, 411  
 Janover, M.L. 183, 265  
 Jaurand, M.C. 240  
 Jodoin, G. 184  
 Jones, D.M. 40  
 Kabvics, M. 206  
 Kanazawa, K. 268  
 Kaneda, M. 267  
 Kannerstein, M. 77, 115, 246  
 Karacharova, V.N. 328  
 Kasahara, S. 267  
 Kaschak, M. 408  
 Kaschula, F.O.C. 520  
 Keal, P.E. 546  
 Keane, W.T. 426  
 Keelan, P.J. 119  
 Keenan, R.G. 397  
 Kellermeyer, R.W. 269  
 Kemp, J.H. 112  
 Kennedy, M.C.S. 412  
 Kenton, C. 51  
 Kidwai, M.M. 54  
 Kim, Y. 32  
 King, P.C. 264  
 Kiviluoto, R. 242, 270, 271  
 Kleinfeld, M.J. 52, 53, 272, 368, 427  
 Klosterkotter, W. 48, 213  
 Knox, J.P. 369, 464  
 Knudtson, K.P. 526  
 Kogan, F.M. 116, 273, 328, 428  
 Kohl, G. 89  
 Koprowska, I. 533  
 Kuyper, L.W. 274  
 Kuz'minykh, A.N. 310  
 Laamanen, A. 465  
 LaChance, M. 12, 107  
 Lainhart, W.S. 34, 242  
 Lal, M.M. 54  
 Langer, A.M. 37, 53, 55, 185, 186, 187, 275, 276, 358  
 Langlands, J.W.M. 188, 230  
 Lawther, P.J. 189  
 Leach, A.A. 424  
 Leathart, G.L. 518, 547  
 LeBouffant, L. 329  
 Lebreuil, G. 317  
 Legrand, M. 56  
 Legrand, P.P. 530  
 Leineweber, J.P. 343  
 Lemonde, J. 190  
 Lepinay, A. 124  
 Lesohre, R. 56  
 Lihshitz, H.I. 13  
 Lichtenstein, E.P. 277  
 Lieben, J. 413  
 Lieberman, M.S. 43  
 Litterst, C.L. 277  
 Longley, E.O. 330  
 Lowe, A.E. 203  
 Lowe, D.B. 253  
 Luce, R.W. 191  
 Lulenski, G.C. 192  
 Lumley, K.P.S. 193, 194  
 Luxon, S.G. 195  
 Lynch, J.R. 370, 397, 429

## AUTHOR INDEX

MacDonald, R.R. 520  
 Mackenzie, F.A.F. 112, 196, 278  
 Macklem, P.T. 184  
 Mackler, A.D. 37  
 MacNab, G. 178, 414  
 MacPherson, P. 331  
 Maggiore, C.J. 122  
 Magner, D. 58  
 Mair, A. 169, 280  
 Mann, R.H. 430, 431  
 Manojlovic, N. 98  
 Manouvrier, F. 361  
 Manouvrier, R. 363  
 Maranzana, P. 392, 490  
 Marchand, P. 540, 549  
 Markovic, Z. 206  
 Maroudas, N.G. 57  
 Martin, J.C. 124, 329  
 Martindale, R.W. 325  
 Massey, D.G. 190  
 Masson, T.J. 14  
 Matsusura, K. 529  
 May, T.C. 466, 509  
 McCallum, R.I. 197  
 McCaughey, W.T.E. 449  
 McDonald, A.D. 15, 58, 198, 279  
 McDonald, J.C. 15, 95, 117, 184, 198, 239, 242, 279  
 McEwen, J. 169, 280  
 McGill, T. 75, 76  
 McGrath, M.W. 543  
 McKay, P.W. 14  
 McNulty, J.C. 281, 531  
 McVittie, J.C. 443, 467  
 Medical Research Council  
 Pneumoconiosis Unit. 100  
 Merlin, R.R. 199, 200  
 Messite, J. 53, 427  
 Meurman, L.O. 271, 282, 366, 371  
 Meyer, P.R. 387  
 Michailova, L. 101, 245  
 Michiels, R. 399  
 Michizawa, T. 267  
 Miller, A. 238  
 Miller, F. 384  
 Miller, K. 118, 178  
 Miller, L. 468, 482, 483, 515  
 Miller, R.W. 14, 111  
 Mills, J. 425, 460, 505, 506  
 Milne, J.E.H. 201, 332  
 Molteni, G. 404  
 Mongin, M. 317  
 Moolten, S. 445  
 Mooney, T.F. Jr. 68  
 Moreschi, N. 283  
 Morgan, A. 40, 180, 202, 284, 410  
 Morgan, G.B. 224  
 Morgan, W.K.C. 510  
 Morgenroth, K. 59  
 Morris, T.G. 67, 469  
 Mortimer, R.H. 372  
 Morton, S.A. 258  
 Motlagh, F. 373  
 Mottura, G. 490  
 Mountain, J.T. 203  
 Murphy, F.L.H. 60, 119, 168, 204  
 Myers, J.L. 61  
 Nagelschmidt, G. 470  
 Nasrallah, F.T. 145  
 Navratil, M. 62, 120, 205  
 Naylor, B. 319  
 Menadic, C.M. 304  
 Newhouse, M.L. 63, 96, 121, 285, 333, 334, 415, 471, 472  
 Newman, J.F.E. 441  
 Nice, C.M. 374  
 Nicholas, J.A. 156  
 Nicholson, W.J. 122, 129  
 Normand, C. 329  
 Noro, L. 375, 465  
 Norwood, W.D. 416  
 Nurminen, M. 123  
 O'Donnell, W.M. 430, 431  
 O'Kelly, F.J. 198  
 O'Neill, C.H. 57  
 Occella, E. 159  
 Odlund, B. 366  
 Okuyama, T. 267  
 Ol'shwang, R.A. 328  
 Oldham, P.D. 288  
 Oliver, T.P. 112  
 Oosthuizen, S.P. 511  
 Orfila, J. 124  
 Ose, H. 125  
 Ostrolenk, D.G. 374  
 Otto, H. 64  
 Owen, W.G. 512  
 Parazzi, E. 376  
 Pariente, R. 394  
 Park, J.P. 286  
 Park, W.D. 386  
 Parkes, W.R. 315  
 Payan, H. 317  
 Peacock, A. 519  
 Peacock, P.R. 335, 336, 519  
 Pelzer, A.M. 337, 487  
 Pendergrass, E.P. 242  
 Pendergrass, H.P. 168  
 Penman, H.G. 287  
 Pennarola, R. 417  
 Pernis, B. 376, 392, 473  
 Peters, J.H. 84, 168, 243  
 Pikula, B. 206  
 Pinchon, M.C. 240  
 Pistavka, H. 413  
 Plamenac, P. 206  
 Pochashev, E.W. 273  
 Policard, A. 329  
 Polliack, A. 377  
 Pontefract, R.D. 35, 65, 160  
 Pooley, F.D. 66, 126, 225, 288, 309

## AUTHOR INDEX

Portier, A. 399  
 Pott, F. 70, 127, 144  
 Price, A.B. 102  
 Puccetti, W. 404  
 Pundsack, P.L. 294  
 Puro, H.P. 207  
 Pylev, L.N. 289, 338  
 Rahman, Q. 70, 81  
 Rajan, K.T. 128  
 Ranadive, M.V. 168  
 Raphael, B. 317  
 Rasanen, T. 532  
 Raunio, V. 465  
 Rawcliffe, P.M. 233  
 Redaksie, V.D. 378  
 Redding, P.A. 119  
 Reeves, A.L. 68, 161, 207  
 Regan, G.M. 208  
 Reitze, W.R. 129, 209  
 Rendall, R.E.G. 218  
 Rezzonico, A. 383  
 Ribacchi, R. 339  
 Richards, A.L. 210  
 Richards, D.P. 253  
 Richards, P.J. 67, 211  
 Richardson, B.D. 264  
 Roberts, G.H. 212, 290, 291, 418  
 Roberts, W.H. 469  
 Robin, M. 97  
 Robinson, J. 130  
 Robock, K. 213  
 Roe, F.J.C. 268, 289, 338, 379, 380, 419, 432, 456  
 Roser, H. 209  
 Rosanda, C. 109  
 Rosen, S.H. 445  
 Rossiter, C.P. 15, 85, 95, 117, 131, 198, 239, 242  
 Rous, V. 292  
 Routledge, R. 412  
 Roy-Chowdhury, A.K. 68  
 Royall, H.J. 381  
 Rubenstein, A.I. 541  
 Rubin, I. 276  
 Rubnitz, M.E. 411  
 Ruckelshaus, W.D. 214  
 Rushy, M. 382  
 Ruttner, J.P. 132  
 Sackler, J.P. 90  
 Sacks, M.I. 377  
 Sandalls, F.J. 180  
 Sanders, C.L. 69, 133  
 Sanderson, J.T. 518  
 Sano, H. 529  
 Sano, T. 340  
 Sastre, A. 187  
 Savvaitova, N.I. 105  
 Schall, F.L. 474  
 Scheuer, E. 70  
 Schmidt, A.M. 71  
 Schmidt, K.G. 548  
 Schneider, T. 134  
 Schnitzer, R.J. 135, 293, 294  
 Schulson, M.G. 182  
 Schutz, A. 48  
 Scott, J.K. 215  
 Secchi, G.C. 376, 383  
 Seidman, H. 99  
 Seiffert, B. 47  
 Selak, I. 206  
 Selikoff, I.J. 37, 122, 129, 185, 186, 187, 216, 217, 238, 242, 276, 295, 384, 420, 439, 473, 475, 476, 477, 482, 513, 515, 535  
 Sethi, S. 72, 172  
 Seys-Prosser, D. 502  
 Shanker, R. 80, 87  
 Shapiro, J. 427  
 Sheers, G. 112, 385  
 Shepherd, J.M. 543  
 Shin, M.L. 73  
 Short, M.D. 348  
 Shride, A.E. 74  
 Siemiatycki, J. 198, 239  
 Silverton, R.P. 469  
 Simpson, M.J.C. 166, 188  
 Sirec, A. 146  
 Skeoch, T. 393  
 Skidmore, J.W. 469, 493  
 Skikne, M.I. 218  
 Sleggs, C.A. 296, 540, 549  
 Sluis-Cremer, G.K. 221, 242, 297, 478, 479, 511, 514  
 Smith, A.A. 119  
 Smith, B.A. 219  
 Smith, K.W. 480  
 Smith, M. 504  
 Smith, P.G. 386  
 Smith, R.G. 207  
 Smith, W.E. 381, 388, 468, 481, 482, 483, 515  
 Smither, W.J. 220, 298, 433, 484, 487, 503, 543  
 Soderholm, B. 496  
 Solomon, A. 221, 299, 300, 301, 342  
 Sondic, M. 146  
 Song, H.A. 533  
 Southard, M.E. 13  
 Speil, S. 343  
 Spycher, M.A. 132  
 Stanton, M.P. 67, 344  
 Steel, S.J. 485  
 Stell, P.M. 75, 76  
 Sticher, H. 132  
 Stokinger, H.B. 253, 345  
 Stossel, H.G. 222  
 Stuart, B.O. 286  
 Studeny, J. 292  
 Stumphius, J. 223, 387  
 Styles, J.A. 156  
 Sugimoto, T. 267  
 Supramaniam, J.M.J. 32  
 Sutinen, S. 292  
 Suzuki, T. 77, 136, 346, 347, 388  
 Svirskii, P.L. 273  
 Szymczykiewicz, K. 302

## AUTHOR INDEX

Tabershaw, J.R. 208, 303  
 Tagg, B. 208  
 Talbot, J.H. 218  
 Taskinen, P. 78  
 Taylor, D.G. 304  
 Tayot, J. 361, 363  
 Telisch, M. 541  
 Tellessen, W.G. 542  
 Templeton, A.R. 385  
 Tesluk, H. 526  
 Theriault, G.P. 84  
 Theron, C.P. 879, 511  
 Thiaut, B.F. 104  
 Thompson, C. 50  
 Thompson, H. 471, 472  
 Thompson, R.J. 224  
 Thomson, J.G. 305, 434, 486, 520, 534  
 Thomson, K.J. 287  
 Thomson, M.L. 208, 337, 348, 487, 543  
 Tierstein, E.S. 238, 439  
 Timbrell, V. 82, 225, 306, 307, 308, 309, 313, 389, 488  
 Tolker, E.B. 408  
 Totten, F.S. 884  
 Tremblay, A. 190  
 Trentalance, A.E. 501  
 Trippe, F. 120  
 Troitskii, S.Yu. 310  
 Tsujimoto, T. 529  
 Tuma, J. 176  
 Turiaf, J. 489  
 Turnock, A.C. 226  
 Turok, M.E. 96, 121  
 Ueshima, M. 529  
 Ulrich, P. 227  
 Um, C-R. 228, 298  
 Utidjian, M.D. 390  
 Vadala, C.R. 110  
 Vasseur, M. 124  
 Veret, J. 363  
 Vigliani, E.C. 311, 349, 376, 391, 392, 473, 490  
 Viswanathan, P.N. 79, 80, 81  
 Vorvik, D. 289  
 Vorwald, A.J. 207  
 Wade, O.L. 449, 450  
 Waggoner, C. 85  
 Wagner, J.C. 82, 121, 128, 137, 177, 229, 288, 309, 312, 313, 334, 350, 443, 466, 491, 492, 493, 514, 516, 521, 540, 549  
 Wagner, R. 314  
 Walford, J. 208  
 Wallace, W.P.M. 188, 230  
 Walsh, M. 40  
 Walters, L.G. 522  
 Walters, M.A. 419, 832  
 Walton, M. 393  
 Warren, K.S. 269  
 Warwick, G.P. 338  
 Warwick, M. 231, 315  
 Weber, A.L. 265  
 Webster, I. 83, 221, 316, 389, 517, 523  
 Weeks, J. 231  
 Wegman, D.H. 84  
 Wehner, A. 286  
 Weill, H. 85  
 Weiskopf, R.W. 411  
 Weiss, B. 421  
 Weiss, W. 99, 232  
 Wershba, M.S. 13  
 Whitwell, F. 233  
 Widimsky, J. 496  
 Wiecking, D.K. 435  
 Wiikeri, M. 78  
 Williams, R. 537  
 Williams, W.J. 494  
 Witt, L. 86  
 Woitowitz, H.J. 48  
 Worcester, J. 208  
 Wright, D.S. 112  
 Wright, G.W. 242, 351

## **PERMUTED TITLE INDEX**



## PERMUTED TITLE INDEX

with chrysotile asbestos or benzpyrene in the rat	#Carcinogenesis of $^{239}\text{Pu}$ 02	000069
of tissue reaction and fibers distribution in chrysotile asbestos.*	#Production of	000172
	#Asbestosis and	000133
Identification of serpentine varieties by infrared		000546
lima beans contaminated with asbestos after		
by a toxic factor from asbestos pad and cellulose		
	#Effects of chrysotile and	
ironstone.*	#Serum proteins and amino	
	nickel, and scandium in asbestos by neutron	
composition and biological effects of	#Neutron	
	#Haemolytic	
pulmonary asbestosis.*	#Hemolytic	
	#Phagocytic	
asbestos with preliminary report of		
injection of two types of asbestos in rats with a	#Safety of food	
	lymph nodes of the rat following intraperitoneal	
#Pleural plaques and splenic capsular sclerosis in		
Director of the International	#Report of the	
considerations.*	#Asbestosis in South	
	in asbestosis in the Republic of South	
evidence of an association from studies in South		
	#Asbestos exposure in South	
#Diffuse pleural mesotheliomas in South		
#Asbestosis in non-experimental animals in South		
	#Industrial cancer in South	
biological importance of fibre diameters of South		
	#Asbestosis in South	
	#Dust in South	
Cancers to the Director of the International		
	#Pleural asbestosis in	
	#Asbestos as an urban	
	#Asbestos fibres in the	
	#List of hazardous	
instrumentation and techniques for measurement of		
	#Observations on atmospheric	
	#Status of	
particles.*	#Effect on public health of	
disease hazards associated with community asbestos		
	#Determination of asbestos in ambient	
	#Chrysotile asbestos in urban	
	#Asbestos in the	
	#Hygiene standards for	
techniques of identification and determination of		
	#The determination of amosite and chrysotile in	
risk associated with occupational exposure to		
disease.*	#Body plethysmographic measurements of	
	in evaluating asbestosis and chronic obstructive	
function in health, chronic obstructive		
effect of asbestos dust and CANDIDA		
	#New asbestos detection	
development of	#The effect of small amounts of	
	#Phagocytic activity of the	
	#The	
effects of increased particles on the number of		
	#Determination of asbestos in	
and dust standards in the United States of		
	#Serum proteins and	
banded ironstone.*	#Natural occurrence of	
ray diffraction method.*	#The determination of	
	#Hygiene standards for airborne	
#Pulmonary fibrogenic response of guinea pigs to		
importance of fibre diameters of South African		
intraperitoneal administration of various		
	#FDA's proposed method of	
carcinoma in a textile asbestos factory.*	#Electron microscope	
#Cohort		
particulates.*	#Instrumental	
exposure.*	#The pathology of mesothelioma and an	
	#Electron microscope	
and scandium in asbestos by neutron activation		
	#The risk of asbestosis from a pathological	
	#Pathological	
	#Fibroblast	
	#Fibrous silicates in	
	#Preparation of asbestos fibres for	
and isolation of (3H)benz(a)pyrene from the		
	#Asbestosis in non-experimental	
	abdominal cavity.*	
	#Cocarcinogenesis of $^{239}\text{Pu}$ 02	
	abdominal granulomas and lymph nodes of the rat	
	abdominal mesotheliomas in rats with $^{239}\text{Pu}$ and	
	abdominal neoplasms.*	
	absorption.*	
	# 000191	
	accident.*	
	#FDA detains	
	acetate membrane filters.*	
	of virus growth	
	acid-treated chrysotile on macrophage cultures.*	
	acids in asbestosis.*	
	acids in virgin crocidolite asbestos and banded	
	activation analysis.*	
	of iron, chromium, cobalt,	
	activation techniques in investigations of the	
	activity of asbestos and other mineral dusts.*	
	activity of asbestos dusts.*	
	activity of the alveolar epithelial cells in	
	acute toxicity of heat-treated asbestos in mice.*	
	acute and chronic effects of intraperitoneal	
	additives and solvents.*	
	administration of various amphiboles.*	
	adult male autopsies.*	
	Advisory Committee on Asbestos Cancers to the	
	#Aetiology of pleural plaques.*	
	Africa - certain geographical and environmental	
	Africa and the United Kingdom. I. A proposed	
	Africa and the United Kingdom.*mesothelial tumors:	
	Africa.*	
	African amphiboles.*	
	#Possible	
	African asbestos miners.*	
	African asbestos mines and fiberizing plants.*	
	Agency for Research on Cancer.* on Asbestos	
	agricultural workers.*	
	air contaminant.*	
	air of towns.*	
	air pollutants.*	
	air pollutants.*	
	#Progress in	
	air pollution caused by asbestos.*	
	air pollution health research, 1966.*	
	air pollution with asbestos and other fibrous dust	
	air pollution.*	
	#Critical evaluation of	
	air.*	
	air.*	
	air.*	
	airborne amosite asbestos dust.*	
	#Improved	
	airborne dusts by an X-ray diffraction method.*	
	airborne inorganic fibers.*	
	#Neoplasia	
	airway conductance in obstructive pulmonary	
	airway disease in asbestos workers.*	
	variables	
	airway disease, and asbestosis.*	
	#Mucociliary	
	ALBICANS infection on the lungs of Rhesus Monkeys.*	
	alternatives suggested to FDA.*	
	aluminus, carbon and carborundum on the	
	alveolar epithelial cells in pulmonary asbestosis.*	
	alveolar macrophage.*	
	#The	
	alveolar macrophages.*	
	ambient air.*	
	America for asbestos.*	
	#Dust sampling instruments	
	amino acids in asbestos.*	
	amino acids in virgin crocidolite asbestos and	
	amosite and chrysotile in airborne dusts by an X-	
	amosite asbestos dust.*	
	amosite dust.*	
	amphiboles.*	
	#Possible biological	
	amphiboles.*	
	and lymph nodes of the rat following	
	analysis for asbestos questioned.*	
	analysis of asbestos bodies.*	
	analysis of changes in incidence of bronchial	
	analysis of inspired fibrous pulmonary	
	analysis of their association with asbestos	
	analysis.*	
	of iron, chromium, cobalt, nickel,	
	anatomical viewpoint.*	
	anatomy of hyaline pleural plaques.*	
	anchorage in carcinogenesis by fibres.*	
	animal experiments and cell-culture.*	
	animal experiments.*	
	animal organism after its intratracheal injection	
	animals in South Africa.*	

## PERMUTED TITLE INDEX

#Asbestosis in experimental microscope studies of asbestosis in man and injected into the pleural cavity of experimental diffusion in asbestosis and chronic	000521
#Some polymers as selective	000446
#A study of the mortality of workers in an lungs of rats and guinea-pigs after inhalation of	000251
*	000543
#Circulating rheumatoid and	000293
UICC/Cincinnati Classification of the radiographic	000123
the UICC/Cincinnati Classification of radiographic	000148
lung asbestos count at necropsy and radiological	000231
workers and the relation of pathology and x-ray	000315
at Pneumoconiosis Research Unit, Cardiff, Wales,	000242
#Epidemiology of mesothelial tumors in the London	000114
and exposure to asbestos dust in the Merseyside	000331
an epidemiological study from the Hamburg	000443
following exposure to asbestos in the London	000114
asbestos on trace metals, hydroxyproline, and	000472
*	000512
#Talc (non-	000249
manufacture.*	000471
#A study of workers exposed to	000203
#FDA retains lima beans contaminated with	000141
of disease hazards associated with community	000053
occurrence of amino acids in virgin crocidolite	00019
organism after its intratracheal injection with	000217
dusts. The elution of 3,4-benzo[ <i>a</i> ]pyrene and oils from	000528
function studies in workers dealing with	000289
#Relation between exposure to	000504
particulate exposures: relevance to exposure to	000496
#Effect on public health of air pollution with	000477
#Mesotheliomata in rats after inoculation with	000477
#Haemolytic activity of	000157
#Relationship between exposure to	000151
industry.*	000082
culture.*	000414
#Effect of	000450
of tumors following the intrapleural injection of	00039
lungs of a mesothelioma patient	000428
#Investigation of	000312
#Developmental changes in	000088
#The ultrastructure of	000201
#The ultrastructure of	000500
#Prevalence of	000499
#Study of the secular trend in	000377
cases of primary	000228
Perugia.*	000335
#Retrospective search for	000336
#Examination of lung smears for	000360
#The mechanism of formation of	000276
#Electron microprobe analysis of	000424
#The protein coating of	000250
ultrastructure and chemistry of the formation of	000109
#A histochemical study of the	000347
of hematoxin in the innermost layers of human	000346
#Structure and development of the	000180
#Formation of the	000207
of iron, chromium, cobalt, nickel, and scandium in	000380
#Experimental	000068
#Experimental	000085
#Trace metals in	000017
patterns among workers engaged in manufacture of	000394
#Rain gets request to ban	000273
#Pleural calcifications associated with an	000199
dusts.*	000026
#Data for hygienic evaluation of	000331
#Talc and	000193
#FDA seeks to define issues regarding	000009
appearances.*	000278
#Correlation between lung	000278
levels inside firefighting helmets with chrysotile	000330
#New	000437
#Proposed methodology for	000087
#Changing attitudes to the diagnosis of	000195
#The many faces of	000179
group of the	000512
#The association of exposure to	000251
#Experimental infective pneumoconiosis: effect of	000398
#The use of dust respirators against	000498
#A comparison of mass and fibre concentrations of	000506
#Diffuse mesothelioma and exposure to	000059
fibrogenic effects of chrysotile and crocidolite	000219
organ culture.*	000045
#The effects of chrysotile	000058
#An electron microscopy study of the effect of	000058
#The early effects of chrysotile	000058
reaction in the human lung caused by inhalation of	000058
#The association of phagocytosed	000058
#The locus of pathogenicity of	000058
#Chemical aspects of Indian varieties of	000058
asbestos.*	000058
asbestos.*	000058
#Electron-	000058
animals.*	000058
asbestos.* chrysotile and crocidolite asbestos dust	000058
anomalies in the measurement of pulmonary	000058
antagonists of hemolytic asbestos fibers.*	000058
anthophyllite asbestos factory in Finland.*	000058
anthophyllite.* #Asbestos-body formation in the	000058
Antibodies in some chronic fibrosing lung diseases.	000058
antiinuclear factors in asbestos workers.*	000058
appearances of pneumoconioses.* #Special Report -	000058
appearances of the pneumoconioses: Report of	000058
appearances.* #Correlation between	000058
appearances.* of radiographs of asbestos-exposed	000058
April 13-15, 1971.* Report of meeting held	000058
area.*	000058
area.* #Diffuse mesothelioma	000058
area.* asbestos and exposure to asbestos:	000058
area.* #Mesothelioma of pleura and peritoneum	000058
aryl hydrocarbon hydroxylase in the hamster lung.*	000058
asbestiform and fibrous).*	000058
asbestiform minerals in commercial talc	000058
asbestos after accident.*	000058
asbestos air pollution.* #Critical evaluation	000058
asbestos and banded ironstone.* #Natural	000058
asbestos and carbon black.* pyrene from the animal	000058
asbestos and coals dusts by serum.* on mineral	000058
asbestos and glasswool.* #Cardiopulmonary	000058
asbestos and mesothelioma.*	000058
asbestos and occurrence of cancer.* and mineral	000058
asbestos and other fibrous dust particles.*	000058
asbestos and other materials.*	000058
asbestos and other mineral dusts.*	000058
asbestos and pleural malignancy in Belfast.*	000058
asbestos and respiratory cancer in the asbestos	000058
asbestos and serpentine dusts on pulmonary tissue	000058
asbestos and silica.* #The pathogenesis	000058
asbestos bodies and asbestos fibers found in the	000058
asbestos bodies and their significance.*	000058
asbestos bodies from guinea-pig lungs.*	000058
asbestos bodies from human lung.*	000058
asbestos bodies in basal lung smears.*	000058
asbestos bodies in lungs in London 1936-66.*	000058
asbestos bodies in necropsies and biopsies on	000058
asbestos bodies in 109 consecutive necropsies in	000058
asbestos bodies.*	000058
asbestos bodies.*	000058
asbestos bodies.*	000058
asbestos bodies.* #Further observations on the	000058
asbestos body coating.*	000058
asbestos body coating.* Histochemical demonstration	000058
asbestos body.*	000058
asbestos body.*	000058
asbestos by neutron activation analysis.*	000058
asbestos carcinogenesis.*	000058
asbestos carcinogenesis.*	000058
asbestos carcinogenesis.*	000058
asbestos cement products: a preliminary report.*	000058
asbestos cement water pipes.*	000058
asbestos coniosis detected by examination of	000058
asbestos containing "asbozurite" and "sovelite"	000058
asbestos contamination of rice.*	000058
asbestos contamination*	000058
asbestos count at necropsy and radiological	000058
asbestos covers.* #Asbestos dust	000058
asbestos detection alternatives suggested to FDA.*	000058
asbestos determination is limited, firm says.*	000058
asbestos disease.*	000058
asbestos disease.*	000058
asbestos dust and cancer. A report from a working	000058
asbestos dust and CANDIDA ALBICANS infection on	000058
asbestos dust hazards in the United Kingdom.*	000058
asbestos dust in shipyard processes.*	000058
asbestos dust in the Merseyside area.*	000058
asbestos dust injected into the pleural cavity of	000058
asbestos dust on lung macrophages maintained in	000058
asbestos dust on the lung.*	000058
asbestos dust on the rat lung.*	000058
asbestos dust over long periods.* #Cellular	000058
asbestos dust with lysosome enzymes.*	000058
asbestos dust.*	000058
asbestos dust.*	000058

## PERMUTED TITLE INDEX

#The sequelae of exposure to	asbestos dust.*	000491
#studies on the carcinogenic effects of	asbestos dust.*	000263
#Hygiene standards for airborne asbestos	asbestos dust.*	000031
in rats with pulmonary deposits of chrysotile	asbestos dust.* the development of lung cancer	000408
of the early manifestations of exposure to	asbestos dust.* #The radiological investigation	000196
in long term studies of persons exposed to	asbestos dust.* #Development of pleural hyalinosis	000062
in guinea-pigs by the injection of chrysotile	asbestos dust.* of fibrous pleural lesions produced	000162
of pleural calcification in persons exposed to	asbestos dust, and in the general population in	000120
#Present threshold limit value in the U.S.A. for	asbestos dust: A critique.*	000474
#Effect of quartz, coal, titanium oxide, and	asbestos dusts on experimental CHLAMYDIA PSITTACI	000124
length and #Biological action of different	asbestos dusts with special respect to fibre	000213
#Studies on IN VITRO cytotoxicity of	asbestos dusts.*	000376
#Hemolytic activity of	asbestos dusts.*	000383
of tumors induced in rats by i.p. injection of	asbestos dusts.* concerning morphology	000070
#A survey of pleural thickening: its relation to	asbestos exposure and previous pleural disease.*	000100
lung cancer in factory workers.#Combined effect of	asbestos exposure and smoking on mortality from	000096
in the non-exposed #Pleural calcifications due to	asbestos exposure compared with relevant findings	000205
Province.* #Diffuse pleural mesothelioma and	asbestos exposure in the North Western Cape	000549
#Results of	asbestos exposure in Finland.*	000271
#Results of	asbestos exposure in France.*	000237
#Early effects of	asbestos exposure on lung function.*	000184
#Diffuse malignant pleural mesothelioma and	asbestos exposure.*	000233
#Mesothelioma and	asbestos exposure.*	000413
#Pleural fibrocalcific plaques and	asbestos exposure.*	000371
Pathology of carcinoma of the lung associated with	asbestos exposure.*	000115
due to peritoneal mesothelioma in chronic	asbestos exposure.*#Partial intestinal obstruction	000090
and an analysis of their association with	asbestos exposure.*The pathology of mesothelioma	000507
Recommendation of Sub-Committee on #Evaluation of	asbestos exposures in the working environment.	000159
#Identification and control of	asbestos exposures.*	000158
of the mortality of workers in an anthophyllite	asbestos factory in Finland.* #A study	000123
#The mortality of	asbestos factory workers.*	000285
#A study of the mortality of workers in an	asbestos factory.*	000333
#Secular changes in asbestososis in an	asbestos factory.*	000484
#A follow-up study of workers from an	asbestos factory.*	000502
in incidence of bronchial carcinoma in a textile	asbestos factory.* #Cohort analysis of changes	000644
commercial sources.*	asbestos fiber emissions from industrial and	000209
#Studies of carcinogenesis of	asbestos fibers and their natural oils.*	000456
#Phagocytosis of	asbestos fibers by epithelial cells.*	000388
study of hazards.*	asbestos fibers for clothing proposed after FDA	000093
#Ban of	asbestos fibers found in the lungs of a	000088
mesothelioma #Investigation of asbestos bodies and	asbestos fibers responsible for the biologic	000034
effects #Are trace metals associated with	asbestos fibers.*	000293
#Polymers as selective antagonists of hemolytic	asbestos fibers.*	000309
#Characteristics of respirable	asbestos fibres for animal experiments.*	000171
#Preparation of	asbestos fibres from subcutaneous injection sites	000268
in mice.*	asbestos fibres in mice: migration of fibres to	000419
pathological effects of subcutaneous injections of	asbestos filler.* characteristics of working	000310
conditions in the manufacture of phenoplasts with	asbestos filters criticized; firms warn of	000008
substitute.*	asbestos filters.* #Toxicity	000277
#FDA treatment of	asbestos for use in biological research.*	000226
of HeLa cell growth medium after passage through	asbestos hazard.*	000412
#The synthesis of tritium-labeled	asbestos in ambient air.*	000224
#Investigation of a minor	asbestos in dockyard workers.*	000385
#Determination of	asbestos in human tissues.*	000055
#Effects of	asbestos in lungs of residents of New York City.*	00186
#Identification of	asbestos in mice.* asbestos with preliminary	000411
#Chrysotile	asbestos in naval dockyards.*	000112
report of acute toxicity of heat-treated	asbestos in pesticides is not a health hazard.*	000020
#Radiological survey of men exposed to	asbestos in polyethylene bags.*	000323
#EPA's Korp says	asbestos in rats with a study of the	000073
#Some problems associated with the storage of	asbestos in relation to malignant change.*	000382
of intraperitoneal injection of two types of	asbestos in the lungs of persons in New York City.*	000187
pleural manifestations following the inhalation of	asbestos in the London area.* #Mesothelioma	000471
#Chrysotile	asbestos in tissues.*	000288
of pleura and peritoneum following exposure to	asbestos in urban air.*	000210
#The detection of	asbestos in vivo using radioactive tracer	000202
#Chrysotile	asbestos in vivo.*	000410
of the solubility of constituents of chrysotile	asbestos in Dunedin, New Zealand, assessed by two	000287
#Leaching of constituents of chrysotile	asbestos in Victoria.* of pleural mesothelioma	000332
methods.*	asbestos industry workers in the Urals.*	000116
associated with occupational exposure to	asbestos industry.*	000039
#The cancer mortality rate among	asbestos insulation workers.* #Developments	000459
#Type of asbestos and respiratory cancer in the	asbestos insulation workers.*	000475
in dust sampling and counting techniques in the	asbestos insulation workers, 1943-1968.*	000295
#The occurrence of pleural calcification among	asbestos mine and mill workers of Quebec.*	000015
#Mortality experiences of	asbestos mine and mill workers of Quebec.*	000117
#The health of chrysotile	asbestos mine and mill workers of Quebec.*	000095
#Respiratory symptoms in chrysotile	asbestos miners.*	000297
#Lung function in chrysotile	asbestos mines and fiberizing plants.*	000255
#Asbestosis in South African	asbestos mines and mills of Quebec.*	000107
#Dust in South African	asbestos mines and mills of Quebec.*	000198
#Dust exposure in the chrysotile		
#Mortality in the chrysotile		

## PERMUTED TITLE INDEX

Qualitative aspects of dust exposure in the Quebec	asbestos mining and milling industry.*	* 000174
#Tumour initiation by natural and contaminating	asbestos oils.*	000432
respiratory tract.*	asbestos on benzo (a) pyrene carcinogenesis in the	000468
#Tests for effect of	asbestos on cells in culture.*	000138
#Effects of silica and	asbestos on macrophages.*	000118
#Some biochemical effects of	asbestos on trace metals, hydroxyproline, and aryl	000203
hydrocarbon hydroxylase in #Effects of chrysotile	asbestos on Tyneside - a pathological and social	000236
study.*	asbestos or benzpyrene in the rat abdominal cavity.	000069
* #Cocarcinogenesis of 239PuO2 with chrysotile	asbestos pad and cellulose acetate membrane	000441
#Inhibition of virus growth by a toxic factor from	asbestos pads.*	*Toxicity 000508
of cell culture medium due to filtration through	asbestos particles in pleural mesotheliomas.*	000329
#Research and characterization of	asbestos pipe factory.*	000320
#Radiological findings in a cement-	asbestos pipe factory.*	000256
#Chest symptomatology in an Egyptian cement-	asbestos plants.*	000021
#Wastewater limits sought by EPA could close some	asbestos plastics.*	000113
#Safe use of	asbestos pleurisy.*	000448
#Benign	asbestos processing factory.*	*Routine 000462
lung function studies on 830 employees in an	asbestos products workers in the United States.*	000451
#Mortality among	asbestos questioned.*	000018
#FDA's proposed method of analysis for	asbestos samples on the lungs of rats.* biological	000244
effects of the international standard reference	asbestos samples.*	000218
#Electron diffraction patterns of U.I.C.C.	asbestos spray in building construction.*	000043
#The prohibition of the use of	asbestos standard.*	*Excerpts from 000024
the criteria document: I. Recommendations for an	asbestos still necessary.*	000235
#Keen surveillance of	asbestos textile factory.*	*Mortality from 000369
lung cancer and other causes among workers in an	asbestos textile industry.*	000429
#Measurement of dust exposures in the	asbestos textile products.*	000397
#Exposure to metals in the manufacture of	asbestos textile works.*	000539
#Health progress in an	asbestos through the digestive tract of rats.*	000065
#Penetration of	asbestos usage.*	000381
#The health of the public and	asbestos with corticotrophin on the mucosal mast	000532
cells and tissue	asbestos with preliminary report of acute toxicity	000811
of heat-	asbestos worker.*	000531
#Tissue response to intraperitoneal	asbestos worker.*	000542
#Malignant pleural mesothelioma in an	asbestos worker.*	000680
#Rheumatoid pneumoconiosis in an	asbestos workers in British Columbia.*	000182
#Trends in the health of the	asbestos workers in Northern Italy.*	000392
#Study of	asbestos workers.*	000863
#Epidemiological study of	asbestos workers.*	000121
#Pulmonary neoplasia among Dresden	asbestos workers.*	000315
#A study of the mortality of female	asbestos workers.*	000334
#Circulating rheumatoid and antinuclear factors in	asbestos workers.*	*Lung function 000239
#Validation of death certificates in	asbestos workers.*	*Respiratory cancer in 000038
in relation to radiographic changes in Quebec	asbestos workers.*	000208
relation to occupational exposures among retired	asbestos workers: A three-year follow-up-study.*	000403
and chronic obstructive airway disease in	#	000140
#Pulmonary function in	# Asbestos (all forms).*	000022
	# Asbestos - lung cancer - mesothelioma.*	000190
	# Asbestos and cancer growth.*	000076
	# Asbestos and cancer of head and neck.*	000436
	# Asbestos and cancer.*	000186
	# Asbestos and ferruginous bodies.*	000351
	# Asbestos and health in 1969.*	000220
	# Asbestos and health.*	000075
	# Asbestos and laryngeal carcinoma.*	000083
	# Asbestos and malignancy.*	000495
	# Asbestos and malignancy.*	000177
	# Asbestos and mesothelioma in man.*	000365
	# Asbestos and mesothelioma.*	000261
	# Asbestos and mesotheliomas.*	000378
	# Asbestos and neoplasia.*	000486
	# Asbestos and the urban dweller.*	000396
	# Asbestos as a hazard to health.*	000520
	# Asbestos as a modern urban hazard.*	000448
	# Asbestos as a potential carcinogen for fowls.*	000519
	# Asbestos as an industrial hazard.*	000025
	# Asbestos as an urban air contaminant.*	000434
	# Asbestos bodies and mesothelioma.*	000387
	# Asbestos bodies and pleural plaques in human lungs	000047
	# Asbestos bodies and their bioeffects.*	000362
	# Asbestos bodies in human lungs at autopsy.*	000444
	# Asbestos bodies in lungs at necropsy.*	000418
	# Asbestos bodies in lungs: an Australian report.*	000352
	# Asbestos bodies in the lungs and mesothelioma. A	000366
	# Asbestos bodies in the lungs of a series of	000292
	# Asbestos bodies in the lungs of inhabitants of	000048
	# Asbestos bodies, their formation, composition and	000126
	# Asbestos cancer: past and future hazards.*	000042
	# Asbestos contamination of parenteral drugs.*	000122
	# Asbestos content of the soil and endemic pleural	000285
	# Asbestos dust and its measurements.*	000423
	# Asbestos dust deposition and retention in rats.*	000493

## PERMUTED TITLE INDEX

mesotheliomas of the pleura).\*  
from liquid dispersed chrysotile.\*  
with chrysotile asbestos covers.\*

examination of the malmo material.\*  
tissues: their passage through the intestinal  
significance in environmental disease.\*

the United Kingdom).\*

their pathological action.\*  
functional, and radiological survey.\*  
International Report of the Advisory Committee on

\*Inhalation and Biological Effects of  
#Biologic response to kind and amount of  
#Osha standards and the safe use of  
#Mainly good news about  
#Chemical studies of  
#A transplantable mesothelioma induced by  
#Diffuse mesothelioma of the pleura and  
#The geology, occurrences, and major uses of  
#Tests for carcinogenicity of  
#Occupational and non-occupational exposures to  
#The medical risks of exposure to  
#Cancer and  
#Getting to grips with  
#Ovarian cancer and  
#Mesotheliomas in rats following inoculation with  
#The fibrogenic response to  
#IARC standard reference samples of  
#Experimental pulmonary carcinogenesis with  
#Safety -  
#Action on  
#Hemolysis by  
#The response of human pleura in organ culture to  
#Low exposure to  
problems in the mining, milling and packaging of  
biosynthesis in rat lungs during exposure to  
of carcinomas from mouse lung transplanted with  
hydrocarbons in various materials containing  
factor in serum of individuals exposed to  
characteristics of mesothelioma associated with  
on atmospheric air pollution caused by  
perspectives: the changing hazards of exposure to  
in hamsters following intrapleural injection of  
in rats following the intra-pleural inoculation of  
and mesothelioma in hamsters injected with  
of identification and determination of airborne  
and mesothelioma following exposure to  
mesotheliomas in rats with Pu 239 and chrysotile  
dust standards in the United States of America for  
desquamative interstitial pneumonia associated with  
in elementary schools contain large proportions of  
in growing lung fibroblasts exposed to chrysotile  
of glass fibre, glass powder, and chrysotile  
598 workers with varying duration of exposure to  
Union Against Cancer standard reference samples of  
of the composition and biological effects of  
of dust clouds from milligram quantities of  
Conference on the Biological Effects of

# Asbestos dust exposure and malignancy (diffuse 000516  
# Asbestos dust levels during work with cloths made 000134  
# Asbestos dust levels inside firefighting helmets 000193  
# Asbestos exposure and its results in Italy.\* 000349  
# Asbestos exposure and its results in Italy.\* 000311  
# Asbestos exposure and neoplasia.\* 000513  
# Asbestos exposure and pleural mesotheliomas.\* 000372  
# Asbestos exposure in Australia.\* 000281  
# Asbestos exposure in South Africa.\* 000316  
# Asbestos exposure, smoking, and neoplasia.\* 000384  
# Asbestos fiber in the lung and mesothelioma: A re- 000066  
# Asbestos fibers in beverages, drinking water, and 000035  
# Asbestos fibres in beverages and drinking water.\* 000160  
# Asbestos fibres in the air of towns.\* 000049  
# Asbestos hazards in naval dockyards.\* 000367  
# Asbestos health hazards (recent observations in 000260  
# Asbestos hemolysis.\* 000294  
# Asbestos in the air.\* 000001  
# Asbestos in the water: Temporizing with cancer.\* 000002  
# Asbestos in the work place and the community.\* 000063  
# Asbestos in tumors.\* 000175  
# Asbestos levels in human lungs.\* 000324  
# Asbestos minerals in modern technology.\* 000343  
# Asbestos particles in food and drugs.\* 000071  
# Asbestos related disease.\* 000454  
# Asbestos toxicity\* 000051  
# Asbestos types, their optical investigations and 000548  
# Asbestos workers in Singapore. A clinical, 000032  
Asbestos Cancers to the Director of the 000041  
# Asbestos\* 000007  
# Asbestos\* 000005  
# Asbestos\* 000004  
# Asbestos\* 000003  
Asbestos\* 000308  
asbestos.\* 000052  
asbestos.\* 000061  
asbestos.\* 000455  
asbestos.\* 000481  
asbestos.\* 000449  
asbestos.\* 000457  
asbestos.\* 000483  
asbestos.\* 000461  
asbestos.\* 000415  
asbestos.\* 000354  
asbestos.\* 000353  
asbestos.\* 000350  
asbestos.\* 000391  
asbestos.\* 000389  
asbestos.\* 000344  
asbestos.\* 000163  
asbestos.\* 000173  
asbestos.\* 000178  
asbestos.\* 000128  
asbestos.\* 000119  
asbestos.\* #Dust 000274  
asbestos.\* #Collagen 000161  
asbestos.\* #Induction 000341  
asbestos.\* #Polycyclic 000097  
asbestos.\* #Rheumatoid 000473  
asbestos.\* #Histological 000445  
asbestos.\* #Observations 000465  
asbestos.\* #Problems and 000452  
asbestos.\* #Mesotheliomas 000482  
asbestos.\* #Mesotheliomas 000313  
asbestos.\* #Pleural reaction 000515  
asbestos.\* #Improved techniques 000029  
asbestos.\* #Pleural calcification 000485  
asbestos.\* #Production of abdominal 000133  
asbestos.\* #Dust sampling instruments and 000247  
asbestos.\* #Electron microscopic studies in 000102  
asbestos.\* #Paper mache products widely used 000089  
asbestos.\* and mucopolysaccharide production 000067  
asbestos.\* of effects on macrophage cultures 000094  
asbestos.\* function and radiographic changes in 000238  
asbestos.\* #Characteristics of the International 000306  
asbestos.\* activation techniques in investigations 000284  
asbestos.\* dispenser for the continuous generation 000181  
asbestos. Report on a visit to East Germany and 000327

## PERMUTED TITLE INDEX

# Asbestos.*	000074	
# Asbestos.*	000509	
# Asbestos.*	000466	
# Asbestos.*	000016	
of experimental tumors of the pleura by fibers (dust survey carried out in buildings incorporating after experimental intraperitoneal injection of variation in the classification of radiographs of	#Induction asbestos-based materials in their construction.*#A asbestos-containing dust.* in certain organs asbestos-exposed workers and the relation of	000229 000318 000328 000443
guinea-pigs after inhalation of anthophyllite.*	#Asbestos-- an environmental health hazard.*	000416
experimental study.*	#Asbestos-body formation in the lungs of rats and	000148
	#Asbestos-induced intrathoracic tissue reactions.*	000046
	#Asbestos-like fibers in Duluth water supply.*	000014
	#Asbestos-penicillin induced pleurodesis: an	000373
	#Asbestos-related chest disease in joiners.*	000170
	#Asbestos-the lethal dust.*	000395
	asbestos, and pulmonary fibrosis.*	000232
	#Asbestos, an extrinsic factor in the pathogenesis	000431
	#Asbestos, asbestosis and mesothelioma of the	000433
responsible for the biologic effects attributed to	asbestos?* metals associated with asbestos fibers	000034
	asbestos: a potential hazard.*	000194
#Buildings insulated with sprayed	asbestos: an epidemiological study from the	000249
#Pleural plaques, asbestosis and exposure to	asbestos: occupational health hazards.*	000129
#Application of sprayed inorganic fiber containing	#Asbestos: health hazards, limiting values,	000048
prevention.*	#Asbestos: questions still unanswered*	000142
	#Asbestos: some nonradiological aspects.*	000189
	#Asbestos" bodies in basal lung smear.*	000206
	#Asbestos" bodies in human lungs at necropsy.*	000319
	#Asbestos" bodies: their nonspecificity.*	000406
	asbestosis (three new cases).* characteristics	000363
	asbestosis (two new observations).* #Bronchial	000489
	asbestosis among insulation workers in the United	000476
	asbestosis and chronic bronchitis with emphysema.*	000543
	asbestosis and chronic obstructive airway disease	000208
	asbestosis and exposure to asbestos: an	000249
	asbestosis and in tuberculosis: elements of	000283
	asbestosis and malignant pleuro-peritoneal	000317
	asbestosis and mesothelioma of the pleura.*	000433
	asbestosis and peritoneal mesothelioma.*	000399
	asbestosis and A B O blood groups.*	000143
	asbestosis associated with bronchogenic carcinoma.*	000533
	asbestosis by needle lung biopsy.*	000393
	asbestosis from a pathological-anatomical	000064
	asbestosis in a factory population.*	000298
	asbestosis in agricultural workers.*	000422
	asbestosis in an asbestos factory.*	000484
	asbestosis in guinea pigs.*	000505
	asbestosis in guinea pigs.*	000081
	asbestosis in man and animals.*	000446
	asbestosis in relation to the international	000241
	asbestosis in ship repair workers.*	000168
	asbestosis in the guinea-pig.*	000425
	asbestosis in the Republic of South Africa and the	000479
	asbestosis in Finland.*	000375
	asbestosis in Piedmont and Lombardy.*	000490
	asbestosis of the lung.*	000417
	asbestosis of the lung.*	000535
	asbestosis of the pleura.*	000125
	asbestosis patients.*	000529
	asbestosis proved at post-mortem.* #A pathological-	000514
	asbestosis with four types of fibers: Importance	000460
	asbestosis with metastatic mesothelioma: case	000435
	asbestosis with reference to lung function.*	000537
	asbestosis.*	000530
	asbestosis.*	000541
	asbestosis.*	000545
	asbestosis.*	000527
	asbestosis.*	000538
	asbestosis.*	000357
	asbestosis.*	000361
	asbestosis.*	000430
	asbestosis.*	000503
	asbestosis.*	000510
	asbestosis.*	000440
	asbestosis.*	000518
	asbestosis.*	000453
	asbestosis.*	000497
	asbestosis.*	000164
	asbestosis.*	000158
	asbestosis.*	000165
	asbestosis.*	000245
#Asbestos content of the soil and endemic pleural	asbestosis.*	000221
	massive fibrosis in	

PERMUTED TITLE INDEX

#Chest auscultation in the diagnosis of pulmonary	asbestosis.*	000060
#Pleural manifestations of	asbestosis.*	000056
#Worker-sponsored survey for	asbestosis.*	000084
#Radiology of	asbestosis.*	000301
#The radiology of	asbestosis.*	000342
#Problems in the pathology of	asbestosis.*	000262
#Some aspects of pathogenesis of	asbestosis.*	000302
discriminant value of pulmonary function tests in	asbestosis.*	000487
radiological, and physiological findings in	asbestosis.*	000427
radiological changes in pulmonary and pleural	asbestosis.*	000257
of pulmonary macrophage suppression in developing	asbestosis.*	000106
changes in serum of guinea pigs in experimental	asbestosis.*	000079
of pleura or peritoneum and limited basal	asbestosis.*	000534
of the alveolar epithelial cells in pulmonary	asbestosis.*	#The
in health, chronic obstructive airway disease, and	asbestosis.*	Clinical,
and report of a case associated with pulmonary	asbestosis.*	#The early
with hypertrophic pulmonary osteoarthropathy and	asbestosis.*	#The effect
I. A proposed radiological classification of	asbestosis.*	#Biochemical
carbon dust on the development of silicosis and	asbestosis.*	#Mesotheiloma
and physiological observations in ten cases of	asbestosis.*	#Phagocytic activity
*	asbestosis.*	#Mucociliary function
#Diffuse	asbestosis.*	sarcoma. Review of literature
of the dust content and composition in lungs with	asbestosis.*	intrapulmonary neurogenic sarcoma
prospective study.*	asbestosis.*	South Africa and the United Kingdom.
#Pulmonary function in	asbestosis.*	000155
pulmonary fibrosis caused by	asbestosis.*	000079
with pulmonary deposits of	asbestosis.*	000104
#Experimental	asbestosis.*	000547
significance.*	asbestosis.*	#Clinical, bronchographic, radiological
#Calcified pleural plaques in	asbestosis.*	#Interstitial fibrosis of the lung.
hematopoietic system.*	asbestosis,*	000132
radiologic study.*	asbestosis,*	asbestos, made during work on coal miners
filter manufacture.*	asbestosis,*	#serial tests in a long-term
undercoating.*	asbestosis,*	studies on the progressiveness of the
Africa.*	asbestosis,*	asbestos: the development of lung cancer in rats
and environmental considerations.*	asbestosis,*	asbestos: An investigation into their
environment. Recommendation of Sub-Committee on	asbestosis and abdominal neoplasms.*	000511
in the experimental silicopneumoconiosis and	asbestosis and associated medical problems.*	000546
for hygienic evaluation of asbestos containing "	asbestosis and carcinoma of the larynx*	000402
#Pulmonary asbestos in Dunedin, New Zealand,	asbestosis and carcinoma of the lung.*	000013
#Asbestos and	asbestosis and carcinoma of the lung.*	000544
examination of	asbestosis and lung cancer.*	000526
#Pleural calcifications	asbestosis and malignancy.*	000494
#Pathology of carcinoma of the lung	asbestosis and malignant disease.*	000400
the biologic effects attributed	asbestosis and neoplasia.*	000438
#Are trace metals	asbestosis and neoplasia.*	000420
#Histological characteristics of mesothelioma	asbestosis and neoplasia.*	000368
studies in desquamative interstitial pneumonia	asbestosis and neoplastic disorders of the	000259
#Mesothelioma	asbestosis and nodular lesions of the lung: a	000374
#Primary cytologic diagnosis of asbestososis	asbestosis and primary intrathoracic neoplasms.*	000442
inorganic fibers.*	asbestosis and pulmonary carcinoma.*	000447
#Neoplasia risk	asbestosis following brief exposure in cigarette	000108
in Victoria.*	asbestosis in a worker engaged in automobile	000536
Fifteen cases of pleural mesothelioma	asbestosis in experimental animals.*	000521
sarcoma. Review of literature and report of a case	asbestosis in non-experimental animals in South	000523
polyethylene bags.*	asbestosis in Great Britain.*	000467
groups.*	asbestosis in Rhodesia.*	000258
of diffuse mesothelial tumors: evidence of an	asbestosis in South Africa - certain geographical	000478
cancer. A report from a working group of the	asbestosis in South African asbestos miners.*	000297
lysosome enzymes.*	asbestosis in Western Australia.*	000401
of mesothelioma and an analysis of their	asbestosis of the Permanent Commission and	000159
#Rheumatoid pneumoconiosis in	asbestosis.*	000517
Piedmont and Lombardy.*	#Asbestosis: aspects of its radiological features.*	000270
of the Permanent Commission and International	asbestospumoconiosis.* methionine and H3-glycine	000267
fibers responsible for the biologic effects	asbozurite* and "sovellite" dusts.*	000273
asbestosis.*	assessed by two methods.*	000287
#Observations on	associated medical problems.*	000402
#Changing	associated with asbestos coniosis detected by	000394
asbestosis.*	associated with asbestos exposure.*	000115
#Some problems	associated with asbestos fibers responsible for	000034
of the Permanent Commission and International	associated with asbestos.*	000445
asbestosis.*	associated with asbestos.* #Electron microscopic	000102
#The pathology	associated with asbestos.*	000430
association between asbestososis and A B O blood	associated with bronchogenic carcinoma.*	000533
association from studies in South Africa and the	associated with community asbestos air pollution.*	000217
association of certain cancers with asbestososis.*	associated with occupational exposure to airborne	000216
association of exposure to asbestos dust and	associated with occupational exposure to asbestos	000332
association of phagocytosed asbestos dust with	associated with pulmonary asbestos.* pulmonary	000501
association with asbestos exposure.*#The pathology	associated with the storage of asbestos in	000323
association with asbestososis.*	association between asbestososis and A B O blood	000143
association from studies in South Africa and the	association with community asbestos air pollution.*	000492
association of certain cancers with asbestososis.*	association with occupational exposure to airborne	000497
association of exposure to asbestos dust and	associated with occupational exposure to asbestos	000437
association of phagocytosed asbestos dust with	associated with pulmonary asbestos.* pulmonary	000219
association with asbestos exposure.*#The pathology	associated with the storage of asbestos in	000507
association with asbestososis.*	association between asbestososis and A B O blood	000510
Association of pulmonary tumors with asbestososis in	association with community asbestos air pollution.*	000490
Association on Occupational Health* on Asbestos	association with occupational exposure to airborne	000159
atmospheric air pollution caused by asbestos.*	associated with pulmonary asbestos.* pulmonary	000465
attitudes to the diagnosis of asbestos disease.*	associated with the storage of asbestos in	000278
attributed to asbestos?* associated with asbestos	association between asbestososis and A B O blood	000034
asbestosis.*	association with community asbestos air pollution.*	000060

