Clinical Survey of Chrysotile Asbestos Miners and Millers in Baie Verte, Newfoundland - 1976

Report to the National Institute of
Environmental Health Sciences
December 22, 1977

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A. Summary

1. Most available data concerning the health status of chrysotile miners and millers have been derived from studies among workers in long-extant producing facilities reflecting, at least in part, working conditions in previous decades. A new chrysotile mine and mill, utilizing new equipment and industrial hygiene techniques, was established at Baie Verte, Newfoundland, in 1963. It was of interest to determine whether or not asbestos-associated changes (especially radiographic abnormalities) would occur under the more modern conditions, as they existed 1963-1976, particularly with chrysotile, the type of fiber largely used in U.S. and Canadian industry.

2. With the cooperation of the United Steelworkers of America, AFL-CIO, CLC, representing the workers at the facility, and the Johns-Manville Corporation, which operates the mine, all current employees (approximately 500) were invited to a clinical survey June 14-18, 1976 at the Baie Verte Peninsula Health Centre. 485 participated. A wide range of studies was undertaken.

3. Fifty (10%) had one or more radiographic abnormalities of the type commonly associated with asbestos exposure. Parenchymal abnormalities predominated; pleural changes (fibrosis, calcification) were present in but 3% of individuals.

4. The prevalence of abnormalities increased with increasing duration of employment. 5% of individuals with less than 5 years at the mine had abnormal films while among those who had been employed for 10 or more years, 15% were abnormal. Similarly, those with least intense exposure had fewest abnormalities (7%) and those with heaviest exposure had the most (12%). Clearly, both factors - duration and

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intensity of exposure - were important. Of 14 workers employed for less than five years under least intense exposure conditions, none had x-ray abnormalities. In contrast 8 of 43 (19%) of those employed 10 or more years, under dustiest conditions, showed changes.

5. Under conditions which existed in this mine and mill in the past, chrysotile asbestos exposure has already resulted in chest x-ray changes in an appreciable proportion of employed workers, despite the short period from onset of exposure which has so far elapsed. This raises the important question of the long-term (20-40 year) health experience that might be expected in this group. The full extent of risk of asbestos-associated disease (cancer; extensive asbestosis) cannot yet be predicted with assurance by the results of the current investigation, because of the long period of clinical latency of asbestos-associated cancer or the development of cor pulmonale of asbestos origin.

6. In view of the findings, recommendations are being made concerning industrial hygiene practices and measures for dust control, personal respirator protection, the establishment of a Baie Verte Asbestos Register and associated long-term medical surveillance programs., avoidance of household asbestos contamination, educational programs concerning cigarette smoking and dust control, as well as for control of environmental asbestos contamination in the community (also found to exist).

7. It is anticipated that improved dust control practices and appropriate medical surveillance programs can provide important protection against asbestos-associated disease among these chrysotile mine and mill workers in the future.

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B. History

1. Asbestos disease: During the past 15 years the important disease potential of asbestos exposure has been clarified.[1] The principal hazards have been demonstrated to be cancer of a number of sites, and asbestosis. Excess deaths due to cancer of the lung (especially among cigarette smoking asbestos workers), pleural and/or peritoneal mesothelioma and to a lesser extent cancers of the gastrointestinal tract, oropharynx and larynx account for the increase in cancer deaths. Table 1 provides an analysis of causes of death among 17,800 asbestos insulation workers in the United States and Canada followed prospectively by our Laboratory from January 1, 1967 to January 1, 1977. Table 2 summarizes the mortality experience 1961-1973 of 544 Quebec asbestos mine and mill employees studied by our Laboratory. All the Quebec miners and millers had had at least 20 years of mine and mill experience prior to 1961. While the overall incidence of excess mortality was very much the same, it has been reported by others that Canadian chrysotile asbestos miners and millers have a different pattern of excess cancer mortality than the secondary users such as asbestos textile workers and insulation applicators.[2] Miners and millers had twice as many deaths due to asbestosis compared to the insulation workers, (14% vs. 7% of all deaths). Lung cancer is quite similar, but mesothelioma is considerably different. The insulators have the higher rate. Many possible explanations for the mesothelioma rate difference are being investigated.

Risk of asbestos-associated disease has also been observed in workers in other trades with asbestos exposure, as with the use of asbestos content products (viz. brake repair and brake maintenance workers) or

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individuals simply working near "asbestos workers" and exposed to the same dusts ("bystanders").[3] Risk even extends to individuals not employed in an asbestos-contaminated environment: mesothelioma has been found among family contacts of asbestos workers residing in the same households as the workers, and among people living within a quarter of a mile or so of asbestos plants or other facilities which have used asbestos containing materials.[4] Asbestos-associated chest x-ray changes have been found among family contacts of asbestos workers. The only contact with asbestos for the family contact was the dust brought home by the worker.[5] Similar x-ray changes have been described among individuals living near an asbestos mine and mill in Finland[6] and also in Czechoslovakia.[7]

2. Latency: For all asbestos-associated diseases, malignancies as well as asbestosis, a rather uniform characteristic has been found: that the disease does not become clinically evident for 15, 25, 35 or more years from the onset of asbestos exposure. The first decades are periods of grace with no illness or disability. While some early x-ray changes may be seen after 10 or 15 years, they are limited in extent and not accompanied by significant symptoms or disability. They merely demonstrate that enough asbestos exposure has occurred to produce such changes and are, in this sense, harbingers of future risk of clinical disease, and suggest that additional precautions are necessary and industrial hygiene improvements required.

