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INSTITUTE OF OCCUPATIONAL AND ENVIRONMENTAL HEALTHA REVIEW OF BACKGROUND AND PROJECTS SPONSOREDB A C K G R O U N D

The Institute of Occupational and Environmental Health was established by the Quebec Asbestos Mining Association in 1966 with the objective of assessing the biological effects of asbestos on the health of the asbestos worker, the latter in many instances operating in a working environment where asbestos fibre has become increasingly associated, if not sometimes merged, with many other substances and this under changing conditions of circumstance, time and place.

Although the Quebec Asbestos Mining Association had in the past done its share in the field of industrial health and hygiene, it was nevertheless becoming evident that new health problems were mounting and this to a point that only the implementation of an adequate long range scientific research program could bring light to the question. Such a research program had to be planned and evolved so that the needed points of comparison all over the world would be investigated, true as it is that asbestos fibre is reaching now into so many varieties of uses and commodities and at the

same time becoming more and more of strategic, if not of essential, value to humanity.

Over the years, imputations have periodically been levelled at the Asbestos Industry as a whole, in the field of mining, milling, manufacturing and processing or in some specific building trades (such as that of insulation materials sprayers.) Even the mere user of asbestos (the consumer) was being singled out as subjected to serious hazards of exposure.

It was felt that the Q.A.M.A. should take immediate steps so as to seek and coordinate all possible information and data over the whole world in connection with the asbestos and health problem, whilst establishing and maintaining contacts with (and sometimes enrolling into the process) such bodies or agencies which were already at work or susceptible of becoming constructive parts of the study.

Accordingly, the Q.A.M.A. decided it should carry a substantial share of this responsibility and devote much of its resources, time and energy in that direction, even if the search into the causes of the changes in the health conditions of workers examined

should not happen to impugn specifically chrysotile asbestos as such.

Hitherto the concern as to the health of the worker in the chrysotile mining industry has included the development and maintenance of preventive industrial measures and safeguards of proven effectiveness and the provision of adequate medical services through organized industrial clinics. These were established in the early thirties in Asbestos and in the mid-forties in Thetford Mines and were supported by such consultants and advisors as the Trudeau Laboratory (Saranac, N.Y.) directed by Doctor Leroy U. Gardner, an eminent pathologist and industrial health pioneer, professor Anthony J. Lanza (New York University) and professor J.A. Vidal, a Canadian pneumologist.

Whilst the Association did not and still does not believe that asbestos problems threaten the general public (it seems that same are rather occupational and not environmental) it could see that one avenue that could lead to a sound and thorough quest into the possible causes and ways to redress such a situation was the enlisting of a competent team of research people to investigate,

advise, recommend and SET IN MOTION a plan of scientific research worldwide in scope.

This ambitious scheme has over the past eight years been pursued with the guidance of the Institute of Occupational and Environmental Health Scientific Committee, under the vigorous and enlightened direction of Dr. George Wright, an authority in Labour Medicine and a foremost pioneer on this continent in the field of physiology.

The chrysotile mines in Canada being responsible for some 40% of the world chrysotile mining production, it was not possible to avoid the pursuit of research in those fields beyond mining and milling proper and not to embark into further fields such as manufacturing, processing and uses.

As a result, since the establishment of the Institute of Occupational and Environmental Health in 1966, the industry has sponsored and continues to support major epidemiological and other research projects designed to eliminate asbestos-related health risks not only for thousands of asbestos production workers, but also for worldwide fabricators, applicators and users of the vast range of asbestos-containing products.

R E S E A R C H P R O J E C T S

As of January 1974, nineteen projects had either been completed or were still in progress. These can be briefly described as follows.

Project No. 1 - Epidemiological survey of the biological effects of asbestos

All employees of asbestos mines in Quebec to be recorded and ex-employees traced. A random sample of current employees to be examined by a questionnaire and by a series of pulmonary function tests. The latest x-rays of all employees to be re-read. The past dust exposure for all employees to be assessed. The mutual relations between exposure to dust, symptoms, radiological changes of the lungs and the impairment of respiratory function to be examined. The cause of death of those who died to be traced and correlated with dust exposure.

Cost: \$230,000.

Dr. J.C. McDonald, M.D.,
Department of Epidemiology and Health,
McGill University,
Montreal.