## PERMUTED TITLE INDEX

#Asbestos exposure in	Australia.*	000281
#Asbestosis in Western	Australia.*	000401
#Asbestos bodies in lungs: an	Australian report.*	000352
#Asbestosis in a worker engaged in	automobile undercoating.*	000536
bodies in human lungs: prevalence at random	autopsies.*	*Ferruginous 000390
and splenic capsular sclerosis in adult male	autopsies.*	*Pleural plaques 000130
A retrospective examination of a ten-year-	autopsy material.* in the lungs and mesothelioma.	000366
#Asbestos bodies in human lungs at	autopsy.*	000444
fibers, including chrysotile, in lungs at	autopsy: preliminary report.*	*Inorganic 000185
with the storage of asbestos in polyethylene	bags.*	*Some problems associated 000323
#Rain gets request to	ban asbestos cement water pipes.*	000017
FDA study of hazards.*	Ban of asbestos fibers for clothing proposed after	000093
of amino acids in virgin crocidolite asbestos and	banded ironstone.*	*Natural occurrence 000528
#Mesothelioma of pleura or peritoneum and limited	basal asbestosis.*	000534
#Incidence of "asbestos" bodies in	basal lung smear.*	000206
#Prevalence of asbestos bodies in	basal lung smears.*	000377
Philadelphia Pulmonary Neoplasm Research Project:	Basic risk factors of lung cancer in older men.*	000099
#FDA detains lma	beans contaminated with asbestos after accident.*	000019
control population.*	beer.*	000359
#Insulation workers in	Belfast. 1. Comparison of a random sample with a	000230
#Insulation workers in	Belfast. 2. Morbidity in men still at work.*	000188
#Insulation workers in	Belfast. 3. Mortality 1940-66.*	000166
exposure to asbestos and pleural malignancy in	Belfast.*	*Relationship between
#Study of the distribution and isolation of (3H)	*Benign asbestos pleurisy.*	000448
tract.*	benz(a)pyrene from the animal organism after its	000289
#Tests for effect of asbestos on	benzo (a) pyrene carcinogenesis in the respiratory	000468
after i.p. injection of powdered chrysotile and	benzo(a)pyrene.*	*Tumors of rats 000127
after intratracheal instillation of tritiated 3,4-	benzopyrene in hamsters.*	of radioactivity 000338
hydrocarbons on mineral dusts. The elution of 3,4-	benzopyrene and oils from asbestos and coals dusts	000504
of 239Pu02 with chrysotile asbestos or	benzopyrene in the rat abdominal cavity.*	000069
#Asbestos fibres in	beverages and drinking water.*	000160
passage through the intestinal	beverages, drinking water, and tissues: their	000035
#Asbestos fibers in	biochemical effects of asbestos on macrophages.*	000118
#Some	#Biochemical changes in serum of guinea pigs in	000079
experimental asbestosis.*	bioeffects.*	000362
#Asbestos bodies and their	biologic effects attributed to asbestos?*	000034
with asbestos fibers responsible for the	#Biologic response to kind and amount of asbestos.*	000052
in investigations of the composition and	biological effects of asbestos.* techniques	000284
reference asbestos samples on the lungs of	biological effects of the international standard	000244
#The African asphiboles.*	biological importance of fibre diameters of South	000225
synthesis of tritium-labeled asbestos for use in	biological research.*	*The
special respect to fibre length and semiconductor	Biological action of different asbestos dusts with	000213
to	Biological Effects of Asbestos. Report on a visit	000327
#The Second International Conference on the	Biological Effects of Asbestos*	000308
#Inhalation and	biopsies on cases of primary malignant disease of	000335
search for asbestos bodies in necropsies and	biopsy in the diagnosis of pulmonary lesions.*	000364
#Bronchial brushing and transbronchial forceps	biopsy.*	000393
#Diagnosis of asbestosis by needle lung	biosynthesis in rat lungs during exposure to	000161
asbestos.*	black.*a)pyrene from the animal organism after its	000289
#Collagen	blood groups.*	000143
intratracheal injection with asbestos and carbon	bodies - their formation from nonfibrous	000176
#The association between asbestosis and A B O	bodies and asbestos fibers found in the lungs of a	000088
particulates and from	bodies and mesothelioma.*	000387
#Unusual ferruginous	bodies and pleural plaques in human lungs at	000047
mesothelioma patient by	bodies and their bioeffects.*	000362
#Investigation of asbestos	bodies and their significance.*	000201
necropsy.*	bodies from guinea-pig lungs.*	000500
#Asbestos	bodies from human lung.*	000499
#Asbestos	bodies in basal lung smear.*	000206
#Asbestos	bodies in basal lung smears.*	000377
#Developmental changes in asbestos	bodies in city dwellers: a study of their central	000326
#The ultrastructure of asbestos	bodies in guinea pigs.*	000252
#The ultrastructure of asbestos	bodies in human lungs at autopsy.*	000444
#Incidence of "asbestos"	bodies in human lungs at necropsy.*	000319
#Prevalence of "asbestos"	bodies in human lungs: prevalence at random	000390
autopsies.*	bodies in lungs at necropsy.*	000418
#Ferruginous	bodies in lungs in London 1936-66.*	000228
#Asbestos	bodies in lungs: an Australian report.*	000352
#Asbestos	bodies in necropsies and biopsies on cases of	000335
#Study of the secular trend in asbestos	bodies in the lungs and mesothelioma. *	000366
primary	bodies in the lungs of a series of Finnish lung	000282
#Retrospective search for asbestos	bodies in the lungs of inhabitants of Milan.*	000404
retrospective examination of a ten-year-	bodies in France.*	000240
cancer patients.*	bodies in 109 consecutive necropsies in Perugia.*	000336
#Asbestos	bodies.*	000276
#Asbestos	bodies.*	000360
#Asbestos and ferruginous	bodies.*	000824
and chemistry of the formation of asbestos	bodies.*	000146
#Asbestos	bodies.*Further observations on the ultrastructure	000250
* in the inflammatory response induced by foreign	bodies, their formation, composition and character.	000126
	bodies: comparison with the schistosome egg	000269

## PERMUTED TITLE INDEX

**Asbestos*	bodies: their nonspecificity.*	000406
*A histochemical study of the asbestos in the innermost layers of human asbestos pigs after inhalation of anthophyllite.* #Asbestos conductance in obstructive pulmonary disease.* #Structure and development of the asbestos	body coating.* demonstration of hematoidin	000109
#Formation of the asbestos in the lungs and other organs of the human the intestinal wall and movement through the	body formation in the lungs of rats and guinea-	000148
spectre of today's environmental pollution - USA #Asbestosis following	Body plethysmographic measurements of airway	000337
#Asbestosis in Great	body.*	000347
*Study of asbestos workers in three new cases).* #The special characteristics of #Cohort analysis of changes in incidence of	body.* #Perromagnetic contamination	000346
*Practical steps towards the prevention of biopsy in the diagnosis of pulmonary lesions.* #Asbestosis (two new observations).*	body.* water, and tissues: their passage through	000033
*of pulmonary diffusion in asbestosis and chronic an extrinsic factor in the pathogenesis of	#Brake lining decomposition products.*	000035
cytologic diagnosis of asbestosis associated with observations in ten cases of asbestosis.#Clinical,	brand: new perspectives from an old scout.* #The	000370
diagnosis of pulmonary lesions.* #Bronchial	brief exposure in cigarette filter manufacture.*	000108
*The prohibition of the use of asbestos spray in in their #A dust survey carried out in	Britain.*	000467
potential hazard.* #The occurrence of pleural	British Columbia.*	000182
to asbestos.* #Pleural	bronchial cancer in patients with asbestosis (	000363
and in the general #Prevalence of pleural	bronchial carcinoma in a textile asbestos factory.*	000464
in guinea-pigs by the injection of chrysotile #The	bronchial carcinoma.*	000254
coniosis detected by examination of #Pleural	Bronchial brushing and transbronchial forceps	000364
with relevant findings in the non-exposed #Pleural	Bronchial cancer and pleural mesothelioma in cases	000489
elements of differential diagnosis.* #Pleural	bronchitis with emphysema.* in the measurement	000543
of the soil in regions with endemic pleural	bronchogenic carcinoma and mesothelioma.*Asbestos,	000431
investigation into their significance.* #Primary	bronchogenic carcinoma.*	000533
#Primary malignant mesothelial tumors in	Bronchographic, radiological and physiological	000547
of primary malignant mesothelial tumors in	#Bronchopulmonary cancer after asbestosis.*	000361
#Asbestos - lung	brushing and transbronchial forceps biopsy in the	000364
#Ovarian	building construction.*	000043
asbestos textile factory.* #Mortality from lung	buildings incorporating asbestos-based materials	000318
asbestosis (two new observations).*	Buildings insulated with sprayed asbestos: a	000194
#Some recent developments in the field of	calcification among asbestos insulation workers.*	000475
#Asbestos and	calcification and mesothelioma following exposure	000485
exposure and smoking on mortality from lung	calcification in persons exposed to asbestos dust,	000120
Research Project: Basic risk factors of lung	calcification of fibrous pleural lesions produced	000162
cases).* #The special characteristics of bronchial	calcifications associated with an asbestos	000394
#Experimental asbestosis: the development of lung	calcifications due to asbestos exposure compared	000205
retired asbestos workers.* #Respiratory	calcifications in asbestosis and in tuberculosis:	000283
#Type of asbestos and respiratory	calcifications.* #Sepiolite content	000101
#Industrial	Calcified pleural plaques in asbestosis: An	000511
workers in the Urals.* #The	Canada.*	000058
#Asbestos and	Canada.* #Epidemiology	000279
bodies in the lungs of a series of Finnish lung	cancer - mesothelioma.*	000022
Characteristics of the International Union Against	cancer after asbestosis.*	000361
#The association of exposure to asbestos dust and	cancer and asbestos.*	000405
#Asbestos and	cancer and other causes among workers in an	000369
#Relationship between pneumoconiosis and lung	cancer and pleural mesothelioma in cases of	000489
#Asbestos and lung	cancer causation.*	000379
#Asbestos in the water: Temporizing with	cancer growth.*	000190
#Talc-treated rice and Japanese stomach	cancer in factory workers.* effect of asbestos	000096
The role of international research in occupational	cancer in older men.* Pulmonary Neoplasm	000099
exposure and its relation to type of lung	cancer in patients with asbestosis (three new	000363
to exposure to asbestos and occurrence of	cancer in rats with pulmonary deposits of	000408
of the International Agency for Research on	cancer in relation to occupational exposures among	000038
a working group of the International Union Against	cancer in the asbestos industry.*	000039
#Asbestos	cancer in South Africa.*	000522
#The association of certain	cancer mortality rate among asbestos industry	000116
pneumoconioses: effect of asbestos dust and	cancer of head and neck.*	000076
inhaled crocidolites from Transvaal and North-west	cancer patients.* #Asbestos	000282
and asbestos exposure in the North Western	Cancer and asbestos.*	000354
#Pleural plaques and splenic	Cancer standard reference samples of asbestos.* #	000306
#The effect of small amounts of aluminum,	Cancer. A report from a working group of the	000437
its intratracheal injection with asbestos and	cancer.*	000436
formation from nonfibrous particulates and from	cancer.*	000340
effect of small amounts of aluminum, carbon and	cancer.*	000494
	cancer.*	000002
	cancer.*	000200
	cancer.*	# 000137
	cancer.*	000246
	cancer.* mineral particulate exposures: relevance	000157
	Cancer.* on Asbestos Cancers to the Director	000041
	Cancer.* to asbestos dust and cancer. A report from	000437
	cancer: past and future hazards.*	000042
	cancers with asbestosis.*	000497
	Cancers to the Director of the International	000041
	CANDIDA ALBICANS infection on the lungs of Rhesus	000087
	Cape mines on the lungs of rats and guinea pigs.*	000098
	Cape Province.* #Diffuse pleural mesothelioma	000549
	Cape.* #Mesothelioma, including peripheral	000296
	capsular sclerosis in adult male autopsies.*	000130
	carbon and carbonundum on the development of	000104
	carbon black.* from the animal organism after	000289
	carbonaceous fibrous particles.* bodies - their	000176
	carbonundum on the development of silicosis and	000104

## PERMUTED TITLE INDEX

#Asbestos as a potential	carcinogen for fowls.*	000519
#Talc: A possible occupational and environmental	carcinogen.*	000030
#Tests for effect of asbestos on benzo (a) pyrene	carcinogenesis by fibres.*	000057
natural oils.*	carcinogenesis in the respiratory tract.*	000468
#Studies of	carcinogenesis of asbestos fibers and their	000456
#Experimental pulmonary	carcinogenesis with asbestos.*	000344
#A survey of metal	carcinogenesis.*	000322
#Cocarcinogenic studies in pulmonary	carcinogenesis.*	000286
#Trace metals in asbestos	carcinogenesis.*	000068
#Experimental asbestos	carcinogenesis.*	000380
#Experimental asbestos	carcinogenesis.*	000207
#The Role of trace metals in chemical	carcinogenesis.*	000253
#Studies on the	carcinogenic effects of asbestos dust.*	000263
#Tests for	carcinogenicity of asbestos.*	000483
factor in the pathogenesis of bronchogenic	carcinoma and mesothelioma.* Asbestos, an extrinsic	000431
analysis of changes in incidence of bronchial	carcinoma in a textile asbestos factory.* #Cohort	000464
exposure.*	carcinoma of the larynx*	000013
#Asbestosis and	carcinoma of the lung associated with asbestos	000115
#Pathology of	carcinoma of the lung.*	000526
#Asbestosis and	carcinoma of the lung.*	000544
#Asbestosis and	carcinoma.*	000447
#Asbestosis and pulmonary	carcinoma.*	000075
#Asbestos and laryngeal	carcinoma.*	000254
steps towards the prevention of bronchial	carcinomas from mouse lung transplanted with	000533
of asbestosis associated with bronchogenic	Cardiff, Wales, April 13-15, 1971.* Report	000381
asbestos.*	Cardiopulmonary function studies in workers	000496
#Induction of	carried out in buildings incorporating asbestos-	000318
of meeting held at Pneumoconiosis Research Unit,	cases of asbestosis (two new observations).*	000489
dealing with asbestos and glasswool.*	cases of asbestosis proved at post-mortem.*	000518
based materials in their	cases of asbestosis.* #Clinical, bronchographic,	000547
#Bronchial cancer and pleural mesothelioma in	cases of pleural mesothelioma associated with	000332
#A pathological-radiological correlation in 108	cases of pleurisy with effusions in ex-miners from	000103
radiological and physiological observations in ten	cases of primary malignant disease of the lung.*	000335
occupational exposure to asbestos in	cases.*	000291
Wittenoom Gorge.*	cases.*	000111
#A study of 16	cases.* #Correlation between the	000321
for asbestos bodies in necropsies and biopsies on	cases.* #The special characteristics of bronchial	000363
#Peritoneal mesothelioma. A report of 4	causation.*	000379
#Malignant mesothelioma in childhood: Report of 13	cavity of experimental animals.* and crocidolite	000251
electrocardiogram and radiological picture in 29	cavity.* of 239Pu02 with chrysotile	000069
cancer in patients with asbestosis (three new	cell culture medium due to filtration through	000508
#Some recent developments in the field of cancer	cell growth medium after passage through asbestos	000277
asbestos dust injected into the pleural	cell-culture.*	000184
asbestos or benzpyrene in the rat abdominal	cells and tissue eosinophils of rat stomach.* and	000532
asbestos pads.*	cells in culture.*	000138
#Toxicity of filters.*	cells in pulmonary asbestosis.*	000136
#Fibrous silicates in animal experiments and	cells in vitro.*	000135
asbestos with corticotrophin on the mucosal mast	cells.*	000388
#Effects of silica and asbestos on	Cellular reaction in the human lung caused by	000059
#Phagocytic activity of the alveolar epithelial	cellulose acetate membrane filters.* of virus	000041
#Interactions of mineral fiber surfaces with	cement products: a preliminary report.* patterns	000085
#Phagocytosis of asbestos filters by epithelial	cement water pipes.*	000017
inhalation of asbestos dust over long periods.*	cement-asbestos pipe factory.*	000320
#growth by a toxic factor from asbestos pad and	cement-asbestos pipe factory.*	000256
among workers engaged in manufacture of asbestos	central fiber.* #Pulmonary ferruginous	000326
#Rain gets request to ban asbestos	certificates in asbestos workers.*	000334
#Radiological findings in a	character.*	000126
#Chest symptomatology in an Egyptian	characterization of asbestos particles in pleural	000329
bodies in city dwellers: a study of their	chemical carcinogenesis.*	000253
#Validation of death	chemical mediators in the inflammatory response	000269
#Asbestos bodies, their formation, composition and	#Chemical aspects of Indian varieties of asbestos	000054
mesotheliomas.*	Chemical studies of asbestos.*	000855
#Research and	chemistry of the formation of asbestos bodies.*	000250
induced by foreign bodies: comparison	chest disease in joiners.*	000170
#The role of dust.*	Chest auscultation in the diagnosis of pulmonary	000060
#Further observations on the ultrastructure and	childhood: Report of 13 cases.*	000111
asbestos pipe factory.*	CHLAMYDIA PSITTACI infection in mice.* coal,	000124
#Malignant mesothelioma in	chromium, cobalt, nickel, and scandium in asbestos	000180
titanium oxide, and asbestos dusts on experimental	chronic asbestos exposure.* #Partial intestinal	000090
by neutron activation	chronic bronchitis with emphysema.* the measurement	000543
obstruction due to peritoneal mesothelioma in	chronic effects of intraperitoneal injection of	000073
of pulmonary diffusion in asbestosis and	chronic fibrosing lung diseases.*	000231
two types of asbestos in rats with a	chronic obstructive airway disease in asbestos	000208
#Acute and	chronic obstructive airway disease, and asbestosis.	000348
function variables in evaluating asbestosis and	chronic respiratory disease; asbestosis in ship	000168
#Repair workers.*	chrysotile and acid-treated chrysotile on	000145
#Mucociliary function in health,	chrysotile and benzo(a)pyrene.*	000127
macrophage cultures.*	chrysotile asbestos dust injected	000251
#Tumors of rats after i.p. injection of powdered	chrysotile asbestos covers.* #Asbestos	000193
into the		
#The long term fibrogenic effects of		
dust levels inside firefighting helmets with		

## PERMUTED TITLE INDEX

maintained in organ culture.*	#The effects of	000398
of lung cancer in rats with pulmonary deposits of	#The early effects of	000506
produced in guinea-pigs by the injection of		000408
#Studies of the solubility of constituents of	chrysotile asbestos dust.* the development	000162
Quebec.*	#Leaching of constituents of	000202
Quebec.*	chrysotile asbestos dust on lung macrophages	000410
Quebec.*	chrysotile asbestos dust on the rat lung.*	000117
Quebec.*	chrysotile asbestos dust.* fibrous pleural lesions	000095
	chrysotile asbestos in vivo using radioactive	00015
	chrysotile asbestos in vivo.*	000107
	chrysotile asbestos mine and mill workers of	000198
	chrysotile asbestos mine and mill workers of	000203
	chrysotile asbestos mine and mill workers of	000069
	chrysotile asbestos mines and mills of Quebec.*	000133
	chrysotile asbestos mines and mills of Quebec.*	000067
	chrysotile asbestos on trace metals,	000094
	chrysotile asbestos or benzpyrene in the rat	000407
	chrysotile asbestos.* #Production	000325
	chrysotile asbestos.* and mucopolysaccharide	000112
	chrysotile asbestos.* of effects on macrophage	000145
	chrysotile dust.* studies on the progressiveness	000187
	chrysotile in airborne dusts by an X-ray	000210
	chrysotile industry.*	000145
	chrysotile on macrophage cultures.*	000134
	chrysotile.* #Asbestos dust levels	000185
	chrysotile, in lungs at autopsy: preliminary	000186
	Chrysotile asbestos in lungs of residents of New	000186
	Chrysotile asbestos in the lungs of persons in New	000187
	Chrysotile asbestos in urban air.*	000108
	cigarette filter manufacture.*	000232
	Cigarette smoking, asbestos, and pulmonary	000114
	Cincinnati Classification of radiographic	000242
	Circulating rheumatoid and antinuclear factors in	000315
	city dwellers: a study of their central fiber.*	000326
	City.* #Chrysotile	000186
	City.* #Chrysotile	000187
	classification of asbestosis.* of South Africa	000479
	classification of pulmonary asbestosis.*	000440
	classification of radiographs in pneumoconiosis.*	000241
	classification of radiographs of asbestos-exposed	000443
	Classification of radiographic appearances of the	000114
	Classification of the radiographic appearances of	000242
	clearance using radioactive tracer techniques.*the	000040
	clinical and experimental observations.*	000272
	clinical and pathological study.*	000290
	Clinical picture of dust-induced pulmonary disease	000105
	clinical, functional, and radiological survey.*	000032
	clinical, radiological and pulmonary function	000208
	Clinical, bronchographic, radiological and	000547
	Clinical, environmental, radiologic and	000204
	Clinical, radiological, and physiological findings	000427
	close some asbestos plants.*	000021
	clothing proposed after FDA study of hazards.*	000093
	cloths made from liquid dispersed chrysotile.*	000134
	clouds from milligram quantities of asbestos.*	000181
	coal miners pneumoconiosis.* and composition	000470
	coal, titanium oxide, and asbestos dusts on	000124
	coals dusts by serum.* mineral dusts. The elution	000504
	coated with glucose and talc.*	000010
	coating of asbestos bodies.*	000424
	coating.*	000109
	coating.*Histochemical demonstration of hematoidin	000110
	cobalt, nickel, and scandium in asbestos by	000180
	Cocarcinogenesis of 239Pu02 with chrysotile	000069
	Cocarcinogenic studies in pulmonary carcinogenesis.	000286
	Cohort analysis of changes in incidence of	000464
	collagen by newborn hamster fibroblasts.*	000264
	Collagen and mucopolysaccharide production in	000067
	Collagen biosynthesis in rat lungs during exposure	000161
	Columbia.*	000182
	commercial sources.* #Control	000209
	commercial talc manufacture.* #A study	000053
	Commercial talc and talcosis.*	000421
	Commission and International Association on	000159
	Committee on Asbestos Cancers to the Director of	000041
	Committee on Asbestosis of the Permanent	000159
	community asbestos air pollution.* #Critical	000217
	community.*	000063
	compensated??*	000314
	Complications of asbestosis.*	000545
	composition and biological effects of asbestos.*	000284
	composition and character.*	000126
	composition in lungs with asbestosis, made during	000470
	concentrations of asbestos dust in shipyard	000179

## PERMUTED TITLE INDEX

#Some current	concepts of the pneumoconioses.*	000028
#Body plethysmographic measurements of airway	conductance in obstructive pulmonary disease.*	000337
Report on a visit to	Conference on the Biological Effects of Asbestos.	000327
Pleural calcifications associated with an asbestos	coniosis detected by examination of microspecimens	000398
of lung smears for asbestos bodies in 109	consecutive necropsies in Perugia.* #Examination	000336
radioactive tracer	constituents of chrysotile asbestos in vivo using	000202
#Studies of the solubility of	constituents of chrysotile asbestos in vivo.*	000410
#Leaching of	#A	000303
labor-management occupational health service in a	construction.* #The prohibition	000043
of the use of asbestos spray in building	construction.*dust survey carried out in buildings	000318
incorporating asbestos-based materials in their	contaminant.*	000834
#Asbestos as an urban air	contaminated with asbestos after accident.*	000019
#FDA retains lima beans	contaminating asbestos oils.*	000432
#Tumour initiation by natural and	contamination in the lungs and other organs of the	000033
human body.*	contamination of parenteral drugs.*	000122
#Ferromagnetic	contamination of rice.*	000199
#Asbestos	contamination*	000026
#Talc and asbestos	control of asbestos exposures.*	000158
#FDA seeks to define issues regarding asbestos	control population.* #Insulation workers in	000230
#Identification and	Control of asbestos fiber emissions from	000209
Belfast. 1. Comparison of a random sample with a	Control of environmental lung disease.*	000243
industrial and commercial sources.*	control.*	000458
#Economics of dust	controls.* radiologic and epidemiologic	000204
observations in shipyard pipe coverers and	correlation in 108 cases of asbestosis proved at	000514
post-mortem.* #A pathological-radiological	correlations in asbestosis in the Republic of	000479
South Africa and	Correlation between lung asbestos count at	000331
#Radiological and pathological	Correlation between the electrocardiogram and	000321
necropsy and radiological appearances.*	corticotrophin on the mucosal mast cells and	000532
#Radiological picture in 29 cases.*	could close some asbestos plants.*	000021
#Effects of heparin and asbestos with	count at necropsy and radiological appearances.*	000331
tissue	counting techniques in the asbestos industry.*	000459
#Wastewater limits sought by EPA	covers.* #Asbestos dust levels inside	000204
#Correlation between lung asbestos	criteria and standards for the environment.*	000023
#Developments in dust sampling and	criteria document: I. Recommendations for an	000024
and epidemiologic observations in shipyard pipe	Critical evaluation of disease hazards associated	000217
firefighting helmets with chrysotile asbestos	criticized by USDI, environmental groups.*	000006
#Health	criticized; firms warn of substitute.*	000008
asbestos standard.*	critique.* #Present threshold	000474
#Excerpts from the	crocidolite asbestos and banded ironstone.*	000528
with community asbestos air pollution.*	crocidolite asbestos dust injected into the	000251
#FDA optical test method	crocidolites from Transvaal and North-west Cape	000098
#FDA treatment of asbestos filters	culture medium due to filtration through asbestos	000508
limit value in the U.S.A. for asbestos dust: A	culture.*	000128
#Natural occurrence of amino acids in virgin	culture.*	000138
The long term fibrogenic effects of chrysotile and	culture.* #Effect of	000144
mines on the lungs of rats	cultures of glass fibre, glass powder, and	000398
#The effects of inhaled	cultures.* #Effects of chrysotile	000145
pads.*	current concepts of the pneumoconioses.*	000028
#The response of human pleura in organ	current hypothesis of the lymphatic transport of	000078
#Effects of silica and asbestos on cells in	Cytodynamic reactivity of the mesothelium.*	000153
#Fibrous silicates in animal experiments and cell-	Cytologic diagnosis of asbestosis associated with	000533
asbestos and serpentine dusts on pulmonary tissue	Cytologic morphology of the sputum in asbestosis	000417
dust on lung macrophages maintained in organ	Cytotoxic effects of some mineral dusts on Syrian	000147
chrysotile	cytotoxicity of asbestos dusts.*	000376
#Comparison of effects on macrophage	dealing with asbestos and glasswool.*	000496
and acid-treated chrysotile on macrophage	death certificates in asbestos workers.*	000334
#Some	deceased persons: A means of obtaining histories	000169
inspired dust to the parietal pleura.*	decomposition products.*	000370
#Primary	define issues regarding asbestos contamination*	000026
bronchogenic carcinoma.*	Definitions and procedural and interpretative	000092
of the lung.*	del peritoneo.*	000339
hamster peritoneal macrophages.*	demonstration of hematoxin in the innermost	000110
#Studies on IN VITRO	deposition and retention in rats.*	000493
#Cardiopulmonary function studies in workers	deposition of inhaled fibrous material in the	000040
#Validation of	deposits of chrysotile asbestos dust.* the	000008
of exposure to	desquamative interstitial pneumonia associated with	000102
#Home interviews with relatives of	detains lima beans contaminated with asbestos	000019
#Brake lining	detected by examination of microspecimens with the	000394
regulations.*	detection alternatives suggested to FDA.*	000009
#Part 191 - Hazardous substances:	detection of asbestos in tissues.*	000288
#Mesotelioma	developing asbestosis.*	000106
layers of human asbestos body	Developmental changes in asbestos bodies and their	000201
#Histochemical	diagnosis in the pathology of asbestosis.*	000453
#Asbestos dust	diagnosis of asbestos disease.*	000278
respiratory tract of the rat and	diagnosis of asbestosis associated with	000533
development of lung cancer in rats with pulmonary	diagnosis of asbestosis.*	000154
asbestos.*	diagnosis of pulmonary asbestosis.*	000060
#Electron microscopic studies in	diagnosis of pulmonary lesions.* #Bronchial	000364
after accident.*		
associated with an asbestos coniosis		
#New asbestos		
#The		
The effect of pulmonary macrophage suppression in		
significance.*		
#Differential		
changing attitudes to the		
bronchogenic carcinoma.*		
#Primary cytologic		
#Early		
#Chest auscultation in the		
brushing and transbronchial forceps biopsy in the		

## PERMUTED TITLE INDEX

#	Diagnosis of asbestosis by needle lung biopsy.*	000393
	#Pleural calcifications in asbestosis	000283
	diameters of South African amphiboles.*	000225
	differential diagnosis.*	000283
	#Pleural calcifications	000283
#	differential diagnosis in the pathology of	000453
	diffraction method.*	000325
	#The determination of amosite	000218
	diffraction patterns of U.I.C.C. asbestos samples.*	000218
	diffuse mesothelial tumors: evidence of an	000492
	diffuse mesothelioma.*	000299
	diffuse mesothelioma.*	000300
	diffuse mesotheliomas of the pleura).*	000516
	diffuse pulmonary fibrosis.*	000525
#	diffuse 'asbestosis-like' interstitial fibrosis of	000132
	#diffuse malignant pleural mesothelioma and	000233
	#diffuse mesothelioma and exposure to asbestos dust	000512
	#diffuse mesothelioma of the pleura and asbestos.*	000449
	#diffuse pleural mesothelioma and asbestos exposure	000549
	#diffuse pleural mesothelioma, a clinical and	000290
	#diffuse pleural mesotheliomas in South Africa.*	000540
	diffusion in asbestosis and chronic bronchitis	000543
	digestive tract of rats.*	000065
	Director of the International Agency for Research	000041
	discriminant value of pulmonary function tests in	000487
	disease following exposure to some types of the	000105
	disease hazards associated with community asbestos	000217
	disease in asbestos workers.*	000208
	in evaluating	000170
	disease in joiners.*	000170
	disease of the lung.*asbestos bodies in necropsies	000335
	disease.*	000330
	disease.*	000278
	disease.*	000243
	disease.*	000454
	disease.*	000438
	#Asbestos fibers in human	000037
	disease.*	000337
	#Body plethysmographic measurements	000100
	disease.*	000168
	#A survey of pleural thickening: its	000348
	disease; asbestosis in ship repair workers.*	000272
	disease, and asbestosis.*	000231
	#Mucociliary	000231
	disease: clinical and experimental observations.*	000231
	diseases.*	000524
	disorders of the hematopoietic system.*	000259
	dispenser for the continuous generation of dust	000181
	dispersed chrysotile.*	000134
	#Asbestos dust	000289
	distribution and isolation of (3H) benz(a)pyrene	000172
	distribution in abdominal granulomas and lymph	000172
	district.*	000120
	in persons exposed to asbestos	000120
	dockers.*	000222
	dockyard workers.*	000385
	dockyards.*	000367
	#Radiological	000112
	document: I. Recommendations for an asbestos	000024
	dose-response relation in pneumoconiosis (1).*	000131
	Dresden asbestos workers.*	000463
	drinking water.*	000160
	drinking water, and tissues: their passage through	000035
	drugs.*	000122
	drugs.*	000071
	drulith water supply.*	000014
	Dunedin, New Zealand, assessed by two methods.*	000287
	duration of exposure to asbestos.*	000238
	function and	000437
	dust and cancer. A report from a working group of	000423
	dust and its measurements.*	000423
	dust and CANDIDA ALBICANS infection on the lungs	000087
	dust clouds from milligram quantities of asbestos.*	000181
	dust content and composition in lungs with	000470
	dust control.*	000458
	dust deposition and retention in rats.*	000493
	dust diseases.*	000524
	dust exposure and malignancy (diffuse	000516
	dust exposure in the Quebec asbestos mining and	000174
	dust exposures in the asbestos textile industry.*	000429
	dust from the lung.*	000044
	dust hazards in the United Kingdom.*	000195
	dust in shipyard processes.*	000179
	#A comparison	000179
	dust in the Merseyside area.*	000512
	dust injected into the pleural cavity of	000251
	dust levels during work with cloths made from	000134
	dust levels inside firefighting helmets with	000193
	dust on lung macrophages maintained in organ	000398
	dust on the lung.*	000498

## PERMUTED TITLE INDEX

*The early effects of chrysotile asbestos in the human lung caused by inhalation of asbestos of air pollution with asbestos and other fibrous the United Kingdom.*	dust on the rat lung.*	000506
*The use of standard rat.*	dust over long periods.*	000059
*Comparison of asbestos industry.*	*Cellular reaction dust particles.*	000151
*Developments in asbestos.*	*Effect on public health dust respirators against asbestos dust hazards in	000195
*Dust sampling instruments and asbestos-based materials in their construction.*	dust retention in specific pathogen free and	000469
*A hypothesis of the lymphatic transport of inspired dust sampling and counting techniques in the	dust standards in the United States of America for	000459
*The association of phagocytosed asbestos mills of Quebec.*	dust survey carried out in buildings incorporating	000247
*Fiberizing plants.*	dust to the parietal pleura.*	000318
*Asbestos.*	*A current dust with lysosome enzymes.*	000078
the United States of America for asbestos.*	Dust exposure in the chrysotile asbestos mines and	000219
*Studies on the carcinogenic effects of asbestos	Dust in South African asbestos mines and	000255
*The sequelae of exposure to asbestos	Dust problems in the mining, milling and packaging	000274
*The locus of pathogenicity of asbestos	Dust sampling instruments and dust standards in	000247
*Hygiene standards for airborne amosite asbestos	dust.*	000263
*Chemical aspects of Indian varieties of asbestos	dust.*	000491
*Asbestos—the lethal fibrogenic response of guinea pigs to amosite	dust.*	000045
the early manifestations of exposure to asbestos	dust.*	000031
long term studies of persons exposed to asbestos	dust.*	000054
with pulmonary deposits of chrysotile asbestos	dust.*	000395
following exposure to some types of the silicate	dust.*	000080
of the pulmonary fibrosis caused by chrysotile	*Pulmonary dust.*	000196
pigs by the injection of chrysotile asbestos	*The radiological investigation of	000062
intraperitoneal injection of asbestos-containing	dust.*	000408
to some types of the silicate	the development of pleural hyalinosis in	000105
industry.*	dust.*	000407
calcification in persons exposed to asbestos	picture of dust-induced pulmonary disease	000162
threshold limit value in the U.S.A. for asbestos	dust.*	000328
of amosite and chrysotile in airborne	asbestosis: studies on the progressiveness	000105
of 3,4-benzpyrene and oils from asbestos and coals	dust.*	000012
*Comparison between IN VITRO toxicity of	fibrous pleural lesions produced in guinea-	000120
of quartz, coal, titanium oxide, and asbestos	dust.*	000478
*The direct effects of	*Changes in certain organs after experimental	000120
*Effect of asbestos and serpentine	dust.*	000325
*Cytotoxic effects of some mineral	dusts by an X-ray diffraction method.*	000504
*Biological action of different asbestos	dusts by serum.*	000156
asbestos and *Studies of hydrocarbons on mineral	on mineral dusts. The elution	000124
*The inhalation of fibrous	dusts of certain polymers and minerals and their	000211
*Nonabsorbable	dusts on experimental CHLAMYDIA PSITTACI infection	000428
*Hemolytic activity of asbestos	dusts on lung fibroblasts grown in vitro.*	000147
*Haemolytic activity of asbestos and other mineral	dusts on pulmonary tissue culture.*	000213
*Studies on IN VITRO cytotoxicity of asbestos	dusts on Syrian hamster peritoneal macrophages.*	000504
of asbestos containing "asboruite" and "sovelite"	dusts with special respect to fibre length and	000488
induced in rats by i.p. injection of asbestos	dusts. The elution of 3,4-benzpyrene and oils from	000197
*Pollution at work:	dusts.*	000215
*Asbestos and the urban	dusts.*	000383
*Pulmonary ferruginous bodies in city	dusts.*	000414
rat lung.*	dusts.*	000376
*The radiological investigation of the	dusts.*	000273
pleural asbestosis.*	*Data for hygienic evaluation	000070
*The	concerning morphology of tumors	000196
function.*	dusty work in the 1970's.*	000257
Effects of Asbestos. Report on a visit to	dweller.*	000154
*Potential hazard from	dwellers: a study of their central fiber.*	000326
*A study of 16 cases of pleurisy with	early effects of chrysotile asbestos dust on the	000506
by foreign bodies: comparison with the schistosome	early manifestations of exposure to asbestos dust.*	000196
*Chest symptomatology in an	early radiological changes in pulmonary and	000257
cases.*	*Early diagnosis of asbestosis.*	000184
*Correlation between the	Early effects of asbestos exposure on lung	000327
fibrosis.*	East Germany and England.*	000010
*Lung function tests and	on the Biological	000458
particulate exposures: relevance to exposure to	eating rice coated with glucose and talc.*	000103
*Asbestos dust on the lung.*	*Economics of dust control.*	000269
*An	effusions in ex-miners from Wittenoom Gorge.*	000256
found in the lungs of a mesothelioma patient by	egg granuloma.*	000321
samples.*	the inflammatory response induced	000355
interstitial pneumonia associated with asbestos.*	Egyptian cement-asbestos pipe factory.*	000157
and animals.*	electrocardiogram and radiological picture in 29	000157
*Paper mache products widely used in	electrocardiographic examinations in pulmonary	000498
instillation of tritiated 3,4-benzopyrene in	Electromotive phenomenon in metal and mineral	000088
and *Studies of hydrocarbons on mineral dusts. The	electron microscopy study of the effect of	000218
*Control of asbestos fiber	electron microscopy.*	000276
in asbestosis and chronic bronchitis with	bodies and asbestos fibers	000275
*Routine lung function studies on 830	*Electron diffraction patterns of U.I.C.C. asbestos	000102
*Asbestos content of the soil and	*Electron microprobe analysis of asbestos bodies.*	000102
*Sepiolite content of the soil in regions with	*Electron microprobe analysis.*	000089
*Asbestosis in a worker	*Electron microscopic studies in desquamative	000338
	elementary schools contain large proportions of	000504
	*Elimination of radioactivity after intratracheal	000209
	elution of 3,4-benzpyrene and oils from asbestos	000543
	emissions from industrial and commercial sources.*	000462
	*Employees in an asbestos processing factory.*	000245
	*Endemic pleural asbestosis.*	000101
	*Endemic pleural calcifications.*	000536
	engaged in automobile undercoating.*	

## PERMUTED TITLE INDEX

and physiologic patterns among workers of Asbestos. Report on a visit to East Germany and	000085
*The work	000327
#Evaluation of asbestos exposures in the working	000356
#Health criteria and standards for the	000159
#Talc: A possible occupational and	000023
in South Africa - certain geographical and	000030
fibers in human lungs: forensic significance in	000078
#FDA optical test method criticized by USDI,	000037
#Asbestos - an	000006
#Control of	000416
perspectives from an old	000243
observations in shipyard pipe covers	000345
#Clinical,	000204
#Pulmonary lysosomal	000081
of phagocytosed asbestos dust with lysosome	000219
on the mucosal mast cells and tissue	000532
#Wastewater limits sought by	000021
health hazard.*	000020
#Control of	000204
covers	000249
#Clinical, environmental, radiologic and	000125
plaques, asbestos and exposure to asbestos: an	000392
#On the	000492
Northern Italy.*	000223
evidence of an association from studies in South	000279
area.*	000136
#Tumors in Canada.*	000388
#Phagocytic activity of the alveolar	000103
#Phagocytosis of asbestos fibers by	000355
#A study of 16 cases of pleurisy with effusions in	000024
#Lung function tests and electrocardiographic	000295
Recommendations for an asbestos standard.*	000205
1968.*	000053
#Mortality	000062
compared with relevant findings in the non-	000120
manufacture.*	000112
#A study of workers	000472
pleural hyalinosis in long term studies of persons	000112
#Prevalence of pleural calcification in persons	000473
#Radiological survey of men	000067
#Rheumatoid factor in serum of individuals	000443
production in growing lung fibroblasts	000246
in the classification of radiographs of asbestos-	000311
#Occupational	000349
#Asbestos	000516
#Asbestos	000513
#Asbestos	000372
#Asbestos	000100
#Asbestos	000096
#Asbestos	000205
#Asbestos	000108
#Asbestos	000107
#Asbestos	000549
#Asbestos	000174
#Asbestos	000281
#Asbestos	000271
#Asbestos	000237
#Asbestos	000316
#Asbestos	000184
#Asbestos	000169
#Asbestos	000216
#Asbestos	000477
#Asbestos	000157
#Asbestos	000450
#Asbestos	000437
#Asbestos	000512
#Asbestos	000491
#Asbestos	000196
#Asbestos	000471
#Asbestos	000332
#Asbestos	000485
#Asbestos	000161
#Asbestos	000415
#Asbestos	000119
#Asbestos	000452
#Asbestos	000238
#Asbestos	000249
#Asbestos	000105
#Asbestos	000397
#Asbestos	000413
#Asbestos	000371
#Asbestos	000233

## PERMUTED TITLE INDEX

of carcinoma of the lung associated with asbestos due to peritoneal mesothelioma in chronic asbestos and an analysis of their association with asbestos	asbestos	exposure.*	*Pathology	000115
Recommendation of Sub-	#Evaluation of asbestos	exposure.*	*Partial intestinal obstruction	000090
#Occupational and non-occupational	#Measurement of dust	exposure.*	*The pathology of mesotheliomata	000507
#Identification and control of asbestos and sputum: relationship to smoking and industrial phenomenon in metal and mineral particulate bronchogenic carcinoma and	*Asbestos, an	exposure, smoking, and neoplasia.*	000384	
#The many	*Asbestos, an	exposures among retired asbestos workers.*	000038	
mortality of workers in an anthophyllite asbestos	*The many	exposures in the asbestos textile industry.*	000429	
#Some observations on asbestos in a	*Asbestos, an	exposures in the working environment.	000159	
#The mortality of asbestos	*Asbestos, an	exposures to asbestos.*	000461	
and smoking on mortality from lung cancer in	*Asbestos, an	exposures.*	000158	
#Radiological findings in a cement-asbestos pipe	*Asbestos, an	#Thiocyanate in saliva	000248	
#A follow-up study of workers from an asbestos	*Asbestos, an	exposures: relevance to exposure to asbestos and	000157	
#Secular changes in asbestososis in an asbestos	*Asbestos, an	extrinsic factor in the pathogenesis of	000431	
#A study of the mortality of workers in an asbestos	*Asbestos, an	faces of asbestos disease.*	000330	
sympomatology in an Egyptian cement-asbestos pipe	*Asbestos, an	factory in Finland.*	*A study of the	000123
studies on 830 employees in an asbestos processing	*Asbestos, an	factory population.*	000298	
other causes among workers in an asbestos textile	*Asbestos, an	factory workers.*	000285	
of bronchial carcinoma in a textile asbestos	*Asbestos, an	factory workers.*	effect of asbestos exposure	000096
after accident.*	*Asbestos, an	factory.*	000320	
environmental groups.*	*Asbestos, an	factory.*	000502	
contamination*	*Asbestos, an	factory.*	000484	
Ban of asbestos fibers for clothing proposed after	*Asbestos, an	factory.*	\$ 000333	
firms warn of substitute.*	*Asbestos, an	*Chest	000256	
#New asbestos detection alternatives suggested to	*Asbestos, an	factory.*	#Routine lung function	000462
questioned.*	*Asbestos, an	factory.*	*Mortality from lung cancer and	000369
#A study of the mortality of	*Asbestos, an	factory.*	#Cohort analysis of changes in incidence	000464
organs of the human body.*	*Asbestos, an	*FDA detains lima beans contaminated with asbestos	000019	
nonfibrous particulates and from	*Unusual	*FDA optical test method criticized by USDI,	000006	
their central fiber.*	*Pulmonary	*FDA seeks to define issues regarding asbestos	000026	
#Incidence of pulmonary	*Asbestos and	*FDA study of hazards.*	* 000093	
random autopsies.*	*Asbestos and	*FDA treatment of asbestos filters criticized;	000008	
hazards.*	*Asbestos and	*FDA.*	000009	
#Application of sprayed inorganic	*Asbestos and	*FDA's proposed method of analysis for asbestos	000018	
sources.*	*Asbestos and	female asbestos workers.*	000121	
#Control of asbestos	*Asbestos and	#Ferromagnetic contamination in the lungs and other	000033	
examination of the malmo material.*	*Asbestos and	ferruginous bodies - their formation from	000176	
#Asbestos industry.*	*Asbestos and	ferruginous bodies in city dwellers: a study of	000326	
#Dust-	*Asbestos and	ferruginous bodies in France.*	000240	
#Interactions of mineral	*Asbestos and	ferruginous bodies in guinea pigs.*	000252	
bodies in city dwellers: a study of their central	*Asbestos and	#Ferruginous bodies in human lungs: prevalence at	000390	
#Dust in South African asbestos mines and	*Asbestos and	fiber containing asbestos: occupational health	000129	
#Production of experimental tumors of the pleura by	*Asbestos and	fiber emissions from industrial and commercial	000209	
#Studies of carcinogenesis of asbestos	*Asbestos and	fiber in the lung and mesothelioma: A re-	000066	
#Phagocytosis of asbestos	*Asbestos and	fiber relationships in the Quebec chrysotile	000012	
lymph nodes of the	*Asbestos and	fiber surfaces with cells in vitro.*	000135	
hazards.*	*Asbestos and	fiber.*	*Pulmonary ferruginous	000326
#Ban of asbestos	*Asbestos and	fiberizing plants.*	000255	
#Investigation of asbestos bodies and asbestos	*Asbestos and	fibers (asbestos).*	000229	
their passage through the intestinal	*Asbestos and	fibers and their natural oils.*	000456	
environmental disease.*	*Asbestos and	fibers by epithelial cells.*	000388	
#Asbestos-like	*Asbestos and	fibers distribution in abdominal granulomas and	000172	
#Are trace metals associated with asbestos	*Asbestos and	fibers for clothing proposed after FOA study of	000093	
#Characteristics of respirable asbestos	*Asbestos and	fibers found in the lungs of a mesothelioma	000068	
as selective antagonists of hemolytic asbestos	*Asbestos and	fibers in beverages, drinking water, and tissues:	000035	
with occupational exposure to airborne inorganic	*Asbestos and	fibers in human lungs: forensic significance in	000037	
preliminary report.*	*Asbestos and	fibers in Duluth water supply.*	000014	
#Inorganic	*Asbestos and	fibers responsible for the biologic effects	000034	
#Experimental asbestososis with four types of	*Asbestos and	fibers.*	000309	
processes.*	*Asbestos and	fibers.*	*Polymers	000293
#A comparison of mass and	*Asbestos and	fibers, including chrysotile, in lungs at autopsy:	000216	
#Possible biological importance of	*Asbestos and	fibers: Importance of small particles.*	000185	
different asbestos dusts with special respect to	*Asbestos and	fibre concentrations of asbestos dust in shipyard	000460	
of effects on macrophage cultures of glass	*Asbestos and	fibre diameters of South African amphiboles.*	000225	
#Preparation of asbestos	*Asbestos and	fibre length and semiconductor properties.*	000213	
#Migration of asbestos	*Asbestos and	fibre, glass powder, and chrysotile asbestos.*	000094	
#Examination of	*Asbestos and	fibres for animal experiments.*	000171	
#Asbestos	*Asbestos and	fibres from subcutaneous injection sites in mice.*	000268	
effects of subcutaneous injections of asbestos	*Asbestos and	fibres in beer.*	000359	
#Asbestos	*Asbestos and	fibres in beverages and drinking water.*	000160	
of asbestos fibres in mice: migration of	*Asbestos and	fibres in mice: migration of fibres to	000419	
#Fibroblast anchorage in carcinogenesis by	*Asbestos and	fibres in the air of towns.*	000049	
and mucopolysaccharide production in growing lung	*Asbestos and	fibres to submesothelial tissues and induction of	000419	
#The direct effects of dusts on lung	*Asbestos and	fibres.*	000057	
#The synthesis of collagen by newborn hamster	*Asbestos and	fibroblasts exposed to chrysotile asbestos.*	000067	
asbestos dust injected into the	*Pleural	fibroblasts grown in vitro.*	000211	
	*The long term	fibroblasts.*	000264	
		* Fibroblast anchorage in carcinogenesis by fibres.*	000057	
		fibrocalcific plaques and asbestos exposure.*	000371	
		fibrogenic effects of chrysotile and crocidolite	000251	

## PERMUTED TITLE INDEX

*	#Pulmonary	fibrogenic response of guinea pigs to amosite dust. 000080
	*The	fibrogenic response to asbestos.* 000391
	dusts of certain polymers and minerals and their	fibrogenicity.* between IN VITRO toxicity of 000156
	#Antibodies in some chronic	fibrosing lung diseases.* 000231
	studies on the progressiveness of the pulmonary	fibrosis caused by chrysotile dust.* asbestos: 000407
	#Massive	fibrosis in asbestos.* 000221
	#Diffuse 'asbestosis-like' interstitial	fibrosis of the lung.* 000132
	#Cigarette smoking, asbestos, and pulmonary	fibrosis.* 000232
	#Nonoccupational diffuse pulmonary	fibrosis.* 000525
	and electrocardiographic examinations in pulmonary	#Lung function tests 000355
	#Lymphatic transport of	fibrous dust from the lung.* 00044
	health of air pollution with asbestos and other	fibrous dust particles.* #Effect on public 000151
	#The inhalation of	fibrous dusts.* 000488
	rat and its #Studies on the deposition of inhaled	fibrous material in the respiratory tract of the 00040
	from nonfibrous particulates and from carbonaceous	fibrous particles.* bodies - their formation 000176
	the injection of chrysotile #The calcification of	fibrous pleural lesions produced in guinea-pigs by 000162
	#Instrumental analysis of inspired	fibrous pulmonary particulates.* 000358
	culture.*	#Fibrous silicates in animal experiments and cell- 000144
	#Talc (non-asbestiform and	fibrous).* 000141
	#Some recent developments in the	field of cancer causation.* 000379
	with occupational exposure to asbestos in	#Fifteen cases of pleural mesothelioma associated 000332
	in the manufacture of phenoplasts with asbestos	filler.* characteristics of working conditions 000310
	#Asbestosis following brief exposure in cigarette	filter manufacture.* 000108
	#FDA treatment of asbestos	filters criticized; firms warn of substitute.* 000008
	cell growth medium after passage through asbestos	#Toxicity of beta 000277
	from asbestos pad and cellulose acetate membrane	filters.* of virus growth by a toxic factor 000441
	#Toxicity of cell culture medium due to	filtration through asbestos pads.* 000508
	#Radiological	findings in a cement-asbestos pipe factory.* 000320
	#Clinical, radiological, and physiological	findings in asbestosis.* 000427
	due to asbestos exposure compared with relevant	findings in the non-exposed population.* 000205
	#Results of asbestos exposure in	Finland.* 000271
	#Occupational and "non-occupational" asbestosis in	Finland.* 000375
	of workers in an anthophyllite asbestos factory in	#A study of the mortality 000123
	#Asbestos bodies in the lungs of a series of	Finnish lung cancer patients.* 000282
	covers.* #Asbestos dust levels inside	firefighting helmets with chrysotile asbestos 000193
	methodology for asbestos determination is limited,	#Proposed 000027
	#FDA treatment of asbestos filters criticized;	firms warn of substitute.* 000008
	factory.* #A	follow-up study of workers from an asbestos 000502
	function in asbestos workers: A three-year	follow-up-study.* #Pulmonary 000403
	#Safety of	food additives and solvents.* 000167
	#Asbestos particles in	food and drugs.* 000071
	lesions.* #Bronchial brushing and transbronchial	forceps biopsy in the diagnosis of pulmonary 000364
	mediators in the inflammatory response induced by	foreign bodies: comparison with the schistosome 000269
	#Asbestos fibers in human lungs:	forensic significance in environmental disease.* 000037
	#Unusual ferruginous bodies - their	formation from nonfibrous particulates and from 000176
	after inhalation of anthophyllite.* #Asbestos-body	formation in the lungs of rats and guinea-pigs 000148
	#The mechanism of	formation of asbestos bodies.* 000360
	on the ultrastructure and chemistry of the	formation of asbestos bodies.*#Further observations 000250
	#Asbestos bodies, their	#Formation of the asbestos body.* 000346
	#Asbestos (all	formation, composition and character.* 000126
	#Asbestos as a potential carcinogen for	forms.* 000140
	#Results of asbestos exposure in	fowls.* 000519
	#Incidence of pulmonary ferruginous bodies in	France.* 000237
	with varying duration of exposure to	France.* 000240
	#Pulmonary	function and radiographic changes in 598 workers 000238
	#Pulmonary	function in asbestos workers: A three-year follow- 000403
	#Pulmonary	function in asbestosis of the lung.* 000535
	#Pulmonary	function in asbestosis: serial tests in a long- 000439
	#Lung	function in chrysotile asbestos mine and mill 000095
	#Mucociliary	function in health, chronic obstructive airway 000348
	#Lung	function in relation to radiographic changes in 000239
	#Quebec asbestos workers.*	function studies in workers dealing with asbestos 000496
	#Lung	function studies on 830 employees in an asbestos 000462
	#Cardiopulmonary	function tests and electrocardiographic 000355
	#Cardiopulmonary	function tests in asbestos.* 000487
	#Routine lung	function variables in evaluating asbestosis and 000208
	#Lung	function.* 000184
	#The discriminant value of pulmonary	# 000537
	importance of clinical, radiological and pulmonary	functional, and radiological survey.* 000032
	#Early effects of asbestos exposure on lung	future hazards.* 000042
	The pathology of asbestosis with reference to lung	generation of dust clouds from milligram 000181
	#Asbestos workers in Singapore. A clinical,	geographical and environmental considerations.* 000478
	#Asbestos cancer: past and	geology, occurrences, and major uses of asbestos.* 000457
	#The konimiser--a dispenser for the continuous	Germany and England.* Conference on the Biological 000327
	#Asbestosis in South Africa - certain	gets request to ban asbestos cement water pipes.* 000017
	#The	Getting to grips with asbestos.* 000353
	Effects of Asbestos. Report on a visit to East	glass fibre, glass powder, and chrysotile asbestos. 000094
	#Rain	glass is another moment of truth.* 000086
	#Comparison of effects on macrophage cultures of	glass powder, and chrysotile asbestos.*#Comparison 000094
	"#Each	glasswool.* #Cardiopulmonary function 000496
	of effects on macrophage cultures of glass fibre,	glucose and talc.* 000010
	studies in workers dealing with asbestos and	
	#Potential hazard from eating rice coated with	