The frequency with which asbestosis occurs is directly related to the intensity of exposure, the duration of exposure and the duration from onset of exposure. The three intertwine and permutations exist in which one or another is the most important. Thus with

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limited exposure, asbestosis may not not appear despite the passage of many years of continued inhalation of very small numbers of fibers. A short, intense, exposure may in time be followed by disease. Table 3 shows the mortality experience of heavily exposed amosite asbestos factory workers, some of whom had only 1 month or less of asbestos employment in the period 1941 to 1945. Their mortality experience through 1974 shows that even the shortest exposure group had an excess of asbestos-associated deaths. The effect of lengthening duration of employment can also be seen.

Measures to take into account the effect of intensity of exposure and duration of exposure have been devised. When dust measurements have been available, exposure indices may be used (dust count x length of employment). Such indices show an association between excess cancer, chest x-ray abnormalities and increasing index value. Table 4 shows the results of one such reporting technique as used by Rossiter et al.,[8] and Gibbs et al.[9] in discussing findings among Canadian chrysotile asbestos miners and millers. A similar relationship is seen in our study when the men are divided into two groups, high dust and low dust, as in Table 2.

Intense exposure, sufficient to result in pulmonary fibrosis or excess malignancies with the passage of time, would generally not, however, produce this result in the short term as, for example, one or two years. Analyzing findings using only a dust index does not always adequately take into account the effect of duration from onset of first exposure, although in many cases of actively working employees, duration from onset and duration of exposure will be the same. Table 5 shows the effect of duration from onset on mortality experience among asbestos insulation workers. Those

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with less than 20 years from onset of their asbestos exposure had a different mortality experience than those with longer duration from onset. The excess deaths in the group as a whole were primarily concentrated in the longer duration-from-onset group.

A similar effect can be seen with chest x-ray abnormalities and duration from onset of exposure. Table 6 demonstrates this association clearly. Among the insulation workers examined, only 10% of those who were less than 10 years from the onset of their first asbestos exposure had abnormal x-rays, while 94% of those with more than 40 years from onset of exposure had abnormalities present.[10]

In a study conducted by the Environmental Sciences Laboratory of 1,163 Quebec asbestos mine and mill workers, all were more than 20 years from onset of exposure. Table 7 shows the overall results expressed by time from onset of exposure, as well as by a total dust index. In this group with long exposures, the two methods parallel each other. The dust exposure index is most useful when duration from onset is held constant.

Recognition of the mutual interrelationship among the three factors discussed allows appropriate evaluation of differences among studies reporting different incidence of asbestosis. It should be remembered that there is no single "incidence" of asbestosis but rather a frequency to be uniquely determined for each set of circumstances in which asbestos exposure occurs.

C. Clinical Survey of Advocate Mines Employees, Baie Verte, Newfoundland

Most data available from investigations of chrysotile miners and millers have accumulated from studies among workers in long-extant producing

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facilities and, at least in part, reflect previous working conditions. In contrast, a new chrysotile mine and mill (Advocate), utilizing new equipment and industrial hygiene techniques, was established at Baie Verte, Newfoundland approximately 14 years ago (1963). Because of its geographical location the work force has tended to be a stable one. While other mines are present in the area, none of them mine chrysotile and there are few other opportunities for asbestos-exposure employment.

Investigation of the status of the work force in this facility was considered of interest in that the observations would be concerned with chrysotile, the type of fiber largely used in U.S. and Canadian industry (95% of all asbestos utilized) and it would be of additional interest to determine whether or not asbestos-associated disease (specifically radiographic abnormalities) had occurred under the more modern conditions, as they existed 1963-1975. A survey of these men would also offer an opportunity to look for possible early, minimal changes on x-ray, pulmonary function testing and blood analyses which in time could prove useful prognostically. Previous studies have concentrated on long-term employees and gross abnormalities. Such studies could be considered as addressing "long standing, end-stage" changes. Most of the employees at Advocate Mines could be considered to still be in their "grace period."

1. Survey design

With the cooperation of the United Steelworkers of America, AFL-CIO, C.L.C., which represents the men employed at the Advocate Mine, and with the cooperation of the mine management and the Johns-Manville Corporation, which operates the mine, all current employees (approximately 500) were invited to participate in a health survey undertaken June 14-18, 1976, at the Baie Verte Peninsula Health Centre.

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2. Survey protocols

Extensive examinations were undertaken by an experienced scientific team of Environmental Sciences Laboratory staff, including physicians, pulmonary physiologists, and technical staff (Appendix 1). The examination included: full occupational history with special attention to mining and dusty jobs held prior to Advocate Mines employment; detailed industrial hygiene history, including potential exposures, protective equipment; current and past medical history, including accidents and hospitalizations; respiratory history, based on the Medical Research Council questionnaire; smoking history; alcohol consumption; complete physical examination; 14 X 17 PA chest x-ray; pulmonary function tests, including spirometry with recorded flow volume curve (predicted values of Morris used); biochemical blood tests; urine analysis.

3. Collaborative research

Investigation of aryl-hydrocarbon hydroxylase activity in blood, alpha-1 antitrypsin activity in the blood, and sputum cytopathology were conducted in collaboration with Dr. Peter O'Brien at the Memorial University of Newfoundland. While not ready for use in routine surveillance programs, these tests are being investigated for possible utility in identifying individuals at higher risk of developing asbestos-associated disease.

As part of a collaborative study being conducted with Hoffmann-LaRoche, Inc., investigating high risk occupational groups, Carcinoembryonic Antigen serum titers were also obtained in each survey participant. This test is also being investigated as a possible indicator of health risk. Prospective observation of the collaborative study group will help assess its usefulness.