Project No. 2 - Epidemiological study of primary malignant
tumours of the pleura and peritoneum in Canada

. All cases of primary malignant tumours of the pleura and peritoneum that occurred in Canada since 1960 to be registered and two matching control series to be found, one series comprising patients with secondary malignant disease of the lung. Relative importance of previous exposures to
1) asbestos at home and work, 2) other environmental carcinogen,
3) tobacco smoke to be investigated in the epidemiology of mesothelioma.

Cost: \$6,940.

Dr. J.C. McDonald, M.D.,
Department of Epidemiology and Health,
McGill University,
Montreal.

Project No. 3 - Chemical and mineralogical studies of
chrysotile asbestos with particular
reference to oils and waxes

Samples of rock and dust to be collected in a carefully controlled manner, pulverized and extracted with organic solvents. The extracts to be examined for polycyclic hydrocarbons and other chemical constituents. The aim is to investigate

their presence prior to any processing of the rock.

Cost: \$17,750.

Dr. J.C. McDonald, M.D., &
Dr. G.W. Gibbs, M.Sc.,
Department of Epidemiology and Health,
McGill University,
Montreal.

Project No. 4 - Ultrastructural study of experimentally
induced asbestos granulomas in hamsters

Samples of chrysotile obtained from Dr. Holt (Reading) to be injected into the peritoneal cavity of hamsters. Formation of asbestos bodies to be investigated by classical histology, electron-microscopy and histochemistry.

Other samples of chrysotile to be injected into Selye's granuloma pouches. Local reaction to be investigated and its modification by various agents incl P_2O_4 .

Cost: \$11,266.

Dr. André Dumont, M.D., &
Dr. A. Alcindor, M.D.,
Université de Montréal,
Montreal.

Project No. 5 - Epidemiological study on the biological
effects of asbestos dust at the Balangero
Mine and among the Port of Genoa and LaSpezia
Arsenal insulation workers.

Epidemiological study of all workers past and present of the chrysotile mine and of a representative cohort of insulation workers from the shipyards and environmental study of their dust exposure.

Objectives are:

- 1) Does the inhalation of asbestos fibres bear any relationship with: a) the occurrence of carcinoma of the lung; and/or b) the occurrence of mesothelioma of the pleura and/or the peritoneum?
- 2) Do people exposed to the inhalation of very low concentrations of asbestos dust, such as workers exposed to concentrations well below any threshold limit or people living in villages in the vicinity of asbestos mines, exhibit an abnormally high incidence of calcified pleural plaques?
- 3) Do the different types of asbestos behave in the same way in regard to lung cancer, mesothelioma of the pleura and pleural plaques, or is one type of asbestos prevalent

among the others as a causative agent?

Cost: \$85,000.

Dr. Enrico C. Vigliani, M.D.,
Clinica del Lavoro,
Milano, Italy.

Project No. 6 - The cellular basis of the biological
effects of asbestos.

Study of morphological and biochemical changes of macrophages and fibroblasts cultured in vitro in the presence of well defined particles of asbestos, such as: chrysotile, amosite, crocidolite, anthophyllite, tridimite, and in each of them long fibres and very finely divided particles seperately. Whenever indicated the in vitro experiments to be expanded by suitable studies on experimental animals.

Cost: \$45,000.

Dr. Benvenuto Pernis, M.D.,
Università degli studi di Genova,
Via Balbi 5,
Genoa, Italy.

Project No. 7 - Anthophyllite asbestosis in Finland.

1. Clinical picture of anthophyllite asbestosis (fibrosis of the lungs) to be investigated in a cohort of past and present workers of Finnish anthophyllite mines and mills. Differences from the classical asbestosis in radiological picture, speed of development, frequency of simultaneous findings of pulmonary fibrosis with pleural plaques, cause of death, etc., to be explored.

2. Prevalence of pleural plaques and calcifications in the general population to be investigated in correlation with the environmental conditions.

3. Prevalence of all signs of asbestos exposure to be investigated in a cohort of construction workers.

Cost: \$42,000

Dr. Leo Noro, M.D.,
Institute of Occupational Health,
Haartmaninkatu 1,
Helsinki 25, Finland.

Project No. 8 - A study of the health effects related to
asbestos exposure in workers of the industry
and other residents of New Orleans.