## PERMUTED TITLE INDEX

on the incorporation of S35-methionine and H3- with effusions in ex-miners from Witteboom bodies: comparison with the schistosome egg reaction and fibers distribution in abdominal reaction and fibers distribution in abdominal *Getting to	glycine in the experimental silicopneumoconiosis Gorge.* #A study of 16 cases of pleurisy granuloma.* response induced by foreign granulomas and lymph nodes of the rat following grips with asbestos.*	000267 000103 000269 000172 000353 000067 000211 000481 000277 000192 000190 000079 000080 000252 000505 000081 000098 000500 000425 000148 000162 000414 000289 000264 000203 000147 000482 000515 000338 000010 000396 000412 000416 000025 000520 000020 000194 000214 000169 000092 000260 000217 000367 000195 000452 000426 000042 000093 000129 000068 000076 000020 000416 000260 000129 000048 000351 000151 000115 000480 000381 000409 000303 000023 000152 000539 000159 000396 000220 000348 000411 000277 000193 000110 000259 000178 000294 000293 000383 000532 000109
*Collagen and mucopolysaccharide production in *The direct effects of dusts on lung fibroblasts cellulose acetate membrane #Inhibition of virus filters.* #Toxicity of HeLa cell #Rapid	#Asbestos and cancer #Biochemical changes in serum of #Pulmonary fibrogenic response of #Ferruginous bodies in #Experimental asbestosis in lysosomal enzymes in experimental asbestosis in and North-west Cape mines on the lungs of rats and #The ultrastructure of asbestos bodies from #Experimental asbestosis in the #Asbestos-body formation in the lungs of rats and of fibrous pleural lesions produced in dusts.* #Asbestos: an epidemiological study from the #The synthesis of collagen by newborn and aryl hydrocarbon hydroxylase in the #Cytotoxic effects of some mineral dusts on Syrian asbestos.* #Mesotheliomas in #Pleural reaction and mesothelioma in instillation of tritiated 3,4-benzopyrene in talc.* #Potential #Asbestos as a #Investigation of a minor asbestos #Asbestos--an environmental health #Asbestos as an industrial #Asbestos as a modern urban s Korp says asbestos in pesticides is not a health insulated with sprayed asbestos: a potential #List of A means of obtaining histories of exposure to a and interpretative regulations.* #Part 191 - .* #Asbestos health pollution.* #Critical evaluation of disease #Asbestos #The use of dust respirators against asbestos dust #Problems and perspectives: the changing #Occupational #Asbestos cancer: past and future fibers for clothing proposed after FDA study of fiber containing asbestos: occupational health #Asbestos: health #Asbestos and cancer of #EPA's Korp says asbestos in pesticides is not a #Asbestos--an environmental Kingdom).* #Asbestos inorganic fiber containing asbestos: occupational health #Asbestos: #Asbestos and fibrous dust particles.* #Effect on public workers of Quebec.* #The #Trends in the #The #Status of air pollution #A labor-management occupational	growing lung fibroblasts exposed to chrysotile grow in vitro.* growth by a toxic factor from asbestos pad and growth medium after passage through asbestos growth of a pleural mesothelioma* growth.* guinea pigs in experimental asbestosis.* guinea pigs to amosite dust.* guinea pigs.* guinea pigs.* guinea pigs.* #Pulmonary guinea pigs* inhaled crocidolites from Transvaal guinea-pig lungs.* guinea-pig.* guinea-pigs after inhalation of anthophyllite.* guinea-pigs by the injection of chrysotile Haemolytic activity of asbestos and other mineral Hamburg area.* plaques, asbestosis and exposure hamster fibroblasts.* hamster lung.* on trace metals, hydroxyproline, hamster peritoneal macrophages.* hamsters following intrapleural injection of hamsters injected with asbestos.* hamsters.* of radioactivity after intratracheal hazard from eating rice coated with glucose and hazard to health.* hazard.* hazard.* hazard.* hazard.* hazard.* hazard.* #EPA hazard.* #Buildings hazardous air pollutants.* hazardous substance.* of deceased persons: hazardous substances: Definitions and procedural hazards (recent observations in the United Kingdom) hazards associated with community asbestos air hazards in naval dockyards.* hazards in the United Kingdom.* hazards of exposure to asbestos.* hazards of pipe insulators.* hazards.* hazards.* #Ban of asbestos hazards.* #Application of sprayed inorganic hazards, limiting values, prevention.* head and neck.* health hazard.* health hazard.* health hazard.* health hazards (recent observations in the United health hazards.* #Application of sprayed health hazards, limiting values, prevention.* health in 1969.* health of air pollution with asbestos and other health of chrysotile asbestos mine and mill health of the asbestos worker.* health of the public and asbestos usage.* health research, 1966.* health service in a construction industry.* Health criteria and standards for the environment.* Health in power stations.* Health progress in an asbestos textile works.* Health* on Asbestosis of the Permanent Commission health.* health, chronic obstructive airway disease, and heat-treated asbestos in mice.* asbestos HeLa cell growth medium after passage through helmets with chrysotile asbestos covers.* hematoidia in the innermost layers of human hematopoietic system.* Hemolysis by asbestos.* hemolysis.* hemolytic asbestos fibers.* #Remolitic activity of asbestos dusts.* heparin and asbestos with corticotrophin on the histochemical study of the asbestos body coating.*
and International Association on Occupational #Asbestos as a hazard to #Asbestos and asbestosis.* #Mucociliary function in with preliminary report of acute toxicity of asbestos filters.* #Toxicity of #Asbestos dust levels inside firefighting asbestos body #Histochemical demonstration of #Asbestosis and neoplastic disorders of the		
#Asbestos #Polymers as selective antagonists of mucosal mast cells and tissue #Effects of #A		

## PERMUTED TITLE INDEX

innermost layers of human asbestos body coating.*	#	Histochemical demonstration of hematoidin in the	000110
associated with asbestos.*		Histological characteristics of mesothelioma	000445
two types of asbestos in rats with a study of the		histopathogenesis and ultrastructure of resulting	000073
of deceased persons: A means of obtaining		histories of exposure to a hazardous substance.*	000169
persons: A means of obtaining histories of		Home interviews with relatives of deceased	000169
#Case records of the Massachusetts General		Hospital.*	000183
of hematoidin in the innermost layers of		human asbestos body coating.* demonstration	000110
contamination in the lungs and other organs of the		human body.* #Ferromagnetic	000033
over long periods.*		human lung caused by inhalation of asbestos dust	000059
#The ultrastructure of asbestos bodies from		human lung.*	000499
#Asbestos bodies in		human lungs at autopsy.*	000444
#Asbestos bodies and pleural plaques in		human lungs at necropsy.*	000047
#Prevalence of "asbestos" bodies in		human lungs at necropsy.*	000319
environmental disease.*		human lungs.*	000324
#Asbestos fibers in		human lungs: forensic significance in	000037
#Ferruginous bodies in		human lungs: prevalence at random autopsies.*	000390
#Ultrastructure of		human mesothelioma.*	000077
#The response of		human pleura in organ culture to asbestos.*	000128
#Identification of asbestos in		human tissues.*	000055
#Pathological anatomy of		hyaline pleural plaques.*	000227
to asbestos dust.*		hyalinosis in long term studies of persons exposed	000062
#Development of pleural		hydrocarbon hydroxylase in the hamster lung.*	000203
asbestos on trace metals, hydroxyproline, and aryl		hydrocarbons in various materials containing	000097
asbestos.*		hydrocarbons on mineral dusts. The elution of 3,4-	000504
#Polycyclic		hydroxylation in the hamster lung.* asbestos on	000203
benzpyrene and oils from asbestos and		hydroxyproline, and aryl hydrocarbon hydroxylase	000203
trace metals, hydroxyproline, and aryl hydrocarbon		Hygiene standards for airborne amosite asbestos	000031
#Effects of chrysotile asbestos on trace metals,		hygienic evaluation of asbestos containing "	000273
dust.*		Hygienic characteristics of working conditions in	000310
"asbozurite" and "sovelite" dusts.*		hypertrophic pulmonary osteoarthropathy and	000155
#Data for		hypothesis of the lymphatic transport of inspired	000078
the manufacture of phenoplasts with asbestos		H <sub>3</sub> -glycine in the experimental	000267
#Primary intrapulmonary neurogenic sarcoma with		identification and determination of airborne	000029
dust to the parietal pleura.*		identification.*	000304
#A current		Identification and control of asbestos exposures.*	000158
study on the incorporation of S35-methionine and		Identification of asbestos in human tissues.*	000055
asbestos.*		#Identification of serpentine varieties by infrared	000191
#Improved techniques of		Immunoelectrophoretic pattern changes in	000164
#Infrared spectra for mineral		incidence of bronchial carcinoma in a textile	000464
	#	Incidence of "asbestos" bodies in basal lung smear.	000206
absorption.*		Incidence of pulmonary ferruginous bodies in	000240
asbestosis.*		Indian varieties of asbestos dust.*	000054
asbestos factory.*	#	Individuals exposed to asbestos.*	000473
Cohort analysis of changes in		Industrial and commercial sources.*	000209
*		Industrial exposures.*	000248
France.*		#Thiocyanate	000025
#Chemical aspects of		Industrial hazard.*	000522
#Rheumatoid factor in serum of		Industrial cancer in South Africa.*	000272
#Control of asbestos fiber emissions from		Industrial pulmonary disease: clinical and	000116
in saliva and sputum: relationship to smoking and		industry workers in the Urals.*	000012
#Asbestos as an		industry.*	000039
	#	industry.*	000429
experimental observations.*		#Measurement	000303
#The cancer mortality rate among asbestos		industry.*	000459
#Dust-fiber relationships in the Quebec chrysotile		#A labor-management	000174
of asbestos and respiratory cancer in the asbestos		#Developments in dust	000124
of dust exposures in the asbestos textile		#Qualitative aspects of dust	000087
occupational health service in a construction		infection in mice.* coal, titanium oxide, and	000087
sampling and counting techniques in the asbestos		infection on the lungs of Rhesus Monkeys.*	000269
exposure in the Quebec asbestos mining and milling		infective pneumoconiosis: effect of asbestos dust	000191
asbestos dusts on experimental CHLAMYDIA PSITTACI		inflammatory response induced by foreign bodies:	000404
effect of asbestos dust and CANDIDA ALBICANS		Infrared absorption.*	000308
and CANDIDA ALBICANS infection on		Infrared spectra for mineral identification.*	000188
comparison #The role of chemical mediators in the		Inhabitants of Milan.*	000059
#Identification of serpentine varieties by	#	Inhalation of anthophyllite.* body formation	000382
		inhalation of asbestos dust over long periods.*	000307
#Asbestos bodies in the lungs of		inhalation of asbestos in relation to malignant	000488
in the lungs of rats and guinea-pigs after		inhalation of fibres.*	000308
#Cellular reaction in the human lung caused by		inhalation of fibrous dusts.*	000441
change.*		Inhalation and Biological Effects of Asbestos*	000432
#Pleural manifestations following the		inhaled crocidolites from Transvaal and North-west	000432
#The		inhaled fibrous material in the respiratory tract	000251
#The		Inhibition of virus growth by a toxic factor from	000251
Cape mines on the lungs of rats		initiation by natural and contaminating asbestos	000155
of the rat and its		injected into the pleural cavity of experimental	000050
#Studies on the deposition of		injected with asbestos.*	000312
asbestos pad and cellulose acetate membrane		injection in rats.* #Evaluation of the tumorigenic	000040
#oils.*		injection of asbestos and silica.* #The	000312
of chrysotile and crocidolite asbestos dust		injection of asbestos dusts.* concerning	000070
#Pleural reaction and mesothelioma in hamsters		injection of asbestos.*	000482
potential of vermiculite by intrapleural		injection of asbestos-containing dust.* #Changes in	000328
pathogenesis of tumors following the intrapleural		injection of chrysotile asbestos dust.* of fibrous	000162
morphology of tumors induced in rats by i.p.		injection of powdered chrysotile and benzo(a)	000127
#Mesotheliomas in hamsters following intrapleural			
certain organs after experimental intraperitoneal			
pleural lesions produced in guinea-pigs by the			
pyrene.*			
#Tumors of rats after i.p.			

## PERMUTED TITLE INDEX

*Acute and chronic effects of intraperitoneal	injection of two types of asbestos in rats with a	000073
*Tissue response to a single intraperitoneal	injection of various substances in rats.*	000072
*Migration of asbestos fibres from subcutaneous	injection sites in mice.*	000268
from the animal organism after its intratracheal	injection with asbestos and carbon black.*a)pyrene	000289
of	injections of asbestos fibres in mice: migration	000419
*The pathological effects of subcutaneous	innermost layers of human asbestos body coating.*	000110
*Histochemical demonstration of hematoidin in the	inoculation of asbestos.*	000313
mesotheliomas in rats following the intra-pleural	inoculation with asbestos and other materials.*	000082
*Mesotheliomas in rats after	inoculation with asbestos.*	000350
health hazards.*	inorganic fiber containing asbestos: occupational	000129
*Mesotheliomas in rats following	inorganic fibers.*	000216
*Application of sprayed	*Neoplasia risk	000185
associated with occupational exposure to airborne	inorganic fibers, including chrysotile, in lungs	000185
at autopsy: preliminary report.*	inspired dust to the parietal pleura.*	000078
*A current hypothesis of the lymphatic transport of	inspired fibrous pulmonary particulates.*	000358
*Instrumental analysis of	instillation of tritiated 3,4-benzopyrene in	000338
*Elimination of radioactivity after intratracheal	instrumentation and techniques for measurement of	000111
air pollutants.*	instruments and dust standards in the United	000247
*Progress in	*Instrumental analysis of inspired fibrous	000358
States of America for asbestos.*	insulated with sprayed asbestos: a potential	000194
*Dust sampling	insulating workers.*	000356
pulmonary particulates.*	insulation workers in the United States.*	000476
hazard.*	insulation workers.*	000475
*Buildings	*Insulation workers in Belfast. 1. Comparison of a	000230
*The work environment of	*Insulation workers in Belfast. 2. Morbidity in men	000188
*The occurrence of asbestosis among	*Insulation workers in Belfast. 3. Mortality 1940-	000166
occurrence of pleural calcification among asbestos	insulators.*	000426
random sample with a control population.*	insulation workers, 1943-1968.*	000295
still at work.*	*Interactions of mineral fiber surfaces with cells	000135
66.*	international classification of radiographs in	000241
*Occupational hazards of pipe	international research in occupational cancer.*	000137
*Mortality experiences of asbestos	international standard reference asbestos samples	000244
in vitro.*	International Agency for Research on Cancer.*	000041
*The problem of asbestosis in relation to the	International Association on Occupational Health*	000159
on the lungs of	International Conference on the Biological Effects	000327
*The biological effects of the	International Union Against Cancer standard	000306
on Asbestosis to the Director of the	International Union Against Cancer.* asbestos dust	000437
on Asbestosis. Report on a visit to East	interpretative regulations.* *Part 191 - Hazardous	000092
reference samples of	interstitial pneumonia associated with asbestos.*	000102
*Characteristics of the	interstitial fibrosis of the lung.*	000132
and cancer. A report from a working group of the	interviews with relatives of deceased persons: A	000169
substances: Definitions and procedural and	intestinal obstruction due to peritoneal	000090
*Electron microscopic studies in desquamative	intestinal wall and movement through the body.*	000035
*Diffuse 'asbestosis-like'	intra-pleural inoculation of asbestos.*	000313
means of obtaining histories of exposure to *Home	intraperitoneal administration of various	000172
mesothelioma in chronic asbestos exposure.*Partial	intraperitoneal asbestos with preliminary report	000411
water, and tissues: their passage through the	intraperitoneal injection of asbestos-containing	000328
*Mesotheliomas in rats following the	intraperitoneal injection of two types of asbestos	000073
granulomas and lymph nodes of the rat following	intraperitoneal injection of various substances in	000072
of acute toxicity of heat-	intraperitoneal injection in rats.*	000050
*Tissue response to	*Evaluation	000050
dust.*Changes in certain organs after experimental	intraperitoneal injection of asbestos and silica.*	000312
in rats with a study *Acute and chronic effects of	intraperitoneal injection of asbestos.*	000482
rats.*	intrapulmonary neurogenic sarcoma with	000155
*Tissue response to a single	intrathoracic neoplasms.*	000442
of the tumorigenic potential of vermiculite by	intratracheal tissue reactions.*	000046
*The pathogenesis of tumors following the	intratracheal injection with asbestos and carbon	000289
*Mesotheliomas in hamsters following	intratracheal instillation of tritiated 3,4-	000338
hypertrophic pulmonary osteoarthropathy *Primary	iron, chromium, cobalt, nickel, and scandium in	000180
*Asbestos and primary	ironstone.*	000528
*Asbestos-induced	*Natural occurrence of amino	000223
benz(a)pyrene from the animal organism after its	island.*	000223
benzopyrene in *Elimination of radioactivity after	isolation of (3H)benz(a)pyrene from the animal	000289
asbestos by neutron activation *Determination of	issues regarding asbestos contamination*	000026
acids in virgin crocidolite asbestos and banded	Italy.*	000311
*Epidemiology of mesothelioma on Walcheren	Italy.*	000349
organism after its *Study of the distribution and	Italy.*	000392
*FDA seeks to define	*Epidemiological	000200
*Asbestos exposure and its results in	joiners.*	000170
*Asbestos exposure and its results in	Keen surveillance of asbestos still necessary.*	000235
study of asbestos workers in Northern	kind and amount of asbestos.*	000052
*Talc-treated rice and	Kingdom. I. A proposed radiological classification	000879
*Asbestos-related chest disease in	Kingdom.*	00195
*Biologic response to	*The use of dust respirators	000492
in the Republic of South Africa and the United	Kingdom.* tumors: evidence of an association	000260
against asbestos dust hazards in the United	Kingdom).*	000181
from studies in South Africa and the United	Konimiser--a dispenser for the continuous	000020
health hazards (recent observations in the United	Korp says asbestos in pesticides is not a health	000026
generation of dust clouds from milligram	labeled asbestos for use in biological research.*	000303
hazard.*	labor-management occupational health service in a	000075
*The synthesis of tritium-	laryngeal carcinoma.*	000013
construction industry.*	layers of human asbestos body coating.*	000110
*Asbestos and	Leaching of constituents of chrysotile asbestos in	000410
*Asbestosis and carcinoma of the	length and semiconductor properties.* of different	000213
vivo.*		
*Asbestosis and carcinoma of the		
demonstration of hematoidin in the innermost		
innermost layers of human asbestos body coating.*		
asbestos dusts with special respect to fibre		

## PERMUTED TITLE INDEX

*Asbestosis and nodular	lesions of the lung: a radiologic study.*	000374
of forceps biopsy in the diagnosis of pulmonary	lesions produced in guinea-pigs by the injection	000162
accident.*	#Bronchial brushing and transbronchial	000364
critique.*	lethal dust.*	000395
#Mesothelioma of pleura or peritoneum and	lima beans contaminated with asbestos after	000019
Proposed methodology for asbestos determination is	limit value in the U.S.A. for asbestos dust: a	000474
plants.*	limited basal asbestosis.*	000534
#Asbestos: health hazards,	limited, firm says.*	# 000027
#Wastewater	limiting values, prevention.*	000048
#Brake	limits sought by EPA could close some asbestos	000021
dust levels during work with cloths made from	lining decomposition products.*	000370
#Resection of primary pulmonary sarcoma. Review of	#Asbestos	000134
The	literature and report of a case associated with	000501
pulmonary tumors with asbestosis in Piedmont and	locus of pathogenicity of asbestos dust.*	000045
#Epidemiology of mesothelial tumors in the	Lombardy.*	#Association of
peritoneum following exposure to asbestos in the	London area.*	000490
the secular trend in asbestos bodies in lungs in	London area.*	000472
malma material.*	#Mesothelioma of pleura and	000471
appearances.*	London 1936-66.*	#Study of
#Pathology of carcinoma of the	Low exposure to asbestos.*	000228
#Diagnosis of asbestosis by needle	lung and mesothelioma: A re-examination of the	000119
#Asbestos -	lung asbestos count at necropsy and radiological	000066
asbestos textile factory.*	lung associated with asbestos exposure.*	000331
#Mortality from	lung biopsy.*	000115
of asbestos exposure and smoking on mortality from	lung cancer - mesothelioma.*	000393
Neoplasm Research Project: Basic risk factors of	lung cancer and other causes among workers in an	000022
#Experimental asbestosis: the development of	lung cancer in factory workers.*	#Combined effect
bodies in the lungs of a series of Finnish	lung cancer in older men.*	000099
#Occupational exposure and its relation to type of	Philadelphia Pulmonary	000408
#Relationship between pneumoconiosis and	lung cancer in rats with pulmonary deposits of	000282
long periods.*	lung cancer patients.*	#Asbestos
#Asbestosis and	lung cancer.*	000246
#Control of environmental	lung cancer.*	000340
#Antibodies in some chronic fibrosing	lung caused by inhalation of asbestos dust over	000059
and mucopolysaccharide production in growing	lung disease.*	000243
#The direct effects of dusts on	lung diseases.*	000231
asbestos processing factory.*	lung fibroblasts exposed to chrysotile asbestos.*	000067
#Routine	lung fibroblasts grown in vitro.*	000211
#Early effects of asbestos exposure on	lung function studies on 830 employees in an	000462
#The pathology of asbestosis with reference to	lung function.*	000184
#The effects of chrysotile asbestos dust on	lung function.*	000537
Cape.*	lung macrophages maintained in organ culture.*	000398
#Mesothelioma, including peripheral	lung malignancy and tuberculosis in the North West	000296
#Incidence of "asbestos" bodies in basal	lung smear.*	000206
necropsies in Perugia.*	lung smears for asbestos bodies in 109 consecutive	000336
#Prevalence of asbestos bodies in basal	lung smears.*	000377
#Induction of carcinomas from mouse	lung transplanted with asbestos.*	000341
workers of Quebec.*	Lung function in chrysotile asbestos mine and mill	000095
#In Quebec asbestos workers.*	Lung function in relation to radiographic changes	000239
examinations in pulmonary fibrosis.*	Lung function tests and electrocardiographic	000355
#Asbestosis and carcinoma of the	lung.*	000526
#The ultrastructure of asbestos bodies from human	lung.*	000499
#Asbestosis and carcinoma of the	lung.*	000544
#Pulmonary function in asbestosis of the	lung.*	000535
#Lymphatic transport of fibrous dust from the	lung.*	000044
'asbestosis-like' interstitial fibrosis of the	lung.*	#Diffuse
morphology of the sputum in asbestosis of the	lung.*	000132
effects of chrysotile asbestos dust on the rat	lung.*	#cytologic
study of the effect of asbestos dust on the	lung.*	000417
and aryl hydrocarbon hydroxylase in the hamster	lung.*	#The early
on cases of primary malignant disease of the	lung.*	000506
#Asbestosis and nodular lesions of the	lung.*	#An electron microscopy
examination of a ten-year- #Asbestos bodies in the	lung.*	000203
#Ferromagnetic contamination in the	lung.*	asbestos bodies in necropsies and biopsies
#Asbestos bodies in human	lung: a radiologic study.*	000335
#Inorganic fibers, including chrysotile, in	lungs and mesothelioma. A retrospective	000374
#Asbestos bodies in	lungs and other organs of the human body.*	000366
#Asbestos bodies and pleural plaques in human	lungs at autopsy.*	000033
#Prevalence of "asbestos" bodies in human	lungs at autopsy: preliminary report.*	000185
#Collagen biosynthesis in rat	lungs at necropsy.*	000418
#Study of the secular trend in asbestos bodies in	lungs at necropsy.*	000047
asbestos bodies and asbestos fibers found in the	lungs at necropsy.*	000319
#Asbestos bodies in the	lungs during exposure to asbestos.*	000161
#Asbestos bodies in the	lungs in London 1936-66.*	000228
from Transvaal and North-west Cape mines on the	lungs of a mesothelioma patient by electron	000088
anthophyllite.*	lungs of a series of Finnish lung cancer patients.*	000282
standard reference asbestos samples on the	lungs of inhabitants of Milan.*	000404
#Chrysotile asbestos in	lungs of persons in New York City.*	000187
dust and CANDIDA ALBICANS infection on the	lungs of rats and guinea pigs.*	crocidolites
of the dust content and composition in	lungs of rats and guinea-pigs after inhalation of	000148
#Asbestos levels in human	lungs of rats.*	000244
	effects of the international	000186
	lungs of residents of New York City.*	000087
	lungs of Rhesus Monkeys.*	effect of asbestos
	lungs with asbestosis, made during work on coal	000470
	lungs.*	000324

## PERMUTED TITLE INDEX

ultrastructure of asbestos bodies from guinea-pig disease.*	#Asbestos bodies in human	lungs.*	#The 000500
#Ferruginous bodies in human		lungs: an Australian report.*	000352
fibers distribution in abdominal granulomas and parietal pleura.*	#A current hypothesis of the	lungs: forensic significance in environmental	000037
guinea pigs.*	#Pulmonary	lungs: prevalence at random autopsies.*	000390
The association of phagocytosed asbestos dust with pollutants.*	#Effects of particles on	lymph nodes of the rat following intraperitoneal	000172
contain large proportions of asbestos.*	#Paper and chrysotile asbestos.**Comparison of effects on	lymphatic transport of inspired dust to the	000078
of chrysotile and acid-treated chrysotile on	#The effect of pulmonary	Lymphatic transport of fibrous dust from the lung.*	000044
#The alveolar		lysosomal enzymes in experimental asbestosis in	000081
#The effects of chrysotile asbestos dust on lung		lysosome enzymes.*	# 000219
#Some biochemical effects of asbestos on		Lysosomes and the toxicity of particulate	000139
of increased particles on the number of alveolar		lysosomes.*	000234
of some mineral dusts on Syrian hamster peritoneal		macroe products widely used in elementary schools	000089
plaques and splenic capsular sclerosis in adult		macrophage cultures of glass fibre, glass powder,	000098
#Asbestos dust exposure and		macrophage cultures.*	#Effects 000145
* #Mesothelioma, including peripheral lung	#Asbestosis and	macrophage suppression in developing asbestosis.*	000106
between exposure to asbestos and pleural	#Asbestos and	macrophage.*	000149
#Asbestosis and	#Asbestos and	macrophages maintained in organ culture.*	000398
#Asbestosis and	#Asbestos and	macrophages.*	000118
the inhalation of asbestos in relation to		macrophages.*	#The effects 000150
in necropsies and biopsies on cases of primary		Macrophages.*	Cytotoxic effects 000147
#Asbestosis and		Mainly good news about asbestos.*	000091
#Epidemiology of primary		male autopsies.*	#Pleural 000130
exposure.*	#Primary	malignancy (diffuse mesotheliomas of the pleura).*	000516
#Diffuse		malignancy and tuberculosis in the North West Cape.	000296
#The radiological manifestations of		malignancy in Belfast.*	#Relationship 000450
#Pleuro-pulmonary asbestosis and		malignancy.*	000400
cases.*		malignancy.*	000495
worker.*		malignancy.*	000083
the lung and mesothelioma: A re-examination of the		malignant change.*Pleural manifestations following	000382
#Electron-microscope studies of asbestosis in		malignant disease of the lung.*for asbestos bodies	000335
#Asbestos and mesothelioma in		malignant disease.*	000438
construction industry.*	#A labor-	malignant mesothelial tumors in Canada.*	000279
asbestos in relation to malignant change.*#Pleural	#Asbestosis	malignant mesothelial tumors in Canada.*	000058
#Pleural		malignant pleural mesothelioma and asbestos	000233
#The radiological investigation of the early		malignant pleural mesothelioma.*	000265
#The radiological		malignant pleuro-peritoneal mesothelioma.*	000317
and physiologic patterns among workers engaged in		Malignant mesothelioma in childhood: Report of 13	000111
#Exposure to metals in the		Malignant pleural mesothelioma in an asbestos	000531
characteristics of working conditions in the		malmo material.*	#Asbestos fiber in 000066
following brief exposure in cigarette filter		man and animals.*	000046
exposed to asbestosiform minerals in commercial talc		man.*	000177
shipyard processes.*	#A comparison of	management occupational health service in a	000303
#Case records of the		manifestations following the inhalation of	000382
#		manifestations of asbestosis.*	000056
and asbestos with corticotrophin on the mucosal		manifestations of exposure to asbestos dust.*	000196
its #Studies on the deposition of inhaled fibrous		manifestations of malignant pleural mesothelioma.*	000265
and mesothelioma: A re-examination of the malmo		manufacture of asbestos cement products: a	000085
#A retrospective examination of a ten-year-autopsy		manufacture of asbestos textile products.*	000397
#Polycyclic hydrocarbons in various		manufacture of phenoplasts with asbestos filler.*	000310
out in buildings incorporating asbestos-based		manufacture.*	#Asbestosis 000108
in rats after inoculation with asbestos and other		manufacture.*	#A study of workers 000053
#Particulate		mass and fibre concentrations of asbestos dust in	000179
#Progress in instrumentation and techniques for		Massachusetts General Hospital.*	000183
and chronic bronchitis with #Some anomalies in the		Massive fibrosis in asbestosis.*	000221
pulmonary disease.*	#Body plethysmographic	mast cells and tissue eosinophils of rat stomach.*	000532
#Asbestos dust and its	#Asbestos and	material in the respiratory tract of the rat and	000040
textile industry.*		material.*	#Asbestos fiber in the lung 000066
#The		material.*	odies in the lungs and mesothelioma. 000366
foreign bodies: comparison	#The role of chemical	materials containing asbestos.*	000097
#Asbestosis and associated		materials in their construction.*	Survey carried 000318
#The		materials.*	#Mesothelioma 000082
#Toxicity of HeLa cell growth		matter of particular interest.*	000036
#Toxicity of cell culture		measurement of air pollutants.*	000011
appearances of the pneumoconioses: Report of		measurement of pulmonary diffusion in asbestosis	000543
factor from asbestos pad and cellulose acetate		measurements of airway conductance in obstructive	000337
#Radiological survey of		measurements.*	000423
#Insulation workers in Belfast. 2. Morbidity in		Measurement of dust exposures in the asbestos	000429
Basic risk factors of lung cancer in older		mechanism of formation of asbestos bodies.*	000360
mesothelioma and exposure to asbestos dust in the		mediators in the inflammatory response induced by	000269
#Epidemiology of		medical problems.*	000402
		medical risks of exposure to asbestos.*	000415
		medium after passage through asbestos filters.*	000277
		medium due to filtration through asbestos pads.*	000508
		meeting held at Pneumoconiosis Research Unit,	000118
		membrane filters.*	of virus growth by a toxic
		men exposed to asbestos in naval dockyards.*	000441
		men still at work.*	000112
		men.*	000188
		Pulmonary Neoplasm Research Project:	000099
		Merseyside area.*	#Diffuse 000512
		Mesothelioma del peritoneo.*	000339
		mesothelial tumors in the London area.*	000472

## PERMUTED TITLE INDEX

#Epidemiology of primary malignant	#Primary malignant	000279
from studies in South Western Cape Province.*	#Epidemiology of diffuse	000058
	#Diffuse pleural	000492
Merseyside area.*	#Diffuse malignant pleural	000549
	#Diffuse	000233
to asbestos in Victoria.*#Fifteen cases of pleural	#Histological characteristics of	000512
	#Pleural calcification and	000445
observations).*	#Malignant pleural	000332
	#Bronchial cancer and pleural	000485
#Partial intestinal obstruction due to peritoneal	#Malignant	000531
	#Pleural reaction and	000489
	#Asbestos and	000090
	#A transplantable	000515
	#Diffuse	000177
	#Asbestos, asbestosis and	000481
bodies and asbestos fibers found in the lungs of a	#Epidemiology of	000449
	#Peritoneal	000433
	#Peritoneal	000223
year-autopsy	#Asbestos bodies in the lungs and	000088
	#Asbestos and	000386
	#Asbestos bodies and	000291
	#Radiological features of diffuse	000366
	#Radiological features of diffuse	000365
	#Pulmonary asbestosis and peritoneal	000387
#Relation between exposure to asbestos and	#Pulmonary	000300
	#Ultrastructure of human	000299
	#Asbestos - lung cancer -	000399
radiological manifestations of malignant pleural	#Asbestos - lung cancer -	000477
asbestosis and malignant pleuro-peritoneal	#Radiological features of	000077
in the pathogenesis of bronchogenic carcinoma and	#Radiological features of	000223
	#Rapid growth of a pleural	00022
	#Diffuse pleural	000265
#Pulmonary asbestosis with metastatic	#The	000317
material.*	#Asbestos fiber in the lung and	000431
	#Pleural	000192
asbestos.*	#Production of abdominal	000290
	#Diffuse pleural	000477
#Asbestos dust exposure and malignancy (diffuse	#Asbestos, an extrinsic factor	000077
	#Asbestos and	000266
	#Asbestos exposure and pleural	000222
characterization of asbestos particles in pleural	#Asbestos, an extrinsic factor	000133
histopathogenesis and ultrastructure of resulting	#Asbestos, an extrinsic factor	000540
association with asbestos	#The pathology of	000516
fibres to submesothelial tissues and induction of	#The pathology of	000261
pathological and social study.*	#The pathology of	000372
	#The pathology of	000329
exposure to asbestos in the London area.*	#Research and	000073
basal asbestosis.*	mesotheliomas.* in rats with a study of the	000507
	mesothelioma and an analysis of their	000419
and tuberculosis in the North West Cape.*	mesothelioma.* fibres in mice: migration of	000413
injection of asbestos.*	mesothelioma and asbestos exposure.*	000236
asbestos.*	mesothelioma and asbestos on Tyneside - a	000357
inoculation of asbestos.*	mesothelioma and asbestos.*	000430
asbestos and other materials.*	mesothelioma associated with asbestosis.*	000280
	mesothelioma in Scotland.*	000471
#Cytodynamic reactivity of the	mesothelioma of pleura and peritoneum following	000534
to exposure to	mesothelioma of pleura or peritoneum and limited	000266
	mesothelioma of the pleura.*	000471
#Electromotive phenomenon in	mesothelioma, including peripheral lung malignancy	000296
	#A survey of	000482
for the biologic effects attributed to	mesotheliomas in hamsters following intrapleural	000350
	#Trace	000313
#The Role of trace	mesotheliomas in rats following inoculation with	000082
products.*	mesothelioma in rats after inoculation with	000153
#Exposure to	mesothelioma.*	000157
#Effects of chrysotile asbestos on trace	metal and mineral particulate exposures: relevance	000322
	metal carcinogenesis.*	000034
#Pulmonary asbestosis with	metals associated with asbestos fibers responsible	000068
radioautographic study on the incorporation of S35-	metals in asbestos carcinogenesis.*	000253
firm says.*	metals in chemical carcinogenesis.*	000397
	metals in the manufacture of asbestos textile	000203
fibres from subcutaneous injection sites in	metals, hydroxyproline, and aryl hydrocarbon	000435
of acute toxicity of heat-treated asbestos in	metastatic mesothelioma: case report.*	000267
on experimental CHLAMYDIA PSITTACI infection in	methionine and H3-glycine in the experimental	000027
of subcutaneous injections of asbestos fibres in	methodology for asbestos determination is limited,	000268
	mice.* #Migration of asbestos	000411
	mice.* asbestos with preliminary report	000124
animals.*	mice: migration of fibres to submesothelial	000419
	microprobe analysis of asbestos bodies.*	000276
examination of microspecimens with the polarizing	microprobe analysis.*	000275
pneumonia associated with asbestos.*	microscope studies of asbestosis in man and	000446
	microscope.* with an asbestos coniosis detected by	000394
	microscopic studies in desquamative interstitial	000102

## PERMUTED TITLE INDEX

the lung.*	#An electron	microscopy study of the effect of asbestos dust on	000498
in the lungs of a mesothelioma patient by electron	microscopy.*	bodies and asbestos fibers found	000088
an asbestos coniosis detected by examination of	microspecimens with the polarizing microscope.*	000394	
injections of asbestos fibres in mice: injection sites in mice.*	migration of fibres to submesothelial tissues and	000419	
#Asbestos bodies in the lungs of inhabitants of	migration of asbestos fibres from subcutaneous	000268	
#Lung function in chrysotile asbestos mine and	Milan.*	000404	
#The health of chrysotile asbestos mine and	mill workers of Quebec.*	000095	
symptoms in chrysotile asbestos mine and	mill workers of Quebec.*	000115	
for the continuous generation of dust clouds from	mill workers of Quebec.*	#Respiratory	
#Dust problems in the mining, of dust exposure in the Quebec asbestos mining and	milligram quantities of asbestos.*	000181	
#Mortality in the chrysotile asbestos mines and	-a dispenser	000274	
Dust exposure in the chrysotile asbestos mines and	milling and packaging of asbestos.*	000174	
#Respiratory symptoms in chrysotile asbestos	#Qualitative aspects	000198	
#Lung function in chrysotile asbestos	mills of Quebec.*	000198	
macrophages.*	mills of Quebec.*	#000107	
#Cytotoxic effects of some	mine and mill workers of Quebec.*	000117	
oils from asbestos and #Studies of hydrocarbons on	mine and mill workers of Quebec.*	000095	
#Haemolytic activity of asbestos and other	mine and mill workers of Quebec.*	000015	
#Interactions of	mineral dusts on Syrian hamster peritoneal	000147	
#Infrared spectra for	mineral dusts. The elution of 3,4-benzpyrene and	000504	
exposure to #Electromotive phenomenon in metal and	mineral dusts.*	000414	
IN VITRO toxicity of dusts of certain polymers and	mineral fiber surfaces with cells in vitro.*	000135	
#A study of workers exposed to asbestosiform	mineral identification.*	000304	
#Asbestos	mineral particulate exposures: relevance to	000157	
study of 16 cases of pleurisy with effusions in ex-	minerals and their fibrogenicity.*	000156	
in lungs with asbestosis, made during work on coal	between minerals in commercial talc manufacture.*	000053	
#Asbestosis in South African asbestos	minerals in modern technology.*	000343	
#Dust in South African asbestos	miners from Witteenoos Gorge.*	#A 000103	
#Dust exposure in the chrysotile asbestos	miners pneumoconiosis.*	000470	
#Mortality in the chrysotile asbestos	content and composition	000297	
crocidolites from Transvaal and North-west Cape	miners.*	000255	
aspects of dust exposure in the Quebec asbestos	mines and fiberizing plants.*	000107	
#Dust problems in the	mines and mills of Quebec.*	000198	
#Investigation of a	mines on the lungs of rats and guinea pigs.*	000098	
#Asbestos minerals in	mining and milling industry.*	#Qualitative	
#Asbestos as a	#Qualitative	000174	
**Each glass is another	mining, milling and packaging of asbestos.*	000274	
CANDIDA ALBICANS infection on the lungs of Rhesus	minor asbestos hazard.*	000412	
#Insulation workers in Belfast. 2.	modern asbestos hazard.*	000343	
* #Cytologic	modern urban hazard.*	000520	
injection of asbestos #Investigations concerning	moment of truth.*	000086	
effect of asbestos exposure and smoking on	Monkeys.*	000087	
#The	effect of asbestos dust and	000188	
factory in Finland.*	Morbidity in men still at work.*	000417	
#A study of the	morphology of the sputum in asbestosis of the lung.	000070	
the Urals.*	morphology of tumors induced in rats by i.p.	000096	
#The cancer	mortality from lung cancer in factory workers.*	000285	
United States.*	mortality of asbestos factory workers.*	000121	
workers, 1943-1968.*	mortality of workers in an anthophyllite asbestos	000123	
workers in an asbestos textile factory.*	mortality of workers in an asbestos factory.*	000333	
mills of Quebec.*	mortality rate among asbestos industry workers in	000116	
#Insulation workers in Belfast. 3.	Mortality among asbestos products workers in the	000451	
in 108 cases of asbestosis proved at post-	Mortality experiences of asbestos insulation	000295	
#Induction of carcinomas from	Mortality from lung cancer and other causes among	000369	
their passage through the intestinal wall and	Mortality in the chrysotile asbestos mines and	000198	
obstructive airway disease, and asbestosis.*	Mortality 1940-66.*	000166	
#fibroblasts exposed to chrysotile	Mortes.*	#A pathological-radiological correlation	
#Collagen and	mouse lung transplanted with asbestos.*	000341	
of heparin and asbestos with corticotrophin on the	movement through the body.*	water, and tissues:	
#Tumour initiation by	movement through the body.*	000035	
of carcinogenesis of asbestos fibers and their	Mucociliary function in health, chronic	000348	
crocidolite asbestos and banded ironstone.*	mucopolysaccharide production in growing lung	000067	
#Asbestos hazards in	mucosal mast cells and tissue eosinophils of rat	000532	
#Radiological survey of men exposed to asbestos in	natural and contaminating asbestos oils.*	000432	
#Asbestos and cancer of head and	natural oils.*	#Studies 000456	
#Retrospective search for asbestos bodies in	Natural occurrence of amino acids in virgin	000528	
lung smears for asbestos bodies in 109 consecutive	naval dockyards.*	000367	
#Correlation between lung asbestos count at	naval dockyards.*	000112	
#Prevalence of "asbestos" bodies in human lungs at	neck.*	000076	
#Asbestos bodies in lungs at	necropsies and biopsies on cases of primary	000335	
bodies and pleural plaques in human lungs at	necropsies in Perugia.*	#Examination of 000336	
#Diagnosis of asbestosis by	necropsy and radiological appearances.*	000331	
#Pulmonary	necropsy.*	000319	
exposure to airborne inorganic fibers.*	necropsy.*	000418	
#Asbestosis and	necropsy.*	#Asbestos 000047	
#Asbestos and	needle lung biopsy.*	000393	
#Asbestosis and	neoplasia among Dresden asbestos workers.*	000463	
#Asbestos exposure, smoking, and	Neoplasia risk associated with occupational	000216	
lung cancer in older	neoplasia.*	000420	
#Asbestos exposure and	neoplasia.*	000378	
The Philadelphia Pulmonary	neoplasia.*	000368	
Neoplasm Research Project: Basic risk factors of	neoplasia.*	000384	
	neoplasia.*	000513	
		000099	

## PERMUTED TITLE INDEX

#Asbestosis and abdominal	neoplasms.*	000546
*Asbestosis and primary intrathoracic	neoplasms.*	000442
osteoarthropathy and	neoplastic disorders of the hematopoietic system.*	000259
cobalt, nickel, and scandium in asbestos by	neurogenic sarcoma with hypertrophic pulmonary	000155
the composition and biological effects of	neutron activation analysis.* of iron, chromium,	000180
*The synthesis of collagen by	Neutron activation techniques in investigations of	000284
*Mainly good	newborn hamster fibroblasts.*	000264
*Determination of iron, chromium, cobalt,	news about asbestos.*	000091
distribution in abdominal granulomas and lymph	nickel, and scandium in asbestos by neutron	000180
*Asbestosis in	nodes of the rat following intraperitoneal	000172
exposure compared with relevant findings in the	nodular lesions of the lung: a radiologic study.*	000374
*Occupational and	non-experimental animals in South Africa.*	000141
*Occupational and *	non-exposed population.* due to asbestos	000205
*Unusual ferruginous bodies - their formation from	non-occupational exposures to asbestos.*	000461
*Asbestos: some	non-occupational" asbestos in Finland.*	000375
**"Asbestos" bodies: their	Nonabsorbable dusts.*	000215
peripheral lung malignancy and tuberculosis in the	nonfibrous particulates and from carbonaceous	000176
pleural mesothelioma and asbestos exposure in the	Nonoccupational diffuse pulmonary fibrosis.*	000525
effects of inhaled crocidolites from Transvaal and	nonradiological aspects.*	000189
*Epidemiological study of asbestos workers in	nonspecificity.*	000406
radiographs of	North West Cape.* Mesothelioma, including	000296
chronic asbestos exposure.*	North Western Cape Province.*	000549
*Partial intestinal	*Diffuse	000098
variables in evaluating asbestosis and chronic	North-west Cape mines on the lungs of rats and	000392
*Mucociliary function in health, chronic	Northern Italy.*	000443
measurements of airway conductance in	observer variation in the classification of	000090
*Talc: A possible	obstruction due to peritoneal mesothelioma in	000208
*The role of international research in	obstructive airway disease in asbestos workers.*	000348
*Neoplasia risk associated with	obstructive airway disease, and asbestosis.*	000337
cases of pleural mesothelioma associated with	obstructive pulmonary disease.* plethysmographic	000030
workers.*	occupational and environmental carcinogen.*	000137
*Respiratory cancer in relation to	occupational cancer.*	000216
*Occupational and non-	occupational exposure to airborne inorganic fibers.	000332
of sprayed inorganic fiber containing asbestos:	occupational exposure to asbestos in Victoria.*	000038
industry.*	occupational exposures among retired asbestos	000461
*A labor-management	occupational exposures to asbestos.*	000129
*Occupational and "non-	occupational health hazards.*	000303
Finland.*	Application	000375
asbestos.*	occupational health service in a construction	000032
lung cancer.*	occupational" asbestosis in Finland.*	000457
Commission and International Association on	Occupational and "non-occupational" asbestosis in	000456
mineral dusts. The elution of 3,4-benzpyrene and	Occupational and non-occupational exposures to	000461
initiation by natural and contaminating asbestos	Occupational exposure and its relation to type of	000246
of asbestos fibers and their natural	Occupational hazards of pipe insulators.*	000426
Project: Basic risk factors of lung cancer in	Occupational Health on Asbestosis of the Permanent	000159
action.*	occurrences, and major uses of asbestos.*	000504
*Asbestos types, their	oils from asbestos and coals dusts by serum.* on	000432
environmental groups.*	oils.*	000046
*The response of human pleura in	#Studies of carcinogenesis	000456
asbestos dust on lung macrophages maintained in	older men.* Pulmonary Neoplasia Research	000099
and isolation of (3H)benz(a)pyrene from the animal	optical investigations and their pathological	000548
injection of asbestos-	optical test method criticized by USDI,	000006
*Changes in certain	organ culture to asbestos.*	000128
Ferromagnetic contamination in the lungs and other	organ culture.*	000398
neurogenic sarcoma with hypertrophic pulmonary	The effects of chrysotile	000289
CHLAMYDIA	organism after its intratracheal injection with	000328
*Effect of quartz, coal, titanium	organs after experimental intraperitoneal	000033
*Dust problems in the mining, milling and	organs of the human body.*	000061
of virus growth by a toxic factor from asbestos	Osha standards and the safe use of asbestos.*	000155
culture medium due to filtration through asbestos	osteoarthropathy and asbestosis.* intrapulmonary	000405
schools contain large proportions of asbestos.*	Ovarian cancer and asbestos.*	000124
*Asbestos contamination of	oxide, and asbestos dusts on experimental	000274
of the lymphatic transport of inspired dust to the	packaging of asbestos.*	000122
*The pathology of	pad and cellulose acetate membrane filters.*	000078
*Asbestos	*Toxicity of cell	000508
*Research and characterization of asbestos	Paper mache products widely used in elementary	000089
*Effects of	parietal drugs.*	000041
with four types of fibers: Importance of small	Parietal pleura.*	000212
air pollution with asbestos and other fibrous dust	Parietal pleural plaques.*	000071
particulates and from carbonaceous fibrous	particles in food and drugs.*	000329
*Electromotive phenomenon in metal and mineral	particles in pleural mesotheliomas.*	000234
*Lysosomes and the toxicity of	particles on lysosomes.*	000150
bodies - their formation from nonfibrous	particles on the number of alveolar macrophages.*	000460
analysis of inspired fibrous pulmonary	particles.*	000151
*Toxicity of HeLa cell growth medium after	Effect on public health of	000176
in beverages, drinking water, and tissues: their	particles.* - their formation from nonfibrous	000139
	particulate exposures: relevance to exposure to	000157
	particulate pollutants.*	000358
	particulates and from carbonaceous fibrous	000176
	particulates.*	Instrumental
	Particulate matter of particular interest.*	000036
	passage through asbestos filters.*	000277
	passage through the intestinal wall and movement	000035

## PERMUTED TITLE INDEX

#Asbestos cancer:	past and future hazards.*	000042
#Comparison of dust retention in specific mesothelioma.*	pathogen free and standard rat.*	000469
#Some aspects of asbestos, an extrinsic factor in the injection of asbestos and silica.*	pathogenesis of asbestosis.*	000302
#The types, their optical investigations and their #Mesothelioma and asbestos on Tyneside - a Republic of South Africa and the asbestos fibres in mice: migration of fibres #The #Radiological and #Diffuse pleural mesothelioma, a clinical and #The risk of asbestosis from a of asbestos proved at post-mortem.*	pathogenesis of bronchogenic carcinoma and pathogenesis of pleural plaques.*	000431
of asbestos-exposed workers and the relation of function.*	pathogenesis of tumors following the intrapleural pathogenicity of asbestos dust.*	000305
#The #Differential diagnosis in the their association with asbestos exposure.*	pathological action.*	000312
#The asbestos exposure.*	#Asbestos pathological and social study.*	00045
fibers found in the lungs of a mesothelioma	pathological correlations in asbestosis in the	000548
The special characteristics of bronchial cancer in	pathological effects of subcutaneous injections of	000236
#Studies on the course of asbestosis	pathological study.*	000479
in the lungs of a series of Finnish lung cancer	pathological-anatomical viewpoint.*	000419
#Imunolectrophoretic	pathological-radiological correlation in 108 cases	000290
asbestos cement	#Pathological anatomy of hyaline pleural plaques.*	000427
#Radiographic and physiologic	pathology and x-ray appearances.*	000443
tract of rats.*	of radiographs	000537
study.*	pathology of asbestosis with reference to lung	000453
caused by inhalation of asbestos dust over long	pathology of asbestosis.*	000262
North West Cape.*	pathology of mesotheliomata and an analysis of	000115
#Mesothelioma, including effects of some mineral dusts on Syrian hamster	pathology of parietal pleural plaques.*	000507
exposure.*	#Pathology of carcinoma of the lung associated with	000363
#Partial intestinal obstruction due to	patient by electron microscopy.*	000088
#Pleuro-pulmonary asbestosis and malignant pleuro-	and asbestos	000529
#Pulmonary asbestosis and	patients with asbestosis (three new cases).*	000333
	#Asbestos bodies	000282
	pattern changes in asbestosis.*	000168
	patterns among workers engaged in manufacture of	000085
	patterns of U.I.C.C. asbestos samples.*	000218
	Penetration of asbestos through the digestive	000065
	penicillin induced pleurodesis: an experimental	000373
	periods.*	000059
	#Cellular reaction in the human lung	000296
	peripheral lung malignancy and tuberculosis in the	000147
	peritoneal macrophages.*	000090
	#Cytotoxic	000317
	peritoneal mesothelioma in chronic asbestos	000399
	peritoneal mesothelioma.*	000291
	peritoneal mesothelioma presenting surgically.*	000503
	#Peritoneal mesothelioma. A report of 4 cases.*	000339
	peritoneal tumours in asbestosis.*	000338
	peritoneo.*	000471
	peritoneum and limited basal asbestosis.*	000159
	peritoneum following exposure to asbestos in the	000062
	Permanent Commission and International Association	000120
	persons exposed to asbestos dust.*	000187
	#Development	000169
	persons exposed to asbestos dust, and in the	000345
	persons in New York City.*	000452
	persons: A means of obtaining histories of	000336
	perspectives from an old scout.*	000020
	#The spectre of	000136
	perspectives: the changing hazards of exposure to	000219
	Perugia.*	000388
	#Examination of lung smears for	0000157
	pesticides is not a health hazard.*	000099
	Phagocytic activity of the alveolar epithelial	000085
	phagocytosed asbestos dust with lysosome enzymes.*	000427
	#Phagocytosis of asbestos fibers by epithelial	000547
	phenomenon in metal and mineral particulate	000310
	phenoplasts with asbestos filler.*	000098
	characteristics	000079
	Philadelphia Pulmonary Neoplasm Research Project:	000020
	physiologic patterns among workers engaged in	000490
	physiological findings in asbestosis.*	000500
	physiological observations in ten cases of	000425
	picture in 29 cases.*	000321
	#Correlation	000105
	picture of dust-induced pulmonary disease	000490
	Piedmont and Lombardy.*	000500
	pig lungs.*	000425
	pig.*	000198
	pigs after inhalation of anthophyllite.*	000162
	#Asbestos-	000079
	pigs by the injection of chrysotile asbestos dust.*	000080
	pigs in experimental asbestosis.*	000050
	pigs to amosite dust.*	000252
	pigs.*	000081
	#Pulmonary lysosomal	000098
	pigs.*	000204
	crocidolites from Transvaal and North-	000320
	pipe coverers and controls.*	000256
	radiologic	000426
	pipe factory.*	000017
	pipe insulators.*	000255
	#Chest	000021
	pipes.*	#Dust
	plants.*	000255
	plants.*	#Wastewater