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As part of the collaborative effort of management, labor and Mount Sinai, industrial hygiene dust measurements made since the opening of the mine will be utilized to calculate a fiber-years exposure index for each person examined. The dust measurements available for each job category are being used and the index made utilizing all Advocate Mine jobs held by each man. The chest x-rays taken, identified by special study number, have been read by Mount Sinai physicians as well as by Johns-Manville Company consultants, and inter-observer variability is being determined.

4. X-ray evaluation

All films were interpreted by a group of five Mount Sinai readers. For this report and the clinical reports each individual received, the group consensus reading was utilized. Subsequent analyses will discuss intra and inter-reader variability among Mount Sinai and Johns-Manville's readers. All films were read without knowledge of the exposure category, age or work history of the individual and categorized following the ILO U/C International Classification of Radiographs of Pneumoconiosis (Appendix 2). All films were screened at the time of examination for "acute" problems and, where found, each individual concerned was advised to seek further investigation and treatment from his personal physician.

5. Reports to examined workers

Findings have been reported to each individual examined, with details given concerning data obtained in his or her examination. This information is considered confidential and has not been released to either the Union or Advocate Mines Management. Upon written authorization, appropriate material has been transmitted to individual personal physicians. Only statistical summaries of findings will otherwise be made public.

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Current Perspectives

1. Results of the survey of Advocate Mines Employees: x-ray abnormalities

Table 8 summarizes the overall chest x-ray findings among the 485 individuals examined. Fifty (10%) had one or more radiographic abnormalities present of the type commonly associated with asbestos exposure. Parenchymal abnormalities predominated. Pleural changes as the only abnormality were present in but 3% of individuals. Only 3 individuals had both parenchymal and pleural abnormalities. Table 9 shows the ILO U/C category of the parenchymal abnormalities (irregular small opacities) reported. The abnormalities described tended to be very early and classification in 2/3 of cases was in the lowest category (1/0). Table 10 summarizes the type of pleural abnormalities seen. Pleural calcification was present in only 3 instances, lateral diffuse wall thickening in 8 individuals and discrete plaques on the diaphragms in 6 individuals. As in the case of parenchymal abnormalities, pleural changes were more limited in extent than those seen among asbestos workers with longer duration from onset of exposure.

Table 11 summarizes the distribution of abnormalities by the duration of employment of each individual. A definite increase in the prevalence of abnormalities is seen with increasing duration of employment. 5% of individuals with less than 5 years at the mine had abnormal films while among those who had been in the mine and mill for 10 or more years, 15% were abnormal. The greatest increase was seen for parenchymal abnormalities, with a 4 fold increase, from 3% to 11.5%.

Prior to the examinations, a Mount Sinai industrial hygienist met with union and management representatives to categorize the various jobs in the plant as to relative exposures. Until the dust measure-

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ments can be incorporated into the formula, jobs have been placed into four relative exposure groups, category 1 being the least exposure (storesman, toolroom clerk, etc.) and category 4 having the highest exposure (primary crusher, mill operator, tailings helper, etc.). Table 12 shows the distribution of abnormalities by the exposure categories developed prior to the examinations. For all abnormalities and parenchymal changes, the higher category individuals had the higher prevalence of abnormalities. The importance of including duration of employment can be seen in Table 13. Abnormalities were present in the lowest exposure category only in the more-than-10-year group. The prevalence of abnormalities for the exposure categorized increases within each duration-of-exposure category and, as a whole, each successive duration group has a higher prevalence than the preceding group. The group with more than 10 years of employment, classified as exposure category 4, had the highest prevalence of abnormalities (19%).

From available sources, it was found that a total of 58 mines were operating or had operated within the area where the examinees may have sought work. From our occupational histories, it was found that 111 of those participating had worked for 1 or more months in one or more of these mines. Table 14 gives the distribution of x-ray abnormalities according to whether or not the man had worked in another mine. For the radiographic abnormalities reported here (irregular small opacities and pleural thickening and calcification), there was no detectable contribution of other mining experience.

A small group of 46 individuals had also worked during the construction of the Advocate mine and mill (beginning as early as 1959). Table 15

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shows the distribution of their x-ray findings. The group of 42 who had helped build the mine and mill and worked there continously had the highest prevalence of abnormalities (31%). In most cases, their duration from onset of first exposure was 15 or more years.

2. Pulmonary function test results

Only 6 of the 474 adequate tests performed showed any evidence of a restrictive impairment. As a whole, the men performed better than their predicted values (mean forced vital capacity was 106% of predicted).

3. Interpretation of findings

Radiographic evidence of asbestos-associated lung changes was found among 10% of those examined. The extent of asbestotic pulmonary changes was not sufficient, at this time, to produce disability or serious symptoms for any of those examined. The changes found were limited in extent. Length of exposure and duration from first exposure to the time of examination have not been sufficient for the asbestos dust inhaled and retained in the lungs of these workers to cause clinically disability, if this is to occur.

A dose-response relationship is suggested when exposure category and duration of employment is considered. Parenchymal abnormalities, which in other occupational groups exposed to asbestos appear before pleural changes, were the predominant abnormality seen. The different "latent" periods for these two abnormalities is apparent in Table 6. In the group of insulators examined only 10% of those with less than 10 years from onset of exposure had abnormalities. Because of retention of inhaled asbestos in the lung, and consequent progression of disease even without

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further exposure, the percentage of individuals with abnormalities will not be static; rather, the percentage will inevitably increase with time.

Experience elsewhere suggests that only a limited proportion of men or women will ever become seriously disabled as the result of their asbestosis, and it is unlikely that more than a small proportion of individuals will have extensive asbestosis and/or cor pulmonale.