Phase I: All employees of a Johns-Manville plant and a National Gypsum plant manufacturing asbestos-cement goods

to be examined by a questionnaire on occupational and respiratory history, by a physical examination, by PA, and two oblique chest X-rays and by spirometry and transfer factor measurements. Additional physiological measurements to be done in those with abnormal clinical or radiological findings. Past employees to be traced and the cause of death to be investigated in those who died. Attempts to be made to assess the past dust exposure and current measurement done in the plants to be utilized.

Phase II: Plans for community investigation of risk of malignancy in individuals outside the plants to be prepared during the first year for the later realization.

Cost: \$291,380.

Dr. Hans Weill, M.D., &
Dr. Morton Ziskind, M.D.,
Tulane Medical School - Section of Pulmonary Diseases,
New Orleans, Louisiana.

Project No. 9 - Monograph "The Health Problems of Asbestos".

Preparation of the manuscript of a new book entitled "The Health Problems of Asbestos".

Cost: \$3,291.

Dr. John Beattie, Professor,
Ash Tree House,
Swavesey,
Cambridgeshire, England.

Project No. 10 - Continued Epidemiological Research Relating
to the Effects of Asbestos on Man.

- 1) Cohort Study. Observation of causes of death in the present cohort of workers of asbestos mines who were born 1891-1920 to be prolonged up to 1972 to see causes of additional about 100 deaths expected until then.
- 2) Mesothelioma Survey. All cases from Ontario and Quebec which occur until 1973 to be investigated epidemiologically. Additional about 25 cases a year can be expected in these provinces.
- 3) Clinical Study. Standard examination of chest radiogram, two simple tests of pulmonary function (vital capacity and ventilation rate on exercise) and a questionnaire of respiratory symptoms to be introduced and their reliability and their relative efficiency to be evaluated.
- 4) Etiology of pleural plaques to be investigated by a) case control inquiries, b) chemical and mineralogical examination of plaque material, c) geological studies of mines where the plaques occur, d) review of dust radiograms from population groups also elsewhere in Canada as prompted by the results of the inquiries above.
- 5) Further Radiological Studies. Development of abnormality in individual workers to be correlated with exposures to

fibres with the aim to establish a maximum allowable dust concentration.

Cost: \$474,700.

Dr. J.C. McDonald, M.D.,
Department of Epidemiology,
McGill University,
Montreal, Canada.

Project No. 11 - A chemical and mineralogical study of
insulation material.

- a) The nature of the insulation material used now and in the past in Canada and in the U.S. to be investigated and samples to be examined for mineralogical and chemical composition.
- b) Samples of insulation material from old boilers and heating systems to be obtained and examined for mineralogical and chemical composition.

Changes to be sought between a) and b).

Cost: \$52,000.

Dr. Graham W. Gibbs, M.Sc.,
Department of Epidemiology and Health,
McGill University,
Montreal, Canada.

Project No. 12 - Identification and quantitation of
fibrous dust and ferruginous bodies
in lungs of autopsied adults.

Lungs to be obtained from autopsies of persons:

- 1) not occupationally exposed to asbestos whose life has been spent chiefly in urban areas,
- 2) not occupationally exposed to asbestos whose life has been spent chiefly in rural areas,
- 3) occupationally exposed to asbestos with asbestosis,
- 4) occupationally exposed to asbestos without asbestosis.

Fibre counts and ferruginous bodies counts to be made in the lungs and compared in order to determine whether there is any relationship between asbestos related disease and fibre content of the lungs.

This one year study should test feasibility of method available to authors.

Cost: \$19,921.

Dr. Paul Gross, M.D., &
R.T.P. deTreville, M.D.,
Industrial Health Foundation,
5231 Centre Avenue,
Pittsburgh, Pa. 15232, U.S.A.

Project No. 13 - Epidemiological study on the biological
effects of asbestos dust at the Balangero
Mine - Continuation as a prospective study.

- 1) Causes of future deaths in Balangero miners and ex-miners to be investigated and correlated with same in a control group selected from adjacent villages.
- 2) The CO transfer in the workers exposed to asbestos to be repeatedly studied and compared to radiological appearance of the chest in order to see whether changes of the transfer factor precede radiological changes.
- 3) Prevalence of pleural calcifications among the adult population of the villages nearest to the Balangero mines to be investigated by mass survey with 10 x 10 X-ray film apparatus.
- 4) Dust concentration measurements to be repeatedly done in the mines in question.

Cost: \$49,220.