## PERMUTED TITLE INDEX

male autopsies.*	#Pleural fibrocalcific	plaques and asbestos exposure.*	000371
significance.*	#Calcified pleural	plaques and splenic capsular sclerosis in adult	000130
	#Asbestos bodies and pleural	plaques in asbestosis: An investigation into their	000511
	#Aetiology of pleural	plaques in human lungs at necropsy.*	000047
	#The pathogenesis of pleural	plaques.*	000292
	#The pathological of parietal pleural	plaques.*	000305
	#Pathological anatomy of hyaline pleural	plaques.*	000212
	epidemiological study from the Hamburg	plaques, asbestosis and exposure to asbestos: an	000249
	#Safe use of asbestos	plastics.*	000113
conductance in obstructive pulmonary disease.*	#Body	plethysmographic measurements of airway	000337
	#Diffuse mesothelioma of the	pleura and asbestos.*	000449
asbestos in the London area.*	#Mesothelioma of	pleura and peritoneum following exposure to	000471
	#Induction of experimental tumors of the	pleura by fibers (asbestos).*	000229
	#The response of human	pleura in organ culture to asbestos.*	000128
	#Mesothelioma of	pleura or peritoneum and limited basal asbestosis.*	000534
	#On the epidemiology of asbestosis of the	pleura.*	000125
	#Mesothelioma of the	pleura.*	000266
	#Asbestos, asbestosis and mesothelioma of the	pleura.*	000433
	transport of inspired dust to the parietal	#A current hypothesis of the lymphatic	000078
	and malignancy (diffuse mesotheliomas of the	pleura).*	000516
	#Asbestos content of the soil and endemic	#Asbestos dust exposure	000245
	#The early radiological changes in pulmonary and	pleural asbestosis.*	000257
workers.*	#The occurrence of	pleural calcification among asbestos insulation	000475
	content of the soil in regions with endemic	pleural calcification in persons exposed to	000120
	and crocidolite asbestos dust injected into the	pleural calcifications.*	000101
	its relation to asbestos exposure and previous	#Sepiolite	000251
	exposed to asbestos dust.*	pleural cavity of experimental animals.*	000100
	#Development of	chrysotile	000062
	#Mesotheliomas in rats following the intra-	pleural disease.*	000313
	injection of	#A survey of pleural thickening:	000162
	#The calcification of fibrous	pleural hyalinosis in long term studies of persons	000450
	#Relationship between exposure to asbestos and	pleural inoculation of asbestos.*	000233
North Western Cape Province.*	#Diffuse	pleural lesions produced in guinea-pigs by the	0000549
	#Diffuse malignant	pleural malignancy in Belfast.*	000233
exposure to asbestos in Victoria.*	#Fifteen cases of	pleural mesothelioma and asbestos exposure.*	000332
	#Malignant	pleural mesothelioma associated with occupational	000531
new observations).*	#Bronchial cancer and	pleural mesothelioma in an asbestos worker.*	000489
	#The radiological manifestations of malignant	pleural mesothelioma in cases of asbestosis (two	000192
	#Rapid growth of a	pleural mesothelioma.*	000265
study.*	#Diffuse	pleural mesothelioma, a clinical and pathological	000290
	#Diffuse	pleural mesotheliomas in South Africa.*	000540
	#Asbestos exposure and	pleural mesotheliomas.*	000372
and characterization of asbestos particles in	#Calcified	#Research	000329
into their significance.*	#Asbestos bodies and	pleural plaques in asbestosis: An investigation	000511
	#The pathogenesis of	pleural plaques in human lungs at necropsy.*	000047
	#Aetiology of	pleural plaques.*	000305
	#Pathological anatomy of hyaline	pleural plaques.*	000292
	#The pathology of parietal	pleural plaques.*	000227
exposure and previous pleural disease.*	#A survey of	pleural thickening: its relation to asbestos	000212
		Pleural asbestosis in agricultural workers.*	000422
		Pleural asbestosis.*	000527
		Pleural calcification and mesothelioma following	000485
exposure to asbestos.*	#Calcified	Pleural calcifications associated with an asbestos	000394
coniosis detected by examination of	#Asbestos bodies and	Pleural calcifications due to asbestos exposure	000205
compared with relevant findings in the non-	#The pathogenesis of	Pleural calcifications in asbestosis and in	000283
tuberculosis: elements of differential diagnosis.*	#Aetiology of	Pleural fibrocalcific plaques and asbestos	000371
exposure.*	#Pathological anatomy of hyaline	Pleural manifestations following the inhalation of	000382
asbestos in relation to malignant change.*	#The pathology of parietal	Pleural manifestations of asbestosis.*	000056
		Pleural mesotheliomas in dockers.*	000222
adult male autopsies.*	#A study of 16 cases of	Pleural plaques and splenic capsular sclerosis in	000130
asbestos: an epidemiological study from the	#Benign asbestos	Pleural plaques, asbestosis and exposure to	000249
injected with asbestos.*	#Pleuro-pulmonary asbestosis and malignant	Pleural reaction and mesothelioma in hamsters	000515
Wittenoom Gorge.*	#Peritoneal mesothelioma.*	pleurisy with effusions in ex-miners from	000103
	#Asbestos-penicillin induced	pleurisy.*	000448
	#Some current concepts of the	Pleuro-peritoneal mesothelioma.*	000317
Classification of the radiographic appearances of		Pleuro-pulmonary asbestosis and malignant pleuro-	000317
Classification of radiographic appearances of the		pleurodesis: an experimental study.*	000373
	#Evidence of dose-response relation in	pneumoconioses.*	000028
	#Relationship between	pneumoconioses.* #Special Report - UICC/Cincinnati	000242
	#Rheumatoid	pneumoconioses: Report of meeting held at	000114
	#Rheumatoid	pneumoconiosis (1).*	000131
	#What in	pneumococcosis and lung cancer.*	000340
the international classification of radiographs in		pneumoconiosis in an asbestos worker.*	000542
with asbestosis, made during work on coal miners		pneumoconiosis in association with asbestosis.*	000510
CANDIDA ALBICANS infection #Experimental infective		pneumoconiosis should be compensated?*	000314
of the pneumoconioses: Report of meeting held at		pneumoconiosis.* of asbestos in relation to	000241
microscopic studies in desquamative interstitial		pneumoconiosis.* content and composition in lungs	000470
		pneumoconiosis; effect of asbestos dust and	000087
		Pneumoconiosis Research Unit, Cardiff, Wales,	000114
		pneumonia associated with asbestos.* #Electron	000102

## PERMUTED TITLE INDEX

detected by examination of microspecimens with the	polarizing microscope.* with an asbestos coniosis	000394
*Lysosomes and the toxicity of particulate	pollutants.*	000139
*List of hazardous air	pollutants.*	000214
and techniques for measurement of air	pollutants.*	000011
old scout.*	*Progress in instrumentation	000345
*The spectre of today's environmental	pollution - USA brand: new perspectives from an	000465
*Observations on atmospheric air	pollution caused by asbestos.*	000409
*Status of air	pollution health research, 1966.*	000409
particles.*	pollution with asbestos and other fibrous dust	000151
*Effect on public health of air	pollution at work: dusty work in the 1970's.*	000197
hazards associated with community asbestos air	pollution.*	000217
containing asbestos.*	*Critical evaluation of disease	000097
*Associated with the storage of asbestos in	Polycyclic hydrocarbons in various materials	000323
between IN VITRO toxicity of dusts of certain	polyethylene bags.*	000156
asbestos fibers.*	*Some problems	000293
exposed to asbestos dust, and in the general	polymers and minerals and their fibrogenicity.*	000120
*Some observations on asbestosis in a factory	Polymers as selective antagonists of hemolytic	000298
compared with relevant findings in the non-exposed	population in the same district.*	000205
1. Comparison of a random sample with a control	in persons	000230
correlation in 108 cases of asbestosis proved at	population.*	000514
*Asbestos as a	due to asbestos exposure	000194
*Buildings insulated with sprayed asbestos: a	population.*	000050
in rats.*	*Insulation workers in Belfast.	000010
*Evaluation of the tumorigenic	post-mortem.*	000094
glucose and talc.*	*A pathological-radiological	000127
*On macrophage cultures of glass fibre, glass	potential carcinogen for fowls.*	000152
*tumors of rats after i.p. injection of	potential hazard.*	000050
*Health in	potential of vermiculite by intrapleural injection	000085
*tissue response to intraperitoneal asbestos with	Potential hazard from eating rice coated with	000443
fibers, including chrysotile, in lungs at autopsy:	powder, and chrysotile asbestos.*	000386
in manufacture of asbestos cement products: a	of effects	000390
classification of radiographs of asbestos- III. A	powdered chrysotile and benzo(a)pyrene.*	000390
*Peritoneal mesothelioma	power stations.*	000152
*Ferruginous bodies in human lungs:	preliminary report of acute toxicity of heat-	000411
necropsy.*	preliminary report.*	000185
*	*Inorganic	000085
asbestosis in ship repair workers.*	preliminary report.*patterns among workers engaged	000050
exposed to asbestos dust, and in the general	preliminary study of observer variation in the	000120
*practical steps towards the	presenting surgically.*	000194
*Asbestos: health hazards, limiting values,	prevalence at random autopsies.*	000050
thickening: its relation to asbestos exposure and	Prevalence of "asbestos" bodies in human lungs at	000377
*bodies in necropsies and biopsies on cases of	Prevalence of asbestos bodies in basal lung smears.	000168
*Epidemiology of	Prevalence of chronic respiratory disease;	000120
and report of a case associated with *Resection of	Prevalence of pleural calcification in persons	000254
associated with bronchogenic carcinoma.*	prevention of bronchial carcinoma.*	000048
*hypertrophic pulmonary osteoarthropathy and	prevention.*	000100
*Part 191 - Hazardous substances: Definitions and	previous pleural disease.*	000442
large proportions of asbestos.*	*A survey of pleural	000035
*Paper mache	primary malignant disease of the lung.*	000279
*Mortality among asbestos	asbestos	000501
*Brake lining decomposition	primary malignant mesothelial tumors in Canada.*	000085
to metals in the manufacture of asbestos textile	primary pulmonary sarcoma. Review of literature	000155
workers engaged in manufacture of asbestos cement	*Inorganic	000058
*Health	primary cytologic diagnosis of asbestosis	000335
measurement of air pollutants.*	primary intrapulmonary neurogenic sarcoma with	000092
by	*Inorganic	000386
*Experimental asbestosis: studies on the	primary malignant mesothelial tumors in Canada.*	000451
building construction.*	procedural and interpretative regulations.*	000370
*The Philadelphia Pulmonary Neoplasm Research	products widely used in elementary schools contain	000089
widely used in elementary schools contain large	products workers in the United States.*	000397
in asbestosis: serial tests in a long-term	products.*	000085
*The	#Exposure	000539
*Serum	products: a preliminary report.*	00007
correlation in 108 cases of asbestosis	patterns among	000043
and asbestos exposure in the North Western Cape	progress in an asbestos textile works.*	000097
and asbestos dusts on experimental CHAMYDIA	Progress in instrumentation and techniques for	000011
Production of abdominal mesotheliomas in rats with	progressiveness of the pulmonary fibrosis caused	000040
*The health of the	prohibition of the use of asbestos spray in	000099
other fibrous dust particles.*	Project: Basic risk factors of lung cancer in	000089
*Effect on	proportions of asbestos.*	000439
*The early radiological changes in	*Paper mache products	000024
peritoneal mesothelioma.*	prospective study.*	000381
*Pleuro-	#Pulmonary function	000165
*Radiological classification of	protein coating of asbestos bodies.*	000099
*Chest auscultation in the diagnosis of	proteins and amino acids in asbestos.*	000549
activity of the alveolar epithelial cells in	proved at post-mortem.*	000124
of literature and report of a case associated with	*A pathological-radiological	000133
*Experimental	#Diffuse pleural mesothelioma	000081
*Cocarcinogenic studies in	PSITTACI infection in mice.*	000381
*Asbestosis and	coal, titanium oxide,	000151
the development of lung cancer in rats with	Pu 239 and chrysotile asbestos.*	000257
bronchitis	#Inorganic	000060
*Some anomalies in the measurement of	pulmonary asbestos and malignant pleuro-	000040
of the silicate	pulmonary asbestos.*	000136
*Clinical picture of dust-induced	pulmonary asbestos.*	000501
measurements of airway conductance in obstructive	*Phagocytic	000348
observations.*	pulmonary asbestos.*	000286
*Industrial	pulmonary sarcoma. Review	000447
	pulmonary carcinogenesis with asbestos.*	000008
	#Inorganic	000543
	pulmonary deposits of chrysotile asbestos dust.*	000105
	pulmonary diffusion in asbestosis and chronic	000337
	pulmonary disease following exposure to some types	000272
	pulmonary disease.*	000272
	#Body plethysmographic	000272
	pulmonary disease: clinical and experimental	000272

## PERMUTED TITLE INDEX

#Incidence of asbestosis: studies on the progressiveness of the	000240
*Cigarette smoking, asbestos, and	000407
#Nonoccupational diffuse	000232
tests and electrocardiographic examinations in	000525
#The discriminant value of	000355
relative importance of clinical, radiological and	000487
transbronchial forceps biopsy in the diagnosis of	000208
asbestosis.*	000364
#The effect of	000106
neurogenic sarcoma with hypertrophic	000155
#Instrumental analysis of inspired fibrous	000358
of a case associated with	000501
#Effect of asbestos and serpentine dusts on	000428
Lombardy.*	000490
#Association of	000287
assessed by two methods.*	000399
case report.*	000435
study of their central fiber.*	000541
amosite dust.*	000326
workers with varying duration of exposure to	000080
year follow-up-study.*	000238
a long-term prospective study.*	000403
asbestosis in guinea pigs.*	000535
*	000439
factors of lung cancer in older	000081
#Tests for effect of asbestos on benzo (a)	000463
of the distribution and isolation of (3H)benz(a)	000099
i.p. injection of powdered chrysotile and benzo(a)	000468
asbestos mining and milling industry.*	000289
on experimental CHLAMYDIA PSITTACI	000127
#Effect of	000174
#Qualitative aspects of dust exposure in the	000124
function in relation to radiographic changes in	000174
#Dust-fiber relationships in the	000174
in the chrysotile asbestos mines and mills of	000239
in the chrysotile asbestos mine and mill workers of	000012
in the chrysotile asbestos mines and mills of	000198
in the chrysotile asbestos mine and mill workers of	000015
in the chrysotile asbestos mine and mill workers of	000107
#PDA's proposed method of analysis for asbestos	000095
#Asbestos:	000117
of the rat and its subsequent clearance using	000118
constituents of chrysotile asbestos <i>in vivo</i> using	000142
tritiated 3,4-benzopyrene in	000040
#Elimination of	000202
methionine and H3-glycine in the experimental	000338
#A Report - UICC/Cincinnati Classification of the	000267
status of the UICC/Cincinnati Classification of	000242
#Lung function in relation to	000114
duration of exposure to	000239
#Pulmonary function and	000238
in relation to the international classification of	000241
of observer variation in the classification of	000443
workers engaged in manufacture of asbestos cement	000085
shipyard pipe coverers	000204
#Clinical, environmental,	000374
#Asbestosis and nodular lesions of the lung: a	000547
cases of asbestosis.*	000208
#Clinical, bronchographic,	000331
evaluating	000257
#The relative importance of clinical,	000479
between lung asbestos count at necropsy and	000514
asbestosis.*	000270
#The early	000196
South Africa and the United Kingdom. I. A proposed	000265
asbestosis proved at post-mortem.*	000321
#A pathological	000321
#Asbestosis: aspects of its	000032
manifestations of exposure to asbestos dust.*	000427
#The	000479
mesothelioma.*	000440
#Correlation between the electrocardiogram and	000299
workers in Singapore. A clinical, functional, and	000300
asbestosis.*	000320
#Clinical,	000112
asbestosis in the Republic of South Africa and	000342
asbestosis.*	000301
factory.*	000524
naval dockyards.*	000017
#Radiology of some rarer dust diseases.*	000390
pipes.*	000230
#Ferruginous bodies in human lungs: prevalence at	000192
#Insulation workers in Belfast. 1. Comparison of a	000524
#Radiology of some	000524
rarer dust diseases.*	000524

## PERMUTED TITLE INDEX

with chrysotile asbestos or benzpyrene in the fibrous material in the respiratory tract of the in abdominal granulomas and lymph nodes of the early effects of chrysotile asbestos dust on the	rat abdominal cavity.*#Cocarcinogenesis of 239Pu02 000069
early effects of chrysotile asbestos dust on the	rat and its subsequent clearance using radioactive 000080
#Collagen biosynthesis in the mucosal mast cells and tissue eosinophils of retention in specific pathogen free and standard	rat following intraperitoneal administration of 000172
retention in specific pathogen free and standard	rat lung.* #The 000506
#The cancer mortality and benzo(a)pyrene.*	rat lungs during exposure to asbestos.* 000161
materials.*	rat stomach.* and asbestos with corticotrophin on 000532
and North-west Cape mines on the lungs of	rat.* #Comparison of dust 000469
#Asbestos-body formation in the lungs of	rate among asbestos industry workers in the Urals.* 000116
concerning morphology of tumors induced in	rats after i.p. injection of powdered chrysotile 000127
asbestos.*	rats after inoculation with asbestos and other 000082
#Mesotheliomas in	rats and guinea pigs.* crocidolites from Transvaal 000098
asbestos.*	rats and guinea-pigs after inhalation of 000148
#Mesotheliomas in	rats by i.p. injection of asbestos dusts.* 000070
#Mesotheliomas in	rats following inoculation with asbestos.* 000350
injection of two types of asbestos in asbestosis: the development of lung cancer in	rats following the intra-pleural inoculation of 000313
#Production of abdominal mesotheliomas in	rats with a study of the histopathogenesis and 000073
#Asbestos dust deposition and retention in	rats with pulmonary deposits of chrysotile 000408
intraperitoneal injection of various substances in	rats with Pu 239 and chrysotile asbestos.* 000133
reference asbestos samples on the lungs of	rats.* 000493
of vermiculite by intrapleural injection in	rats.* #Penetration 000065
workers and the relation of pathology and x-	rats.* #Tissue response to a single 000072
amosite and chrysotile in airborne dusts by an X-	rats.* effects of the international standard 000244
#Asbestos fiber in the lung and mesothelioma: A	rats.* #Evaluation of the tumorigenic potential 000050
granulomas and lymph nodes of the #Study of tissue with asbestos.*	ray appearances.* radiographs of asbestos-exposed 000443
#Pleural asbestos dust over long periods.*	ray diffraction method.* #The determination of 000325
#Cellular asbestos-induced intrathoracic tissue	re-examination of the malmo material.* 000066
#Cytodynamic of asbestos exposures in the working environment.	reaction and fibers distribution in abdominal 000172
#Excerpts from the criteria document: I.	reaction and mesothelioma in hamsters injected 000515
#Case	reaction in the human lung caused by inhalation of 000059
#Sepiolite content of the soil in	reactions.* 000046
Definitions and procedural and interpretative	reactivity of the mesothelium.* 000153
#Dust-fiber obtaining histories of #Home interviews with	Recommendation of Sub-Committee on Asbestosis of 000159
in metal and mineral particulate exposures:	Recommendations for an asbestos standard.* 000024
due to asbestos exposure compared with	records of the Massachusetts General Hospital.* 000183
of chronic respiratory disease; asbestosis in ship and pathological correlations in asbestosis in the	regions with endemic pleural calcifications.* 000101
#Rain gets	regulations.* #Part 191 - Hazardous substances: 000092
#The role of international	relationships in the Quebec chrysotile industry.* 000012
particles in pleural mesotheliomas.*	relatives of deceased persons: A means of 000169
to the Director of the International Agency for	relevance to exposure to asbestos and occurrence 000157
cancer in #The Philadelphia Pulmonary Neoplasm	relevant findings in the non-exposed population.* 000205
Report of meeting held at Pneumoconiosis of tritium-labeled asbestos for use in biological	repair workers.* #Prevalence 000168
#Status of air pollution health	Republic of South Africa and the United Kingdom. 000479
literature and report of a case associated with #Chrysotile asbestos in lungs of	request to ban asbestos cement water pipes.* 000017
#Characteristics of	research in occupational cancer.* 000137
United Kingdom.*	Research and characterization of asbestos 000329
#The use of dust	Research on Cancer.* Committee on Asbestos Cancers 000041
workers.*	Research Project: Basic risk factors of lung 000099
#Prevalence of chronic	Research Unit, Cardiff, Wales, April 13-15, 1971.* 000114
the deposition of inhaled fibrous material in the	research.* #The synthesis 000226
asbestos on benzo (a) pyrene carcinogenesis in the	research, 1966.* 000409
exposures among retired asbestos workers.*	Resection of primary pulmonary sarcoma. Review of 000501
and mill workers of Quebec.*	residents of New York City.* 000186
The role of chemical mediators in the inflammatory	respirable asbestos fibers.* 000309
asbestos.*	respirators against asbestos dust hazards in the 000195
#The	respiratory cancer in the asbestos industry.* 000039
#Evidence of dose-	respiratory disease; asbestosis in ship repair 000168
various substances in rats.*	respiratory tract of the rat and its subsequent 000040
#Tissue	respiratory tract.* #Tests for effect of 000468
preliminary report of acute toxicity of #Tissue	Respiratory cancer in relation to occupational 000038
#Biologic	Respiratory symptoms in chrysotile asbestos mine 000117
#Are trace metals associated with asbestos fibers	response induced by foreign bodies: comparison 000269
#Asbestos dust deposition and	response of guinea pigs to amosite dust.* 000080
rat.*	response of human pleura in organ culture to 000128
#Comparison of dust	response relation in pneumoconiosis (!).* 000131
cancer in relation to occupational exposures among	response to a single intraperitoneal injection of 000072
#Asbestos bodies in the lungs and mesothelioma. A	response to asbestos.* 000391
necropsies and biopsies on cases of primary	response to intraperitoneal asbestos with 000411
#Resection of primary pulmonary sarcoma.	response to kind and amount of asbestos.* 000052
and CANDIDA ALBICANS infection on the lungs of	responsible for the biologic effects attributed to 000034
workers.*	retention in rats.* 000493
#Circulating	retention in specific pathogen free and standard 000469
to asbestos.*	retired asbestos workers.* #Respiratory 000038
asbestosis.*	retrospective examination of a ten-year-autopsy 000366
#Asbestosis in	Retrospective search for asbestos bodies in 000335
	Review of literature and report of a case 000501
	Rhesus Monkeys.* effect of asbestos dust 000087
	Rheumatoid and antinuclear factors in asbestos 000315
	Rheumatoid factor in serum of individuals exposed 000473
	#Rheumatoid pneumoconiosis in an asbestos worker.* 000542
	#Rheumatoid pneumoconiosis in association with 000510
	Rhodesia.* 000258

## PERMUTED TITLE INDEX

#Talc-treated	rice and Japanese stomach cancer.*	000200
#Potential hazard from eating	rice coated with glucose and talc.*	000010
#Talc and asbestos contamination of	rice.*	000199
airborne inorganic fibers.*	risk associated with occupational exposure to	000216
Pulmonary Neoplasm Research Project: Basic	risk factors of lung cancer in older men.*	000099
viewpoint.*	risk of asbestos from a pathological-anatomical	000064
	risks of exposure to asbestos.*	000415
	Roentgenologic aspects of asbestosis.*	000538
#The	safe use of asbestos.*	000061
#The medical	# Safe use of asbestos plastics.*	000113
	# Safety - asbestos.*	000163
#Osha standards and the	# Safety of food additives and solvents.*	000167
	saliva and sputum relationship to smoking and	000248
	sampling and counting techniques in the asbestos	000459
	sampling instruments and dust standards in the	000247
	sarcoma with hypertrophic pulmonary	000155
	Review of literature and report of a case	000501
industrial exposures.*	says asbestos in pesticides is not a health hazard.	000020
	#Proposed methodology	000027
	scandium in asbestos by neutron activation	000180
	#Primary intrapulmonary neurogenic	000269
associated with	resection of primary pulmonary	
*	#EPA's Korp	
	for asbestos determination is limited, firm	
	of iron, chromium, cobalt, nickel, and	
	induced by foreign bodies: comparison with the	
#Paper mache products widely used in elementary		
	#Pleural plaques and splenic capsular	
	#Mesothelioma in	
	- USA brand: new perspectives from an old	
biopsies on cases of primary	#Retrospective	
London 1936-66.*	#Study of the	
factory.*	#FDA	
contamination*	#Polymers as	
*	dusts with special respect to fibre length and	
	endemic pleural calcifications.*	
	#The	
	#Pulmonary function in asbestosis:	
	#Asbestos bodies in the lungs of a	
	#Effect of asbestos and	
	#Identification of	
	#Biochemical changes in	
	#Rheumatoid factor in	
	and oils from asbestos and coals dusts by	
	#A labor-management occupational health	
	of chronic respiratory disease; asbestosis in	
	radiologic and epidemiologic observations in	
	mass and fibre concentrations of asbestos dust in	
	#What in pneumoconiosis	
	#Effects of	
	the intrapleural injection of asbestos and	
	disease following exposure to some types of the	
	#Fibrous	
	S35-methionine and H3-glycine in the experimental	
	carbon and carbonardum on the development of	
	radiological survey.*	
	#Asbestos workers in	
	substances in rats.*	
	#Tissue response to a	
	of asbestos fibres from subcutaneous injection	
	#Incidence of "asbestos" bodies in basal lung	
	necropsies in Perugia.*	
	#Examination of lung	
	#Prevalence of asbestos bodies in basal lung	
	#Thiocyanate in saliva and sputum: relationship to	
	workers.*	
	#Combined effect of asbestos exposure and	
	#Asbestos exposure,	
	#Cigarette	
	and asbestos on Tyneside - a pathological and	
	#Asbestos content of the	
	calcifications.*	
	#Sepiolite content of the	
	in vivo using radioactive tracer	
	#Studies of the	
	#Safety of food additives and	
	#Wastewater limits	
	fiber emissions from industrial and commercial	
	environmental considerations.*	
	#Asbestosis in	
	correlations in asbestosis in the Republic of	
	tumors: evidence of an association from studies in	
	#Asbestos exposure in	
	#Asbestosis in non-experimental animals in	
	#Diffuse pleural mesotheliomas in	
	#Industrial cancer in	
	biological importance of fibre diameters of	
	#Asbestosis in	
	#Dust in	
*	of asbestos containing "asbozurite" and "	
	#Infrared	
	spectra for mineral identification.*	

## PERMUTED TITLE INDEX

brand: new perspectives from an old scout.*	*The	spectre of today's environmental pollution - USA	000345
*#Pleural plaques and	#Worker-	splenic capsular sclerosis in adult male autopsies.	000130
#The prohibition of the use of asbestos		sponsored survey for asbestosis.*	000084
#Buildings insulated with		spray in building construction.*	000083
occupational health hazards.*	#Application of	sprayed asbestos: a potential hazard.*	000194
#Cytologic morphology of the		sprayed inorganic fiber containing asbestos:	000129
exposures.*	#Thiocyanate in saliva and	sputum in asbestosis of the lung.*	000417
of dust retention in specific pathogen free and		Sputum examination in asbestosis.*	000530
of #The biological effects of the international		sputum: relationship to smoking and industrial	000248
of the International Union Against Cancer		standard rat.*	000669
#UIICC		#Comparison	
document: I. Recommendations for an asbestos	#OSHA	standard reference asbestos samples on the lungs	000244
#Dust sampling instruments and dust	#Hygiene	standard reference samples of asbestos.*	000306
asbestos.*	#Health criteria and	standard reference samples of asbestos.*	000389
#Health in power		standard.*	000024
radiographic appearances of the	#Present	#Excerpts from the criteria	
#Practical		standards and the safe use of asbestos.*	000061
carcinoma.*		standards for airborne amosite asbestos dust.*	000031
Insulation workers in Belfast. 2. Morbidity in men	#Keen surveillance of asbestos	standards for the environment.*	000023
#Keen surveillance of asbestos	#Asbestos: questions	standards in the United States of America for	000247
#Talc-treated rice and Japanese		stations.*	000152
mucosal mast cells and tissue eosinophils of rat	#Some problems associated with the	status of the UIICC/Cincinnati Classification of	000114
#Some problems associated with the		Status of air pollution health research, 1966.*	000089
in the working environment. Recommendation of		steps towards the prevention of bronchial	000254
#Migration of asbestos fibres from		still at work.*	000188
mice: migration of #The pathological effects of		still necessary.*	000235
of asbestos fibres in mice: migration of fibres to		still unanswered.*	000142
of obtaining histories of exposure to a hazardous		stomach cancer.*	000200
to a single intraperitoneal injection of various		#Stomach and asbestos with corticotrophin on the	000532
interpretative regulations.* #Part 191 - Hazardous		storage of asbestos in polyethylene bags.*	000323
of asbestos filters criticized; firms warn of		Structure and development of the asbestos body.*	000347
#New asbestos detection alternatives		Sub-Committee on Asbestosis of the Permanent	000159
#Asbestos-like fibers in Duluth water		subcutaneous injection sites in mice.*	000268
#The effect of pulmonary macrophage		subcutaneous injections of asbestos fibres in	000419
#Interactions of mineral fiber		submesothelial tissues and induction of	000419
#Peritoneal mesothelioma presenting		substance.* relatives of deceased persons: A means	000169
#Keen		substances in rats.*	000072
asbestos-based materials in their	#A dust	#Tissue response	
dockyards.*	#Worker-sponsored	substances: Definitions and procedural and	000092
#Radiological		substitute.*	000008
#A		#FDA treatment	
asbestos exposure and previous pleural disease.* #A		suggested to FDA.*	000009
A clinical, functional, and radiological		supply.*	000014
factory.*	#Chest	suppression in developing asbestosis.*	000106
workers of Quebec.*	#Respiratory	surfaces with cells in vitro.*	000135
fibroblasts.*		surgically.*	000386
#The		surveillance of asbestos still necessary.*	000235
biological research.*		survey carried out in buildings incorporating	000318
#Cytotoxic effects of some mineral dusts on		survey for asbestosis.*	000084
and neoplastic disorders of the hematopoietic		survey of men exposed to asbestos in naval	000112
#A radioautographic study on the incorporation of		survey of metal carcinogenesis.*	000322
exposed to asbestiform minerals in commercial	#Commercial	survey of pleural thickening: its relation to	000100
hazard from eating rice coated with glucose and		survey.* #Asbestos workers in Singapore.	000032
carcinogen.*		symptomatology in an Egyptian cement-asbestos pipe	000256
#Commercial talc and		symptoms in chrysotile asbestos mine and mill	000117
#Asbestos minerals in modern		synthesis of collagen by newborn hamster	000264
#Asbestos in the water:		synthesis of tritium-labeled asbestos for use in	000226
crocidolite asbestos dust injected into	#The long	Syrian hamster peritoneal macrophages.*	000147
function in asbestosis: serial tests in a long-		system.*	000259
changes in incidence of bronchial carcinoma in a		S <sup>35</sup> -methionine and H <sup>3</sup> -glycine in the experimental	000267
and other causes among workers in an asbestos		talc and talcosis.*	000421
#Measurement of dust exposures in the asbestos		talc manufacture.*	000053
#Exposure to metals in the manufacture of asbestos		#A study of workers	
#Health progress in an asbestos		#Talc (non-asbestiform and fibrous).*	000141
previous pleural disease.* #A survey of pleural		#Talc and asbestos contamination of rice.*	000199
smoking and industrial exposures.*		talc.*	000010
dust: A critique.*	#Present	#Potential	
of asbestos and serpentine dusts on pulmonary		#Talc-treated rice and Japanese stomach cancer.*	000200
with corticotrophin on the mucosal mast cells and		Talc: A possible occupational and environmental	000030
abdominal granulomas and lymph nodes of		talcosis.*	000421
#Asbestos-induced intrathoracic		technology.*	000343
		Temporizing with cancer.*	000002
		term fibrogenic effects of chrysotile and	000251
		term prospective study.*	000439
		#Pulmonary	
		term studies of persons exposed to asbestos dust.*	000062
		textile asbestos factory.*	000464
		#Cohort analysis of	
		textile factory.*	000369
		#Mortality from lung cancer	
		textile industry.*	000429
		textile products.*	000397
		textile works.*	000539
		thickening: its relation to asbestos exposure and	000100
		thiocyanate in saliva and sputum: relationship to	000248
		threshold limit value in the U.S.A. for asbestos	000474
		tissue culture.*	000428
		#Effect	
		tissue eosinophils of rat stomach.* and asbestos	000532
		tissue reaction and fibers distribution in	000172
		tissue reactions.*	000046

## PERMUTED TITLE INDEX

injection of various substances in rats.*	# Tissue response to a single intraperitoneal	000072
preliminary report of acute toxicity of heat- in mice: migration of fibres to submesothelial	# Tissue response to intraperitoneal asbestos with	000411
in mice: migration of fibres to submesothelial	tissues and induction of mesotheliomata.* fibres	000419
#Identification of asbestos in human	tissues.*	000055
#The detection of asbestos in	tissues: their passage through the intestinal wall	000288
#Asbestos fibers in beverages, drinking water, and CHLAMYDIA PSITTACI	titanium oxide, and asbestos dusts on experimental	000124
perspectives from an old scout.*	today's environmental pollution - USA brand: new	000345
#Asbestos fibres in the air of	towns.*	000049
acetate membrane	toxic factor from asbestos pad and cellulose	000441
#Inhibition of virus growth by a	toxicity of dusts of certain polymers and minerals	000156
and their	toxicity of heat-treated asbestos in mice.*	000411
#Comparison between IN VITRO	toxicity of particulate pollutants.*	000139
asbestos with preliminary report of acute	#Asbestos	000051
#Lysosomes and the	# Toxicity of cell culture medium due to filtration	000508
through asbestos pads.*	# Toxicity of HeLa cell growth medium after passage	000277
through asbestos filters.*	trace metals associated with asbestos fibers	000034
responsible for the biologic effects	trace metals in chemical carcinogenesis.*	000253
#Are	trace metals, hydroxyproline, and aryl hydrocarbon	000203
#The Role of	tracer techniques.* the solubility of constituents	000068
hydroxylase in	tracer techniques.* in the respiratory tract of the	000202
#Effects of chrysotile asbestos on	tract of rats.*	000040
of chrysotile asbestos in vivo using radioactive	tract of the rat and its subsequent clearance	000040
rat and its subsequent clearance using radioactive	tract.*	000468
#Penetration of asbestos through the digestive	#Tests for effect of asbestos on	000364
of inhaled fibrous material in the respiratory	transbronchial forceps biopsy in the diagnosis of	000481
benzo (a) pyrene carcinogenesis in the respiratory	transplantable mesothelioma induced by asbestos.*	000341
pulmonary lesions.*	transplanted with asbestos.*	000044
#Bronchial brushing and	transport of fibrous dust from the lung.*	000078
#A	transport of inspired dust to the parietal pleura.*	000098
#Induction of carcinomas from mouse lung	Transvaal and North-west Cape mines on the lungs	000228
#Lymphatic	trend in asbestos bodies in lungs in London 1936-	000480
of rats	# Trends in the health of the asbestos worker.*	000338
#The effects of inhaled crocidolites from	tritiated 3,4-benzopyrene in hamsters.* of	000226
66.*	tritium-labeled asbestos for use in biological	000086
#Study of the secular	truth".*	000296
radioactivity after intratracheal instillation of	tuberculosis in the North West Cape.* Mesothelioma,	000283
research.*	tuberculosis: elements of differential diagnosis.*	000050
#The synthesis of	tumorigenic potential of vermiculite by	000312
#Each glass is another moment of	tumors following the intrapleural injection of	000472
including peripheral lung malignancy and	tumors in the London area.*	000279
#Pleural calcifications in asbestosis and in	tumors in Canada.*	000058
intrapleural injection in rats.*	tumors induced in rats by i.p. injection of	000070
#Evaluation of the	tumors of the pleura by fibers (asbestos).*	000229
asbestos and silica.*	tumors with asbestosis in Piedmont and Lombardy.*	000490
#The pathogenesis of	# Tumors of rats after i.p. injection of powdered	000127
#Epidemiology of mesothelial	tumors.*	000175
#Epidemiology of primary malignant mesothelial	tumors: evidence of an association from studies in	000492
#Primary malignant mesothelial	# Tumour initiation by natural and contaminating	000432
asbestos	tumours in asbestos.*	000503
#Investigations concerning morphology of	# Tyneside - a pathological and social study.*	000236
#Induction of experimental	# IICC standard reference samples of asbestos.*	000389
#Association of pulmonary	IICC/Cincinnati Classification of radiographic	000114
chrysotile and benzo(a)pyrene.*	ultrastructure and chemistry of the formation of	000242
#Asbestos in	ultrastructure of asbestos bodies from guinea-pig	000250
South Africa	ultrastructure of asbestos bodies from human lung.*	000500
#Epidemiology of diffuse mesothelial	ultrastructure of resulting mesotheliomas.*	000499
asbestos oils.*	ultrastructure of human mesothelioma.*	000073
#Peritoneal	unanswered.*	000077
#Mesothelioma and asbestos on	undercoating.*	000142
appearances of the	Union Against Cancer standard reference samples of	000536
appearances of pneumoconioses.*	Union Against Cancer.* to asbestos dust and cancer.	000306
#Special Report -	Unit, Cardiff, Wales, April 13-15, 1971.*	000437
asbestos bodies.*	United Kingdom. I. A proposed radiological	000114
#Further observations on the	United Kingdom.*	000479
lungs.*	The use of dust	000195
#The	United Kingdom.* mesothelial tumors: evidence of an	000492
in rats with a study of the histopathogenesis and	United Kingdom.*	000260
#Asbestos: questions still	#Asbestos	000247
#Asbestosis in a worker engaged in automobile	United States.*	000451
asbestos.*	#The occurrence	000476
#Characteristics of the International	#Unusual ferruginous bodies - their formation from	000176
A report from a working group of the International	Urals.*	000116
Report of meeting held at Pneumoconiosis Research	#The cancer mortality	000434
asbestosis in the Republic of South Africa and the	urban air contaminant.*	000210
respirators against asbestos dust hazards in the	urban air.*	000486
association from studies in South Africa and the	urban dweller.*	000520
health hazards (recent observations in the	urban hazard.*	0000345
sampling instruments and dust standards in the	USA brand: new perspectives from an old scout.*	000006
#Mortality among asbestos products workers in the	USDI, environmental groups.*	000334
of asbestosis among insulation workers in the	# Validation of death certificates in asbestos	
nonfibrous particulates and from carbonaceous		
rate among asbestos industry workers in the		
#Asbestos as an		
#Chrysotile asbestos in		
#Asbestos and the		
#Asbestos as a modern		
#The spectre of today's environmental pollution -		
#FDA optical test method criticized by		
workers.*		

## PERMUTED TITLE INDEX

\*Present threshold limit  
 \*The discriminant  
 #Asbestos: health hazards, limiting of clinical, radiological and pulmonary function  
 #Identification of serpentine  
 #Chemical aspects of Indian  
 #Evaluation of the tumorigenic potential of with occupational exposure to asbestos in risk of asbestos from a pathological-anatomical  
 #Natural occurrence of amino acids in and cellulose acetate membrane  
 #Inhibition of on the Biological Effects of Asbestos. Report on a  
 #Studies on IN  
 minerals and their  
 #Comparison between IN  
 effects of dusts on lung fibroblasts grown in  
 of mineral fiber surfaces with cells in  
 of constituents of chrysotile asbestos in  
 Leaching of constituents of chrysotile asbestos in  
 #Epidemiology of mesothelioma on held at Pneumoconiosis Research Unit, Cardiff, and tissues: their passage through the intestinal treatment of asbestos filters criticized; firms asbestos plants.\*  
 #Rain gets request to ban asbestos cement  
 #Asbestos-like fibers in Duluth  
 #Asbestos fibres in beverages and drinking  
 intestinal #Asbestos fibers in beverages, drinking  
 #Asbestos in the of inhaled crocidolites from Transvaal and North lung malignancy and tuberculosis in the North  
 #Asbestosis in mesothelioma and asbestos exposure in the North proportions of asbestos.\* #Paper mache products cases of pleurisy with effusions in ex-miners from  
 #The  
 #Pollution at work: dusty composition in lungs with asbestosis, made during  
 #Asbestos in the chrysotile.\* #Asbestos dust levels during workers in Belfast. 2. Morbidity in men still at  
 #Pollution at  
 #Asbestosis in a  
 #Malignant pleural mesothelioma in an asbestos  
 #Rheumatoid pneumoconiosis in an asbestos  
 #Trends in the health of the asbestos  
 #Classification of radiographs of asbestos-exposed  
 #Cardiopulmonary function studies in  
 #Radiographic and physiologic patterns among commercial talc manufacture.\* #A study of  
 #A follow-up study of  
 Finland.\* #A study of the mortality of  
 #A study of the mortality of  
 #Mortality from lung cancer and other causes among  
 #The occurrence of asbestosis among insulation  
 #Mortality among asbestos products  
 #The cancer mortality rate among asbestos industry sample with a control population.\* #Insulation  
 #Insulation  
 #Insulation  
 #Study of asbestos  
 #Epidemiological study of asbestos radiological survey.\* #Asbestos  
 #The health of chrysotile asbestos mine and mill  
 Lung function in chrysotile asbestos mine and mill  
 symptoms in chrysotile asbestos mine and mill  
 Pulmonary function and radiographic changes in 598  
 #A study of the mortality of female asbestos  
 #Effects of asbestos in dockyard  
 #The work environment of insulating  
 #Validation of death certificates in asbestos  
 #Pleural asbestosis in agricultural  
 #Pulmonary neoplasia among Dresden asbestos  
 #The mortality of asbestos factory  
 rheumatoid and antinuclear factors in asbestos  
 of pleural calcification among asbestos insulation  
 respiratory disease; asbestosis in ship repair  
 to radiographic changes in Quebec asbestos  
 to occupational exposures among retired asbestos  
 and chronic obstructive airway disease in asbestos  
 smoking on mortality from lung cancer in factory  
 value in the U.S.A. for asbestos dust: A critique.\* 000474  
 value of pulmonary function tests in asbestosis.\* 000487  
 values, prevention.\* 000048  
 variables in evaluating asbestosis and chronic 000208  
 varieties by infrared absorption.\* 000191  
 varieties of asbestos dust.\* 000054  
 vermiculite by intrapleural injection in rats.\* 000050  
 Victoria.\*cases of pleural mesothelioma associated 000332  
 viewpoint.\* #The 000064  
 virgin crocidolite asbestos and banded ironstone.\* 000528  
 virus growth by a toxic factor from asbestos pad 000441  
 visit to East Germany and England.\* Conference 000327  
 VITRO cytotoxicity of asbestos dusts.\* 000376  
 VITRO toxicity of dusts of certain polymers and 000156  
 vitro.\* #The direct 000211  
 vitro.\* #Interactions 000135  
 vivo using radioactive tracer techniques.\* 000202  
 vivo.\* 000410  
 Walcheren Island.\* 000223  
 Wales, April 13-15, 1971.\* Report of meeting 000118  
 wall and movement through the body.\* water, 000035  
 warn of substitute.\* #PDA 000008  
 Wastewater limits sought by EPA could close some 000021  
 water pipes.\* 000017  
 water supply.\* 000014  
 water.\* 000160  
 water, and tissues: their passage through the 000035  
 water: Temporizing with cancer.\* 000002  
 west Cape mines on the lungs of rats and guinea 000098  
 West Cape.\* #Mesothelioma, including peripheral 000296  
 Western Australia.\* 000401  
 Western Cape Province.\* #Diffuse pleural 000549  
 widely used in elementary schools contain large 000089  
 Witteboom Gorge.\* #A study of 16 000103  
 work environment of insulating workers.\* 000356  
 work in the 1970's.\* 000197  
 work on coal miners pneumoconiosis.\* content and 000470  
 work place and the community.\* 000063  
 work with cloths made from liquid dispersed 000134  
 work.\* #Insulation 000188  
 work: dusty work in the 1970's.\* 000197  
 worker engaged in automobile undercoating.\* 000536  
 worker.\* 000531  
 worker.\* 000542  
 worker.\* 000480  
 #Worker-sponsored survey for asbestosis.\* 000084  
 workers and the relation of pathology and x-ray 000843  
 workers dealing with asbestos and glasswool.\* 000496  
 workers engaged in manufacture of asbestos cement 000085  
 workers exposed to asbestos minerals in 000053  
 workers from an asbestos factory.\* 000502  
 workers in an anthophyllite asbestos factory in 000123  
 workers in an asbestos factory.\* 000333  
 workers in an asbestos textile factory.\* 000369  
 workers in the United States.\* 000476  
 workers in the United States.\* 000451  
 workers in the Urals.\* 000116  
 workers in Belfast. 1. Comparison of a random 000230  
 workers in Belfast. 2. Morbidity in men still at 000188  
 workers in Belfast. 3. Mortality 1940-66.\* 000166  
 workers in British Columbia.\* 000182  
 workers in Northern Italy.\* 000392  
 workers in Singapore. A clinical, functional, and 000032  
 workers of Quebec.\* 000015  
 workers of Quebec.\* #Respiratory 000095  
 workers of Quebec.\* workers with varying duration of exposure to 000238  
 workers.\* 000121  
 workers.\* 000386  
 workers.\* 000356  
 workers.\* 000338  
 workers.\* 000422  
 workers.\* 000463  
 workers.\* 000285  
 workers.\* #Circulating 000315  
 workers.\* #The occurrence 000475  
 workers.\* #Prevalence of chronic 000168  
 workers.\* #Lung function in relation 000239  
 workers.\* #Respiratory cancer in relation 000038  
 workers.\* variables in evaluating asbestosis 000208  
 workers.\* #Combined effect of asbestos exposure and 000096

## PERMUTED TITLE INDEX

#Mortality experiences of asbestos insulation phenoplasts with Committee	#Pulmonary function in asbestos	workers, 1943-1968.*	000295
#Evaluation of asbestos exposures in the to asbestos dust and cancer. A report from a	#Hygienic characteristics of	workers: A three-year follow-up-study.*	000403
#Health progress in an asbestos textile		working conditions in the manufacture of	000310
#Chrysotile asbestos in lungs of residents of New		working environment. Recommendation of Sub-	000159
#Chrysotile asbestos in the lungs of persons in New		working group of the International Union Against	000437
#Pulmonary asbestos in Dunedin, New		works.*	000539
		York City.*	000186
		York City.*	# 000187
		Zealand, assessed by two methods.*	000287



## **KEYTERM INDEX**



## KEYTERMS INDEX

ACTINOLITE 61, 74, 140, 178, 328, 343, 353, 381, 395, 457

ADENOMA 220

AMOSITE 31, 46, 55, 61, 63, 68, 70, 74, 79, 80, 81, 83, 87, 113, 118, 126, 135, 137, 140, 142, 144, 159, 172, 177, 178, 195, 207, 213, 216, 218, 229, 244, 258, 275, 276, 284, 298, 297, 306, 308, 309, 312, 313, 316, 325, 343, 346, 350, 353, 354, 356, 362, 365, 367, 380, 381, 383, 389, 391, 395, 401, 402, 414, 415, 419, 425, 433, 436, 437, 438, 455, 456, 457, 460, 466, 469, 470, 478, 482, 483, 488, 493, 499, 503, 504, 514, 515, 516, 518, 521, 528, 535, 542, 548

AMPHIBOLE 55, 66, 160, 172, 218, 255, 274, 307, 381, 387, 395, 457

ANALYSIS 6, 9, 11, 12, 18, 27, 29, 54, 97, 101, 132, 157, 158, 159, 174, 175, 176, 179, 180, 185, 186, 189, 191, 210, 218, 224, 225, 240, 275, 276, 284, 287, 304, 306, 323, 325, 329, 355, 358, 359, 394, 423, 455, 470, 499, 528, 548

ANTHOPHYLLITE 42, 53, 55, 61, 63, 70, 74, 101, 113, 123, 126, 135, 140, 144, 148, 172, 213, 216, 218, 245, 270, 271, 275, 294, 304, 306, 309, 343, 353, 360, 362, 375, 381, 383, 389, 391, 395, 414, 415, 421, 425, 433, 436, 437, 438, 455, 457, 460

ANTINUCLLEAR FACTOR 315

ASBESTOS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 41, 42, 43, 45, 48, 49, 51, 52, 54, 55, 56, 57, 58, 59, 61, 62, 63, 64, 65, 66, 68, 69, 71, 72, 73, 74, 75, 76, 77, 78, 80, 82, 83, 84, 85, 86, 89, 90, 91, 92, 93, 95, 96, 97, 99, 100, 101, 103, 105, 106, 108, 111, 112, 113, 114, 115, 116, 118, 119, 120, 121, 122, 124, 125, 127, 128, 129, 131, 132, 133, 134, 135, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 218, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 238, 239

ASBESTOS 240, 242, 243, 244, 246, 247, 248, 249, 250, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 298, 299, 301, 302, 304, 305, 306, 307, 308, 309, 310, 311, 313, 314, 315, 316, 317, 318, 320, 321, 322, 323, 324, 325, 327, 329, 330, 333, 334, 338, 339, 340, 342, 343, 344, 345, 349, 351, 352, 353, 354, 356, 356, 357, 358, 359, 361, 362, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 377, 378, 379, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 409, 411, 412, 413, 414, 415, 416, 417, 419, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 479, 480, 481, 482, 483, 484, 485, 486, 489, 491, 493, 496, 498, 500, 501, 502, 504, 506, 507, 509, 509, 510, 511, 512, 515, 516, 519, 520, 521, 523, 524, 525, 526, 527, 528, 530, 531, 532, 533, 534, 535, 536, 539, 540, 542, 543, 544, 545, 546, 547, 548, 549

ASBESTOS BODIES 28, 47, 49, 66, 88, 91, 98, 102, 109, 110, 126, 130, 136, 142, 146, 148, 149, 176, 183, 185, 186, 187, 189, 201, 206, 212, 223, 228, 233, 236, 237, 240, 250, 252, 261, 276, 282, 287, 288, 290, 317, 319, 327, 330, 331, 332, 335, 336, 339, 342, 346, 347, 352, 360, 361, 362, 366, 372, 374, 377, 381, 386, 387, 390, 396, 396, 404, 406, 407, 413, 417, 418, 420, 424, 425, 430, 434, 444, 446, 448, 450, 460, 477, 484, 486, 491, 498, 499, 500, 507, 512, 517, 525, 526, 527, 529, 531, 534, 536, 537, 541

ASBESTOS FILTERS 7, 8, 26, 36, 71, 122, 167, 359, 441

ASBESTOS MINING 16, 54, 83, 95, 103, 107, 131, 198, 221, 255, 270, 271, 274, 281, 297, 300, 308, 316, 349, 381, 392, 395, 397, 401, 509, 514, 516, 522, 523, 525, 540, 549

ASBESTOSIS 13, 24, 30, 32, 48, 56, 60, 61, 62, 64, 81, 83, 84, 90, 91, 100, 105, 106, 108, 110, 114, 119, 123, 129, 130, 132, 140, 142, 143, 144, 151, 154, 155, 164, 165, 174, 182, 183, 185

ASBESTOSIS 187, 188, 189, 196, 201, 204, 208, 215, 216, 217, 220, 221, 221, 230, 231, 233, 234, 235, 237, 238, 239, 241, 244, 245, 249, 257, 258, 259, 260, 262, 267, 270, 271, 281, 282, 283, 285, 288, 295, 296, 297, 298, 299, 300, 302, 303, 304, 305, 314, 316, 320, 321, 327, 330, 331, 334, 337, 340, 342, 348, 349, 353, 354, 355, 357, 362, 363, 366, 367, 368, 374, 375, 377, 378, 379, 386, 390, 392, 393, 395, 400, 401, 402, 404, 405, 407, 408, 412, 415, 416, 417, 418, 420, 422, 425, 427, 430, 431, 433, 435, 436, 438, 439, 440, 442, 443, 444, 446, 447, 451, 452, 453, 460, 461, 462, 463, 467, 470, 473, 475, 476, 477, 479, 484, 487, 489, 490, 491, 494, 495, 497, 501, 503, 505, 510, 511, 513, 517, 518, 522, 524, 525, 526, 527, 529, 530, 531, 533, 537, 538, 541, 542, 543, 544, 545, 546, 547