On the other hand, the appearance of any asbestotic x-ray changes indicates that exposure was sufficient to cause a pulmonary reaction and raises the serious question of an important increased risk of asbestos-associated neoplasms in the future. The principal site to be considered must be the lung. The full extent of such risk cannot be predicted with assurance by the current investigation. From the experience of other asbestos exposed groups reliable data would not be expected to begin to appear for 10 or more years, in this group.

E. Recommendations

Information obtained from the union and management at the time of the survey suggests that some major improvements have been made in the recent past and others are planned. It would appear that the sort of asbestos exposures which occurred in the past are less likely to occur now, with increased awareness of risk of asbestos disease and the important necessity for exposure control.

Although some may have already been anticipated, the following recommendations are offered for consideration.

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1. Analysis of present industrial hygiene practice

Detailed study is warranted to determine whether all necessary precautions are being taken, to avoid current and future asbestos exposure. Environmental hygiene practices in mine and mill should be considered; in this, results of dust measurements in the past should be made available, to establish baselines for the future even though it be understood that dust counts are a subsidiary measure in a program of environmental control. Work practices are the keystone; such things as enclosed conveyors, rapid recognition and repair of leaks and breakdowns, total enclosure of dusty processes, proper exhausts (including the machine shop), warehouse housekeeping, wet processing where feasible, mechanization of bagging, transport, clothes change facilities, and special laundering procedures.

Particular attention should be paid to tailings disposal; our measurements of dust levels beneath the "plume" showed an important hazard.

We urge that close cooperation between management and the union be established on a continuing basis, to develop and expedite institution of proper work practices. Memorial University scientists can surely be of assistance, as well.

i. Respirator program

It is likely, in the varied operations of mining and milling, that some circumstances will exist which will require respirator protection of individual workers. Careful attention should be directed to such a program, not only concerning the most appropriate equipment but medical evaluation of its suitability for individual workers and instruction for most effective use.

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ii. Dust education programs

Industry programs can be effective in promoting full understanding of hazards associated with excessive dust exposure; worker appreciation of such hazards can add much to day-to-day avoidance of dust exposure in the mine and mill.

iii. Acceptable dust levels

This problem is being studied by regulatory bodies and other agencies. Statutory requirements will not allow dust exposures above legal limits. But, in addition, it is recommended that no avoidable exposure be considered warranted, and that only the best available industrial procedures and work practices be accepted.

2. Environmental considerations

A limited program of environmental sampling was undertaken by Dr. William J. Nicholson and his colleagues at the time of our survey of mine and mill workers. Nevertheless, it was clear that significant environmental asbestos hazard exists. Against a background of knowledge that ambient air levels in U.S. urban areas generally range from 0.5-10.0ng/m^3, measurements of 760ng/m^3 were made along the road to Seal Cove Lake, 360ng/m^3 3 1/2 miles from the mill and mine on the road to Fleur de Lys; 240-580 in the parking lot of the hospital and 14,000 on the road to Fleur de Lys, under the falling plume. Inside the Weeks Hotel, 1400ng/m^3 were also measured, perhaps reflecting much mine dust tracked in and intermittently re-entrained (Table 16).

A number of suggestions come immediately to mind:

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1. Paving of roads with asphalt, to cover asbestos-content crushed rock.

2. Control of emissions from mine and mill.

3. Development of car-cleaning techniques to prevent workers' cars from spreading caked mine dust or mud.

4. Clothes changing facilities; showers.

5. Control of tailings plume.

6. Environmental sampling program to monitor effectiveness of control measures.

3. Medical surveillance

The potential of such surveillance to minimize the likelihood of disease and to save lives of those who might suffer such problems would be an important consideration, and would include identification of the groups at highest risk. Medical surveillance would be directed to conditions for which the greatest potential benefit could be anticipated.

Asbestosis: Knowledge of the presence of this disease would be valuable for both the patient and the treating physician since most deaths of asbestosis are due to intercurrent respiratory infections, rather than to progressive pulmonary fibrosis. Pulmonary infections can nowadays be well treated, and experience has shown that many lives can be saved.

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Early diagnosis of lung cancer can increase the likelihood of successful treatment of the neoplasm to some extent (by no means as much as we would like). It is not known whether more energetic surveillance (as with frequent sputum cytology studies) will increase the percentage of those successfully treated. Studies are now in progress to investigate this possibility.

Early diagnosis of cancer of the colon or rectum increases the likelihood of cure. Methods are available to assist in such earlier diagnosis.

Awareness of the possibility of oropharyngeal, laryngeal or renal carcinoma improves chances for early study and diagnosis of these conditions, all of which can be cured in some cases.

Peural and/or peritoneal mesothelioma. Effective therapy is not now available and early diagnosis does not significantly increase the likelihood of survival. However, research concerning therapy is now underway in the United States, Great Britain and France and it may be hoped that improved treatment methods will become available.

a. Surveillance programs

It is urged that responsibility be shared by the company, the union, appropriate government agencies, and scientific groups. However it be done, record keeping and continuity should be assured, as well as confidentiality coupled with full information to the worker, and to his medical attendant at the worker's request.

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i. Register: it is recommended that a Baie Verte Asbestos Register be established, to include all workers who have been employed for one month or more at Advocate. Notification of former employees should be undertaken, and they should be informed of the Register's existance and the examination and other rights it may include.

ii. An examination schedule should be developed by the mine management and the union, with such advice as they might wish to seek. Advantage should be taken of Johns-Manville's experience with surveillance schedules in other units of the company.

iii. Statistical evaluation of the results should be sought each year, and reported to the company, the union and to governmental authorities.

iv. Household contact disease: Our survey did not include investigation of the possibility of household contact asbestos disease. Information on this question should be obtained.