Dr. Enrico C. Vigliani, M.D.,
Clinica del Lavoro,
Via S. Barnaba 8,
20122 Milano, Italy.

Project No. 14 - Fibre shape and biological activity.

19 samples of fibres (glass, microquartz and asbestos) of various lengths and diameters to be tested for carcinogenicity in groups of 50 hamsters each. The tests are designed to disclose whether carcinogenicity of fibrous particles is dependent on some critical shape, independent of chemical composition, and thus controllable by a general principle.

Cost: \$276,000.

Dr. William E. Smith, M.D.,
Director - Health Research Institute,
Fairleigh Dickinson University,
Rutherford, N.J. 07070 - U.S.A.

Project No. 15 - Fibre Diameter of Dust in Mining, Milling,
Manufacturing and Insulation operations -
A Pilot Study -

A preliminary study to be carried out of the asbestos fibre diameters of airborne dust to which workers are exposed in
a) mining and milling, b) textile manufacturing and
c) insulation work.

Five samples to be collected at each of at least 3 locations in each of A), B) and C).

All samples to be examined using a scanning electron microscope and the diameter and length of fibres to be measured.

Results to be interpreted in the light of available epidemiological information.

Cost: \$18,830.

Dr. G.W. Gibbs, M.Sc.,
Department of Epidemiology and Health,
McGill University,
3775 University Ave.,
Montreal 112, Canada.

Project No. 16 - Study of the health effects related to
asbestos exposure in workers of the industry
and other residents of New Orleans - 2nd Phase

- 1) Analysis of data collected in previous study (IOEH # 8)
 - a) correlation of clinical features with radiographic changes and pulmonary function.
 - b) relationship of pulmonary function and total dust exposure.
 - c) relationship of smoking and radiographic changes and pulmonary function.
- 2) A study of mortality in 8,000 previously employed workers in the two asbestos cement factories.

- 3) Follow-up examinations (in three-yearly intervals) of the 300 men aged 40-59 from the original study group (IOEH # 8).

Cost: \$270,000.

Dr. Hans Weill, M.D.,
Dr. Morton Ziskind, M.D.,
Tulane Medical School,
Section of Pulmonary Diseases,
New Orleans, Louisiana.

Project No. 17 - Relationship between asbestos and tissues

A. Mechanism of coating in formation of the asbestos body

to be studied:

- 1) in the lungs from patients with asbestosis
- 2) in tissues of animals exposed to asbestos and various other dusts
- 3) in cell cultures of fibroblasts and macrophages
- 4) in vitro systems incubating asbestos and various other dusts with substances present in asbestos body coating.

B. Studies on the relationship between the asbestos content of the lungs and the degree of fibrosis:

To be examined:

- 1) lungs from workers exposed to asbestos inhalation with and without fibrotic lesions
- 2) lungs from comparable non-exposed population
- 3) tissues from experimental animals exposed to asbestos and to various other dusts
- 4) fibroblasts cultured in vitro with asbestos and various other dusts.

Cost: \$45,000.

Dr. Benvenuto Pernis, M.D.
Istituto di Medicina del Lavoro
della Università di Genova
16132 Genova, Italy.

Project No. 18 - A factor to convert total airborne dust concentrations using the midget impinger technique to fibre counts as recorded by membrane filter method

At 20 locations at each participating asbestos mine a minimum

of 5 duplicate samples of airborne dust will be collected using side by side millipore membrane filters and midget impingers. These at least 1,800 samples will be counted at McGill and by participating members of the industry. Simultaneously the total and respirable mass concentration of dust will be determined using Hexhlet and/or MRE samplers. Objectives are:

- 1) The calculation of a conversion factor, to convert midget impinger counts to membrane filter fibre counts.
- 2) The description of observer variation in counting fibres using the membrane filter or total dust using the midget impinger techniques.
- 3) Measurement of total and "respirable" airborne dust mass concentrations in the mines and mills to examine their relationship, if any, to particle and fibre counts.

Cost: \$37,375.

Dr. G.W. Gibbs, Ph.D.,
Department of Epidemiology and Health,
McGill University,
3775 University St.,
Montreal, Canada.