PABOON 523

BIBLIOGRAPHY 51

BIOCHEMICAL EFFECTS 79, 143, 161, 164, 165, 203, 205, 211, 219, 253, 376, 532

BIOLOGICAL ELIMINATION 40, 65

BLUE ASBESTOS 83, 108, 128, 132, 401, 433, 531

BRONCHITIS 32, 182, 272, 337

CANCER 2, 5, 10, 13, 14, 17, 22, 24, 25, 28, 30, 38, 39, 41, 42, 46, 48, 50, 57, 58, 62, 63, 64, 68, 69, 70, 73, 75, 76, 77, 82, 86, 91, 92, 96, 99, 103, 112, 115, 116, 121, 122, 123, 137, 143, 151, 157, 166, 169, 170, 175, 177, 182, 189, 198, 199, 200, 203, 207, 215, 217, 220, 222, 229, 243, 246, 254, 258, 263, 266, 270, 271, 278, 280, 282, 285, 286, 303, 311, 314, 317, 322, 324, 327, 329, 330, 333, 336, 338, 340, 341, 344, 345, 349, 351, 353, 354, 356, 361, 363, 364, 367, 368, 369, 371, 372, 374, 375, 378, 379, 384, 387, 390, 392, 395, 396, 399, 405, 408, 413, 416, 417, 419, 420, 430, 431, 432, 434, 436, 437, 438, 442, 445, 451, 454, 456, 461, 463, 464, 467, 468, 472, 476, 477, 480, 482, 489, 491, 494, 495, 497, 501, 502, 507, 513, 519, 526, 533, 534, 541, 544, 545, 546

CANCER MORTALITY 14, 38, 39, 96, 116, 121, 166, 174, 198, 271, 303, 333, 369, 451

CARCINOMA 13, 42, 61, 62, 63, 75, 76, 83, 96, 115, 175, 237, 254, 256, 257, 258, 270, 271, 272, 281, 286, 295, 296, 303, 314,

## KEYTERMS INDEX

CARCINOMA 330, 334, 335, 340, 341, 354, 361, 364, 367, 374, 384, 408, 415, 416, 418, 431, 432, 435, 436, 437, 438, 442, 444, 447, 449, 452, 463, 468, 476, 494, 519, 526, 533, 541, 544, 546

CELL CULTURE 57, 67, 135, 138, 144, 145, 147, 156, 211, 213, 277, 383, 414, 428, 441, 508

CHEMICAL COMPOSITION 54, 68, 109, 157, 284, 306, 323, 343, 358, 528

CHICKEN 510

CHRYSOTILE 362

CHYSOTILE 6, 15, 35, 39, 42, 44, 45, 46, 50, 55, 61, 63, 66, 67, 68, 69, 70, 73, 74, 83, 88, 94, 97, 107, 113, 117, 118, 124, 126, 126, 127, 131, 133, 134, 135, 136, 137, 138, 140, 142, 144, 145, 150, 153, 159, 160, 162, 173, 178, 180, 185, 186, 187, 187, 189, 191, 195, 202, 207, 210, 211, 213, 216, 217, 218, 219, 226, 229, 244, 251, 253, 255, 258, 263, 274, 275, 276, 284, 293, 294, 304, 306, 307, 308, 309, 312, 313, 316, 323, 325, 326, 328, 341, 343, 346, 347, 350, 351, 353, 354, 356, 357, 365, 369, 376, 380, 381, 383, 388, 389, 391, 392, 395, 397, 398, 401, 402, 407, 408, 410, 411, 414, 419, 425, 433, 436, 437, 438, 446, 455, 456, 457, 460, 464, 466, 469, 470, 482, 483, 488, 493, 498, 500, 502, 503, 504, 506, 515, 516, 521, 525, 528, 530, 535, 542, 548

CO-CARCINOGEN 52, 69, 97, 115, 127, 174, 203, 232, 246, 253, 286, 378, 384, 387, 396, 408, 455, 456, 468

COLLAGEN 161, 264

CROCIDOLITE 39, 40, 42, 46, 55, 61, 63, 68, 70, 72, 73, 74, 82, 83, 85, 98, 103, 104, 113, 118, 126, 135, 137, 140, 142, 144, 159, 167, 172, 177, 178, 179, 180, 194, 195, 207, 213, 216, 218, 229, 244, 251, 258, 268, 275, 281, 284, 294, 297, 304, 306, 308, 309, 313, 316, 332, 350, 351, 353, 354, 362, 365, 367, 369, 376, 380, 381, 383, 389, 391, 395, 401, 402, 418, 415, 419, 425, 426, 433, 436, 437, 438, 455, 456, 457, 460, 464, 466, 470, 472, 478, 488, 493, 503, 504, 505, 514, 516, 519, 521, 528, 531, 535, 540, 542, 548, 549

CYTOTOXICITY 48, 57, 135, 138, 145, 147, 156, 211, 213, 277, 293, 294, 376, 383, 428, 441, 508

DIAGNOSIS 32, 37, 64, 90, 131, 215, 227, 265, 266, 283, 298, 321, 330, 337, 357, 361, 368, 369, 374, 386, 393, 394, 401, 408, 452, 453, 462, 467, 475, 479, 485, 530, 543, 547

DOG 373

DRUG CONTAMINATION 30, 36, 71

DUST CONTROLS 107, 134, 195, 209, 255, 310, 320, 423, 452, 458, 459, 464, 465, 539

DYSPNEA 53, 60, 102, 108, 183, 256, 357, 372, 485, 525, 531, 536, 541

ELECTROCARDIOGRAM 321, 355, 427

ELECTRON MICROSCOPY 185

EMPHYSEMA 78, 119, 256, 272, 535, 537

ENVIRONMENTAL CONTAMINATION 1, 2, 3, 4, 5, 6, 14, 17, 20, 21, 26, 28, 29, 35, 44, 49, 86, 89, 93, 111, 137, 151, 157, 160, 173, 185, 186, 187, 189, 206, 214, 217, 224, 240, 245, 286, 296, 318, 336, 345, 352, 353, 370, 377, 378, 396, 400, 409, 416, 420, 444, 465, 486, 520, 523

ENVIRONMENTAL SAMPLING 11, 12, 18, 21, 29, 159, 179, 197, 210, 224, 247, 318, 325, 423, 459

EXPERIMENTAL PREPARATION 171

FERRUGINOUS BODIES 146, 176, 201, 206, 240, 252, 319, 326, 351, 352, 390, 396, 406

FIBROBLAST 67, 210, 251, 264, 398, 500

FIBROGENIC TISSUE RESPONSE 52, 72, 328, 391, 411, 469

FIBROSIS 15, 22, 34, 45, 60, 63, 64, 67, 78, 80, 87, 92, 108, 131, 132, 139, 141, 151, 161, 162, 170, 172, 183, 188, 189, 203, 215, 220, 221, 230, 231, 232, 234, 249, 256, 257, 262, 272, 278, 301, 302, 305, 320, 341, 342, 344, 351, 355, 368, 372, 378, 385, 390, 395, 399, 402, 404, 411, 421, 425, 435, 444, 453, 460, 470, 483, 500, 503, 506, 521, 523, 524, 525, 529, 536, 537, 541, 547

FINGER CLUBBING 60, 102, 119, 183, 188, 208, 230, 256, 357, 372, 401, 467, 510, 531, 541, 544

FOOD CONTAMINATION 7, 8, 10, 19, 35, 71, 91, 167, 199, 359

GASTROINTESTINAL 17, 40, 91, 116, 122, 166, 189, 199, 200, 215, 271, 378, 416, 438, 451, 454, 502, 513, 532, 546

GIANT CELL 149, 162, 219, 251, 398, 446

GRANULOMA 73, 91, 144, 162, 172, 219, 250, 251, 269, 373, 515

GUINEA PIG 79, 80, 81, 94, 98, 145, 168, 162, 207, 213, 219, 250, 251, 252, 263, 302, 360, 376, 398, 405, 407, 425, 446, 460, 498, 499, 500, 505, 521

HAMSTER 46, 118, 136, 147, 150, 157, 203, 207, 235, 263, 264, 286, 289, 338, 346, 347, 365, 388, 406, 407, 468, 481, 482, 483, 508, 515

HEALTH CRITERIA 23, 429

HEMATOPOIETIC EFFECTS 259

HEMOLYSIS 138, 178, 293, 294, 383, 414

HEMOSIDERIN 346, 347, 360

HEMOSTEROSIS 453

HORSE 135

HUMAN 4, 5, 10, 15, 22, 24, 30, 32, 33, 37, 38, 39, 41, 44, 47, 49, 52, 55, 56, 59, 60, 62, 66, 75, 76, 77, 78, 84, 85, 88, 89, 90, 91, 99, 100, 101, 102, 103, 105, 107, 108, 110, 111, 112, 115, 116, 117, 121, 123, 125, 126, 128, 130, 131, 132, 134, 135, 137, 141, 142, 143, 146, 155, 157, 160, 163, 164, 165, 166, 168, 169, 170, 173, 174, 175, 176, 179, 182, 183, 184, 185, 186, 187, 188, 189, 192, 193, 194, 197, 198, 199, 200, 201, 204, 205, 206, 208, 212, 216, 217, 220, 221, 222, 223, 225, 227, 229, 230, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 243, 245, 246, 248, 249, 254, 256, 257, 258, 258, 259, 260, 261, 265, 270, 271, 273, 274, 276, 279, 280, 281, 282, 283, 285, 287, 291, 292, 295, 296, 298, 299, 300, 301, 303, 305, 307, 309, 311, 312, 314, 315, 316, 317, 319, 321, 322, 324, 326, 327, 333, 335, 336, 337, 339, 340, 345, 348, 352, 353, 355, 356, 357, 361, 363, 364, 365, 366, 367, 368, 369, 371, 372, 374, 375, 377, 378, 379, 381, 383, 388, 385, 386, 387, 390, 391, 392, 393, 394, 395, 396, 397, 400, 401, 402, 403, 404, 405, 412, 413, 416, 417, 418, 420, 424, 426, 430, 431, 434, 435, 437, 438, 439, 440, 442, 444, 445, 446, 447, 448, 449, 450, 451, 451, 452, 453, 454, 461, 462, 463, 464, 467, 470, 471, 472, 475, 476, 477, 478, 484, 485, 486, 487, 490, 492, 494, 495, 496, 497, 499, 501, 502, 503, 507, 510, 511, 512, 513, 514, 516, 518, 520, 522, 525, 526, 529, 530, 533, 534, 535, 536, 537, 538, 539, 540, 541, 544, 545, 547, 549

## KEYTERMS INDEX

INGESTION 4, 5, 10, 14, 17, 30, 35, 86, 122, 160, 199, 200, 262

INHALATION 22, 25, 30, 40, 59, 61, 89, 93, 98, 106, 122, 148, 148, 181, 186, 187, 193, 201, 207, 215, 217, 217, 220, 225, 229, 232, 263, 307, 309, 309, 338, 348, 360, 374, 382, 393, 407, 409, 420, 430, 469, 471, 488, 493, 500, 505, 506, 517, 521

INSULATION WORKERS 90, 129, 152, 166, 170, 182, 188, 216, 230, 295, 303, 333, 356, 384, 386, 392, 412, 426, 467, 473, 476, 477, 513, 518

LUNG 22, 25, 28, 33, 35, 40, 48, 45, 47, 48, 55, 56, 59, 60, 61, 62, 66, 67, 69, 78, 80, 81, 96, 98, 99, 100, 102, 104, 108, 110, 111, 115, 116, 119, 121, 123, 126, 132, 148, 150, 154, 161, 168, 170, 175, 176, 183, 184, 186, 187, 189, 203, 206, 212, 216, 217, 220, 221, 223, 225, 226, 227, 228, 234, 235, 237, 238, 239, 240, 243, 246, 251, 253, 262, 263, 269, 271, 275, 281, 282, 287, 288, 289, 300, 301, 302, 303, 304, 307, 308, 311, 314, 317, 319, 324, 326, 328, 331, 332, 335, 336, 340, 346, 348, 349, 352, 356, 361, 379, 387, 388, 398, 404, 406, 407, 408, 410, 413, 424, 434, 435, 437, 438, 442, 444, 447, 449, 454, 460, 463, 469, 470, 476, 477, 481, 490, 491, 494, 495, 497, 498, 499, 500, 501, 502, 505, 506, 510, 512, 514, 517, 519, 520, 523, 526, 527, 530, 533, 536, 541, 544, 545, 546, 547

LYSOSOME 139, 219, 234

MACROPHAGE 94, 102, 106, 118, 136, 138, 139, 145, 147, 148, 149, 150, 219, 231, 250, 251, 264, 346, 347, 360, 388, 398, 446, 498, 500, 504

MESOTHELIOMA 15, 22, 42, 46, 48, 50, 57, 58, 62, 63, 66, 68, 69, 73, 77, 82, 83, 88, 90, 91, 92, 103, 111, 112, 121, 128, 133, 137, 142, 151, 166, 169, 170, 175, 177, 183, 187, 192, 196, 198, 201, 207, 215, 216, 217, 220, 222, 223, 229, 233, 235, 236, 243, 246, 257, 260, 261, 265, 266, 268, 271, 274, 278, 279, 280, 285, 287, 290, 291, 295, 296, 299, 300, 305, 308, 311, 312, 313, 318, 316, 317, 327, 329, 330, 332, 334, 336, 339, 345, 350, 351, 352, 353, 354, 357, 366, 367, 371, 372, 374, 377, 378, 379, 380, 381, 385, 386, 387, 390, 392, 395, 399, 400, 405, 411, 413, 415, 416, 419, 430, 431, 433, 435, 435, 436, 437, 438, 442, 444, 445, 447, 449, 450, 452, 456, 467, 471, 472, 476, 477, 481, 482, 483, 485, 489, 490, 491, 492, 493, 494, 495, 496, 497, 501, 502, 503, 510, 511, 512, 513, 516, 518, 522, 524, 525, 526, 527, 535, 536, 538, 539, 540, 541, 542, 543, 545, 546, 547, 549

MESOTHELIOMA 492, 494, 497, 502, 507, 512, 513, 515, 516, 517, 520, 531, 534, 538, 540, 549

MONKEY 87, 521, 523

MOUSE 124, 250, 251, 268, 302, 341, 365, 380, 405, 411, 419, 432

NEOPLASTA 28, 137, 286, 369, 392, 490

NEOPLASM 99, 142, 216, 295, 344, 378, 384, 390, 431, 442, 481, 495, 507, 513, 516

NON-OCCUPATIONAL EXPOSURE 14, 19, 20, 25, 28, 30, 43, 48, 49, 63, 83, 89, 93, 101, 111, 120, 122, 151, 160, 173, 185, 186, 187, 188, 205, 206, 216, 217, 233, 249, 280, 287, 296, 299, 300, 318, 319, 326, 335, 351, 352, 375, 377, 381, 382, 390, 395, 396, 400, 404, 418, 422, 430, 454, 471, 472, 486, 492, 495, 511, 516, 520, 523, 534

OCCUPATIONAL EXPOSURE 1, 13, 15, 16, 22, 24, 25, 28, 30, 31, 32, 37, 38, 39, 43, 44, 48, 53, 54, 58, 60, 62, 64, 75, 76, 77, 83, 84, 85, 90, 91, 95, 96, 99, 103, 105, 107, 108, 112, 115, 116, 117, 119, 120, 121, 122, 123, 125, 129, 134, 137, 140, 141, 142, 143, 151, 152, 154, 155, 158, 159, 163, 164, 165, 168, 169, 170, 173, 174, 179, 183, 184, 188, 192, 193, 194, 195, 196, 197, 198, 204, 205, 208, 209, 210, 216, 217, 220, 221, 222, 223, 230, 233, 235, 236, 239, 243, 247, 248, 249, 255, 256, 257, 258, 265, 270, 271, 272, 273, 274, 278, 279, 280, 281, 285, 290, 291, 295, 296, 297, 298, 299, 300, 301, 310, 311, 314, 317, 320, 321, 330, 332, 333, 334, 345, 349, 351, 353, 356, 357, 361, 365, 367, 369, 372, 374, 375, 379, 381, 382, 384, 385, 386, 387, 392, 393, 394, 395, 397, 399, 400, 401, 402, 403, 412, 413, 415, 416, 418, 421, 422, 426, 427, 428, 430, 431, 435, 437, 438, 439, 449, 450, 451, 454, 458, 461, 462, 463, 464, 467, 471, 472, 473, 477, 478, 480, 484, 485, 486, 487, 489, 490, 494, 495, 496, 497, 501, 502, 503, 510, 511, 512, 513, 516, 518, 522, 524, 525, 526, 527, 535, 536, 538, 539, 540, 541, 542, 543, 545, 546, 547, 549

ORGAN CULTURE 128, 398

OVARY 405

PERITONEUM 25, 73, 90, 175, 261, 271, 280, 285, 291, 295, 299, 305, 344, 386, 399, 411, 413, 431, 445, 471, 472, 477, 491, 492, 497, 503, 507, 512, 534

PHAGOCYTOSIS 57, 59, 94, 136, 144, 145, 150, 156, 219, 250, 346, 347, 360, 388, 424, 498, 506

PIPE COVERERS 60, 119, 166, 168, 204, 513

PLEURA 25, 121, 153, 175, 183, 189, 208, 229, 238, 246, 251, 257, 261, 265, 271, 280, 285, 291, 295, 305, 311, 312, 313, 316, 344, 350, 373, 400, 402, 410, 411, 413, 431, 444, 445, 449, 471, 472, 477, 483, 489, 490, 491, 497, 502, 507, 512, 515, 534

PLEURAL CALCIFICATION 90, 101, 120, 162, 168, 170, 188, 205, 217, 230, 257, 278, 283, 371, 372, 382, 394, 475, 483, 485, 538

PLEURAL HYPALINOSTS 278

PLEURAL PLAQUES 47, 56, 78, 100, 103, 125, 130, 170, 182, 196, 212, 217, 227, 237, 245, 249, 268, 281, 287, 292, 297, 301, 305, 331, 342, 349, 352, 371, 372, 404, 418, 483, 511, 537, 538

PLEURISY 448

PLEURODESIS 373

PNEUMOCOONIOSIS 15, 53, 54, 78, 83, 105, 114, 131, 140, 165, 241, 242, 281, 297, 300, 305, 318, 320, 340, 342, 356, 356, 407, 420, 421, 487, 510, 517, 524, 525, 527, 528, 529, 531, 536, 538, 544

PRODUCTION 509

PSEUDO-ASBESTOS BODIES 176

RABBIT 67, 211, 302, 405, 432, 521

RALES 188, 529

RAT 35, 40, 46, 50, 57, 65, 69, 70, 72, 73, 82, 98, 104, 127, 133, 142, 144, 148, 150, 153, 156, 157, 161, 172, 177, 190, 202, 207, 229, 244, 250, 251, 253, 263, 267, 273, 309, 312, 313, 328, 344, 350, 407, 408, 410, 469, 493, 498, 506, 523, 532

RESPIRATORY DISEASE 32, 84, 85, 100, 104, 112, 117, 121, 123, 182, 183, 184, 197, 198, 208, 217, 220, 243, 256, 262, 272, 301, 315, 324, 337, 355, 356, 397, 402, 412, 451, 454, 464, 480, 496, 536

RHEUMATOID FACTOR 315, 473

SARCOMA 46, 69, 70, 133, 155, 341, 408, 501

SERPENTINE 191

SHEEP 135, 293, 294

SHIPYARDS 60, 112, 119, 166, 168,

## KEYTERMS INDEX

SHIPYARDS 170, 179, 194, 196, 204, 222, 223, 236, 260, 278, 280, 290, 349, 367, 385, 387, 418

SILICOSIS 55, 78, 81, 114, 132, 149, 215, 267, 320, 401, 453, 531, 538

SMOKING 52, 61, 99, 117, 121, 168, 176, 188, 216, 232, 233, 246, 248, 254, 282, 286, 348, 372, 378, 384, 396, 533, 544

STANDARDS 3, 4, 6, 8, 9, 10, 11, 12, 15, 16, 17, 18, 21, 23, 24, 26, 27, 30, 31, 43, 48, 51, 71, 92, 93, 113, 114, 140, 141, 158, 159, 163, 173, 194, 195, 197, 204, 209, 210, 214, 247, 310, 327, 351, 356, 389, 429, 437, 458, 474, 536, 539

TALC 9, 30, 200

TALCOSIS 30

TEXTILE INDUSTRY 195, 210, 237, 349, 397, 429, 430, 431, 539

TISSUE DISTRIBUTION 35, 40, 65, 144, 172, 202, 261, 268, 289, 410, 488

TRACE METALS 30, 46, 52, 68, 82, 97, 157, 159, 174, 180, 202, 203, 215, 253, 254, 284, 322, 396, 397, 408, 455, 456

TREATMENT 265, 266

TREMOLITE 53, 56, 61, 74, 101, 140, 245, 275, 294, 304, 328, 343, 351, 365, 395, 405, 421, 436, 437

TUBERCULOSIS 258, 296

TUMOR 22, 46, 50, 58, 69, 70, 76, 77, 91, 96, 111, 115, 121, 127, 155, 175, 177, 190, 207, 222, 229, 259, 263, 265, 285, 322, 324, 330, 332, 334, 335, 336, 339, 341, 349, 350, 364, 374, 408, 415, 419, 432, 435, 436, 442, 445, 450, 452, 454, 456, 463, 468, 481, 482, 489, 490, 491, 492, 494, 502, 507, 507, 513, 515, 516, 519, 541

UTCC CLASSIFICATION 242

USP 457, 509

VENTILATORY DEFECTS 15, 32, 85, 95, 108, 119, 154, 184, 188, 208, 238, 239, 239, 337, 355, 374, 403, 427, 439, 529, 543, 547

WHITE ASBESTOS 189, 401, 433

X-RAY 13, 15, 53, 60, 85, 100, 119, 131, 154, 170, 182, 188, 192, 196, 210, 227, 230, 238, 239, 241, 254, 266, 270, 276, 290, 299, 301, 320, 321, 330, 331, 342, 368, 382, 401, 402, 427, 435, 440, 447, 478, 487, 511, 514, 531

## **SIMPLE TITLE INDEX**



## SIMPLE TITLE INDEX

"Asbestos" bodies: their nonspecificity. 406

"Each glass is another moment of truth". 86

A comparison of mass and fibre concentrations of asbestos dust in shipyard processes. 179

A current hypothesis of the lymphatic transport of inspired dust to the parietal pleura. 78

A dust survey carried out in buildings incorporating asbestos-based materials in their construction. 318

A follow-up study of workers from an asbestos factory. 502

A histochemical study of the asbestos body coating. 109

A labor-management occupational health service in a construction industry. 303

A pathological-radiological correlation in 108 cases of asbestosis proved at post-mortem. 514

A radioautographic study on the incorporation of  $^{35}\text{S}$ -methionine and  $^{3}\text{H}$ -glycine in the experimental silicopneumoconiosis and asbestospneumoconiosis. 267

A study of the mortality of female asbestos workers. 121

A study of the mortality of workers in an anthophyllite asbestos factory in Finland. 123

A study of the mortality of workers in an asbestos factory. 333

A study of workers exposed to asbestiform minerals in commercial talc manufacture. 53

A study of 16 cases of pleurisy with effusions in ex-miners from Wittenoom Gorge. 103

A survey of metal carcinogenesis. 322

A survey of pleural thickening: its relation to asbestos exposure and previous pleural disease. 100

A transplantable mesothelioma induced by asbestos. 481

Action on asbestos. 173

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. 73

Aetiology of pleural plaques. 292

An electron microscopy study of the effect of asbestos dust on the lung. 498

Antibodies in some chronic fibrosing lung diseases. 231

Application of sprayed inorganic fiber containing asbestos: occupational health hazards. 129

Are trace metals associated with asbestos fibers responsible for the biologic effects attributed to asbestos? 34

Asbestos 3, 4, 5, 7

Asbestos (all forms). 180

Asbestos - lung cancer - mesothelioma. 22

Asbestos and cancer growth. 190

Asbestos and cancer of head and neck. 76

Asbestos and cancer. 436

Asbestos and ferruginous bodies. 146

Asbestos and health in 1969. 351

Asbestos and health. 220

Asbestos and laryngeal carcinoma. 75

Asbestos and malignancy. 83, 495

Asbestos and mesothelioma in man. 177

Asbestos and mesothelioma. 365

Asbestos and mesotheliomas. 261

Asbestos and neoplasia. 378

Asbestos and the urban dweller. 486

Asbestos as a hazard to health. 396

Asbestos as a modern urban hazard. 520

Asbestos as a potential carcinogen for fowls. 519

Asbestos as an industrial hazard. 25

Asbestos as an urban air contaminant. 434

Asbestos bodies and mesothelioma. 387

Asbestos bodies and pleural plaques in human lungs at necropsy. 47

Asbestos bodies and their bioeffects. 362

Asbestos bodies in human lungs at autopsy. 444

Asbestos bodies in lungs at necropsy. 418

Asbestos bodies in lungs: an Australian report. 352

Asbestos bodies in the lungs and mesothelioma. A retrospective examination of a ten-year-autopsy material. 366

Asbestos bodies in the lungs of a series of Finnish lung cancer patients. 282

Asbestos bodies in the lungs of inhabitants of Milan. 404

Asbestos bodies, their formation, composition and character. 126

Asbestos cancer: past and future hazards. 42

Asbestos contamination of parenteral drugs. 122

Asbestos content of the soil and endemic pleural asbestosis. 245

Asbestos dust and its measurements. 423

Asbestos dust deposition and retention in rats. 493

Asbestos dust exposure and malignancy (diffuse mesotheliomas of the pleura). 516

## SIMPLE TITLE INDEX

Asbestos dust levels during work with cloths made from liquid dispersed chrysotile. 134

Asbestos dust levels inside firefighting helmets with chrysotile asbestos covers. 193

Asbestos exposure and its results in Italy. 311, 380

Asbestos exposure and neoplasia. 513

Asbestos exposure and pleural mesotheliomas. 372

Asbestos exposure in Australia. 281

Asbestos exposure in South Africa. 316

Asbestos exposure, smoking, and neoplasia. 384

Asbestos fiber in the lung and mesothelioma: A re-examination of the malmo material. 66

Asbestos fibers in beverages, drinking water, and tissues: their passage through the intestinal wall and movement through the body. 35

Asbestos fibers in human lungs: forensic significance in environmental disease. 37

Asbestos fibres in beverages and drinking water. 160

Asbestos fibres in the air of towns. 49

Asbestos hazards in naval dockyards. 367

Asbestos health hazards (recent observations in the United Kingdom). 260

Asbestos hemolysis. 294

Asbestos in the air. 1

Asbestos in the water: Temporizing with cancer. 2

Asbestos in the work place and the community. 63

Asbestos in tumors. 175

Asbestos levels in human lungs. 324

Asbestos minerals in modern technology. 303

Asbestos particles in food and drugs. 71

Asbestos related disease. 454

Asbestos toxicity 51

Asbestos types, their optical investigations and their pathological action. 548

Asbestos workers in Singapore. A clinical, functional, and radiological survey. 32

Asbestos. 16, 74, 466, 509

Asbestos--an environmental health hazard. 416

Asbestos-body formation in the lungs of rats and guinea-pigs after inhalation of anthophyllite. 148

Asbestos-induced intrathoracic tissue reactions. 46

Asbestos-like fibers in Duluth water supply. 14

Asbestos-penicillin induced pleurodesis: an experimental study. 371

Asbestos-related chest disease in joiners. 170

Asbestos-the lethal dust. 305

Asbestos, an extrinsic factor in the pathogenesis of bronchogenic carcinoma and mesothelioma. 431

Asbestos, asbestosis and mesothelioma of the pleura. 433

Asbestos: health hazards, limiting values, prevention. 48

Asbestos: questions still unanswered 142

Asbestos: some nonradiological aspects. 189

Asbestosis and abdominal neoplasms. 546

Asbestosis and associated medical problems. 402

Asbestosis and carcinoma of the larynx 13

Asbestosis and carcinoma of the lung. 526, 544

Asbestosis and lung cancer. 494

Asbestosis and malignancy. 400

Asbestosis and malignant disease. 438

Asbestosis and neoplasia. 368, 420

Asbestosis and neoplastic disorders of the hematopoietic system. 259

Asbestosis and nodular lesions of the lung: a radiologic study. 374

Asbestosis and primary intrathoracic neoplasms. 442

Asbestosis and pulmonary carcinoma. 447

Asbestosis following brief exposure in cigarette filter manufacture. 108

Asbestosis in a worker engaged in automobile undercoating. 536

Asbestosis in experimental animals. 521

Asbestosis in Great Britain. 467

Asbestosis in non-experimental animals in South Africa. 523

Asbestosis in Rhodesia. 258

Asbestosis in ship repair workers. 168

Asbestosis in South Africa - certain geographical and environmental considerations. 478

Asbestosis in South African asbestos miners. 297

Asbestosis in Western Australia. 401

Asbestosis. 517

Asbestosis: aspects of its radiological features. 270

Association of pulmonary tumors with asbestosis in Piedmont and Lombardy. 490

Ban of asbestos fibers for clothing proposed after FDA study of hazards. 93

Benign asbestos pleurisy. 448

## SIMPLE TITLE INDEX

Biochemical changes in serum of guinea pigs in experimental asbestosis. 79

Biologic response to kind and amount of asbestos. 52

Biological action of different asbestos dusts with special respect to fibre length and semiconductor properties. 213

Body plethysmographic measurements of airway conductance in obstructive pulmonary disease. 337

Brake lining decomposition products. 370

Bronchial brushing and transbronchial forceps biopsy in the diagnosis of pulmonary lesions. 364

Bronchial cancer and pleural mesothelioma in cases of asbestosis (two new observations). 489

Bronchopulmonary cancer after asbestosis. 361

Buildings insulated with sprayed asbestos: a potential hazard. 194

Calcified pleural plaques in asbestosis: An investigation into their significance. 511

Cancer and asbestos. 354

Cardiopulmonary function studies in workers dealing with asbestos and glasswool. 496

Case records of the Massachusetts General Hospital. 183

Cellular reaction in the human lung caused by inhalation of asbestos dust over long periods. 59

Changes in certain organs after experimental intraperitoneal injection of asbestos-containing dust. 328

Changing attitudes to the diagnosis of asbestos disease. 278

Characteristics of respirable asbestos fibers. 309

Characteristics of the International Union Against Cancer standard reference samples of asbestos. 306

Chemical aspects of Indian varieties of asbestos dust. 54

Chemical studies of asbestos. 455

Chest auscultation in the diagnosis of pulmonary asbestosis. 60

Chest symptomatology in an Egyptian cement-asbestos pipe factory. 256

Chrysotile asbestos in lungs of residents of New York City. 186

Chrysotile asbestos in the lungs of persons in New York City. 187

Chrysotile asbestos in urban air. 210

Cigarette smoking, asbestos, and pulmonary fibrosis. 232

Circulating rheumatoid and antinuclear factors in asbestos workers. 315

Clinical picture of dust-induced pulmonary disease following exposure to some types of the silicate dust. 105

Clinical, bronchographic, radiological and physiological observations in ten cases of asbestosis. 547

Clinical, environmental, radiologic and epidemiologic observations in shipyard pipe coverers and controls. 204

Clinical, radiological, and physiological findings in asbestosis. 427

Cocarcinogenesis of  $^{239}\text{PuO}_2$  with chrysotile asbestos or benzpyrene in the rat abdominal cavity. 69

Cocarcinogenic studies in pulmonary carcinogenesis. 286

Cohort analysis of changes in incidence of bronchial carcinoma in a textile asbestos factory. 464

Collagen and mucopolysaccharide production in growing lung fibroblasts exposed to chrysotile asbestos. 67

Collagen biosynthesis in rat lungs during exposure to asbestos. 161

Combined effect of asbestos exposure and smoking on mortality from lung cancer in factory workers. 96

Commercial talc and talcosis. 421

Comparison between IN VITRO toxicity of dusts of certain polymers and minerals and their fibrogenicity. 156

Comparison of dust retention in specific pathogen free and standard rat. 469

Comparison of effects on macrophage cultures of glass fibre, glass powder, and chrysotile asbestos. 94

Complications of asbestosis. 545

Control of asbestos fiber emissions from industrial and commercial sources. 209

Control of environmental lung disease. 243

Correlation between lung asbestos count at necropsy and radiological appearances. 371

Correlation between the electrocardiogram and radiological picture in 29 cases. 321

Critical evaluation of disease hazards associated with community asbestos air pollution. 217

Cytodynamic reactivity of the mesothelium. 153

Cytologic morphology of the sputum in asbestosis of the lung. 417

Cytotoxic effects of some mineral dusts on Syrian hamster peritoneal macrophages. 147

Data for hygienic evaluation of asbestos containing "ashozurite" and "sovelite" dusts. 273

Determination of asbestos in ambient air. 224

## SIMPLE TITLE INDEX

determination of iron, chromium, cobalt, nickel, and scandium in asbestos by neutron activation analysis. 180

Development of pleural hyalinosis in long term studies of persons exposed to asbestos dust. 62

Developmental changes in asbestos bodies and their significance. 201

Developments in dust sampling and counting techniques in the asbestos industry. 459

Diagnosis of asbestosis by needle lung biopsy. 393

Differential diagnosis in the pathology of asbestosis. 453

Diffuse 'asbestosis-like' interstitial fibrosis of the lung. 132

Diffuse malignant pleural mesothelioma and asbestos exposure. 233

Diffuse mesothelioma and exposure to asbestos dust in the Merseyside area. 512

Diffuse mesothelioma of the pleura and asbestos. 449

Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province. 509

Diffuse pleural mesothelioma, a clinical and pathological study. 290

Diffuse pleural mesotheliomas in South Africa. 540

Dust exposure in the chrysotile asbestos mines and mills of Quebec. 107

Dust in South African asbestos mines and fiberizing plants. 256

Dust problems in the mining, milling and packaging of asbestos. 274

Dust sampling instruments and dust standards in the United States of America for asbestos. 247

Dust-fiber relationships in the Quebec chrysotile industry. 12

Early diagnosis of asbestosis. 154

Early effects of asbestos exposure on lung function. 184

Economics of dust control. 458

Effect of asbestos and serpentine dusts on pulmonary tissue culture. 628

Effect of quartz, coal, titanium oxide, and asbestos dusts on experimental CHLAMYDIA PSITTACI infection in mice. 124

Effect on public health of air pollution with asbestos and other fibrous dust particles. 151

Effects of asbestos in dockyard workers. 385

Effects of chrysotile and acid-treated chrysotile on macrophage cultures. 145

Effects of chrysotile asbestos on trace metals, hydroxyproline, and aryl hydrocarbon hydroxylase in the hamster lung. 203

Effects of heparin and asbestos with corticotrophin on the mucosal mast cells and tissue eosinophils of rat stomach. 532

Effects of particles on lysosomes. 234

Effects of silica and asbestos on cells in culture. 138

Electromotive phenomenon in metal and mineral particulate exposures: relevance to exposure to asbestos and occurrence of cancer. 157

Electron diffraction patterns of U.I.C.C. asbestos samples. 218

Electron microprobe analysis of asbestos bodies. 276

Electron microprobe analysis. 275

Electron microscopic studies in desquamative interstitial pneumonia associated with asbestos. 102

Electron-microscope studies of asbestosis in man and animals. 446

Elimination of radioactivity after intratracheal instillation of tritiated 3,4-benzoprene in hamsters. 338

EPA's Korp says asbestos in pesticides is not a health hazard. 20

Epidemiological study of asbestos workers in Northern Italy. 392

Epidemiology of diffuse mesothelial tumors: evidence of an association from studies in South Africa and the United Kingdom. 492

Epidemiology of mesothelial tumors in the London area. 472

Epidemiology of mesothelioma on Walcheren Island. 723

Epidemiology of primary malignant mesothelial tumors in Canada. 279

Evaluation of asbestos exposures in the working environment. Recommendation of Sub-Committee on Asbestosis of the Permanent Commission and International Association on Occupational Health 159

Evaluation of the tumorigenic potential of vermiculite by intrapleural injection in rats. 50

Evidence of dose-response relation in pneumoconiosis (!). 131

Examination of fibres in beer. 359

Examination of lung smears for asbestos bodies in 109 consecutive necropsies in Perugia. 336

Excerpts from the criteria document: I. Recommendations for an asbestos standard. 24

Experimental asbestos carcinogenesis. 207, 380

Experimental asbestosis in guinea pigs. 505

Experimental asbestosis in the guinea-pig. 425

Experimental asbestosis with four types of fibers: Importance of small particles. 460

## SIMPLE TITLE INDEX

Experimental asbestosis: studies on the progressiveness of the pulmonary fibrosis caused by chrysotile dust. 407

Experimental asbestosis: the development of lung cancer in rats with pulmonary deposits of chrysotile asbestos dust. 408

Experimental infective pneumoconiosis: effect of asbestos dust and *CANDIDA ALBICANS* infection on the lungs of Rhesus Monkeys. 87

Experimental pulmonary carcinogenesis with asbestos. 344

Exposure to metals in the manufacture of asbestos textile products. 397

FDA detains lima beans contaminated with asbestos after accident. 19

FDA optical test method criticized by USDI, environmental groups. 6

FDA seeks to define issues regarding asbestos contamination 26

FDA treatment of asbestos filters criticized 8

FDA's proposed method of analysis for asbestos questioned. 18

Ferromagnetic contamination in the lungs and other organs of the human body. 33

Ferruginous bodies in guinea pigs. 252

Ferruginous bodies in human lungs: prevalence at random autopsies. 390

Fibroblast anchorage in carcinogenesis by fibres. 57

Fibrous silicates in animal experiments and cell-culture. 144

Fifteen cases of pleural mesothelioma associated with occupational exposure to asbestos in Victoria. 332

firms warn of substitute. 8

Formation of the asbestos body. 346

Further observations on the ultrastructure and chemistry of the formation of asbestos bodies. 250

Getting to grips with asbestos. 353

Haemolytic activity of asbestos and other mineral dusts. 414

Health criteria and standards for the environment. 23

Health in power stations. 152

Health progress in an asbestos textile works. 539

Hemolysis by asbestos. 178

Hemolytic activity of asbestos dusts. 383

Histochemical demonstration of hematoidin in the innermost layers of human asbestos body coating. 110

Histological characteristics of mesothelioma associated with asbestos. 445

Home interviews with relatives of deceased persons: A means of obtaining histories of exposure to a hazardous substance. 169

Hygiene standards for airborne amosite asbestos dust. 31

Hygienic characteristics of working conditions in the manufacture of phenoplasts with asbestos filler. 310

Identification and control of asbestos exposures. 158

Identification of asbestos in human tissues. 55

Identification of serpentine varieties by infrared absorption. 191

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. 443

Immunolectrophoretic pattern changes in asbestosis. 164

Improved techniques of identification and determination of airborne asbestos. 29

Incidence of "asbestos" bodies in basal lung smear. 206

Incidence of pulmonary ferruginous bodies in France. 240

Induction of carcinomas from mouse lung transplanted with asbestos. 341

Induction of experimental tumors of the pleura by fibers (asbestos). 229

Industrial cancer in South Africa. 522

Industrial pulmonary disease: clinical and experimental observations. 272

Infrared spectra for mineral identification. 304

Inhalation and Biological Effects of Asbestos 308

Inhibition of virus growth by a toxic factor from asbestos pad and cellulose acetate membrane filters. 441

Inorganic fibers, including chrysotile, in lungs at autopsy: preliminary report. 185

Instrumental analysis of inspired fibrous pulmonary particulates. 358

Insulation workers in Belfast. 1. Comparison of a random sample with a control population. 230

Insulation workers in Belfast. 2. Morbidity in men still at work. 188

Insulation workers in Belfast. 3. Mortality 1940-66. 166

Interactions of mineral fiber surfaces with cells in vitro. 135

Investigation of a minor asbestos hazard. 412

Investigation of asbestos bodies and asbestos fibers found in the lungs of a mesothelioma patient by electron microscopy. 88

## SIMPLE TITLE INDEX

Investigations concerning morphology of tumors induced in rats by i.p. injection of asbestos dusts. 70

Keen surveillance of asbestos still necessary. 235

Leaching of constituents of chrysotile asbestos *in vivo*. 410

List of hazardous air pollutants. 21u

Low exposure to asbestos. 119

Lung function in chrysotile asbestos mine and mill workers of Quebec. 95

Lung function in relation to radiographic changes in Quebec asbestos workers. 239

Lung function tests and electrocardiographic examinations in pulmonary fibrosis. 355

Lymphatic transport of fibrous dust from the lung. 44

Lysosomes and the toxicity of particulate pollutants. 139

Mainly good news about asbestos. 91

Malignant mesothelioma in childhood: Report of 13 cases. 111

Malignant pleural mesothelioma in an asbestos worker. 531

Massive fibrosis in asbestosis. 221

Measurement of dust exposures in the asbestos textile industry. 429

Mesothelioma del peritoneo. 339

Mesothelioma and asbestos exposure. 413

Mesothelioma and asbestos on Tyneside - a pathological and social study. 236

Mesothelioma and asbestosis. 357

Mesothelioma associated with asbestosis. 430

Mesothelioma in Scotland. 280

Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area. 471

Mesothelioma of pleura or peritoneum and limited basal asbestosis. 534

Mesothelioma of the pleura. 266

Mesothelioma, including peripheral lung malignancy and tuberculosis in the North West Cape. 296

Mesotheliomas in hamsters following intrapleural injection of asbestos. 482

Mesotheliomas in rats following inoculation with asbestos. 350

Mesotheliomas in rats following the intra-pleural inoculation of asbestos. 313

Mesotheliomata in rats after inoculation with asbestos and other materials. 82

Migration of asbestos fibres from subcutaneous injection sites in mice. 268

Mortality among asbestos products workers in the United States. 451

Mortality experiences of asbestos insulation workers, 1943-1968. 295

Mortality from lung cancer and other causes among workers in an asbestos textile factory. 369

Mortality in the chrysotile asbestos mines and mills of Quebec. 198

Mucociliary function in health, chronic obstructive airway disease, and asbestosis. 348

Natural occurrence of amino acids in virgin crocidolite asbestos and banded ironstone. 528

Neoplasia risk associated with occupational exposure to airborne inorganic fibers. 216

Neutron activation techniques in investigations of the composition and biological effects of asbestos. 284

New asbestos detection alternatives suggested to FDA. 9

Nonabsorbable dusts. 21c

Nonoccupational diffuse pulmonary fibrosis. 525

Observations on atmospheric air pollution caused by asbestos. 465

Occupational and "non-occupational" asbestosis in Finland. 375

Occupational and non-occupational exposures to asbestos. 461

Occupational exposure and its relation to type of lung cancer. 246

Occupational hazards of pipe insulators. 426

On the epidemiology of asbestosis of the pleura. 125

Osha standards and the safe use of asbestos. 61

Ovarian cancer and asbestos. 405

Paper mache products widely used in elementary schools contain large proportions of asbestos. 49

Part 191 - Hazardous substances: Definitions and procedural and interpretative regulations. 92

Partial intestinal obstruction due to peritoneal mesothelioma in chronic asbestos exposure. 90

Particulate matter of particular interest. 36

Pathological anatomy of hyaline pleural plaques. 227

Pathology of carcinoma of the lung associated with asbestos exposure. 115

Penetration of asbestos through the digestive tract of rats. 65

Peritoneal mesothelioma presenting surgically. 386

Peritoneal mesothelioma. A report of 4 cases. 201

Peritoneal tumours in asbestosis. 503

## SIMPLE TITLE INDEX

Phagocytic activity of the alveolar epithelial cells in pulmonary asbestosis. 136

Phagocytosis of asbestos fibers by epithelial cells. 388

Pleural asbestosis in agricultural workers. 422

Pleural asbestosis. 527

Pleural calcification and mesothelioma following exposure to asbestos. 485

Pleural calcifications associated with an asbestos coniosis detected by examination of microspecimens with the polarizing microscope. 394

Pleural calcifications due to asbestos exposure compared with relevant findings in the non-exposed population. 205

Pleural calcifications in asbestosis and in tuberculosis: elements of differential diagnosis. 283

Pleural fibrocalcific plaques and asbestos exposure. 371

Pleural manifestations following the inhalation of asbestos in relation to malignant change. 382

Pleural manifestations of asbestosis. 56

Pleural mesotheliomas in dockers. 222

Pleural plaques and splenic capsular sclerosis in adult male autopsies. 130

Pleural plaques, asbestosis and exposure to asbestos: an epidemiological study from the Hamburg area. 249

Pleural reaction and mesothelioma in hamsters injected with asbestos. 515

Pleuro-pulmonary asbestosis and malignant pleuro-peritoneal mesothelioma. 317

Pollution at work: dusty work in the 1970's. 197

Polycyclic hydrocarbons in various materials containing asbestos. 97

Polymers as selective antagonists of hemolytic asbestos fibers. 293

Possible biological importance of fibre diameters of South African amphiboles. 225

Potential hazard from eating rice coated with glucose and talc. 10

Practical steps towards the prevention of bronchial carcinoma. 258

Preparation of asbestos fibres for animal experiments. 171

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. 114

Present threshold limit value in the U.S.A. for asbestos dust: A critique. 474

Prevalence of "asbestos" bodies in human lungs at necropsy. 319

Prevalence of asbestos bodies in basal lung smears. 377

Prevalence of chronic respiratory disease. 168

Prevalence of pleural calcification in persons exposed to asbestos dust, and in the general population in the same district. 120

Primary cytologic diagnosis of asbestosis associated with bronchogenic carcinoma. 533

Primary intrapulmonary neurogenic sarcoma with hypertrophic pulmonary osteoarthropathy and asbestosis. 155

Primary malignant mesothelial tumors in Canada. 58

Problems and perspectives: the changing hazards of exposure to asbestos. 452

Problems in the pathology of asbestosis. 267

Production of abdominal mesotheliomas in rats with Pu 239 and chrysotile asbestos. 133

Progress in instrumentation and techniques for measurement of air pollutants. 11

Proposed methodology for asbestos determination is limited, firm says. 27

Pulmonary asbestos in Dunedin, New Zealand, assessed by two methods. 287

Pulmonary asbestosis and peritoneal mesothelioma. 399

Pulmonary asbestosis with metastatic mesothelioma: case report. 435

Pulmonary asbestosis. 541

Pulmonary ferruginous bodies in city dwellers: a study of their central fiber. 326

Pulmonary fibrogenic response of guinea pigs to amosite dust. 80

Pulmonary function and radiographic changes in 598 workers with varying duration of exposure to asbestos. 238

Pulmonary function in asbestos workers: a three-year follow-up-study. 403

Pulmonary function in asbestosis of the lung. 535

Pulmonary function in asbestosis: serial tests in a long-term prospective study. 439

Pulmonary lysosomal enzymes in experimental asbestosis in guinea pigs. 81

Pulmonary neoplasia among Dresden asbestos workers. 463

Qualitative aspects of dust exposure in the Quebec asbestos mining and milling industry. 174

Radiographic and physiologic patterns among workers engaged in manufacture of asbestos cement products: a preliminary report. 85

Radiological and pathological correlations in asbestosis in the Republic of South Africa and the United Kingdom. I. A proposed radiological classification of asbestosis. 479

## STMPLE TITLE INDEX

Radiological classification of pulmonary asbestosis. 440

Radiological features of diffuse mesothelioma. 299, 300

Radiological findings in a cement-asbestos pipe factory. 320

Radiological survey of men exposed to asbestos in naval dockyards. 112

Radiology of asbestosis. 301

Radiology of some rarer dust diseases. 524

Rain gets request to ban asbestos cement water pipes. 17

Rapid growth of a pleural mesothelioma 192

Relation between exposure to asbestos and mesothelioma. 477

Relationship between exposure to asbestos and pleural malignancy in Belfast. 450

Relationship between pneumoconiosis and lung cancer. 340

Report of the Advisory Committee on Asbestos Cancers to the Director of the International Agency for Research on Cancer. 41

Research and characterization of asbestos particles in pleural mesotheliomas. 329

Resection of primary pulmonary sarcoma. Review of literature and report of a case associated with pulmonary asbestosis. 501

Respiratory cancer in relation to occupational exposures among retired asbestos workers. 38

Respiratory symptoms in chrysotile asbestos mine and mill workers of Quebec. 117

Results of asbestos exposure in Finland. 271

Results of asbestos exposure in France. 237

Retrospective search for asbestos bodies in necropsies and biopsies on cases of primary malignant disease of the lung. 335

Rheumatoid factor in serum of individuals exposed to asbestos. 873

Rheumatoid pneumoconiosis in an asbestos worker. 542

Rheumatoid pneumoconiosis in association with asbestosis. 510

Roentgenologic aspects of asbestosis. 538

Routine lung function studies on 830 employees in an asbestos processing factory. 462

Safe use of asbestos plastics. 113

Safety - asbestos. 163

Safety of food additives and solvents. 167

Secular changes in asbestosis in an asbestos factory. 894

Sepiolite content of the soil in regions with endemic pleural calcifications. 101

Serum proteins and amino acids in asbestosis. 165

Some anomalies in the measurement of pulmonary diffusion in asbestosis and chronic bronchitis with emphysema. 543

Some aspects of pathogenesis of asbestosis. 302

Some biochemical effects of asbestos on macrophages. 118

Some current concepts of the pneumoconioses. 28

Some observations of the dust content and composition in lungs with asbestosis, made during work on coal miners pneumoconiosis. 470

Some observations on asbestosis in a factory population. 298

Some observations on asbestosis. 518

Some problems associated with the storage of asbestos in polyethylene bags. 323

Some recent developments in the field of cancer causation. 379

Special Report - IJCC/Cincinnati Classification of the radiographic appearances of pneumoconioses. 242

Sputum examination in asbestosis. 530

Status of air pollution health research, 1966. 409

Structure and development of the asbestos body. 347

Studies of carcinogenesis of asbestos fibers and their natural oils. 456

Studies of hydrocarbons on mineral dusts. The elution of 3,4-benzpyrene and oils from asbestos and coals dusts by serum. 504

Studies of the solubility of constituents of chrysotile asbestos in vivo using radioactive tracer techniques. 202

Studies on IN VITRO cytotoxicity of asbestos dusts. 376

Studies on the carcinogenic effects of asbestos dust. 263

Studies on the course of asbestosis patients. 529

Studies on the deposition of inhaled fibrous material in the respiratory tract of the rat and its subsequent clearance using radioactive tracer techniques. 40

Study of asbestos workers in British Columbia. 182

Study of the distribution and isolation of (3H)benz(a)pyrene from the animal organism after its intratracheal injection with asbestos and carbon black. 289

Study of the secular trend in asbestos bodies in lungs in London 1936-66. 228

Study of tissue reaction and fibers distribution in abdominal granulomas and lymph nodes of the rat following intraperitoneal administration of various amphiboles. 172

Talc (non-asbestiform and fibrous). 141

## SIMPLE TITLE INDEX

Talc and asbestos contamination of rice. 199

Talc-treated rice and Japanese stomach cancer. 200

Talc: A possible occupational and environmental carcinogen. 30

Tests for carcinogenicity of asbestos. 483

Tests for effect of asbestos on benzo (a) pyrene carcinogenesis in the respiratory tract. 468

The alveolar macrophage. 149

The association between asbestosis and A B O blood groups. 143

The association of certain cancers with asbestosis. 497

The association of exposure to asbestos dust and cancer. A report from a working group of the International Union Against Cancer. 437

The association of phagocytosed asbestos dust with lysosome enzymes. 219

The biological effects of the international standard reference asbestos samples on the lungs of rats. 244

The calcification of fibrous pleural lesions produced in guinea-pigs by the injection of chrysotile asbestos dust. 162

The cancer mortality rate among asbestos industry workers in the Urals. 116

The detection of asbestos in tissues. 288

The determination of amosite and chrysotile in airborne dusts by an X-ray diffraction method. 325

The direct effects of dusts on lung fibroblasts grown *in vitro*. 211

The discriminant value of pulmonary function tests in asbestosis. 487

The early effects of chrysotile asbestos dust on the rat lung. 506

The early radiological changes in pulmonary and pleural asbestosis. 257

The effect of pulmonary macrophage suppression in developing asbestosis. 106

The effect of small amounts of aluminum, carbon and carborundum on the development of silicosis and asbestosis. 104

The effects of chrysotile asbestos dust on lung macrophages maintained in organ culture. 398

The effects of increased particles on the number of alveolar macrophages. 150

The effects of inhaled crocidolites from Transvaal and North-west Cape mines on the lungs of rats and guinea pigs. 98

The fibrogenic response to asbestos. 391

The geology, occurrences, and major uses of asbestos. 457

The health of chrysotile asbestos mine and mill workers of Quebec. 15

The health of the public and asbestos usage. 381

The inhalation of fibres. 307

The inhalation of fibrous dusts. 488

The konimiser--a dispenser for the continuous generation of dust clouds from milligram quantities of asbestos. 181

The locus of pathogenicity of asbestos dust. 45

The long term fibrogenic effects of chrysotile and crocidolite asbestos dust injected into the pleural cavity of experimental animals. 251

The many faces of asbestos disease. 330

The mechanism of formation of asbestos bodies. 360

The medical risks of exposure to asbestos. 415

The mortality of asbestos factory workers. 285

The occurrence of asbestosis among insulation workers in the United States. 476

The occurrence of pleural calcification among asbestos insulation workers. 475

The pathogenesis of pleural plaques. 305

The pathogenesis of tumors following the intrapleural injection of asbestos and silica. 312

The pathological effects of subcutaneous injections of asbestos fibres in mice: migration of fibres to submesothelial tissues and induction of mesothelioma. 410

The pathology of asbestosis with reference to lung function. 537

The pathology of mesothelioma and an analysis of their association with asbestos exposure. 507

The pathology of parietal pleural plaques. 212

The Philadelphia Pulmonary Neoplasm Research Project: Basic risk factors of lung cancer in older men. 99

The problem of asbestosis in relation to the international classification of radiographs in pneumoconiosis. 241

The prohibition of the use of asbestos spray in building construction. 63

The protein coating of asbestos bodies. 424

The radiological investigation of the early manifestations of exposure to asbestos dust. 196