1) Measurement of asbestos contamination of households, including both settled dusts, and airborne dust levels.
2) Evaluation of hygiene measures to rid contaminated households of asbestos dust. Government experts might be assigned this task, with monitoring to ascertain whether recommended measures are effective.
3) A pilot study (x-ray) of household contacts of long-term workers would allow evaluation of the desirability of including family contacts in the Baie Verte Asbestos Register.

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Measures outlined in (iv.) above would serve to minimize household contamination in the future. Additional help could be obtained by an adequate educational program for workers' families.

v. Special x-ray equipment should be obtained for the ongoing surveillance program, optimum for the type of chest roentgenograms best suited for diagnosis and evaluation of pulmonary asbestosis. The ILO U/C International Classification of Radiographs of Pneumoconiosis should be used for recording of roentgenographic findings (Appendix 2).

vi. Follow-up survey of the 485 individuals examined in 1976 should be planned for 1980, to obtain information on the prognostic significance of observations made earlier. Of interest would be the later status of individuals who ceased work 1976-1977, compared to like workers who continued employment.

b. Education programs

Asbestos workers who do not have a history of cigarette smoking have greater risk of lung cancer than non-smokers in general, but since that latter risk is comparatively low, even its increase does not lead to an important public health problem. Rather, the difficulty lies in the already very high risk of cigarette smokers being greatly multiplied by asbestos exposure. Few lung cancers occur among asbestos workers with no history of regular cigarette smoking; many occur among workers with such history. It is urgent that

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this information becomes available to workers who have been exposed to asbestos, and that every assistance be afforded them to help in efforts to control and eliminate smoking, especially cigarette smoking. Some data are also available suggesting that cessation of smoking will, after a number of years, reduce the risk of lung cancer. Should these experiences be confirmed, it will be even more urgent to alert current and former asbestos miners and millers, to acquaint them with the important risk of lung cancer should they continue cigarette smoking. Cigarette smoking also increases the risk of disabling disease associated with pulmonary fibrosis, and of the development of cancer of the esophagus. Again, educational programs would be of value.

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Bibliography

1. Selikoff, I.J. Asbestos disease in the United States, 1918-1975. Rev. fr. Mal. Resp. 4: 7-24, 1976.

2. McDonald, J.C., McDonald, A.D., Gibbs, G.W., Siemiatycki, J. and Rossiter, C.E. Mortality in the chrysotile asbestos mines and mills of Quebec. Arch Environ Health 22: 677-686, 1971.

3. Harries, P.G. Experience with asbestos disease and its control in Great Britain's Naval dockyards. Environ Res. 11: 261-267, 1976.

4. Newhouse, M.L. and Thompson, H. Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area. Br. J. Ind. Med. 22: 261-269, 1965.

5. Anderson, H.A., Lilis, R., Daum, S.M., Fischbein, A.S. and Selikoff, I.J. Household contact asbestos neoplastic risk. Ann. N.Y. Acad. Sci. 271: 311-323, 1976.

6. Kiviluoto, R. Pleural calcificiation as a roentgenologic sign of non-occupational endemic anthophyllite-asbestosis. Acta Radiol. 194: 1-67, 1960.

7. Navratil, M. and Trippe, F. Prevalence of pleural calcification in persons exposed to asbestos dust, and in the general population in the same district. Envir. Res. 5:210-216, 1972.

8. Rossiter, C.E., Bristol, L.J., Cartier, P.H., Gilson, J.G., Grainger, T.R., Sluis-Cremer, G.K. and McDonald, J.C. Radiographic changes in chrysotile asbestos mine and mill workers in Quebec. Arch. Environ. Health 24: 388-400, 1972.

9. Gibbs, G.W. and Lachance, M. Dust exposure in the chrysotile asbestos mines and mills of Quebec. Arch. Environ. Health 24: 189-197, 1972.

10. Selikoff, I.J, Churg, J. and Hammond, E.C. The occurrence of asbestosis among insulation workers in the United States. Ann. N.Y. Acad. Sci. 132: 139-155, 1965.

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Table 1

Deaths among 17,800 asbestos insulation workers
in the United States and Canada
January 1, 1967 - January 1, 1977

Number of men	17,800
Man-years of observation	166,855

	Expected	Observed	Ratio
Total deaths, all causes	1,660.96	2,270	1.37
Total cancer, all sites	319.90	994	3.11
Lung cancer	105.97	485	4.58
Pleural mesothelioma	**	66	--
Peritoneal mesothelioma	**	109	--
Cancer of esophagus	7.01	18	2.57
Cancer of stomach	14.23	22	1.55
Cancer of colon - rectum	37.86	59	1.56
All other cancer	154.83	235	1.52
Asbestosis	**	162	--
All other causes	1,351.06	1,114	0.82

* Expected deaths are based upon white male age specific mortality data of the U.S. National Center for Health Statistics for 1967-1975 and extrapolation to 1976.

** These are rare causes of death in the general population.

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Table 2

Expected and observed mortality among 544 Quebec Asbestos mine and mill employees, 1961-1973

Cause of Death	Low Dust Exposure			High Dust Exposure		
	Exp.	Obs.	Ratio	Exp.	Obs.	Ratio
All Causes of Death	68.29	65	0.95	44.56	67	1.50
All Cancers	15.45	15	0.97	10.11	18	1.78
Lung	4.52	7	1.55	3.00	13	4.33
Mesothelioma	—	1		—	0	
Gastro-Intestinal	4.18	3	0.72	2.71	3	1.11
Other Cancers	6.75	4	0.59	4.40	2	0.45
Respiratory Diseases	4.79	10	2.09	3.02	15	4.24
Pneumonia	2.01	1	0.50	1.27	1	0.78
Asbestosis	—	7		—	11	
Other respiratory	2.79	2	0.72	1.76	3	1.70
All Other Causes	48.05	40	0.83	31.43	34	1.08

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Table 3

Deaths of all "asbestos disease" among 933* workers employed in an amosite asbestos factory, starting five years from onset of work 1941-1945 to December 31, 1974. Effect of duration of exposure.