Project No. 19 - Epidemiological study of mesothelioma in USA

- 1) Ascertainment of fatal cases of mesothelioma by getting an answer from every pathologist as to whether or not he has made such diagnosis during the previous year.
- 2) Visits by M.D. to every pathologist who reports a case to review the case and to select a control case.
- 3) A field survey in which Public Health Nurses obtain occupational and residential histories for cases and controls.
- 4) Pathological review by the US mesothelioma panel.

Cost: \$59,800.

Dr. Alison McDonald, M.D.,
Department of Epidemiology,
McGill University,
Montreal, Canada.

Expenditures incurred by the Institute of Occupational and Environmental Health Inc., showing payments to end of 1972.

<u>No.</u>	<u>PROJECT</u>	<u>AUTHORIZED</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>T O T A</u>
1	McDonald	\$ 230,000	\$ 46,000	\$ 81,400	\$ 68,375	\$ 34,375	----	----	----	\$ 230,000
2	McDonald	6,940	----	----	6,940	----	----	----	----	6,940
3	McDonald & Gibbs	17,750	----	----	9,250	8,500	----	----	----	17,750
4	Dumont	11,266	----	----	6,000	5,266	----	----	(3,946)	7,320
5	Vigliani	85,000	----	----	4,555	29,911	32,946	11,069	----	78,481
6	Pernis	45,000	----	----	9,412	13,184	15,928	5,429	----	43,953
7	Karvonen	42,000	----	----	5,257	10,504	10,506	10,513	5,257	42,037
8	Tulane Univ.	291,380	----	----	----	32,401	71,385	99,502	89,111	292,399
9	Beattie	3,291	----	----	----	3,292	----	----	----	3,292
10	McDonald	474,700	----	----	----	----	102,500	102,500	102,500	307,500
11	Gibbs	52,000	----	----	----	----	----	27,750	24,250	52,000
12	Ind. Health Fdn	19,921	----	----	----	----	----	20,505	----	20,505
13	Vigliani	49,220	----	----	----	----	----	----	12,305	12,305
14	Smith	276,000	----	----	----	----	----	----	28,235	28,235
15	Gibbs	18,830	----	----	----	----	----	----	18,830	18,830
	Sub-Total	<u>1,623,298</u>	<u>46,000</u>	<u>81,400</u>	<u>109,789</u>	<u>137,433</u>	<u>233,265</u>	<u>276,968</u>	<u>276,542</u>	<u>1,161,336</u>
	Gathering and Distribution of Scientific data, Operating costs, etc.		<u>113,157</u>	<u>161,338</u>	<u>153,766</u>	<u>128,654</u>	<u>97,266</u>	<u>124,952</u>	<u>138,372</u>	<u>817,545</u>
	GRAND TOTAL		<u><u>159,157</u></u>	<u><u>242,738</u></u>	<u><u>263,555</u></u>	<u><u>266,087</u></u>	<u><u>330,531</u></u>	<u><u>401,920</u></u>	<u><u>414,914</u></u>	<u><u>2,078,916</u></u>

INSTITUTE OF OCCUPATIONAL AND ENVIRONMENTAL HEALTH

SCIENTIFIC COMMITTEE

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THE NEED FOR A CONCERTED EFFORT

The asbestos related industries, at one time concerned only with preventive pulmonary fibrosis, are now faced with additional biological hazards associated with the fiber. To correct the situation, the options available to the industry are apparent.

- 1) The production of this very useful material could be abandoned.
- 2) Users of the fibre might minimize their responsibility by adopting substitutes of lesser biological activity.
- 3) It is conceivable that the fibre might be altered to remove any injurious effect, while retaining its desirable qualities.

None of these options are attractive or appear to be practical.

Therefore, the remaining option that industry is pursuing is to determine what exposure patterns can be tolerated without the production of disease and to adopt commensurate engineering methods capable of reducing the concentration to that which is consistent with good health throughout the life of persons who might be thus exposed. This objective must be achieved if the industrial use of asbestos fibre is to continue.

With imputations, moreover, pointing to the existence of additional biological hazards associated with prolonged exposure to asbestos dust concentrations, the industry is deeply convinced of the vital importance of pursuing objective scientific studies aimed at identifying and devising means of eliminating asbestos-related health risks not solely for production workers in Quebec, but for all persons in all countries who are engaged in the manufacture or use of asbestos-containing products.

There is no reason to believe that these problems will disappear nor that adequate information will be obtained spontaneously without directed effort. The time accordingly has come for a concerted approach by industry and government towards a vigorous pursuit of the problem.