The radiological manifestations of malignant pleural mesothelioma. 265

The radiology of asbestosis. 342

The relative importance of clinical, radiological and pulmonary function variables in evaluating asbestosis and chronic obstructive airway disease in asbestos workers. 208

The response of human pleura in organ culture to asbestos. 128

## SAMPLE TITLE INDEX

The risk of asbestosis from a pathological-anatomical viewpoint. 64

The role of chemical mediators in the inflammatory response induced by foreign bodies: comparison with the schistosome egg granuloma. 260

The role of international research in occupational cancer. 137

The role of trace metals in chemical carcinogenesis. 253

The Second International Conference on the Biological Effects of Asbestos. Report on a visit to East Germany and England. 327

The sequelae of exposure to asbestos dust. 491

The special characteristics of bronchial cancer in patients with asbestosis (three new cases). 363

The spectre of today's environmental pollution - USA brand: new perspectives from an old scout. 345

The synthesis of collagen by newborn hamster fibroblasts. 264

The synthesis of tritium-labeled asbestos for use in biological research. 226

The ultrastructure of asbestos bodies from guinea-pig lungs. 500

The ultrastructure of asbestos bodies from human lung. 499

The use of dust respirators against asbestos dust hazards in the United Kingdom. 195

The work environment of insulating workers. 356

Thiocyanate in saliva and sputum: relationship to smoking and industrial exposures. 248

Tissue response to a single intraperitoneal injection of various substances in rats. 72

Tissue response to intraperitoneal asbestos with preliminary report of acute toxicity of heat-treated asbestos in mice. 411

Toxicity of cell culture medium due to filtration through asbestos pads. 508

Toxicity of HeLa cell growth medium after passage through asbestos filters. 277

Trace metals in asbestos carcinogenesis. 68

Trends in the health of the asbestos worker. 480

Tumors of rats after i.p. injection of powdered chrysotile and benzo(a)pyrene. 127

Tumour initiation by natural and contaminating asbestos oils. 432

Type of asbestos and respiratory cancer in the asbestos industry. 39

WICC standard reference samples of asbestos. 389

Ultrastructure of human mesothelioma. 77

Unusual ferruginous bodies - their formation from nonfibrous particulates and from carbonaceous fibrous particles. 176

Validation of death certificates in asbestos workers. 334

Wastewater limits sought by FPA could close some asbestos plants. 21

What in pneumoconiosis should be compensated? 314

Worker-sponsored survey for asbestosis. 84

## **JOURNAL INDEX**



## JOURNAL INDEX

Acta Endocrinol. 532  
 Acta Histochem. Cytochem. 267  
 Acta Med. Jugoslav. 206  
 Acta Pathol. Microbiol. Scand. 366  
 Acta Pathol. Microbiol. Scand., Sect. A 47, 66  
 Acta Cytol. 533  
 Adv. Sci. 234  
 Amer. Ind. Hyg. Assoc. J. 29, 129, 157, 158, 161, 180, 195, 304, 323, 344, 345, 356, 375, 397, 406, 429  
 Amer. J. Clin. Pathol. 259  
 Amer. J. Epidemiol. 99  
 Amer. J. Med. 420, 535  
 Amer. J. Med. Sci. 454  
 Amer. J. Pathol. 73, 77, 136, 347  
 Amer. J. Roentgenol. Radium Ther. Nucl. Med. 265, 400, 538  
 Amer. Pract. 527  
 Amer. Rev. Resp. Dis. 184, 232, 337, 351  
 Amer. Surg. 435  
 Analyst 325  
 Ann. Clin. Lab. Sci. 28  
 Ann. Intern. Med. 36  
 Ann. N.Y. Acad. Sci. 114, 135, 439, 440, 442, 443, 445, 446, 450, 451, 452, 453, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 467, 468, 470, 472, 473, 474, 475, 476, 478, 479, 480, 483, 484, 486, 487, 488, 490, 491, 492, 493  
 Ann. Occup. Hyg. 31, 63, 134, 143, 164, 165, 179, 181, 193, 198, 318, 367, 387, 423, 437, 518  
 Arch. Environ. Health 12, 15, 32, 39, 45, 68, 84, 95, 107, 117, 119, 153, 169, 176, 187, 198, 248, 293, 303, 326, 390, 396, 407, 408, 409, 413, 421, 426, 447, 494, 504, 525, 539, 544  
 Arch. Geschwulstforsch. 70  
 Arch. Intern. Med. 139, 427  
 Arch. Mal. Prof. Med. Trav. Secur. Sociale 37, 97  
 Arch. Pathol. 46, 130, 252, 434, 541  
 Arch. Riga. Rada 146  
 Assessment of Airborne Particles: Third Rochester International Conference on Environmental Toxicity 308  
 Atmos. Environ. 49  
 Aust. N.Z. J. Med. 103  
 B. Westley (Editor). 224  
 Beitr. Path. Bd. 59  
 Biochem. J. 424  
 Bull. Esp. Biol. Med. 328  
 Bristol, England. 379  
 Brit. Columbia Med. J. 182  
 Brit. Empire Cancer Campaign 519  
 Brit. Exp. Pathol. 398  
 Brit. J. Cancer 82, 268, 338, 350  
 Brit. J. Dis. Chest 290, 485  
 Brit. J. Exp. Pathol. 98, 118, 162, 251, 498, 499, 500  
 Brit. J. Ind. Med. 38, 41, 50, 98, 109, 112, 121, 145, 166, 188, 223, 230, 333, 334, 369, 412, 471, 502, 503, 521, 547, 549  
 Brit. J. Surg. 291, 386  
 Brit. Med. J. 228, 280, 315, 331, 354, 385, 449, 495, 512, 545  
 British Empire Cancer Campaign Research, London, S.W.1. 519  
 Bull. Pol. Med. Sci. Hist. 302  
 C.L. Sanders, R.H. Busch, J.E. Ballou, and D.D. Mahlum (Editors). U.S. Atomic Energy Commission, Oak Ridge, TN. 69  
 C.W. Davies (Editor). Pergamon Press, London. 469  
 Can. Med. Assoc. J. 436  
 Cancer 58, 111, 115, 279, 430, 431, 526  
 Cancer Res. 253  
 Chemoscience 21  
 Chemosphere 54, 79  
 Chest 78, 192, 242  
 Clin. Allergy 231  
 Clin. Radiol. 257  
 Clin. Res. 190  
 Clin. Sci. 208, 543  
 Composites 113  
 Compt. Rend., Ser. D (Paris) 124, 329  
 Consumer Reports 2  
 Curr. Top. Pathol. 149  
 Dis. Chest 319, 364, 373, 374  
 Dissertation Absts. Intern. 106  
 Documentation of the Threshold Limit Values for Substances in Workroom Air. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (Third Edition) 140  
 Documentation of the Threshold Limit Values of Substances in Workroom Air. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio. 141  
 Drill's Pharmacology in Medicine, J. R. DiPalma (Editor), 4th Edition. McGraw-Hill Book Company, New York. 215  
 Environ. Act. 1  
 Environ. Physiol. Biochem. 81  
 Environ. Res. 40, 53, 62, 87, 100, 120, 126, 178, 202, 207, 218, 221, 226, 240, 245, 261, 294, 297, 300, 343, 345, 371, 405, 411, 422  
 Environment 89  
 Environmental Protection Agency 11  
 Europ. J. Cancer 335, 336  
 Exp. Mol. Pathol. 250  
 FDA Consumer 26  
 FDA Papers 93  
 Fed. Proc. 481  
 Fed. Regist. 71, 92, 214  
 Polia Medica 417  
 Food Chem. News 3, 4, 5, 7, 8, 19  
 Food Cosmet. Toxicol. 91, 142,

## JOURNAL INDEX

Food Cosmet. Toxicol. 235, 353, 380

Fortschr. Geb. Rontgenstr. Nuklearmed. 222

Gig. Sanit. 116

Gig. Tr. Prof. Zabol. 105

Health Phys. 133

Hyg. Sanit. 273, 310, 428

Inhaled Particles and Vapours II. Proceedings of an International Symposium (Cambridge, England, 1965) 660

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Inhaled Particles III: Proceedings of an International Symposium (London, 1970). W.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England. 174, 213

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Inhaled Particles III: Proceedings of an International Symposium, (London, 1970). W.H. Walton (Editor). Unwin Brothers Limited, Gresham Press, Surrey, England. 138, 144, 150, 156

Int. Arch. Arbeitsmed. 80, 101, 110, 171, 172

Int. J. Cancer 389, 419, 432

International Symposium on Identification and Measurement of Environmental Pollutants (Ontario, Canada) 224

Irish J. Med. Sci. 266

Israel J. Med. Sci. 377

J. Air Pollut. Contr. Assoc. 370

J. Amer. Med. Assoc. 10, 13, 14, 199, 362, 365, 384, 444, 448, 513

J. Amer. Rev. Resp. Dis. 403

J. Appl. Physiol. 348

J. Assoc. Offic. Anal. Chem. 35

J. Clin. Pathol. 175, 212, 324, 418

J. Egypt. Med. Assoc. 256, 320, 321

J. Exp. Med. 147, 269

J. Fr. Med. Chir. Thorac. 361

J. Fr. Med. Chir. Thorac. 317, 394, 399

J. Mt. Sinai Hosp. N.Y. 482

J. Occup. Med. 24, 30, 34, 43, 44, 52, 55, 60, 85

J. Pathol. 148, 219

J. Pathol. Bacteriol. 360, 425, 506

J. Roy. Inst. Public Health 381

J. Roy. Nav. Med. Serv. 278, 382

J. Sci. Labor 340

J. Thoracic Cardiovas. Surg. 501

Jap. J. Med. 529

Lab. Invest. 388

Lab. Pract. 277

Laboratory Diagnosis of Diseases Caused by Toxic Agents. F.W. Sunderman and P.W. Sunderman, Jr. (Editors). Warren H. Green, Inc., St. Louis, Missouri, U.S.A. 275

Laret 22, 57, 75, 76, 96, 546

Lavori Ist. Anat. Istol. Patol., Univ. Studi Perugia 339

Life Sci. 67, 211

Med. J. Aust. 25, 330, 332, 372, 531

Med. Lavoro 283, 349, 376, 383, 391, 392, 404

Med. Proc. (Mediese Bydraes) 511, 522

Med. Times 368

Mikrochim. Acta 88

Minerals Yearbook 1963: Metals and Minerals. Bureau of Mines, U.S. Department of the Interior 509

Minerals Yearbook: Metals and Minerals. U.S. Department of the Interior, Bureau of Mines. 466

Morphology of Experimental Respiratory Carcinogenesis U.S.A. P.C. Symposium Series, No. 21. U.S. Atomic Energy Commission, Division of Technical Information, Springfield, Virginia. 312

Morphology of Experimental Respiratory Carcinogenesis, USAPC Symposium Series, No. 21. U.S. Atomic Energy Commission, Division of Technical Information, Springfield, Virginia. 286

Mt. Sinai J. Med. 238

N.Y. State J. Med. 90

Nat. Safety News 16

National Environmental Research Center 11

Nature 65, 128, 160, 177, 210, 225, 359, 410, 414, 441, 508, 523

New Engl. J. Med. 173, 183, 204, 243, 438, 477, 536

NLM Literature Search 51

Northwest Med. 416

Nouv. Presse Med. 56

Occup. Health 163, 220

Office of Research and Development 11

Oncology: Proceedings of the 10th International Cancer Congress (1970) 216, 229

P. Nettesheim, M.G. Hanna, J.W. Deatherage (Editors). Atomic Energy Commission, Division of Technical Information, Springfield, Virginia, U.S.A. 246

Pathol. Microbiol. 132

Pathology 287, 352

Pest. Chem. News 6, 9, 17, 18, 20, 27

Pharm. Biol. 530

Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro (Editor). Oxford University Press, New York. 236, 237, 239, 241, 247, 255, 258, 260, 262, 264, 270, 271, 278, 276, 281, 282, 284, 285, 288, 295, 296, 298, 299, 301, 305, 306, 307, 309, 311, 313, 314, 316

## JOURNAL INDEX

Pneumoconiosis: Proceedings of the International Conference (Johannesburg, 1969). H.A. Shapiro, (Editor). Oxford University Press, New York. 263

Pneumonologie 227, 289

Poumon Coeur 363, 489

Practitioner 415

Praxis Pneumol. 355

Proc. Amer. Assoc. Cancer Res. 341, 515

Proc. Roy. Soc. Med. 42, 152, 170, 189, 196, 433

Proceedings of the Fourteenth International Congress of Occupational Health (Madrid, 1963). Excerpta Medica Foundation, New York. 497, 505, 514, 516

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Progr. Exp. Tumor Res. 322

R. L. Clark (Editor). Chicago, Illinois. 229

R.L. Clark (Editor). Chicago, Illinois. 216

Radiology 402

Radionuclide Carcinogenesis, United States Atomic Energy Commission Symposium Series 69

Respiration 108, 357

Rev. Tuberc. (Paris) 151

Roy. Soc. Health J. 197

S. Afr. Cancer Bull. 327

S. Afr. Med. J. 83, 104, 244, 342, 378, 395, 517, 520, 534, 540

Schweiz. Med. Wochensch. 154

Science 33, 122, 200, 528

Scot. Med. J. 169, 254, 524

Staub Reinhardt. Luft 48, 64, 548

T.T. Mercer, P.E. Morrow, and W. Stober (Editors). Charles C. Thomas, Publisher, Springfield, Illinois. 308

Technical Papers 61

The Veterinary Annual. XIX + 311p. Pool, W.A. (Editor), John Wright and Sons, Ltd. 379

Thorax 102, 155, 233, 292, 393, 496, 507, 510, 537, 542

Today's Health 86

Toxicol. Appl. Pharmacol. 203

Trans. N.Y. Acad Sci. 272

Trans. N.Y. Acad. Sci. 358

Trans. Soc. Occup. Med. 131, 201

U.S. Atomic Energy Commission Symposium Series, No. 21: Morphology of experimental respiratory carcinogenesis 246

U.S. Geol. Survey Prof. Paper 191

United States Mineral Resources, D. A. Prabst and W.P. Pratt (Editors). Geological Survey Professional Paper 820, United States Government Printing Office, Washington, D.C. 74

Vop. Onkol. 289

WHO Chronicle 23

Work, Environ., Health 123

Work, Environment, Health 159

World Health Organ. Chron. 167

Z. Erkr. Atmungsorgane 125

Zentralbl. Bakteriol. Parasitenk 127

Zentralbl. Bakteriol. Parasitenk. 72



## **PUBLICATION DATE INDEX**



## PUBLICATION DATE INDEX

1960: 544, 545, 546, 547, 548, 549

1961: 535, 536, 537, 538, 539, 540, 541, 542, 543

1962: 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534

1963: 518, 519, 520, 521, 522, 523

1964: 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517

1965: 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494

1966: 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435

1967: 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422

1968: 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393

1969: 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352

1970: 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316

1971: 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161

1971: 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233

1972: 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137

1973: 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88

1974: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15



**III. A Literature Compilation**

**1974 - 1977**

**S. A. Black**

## **ABBREVIATIONS**

BA.....Biological Abstracts  
CA.....Chemical Abstracts  
EM(GP).....Excerpta Medica, General Pathology  
EM(IM).....Excerpta Medica, Internal Medicine

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**PERMUTED TITLE INDEX**



PERMUTED TITLE

oxide with chrysotile asbestos or benzpyrene in the rat experimental silicosis caused by crystalline and conditions.*	# Dissolution of silicic by crystalline and condensed #Accumulation of nucleic Chemical carcinogens.*	# Accumulation of nucleic inflammatory steroids.*	# Macrophage plasminogen in rats.*	# Surface charge and hemolytic #Carcinogenic #Carcinogenic group) after intrapleural injections into #Carcinogenic #Modification of biological surface #Carcinogenic association with disease, occupation, and domiciliary literature and presentation of a case with associated #Induction of lung tumors in rats by intratracheal the carcinogenic effect of asbestos material after oral chrysotile asbestos.*	# The of micro-quantities of chrysotile asbestos by dye minerals and its application to the measurement of with rodents.*	# Evaluation of spiculate components in some industrial mesotheliomas in rats.*	# Effect of of asbestos origin in a man of 20 years of Evaluation of Carcinogenic Risk of #IARC (International No. 8, Biological effects of #IARC (International electron microscopy.*	# The blood- #Asbestos fibres in the #Hazards to health due to #Asbestos: Rationale behind a proposed and measurement of the concentration of asbestos in #It stacks up!	# Quantitative determination of eyepiece graticule.*	# A comparison of Preliminary findings.*	# Physical parameters of techniques of identification and determination of documentation on evaluation of occupational exposure to	# Early detection of expiratory pneumoconiosis. Effect of asbestos dust and Candida the measurement of surface #Adsorption of human serum fields.*	# Possible asbestos hazards in clinical #Interaction of asbestos with Cytoplasmic hyalin in asbestos. A reaction of injured vitro. Biochemical and #Effect of fibrous dust on electron microscope of the effects of asbestos dust on Chemical carcinogens.*	# The adsorption of water and benzene on #Dissolution of silicic acid from #Pulmonary fibrogenic response of guinea pigs to the endemic occurrence of pleural plaques.*	# Concentrations in municipal water supplies. #Asbestiform into #Carcinogenic activity of magnesia-ffvedsonite ( pneumoconioses induced by Soviet and non-Soviet of asbestos dust with an electron microscope microprobe in biological materials.*	# Distribution and elemental #Quantitative differential thermal #Pleural mesotheliomas. An #Asbestos exposure in a Yale building: males.*	# Results of generation and evaluation of IICC asbestos clouds in material after oral administration.*	# Experimental carcinogenesis.*	# Oncogenic effect of fibrous dusts. and fine structure of peritoneal tumors produced in asbestos.*	# Small #Tumorigenic effect of fibrous dusts in experimental by X-ray diffraction using conventional and rotating the lungs of rats and guinea pigs after inhalation of and condensed silicon dioxide, during asbestos, activator: Induction by asbestos is blocked by #Pulmonary fibrosis.*	# Frequency of HLA #Pathogenic effects of inhaled particles and #Justise joins in diseases of the #Temporary disability of workers of the of mesothelioma. Report on 150 cases from the Hamburg and its application to the measurement of surface #Air quality in work	# Toxicity determination report H.H.E. 74-94-253, measurement of #Adsorption of human serum albumin by #A study of workers exposed to #Biochemical effects of measurement of high concentrations in municipal water #Effects of heated chrysotile the body cavities of mice. #Effects of heated chrysotile abdominal cavity.*	# Cocarcinogenesis of plutonium-239(IV) # Accumulation of nucleic acids in the lungs during acid from amosite and quartz dusts under physiological acids in the lungs during experimental silicosis caused # ACS (American Chemical Society) Monograph, Vol. 173, activator: Induction by asbestos is blocked by anti- activity of asbestos.*	# Activity of chrysotile-asbestos injected intrapleurally activity of commercial chrysotile asbestos.*	# Activity of magnesia-ffvedsonite (amphibole-asbestos activity of particles.*	# Activity of synthetic asbestos.*	# Bodies in a necropsy series in East London: Adenocarcinoma of the rete testis: A review of the administration of benzo(a)pyrene and chrysotile administration.*	# Experimental animal studies on adsorption of water and benzene on amosite and adsorption.*	# Determination of adsorption of human serum albumin by asbestiform aerosol exposure system for chronic inhalation studies aerosols.*	# Mineralogical characteristics and hygienic age at inoculation of asbestos on occurrence of #Pleural calcifications	# Agency for Research on Cancer) Monographs on the Agency for Research on Cancer) Scientific Publication, air barrier in pulmonary asbestosis: Study of a case by air of towns.*	# Pleural calcifications	# Air pollution with asbestos.*	# Air quality standard.*	# Detection	# Air pollution explained in plain English.)*	# Air quality in work areas.*	# Airborne asbestos dust in occupational environment by X-airborne asbestos fiber counting with and without an airbone asbestos fibres in various work environments: #Improved airbone asbestos.*	# Background airbone asbestos in the vicinity of a freeway.*	# Airflow obstruction in cement workers.*	# Alibicus infection of the lungs of rhesus monkeys.*	# Alumina by asbestiform minerals and its application to	# Alignment of respirable asbestos fibers by magnetic #Allergy.*	# Alveolar cells.*	# Alveolar epithelium.*	# Alveolar macrophages and on other cells cultivated in alveolar macrophages.*	# Study under the #Amphibol asbestos in the soil and its significance for amphibole minerals: detection and measurement of high amphibole-asbestos group) after intrapleural injections amphibolic asbestos.*	# Characteristics of experimental analyser.*	# The identification analysis of asbestos fibers and accompanying minerals analysis of inorganic particulates in pulmonary tissue.*	# Analysis of small dust samples containing quartz.*	# Analysis of 18 cases and review of the literature.*	# Analysis and resolution.*	# Analysis of particles in stomach tumours from Japanese animal experiments concerning the carcinogenic effect animal exposure charters.*	# The animal studies on the carcinogenic effect of asbestos	# Animal experimentation and relations to human animals by injections of asbestos.*	# Histogenesis animals in the study of pathological effects of animals.*	# Animals.*	# Anode X-ray tube.*	# Dust in occupational environment anthophyllite.*	# Asbestos body formation in anthracosis, and pneumoconiosis from grog dust.*	# Anti-inflammatory steroids.*	# Macrophage plasminogen antigenicity in experimental asbestosis and silicosis.*	# Antigens in asbestos workers with and without pulmonary antigens.*	# Appeal on taconite pollution.*	# Ararat asbestos-cement plant due to suppurative area.*	# Retrospective investigations on the genesis areas of dispersed samples of chrysotile.*	# Minerals areas.*	# Armstrong Cork Company, Jackson, Mississippi.*	# Asbestiform minerals and its application to the asbestiform minerals in commercial talc manufacture.*	# Asbestiform minerals on lung fibroblast cultures.*	# Asbestiform amphibole minerals: detection and asbestos and automobile brake lining dust injected into	000246	000220	000020	000254	000121	000173	000213	000214	000219	000252	000216	000067	000096	000245	000095	000099	000176	000189	000304	000183	000024	000089	000139	000028	000103	000134	000065	000037	000180	000177	000226	000126	000014	000094	000009	000143	000003	000146	000315	000189	000285	000022	000279	000156	000012	000059	000254	000099	000220	000290	000040	000051	000219	000203	000207	000165	000034	000307	000281	000248	000129	000210	000013	000095	000209	000058	000132	000211	000275	000126	000031	000020	000121	000077	000002	000043	000108	000117	000189	000226	000080	000189	000150	000137	000051	000067
---	---	---	------------------------------------	---	---	---	--	--	--	--	--	--	---	---	--	---	--	---------------------------------	---	--	--	---	---	--	--	------------------------------------	---	--	---	--	--	--------------------------	---------------------------------	--------------------------	-------------	---	-------------------------------	---	--	---	---	--	--	--------------------	-------------------------	--	---	--	---	--	---	-----------------------------	---	---	---	--	-------------	----------------------	--	---	--------------------------------	--	--	----------------------------------	--	--	--------------------	--	---	--	---	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

## PERMUTED TITLE

with low asbestos exposure.*	#Association of	asbestos and bronchogenic carcinoma in a population	000299
#Light microscope studies on the effects of chrysotile	#Chronic inhalation of	asbestos and cigarette smoke by hamsters.*	000303
injection.*	#Exposure to	asbestos and fiber glass on the morphology and	000232
#Mesothelioma in rats after inoculation with	#Mesothelial reaction to	asbestos and laryngeal carcinoma.*	000274
optical systems to obtain a microscopic profile of		asbestos and other irritants after intraperitoneal	000072
industry.*		asbestos and other materials.*	000297
in the fabrication of friction coatings containing		asbestos and other nonopaque particulate matter larger	000007
#Type of		asbestos and respiratory cancer in the asbestos	000074
#Current status of		asbestos and their handling in car repair shops.*	000128
#Dust factor in the production of		asbestos based on 50 observations.*	000170
of a mesothelioma patient by electron	#Investigation of	asbestos board.*	000280
association with disease, occupation,	#Prevalence of	asbestos bodies and asbestos fibers found in the lungs	000317
		asbestos bodies in a necropsy series in East London:	000067
		asbestos bodies in 50 necropsies in Trieste.*	000027
		asbestos bodies--1940 to 1972: a necropsy study.*	000025
		asbestos body coating.* #Histochemical demonstration	000102
		asbestos by dye adsorption.*	000176
		asbestos cement manufacturing plants.*	000306
		asbestos cement workers.* #Vital capacity and	000008
		asbestos clouds in animal exposure chambers.*	000013
		asbestos deposits.*	000079
		asbestos dust a biological hazard?*	000110
		asbestos dust and the dissolution of nickel.*	000314
		asbestos dust and Candida albicans infection of the	000315
		asbestos dust in experiments.*	000152
		asbestos dust in occupational environment by X-ray	000126
		asbestos dust in the lungs of rats.*	000221
		asbestos dust on alveolar macrophages.*	000059
		asbestos dust on benz(a)pyrene-induced carcinogenesis	000244
		asbestos dust on macrophages.* #In vitro studies	000148
		asbestos dust on mitochondrial enzymes of rat lung.*	000019
		asbestos dust on the emergence of respiratory tract	000293
		asbestos dust on the reducing effect of macrophages	000236
		asbestos dust with an electron microscope microprobe	000207
		asbestos dust.* #Biochemical	000263
		asbestos dust.* #Prophylaxis	000230
		asbestos dust.* #Monosymptomatic	000179
		asbestos dust.* microscope study of the response	000056
		asbestos dust.* of lung tumors in rats by intratracheal	000245
		asbestos dust: A theory.*	000111
		asbestos dusts on cultured macrophages.*	000153
		asbestos dusts on cytotoxicity and electron structure.*	000235
		asbestos dusts.* #Investigations concerning morphology	000250
		asbestos exposure. Report of two cases.*	000026
		asbestos exposure.*	000104
		asbestos exposure.*	000053
		asbestos exposure.*	000276
		asbestos exposure.* #The epidemiologic	000199
		asbestos exposure.* #Association of asbestos	000299
		asbestos exposure.*mesothelioma in Victoria, Australia.	000186
		asbestos exposure: A case report.*	000172
		asbestos exposure: A case report.* mesothelioma of	000082
		asbestos fiber concentrations.*	000010
		asbestos fiber content.*	000130
		asbestos fiber counting with and without an eyepiece	000014
		asbestos fibers and accompanying minerals in biological	000165
		asbestos fibers by magnetic fields.*	000285
		asbestos fibers by the most probable number method.*	000229
		asbestos fibers detected by electron microscopy.*	000184
		asbestos fibers found in the lungs of a mesothelioma	000317
		asbestos fibers.*	000247
		asbestos fibers.*	000227
		asbestos fibers.*	000060
		asbestos fibers.*	000301
		asbestos fibers.*	000036
		asbestos fibers.* #Depression	000116
		asbestos fibers.* #Induction of chromosome	000262
		asbestos fibre coating in experimental carrageenin	000101
		asbestos fibres from potable water by coagulation and	000163
		asbestos fibres in rats: Cover slip method.* formation	000259
		asbestos fibres in various work environments:	000094
		asbestos garments.*	000093
		asbestos group after intrapleural injections into	000219
		asbestos hazards in clinical allergy.*	000022
		asbestos in air.*	000180
		asbestos in city water: Surveillance of	000171
		asbestos in mice.*	000310
		asbestos in plastics.*	000193
		asbestos in rats.*	000296
		asbestos in rats.* #Transplantable	000218
		asbestos in southeast Turkey.* #Pleural	000312
		asbestos in the soil and its significance for the	000040
		asbestos in the use of consumer spackling, patching,	000237
		asbestos in the vicinity of a freeway.*	000003
		asbestos in the Havre region.*	000086
		asbestos in tissue.*	000295
		asbestos induction of pleural mesotheliomas in rats.*	000217
		asbestos industry.*	000074

PERMUTED TITLE

#Dust control techniques in the	asbestos industry.*
#The short-term effects of chronic	asbestos ingestion in rats.*
#Carcinogenic activity of chrysotile	asbestos injected intrapleurally in rats.*
#Macrophage plasminogen activator: Induction by	asbestos is blocked by anti-inflammatory steroids.*
#An examination of the fibrous mineral content of	asbestos lung tissue from the Canadian chrysotile
animal studies on the carcinogenic effect of	asbestos material after oral administration.*
systems.*	asbestos minerals and their effects on biological
#Research perspectives concerning	asbestos minerals.*
#Surface energetics of	asbestos on erythrocyte surface charge.*
#Effect of quartz and	asbestos on lipid peroxidation in the red cells.*
pcpulation characteristics of	asbestos on macrophage membrane structure and
#Effect of age at inoculation of	asbestos on occurrence of mesotheliomas in rats.*
seen over a period of 6 years in Nantes.*	asbestos on the lungs. Report of 27 cases of asbestosis
#Practical aspects of counting	asbestos on the Millipore MC.*
organs	asbestos on DNA synthesis in the pancreas and other
#The short-term effects of ingested chrysotile	asbestos or benzopyrene in the rat abdominal cavity.*
of plutonium-239(IV) oxide with chrysotile	asbestos or quartz particles on the mixed cultures of
macrophage and 3T6 cell.*	asbestos particles in the cerebrospinal fluid. Study
ccnducted with various optical	asbestos particles in the human respiratory tract.*
#First finding of	asbestos plus kieselgur.*
among persons subjected to occupational inhalation of	#Morphogenesis
of granulomas produced by asbestos, kieselgur, and	asbestos pneumoconioses: A comparative clinical-
roentgenographic study.*	asbestos spray process.*
#Cement, asbestos, and cement-	asbestos textile facilities.*
#Monitoring an	asbestos textile workers at Hamburg.*
#Technological feasibility of the two fibers/cc	asbestos the only hazard?*
#Retrospective study in 236	asbestos through the digestive wall in rats.*
#Fiber carcinogenesis: Is	asbestos to asbestos exposure.*
#Penetration of	asbestos toxicity.*
#Quantitative relationship of fecal	asbestos with alveolar cells.*
#Surface charge and	asbestos with hamster respiratory mucosa in organ
#Interaction of	asbestos workers with and without pulmonary fibrosis.*
culture.*	asbestos workers.*
#Interaction of crocidolite	asbestos workers.*
#Frequency of HIA antigens in	asbestos workers.*
#Sputum cytopathological findings in former	asbestos workers.*
#Lung function in relation to radiographic changes in	asbestos workers.*
#The HL-A system in	asbestos workers.*
#Autoantibodies and serum immunoglobulin levels in	asbestos workers.*
#Pulmonary function profiles in Quebec	asbestos workers.*
#Pulmonary cytopathology of former	asbestos workers: Report of the first year.*
Durham, N.C., November	asbestos. Chrysotile asbestos in plastics.*
Scientific Publication, No. 8. Biological effects of	asbestos. Proceedings of a joint NIEHS-EPA conference,
#Lymphohematogenous spread of	asbestos. Proceedings of a Working Conference.* Cancer)
#Surface charge and hemolytic activity of	asbestos.*
#The biological effect of dusts of	asbestos.*
#Fibrogenic response in murine lungs to	asbestos.*
#Cytogenetic studies on chrysotile	asbestos.*
#Inhalation carcinogenesis from various forms of	asbestos.*
#The biological effects of	asbestos.*
#Small animals in the study of pathological effects of	asbestos.*
#Ingestion of	asbestos.*
#Placental transfer of	asbestos.*
#The identification of	asbestos.*
#Immunological reflections on	asbestos.*
#Carcinogenic activity of synthetic	asbestos.*
#Hazards to health due to air pollution with	asbestos.*
of citrate ions on the dissolution of silica from	#Influence
health risks in studies of the health effects of	#Estimating
ascertained cases of lung and pleural tumors due to	#Post mortem
study of rat pleural mesotheliomas induced by	#Histochemical
of water and benzene on a/csite and chrysotile	#The adsorption
on the distribution of trace metals in chrysotile	#Seme observations
of identification and determination of airborne	#Improved techniques
in lung fibroblast cultures exposed to chrysotile	#Ultrastructural changes
on evaluation of occupational exposure to airborne	#Background documentation
peritoneal tumors produced in animals by injections of	#Histogenesis and fine structure of
Deposition of the UICC standard reference samples of	asbestos.* using radioactive tracer techniques: II.
of small quantities of single varieties of UICC	asbestos.* infrared spectrophotometry for the estimation
radioactive tracer techniques: I. UICC crocidolite	asbestos.* of the rat and its subsequent clearance using
dwellers, and patients with pulmonary	asbestos) bodies and primary carcinoma of the colon.*
#Ferruginous (	asbestos) bodies in the lungs of rural dwellers, urban
#Health hazards:	asbestos; a review.*
#Pathological and environmental aspects of	asbestos-associated diseases.*
of benzo(a)pyrene in rat liver microsomes. Effect of	asbestos-associated metal ions and pH.*
the skin.#Temporary disability of workers of the Ararat	#Metabolism
ciliate epithelium.*	asbestos-cement plant due to suppurative diseases of
#The effect of	asbestos-containing dusts on the motor function of the
#The radiology of	asbestos-induced disease of the lungs.*
#Prevention of	asbestos-induced hemolysis.*
#Benign	asbestos-induced pleurisy.*
#The spectrum of	asbestos-related diseases.*
#Lung cancer complicated with	asbestos-tuberculosis of the lung.*
comparative clinical-roentgenographic study.*	asbestos, and cement-asbestos pneumoconioses: A
carcinoma.*	asbestos, collagen formation, ferruginous bodies and
#Relationship between exposure to	asbestos, kieselgur, and asbestos plus kieselgur.*
#Morphogenesis of granulomas produced by	asbestos?*
#The risk equations: A ban on	asbestos: a review of 72 cases.*
#Mesothelioma following exposure to	asbestos: controlling a potential hazard.*
#Steelwork insulated with sprayed crocidolite	asbestos: significance of asbestosis and value as a
model of carcinogenesis.*	000138

## PERMUTED TITLE

Netherlands.*	#Pleura mesothelioma and exposure to asbestos: A retrospective case-control study in the	000318
	#Asbestos and health.*	000136
exposed autopsy population.*	#Asbestos and its environmental impact.*	000135
	#Asbestos and lung cancer in a non-occupationally	000300
	#Asbestos and mesothelioma incidence in Connecticut.*	000038
	#Asbestos as an environmental carcinogen.*	000142
	#Asbestos bodies and fibers in lung tissues.*	000084
	#Asbestos bodies and pleural plaques in human lungs at	000115
necropsy.*	#Asbestos bodies in the post mortem of inhabitants of	000064
Zagreb and their relationship to malignant tumors (	#Asbestos body formation in the lungs of rats and guinea	000031
pigs after inhalation of anthophyllite.*	#Asbestos carcinogenicity.*	000260
cell culture.*	#Asbestos cytotoxicity in the long term macrophage-like	000294
	#Asbestos emissions from baghouse controlled sources.*	000124
repair.*	#Asbestos exposure and multiple primary tumors.*	000066
resolution.*	#Asbestos exposure during brake lining maintenance and	000239
	#Asbestos exposure in a Yale building: Analysis and	000248
examination of the Malmo material.*	#Asbestos fibers in drinking water.*	000109
and hypertensive effects.*	#Asbestos fibers in the colonic wall.*	000308
	#Asbestos fibre in the lung and mesothelioma: A re-	000206
treatment.*	#Asbestos fibres in the air of towns.*	000134
sclubility.*	#Asbestos in drinking water: the possible nephrotoxicity	000044
from mononuclear phagocytes.*	#Asbestos in potable water.*	000120
their epidemiology and implications for clinical	#Asbestos in the work place and the community.*	000198
cancer.*	#Asbestos in the workplace and the community.*	000269
standard.*	#Asbestos in water: Mining and processing effluent	000164
	#Asbestos-induced hemolysis in relation to its silica	000223
	#Asbestos-induced intrathoracic tissue reactions.*	000112
	#Asbestos-induced selective release of lysosomal enzymes	000055
	#Asbestos-related diseases of the lung and other organs:	000016
	#Asbestos-related disorders.*	000201
	#Asbestos, smoking, and laryngeal carcinoma.*	000261
	#Asbestos, talc, and nitrates in relation to gastric	000267
	#Asbestos: Rationale behind a proposed air quality	000037
	asbestosis.*	000203
	of experimental pneumoconioses	000089
	asbestosis and silicosis.*	000202
	asbestosis and value as a model of carcinogenesis.*	000138
	asbestosis in guinea pigs.*	000291
	asbestosis in the United Kingdom.* of the histological	000309
cell types of lung cancer in workers suffering from	asbestosis seen over a period of 6 years in Nantes.* #	000188
Effects of asbestos on the lungs. Report of 27 cases of	asbestosis with central nervous system lesions.*various	000062
optical microscopy techniques in a case of pulmonary	asbestosis. A reaction of injured alveolar epithelium.*	000156
	asbestosis.*	000288
	#Cytoplasmic hyaline in	000021
	#Radiologic features of	000161
	#Nodule morphogenesis in experimental	000085
	#Pleural mesothelioma and	000270
	#Concerning an unusual case of talcum-	000253
	#The visceral pleura in	000257
	#The diagnosis of	000070
	#The radiologic pulmonary volume in patients with	000258
	#Bone marrow changes in	000096
	studies on the expectoration of subjects with	000020
	literature and presentation of a case with associated	000283
	by crystalline and condensed silicon dioxide, during	000302
	pulmonary surfactant and whole lung #Chrysotile-induced	000103
	without a control group.* #Worker-sponsored survey for	000137
	#The blood-air barrier in pulmonary	000133
	#Enzymic changes in lung tissue of	000119
asbestos.*	#Post mortem	000264
	mesothelioma by microcytotoxicity tests.*	000187
	#of the literature and presentation of a case with	000071
	#pathological and environmental aspects of asbestos-	000096
	-a pyrene in rat liver microsomes. Effect of asbestos-	000145
	southeast Turkey.* #Fleural calcification	000312
	of asbestos bodies in a necropsy series in East London:	000067
	#Inorganic particles in human tissues and their	000160
	population with low asbestos exposure.*	000299
	#"Nonspecific" interstitial pulmonary fibrosis:	000184
	#Thirty-two cases of mesothelioma in Victoria,	000186
	capacity and one-second forced expiratory volume in	000008
asbestos workers.*	#Asbestos emissions from	000157
	#The risk equations: A	000061
cavities of #Effects of heated chrysotile asbestos and	#Background documentation on evaluation of occupational	000300
	and lung cancer in a non-occupationally exposed	000143
exposure to airborne asbestos.*	#Asbestos emissions from	000124
	#The risk equations: A	000195
	#The blood-air	000103
electron microscopy.*	#Ferruginous bodies in	000241
	#The adsorption of water and	000200
	lung tumors in rats by intratracheal administration of	000099
	asbestos-associated metal icns and pH.* #Metabolism of	000245
	#Effect of chrysotile-asbestos dust on	000284
	of plutonium-239(IV) oxide with chrysotile asbestos or	000244
	exposure.* #Massive	000246
	macrophages and on other cells cultivated in vitro.	000104
	Biochemical and morphologic study.* dust on alveolar	000012

## PERMUTED TITLE

pigs to asbestos dust.*	# Biochemical changes and pulmonary response of guinea	000263
lungs of rats.*	# Biochemical changes caused by asbestos dust in the	000221
fibroblast cultures.*	# Biochemical effects of asbestos minerals on lung	000131
	# Biologic exposure to dental materials.*	000168
	# The biological effect of dusts of asbestos.*	000234
	#The biological effects of asbestos.*	000194
	#Is short-fibered asbestos dust a	000110
of asbestos fibers and accompanying minerals in	#Modification of	000165
concerning asbestos minerals and their effects on	#Research perspectives	000159
for Research on Cancer) Scientific Publication, No. 8.	Biological effects of asbestos. Proceedings of a	000028
a joint NIEHS-EPA conference, Durham, N.C., November 8-*	Biological effects of tremolite talc on hamsters.*	000166
	#Dust factor in the production of asbestos	000268
mesothelioma patient by	#Investigation of asbestos	000121
exposure to asbestos, collagen formation, ferruginous	blocked by anti-inflammatory steroids.*	000103
	#Asbestos	000280
	#Asbestos	000084
with disease, occupation, and	#Ferruginous (asbestos)	000115
and patients with pulmonary	#Prevalence of asbestos	000242
their relationship to malignant tumors (	#Ferruginous	000067
	#Lung asbestos	000241
in prevalence and concentration of pulmonary asbestos	#Asbestos	000033
and automobile brake lining dust injected into the	#Asbestos	000064
of hematoidin in the innermost layers of human asbestos	#Asbestos	000027
after inhalation of anthophyllite.*	#Foreign	000025
	#Locating fibers in the	000070
	#Malignant fibrous mesothelioma: Metastatic to	000205
	#Effects of heated chrysotile asbestos and automobile	000298
asbestos exposure.*	#Asbestos exposure during	000061
	#Association of asbestos and	000239
	#Asbestos exposure in a Yale	000299
Proceedings of a joint NIEHS-EPA conference, Durham, N.	#Asbestos	000166
asbestos in southeast Turkey.*	#Pleural	000312
years of age.*	#Pleural	000089
	#So-	000256
mineral content of asbestos lung tissue from the	#Digestive system	000208
inhalation of asbestos particles: A	#Lung	000251
lung.*	#Asbestos and lung	000286
	#Type of asbestos and respiratory	000300
United	#A study of the histological cell types of lung	000171
	in city water: Surveillance of gastrointestinal	000255
	#Epidemiology of gastrointestinal	000181
	#Occupational differences in rates of lung	000267
	#Asbestos, talc, and nitrates in relation to gastric	000114
	mineral fibers: Do they penetrate tissue or cause	000178
	rice.*	000079
	#Japanese gastric	000139
Risk of	#Inhalation	000028
effects of	#Multiple factors in	000028
infective pneumoconiosis. Effect of asbestos dust and	carcinogenesis in humans.*	000315
coatings containing asbestos and their handling in	the carcinogenic effect of	000128
	#Asbestos as an environmental	000142
	#Inhalation	000228
	fibrous dusts and their interpretation with regard to	000210
	of chrysotile-asbestos dust on benzo(a)pyrene-induced	000244
	#Multiple factors in	000075
	dusts. Animal experimentation and relations to human	000209
	significance of asbestosis and value as a model of	000138
	#Fiber	000272
	administration.*	000095
	#Experimental animal studies on the	000210
	#Results of animal experiments concerning the	000227
	#The	000178
	#Japanese gastric cancer: Potentially	000213
	intrapleurally in rats.*	000214
*		000219
amphibole-asbestos group) after intrapleural	#Carcinogenic activity of magnesia afvedsonite (	000216
experiments.*	#Carcinogenic activity of synthetic asbestos.*	000152
for Research on Cancer) Monographs on the Evaluation of	#Carcinogenic effect of the chrysotile-asbestos dust in	000139
	#Asbestos	000260
the rat in relation to fiber dimension.*	Carcinogenic Risk of Chemicals to Man, Vol. 2. Some	000273
Chemical Society) Monograph, Vol. 173, Chemical	carcinogenicity.*	000254
#Association of asbestos and bronchogenic	#Carcinogenicity of fibrous glass: Pleural response in	000299
#Ferruginous (asbestos) bodies and primary	carcinogens.*	000242
	#Exposure to asbestos and laryngeal	000274
	#Asbestos, smoking, and laryngeal	000261
of the peritoneum in women: Mesothelioma or papillary	#Papillary tumors	000147
tc asbestos, collagen formation, ferruginous bodies and	carcinoma.*	000083
study of asbestos fibre coating in experimental	#Relationship between exposure	000101
	carrageenin granulomas.*	000101

## PERMUTED TITLE

#Pleural mesotheliomas. An analysis of 18 on the genesis of mesothelioma. Report on 150 Nantes.**Effects of asbestos on the lungs. Report of 27 #Post mortem ascertained retrospective survey related to #Thirty-two following exposure to asbestos: a review of 72 mesothelioma and asbestos exposure. Report of two and automobile brake lining dust injected into the body chrysotile asbestos or benzpyrene in the rat abdominal #Technological feasibility of the two fibers/ #Asbestos cytotoxicity in the long term macrophage-like crocidolite asbestos fibres in rats: Cover slip #Giant microcytotoxicity tests.* #Assessment of #Depression of viral interferon induction in #Chrysotile-induced asbestosis: changes in the free asbestos in the United #A study of the histological particles on the mixed cultures of macrophage and 3T6 #Penetration of #Induction of chromosome changes in Chinese hamster cf fibrous dust on alveolar macrophages and on other microscope study of the response of mesothelial #Interaction of asbestos with alveolar #Effect of asbestos on lipid peroxidation in the red chloride and on oxygen consumption by the Lung function consequences of dust exposure in asbestos #Temporary disability of workers of the Ararat asbestos #Early detection of expiratory airflow obstruction in forced expiratory volume in Australian male asbestos recentgenographic study.* #Cement, asbestos, and comparative clinical-roentgenographic study.* #Techniques in a case of pulmonary asbestosis with optical #First finding of asbestos particles in the evaluation of UICC asbestos clouds in animal exposure #Consumer talcums and powders: Mineral and chemical #Surface #Surface #Effect of quartz and asbestos on erythrocyte surface toxicity determination. Fortune Industries, Inc., #Consumer talcums and powders: Mineral and dusts on #Effect of mechanical thermal, and #ACS (American Chemical Society) Monograph, Vol. 173, carcinogens.* #ACS (American Monographs on the Evaluation of Carcinogenic Risk of #Induction of chromosome changes in of macrophages with regard to triphenyltetrazolium to asbestos fibers.* #The short-term effects of #Aerosol exposure system for hamsters.* #Effects of heated and #Light microscope studies on the effects of #Determination of micro-quantities of by intratracheal administration of benzo(a)pyrene and #Pleural calcification associated with exposure to and other organs of #The short-term effects of ingested #Cocarcinogenesis of plutonium-239(IV) oxide with #Carcinogenic activity of commercial #The adsorption of water and benzene on amosite and #Cytogenetic studies on observations on the distribution of trace metals in changes in lung fibroblast cultures exposed to #Inhibition of #Solubility of content of asbestos lung tissue from the Canadian tract and liver of the rat.* #Effects of ingested tract, liver, and #Dose-dependent effects of ingested #Cytotoxicity of heated measurement of surface areas of dispersed samples of #Carcinogenic effect of the carcinogenesis in rat lungs.* #Effect of #Carcinogenic activity of #Handling asbestos. population, pulmonary surfactant and whole lung tissue #Chronic inhalation of asbestos and life span and decreased weight in hamsters exposed to asbestos-containing dusts on the motor function of the * #Investigating possible effects of asbestos in in the respiratory tract of the rat and its subsequent in the respiratory tract of the rat and its subsequent #Possible asbestos hazards in #The other organs: their epidemiology and implications for and cement-asbestos pneumoconioses: A comparative #The generation and evaluation of UICC asbestos #Removal of asbestos fibres from potable water by #Histochemical study of asbestos fibre cases and review of the literature.* cases from the Hamburg area.* investigations cases of asbestosis seen over a period of 6 years in cases of lung and pleural tumors due to asbestos.* cases of mesothelioma in Victoria, Australia. A cases.* #Mesothelioma cases.* #Diffuse peritoneal cavities of mice.*Effects of heated chrysotile asbestos cavity.* #Effects of plutonium-239(IV) oxide with cc asbestos textile facilities.* cell culture.* cell cultures to asbestos fibers.* cell formation after intraperitoneal application of cell mediated immunity to malignant mesothelioma by cell monolayers by asbestos fibers.* cell population, pulmonary surfactant and whole lung cell types of lung cancer in workers suffering from cell.* #Effects of asbestos or quartz cells by asbestos fibers.* cells by exposure to asbestos fibers.* cells cultivated in vitro. Biochemical and morphologic cells to the intrapleural injection of asbestos dust.* cells.* cells.* cells.* macrophages with regard to triphenyltetrazolium cement manufacturing plants.* #Cement plant due to suppurative diseases of the skin.* cement workers.* #Vital capacity and one-second cement-asbestos pneumoconioses: A comparative clinical- Cement, asbestos, and cement-asbestos pneumoconioses: A central nervous system lesions.* optical microscopy cerebrospinal fluid. Study conducted with various chambers.* #The generation and characterization.* charge and asbestos toxicity.* charge and hemolytic activity of asbestos.* charge.* Chelsea, Michigan.* #Health hazard evaluation/ chemical characterization.* chemical treatments of silicon dioxide and asbestos Chemical carcinogens.* Chemical Society Monograph, Vol. 173, Chemical Chemicals to Man, Vol. 2. Some inorganic and Chinese hamster cells by exposure to asbestos fibers.* chloride and on oxygen consumption by the cells.*effect chromosome changes in Chinese hamster cells by exposure chronic asbestos ingestion in rats.* chronic inhalation studies with rodents.* #Chronic inhalation of asbestos and cigarette smoke by chrysotile asbestos and automobile brake lining dust chrysotile asbestos and fiber glass on the morphology chrysotile asbestos by dye adsorption.* chrysotile asbestos dust.* #of lung tumors in rats chrysotile asbestos in southeast Turkey.* chrysotile asbestos on DNA synthesis in the pancreas chrysotile asbestos or benzpyrene in the rat abdominal chrysotile asbestos.* chrysotile asbestos.* chrysotile asbestos.* chrysotile asbestos.* chrysotile asbestos.* #Some chrysotile asbestos.* #Ultrastructural chrysotile hemolysis by polymers.* chrysotile in vitro and in human lungs.* chrysotile mining industry.* #of the fibrous mineral chrysotile on DNA synthesis in the gastrointestinal chrysotile on DNA synthesis in the gastrointestinal chrysotile.* #Chrysotile minerals and its application to the chrysotile-asbestos dust in experiments.* chrysotile-asbestos dust on benzo(a)pyrene-induced chrysotile-asbestos injected intrapleurally in rats.* Chrysotile asbestos in plastics.* Chrysotile-induced asbestosis: changes in the free cell cigarette smoke by hamsters.* #Increased cigarette smoke.* #The effect of ciliate epithelium.* citrate ions on the dissolution of silica from asbestos in city water: Surveillance of gastrointestinal cancer clearance using radioactive tracer techniques: I. UICC clearance using radioactive tracer techniques: II. clinical allergy.* clinical aspects of mesothelioma.* clinical practice.* related diseases of the lung and clinical-roentgenographic study.* #Cement, asbestos, clouds in animal exposure chambers.* coagulation and filtration.* coating in experimental carageenin granulomas.*	000281 000117 000188 000187 000186 000030 000026 000061 000246 000054 000294 000036 000259 000071 000116 000283 000309 000154 000060 000262 000012 000056 000279 000090 000236 000306 000108 000146 000008 000249 000062 000062 00013 000238 000174 000173 000091 000006 000238 000235 000254 000254 000139 000262 000236 000262 000029 000304 000303 000061 000232 000176 000312 000076 000246 000214 000099 000162 000191 000231 000197 000141 000208 000005 000004 000125 000189 000152 000244 000213 000193 000283 000303 000305 000287 000224 000171 000078 000190 000022 000069 000116 000249 000013 000163 000101
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## PERMUTED TITLE

in the innermost layers of human asbestos body	coating.*	#Histochemical demonstration of hematoxin	000102
#Dust concentrations in the fabrication of friction chrysotile asbestos or benzpyrene in the rat abdominal #	coatings containing asbestos and their handling in car	000128	
#Relationship between exposure to asbestos, (asbestos) bodies and primary carcinoma of the #	Cocarcinogenesis of plutonium-239(IV) oxide with	000246	
#Technique for the systematic examination of #Asbestos fibers in the	collagen formation, ferruginous bodies and carcinoma.*	000083	
#A study of workers exposed to asbestos minerals in #Asbestos in the work place and the #	colon.*	#Ferruginous	000242
#Asbestos in the workplace and the #	colon-rectum specimens.*		000233
Cement, asbestos, and cement-asbestos pneumoconioses: A pneumoconioses induced by Soviet and non-Soviet #	colon wall.*		000308
#Lung cancer characteristics and hygienic evaluation of spiculate in the use of consumer spackling, patching, and taping to man, Vol. 2. Some inorganic and organometallic #	commercial chrysotile asbestos.*		000214
#The measurement of fibre #Detection and measurement of the #	commercial talc manufacture.*		000150
1972: a necropsy #Secular trends in prevalence and #	community.*		000198
amphibole minerals: detection and measurement of high containing asbestos and their handling in car #	comparative clinical-roentgenographic study.*		000269
#Quantitative determination of asbestos fiber during experimental silicosis caused by crystalline and of asbestos particles in the cerebrospinal fluid. Study of ingested asbestos. Proceedings of a joint NIEHS-EPA effects of asbestos. Proceedings of a Working #	Comparative characteristics of experimental		000249
#Asbestos and mesothelioma incidence in #	complicated with asbestos-tuberculosis of the lung.*		000203
#Exposure to asbestos in the use of characterization.* #	components in some industrial aerosols.* #Mineralogical		000286
regard to triphenyltetrazolium chloride and on oxygen human body.* #	compounds.*	#Exposure to asbestos	000183
Detection of occupational lung disease without a and exposure to asbestos: A retrospective case- #	#Evaluation of Carcinogenic Risk of Chemicals		000237
#Dust #Asbestos emissions from baghouse #	concentration in lung dusts.*		000139
#Steelwork insulated with sprayed crocidolite asbestos: in occupational environment by X-ray diffraction using determination report H.H.E. 74-94-253, Armstrong fiber content.* #	concentration of asbestos in air.*		000088
#Practical aspects of #A comparison of airborne asbestos fiber method.* #	concentration of pulmonary asbestos bodies--1940 to		000180
application of crocidolite asbestos fibres in rats: cell formation after intraperitoneal application of organ culture.* #Interaction of clearance using radioactive tracer techniques: I. UICC #	concentrations in municipal water supplies.* #Asbestiform		000025
#Steelwork insulated with sprayed #	concentrations in the fabrication of friction coatings		000051
#Radiological diagnosis of in the lungs during experimental silicosis caused by fibrous dust on alveolar macrophages and on other cells #	concentrations.*		000128
#Organ cytotoxicity in the long term macrophage-like cell asbestos with hamster respiratory mucosa in organ glass on the morphology and reticulin formation of #	condensed silicon dioxide, during asbestosis,		000010
#Effect of asbestos dusts on #Ultrastructural changes in lung fibroblast #	conducted with various optical microscopy techniques in		000020
#Effects of asbestos or quartz particles on the mixed #	conference, Durham, N.C., November 8-20, 1973.* effects		000062
effects of asbestos minerals on lung fibroblast inspired dust to the parietal pleura.* #A	Conference.* Scientific Publication, No. 8. Biological		000166
with asbestosis.* #Cytomorphological and #	#Conjugal malignant mesothelioma.*		000028
expectoration of subjects with asbestosis.* #	Connecticut.*		000175
#Pulmonary first year.* #	consumer spackling, patching, and taping compounds.*		000038
alveolar epithelium.* #	#Consumer talcums and powders: Mineral and chemical		000237
dust on macrophages.* #In vitro studies on the #	consumption by the cells.* effect of macrophages with		000238
treatments of silicon dioxide and asbestos dusts on culture.* #Asbestos	contamination in the lungs and other organs of the		000050
#	control group.* #Worker-sponsored survey for asbestosis: control study in the Netherlands.* #Pleura mesothelioma		000302
#	control techniques in the asbestos industry.*		000318
#	controlled sources.*		000097
#	controlling a potential hazard.*		000124
#	conventional and rotating anode X-ray tube.* dust		000167
#	Cork Company, Jackson, Mississippi. #Evaluation/toxicity		000126
#	#Correlation between the tissue response and asbestos		000080
#	counting asbestos on the Millipore MC.*		000130
#	Counting asbestos fibers by the most probable number		000144
#	Cover slip method.* cell formation after intraperitoneal		000229
#	crocidolite asbestos fibres in rats: Cover slip method.*		000259
#	crocidolite asbestos with hamster respiratory mucosa in		000192
#	crocidolite asbestos.* of the rat and its subsequent		000078
#	crocidolite asbestos: controlling a potential hazard.*		000167
#	crocidolite induced pleural mesothelioma in the rat.*		000196
#	crystalline and condensed silicon dioxide, during		000020
#	cultivated in vitro. Biochemical and morphologic study.*		000012
#	culture.*		000225
#	#Asbestos culture.*		000294
#	#Interaction of crocidolite cultured lung fibroblasts.* asbestos and fiber		000192
#	cultured macrophages.*		000232
#	cultures exposed to chrysotile asbestos.*		000153
#	cultures of macrophage and 3T6 cell.*		000231
#	cultures to asbestos fibers.*		000154
#	cultures.*		000036
#	#Biochemical current hypothesis of the lymphatic transport of		000131
#	current status of asbestos based on 50 observations.*		000282
#	cytochemical studies on the expectoration of subjects		000170
#	#Cytogenetic studies on chrysotile asbestos.*		000258
#	#Cytomorphological and cytochemical studies on the		000162
#	cytopathological findings in former asbestos workers.*		000258
#	cytopathology of former asbestos workers: Report of the		000107
#	Cyttoplasmic hyalin in asbestosis. A reaction of injured		000106
#	cytotoxic action of different varieties of asbestos		000156
#	cytotoxicity and electron structure.* and chemical		000148
#	cytotoxicity in the long term macrophage-like cell		000235
#	Cytotoxicity of heated chrysotile.*		000294
#	decreased weight in hamsters exposed to cigarette smoke.		000125
#	demonstration of hematoxin in the innermost layers of		000305
#	dental materials.*		000102
#	dependent effects of ingested chrysotile on DNA		000168
#	deposition of asbestos particles in the human		000004
#	deposition of inhaled fibrous material in the		000017
#	deposition of inhaled fibrous material in the		000078
#	Deposition of the UICC standard reference samples of		000190
#	deposits.*		000190
#	#Depression of viral interferon induction in cell		000079
#	detected by electron microscopy.* interstitial		000116
#	detection and measurement of high concentrations in		000184
#	detection of expiratory airflow obstruction in cement		000051
#	#Detection and measurement of the concentration of		000146
#	Detection of occupational lung disease without a		000180