Duration of employment	No.	Death of "asbestos disease" 1946-1974 Expected	Observed	Ratio
< 1 month	62	3.47	6	1.73
1 month	92	3.73	8	2.14
2 months	79	3.73	11	2.95
3-5 months	145	5.98	17	2.84
6-11 months	129	4.15	21	5.06
1 year	105	3.74	20	5.35
2 years	77	2.91	24	8.25
3-4 years	51	2.36	15	6.36
5+ years	65	2.88	34	11.81
Total	805	32.95	156	4.73

* "Asbestos disease": asbestosis and chronic pulmonary insufficiency, lung cancer, pleural and peritoneal mesothelioma, cancer of esophagus, stomach, colon-rectum.

128 workers were omitted from these calculations: 33 had prior asbestos exposure; 38 died in the first five years after onset of employment. 49 were not completely traced; and eight had other asbestos employment after the five year from onset point.

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Table 4

EXPOSURE-RESPONSE RELATIONSHIPS IN QUEBEC CHRYSOTILE ASBESTOS MINERS AND MILLERS

Dust Index*	<10	10-	100-	200-	400-	800	Source	Reference
Death rate/1,000 persons† from								
Respiratory cancer	10	13	13	16	21	32	Cohort of	85, 92
Pneumoconiosis	2	2	1	6	6	24	11,107	
Abdominal cancer	18	14	19	12	26	29	men born	
Other respiratory causes	12	18	24	19	16	25	1891–1920)	
Circulatory causes	123	119	118	116	118	135		
Prevalence of radiologic changes								
In men 55–65 years, %**								
Small, irregular opacities (1/0 or +)							Study of chest	88, 92
Thetford area	–	7	10	13	21	34	radiographs of	
Asbestos area	10	6	17	23	15	20	13,021 past	
Any pleural changes							and present	
Thetford area	23	20	33	29	34	30	employees	
Asbestos area	5	15	18	14	15	24		
Prevalence, %††								
Dyspnea	7	18	23	26	30	37	(1,015 current workers)	86, 92
Decrease in lung function, %***								
VC	0	−4	−9	−11	−14	−15	(1,015 current workers)	87, 92
FEV_1	0	−4	−7	−10	−13	−14		
Steady-state DL_{CO}, at rest	0	−3	−6	−5	−9	−11		

*Million particles per foot^3 per year (81).
†Age corrected; followed up to 1960.
**Standardized for age and years of employment.
††Age standardized.
***Age and height standardized.

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Table 5

Deaths among 17,800 asbestos insulation workers in the United States and Canada January 1, 1967 - January 1, 1977: Analysis by duration from onset of employment

Total men	12,683			12,051		
Man-years of observation	89,466			77,389		
	Before 20 years from onset			20 or more years from onset		
	Expected*	Observed	Ratio	Expected	Observed	Ratio
Total deaths, all causes	283.93	324	1.14	1,377.01	1,946	1.41
Cancer, all sites	42.65	83	1.95	277.25	911	3.29
Lung cancer	12.03	36	2.99	93.94	449	4.78
Pleural mesothelioma	**	2	--	**	64	--
Peritoneal mesothelioma	**	3	--	**	106	--
Cancer of esophagus	0.66	1	--	6.35	17	2.68
Cancer of stomach	1.56	1	--	12.67	21	1.66
Cancer of colon-rectum	4.07	4	--	33.79	55	1.63
Asbestosis	**	8	--	--	154	--

* Expected deaths are based upon white male age specific mortality data of the U.S. National Center for Health Statistics for 1967-1975 and extrapolation to 1976.

** These are rare causes of death in the general population.

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Table 6

X-ray changes in asbestos insulation workers

Onset of exposure (yrs.)	No.	% Normal	% Abnormal	Asbestosis (grade) 1	2	3
40+	121	5.8	94.2	35	51	28
30-39	194	12.9	87.1	102	49	18
20-29	77	27.2	72.8	35	17	4
10-19	379	55.9	44.1	158	9	0
0-9	346	89.6	10.4	36	0	0
Total	1,117	51.5	48.5	366	126	50

Table 7

Pleural abnormalities among asbestos insulation workers

Years from onset of exposure	Number examined	Normal pleura	Abnormal pleura % Normal	Fibrosis	%	Calcification	%
40+	121	28	23.1	65	53.7	70	57.9
30-39	194	96	49.5	62	32.0	67	34.5
20-29	77	47	61.0	25	32.5	8	10.4
10-19	379	340	89.7	36	9.5	5	7.3
0-9	346	342	98.8	4	1.2	0	0.0
Total	1,117	853					

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Table 9

Parenchymal abnormalities among asbestos miners and millers in Newfoundland

Total examined	ILO U/C Classification 1/0	1/1
485	23(5%)	14(3%)

Table 10

Pleural abnormalities among asbestos miners and millers in Newfoundland

Total examined	Pleural thickening present	Pleural plaques present	Pleural calcification present
485	8(2%)	6(1%)	3(.7%)

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Table 11

X-ray abnormalities among asbestos miners and millers in Newfoundland

Type of abnormality	Less than 5 yrs.(168) number	%	5-9 yrs.(117) number	%	10+yrs.(200) number	%
Any abnormality	9	5.4	12	10	29	15
All parenchyma	6	3	8	7	23	11.5
Parenchyma only	5	3	8	7	21	11
Parenchyma & pleura	1	.5	0	0	2	1
All pleura	4	2	4	3	8	4
Pleura only	3	2	4	3	6	3

Table 12

X-ray abnormalities among asbestos miners and millers in Newfoundland by degrees of exposure

Exposure category	Total examined	Parenchymal abnormality	Pleural abnormality	Any abnormality
1	44	0	3(7%)	3(7%)
2	142	8(6%)	6(4%)	13(9%)
3	191	17(9%)	5(3%)	21(11%)
4	108	12(11%)	2(2%)	13(12%)
Total	485	37(8%)	16(3%)	50(10%)

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Table 13

X-ray abnormalities among asbestos miners and millers in Newfoundland

Duration of exposure	Exposure category	Total examined	Parenchymal abnormality	Pleural abnormality	Any abnormality
0-4 years	1	14	0	0	0
	2	59	1(2%)	3^{2}(6%)	4(7%)
	3	55	2(4%)	0	2(4%)
	4	40	3^{1}(8%)	1(3%)	3(8%)
5-9 years	1	10	0	1^{1}(10%)	0
	2	30	2(7%)	0	2
	3	52	5(10%)	2(4%)	7(13%)
	4	25	1(4%)	1(4%)	2(8%)
10+ years	1	20	0	2(10%)	2(10%)
	2	53	5(10%)	3(6%)	7(13%)
	3	84	10^{2}(12%)	3^{2}(3%)	12(14%)
	4	43	8^{3}(18%)	0	8(19%)

1 - one individual in group has previously worked in another mine.

2 - two individuals in the group had previously worked in other mines.

3 - three individuals in the group had previously worked in other mines.

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Table 14

Chest x-ray abnormalities among asbestos miners and millers in Newfoundland

	Total examined	parenchymal abnormalities	pleural abnormalities	any abnormality
Asbestos mine only	374	28(6%)	8(2%)	40(11%)
Asbestos mine and other mines	111	6(5%)	5(5%)	10(10%)

Table 15

Chest x-ray abnormalities among asbestos miners and millers in Newfoundland who also worked on the construction of the mine and mill

Duration at mine	Total examined	Parenchymal abnormalities	Pleural abnormalities	Any abnormality
0-4 years	2	0	0	0
5-9 years	2	0	1(50%)	1(50%)
10+ years	42	11[6](26%)	4[1](10%)	13[6](31%)
Total	46	11(24%)	5(11%)	14(30%)

1 - individual had worked in another mine

6 - individuals had workin in other mines

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Table 16

Environmental asbestos measurements in vicinity of Baie Verte, June, 1976

Date	Location	Sampling time(hr.)	Asbestos Concentration ng/m^3
June 15, 1976	40' east of mill road	6.25	1,200
June 15, 1976	Rear of local hospital	7.50	240
June 16, 1976	Fleur de Lys road, under plume from tailings swivel piler	5.30	14,000
June 16, 1976	Interior of local hotel	4.00	1,700
June 17, 1976	Adjacent to road, Seal Cove Lake	2.00	760
June 17, 1976	Adjacent to road en route to Fleur de Lys, 3.6 miles beyond mine turnoff	3.00	360
June 17, 1976	Rear of local hospital	2.00	580

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ACKNOWLEDGEMENTS

Public health questions, particularly those concerned with occupational and environmental matters, require careful scientific investigation and evaluation. Yet such studies can only infrequently be undertaken in cloistered, isolated conditions. Rather, they are often best examined in their own, local settings, reflecting circumstances as they exist.

To best do this, scientists hope for assistance from those people whose experiences form the texture of the problem; in occupational questions, of workers, industry experts, and public health authorities.

In our research concerning chrysotile mining and milling in Baie Verte we had precisely such happy cooperation, not only facilitating our work and enriching its scientific scope and significance, but making our stay in Newfoundland pleasurable and memorable.

Many helped, the members and leaders of the United Steelworkers of America, C.L.C., including Mr. Martin J. Saunders, President, and Mr. Gerald B. Dwyer, Vice-president, of Local 7713 in Baie Verte, and Mr. K. A. Valentine and Mr. Lorne Heard, both of the Education and Welfare Department of the USWA office in Toronto provided valuable guidance and during the examinations, local union members provided daily assistance.

We had the close cooperation of the mine management, including those charged with the day-to-day supervision of the busy work of the facility. Mr. John Lawrence, Personnel Manager and his Assistant, Mr. Rod LaRue, worked closely with our staff in planning the survey, setting up the examination schedules and assisting in the numerous details of our undertaking. Daily help of Mr. Paul Miller and Mr. Wayne Rice was graciously provided by the mine. Mine Manager Mr. Jack G. Cole and his

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colleagues showed us the full workings of mine and mill and shared experiences with us. Dr. Paul Kotin, Medical Director of the Johns-Manville Company, Dr. Gerald Chase, Corporate Biostatistician and Epidemiologist, and Mr. William Reitze, Director of Environmental Safety and Quality, provided much additional valuable information.