## PERMUTED TITLE

in the rat.*	#The diagnosis of asbestosis.*	000253
of respiratory tract tumors in	#Radiological diagnosis of crocidolite induced pleural mesothelioma	000196
containing quartz.*	#Combined effect of diethylnitrosamine and asbestos dust on the emergence	000293
asbestos dust in occupational environment by X-ray	#Occupational differences in rates of lung cancer.*	000181
Report of two cases.*	#Quantitative differential thermal analysis of small dust samples	000307
	#X-ray diffraction characteristics of some silicates.*	000118
	#Penetration of asbestos through the	000126
occupational inhalation of asbestos particles: A	#Digestive system cancer among persons subjected to	000251
glass: Pleural response in the rat in relation to fiber	dimension.*	000273
mechanical thermal, and chemical treatments of silicon	#Carcinogenicity of fibrous	000235
silicosis caused by crystalline and condensed silicon	dioxide and asbestos dusts on cytotoxicity and electron	000200
plant due to suppurative diseases of the	dioxide, during asbestosis, anthracosis, and	000108
	disability of workers of the Ararat asbestos-cement	000271
	disease of the lungs.*	000271
	#The radiology of asbestos-induced	000098
primates in pneumoconiosis and other industrial	disease research.*	000098
survey for asbestosis: Detection of occupational lung	#The use of nonhuman	000302
in human tissues and their association with neoplastic	disease without a control group.*	000302
in a necropsy series in East London: association with	#Worker-sponsored	000160
#Occupational diseases of the lungs: II. Inhalation	disease, occupation, and domiciliary address.*	000067
epidemiology and implications for	bodies	000311
of the Ararat asbestos-cement plant due to suppurative	diseases due to inorganic dust.*	000016
	diseases of the lung and other organs: their	000311
	diseases of the lungs: II. Inhalation diseases due to	000016
	diseases of the skin.*	000108
	#Temporary disability of workers	000240
	diseases.*	000145
	#Pathological	000201
	disorders.*	000145
its application to the measurement of surface areas of	dispersed samples of chrysotile.*	000189
of gastric mucosa to ingested asbestos dust and the	minerals and	000189
	dissolution of nickel.*	000314
	#Early response	000224
dusts under physiological conditions.*	dissolution of silica from asbestos.*	000220
	#Dissolution of silicic acid from amosite and quartz	000191
	distribution of trace metals in chrysotile asbestos.*	000034
of the rat.*	#Distribution and elemental analysis of inorganic	000005
	DNA synthesis in the gastrointestinal tract and liver	000004
#Dose-dependent effects of ingested chrysotile on	DNA synthesis in the gastrointestinal tract, liver, and	000076
short-term effects of ingested chrysotile asbestos on	DNA synthesis in the pancreas and other organs of a	000212
	dock-yard workers in Genoa.*	000212
airborne asbestos.*	documentation on evaluation of occupational exposure to	000143
	domiciliary address.*	000067
East London: association with disease, occupation, and	bodies in a necropsy series in	000251
particles: A literature review with emphasis on	dose response.*	000004
synthesis in the gastrointestinal tract, liver, and	#Dose-dependent effects of ingested chrysotile on DNA	000109
	drinking water.*	000109
	#Asbestos fibers in	000149
	#What is happening to our	000044
hypertensive effects.*	#Asbestos in	000007
	matter larger than 5 micrometers in parenteral	000171
Surveillance of gastrointestinal cancer incidence in	Duluth, Minnesota.*	000166
asbestos. Proceedings of a joint NIEHS-EPA conference,	effects of asbestos in city water:	000110
	#Is short-fibered asbestos	000110
	#New aspects on	000151
#Early response of gastric mucosa to ingested asbestos	dust and the dissolution of nickel.*	000314
infective pneumoconiosis. Effect of asbestos	dust and Candida albicans infection of the lungs of	000315
	dust exposure in asbestos cement manufacturing plants.*	000306
#Carcinogenic effect of the chrysotile-asbestos	dust for asbestos in the Havre region.*	000086
using	dust in experiments.*	000152
#Quantitative determination of airborne asbestos	dust in occupational environment by X-ray diffraction	000221
	dust in the lungs of rats.*	000221
#Biochemical changes caused by asbestos	dust injected into the body cavities of mice.*	000061
heated chrysotile asbestos and automobile brake lining	dust on alveolar macrophages and on other cells	000012
cultivated in vitro. Biochemical and #Effect of fibrous	dust on alveolar macrophages.*	000059
the electron microscope of the effects of asbestos	#Study under	000244
lungs.*	dust on benzo(a)pyrene-induced carcinogenesis in rat	000148
	dust on macrophages.*	000148
#Effect of chrysotile-asbestos	#In vitro studies on	000019
the cytotoxic action of different varieties of asbestos	dust on mitochondrial enzymes of rat lung.*	000293
	dust on the emergence of respiratory tract tumors in	000236
#Effect of asbestos	dust on the reducing effect of macrophages with regard	000140
tc	dust recovery.*	000307
	dust samples containing quartz.*	000282
#Combined effect of diethylnitrosamine and asbestos	dust to the parietal pleura.*	000282
	#A current	000207
	dust with an electron microscope microprobe analyser.*	000290
	dust.*	000230
	#Prophylaxis	000179
	dust.*	000263
	#Monosymptomatic	000311
	dust.*	000245
	#Biochemical changes	000056
	dust.*	000020
	#Occupational diseases	000223
	dust.*	000111
	tumors in rats by intratracheal administration	000128
	dust.*	000097
	microscope study of the response of mesothelial	000280
	dust.*	000277
	crystalline and condensed silicon dioxide, during	000210
	dust: a study of ninety patients by electron	000278
	dust: A theory.*	000211
	Dust concentrations in the fabrication of friction	000211
	#Dust control techniques in the asbestos industry.*	000234
	#Dust factor in the production of asbestos board.*	000234
	dusts and their fibrogenicity.*	000234
	#Comparison	000234
	dusts and their interpretation with regard to	000234
	dusts and their tissue reactions in vivo.*	000234
	#Comparison	000234
	dusts in experimental animals.*	000234
	dusts of asbestos.*	000234
	dusts on cultured macrophages.*	000153
	dusts on cytotoxicity and electron structure.*	000235
and chemical treatments of silicon dioxide and asbestos	thermal.	000235

## PERMUTED TITLE

#The effect of asbestos-containing carcinogenesis.*	*The effect of silicic acid from amosite and quartz carcinogenesis.*	*Oncogenic effect of fibrous	dusts on the motor function of the ciliate epithelium.*	000287
#Dissolution of silicic acid from amosite and quartz carcinogenesis.*	#The measurement of fibre concentration in lung tumors induced in rats by i. p. injection of asbestos (asbestos) bodies in the lungs of rural dwellers, urban	dusts under physiological conditions.*	dusts. Animal experimentation and relations to human	000220
#Ferruginous (asbestos) bodies in the lungs of rural	#The measurement of fibre concentration in lung tumors induced in rats by i. p. injection of asbestos (asbestos) bodies in the lungs of rural dwellers, urban	dusts.*	dwellers, and patients with pulmonary neoplasms.*	000209
of micro-quantities of chrysotile asbestos by hazard evaluation/toxicity determination report H.H. cement workers.*	#Ferruginous (asbestos) bodies in the lungs of rural	dusts.*	dwellers, urban dwellers, and patients with pulmonary	000088
asbestos exposure: A case report.*	#Ferruginous (asbestos) bodies in the lungs of rural	dye adsorption.*	#Determination	000250
dust and the dissolution of nickel.*	#Ferruginous (asbestos) bodies in the lungs of rural	dusts.*	#Investigations concerning morphology of	000033
#Prevalence of asbestos bodies in a necropsy series in	#Prevalence of asbestos bodies in a necropsy series in	dusts.*	dwellers, and patients with pulmonary neoplasms.*	000033
#Asbestos in water: Mining and processing	#Asbestos in water: Mining and processing	dusts.*	dwellers, urban dwellers, and patients with pulmonary	000176
a study of ninety patients by electron microscopy, by electron microscopy, electron microanalysis, and	#Asbestos in water: Mining and processing	dye adsorption.*	#Determination	000176
#The identification of asbestos dust with an alveolar macrophages.*	#The identification of asbestos dust with an alveolar macrophages.*	E. 74-94-253, Armstrong Cork Company, Jackson,	E. 74-94-253, Armstrong Cork Company, Jackson,	000080
mesothelial cells to the intrapleural injection of #An	#The identification of asbestos dust with an alveolar macrophages.*	Early detection of expiratory airflow obstruction in	Early detection of expiratory airflow obstruction in	000146
population characteristics of macrophages: A scanning	#The identification of asbestos dust with an alveolar macrophages.*	#Early malignant changes in pleural plaques due to	#Early malignant changes in pleural plaques due to	000172
#Recent applications in combined transmission	#Recent applications in combined transmission	#Early response of gastric mucosa to ingested asbestos	#Early response of gastric mucosa to ingested asbestos	000314
air barrier in pulmonary asbestosis: Study of a case by	#Recent applications in combined transmission	East London: association with disease, occupation, and	East London: association with disease, occupation, and	000067
identification of exogenous particles by high-voltage	#Recent applications in combined transmission	effluent treatment.*	effluent treatment.*	000164
fibrosis: Association with asbestos fibers detected by	#Recent applications in combined transmission	electron microanalysis, and electron microdiffraction.*	electron microanalysis, and electron microdiffraction.*	000023
fibers found in the lungs of a mesothelioma patient by	#Recent applications in combined transmission	electron microdiffraction.*	a study of ninety patients	000023
#Pulmonary mineral dust: a study of ninety patients by	#Recent applications in combined transmission	electron microscope microprobe analyser.*	electron microscope microprobe analyser.*	000207
silicon dioxide and asbestos dusts on cytotoxicity and	#Recent applications in combined transmission	electron microscope of the effects of asbestos dust on	electron microscope of the effects of asbestos dust on	000059
pulmonary tissue.*	#Recent applications in combined transmission	electron microscope study of the response of	electron microscope study of the response of	000056
#Distribution and	#Recent applications in combined transmission	electron microscope study.*	membrane structure and	000185
effect of diethylnitrosamine and asbestos dust on the	#Recent applications in combined transmission	electron microscopy and microanalysis.*	electron microscopy and microanalysis.*	000047
#Asbestos	#Recent applications in combined transmission	electron microscopy.*	#The blood-	000103
of asbestos particles: A literature review with	#Recent applications in combined transmission	electron microscopy.*	#Subcellular	000001
asbestos in the soil and its significance for the	#Recent applications in combined transmission	electron microscopy.*	interstitial pulmonary	000184
#Surface	#Recent applications in combined transmission	electron microscopy.*	interstitial pulmonary	000317
#It stacks up! (Air pollution explained in plain	#Recent applications in combined transmission	electron microscopy, electron microanalysis, and	electron microscopy, electron microanalysis, and	000023
determination of airborne asbestos dust in occupational	#Recent applications in combined transmission	electron structure.*	electron structure.*	000235
#Pathological and	#Recent applications in combined transmission	thermal, and chemical treatments of	thermal, and chemical treatments of	000034
#Asbestos as an	#Recent applications in combined transmission	elemental analysis of inorganic particulates in	elemental analysis of inorganic particulates in	000293
#Asbestos and its	#Recent applications in combined transmission	emergence of respiratory tract tumors in hamsters.*	emergence of respiratory tract tumors in hamsters.*	000293
#Human exposure to high radiant	#Recent applications in combined transmission	emissions from baghouse controlled sources.*	emissions from baghouse controlled sources.*	000124
parameters of airborne asbestos fibres in various work	#Recent applications in combined transmission	#The blood-	#The blood-	000251
studies).**#Relation between solubility of silicates and	#Recent applications in combined transmission	environment by X-ray diffraction using conventional and	environment by X-ray diffraction using conventional and	000145
#Asbestos-induced selective release of lysosomal	#Recent applications in combined transmission	environmental aspects of asbestos-associated diseases.*	environmental aspects of asbestos-associated diseases.*	000142
#Pulmonary lysosomal	#Recent applications in combined transmission	#Pathological and	#Pathological and	000135
#Effect of asbestos dust on mitochondrial	#Recent applications in combined transmission	#Environmental carcinogen.*	#Environmental carcinogen.*	000289
pigs.*	#Recent applications in combined transmission	environmental impact.*	environmental impact.*	000289
of ingested asbestos. Proceedings of a joint NIEHS-	#Recent applications in combined transmission	environments: Preliminary findings.*	environments: Preliminary findings.*	000094
and asbestos exposure.*	#Recent applications in combined transmission	*Physical	*Physical	000222
#The related diseases of the lung and other organs: their	#Recent applications in combined transmission	enzyme inhibition in rat lung homogenate (in vitro	enzyme inhibition in rat lung homogenate (in vitro	000055
hyalin in asbestosis. A reaction of injured alveolar	#Recent applications in combined transmission	enzymes from mononuclear phagocytes.*	enzymes from mononuclear phagocytes.*	000291
containing dusts on the motor function of the ciliate	#Recent applications in combined transmission	enzymes in experimental asbestosis in guinea pigs.*	enzymes in experimental asbestosis in guinea pigs.*	000264
#The risk	#Recent applications in combined transmission	enzymes of rat lung.*	enzymes of rat lung.*	000019
#Effect of quartz and asbestos on	#Recent applications in combined transmission	Enzymic changes in lung tissue of asbestotic guinea	Enzymic changes in lung tissue of asbestotic guinea	000166
fibrogenic and nonfibrogenic particles with washed rat	#Recent applications in combined transmission	EPA conference, Durham, N.C., November 8-20, 1973.*	EPA conference, Durham, N.C., November 8-20, 1973.*	000199
effects of asbestos.*	#Recent applications in combined transmission	#The epidemiologic relationship between pleural mesothelioma	#The epidemiologic relationship between pleural mesothelioma	000016
UICC #The use of infrared spectrophotometry for the	#Recent applications in combined transmission	epidemiology and implications for clinical practice.*	epidemiology and implications for clinical practice.*	000255
* #Subcellular identification of	#Recent applications in combined transmission	#Epidemiology of gastrointestinal cancer.*	#Epidemiology of gastrointestinal cancer.*	000169
#Cytomorphological and cytochemical studies on the	#Recent applications in combined transmission	#Epidemiology of mesothelioma in Israel.*	#Epidemiology of mesothelioma in Israel.*	000156
#Oncogenic effect of fibrous dusts. Animal	#Recent applications in combined transmission	epithelium.*	epithelium.*	000287
#Early detection of	#Recent applications in combined transmission	#Cytoplasmic	#Cytoplasmic	000091
workers.*	#Recent applications in combined transmission	epithelium.*	epithelium.*	000195
#Vital capacity and one-second forced	#Recent applications in combined transmission	#The effect of asbestos-	#The effect of asbestos-	000127
#It stacks up! (Air pollution	#Recent applications in combined transmission	equations: A ban on asbestos?*	equations: A ban on asbestos?*	000073
#Asbestos and lung cancer in a non-occupationally	#Recent applications in combined transmission	erythrocyte surface charge.*	erythrocyte surface charge.*	000015
manufacture.*	#Recent applications in combined transmission	#Estimating health risks in studies of the health	#Estimating health risks in studies of the health	000001
#Monosymptomatic exudative pleurisy in persons	#Recent applications in combined transmission	estimation of small quantities of single varieties of	estimation of small quantities of single varieties of	000258
#Ultrastructural changes in lung fibroblast cultures	#Recent applications in combined transmission	exogenous particles by high-voltage electron microscopy.	exogenous particles by high-voltage electron microscopy.	000209
#Increased life span and decreased weight in hamsters	#Recent applications in combined transmission	expectoration of subjects with asbestosis.*	expectoration of subjects with asbestosis.*	000209
#Asbestos	#Recent applications in combined transmission	experimentation and relations to human carcinogenesis.*	experimentation and relations to human carcinogenesis.*	000229
and evaluation of UICC asbestos clouds in animal	#Recent applications in combined transmission	exposure to high radiant environments.*	exposure to high radiant environments.*	000008
rodents.*	#Recent applications in combined transmission	exposure to high radiant environments.*	exposure to high radiant environments.*	000177
#Background documentation on evaluation of occupational	#Recent applications in combined transmission	exposure to high radiant environments.*	exposure to high radiant environments.*	000300
of chromosome changes in Chinese hamster cells by	#Recent applications in combined transmission	exposure to high radiant environments.*	exposure to high radiant environments.*	000150
bodies and carcinoma.*	#Recent applications in combined transmission	exposed autopsy population.*	exposed autopsy population.*	000179
#Mesothelioma following	#Recent applications in combined transmission	exposed to asbestos minerals in commercial talc	exposed to asbestos minerals in commercial talc	000231
study in the Netherlands.*	#Recent applications in combined transmission	exposed to asbestos dust.*	exposed to asbestos dust.*	000305
#Pleura mesothelioma and	#Recent applications in combined transmission	exposed to chrysotile asbestos.*	exposed to chrysotile asbestos.*	000066
#Pleural calcification associated with	#Recent applications in combined transmission	exposure and multiple primary tumors.*	exposure and multiple primary tumors.*	000013
#Biologic	#Recent applications in combined transmission	exposure chambers.*	#The generation	000239
#Human	#Recent applications in combined transmission	exposure during brake lining maintenance and repair.*	exposure during brake lining maintenance and repair.*	000248
#Diffuse peritoneal mesothelioma and asbestos	#Recent applications in combined transmission	exposure in a Yale building: Analysis and resolution.*	exposure in a Yale building: Analysis and resolution.*	000306
#Pleural mesotheliomas and asbestos	#Recent applications in combined transmission	exposure in asbestos cement manufacturing plants.*	exposure in asbestos cement manufacturing plants.*	000304
Quantitative relationship of fecal asbestos to asbestos	#Recent applications in combined transmission	exposure system for chronic inhalation studies with	exposure system for chronic inhalation studies with	000143
bilateral upper lobe fibrosis secondary to asbestos	#Recent applications in combined transmission	exposure to airborne asbestos.*	exposure to airborne asbestos.*	000262
relationship between pleural mesothelioma and asbestos	#Recent applications in combined transmission	exposure to asbestos fibers.*	exposure to asbestos fibers.*	000083
carcinoma in a population with low asbestos	#Recent applications in combined transmission	exposure to asbestos, collagen formation, ferruginous	exposure to asbestos, collagen formation, ferruginous	000030
	#Recent applications in combined transmission	exposure to asbestos: a review of 72 cases.*	exposure to asbestos: a review of 72 cases.*	000318
	#Recent applications in combined transmission	exposure to asbestos: A retrospective case-control	exposure to asbestos: A retrospective case-control	000312
	#Recent applications in combined transmission	exposure to chrysotile asbestos in southeast Turkey.*	exposure to chrysotile asbestos in southeast Turkey.*	000168
	#Recent applications in combined transmission	exposure to dental materials.*	exposure to dental materials.*	000289
	#Recent applications in combined transmission	exposure to high radiant environments.*	exposure to high radiant environments.*	000026
	#Recent applications in combined transmission	exposure. Report of two cases.*	exposure. Report of two cases.*	000276
	#Recent applications in combined transmission	exposure.*	exposure.*	000053
	#Recent applications in combined transmission	exposure.*	#Massive	000104
	#Recent applications in combined transmission	exposure.*	#The epidemiologic	000199
	#Recent applications in combined transmission	exposure.*	#Association of asbestos and bronchogenic	000299

## PERMUTED TITLE

A retrospective survey related to occupational asbestos malignant changes in pleural plaques due to asbestos vaginalis propria testis in a patient with asbestos patching, and taping compounds.*	exposure. *cases of mesothelioma in Victoria, Australia. 000186
of airborne asbestos fiber counting with and without an and their handling in car	exposure: A case report.* #Early 000172
feasibility of the two fibers/cc asbestos textile	exposure: A case report.* mesothelioma of the tunica 000082
#For those in peril on the	Exposure to asbestos and laryngeal carcinoma.* 000274
facilities.*	#Exposure to asbestos in the use of consumer spackling, 000237
#For those in peril: 3 - not only on the	exudative pleurisy in persons exposed to asbestos dust.* 000179
facilities.*	eyepiece graticule.* #A comparison 000014
#Quantitative relationship of	fabrication of friction coatings containing asbestos 000128
organs of the human body.*	facilities.* #Technological 000054
between exposure to asbestos, collagen formation,	factory floor.* 000266
the colon.*	feasibility of the two fibers/cc asbestos textile 000032
wellers, urban dwellers, and patients with pulmonary	fecal asbestos to asbestos exposure.* 000054
#Quantitative determination of asbestos	#Ferromagnetic contamination in the lungs and other 000050
#Correlation between the tissue response and asbestos	ferruginous bodies and carcinoma.* #Relationship 000083
glass: Pleural response in the rat in relation to	#Ferruginous (asbestos) bodies and primary carcinoma of 000242
studies on the effects of chrysotile asbestos and	#Ferruginous (asbestos) bodies in the lungs of rural 000033
#Is short- materials.*	#Ferruginous bodies in benign fibrous pleural plaques.* 000241
#Investigation and analysis of asbestos	fiber concentrations.* 000010
#Alignment of respirable asbestos	fiber content of human lungs.* 000113
#Counting asbestos	fiber counting with and without an eyepiece graticule.* 000130
pulmonary fibrosis: Association with asbestos	fiber dimension.* #Carcinogenicity of fibrous 000273
electron #Investigation of asbestos bodies and asbestos	fiber glass on the morphology and reticulin formation 000232
#Asbestos	#Fiber carcinogenesis: Is asbestos the only hazard??* 000272
#Asbestos bodies and	#Fiber release from asbestos garments.* 000093
#Locating	fibered asbestos dust a biological hazard??* 000110
#Asbestos	fibers and accompanying minerals in biological 000165
#Response of cell cultures to asbestos	fibers by magnetic fields.* 000285
#Penetration of cells by asbestos	fibers by the most probable number method.* 000229
#The carcinogenic effect of inhaled asbestos	fibers detected by electron microscopy.* interstitial 000184
#The ingestion of asbestos	fibers found in the lungs of a mesothelioma patient by 000317
#Health hazards due to inhalation of asbestos	fibers in drinking water.* 000109
interferon induction in cell monolayers by asbestos	fibers in lung tissues.* 000084
in Chinese hamster cells by exposure to asbestos	fibers in the bowel wall.* 000205
#Technological feasibility of the two	fibers.* 000308
#Ingested mineral	fibers.* 000036
#Histochemical study of asbestos	fibers.* 000060
#The measurement of	fibers.* 000227
the Malmo material.*	fibers.* 000301
#Asbestos	fibers.* 000247
#Removal of asbestos	fibers.* #Depression of viral 000116
intraperitoneal application of crocidolite asbestos	fibers/cc asbestos textile facilities.* 000262
#Asbestos	fibers: Do they penetrate tissue or cause cancer??* 000054
findings.*	fibre coating in experimental carrageenin granulomas.* 000114
#Physical parameters of airborne asbestos	fibre concentration in lung dusts.* 000088
#Ultrastructural changes in lung	fibre in the lung and mesothelioma: A re-examination of 000206
the morphology and reticulin formation of cultured lung	fibres from potable water by coagulation and filtration. 000163
#	fibres in rats: Cover slip method.* cell formation after 000259
of the relative rates of hemolysis induced by various	fibres in the air of towns.* 000134
#Pulmonary	fibres in various work environments: Preliminary 000094
#	fibroblast cultures exposed to chrysotile asbestos.* 000231
vitro toxicity of polymer and mineral dusts and their	fibroblasts.* of chrysotile asbestos and fiber glass on 000131
#Pharmacology of	fibrogenesis.* 000232
antigens in asbestos workers with and without pulmonary	fibrogenic and nonfibrogenic particles with washed rat 000123
electron #Nonspecific" interstitial pulmonary	fibrogenic response of guinea pigs to amosite dust.* 000290
cultivated in vitro. Biochemical and #Effect of	fibrogenic response in murine lungs to asbestos.* 000243
experiments concerning the carcinogenic effect of	fibrogenicity.* #Comparison between in 000277
human carcinogenesis.*	fibrosis and tissue injury.* 000049
#Oncogenic effect of	fibrosis secondary to asbestos exposure.* 000104
to fiber dimension.*	#Frequency of HLA 000077
#Carcinogenicity of	fibrosis: Association with asbestos fibers detected by 000184
and its #Studies on the deposition of inhaled	fibrous dust on alveolar macrophages and on other cells 000012
and its #Studies of the deposition of inhaled	fibrous dusts and their interpretation with regard to 000210
#Identification of	fibrous dusts in experimental animals.* 000211
#Malignant	fibrous dusts. Animal experimentation and relations to 000209
the Canadian chrysotile mining #An examination of the	fibrous glass: Pleural response in the rat in relation 000273
vive.*#Comparison between in vitro toxicity of two novel	fibrous material in the respiratory tract of the rat 000078
#Ferruginous bodies in benign	fibrous material in the respiratory tract of the rat 000190
#Alignment of respirable asbestos fibers by magnetic	fibrous material in two public water supplies.* 000081
asbestos fibres from potable water by coagulation and	fibrous mesothelioma: Metastatic to brain and liver.* 000298
fluid. Study conducted with various optical	fibrous mineral content of asbestos lung tissue from 000208
#Sputum cytopathological	fibrous mineral dusts and their tissue reactions in 000278
fibres in various work environments: Preliminary	fields.* 000241
by injections of asbestos.*	filtration.* #Removal of 000285
#For those in peril on the factory	finding of asbestos particles in the cerebrospinal 000163
finding of asbestos particles in the cerebrospinal	findings in former asbestos workers.* 000107
cement workers.*	#Physical parameters of airborne asbestos 000094
#Vital capacity and one-second	fine structure of peritoneal tumors produced in animals 000058
causes.*	floor.* 000266
crocidolite asbestos fibres in rats: Cover	fluid. Study conducted with various optical microscopy 000032
#Giant cell	forced expiratory volume in Australian male asbestos 000062
formation after intraperitoneal application of	#Foreign body granuloma of the skin due to occupational 000008
	000122
	000259

## PERMUTED TITLE

inhalation of anthophyllite.*	#Asbestos body	formation in the lungs of rats and guinea pigs after	000031
and fiber glass on the morphology and reticulin		formation of cultured lung fibroblasts.*	000232
#Relationship between exposure to asbestos, collagen		asbestos	000083
#Sputum cytopathological findings in		formation, ferruginous bodies and carcinoma.*	000107
#Pulmonary cytopathology of		former asbestos workers.*	000107
#Inhalation carcinogenesis from various		former asbestos workers: Report of the first year.*	000106
#Health hazard evaluation/toxicity determination.		forms of asbestos.*	000228
#Airborne asbestos in the vicinity of a		Fortune Industries, Inc., Chelsea, Michigan.*	000006
without pulmonary fibrosis.*		freeway.*	000003
handling in #Dust concentrations in the fabrication of		#Frequency of HLA antigens in asbestos workers with and	000077
cement manufacturing plants.*		friction coatings containing asbestos and their	000128
#Asbestos workers.*		function consequences of dust exposure in asbestos	000306
#Lung		function in relation to radiographic changes in	000316
#The effect of asbestos-containing dusts on the motor		function of the ciliate epithelium.*	000287
		function profiles in Quebec asbestos workers.*	000087
#Fiber release from asbestos		garments.*	000093
#Asbestos, talc, and nitrates in relation to		gastric cancer.*	000267
talc) from rice.*	#Japanese	gastric cancer: Potentially carcinogenic silicates (	000178
dissolution of nickel.*	#Early response of	gastric mucosa to ingested asbestos dust and the	000314
effects of asbestos in city water: Surveillance of		gastrointestinal cancer incidence in Duluth, Minnesota.*	000171
	#Epidemiology of	gastrointestinal cancer.*	000255
#Effects of ingested chrysotile on DNA synthesis in the		gastrointestinal tract and liver of the rat.*	000005
#Passage of particles through the wall of the		gastrointestinal tract.*	000292
effects of ingested chrysotile on DNA synthesis in the		gastrointestinal tract, liver, and pancreas of the rat.*	000004
animal exposure chambers.*		generation and evaluation of UICC asbestos clouds in	000013
#The Hamburg area.*		genesis of mesothelioma. Report on 150 cases from the	000117
#Retrospective investigations on the		Genoa.*	000212
#Pleural mesothelioma among dock-yard workers in		Giant cell formation after intraperitoneal application	000259
of crocidolite asbestos fibres in rats: Cover slip *		glass on the morphology and reticulin formation of	000232
studies on the effects of chrysotile asbestos and fiber		glass: Pleural response in the rat in relation to fiber	000273
dimension.*	#Carcinogenicity of fibrous	granuloma of the skin due to occupational causes.*	000122
	#Foreign body	granulomas produced by asbestos, kieselgur, and	000039
asbestos plus kieselgur.*	#Morphogenesis of	granulomas.*	000101
of asbestos fibre coating in experimental carageenin		#Histochemical study	000014
asbestos fiber counting with and without an eyepiece		graticule.*	000014
during asbestosis, anthracosis, and pneumoconiosis from		#A comparison of airborne	000020
#Asbestos body formation in the lungs of rats and		grog dust.*	000031
	#Pulmonary fibrogenic response of	crystalline and condensed silicon dioxide,	000290
#Biochemical changes and pulmonary response of		guinea pigs after inhalation of anthophyllite.*	000263
#Enzymic changes in lung tissue of asbestotic		guinea pigs to asbestos dust.*	000264
lysosomal enzymes in experimental asbestosis in		guinea pigs.*	000291
hazard evaluation/toxicity determination report H.		#Pulmonary	000291
#Health hazard evaluation/toxicity determination report		H.E. 74-94-253, Armstrong Cork Company, Jackson,	000080
genesis of mesothelioma. Report on 150 cases from the		H.E. 74-94-253, Armstrong Cork Company, Jackson,	000080
#Retrospective study in 236 asbestos textile workers at		Hamburg area.*	000117
	#Induction of chromosomal changes in Chinese	#Retrospective investigations on the	000118
	#Interaction of crocidolite asbestos with	Hamburg.*	000262
	#Increased life span and decreased weight in	hamster cells by exposure to asbestos fibers.*	000192
#Chronic inhalation of asbestos and cigarette smoke by		hamster respiratory mucosa in organ culture.*	000305
	#Biological effects of tremolite talc on	hamsters exposed to cigarette smoke.*	000303
dust on the emergence of respiratory tract tumors in		hamsters.*	000268
	#What is	hamsters.*	000293
#Routine examination of lung dust for asbestos in the		hamsters.*	000149
74-94-253, Armstrong Cork Company, Jackson,	#Health	effect of diethylnitrosamine and asbestos	000086
Industries, Inc., Chelsea, Michigan.*	#Health	happening to our drinking water?*	000080
sprayed crocidolite asbestos: controlling a potential		Havre region.*	000006
#Fiber carcinogenesis: Is asbestos the only		hazard evaluation/toxicity determination report H. H. E.	000167
#Is short-fibered asbestos dust a biological		hazard.*	000272
	#Health	#Steelwork insulated with	000110
	#Possible asbestos	hazard?*	000247
	#Health	hazards due to inhalation of asbestos fibers.*	000022
		hazards in clinical allergy.*	000011
#Hazards to		hazards: asbestos; a review.*	000065
#Estimating health risks in studies of the		#Hazards to health due to air pollution with asbestos.*	000073
asbestos.*		health due to air pollution with asbestos.*	000136
	#Estimating	health effects of asbestos.*	000042
	#Asbestos and	health risks in studies of the health effects of	000080
	#Pollution and public	health.*	000006
H. E. 74-94-253, Armstrong Cork Company, Jackson,		health: taconite case poses major test.*	0000247
Fortune Industries, Inc., Chelsea, Michigan.*		#Health hazard evaluation/toxicity determination report	000080
		#Health hazard evaluation/toxicity determination.	000006
		#Health hazards due to inhalation of asbestos fibers.*	000111
dust injected into the body cavities of	#Effects of	#Health hazards: asbestos; a review.*	000061
body coating.*	#Cytotoxicity of	heated chrysotile asbestos and automobile brake lining	000125
	#Histochemical demonstration of	heated chrysotile.*	000102
	#Inhibition of chrysotile	hematoxylin in the innermost layers of human asbestos	000197
nonfibrogenic	#Asbestos-induced	hemolysis by polymers.*	000223
	#Comparison of the relative rates of	hemolysis in relation to its silica solubility.*	000127
	#Prevention of asbestos-induced	hemolysis induced by various fibrogenic and	000063
	#Surface charge and	hemolysis.*	000173
innermost layers of human asbestos body coating.*		#Histochemical demonstration of hematoidin in the	000102
experimental carageenin granulomas.*		#Histochemical study of asbestos fibre coating in	000101
induced by asbestos.*		#Histochemical study of rat pleural mesotheliomas	000215
produced in animals by injections of asbestos.*		#Histogenesis and fine structure of peritoneal tumors	000058
suffering from asbestosis in the United #A study of the		histological cell types of lung cancer in workers	000309
	#The	HLA system in asbestos workers.*	000182
pulmonary fibrosis.*	#Frequency of	HLA antigens in asbestos workers with and without	000077
	of silicates and enzyme inhibition in rat lung	homogenate (in vitro studies).*	000222
demonstration of hematoidin in the innermost layers of		between solubility	000102
contamination in the lungs and other organs of the		human asbestos body coating.*	000050
fibrous dusts. Animal experimentation and relations to		#Histochemical	000102
		#Ferromagnetic	000050
		human carcinogenesis.*	000209

PERMUTED TITLE

## PERMUTED TITLE

Reaction to asbestos and other irritants after study of the response of mesothelial cells to the magnesia-asbestos (amphibole-asbestos group) after	#Mesothelial 000072
#carcinogenic activity of chrysotile-asbestos injected chrysotile	intraperitoneal injection.* #Mesothelial 000056
water: Surveillance of gastrointestinal cancer liver microsomes. Effect of asbestos-associated metal	intrapleural injection of asbestos dust.* microscope 0000219
#Mesothelial reaction to asbestos and other silicates (talc) from rice.*	intrapleural injections into mongrel rats.* activity of intrapleurally in rats.* 000213
#Analysis of particles in stomach tumours from effects of ingested asbestos. Proceedings of a	intrathoracic tissue reactions.* 000112
produced by asbestos, kieselgur, and asbestos plus #Morphogenesis of granulomas produced by asbestos, in workers suffering from asbestosis in the United of asbestos and other nonopaque particulate matter	intratracheal administration of benzo(a)pyrene and 000245
#Asbestos, smoking, and #Exposure to asbestos and demonstration of hematoidin in the innermost of pulmonary asbestosis with central nervous system cigarette smoke.*	Intratracheal instillation of asbestos in mice.* 000310
asbestos and fiber glass on the morphology and of heated chrysotile asbestos and automobile brake #Asbestos exposure during brake	Investigating possible effects of asbestos in city ions and pH.* #Metabolism of benzo(a)pyrene.* 000171
#Effect of asbestos on #Adenocarcinoma of the rete testis: A review of the to occupational inhalation of asbestos particles: A	irritants after intraperitoneal injection.* 000224
An analysis of 18 cases and review of the ions and pH.* #Metabolism of benzo(a)pyrene in rat on DNA synthesis in the gastrointestinal tract and	Israel.* 000169
Malignant fibrous mesothelioma: Metastatic to brain and on DNA synthesis in the gastrointestinal tract, #Massive bilateral upper	Jackson, Mississippi.* evaluation/toxicity determination 000080
*The of asbestos bodies in a necropsy series in East and bronchogenic carcinoma in a population with material.* #Asbestos fibre in the implications for #Asbestos-related diseases of the	Japanese gastric cancer: Potentially carcinogenic 000178
population.* #Post mortem ascertained cases of United #A study of the histological cell types of	Japanese males.* 000129
#Occupational differences in rates of survey for asbestosis: Detection of occupational	joins in appeal on taconite pollution.* 000043
#Routine examination of #The measurement of fibre concentration in	joint NIEHS-EPA conference, Durham, N.C., November 8- 000166
* #Ultrastructural changes in #Biochemical effects of asbestos on the morphology and reticulin formation of cultured solubility of silicates and enzyme inhibition in rat	Justice joins in appeal on taconite pollution.* 000043
#Digestion of examination of the fibrous mineral content of asbestos free cell population, pulmonary surfactant and whole	kieselgur.* #Morphogenesis of granulomas 000039
#Asbestos bodies and fibers in benzo(a)pyrene and chrysotile asbestos #Induction of	Kieselgur, and asbestos plus kieselgur.* 000039
Effect of asbestos dust on mitochondrial enzymes of rat cancer complicated with asbestos-tuberculosis of the	Kingdom.* of the histological cell types of lung cancer 000309
the lung.* cement manufacturing plants.* asbestos workers.*	larger than 5 micrometers in parenteral drugs.* profile 000007
#Ferromagnetic contamination in the #Asbestos bodies and pleural plaques in human	laryngeal carcinoma.* 000261
crystalline and #Accumulation of nucleic acids in the of asbestos bodies and asbestos fibers found in the anthophyllite.* #Asbestos body formation in the	laryngeal carcinoma.* 000274
#Biochemical changes caused by asbestos dust in the of asbestos dust and Candida albicans infection of the with pulmonary #Ferruginous (asbestos) bodies in the	layers of human asbestos body coating.* #Histochemical lesions.* optical microscopy techniques in a case 000102
period of 6 years in Nantes.#Effects of asbestos on the #Mineral fiber content of human	life span and decreased weight in hamsters exposed to 000062
#Solubility of chrysotile in vitro and in human #The radiology of asbestos-induced disease of the	Light microscope studies on the effects of chrysotile lining dust injected into the body cavities of mice.* 000232
dust on benzo(a)pyrene-induced carcinogenesis in rat pleura.* #Coccupational diseases of the	lining maintenance and repair.* 000061
#Asbestos-induced selective release of pigs.* #Pulmonary	lipid peroxidation in the red cells.* 000090
	literature and presentation of a case with associated literature review with emphasis on dose response.* 000096
	literature.* #Pleural mesotheliomas. 000281
	liver microsomes. Effect of asbestos-associated metal liver of the rat.* #Effects of ingested chrysotile liver.* 000005
	liver, and pancreas of the rat.* of ingested chrysotile lobe fibrosis secondary to asbestos exposure.* 000004
	#Locating fibers in the bowel wall.* 000205
	locus of pathogenicity of asbestos dust: A theory.* 000111
	London: association with disease, occupation, and low asbestos exposure.* #Association of asbestos lung and mesothelioma: A re-examination of the Malmo lung and other organs: their epidemiology and lung and pleural tumors due to asbestos.* 000299
	lung cancer in a non-occupationally exposed autopsy lung cancer in workers suffering from asbestosis in the lung cancer.* 000206
	lung disease without a control group.* #Worker-sponsored lung dust for asbestos in the Havre region.* 000016
	lung dusts.* 000187
	lung fibroblast cultures exposed to chrysotile asbestos. lung fibroblast cultures.* 000086
	lung fibroblasts.* chrysotile asbestos and fiber glass lung homogenate (in vitro studies).* #Relation between lung tissue for mineral dust recovery.* 000231
	lung tissue from the Canadian chrysotile mining lung tissue of asbestos guinea pigs.* 000140
	lung tissue of rats.* induced asbestosis: changes in the lung tissues.* 000283
	lung tumors in rats by intratracheal administration of lung. Pathogenesis, pathology, and radiology.* 000092
	lung.* #Lung 00019
	#Lung asbestos bodies in 50 necropsies in Trieste.* 000286
	#Lung cancer complicated with asbestos-tuberculosis of lung function consequences of dust exposure in asbestos lungs and other organs of the human body.* 000027
	#Lung function in relation to radiographic changes in lungs at necropsy.* 000028
	lungs during experimental silicosis caused by lungs of a mesothelioma patient by electron microscopy.* 000020
	lungs of rats and guinea pigs after inhalation of lungs of rats.* 000317
	lungs of rhesus monkeys.* pneumoconiosis. Effect lungs of rural dwellers, urban dwellers, and patients lungs to asbestos.* 000031
	lungs. Report of 27 cases of asbestosis seen over a lungs.* 000221
	lungs.* 000315
	lungs.* #Effect of chrysotile-asbestos lungs: II. Inhalation diseases due to inorganic dust.* 000243
	#Lymphatic transport of inspired dust to the parietal lymphohematogenous spread of asbestos.* 000282
	lysosomal enzymes from mononuclear phagocytes.* 000035
	lysosomal enzymes in experimental asbestosis in guinea pigs.* 000055

## PERMUTED TITLE

asbestos or quartz particles on the mixed cultures of characteristics of #The in vivo effects of asbestos on	macrophage and 3T6 cell.*	*Effects of	000154
#Monocyte and	macrophage membrane structure and population		000185
#Asbestos cytotoxicity in the long term	macrophage reactions.*		000068
is blocked by anti-inflammatory steroids.*	macrophage-like cell culture.*		000294
Biochemical and #Effect of fibrous dust on alveolar	Macrophage plasminogen activator: Induction by asbestos	000121	
of silica and asbestos dust on the reducing effect of	macrophages and on other cells cultivated in vitro.	000012	
#Effect of asbestos dusts on cultured	macrophages with regard to triphenyltetrazolium	000236	
microscope of the effects of asbestos dust on alveolar	macrophages.*	000153	
action of different varieties of asbestos dust on	macrophages.*		000059
membrane structure and population characteristics of	#Study under the electron		000148
intrapleural injections into #Carcinogenic activity of	macrophages: #In vitro studies on the cytotoxic	000185	
#Alignment of respirable asbestos fibers by	magnesia and feldspar (amphibole-asbestos group) after	000219	
#Asbestos exposure during brake lining	magnetic fields.*	000285	
and one-second forced expiratory volume in Australian	maintenance and repair.*	000239	
#Analysis of particles in stomach tumors from Japanese	male asbestos cement workers.*	#Vital capacity	000008
exposure: A case report.*	males.*		000129
#Assessment of cell mediated immunity to	malignant changes in pleural plaques due to asbestos	000172	
#Conjugal	malignant mesothelioma by microcytotoxicity tests.*		000071
of inhabitants of Zagreb and their relationship to	malignant mesothelioma.*	000175	
liver.*	malignant tumors (Serbo-Croatian).* in the post mortem	000064	
testis in a patient with asbestos exposure: A case	Malignant fibrous mesothelioma: Metastatic to brain and	000298	
in the lung and mesothelioma: A re-examination of the	Malignant mesothelioma of the tunica vaginalis propria	000082	
#Pleural calcifications of asbestos origin in a	Malmo material.*	#Asbestos fibre	000206
on the Evaluation of Carcinogenic Risk of Chemicals to	man of 20 years of age.*	000089	
consequences of dust exposure in asbestos cement	Man, Vol. 2. Some inorganic and organometallic	000139	
#Bone	manufacturing plants.*	#Lung function	000306
asbestos exposure.*	marrow changes in asbestosis.*		000070
animal studies on the carcinogenic effect of asbestos	Massive bilateral upper lobe fibrosis secondary to	000104	
#Studies on the deposition of inhaled fibrous	material after oral administration.*	#Experimental	000095
#Studies of the deposition of inhaled fibrous	material in the respiratory tract of the rat and its	000078	
#Identification of fibrous	material in the respiratory tract of the rat and its	000190	
lung and mesothelioma: A re-examination of the Malmo	material in two public water supplies.*	000081	
#Biologic exposure to dental	material.*	#Asbestos fibre in the	000206
in rats after inoculation with asbestos and other	materials.*		000168
asbestos fibers and accompanying minerals in biological	materials.*	#Mesothelioma	000297
profile of asbestos and other nonopaque particulate	#Investigation and analysis of	000165	
exposed to asbestos minerals in commercial talc	matter larger than 5 micrometers in parenteral drugs.*	000007	
Practical aspects of counting asbestos on the Millipore	manufacture.*	#A study of workers	000150
#The	MC.*		# 000144
supplies.#Asbestiform amphibole minerals: detection and	measurement of fibre concentration in lung dusts.*	000088	
by asbestiform minerals and its application to the	measurement of high concentrations in municipal water	000051	
#Detection and	measurement of surface areas of dispersed samples of	000189	
dioxide and asbestos dusts or cytotoxicity #Effect of	measurement of the concentration of asbestos in air.*	000180	
mesotheliomas in rats.*	mechanical, thermal, and chemical treatments of silicon	000235	
#The microcytotoxicity tests.*	mechanism of asbestos induction of pleural	000217	
#The in vivo effects of asbestos on macrophage	mesothelioma by	000185	
#An electron microscope study of the response of	mesothelial cells to the intrapleural injection of	000056	
after intraperitoneal injection.*	mesothelial cells to malignant mesothelioma	000072	
#Transplantable strain of pleural	mesothelioma and population characteristics of	000218	
#Pleural	mesothelioma reaction to asbestos and other irritants		
*	#Diffuse peritoneal	mesothelioma among dock-yard workers in Genoa.*	000212
#The epidemiologic relationship between pleural	mesothelioma and asbestos exposure. Report of two cases.	000026	
case-control study in the Netherlands.*	#Pleural		
#Assessment of cell mediated immunity to malignant	mesothelioma and asbestosis.*	000161	
#Epidemiology of	mesothelioma and exposure to asbestos: A retrospective	000318	
survey related to occupational	mesothelioma by microcytotoxicity tests.*	000071	
a patient with asbestos exposure: A case	mesothelioma in Israel.*	000169	
#Asbestos and	mesothelioma in Victoria, Australia. A retrospective	000186	
bodies and asbestos fibers found in the lungs of a	mesothelioma incidence in Connecticut.*	000038	
*	mesothelioma of the tunica vaginalis propria testis in	000082	
#Retrospective investigations on the genesis of	mesothelioma patient by electron microscopy.* asbestos	000317	
#Peritoneal	mesothelioma. Report on 150 cases from the Hamburg area.	000117	
#Pleural	mesothelioma.*	000046	
#Pleural	mesothelioma.*	000048	
#Assessment of cell mediated immunity to malignant	mesothelioma.*	000155	
#Conjugal malignant	mesothelioma.*	000175	
#The clinical aspects of	mesothelioma.*	000069	
#Asbestos fibre in the lung and	mesothelioma: A re-examination of the Malmo material.*	000206	
#Malignant fibrous	mesothelioma: Metastatic to brain and liver.*	000298	
of 72 cases.*	Mesothelioma following exposure to asbestos: a review	000030	
#Papillary tumors of the peritoneum in women:	Mesothelioma or papillary carcinoma.*	000147	
#Pleural	Mesothelioma Register 1967-1968.*	000105	
#The mechanism of asbestos induction of pleural	Mesotheliomas and asbestos exposure.*	000276	
of age at inoculation of asbestos on occurrence of	Mesotheliomas in rats.*	000217	
the literature.*	#Effect	000024	
#Histochemical study of rat pleural	Mesotheliomas induced by asbestos.*	000215	
#Ultrastructure of human	Mesotheliomas. An analysis of 18 cases and review of	000281	
#Radiological diagnosis of crocidolite induced pleural	Mesotheliomas.*	000057	
and other materials.*	Mesothelioma in the rat.*	000196	
Effect of asbestos-associated metal ions and pH.*	#Mesothelioma in rats after inoculation with asbestos	000297	
in rat liver microsomes. Effect of asbestos-associated	#Metabolism of benz(a)pyrene in rat liver microsomes.	000284	
#Some observations on the distribution of trace	metal ions and pH.*	#Metabolism of benzo(a)pyrene	000284
#Malignant fibrous mesothelioma:	metals in chrysotile asbestos.*	000191	
#Intratracheal instillation of asbestos in	Metastatic to brain and liver.*	000298	
brake lining dust injected into the body cavities of	mice.*	000310	
determination. Fortune Industries, Inc., Chelsea,	mice.* of heated chrysotile asbestos and automobile	000061	
adsorption.*	Michigan.*	#Health hazard evaluation/toxicity	000006
	micro-quantities of chrysotile asbestos by dye	000176	

PERMUTED TITLE

in combined transmission electron microscopy and of ninety patients by electron microscopy, electron microscopy, electron microanalysis, and electron and other nonopaque particulate matter larger than 5 of asbestos dust with an electron microscope	microanalysis.* #Recent applications	000047
#The identification of asbestos dust with an electron macrophages.* #Study under the electron asbestos and fiber glass on the morphology and #Light to the intrapleural injection of asbestos #An electron characteristics of macrophages: A scanning electron particulate #Use of three optical systems to obtain a #Recent applications in combined transmission electron fluid. Study conducted with various optical in pulmonary asbestosis: Study of a case by electron of exogenous particles by high-voltage electron Association with asbestos fibers detected by electron in the lungs of a mesothelioma patient by electron mineral dust: a study of ninety patients by electron and pH.* #Metabolism of benzo(a)pyrene in rat liver #practical aspects of counting asbestos on the Canadian chrysotile #An examination of the fibrous #Digestion of lung tissue for microscopy, electron microanalysis, and #Pulmonary #Comparison between in vitro toxicity of polymer and between in vitro toxicity of two novel fibrous cancer?*	microanalysis, and electron microdiffraction.* a study microcytotoxicity tests.* #Assessment microdiffraction.* study of ninety patients by electron micrometers in parenteral drugs.* profile of asbestos microprobe analyser.* #The identification microscope microprobe analyser.*	000023 000071 000023 000007 000207 000207 000059 000232 000054 000185 000007 000047 000062 000103 000001 000184 000317 000023 000284 000144 000208 000140 000023 000277 000114 000238 000113 000183 000189 000159 000165 000150 000131 000100 000051 000208 000164 000171 000080 000019 000154 000138 000219 000265 000315 000068 000254 000139 000116 000055 000179 000021 000039 000012 000232 000250 000079 000187 000064 000229 000287 000218 000192 000314 000066 000075 000051 000243 000166 000188 000027 000067 000025 000115 000033 000160 000044 000062 000318 000166 000023 000267 000028 000021 000300
and #Consumer talcums and powders: #of spiculate components in some industrial aerosols.* #Adsorption of human serum albumin by asbestos #Research perspectives concerning asbestos and analysis of asbestos fibers and accompanying #A study of workers exposed to asbestos #Biochemical effects of asbestos #Surface energetics of asbestos concentrations in municipal #Asbestiform amphibole of asbestos lung tissue from the Canadian chrysotile #Asbestos in water: #of gastrointestinal cancer incidence in Duluth, H.H.E. 74-94-253, Armstrong Cork Company, Jackson, #Effect of asbestos dust on #Effects of asbestos or quartz particles on the cf asbestos: significance of asbestosis and value as a asbestos group) after intrapleural injections into and Candida albicans infection of the lungs of rhesus # #ACS (American Chemical Society) #IARC (International Agency for Research on Cancer) #Depression of viral interferon induction in cell induced selective release of lysosomal enzymes from to asbestos dust.* #Nodule kieselgur, and asbestos plus kieselgur.* #and on other cells cultivated in vitro. Biochemical and effects of chrysotile asbestos and fiber glass on the of asbestos dusts.* #Investigations concerning #Cancer to asbestos.* #post to malignant tumors ( #Asbestos bodies in the post #Counting asbestos fibers by the #The effect of asbestos-containing dusts on the #transplantable strain of pleural mesothelioma ( of crocidolite asbestos with hamster respiratory nickel.* #Early response of gastric #Asbestos exposure and detection and measurement of high concentrations in #Fibrogenic response in Proceedings of a joint NIEHS-EPA conference, Durham, 27 cases of asbestosis seen over a period of 6 years in #Lung asbestos bodies in 50 disease, #Prevalence of asbestos bodies in a of pulmonary asbestos bodies--1940 to 1972: a #Asbestos bodies and pleural plaques in human lungs at dwellers, urban dwellers, and patients with pulmonary particles in human tissues and their association with #Asbestos in drinking water: the possible in a case of pulmonary asbestosis with central to asbestos: A retrospective case-control study in the mucosa to ingested asbestos dust and the dissolution of effects of ingested asbestos. Proceedings of a joint microanalysis, and #Pulmonary mineral dust: a study of #Asbestos, talc, and Agency for Research on Cancer) Scientific Publication, #Asbestos and lung cancer in a	#Recent applications microanalysis, and electron microdiffraction.* a study microcytotoxicity tests.* #Assessment microdiffraction.* study of ninety patients by electron micrometers in parenteral drugs.* profile of asbestos microprobe analyser.* #The identification microscope microprobe analyser.*	000023 000071 000023 000007 000207 000207 000059 000232 000054 000185 000007 000047 000062 000103 000001 000184 000317 000023 000284 000144 000208 000140 000023 000277 000114 000238 000113 000183 000189 000159 000165 000150 000131 000100 000051 000208 000164 000171 000080 000019 000154 000138 000219 000265 000315 000068 000254 000139 000116 000055 000179 000021 000039 000012 000232 000250 000079 000187 000064 000229 000287 000218 000192 000314 000066 000075 000051 000243 000166 000188 000027 000067 000025 000115 000033 000160 000044 000062 000318 000166 000023 000267 000028 000021 000300

## PERMUTED TITLE

of experimental pneumoconioses induced by Soviet and rates of hemolysis induced by various fibrogenic and industrial disease research.*	*The use of to obtain a microscopic profile of asbestos and other Association with asbestos fibers detected by electron # in vivo.* #Comparison between in vitro toxicity of two of a joint NIEHS-EPA conference, Durham, N.C., silicosis caused by crystalline and #Accumulation of #Early detection of expiratory airflow series in East London: association with disease, Victoria, Australia. A retrospective survey related to #Foreign body granuloma of the skin due to Quantitative determination of airborne asbestos dust in #Background documentation on evaluation of #Digestive system cancer among persons subjected to #Worker-sponsored survey for asbestosis: Detection of diseases due to inorganic dust.* #Asbestos and lung cancer in a non-experimentation and relations to human carcinogenesis.* #Ferromagnetic contamination in the lungs and other #Asbestos-related diseases of the lung and other #Pleural calcifications of asbestosis #Asbestosis: A reassessment of the abdominal cavity. #Cocarcinogenesis of plutonium-239(IV) with regard to triphenyltetrazolium chloride and on concerning morphology of tumors induced in rats by i. of ingested chrysotile asbestos on DNA synthesis in the DNA synthesis in the gastrointestinal tract, liver, and tumors of the peritoneum in women: Mesothelioma or Mesothelioma or papillary carcinoma.* #Environments: Preliminary findings.* #Physical particulate matter larger than 5 micrometers in of the lymphatic transport of inspired dust to the #Pathogenic effects of inhaled #Subcellular identification of exogenous neoplastic disease.* #Inorganic with various optical #First finding of asbestos #The deposition of asbestos cell.* #Effects of asbestos or quartz tract.* #Passage of induced by various fibrogenic and nonfibrogenic #Modification of biological surface activity of subjected to occupational inhalation of asbestos a microscopic profile of asbestos and other nonopaque #Distribution and elemental analysis of inorganic gastrointestinal tract.* #Exposure to asbestos in the use of consumer spackling, #The end stage lung. #The locus of #Small animals in the study of associated diseases.* #The end stage lung. Pathogenesis, asbestos fibers found in the lungs of a mesothelioma of the tunica vaginalis propria testis in a #Pulmonary mineral dust: a study of ninety #The radiologic pulmonary volume in in the lungs of rural dwellers, urban dwellers, and #Ingested mineral fibers: Do they rats.* #For those in #For those in #Diffuse of two cases.* #Histogenesis and fine structure of carcinosa.* #Papillary tumors of the #Effect of asbestos on lipid #Monosymptomatic exudative pleurisy in asbestos particles: A #Digestive system cancer among effects on biological systems.* #Research Effect of asbestos-associated metal ions and selective release of lysosomal enzymes from mononuclear various work environments: Preliminary findings.* #of silicic acid from amosite and quartz dusts under asbestosis and value as a model of carcinogenesis.* #Asbestos body formation in the lungs of rats and guinea	non-Soviet amphibolic asbestoses.* characteristics 000203 nonfibrogenic particles with washed rat erythrocytes in 000127 nonhuman primates in pneumoconiosis and other 000098 nonopaque particulate matter larger than 5 micrometers 000007 Nonspecific" interstitial pulmonary fibrosis: 000184 novel fibrous mineral dusts and their tissue reactions 000278 November 8-20, 1973.* of ingested asbestos. Proceedings 000166 nucleic acids in the lungs during experimental 000020 obstruction in cement workers.* 000146 occupation, and domiciliary address.* in a necropsy 000067 occupational asbestos exposure.* of mesothelioma in 000186 occupational causes.* 000122 occupational environment by X-ray diffraction using 000126 occupational exposure to airborne asbestos.* 000143 occupational inhalation of asbestos particles: A 000251 occupational lung disease without a control group.* 000302 # Occupational differences in rates of lung cancer.* 000181 # Occupational diseases of the lungs: II. Inhalation 000311 occupationally exposed autopsy population.* 000300 Oncogenic effect of fibrous dusts. Animal 000209 optical microscopy techniques in a case of pulmonary 000062 optical systems to obtain a microscopic profile of 000007 oral administration.* #Experimental animal studies 000095 organ culture.* #Interaction of 000192 Organ culture.* 000225 organometallic compounds.* Evaluation of Carcinogenic 000139 organs of a primate.* effects of ingested chrysotile 000076 organs of the human body.* 000050 organs: their epidemiology and implications for 000016 origin in a man of 20 years of age.* 000089 overall problem.* 000119 oxide with chrysotile asbestos or benzpyrene in the rat 000246 oxygen consumption by the cells.* effect of macrophages 000236 p. injection of asbestos dusts.* #Investigations 000250 pancreas and other organs of a primate.* term effects 000076 pancreas of the rat.* effects of ingested chrysotile on 000004 papillary carcinoma.* #Papillary 000147 Papillary tumors of the peritoneum in women: 000147 parameters of airborne asbestos fibres in various work 000094 parenteral drugs.* of asbestos and other nonopaque 000007 parietal pleura.* #A current hypothesis 000282 particles and antigens.* 000002 particles by high-voltage electron microscopy.* 000001 particles in human tissues and their association with 000160 particles in stomach tumours from Japanese males.* 000129 particles in the cerebrospinal fluid. Study conducted 000062 particles in the human respiratory tract.* 000017 particles on the mixed cultures of macrophage and 3T6 000154 particles through the wall of the gastrointestinal 000292 particles with washed rat erythrocytes in vitro.* 000127 particles.* 000252 particles: A literature review with emphasis on dose 000251 particulate matter larger than 5 micrometers in 000007 particulates in pulmonary tissue.* 000034 #Passage of particles through the wall of the 000292 patching, and taping compounds.* 000237 Pathogenesis, pathology, and radiology.* 000092 Pathogenic effects of inhaled particles and antigens.* 000002 pathogenicity of asbestos dust: A theory.* 000111 pathological effects of asbestos.* 000132 Pathological and environmental aspects of asbestos- 000145 pathology, and radiology.* 000092 patient by electron microscopy.* of asbestos bodies and 000317 patient with asbestos exposure: A case report.* 000082 patients by electron microscopy, electron 000023 patients with asbestosis.* 000257 patients with pulmonary neoplasms.* (asbestos) bodies 000033 penetrate tissue or cause cancer?* 000114 Penetration of asbestos through the digestive wall in 000204 Penetration of cells by asbestos fibers.* 000060 peril on the factory floor.* 000266 peril: 3 - not only on the factory floor.* 000032 peritoneal mesothelioma and asbestos exposure. Report 000026 peritoneal tumors produced in animals by injections of 000058 Peritoneal mesothelioma.* 000046 Peritoneal mesothelioma.* 000048 peritoneum in women: Mesothelioma or papillary 000147 peroxidation in the red cells.* 000090 persons exposed to asbestos dust.* 000179 persons subjected to occupational inhalation of 000251 perspectives concerning asbestos minerals and their 000159 pH.* of benzo(a)pyrene in rat liver microsomes. 000284 phagocytes.* #Asbestos-induced 000055 Pharmacology of fibrosis and tissue injury.* 000049 Physical parameters of airborne asbestos fibres in 000094 physiological conditions.* #Dissolution 000220 Piezoelectricity of asbestos: significance of 000138 pigs after inhalation of anthophyllite.* 000031
---	---	---

## PERMUTED TITLE

#Pulmonary fibrogenic response of guinea pigs to amosite dust.*	000290
#Biochemical changes and pulmonary response of guinea pigs to asbestos dust.*	000263
#Enzymic changes in lung tissue of asbestotic guinea pigs.*	000264
lysosomal enzymes in experimental asbestososis in guinea pigs.*	000291
#Placental transfer of asbestos.*	000052
plain English.).*	000177
plant due to suppurative diseases of the skin.*	000108
plants.*	000306
#Lung function consequences of asbestos exposure: A case report.*	000172
plaques due to asbestos exposure: A case report.*	000115
plaques in human lungs at necropsy.*	000241
plaques.*	000270
#Amphibol asbestos in the soil and its significance for the endemic occurrence of pleural plaques.*	000040
plasminogen activator: Induction by asbestos is blocked by anti-inflammatory steroids.*	000121
#Macrophage Handling asbestos. Chrysotile asbestos in rats.*	000193
#The visceral lymphatic transport of inspired dust to the parietal pleura in asbestososis.*	000270
#The epidemiologic relationship between pleura.*	000282
#Primary	000155
#The mechanism of asbestos induction of pleural mesothelioma and exposure to asbestos: A retrospective case-control study in the Netherlands.*	000318
#Transplantable strain of rats.*	000218
#The epidemiologic relationship between pleural mesothelioma and asbestos exposure.*	000199
#Radiological diagnosis of crocidolite induced pleural mesothelioma.*	000215
#Early malignant changes in pleural mesotheliomas in rats.*	000217
#Histochemical study of rat pleural mesothelioma induced by asbestos.*	000196
#Asbestos bodies and #Post mortem ascertained cases of lung and chrysotile asbestos in southeast Turkey.*	000241
20 years of age.*	000040
#Ferruginous bodies in benign fibrous soil and its significance for the endemic occurrence of pleural tumors due to asbestos.*	000187
#Radiological diagnosis of crocidolite induced pleural calcification associated with exposure to asbestos.*	000312
#Radiological diagnosis of crocidolite induced pleural calcifications of asbestosotic origin in a man of Genoa.*	000089
#Pleural mesothelioma among dock-yard workers in Genoa.*	000212
#Pleural mesothelioma and asbestososis.*	000161
#Pleural mesotheliomas and asbestos exposure.*	000276
#Pleural mesotheliomas. An analysis of 18 cases and pleurisy in persons exposed to asbestos dust.*	000281
review of the literature.*	000273
dimension.*	000179
#Carcinogenicity of fibrous glass: #Monosymptomatic exudative pleurisy.*	000200
#Benign asbestos-induced produced by asbestos, kieselgur, and asbestos benzopyrene in the rat abdominal cavity. #Carcinogenesis of amphibolic #Comparative characteristics of experimental study.*	000039
#Cement, asbestos, and cement-asbestos #The use of nonhuman primates in silicon dioxide, during asbestososis, anthracosis, and albitans infection of the lungs #Experimental infective #It stacks up! (Air #Hazards to health due to air #Justice joins in appeal on taconite test.*	000246
#Comparison between in vitro toxicity of #Inhibition of chrysotile hemolysis by of asbestos on macrophage membrane structure and Association of asbestos and bronchogenic carcinoma in a and lung cancer in a non-occupationally exposed autopsy Chrysotile-induced asbestososis: changes in the free cell #Pollution and public health: taconite case relationship to malignant #Asbestos bodies in the tumors due to asbestos.*	000203
#Removal of asbestos fibres from with sprayed crocidolite asbestos: controlling a #Japanese gastric cancer: #Consumer talcums and their epidemiology and implications for clinical airborne asbestos fibres in various work environments: of the rete testis: A review of the literature and bodies--1940 to 1972: a necropsy #Secular trends in East London: association with disease, occupation, and #Ferruginous (asbestos) bodies and #Asbestos exposure and multiple	000249
on DNA synthesis in the pancreas and other organs of a research.*	000098
#The use of nonhuman primates in pneumoconiosis and other industrial disease C., November #Biological effects of ingested asbestos. Publication, No. 8. Biological effects of asbestos. #Use of three optical systems to obtain a microscopic of asbestos dust.*	000166
case #Malignant mesothelioma of the tunica vaginalis #Pollution and #Identification of fibrous material in two International Agency for Research on Cancer) Scientific #Secular trends in prevalence and concentration of with various optical microscopy techniques in a case of microscopy.*	000028
#The blood-air barrier in of HLA antigens in asbestos workers with and without detected by electron	000062
##"Nonspecific" interstitial	000077
plaques due to asbestos exposure: A case report.*	000082
plaques in human lungs at necropsy.*	000042
plaques.*	000081
#Physical parameters of presentation of a case with associated asbestososis.*	000094
prevalence and concentration of pulmonary asbestos	000025
Prevalence of asbestos bodies in a necropsy series in #Prevention of asbestos-induced temolysis.*	000067
primary carcinoma of the colon.*	000063
primary tumors.*	000242
Primary pleural mesothelioma.*	000155
primate.* term effects of ingested chrysotile asbestos	000076
primates in pneumoconiosis and other industrial disease Proceedings of a joint NIEHS-EPA conference, Durham, N. Proceedings of a Working Conference. (Cancer) Scientific profile of asbestos and other nonopaque particulate profiles in Quebec asbestos workers.*	000098
Prophylaxis of tuberculosis in workers under the effect propria testis in a patient with asbestos exposure: A public health: taconite case poses major test.*	000082
public water supplies.*	000042
Publication, No. 8. Biological effects of asbestos. pulmonary asbestos bodies--1940 to 1972: a necropsy pulmonary asbestososis with central nervous system pulmonary asbestososis: Study of a case by electron pulmonary fibrosis.*	000025
pulmonary fibrosis: Association with asbestos fibers	000103
frequency	000077
pulmonary fibrosis: Association with asbestos fibers	000184

## PERMUTED TITLE

of rural dwellers, urban dwellers, and patients with	pulmonary neoplasms.* (asbestos) bodies in the lungs	000033
#Bicbemical changes and	pulmonary response of guinea pigs to asbestos dust.*	000263
asbestosis: changes in the free cell population,	pulmonary surfactant and whole lung tissue of rats.*	000283
and elemental analysis of inorganic particulates in	pulmonary tissue.*	000034
#The radiologic	#Distribution	
silicosis.*	pulmonary volume in patients with asbestosis.*	000257
Report of the first year.*	#Pulmonary antigenicity in experimental asbestosis and	000202
dust.*	#Pulmonary cytopathology of former asbestos workers:	000106
#Pulmonary fibrogenic response of guinea pigs to amosite	000290	
#Pulmonary function profiles in Quebec asbestos workers.*	000087	
#Pulmonary lysosomal enzymes in experimental asbestosis	000291	
#Pulmonary mineral dust: a study of ninety patients by	000223	
electron microscopy, electron microanalysis, and	pyrene and chrysotile asbestos dust.* of lung tumors	000245
in rats by intratracheal administration of benzo(a)	pyrene in rat liver microsomes. Effect of asbestos-	000284
associated metal ions and pH.* #Metabolism of benzo(a)	pyrene-induced carcinogenesis in rat lungs.*	000244
#Effect of chrysotile-asbestos dust on benzo(a)	#Air	
#Asbestos: Rationale behind a proposed air	quality standard.*	000026
occupational environment by X-ray diffraction using	#Quantitative determination of airborne asbestos dust in	000126
concentrations.*	#Quantitative determination of asbestos fiber	000010
#Effect of chrysotile asbestos dust on the clearance of	#Quantitative differential thermal analysis of small	000307
#Effect of chrysotile asbestos dust on the clearance of	#Quantitative relationship of fecal asbestos to asbestos	000053
#Effect of chrysotile asbestos dust on the clearance of	quartz and asbestos on erythrocyte surface charge.*	000091
#Effect of chrysotile asbestos dust on the clearance of	quartz dusts under physiological conditions.*	000220
#Effect of chrysotile asbestos dust on the clearance of	quartz particles on the mixed cultures of macrophage	000154
#Effect of chrysotile asbestos dust on the clearance of	quartz.*	000307
#Effect of chrysotile asbestos dust on the clearance of	#Quantitative differential	
#Effect of chrysotile asbestos dust on the clearance of	Quebec asbestos workers.*	000087
#Effect of chrysotile asbestos dust on the clearance of	radiant environments.*	000289
#Effect of chrysotile asbestos dust on the clearance of	radioactive tracer techniques: I. IICC crocidolite	000078
#Effect of chrysotile asbestos dust on the clearance of	radioactive tracer techniques: II. Deposition of the	000190
#Effect of chrysotile asbestos dust on the clearance of	radiographic changes in asbestos workers.*	000316
#Effect of chrysotile asbestos dust on the clearance of	radiologic pulmonary volume in patients with asbestosis.	000257
#Effect of chrysotile asbestos dust on the clearance of	#Radiologic features of asbestosis.*	000288
#Effect of chrysotile asbestos dust on the clearance of	#Radiological diagnosis of crocidolite induced pleural	000196
#Effect of chrysotile asbestos dust on the clearance of	radiology of asbestos-induced disease of the lungs.*	000271
#Effect of chrysotile asbestos dust on the clearance of	radiology.*	000092
#Effect of chrysotile asbestos dust on the clearance of	rat abdominal cavity.*Cocarcinogenesis of plutonium-239(	000246
#Effect of chrysotile asbestos dust on the clearance of	rat and its subsequent clearance using radioactive	000190
#Effect of chrysotile asbestos dust on the clearance of	rat and its subsequent clearance using radioactive	000078
#Effect of chrysotile asbestos dust on the clearance of	rat erythrocytes in vitro.*hemolysis induced by various	000127
#Effect of chrysotile asbestos dust on the clearance of	rat in relation to fiber dimension.* #Carcinogenicity	000273
#Effect of chrysotile asbestos dust on the clearance of	rat liver microsomes. Effect of asbestos-associated	000284
#Effect of chrysotile asbestos dust on the clearance of	rat lung homogenate (in vitro studies).*	000222
#Effect of chrysotile asbestos dust on the clearance of	between	
#Effect of chrysotile asbestos dust on the clearance of	rat lung.*	000019
#Effect of chrysotile asbestos dust on the clearance of	#Effect of chrysotile-asbestos	000244
#Effect of chrysotile asbestos dust on the clearance of	rat pleural mesotheliomas induced by asbestos.*	000215
#Effect of chrysotile asbestos dust on the clearance of	#Radiological diagnosis	000196
#Effect of chrysotile asbestos dust on the clearance of	rat.* #Effects of ingested chrysotile on DNA synthesis	000005
#Effect of chrysotile asbestos dust on the clearance of	rat.*effects of ingested chrysotile on DNA synthesis in	000004
#Effect of chrysotile asbestos dust on the clearance of	rates of hemolysis induced by various fibrogenic and	000127
#Effect of chrysotile asbestos dust on the clearance of	rates of lung cancer.*	000181
#Effect of chrysotile asbestos dust on the clearance of	Rationale behind a proposed air quality standard.*	000037
#Effect of chrysotile asbestos dust on the clearance of	rats after inoculation with asbestos and other	000297
#Effect of chrysotile asbestos dust on the clearance of	rats and guinea pigs after inhalation of anthophyllite.*	000031
#Effect of chrysotile asbestos dust on the clearance of	rats by i. p. injection of asbestos dusts.*	000250
#Effect of chrysotile asbestos dust on the clearance of	rats by intratracheal administration of benzo(a)pyrene	000245
#Effect of chrysotile asbestos dust on the clearance of	rats.*	000296
#Effect of chrysotile asbestos dust on the clearance of	rats.*	000204
#Effect of chrysotile asbestos dust on the clearance of	rats.*	# 000029
#Effect of chrysotile asbestos dust on the clearance of	rats.*	000221
#Effect of chrysotile asbestos dust on the clearance of	#The mechanism	000217
#Effect of chrysotile asbestos dust on the clearance of	rats.*	000213
#Effect of chrysotile asbestos dust on the clearance of	#Carcinogenic activity	
#Effect of chrysotile asbestos dust on the clearance of	rats.*	000218
#Effect of chrysotile asbestos dust on the clearance of	#Transplantable strain	
#Effect of chrysotile asbestos dust on the clearance of	rats.*	000024
#Effect of chrysotile asbestos dust on the clearance of	#Effect of age at inoculation	000219
#Effect of chrysotile asbestos dust on the clearance of	rats.* of magnesiaarafvedsonite (amphibole-asbestos	000283
#Effect of chrysotile asbestos dust on the clearance of	rats.* asbestos: changes in the free cell population,	000283
#Effect of chrysotile asbestos dust on the clearance of	rats: Cover slip method.* after intraperitoneal	000259
#Effect of chrysotile asbestos dust on the clearance of	#X-ray diffraction characteristics of some silicates.*	000018
#Effect of chrysotile asbestos dust on the clearance of	#X-ray diffraction using conventional and rotating anode X-	000126
#Effect of chrysotile asbestos dust on the clearance of	#X-ray tube.* dust in occupational environment by X-	000126
#Effect of chrysotile asbestos dust on the clearance of	re-examination of the Malmo material.*	000206
#Effect of chrysotile asbestos dust on the clearance of	reaction of injured alveolar epithelium.*	000156
#Effect of chrysotile asbestos dust on the clearance of	reaction to asbestos and other irritants after	000072
#Effect of chrysotile asbestos dust on the clearance of	reactions in vivo.*Comparison between in vitro toxicity	000278
#Effect of chrysotile asbestos dust on the clearance of	reactions.*	000068
#Effect of chrysotile asbestos dust on the clearance of	reassessmnet of the overall problem.*	000112
#Effect of chrysotile asbestos dust on the clearance of	rectum specimens.*	000119
#Effect of chrysotile asbestos dust on the clearance of	red cells.*	000233
#Effect of chrysotile asbestos dust on the clearance of	reducing effect of macrophages with regard to	000090
#Effect of chrysotile asbestos dust on the clearance of	reflections on asbestos.*	000236
#Effect of chrysotile asbestos dust on the clearance of	region.*	000041
#Effect of chrysotile asbestos dust on the clearance of	#Routine	000086
#Effect of chrysotile asbestos dust on the clearance of	Register 1967-1968.*	000105
#Effect of chrysotile asbestos dust on the clearance of	release from asbestos garments.*	000093
#Effect of chrysotile asbestos dust on the clearance of	release of lysosomal enzymes from mononuclear	000055
#Effect of chrysotile asbestos dust on the clearance of	repair shops.* in the fabrication of friction	000128
#Effect of chrysotile asbestos dust on the clearance of	repair.*	000239
#Effect of chrysotile asbestos dust on the clearance of	research.*	000151
#Effect of chrysotile asbestos dust on the clearance of	research.*	000098
#Effect of chrysotile asbestos dust on the clearance of	#The use of nonhuman	
#Effect of chrysotile asbestos dust on the clearance of	Research on Cancer) Monographs on the Evaluation of	000139

PERMUTED TITLE

Biological effects of #IAFC (International Agency for their effects on biological systems.*	#Asbestos exposure in a Yale building: Analysis and #Type of asbestos and #Interaction of crocidolite asbestos with hamster on the deposition of inhaled fibrous material in the of the deposition of inhaled fibrous material in the and asbestos dust on the emergence of #The deposition of asbestos particles in the human #Correlation between the tissue #Fibrigenic #Carcinogenicity of fibrous glass: Pleural and the dissolution of nickel.* #Early #Pulmonary fibrogenic #Biochemical changes and pulmonary injection of #An electron microscope study of the particles: A literature review with emphasis on dose presentation of a case with #Adenocarcinoma of the asbestos and fiber glass on the morphology and #Pleura mesothelioma and exposure to asbestos: A two cases of mesothelioma in Victoria, Australia. A mesothelioma. Report on 150 cases from the Hamburg #Hamburg.* with associated #Adenocarcinoma of the rete testis: A #Pleural mesotheliomas. An analysis of 18 cases and #Mesothelioma following exposure to asbestos: a inhalation of asbestos particles: A literature #Health hazards: asbestos; a dust and Candida albicans infection of the lungs of cancer: Potentially carcinogenic silicates (talc) from #The #So-called " on Cancer) Monographs on the Evaluation of Carcinogenic exposure system for chronic inhalation studies with cement-asbestos pneumoconioses: A comparative clinical-environment by X-ray diffraction using conventional and #Ferruginous (asbestos) bodies in the lungs of and population characteristics of macrophages: A #IARC (International Agency for Research on Cancer) #Massive bilateral upper lobe fibrosis pulmonary asbestos bodies--1940 to 1972: a necropsy #phagocytes.* #Asbestos-induced of Zagreb and their relationship to malignant tumors ( #Prevalence of asbestos bodies in a necropsy application to the measurement of #Adsorption of human #Autoantibodies and containing asbestos and their handling in car repair macrophages with regard to #Influence of #Influence of citrate ions on the dissolution of #Asbestos-induced hemolysis in relation to its #Japanese gastric cancer: Potentially carcinogenic in vitro studies.* #Relation between solubility of #X-ray diffraction characteristics of some physiological conditions.* #Dissolution of of mechanical thermal, and chemical treatments of silicosis caused by crystalline and condensed of nucleic acids in the lungs during experimental #Pulmonary antigenicity in experimental asbestosis and for the estimation of small quantities of #Foreign body granuloma of the cement plant due to suppurative diseases of the of crocidolite asbestos fibres in rats: Cover #Chronic inhalation of asbestos and cigarette and decreased weight in hamsters exposed to cigarette #Asbestos, #Asbestos, #ACS (American Chemical pleural plaques.* #Amphibol asbestos in the lung homogenate (in vitro studies).* #Relation between #Asbestos-induced hemolysis in relation to its silica #Asbestos emissions from baghouse controlled associated with exposure to chrysotile asbestos in experimental pneumoconioses induced by Soviet and non- of experimental pneumoconioses induced by #Exposure to asbestos in the use of consumer cigarette smoke.* #Increased life for the systematic examination of colon-rectum quantities of single varieties of #The use of infrared #The characteristics and hygienic evaluation of occupational lung disease without a control #Worker hazard.* #Monitoring an asbestos #Steelwork insulated with #Lymphohematogenous workers.* Research on Cancer) Scientific Publication, No. 8. Research perspectives concerning asbestos minerals and resolution.* respirable asbestos fibers by magnetic fields.* respiratory cancer in the asbestos industry.* respiratory mucosa in organ culture.* respiratory tract of the rat and its subsequent respiratory tract of the rat and its subsequent respiratory tract tumors in hamsters.* respiratory tract.* response and asbestos fiber content.* response in murine lungs to asbestos.* response in the rat in relation to fiber dimension.* response of gastric mucosa to ingested asbestos dust response of guinea pigs to amosite dust.* response of guinea pigs to asbestos dust.* response of mesothelial cells to the intrapleural response.* to occupational inhalation of asbestos response of cell cultures to asbestos fibers.* rete testis: A review of the literature and reticulin formation of cultured lung fibroblasts.* retrospective case-control study in the Netherlands.* retrospective survey related to occupational asbestos Retrospective investigations on the genesis of Retrospective study in 236 asbestos textile workers at review of the literature and presentation of a case review of 72 cases.* review with emphasis on dose response.* to occupational review.* thesus monkeys.* pneumoconiosis. Effect of asbestos rice.* #Japanese gastric risk equations: A ban on asbestos?* risk groups.* Risk of Chemicals to Man, Vol. 2. Some inorganic and risks in studies of the health effects of asbestos.* rodents.* #Aerosol roentgenographic study.* #Cement, asbestos, and rotating anode X-ray tube.* dust in occupational rural dwellers, urban dwellers, and patients with scanning electron microscope study.* membrane structure Scientific Publication, No. 8. Biological effects of secondary to asbestos exposure.* Secular trends in prevalence and concentration of selective release of lysosomal enzymes from mononuclear Serbocroatian).* in the post mortem of inhabitants series in East London: association with disease, serum albumin by asbestos minerals and its serum immunoglobulin levels in asbestos workers.* shops.* in the fabrication of friction coatings silica and asbestos dust on the reducing effect of silica from asbestos.* silica solubility.* silicates (talc) from rice.* silicates and enzyme inhibition in rat lung homogenate (silicates.* silica and asbestos dust on the reducing effect of silica from asbestos.* silica solubility.* silicates (talc) from rice.* silicates and enzyme inhibition in rat lung homogenate (silicates.* silicic acid from amosite and quartz dusts under silicon dioxide and asbestos dusts on cytotoxicity and silicon dioxide, during asbestosis, anthracosis, and silicosis caused by crystalline and condensed silicon silicosis.* single varieties of UICC asbestos.* spectrophotometry skin due to occupational causes.* skin.* disability of workers of the Ararat asbestos-slip method.* after intraperitoneal application smoke by hamsters.* #Increased life span smoking, and laryngeal carcinoma.* Society) Monograph, Vol. 173, Chemical carcinogens.* soil and its significance for the endemic occurrence of solubility of silicates and enzyme inhibition in rat solubility.* Solubility of chrysotile in vitro and in human lungs.* sources.* southeast Turkey.* #Pleural calcification Soviet amphibolic asbestos.* characteristics of Soviet and non-Soviet amphibolic asbestos.* spackling, patching, and taping compounds.* span and decreased weight in hamsters exposed to specimens.* #Technique spectrophotometry for the estimation of small spectrum of asbestos-related diseases.* spiculate components in some industrial aerosols.* sponsored survey for asbestosis: Detection of spray process.* sprayed crocidolite asbestos: controlling a potential spread of asbestos.* Sputum cytopathological findings in former asbestos workers.* 000028 000159 000248 000285 000074 000192 000078 000190 000293 000017 0000130 000243 000273 000314 000290 000263 000056 000251 000036 000096 000232 000318 000186 000117 000118 000096 000281 000030 000251 000011 000178 000195 000256 000139 000073 000304 000249 000126 000033 000185 000028 000104 000025 000055 000064 000067 000189 000157 000128 000236 000224 000223 000178 000222 000118 000235 000020 000020 000202 000015 000122 000108 000259 000303 000305 000261 000254 000040 000022 000223 000141 000124 000312 000203 000203 000237 000305 000233 000015 000240 000183 0000254 000302 000265 000167 000035 000107
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## PERMUTED TITLE

\*It stacks up! (Air pollution explained in plain English).\* 000177  
 tracer techniques: II. Deposition of the UICC stage lung. Pathogenesis, pathology, and radiology.\* 000092  
 #Asbestos: Rationale behind a proposed air quality standard reference samples of asbestos.\* radioactive 000190  
 controlling a potential hazard.\* standard.\* 000037  
 Induction by asbestos is blocked by anti-inflammatory status of asbestos based on 50 observations.\* 000170  
 asbestos in rats.\* #Analysis of particles in steelwork insulated with sprayed crocidolite asbestos: 000167  
 #The in vivo effects of asbestos on macrophage membrane steroids.\* #Macrophage plasmogen activator: 000121  
 injections of asbestos.\* #Histogenesis and fine stomach tumours from Japanese males.\* 000218  
 dioxide and asbestos dusts or cytotoxicity and electron strain of pleural mesothelioma (MS-71) induced by 000185  
 high-voltage electron microscopy.\* structure and population characteristics of 000058  
 and cytochemical studies on the expectoration of structure of peritoneal tumors produced in animals by 000235  
 the histological cell types of lung cancer in workers #Subcellular identification of exogenous particles by 000001  
 #Identification of fibrous material in two public water subjects with asbestosis.\* #Cytomorphological 000258  
 measurement of high concentrations in municipal water suffering from asbestosis in the United Kingdom.\* of 000309  
 of workers of the Ararat asbestos-cement plant due to supplies.\* 000081  
 #Modification of biological 000051  
 minerals and its application to the measurement of 000108  
 #Effect of quartz and asbestos on erythrocyte surface activity of particles.\* 000252  
 changes in the free cell population, pulmonary surface areas of dispersed samples of chrysotile.\* 000189  
 possible effects of asbestos in city water: surface charge.\* 000091  
 disease without a control group.\* #Worker-sponsored #Surface charge and asbestos toxicity.\* 000174  
 of mesothelioma in Victoria, Australia. A retrospective #Surface charge and hemolytic activity of asbestos.\* 000173  
 the rat.\* #Effects of ingested chrysotile on DNA #Surface energetics of asbestos minerals.\* 000100  
 #Dose-dependent effects of ingested chrysotile on DNA surfactant and whole lung tissue of rats.\* asbestosis: 000283  
 term effects of ingested chrysotile asbestos on DNA surveillance of gastrointestinal cancer incidence in 000171  
 #Carcinogenic activity of synthesis in the gastrointestinal tract and liver of 000005  
 inhalation of asbestos particles: A #Digestive system for chronic inhalation studies with rodents.\* 000304  
 #Aerosol exposure system in asbestos workers.\* 000182  
 in a case of pulmonary asbestosis with central nervous system lesions.\* various optical microscopy techniques 000062  
 other nonopaque particulate #Technique for the systematic examination of colon-rectum specimens.\* 000233  
 asbestos minerals and their effects on biological systems to obtain a microscopic profile of asbestos and 000007  
 #Pollution and public health: systems.\* #Research perspectives concerning 000159  
 #Justice joins in appeal on talc on hamsters.\* #A study of 000042  
 workers exposed to asbestos minerals in commercial talc manufacture.\* 000150  
 #Biological effects of tremolite talc on hamsters.\* 000268  
 gastric cancer: Potentially carcinogenic silicates ( talc) from rice.\* #Japanese 000178  
 #Asbestos, talc, and nitrates in relation to gastric cancer.\* 000267  
 #Concerning an unusual case of talcum and powders: Mineral and chemical 000085  
 characterization.\* #Consumer #Exposure to asbestos 000237  
 in the use of consumer spackling, patching, and tape compounds.\* 000054  
 textile facilities.\* #Technological feasibility of the two fibers/cc asbestos 000108  
 cement plant due to suppurative diseases of the skin.\* #Temporary disability of workers of the Ararat asbestos-  
 #The short-term effects of chronic asbestos ingestion in rats.\* 000029  
 synthesis in the pancreas and other organs #The short-term effects of ingested chrysotile asbestos on DNA 000076  
 #Asbestos cytotoxicity in the long term macrophage-like cell culture.\* 000294  
 #Malignant mesothelioma of the tunica vaginalis propria testis in a patient with asbestos exposure: A case 000082  
 a case with associated #Adenocarcinoma of the rete testis: A review of the literature and presentation of 000096  
 Technological feasibility of the two fibers/cc asbestos textile facilities.\* #Aerosol exposure report H.H.E. 74-94-253, 000054  
 #Retrospective study in 236 asbestos 000118  
 #The locus of pathogenicity of asbestos dust: A theory.\* 000111  
 quartz.\* #Quantitative differential thermal analysis of small dust samples containing 000307  
 asbestos dusts on cytotoxicity #Effect of mechanical thermal, and chemical treatments of silicon dioxide and 000235  
 #Ingested mineral fibers: Do they penetrate they penetrate tissue or cause cancer?\* 000114  
 Australia. A retrospective survey related to tissue for mineral dust recovery.\* 000186  
 #Digestion of lung tissue from the Canadian chrysotile mining industry.\* 000208  
 of the fibrous mineral content of asbestos lung tissue of asbestos guinea pigs.\* 000283  
 #Pharmacology of fibrosis and tissue of rats.\* induced asbestosis: changes in the free 000023  
 #Enzymic changes in lung tissue or cause cancer?\* 000114  
 cell population, pulmonary surfactant and whole lung tissue reactions in vivo.\* #Comparison between in vitro 000278  
 #Ingested mineral fibers: Do they penetrate tissue reactions.\* 000112  
 toxicity of two novel fibrous mineral dusts and their tissue response and asbestos fiber content.\* 000130  
 #Astrotox-induced intrathoracic tissue.\* 000295  
 #Correlation between the tissue.\* #Distribution and elemental 000034  
 #The significance of asbestos in analysis of inorganic particulates in pulmonary tissues and their association with neoplastic disease.\* 000160  
 #Inorganic particles in human tissues.\* 000084  
 #Asbestos bodies and fibers in lung towns.\* 000134  
 #Asbestos fibres in the air of Armstrong Cork Company, #Health hazard evaluation report H.H.E. 74-94-253, 000080  
 Chelsea, Michigan.\* #Health hazard evaluation/ toxicity determination. Fortune Industries, Inc., 000006  
 fibrogenicity.\* #Comparison between in vitro toxicity of polymer and mineral dusts and their 000277  
 tissue reactions in vivo.\* #Comparison between in vitro toxicity of two novel fibrous mineral dusts and their 000278  
 #Surface charge and asbestos toxicity.\* 000174  
 #Some observations on the distribution of trace metals in chrysotile asbestos.\* 000191  
 the rat and its subsequent clearance using radioactive tracer techniques: I. UICC crocidolite asbestos.\* of 000078  
 the rat and its subsequent clearance using radioactive tracer techniques: II. Deposition of the UICC standard 000190  
 chrysotile on DNA synthesis in the gastrointestinal tract and liver of the rat.\* #Effects of ingested 000005  
 of inhaled fibrous material in the respiratory tract of the rat and its subsequent clearance using 000078  
 of inhaled fibrous material in the respiratory tract of the rat and its subsequent clearance using 000190  
 and asbestos dust on the emergence of respiratory tract tumors in hamsters.\* effect of diethylnitrosamine 000293

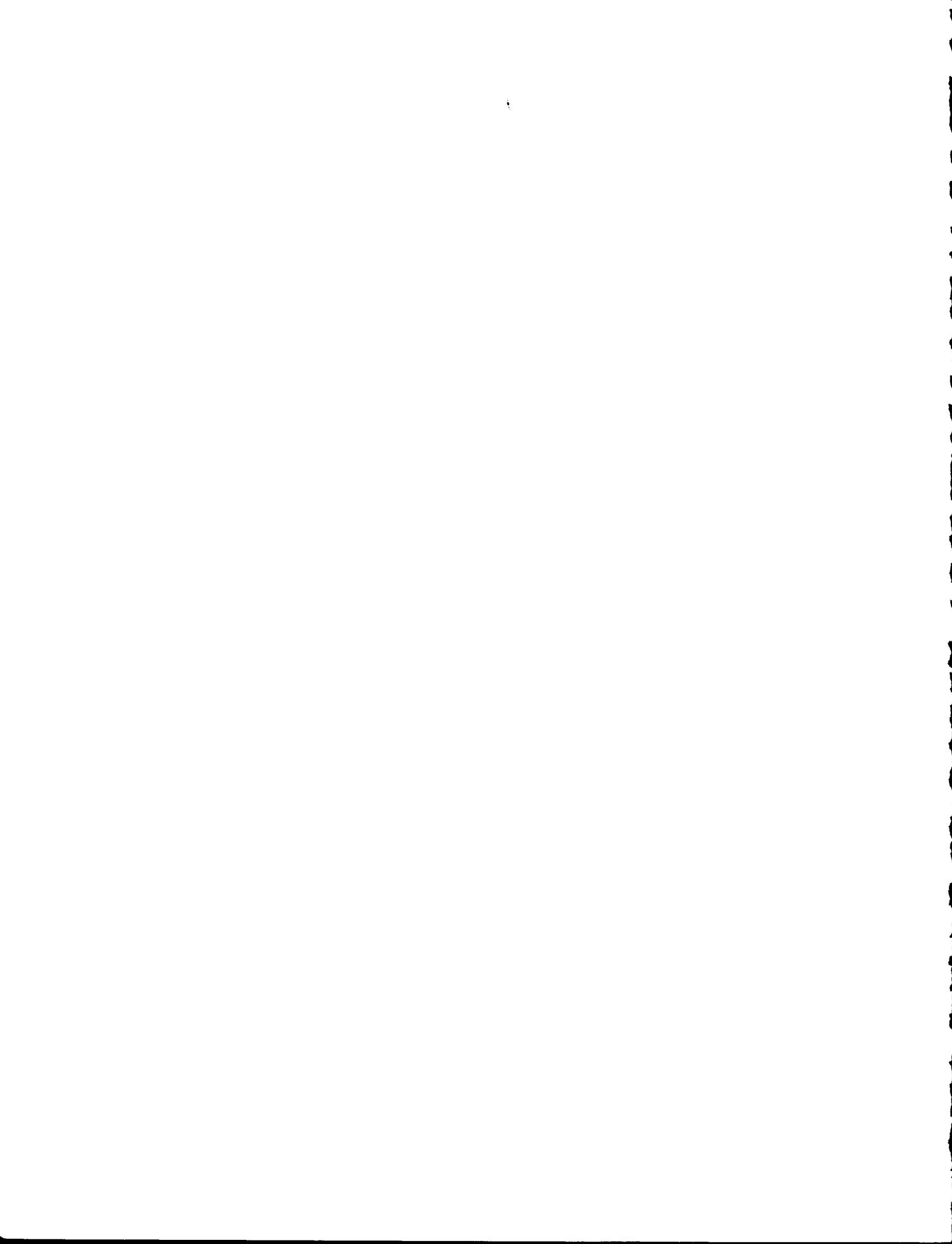
## PERMUTED TITLE

of particles through the wall of the gastrointestinal tract.*	#Passage	000292
of asbestos particles in the human respiratory tract.*	#The deposition	000017
chrysotile on DNA synthesis in the gastrointestinal tract, liver, and pancreas of the rat.*	of ingested	000004
#Placental transfer of asbestos.*		000052
#Recent applications in combined induced by asbestos in rats.*	transmission electron microscopy and microanalysis.*	000047
#A current hypothesis of the lymphatic transport of inspired dust to the parietal pleura.*	Transplantable strain of pleural mesothelioma (MS-71)	000218
#Effect of mechanical thermal, and chemical treatments of silicon dioxide and asbestos dusts on tremolite talc on hamsters.*	transport of inspired dust to the parietal pleura.*	000282
#Biological effects of asbestos bodies--1940 to 1972: a necropsy #Secular trends in prevalence and concentration of pulmonary trends in prevalence and concentration of pulmonary	treatments of silicon dioxide and asbestos dusts on tremolite talc on hamsters.*	000235
#Lung asbestos bodies in 50 necropsies in on the reducing effect of macrophages with regard to diffraction using conventional and rotating anode X-ray dust.*	trends in prevalence and concentration of pulmonary	000268
#Propylaxis of #Lung cancer complicated with asbestos-animals.*	Trieste.*	000025
of Zagreb and their relationship to malignant #Post mortem ascertained cases of lung and pleural tumors due to asbestos.*	triphenyltetrazolium chloride and on oxygen consumption	000236
and asbestos dust on the emergence of respiratory tract tube.*	dust in occupational environment by X-ray	000126
a) pyrene and chrysotile asbestos #Induction of lung tumors in workers under the effect of asbestos	tuberculosis in workers under the effect of asbestos	000230
dusts.*	tuberculosis of the lung.*	000286
#Investigations concerning morphology of papillary carcinoma.*	Tumorigenic effect of fibrous dusts in experimental tumors (SerboCroatian).*	000211
#Papillary #Histogenesis and fine structure of peritoneal tumors (SerboCroatian).*	the post mortem of inhabitants	000064
#Asbestos exposure and multiple primary tumors due to asbestos.*	tumors due to asbestos.*	000187
#Analysis of particles in stomach #Malignant mesothelioma of the tunica vaginalis propria testis in a patient with Turkey.*	effect of diethylnitrosamine	000293
asbestos exposure: A with exposure to chrysotile asbestos in southeast #Pleural calcification associated	tumors in rats by intratracheal administration of benzo(	000245
#The generation and evaluation of #Induction of lung tumors induced in rats by i. p. injection of asbestos	tumors induced in rats by i. p. injection of asbestos	000250
estimation of small quantities of single varieties of clearance using radioactive tracer techniques: I. #Investigations concerning morphology of tumors of the peritoneum in women: Mesothelioma or	tumors produced in animals by injections of asbestos.*	000147
radioactive tracer techniques: II. Deposition of the exposed to chrysotile asbestos.*	tumors.*	000058
#Massive bilateral tumours from Japanese males.*	tumours from Japanese males.*	000066
(asbestos) bodies in the lungs of rural dwellers, exposure: A case #Malignant mesothelioma of the tunica vaginalis propria testis in a patient with Turkey.*	tunica vaginalis propria testis in a patient with Turkey.*	000082
of asbestos: significance of asbestosis and #Pleural calcification associated	#Pleural calcification associated	000312
#In vitro studies on the cytotoxic action of different UICC asbestos clouds in animal exposure chambers.*	UICC asbestos clouds in animal exposure chambers.*	000013
for the estimation of small quantities of single UICC asbestos.*	of infrared spectrophotometry for the	000015
occupational #Thirty-two cases of mesothelioma in UICC crocidolite asbestos.*	UICC crocidolite asbestos.*	000078
#The subject of continuous asbestos fibers.*	the rat and its subsequent	000190
#Depression of UICC standard reference samples of asbestos.*	UICC standard reference samples of asbestos.*	000231
#The in Australian male asbestos cement workers.*	using	000057
#Solubility of chrysotile in #Ultrastructure of human mesotheliomas.*	Ultrastructural changes in lung fibroblast cultures	000057
varieties of asbestos dust on macrophages.*	United Kingdom.*study of the histological cell types of	000309
#In and enzyme inhibition in rat lung homogenate (in #Unusual case of talcum-asbestosis.*	unusual case of talcum-asbestosis.*	000085
fibrogenicity.*	upper lobe fibrosis secondary to asbestos exposure.*	000104
#Comparison between in urban dwellers, and patients with pulmonary neoplasms.*	urban dwellers, and patients with pulmonary neoplasms.*	000033
their tissue reactions in vivo.* #Comparison between in vaginalis propria testis in a patient with asbestos	vaginalis propria testis in a patient with asbestos	000082
alveolar macrophages and on other cells cultivated in value as a model of carcinogenesis.* #Piezoelectricity	value as a model of carcinogenesis.*	000138
ncfibrogenic particles with washed rat erythrocytes in varieties of asbestos dust on macrophages.*	#Piezoelectricity	000148
structure and population characteristics of #The in varieties of UICC asbestos.* infrared spectrophotometry	varieties of asbestos dust on macrophages.*	000015
fibrous mineral dusts and their tissue reactions in Victoria, Australia. A retrospective survey related to	varieties of UICC asbestos.* infrared spectrophotometry	000186
identification of exogenous particles by high #Vigilance.*	Victoria, Australia. A retrospective survey related to	000158
#The radiologic pulmonary viral interferon induction in cell monolayers by	vigilance.*	000116
#Vital capacity and one-second forced expiratory visceral pleura in asbestosis.*	viral interferon induction in cell monolayers by	000270
#Penetration of asbestos through the digestive vital capacity and one-second forced expiratory volume	visceral pleura in asbestosis.*	000008
#Passage of particles through the #In vitro and in human lungs.*	vital capacity and one-second forced expiratory volume	000141
#Locating fibers in the bowel #In vitro studies on the cytotoxic action of different	in vitro and in human lungs.*	000222
#Asbestos fibers in the colonic #Comparison between in	#In vitro studies on the cytotoxic action of different	000148
by various fibrogenic and nonfibrogenic particles with #Comparison between in	#Comparison between in	000227
#The adsorption of #Comparison between in	#Comparison between in	000278
#Removal of asbestos fibres from potable #Comparison between in	#Comparison between in	000127
#Identification of fibrous material in two public #Comparison between in	#Comparison between in	000185
and measurement of high concentrations in municipal #Comparison between in	#Comparison between in	000278
#Asbestos fibers in drinking #Comparison between in	#Comparison between in	000001
#Asbestos in potable #Comparison between in	#Comparison between in	000257
#What is happening to our drinking #Comparison between in	#Comparison between in	000008
effects.* #Asbestos in drinking #Comparison between in	#Comparison between in	000204
#Asbestos in the wall in rats.*	wall in rats.*	000292
#Investigating possible effects of asbestos in city wall.*	wall of the gastrointestinal tract.*	000205
#Increased life span and decreased wall.*	wall.*	000308
#Papillary tumors of the peritoneum in #Asbestos in drinking	washed rat erythrocytes in vitro.* of hemolysis induced	000127
parameters of airborne asbestos fibres in various #Asbestos in drinking	water and benzene on amosite and chrysotile asbestos.*	000099
#Asbestos in the #Asbestos in drinking	water by coagulation and filtration.*	000163
occupational lung disease without a control group.* #Asbestos in drinking	water supplies.*	000081
#Retrospective study in 236 asbestos textile #Asbestos in drinking	water supplies.*	000051
talc manufacture.* #A study of #Asbestos in drinking	amphibole minerals: detection	000109
#Pleural mesothelioma among dock-yard suppurative diseases of the #Temporary disability of	water.*	000120
study of the histological cell types of lung cancer in #Temporary disability of	water?*	000149
#Frequency of HLA antigens in asbestos #Temporary disability of	water: the possible nephrotoxicity and hypertensive	000044
#Pulmonary function profiles in Quebec asbestos #Temporary disability of	water: Mining and processing effluent treatment.*	000164
#Sputum cytopathological findings in former asbestos #Temporary disability of	water: Surveillance of gastrointestinal cancer	000171
	weight in hamsters exposed to cigarette smoke.*	000305
	women: Mesothelioma or papillary carcinoma.*	000147
	work areas.*	000226
	work environments: Preliminary findings.* #Physical	000094
	work place and the community.*	000198
	#Worker-sponsored survey for asbestosis: Detection of	000302
	workers at Hamburg.*	000118
	workers exposed to asbestiform minerals in commercial	000150
	workers in Genoa.*	000212
	workers of the Ararat asbestos-cement plant due to	000108
	workers suffering from asbestosis in the United Kingdom.	000309
	workers under the effect of asbestos dust.*	000230
	workers with and without pulmonary fibrosis.*	000077
	workers.*	000087
	workers.*	000107

## PERMUTED TITLE

#The HL-A system in asbestos detection of expiratory airflow obstruction in cement in relation to radiographic changes in asbestos and serum immunoglobulin levels in asbestos	workers.*	000182
expiratory volume in Australian male asbestos cement	workers.*	000146
#Pulmonary cytopathology of former asbestos No. 6. Biological effects of asbestos. Proceedings of a	workers.*	000316
#Asbestos in the	workers.*	000157
airborne asbestos dust in occupational environment by X-ray diffraction using conventional and rotating anode	#Early Lung function	00008
#Asbestos exposure in a	#Vital capacity and one-second forced	000008
#Pleural mesothelioma among dock- of 27 cases of asbestosis seen over a period of 6	workers: Report of the first year.*	000106
calcifications of asbestosis origin in a man of 20	Working Conference.* on Cancer) Scientific Publication,	000028
#Asbestos bodies in the post mortem of inhabitants of	workplace and the community.*	000269
	#X-ray diffraction characteristics of some silicates.*	000018
	X-ray diffraction using conventional and rotating anode	000126
	X-ray tube.* dust in occupational environment by	000126
	yard building: Analysis and resolution.*	000248
	yard workers in Genoa.*	000212
	years in Nantes.* of asbestos on the lungs. Report	000188
	years of age.*	000089
	#Pleural Zagreb and their relationship to malignant tumors (	000064





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## PUBLICATIONS IN PREPARATION

**ORNL/TIRC-77/3**

Vinylidene Chloride Monomer. An Annotated Literature Collection, 1945-1977. H. S. Warren and B. E. Ricci. (\$15.00).

Leptophos. E. M. Waters.

Vinyl Chloride. H. S. Warren.

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\*Available from the National Technical Information Service, Springfield, Virginia 22161.