We are particularly pleased to acknowledge the broad help and hospitality of Dr. Douglas P. Black, Dr. Betty Dewick and their colleagues who made their facilities at the Baie Verte Peninsula Health Centre available to us for the medical survey. Their wide knowledge of the medical problems in Baie Verte and in the communities round about, such as Coachmans Cove, Fleur de Lys, Green Bay, Mings Bight, Nippers Harbour, Pacquet, Seal Cove, Wild Cove and Westport, which they shared with us, formed an invaluable background for understanding of the medical observations which were made. An important contribution was provided by Mr. Clifford Gale who conscientiously supervised all of the x-ray procedures undertaken at the Baie Verte Public Health Centre during our stay.

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As a background to our support from labor, industry and scientific groups, we were also fortunate to have the interest of the Minister of Health of the Province, Mr. Harold A. Collins; the Deputy Minister, Mr.

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Appendix 1

Scientific and technical field investigation staff: Survey of Chrysotile miners and millers in Baie Verte, Newfoundland
June 14-18, 1976

Environmental Sciences Laboratory, Mount Sinai School of Medicine of the City University of New York

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Arthur M. Langer, Ph.D.
Arthur N. Rohl, Ph.D. and
Steven B. Shirey, M.S.

Collaborating scientific and technical staff:

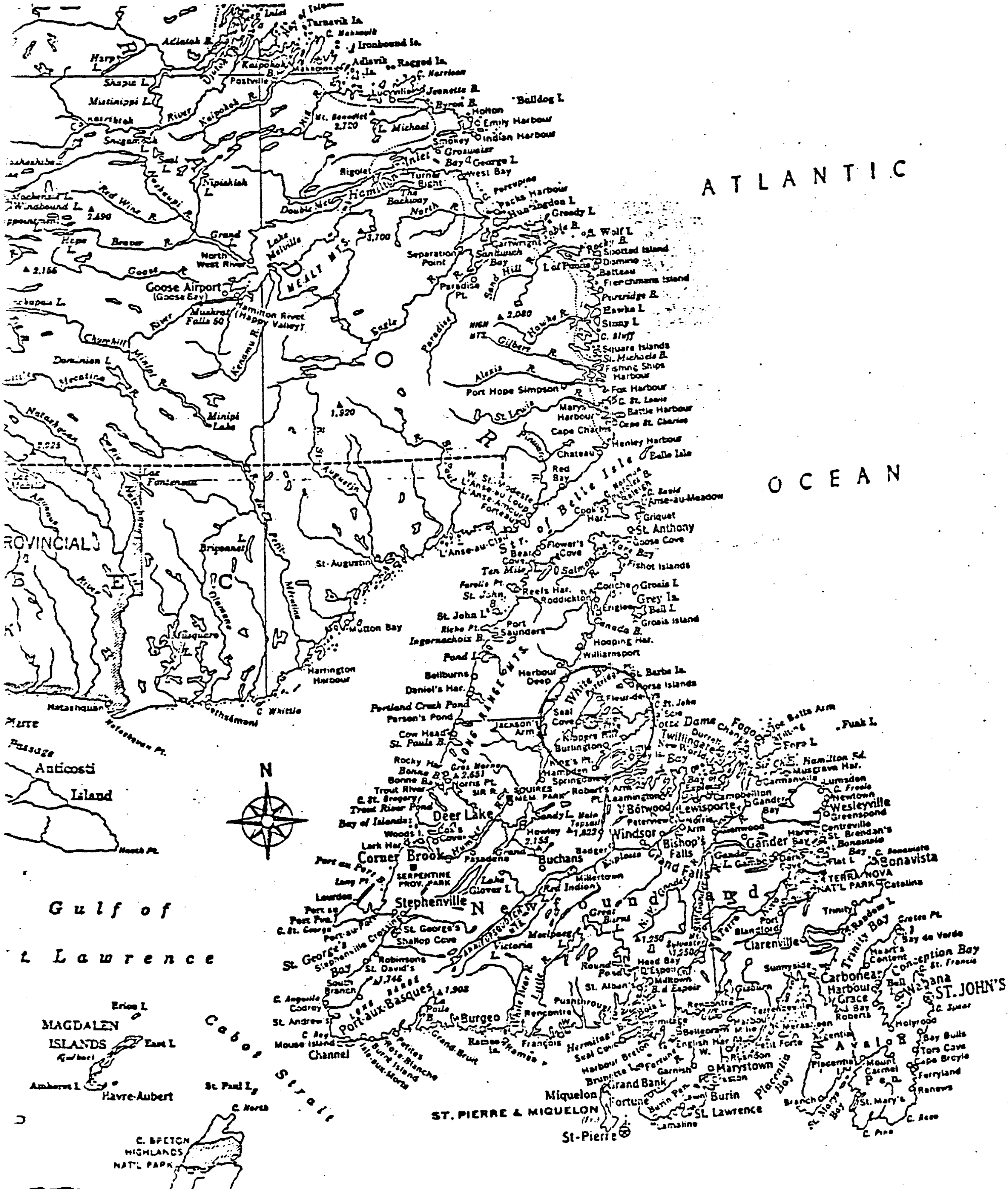
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ENVIRONMENTAL SCIENCES LABORATORY

MOUNT SINAI SCHOOL OF MEDICINE OF THE CITY UNIVERSITY OF NEW YORK

Number _____

Research Group _____

Name _____

Comment: _____

ILO U/C International Classification of Radiographs of Pneumoconioses

BIT U/C Classification Internationale des Radiographies de Pneumoconioses

		ROUNDED SMALL OPACITIES			IRREGULAR SMALL OPACITIES			SMALL OPACITIES	LARGE OPACITIES		PLEURAL THICKENING				ILL DEFINED DIAPHRAGM	ILL DEFINED CARDIAC OUTLINE	PLEURAL CALCIFICATION					
Date	Quality	Type	Profusion	Zones	Type	Profusion	Zones	Combined Profusion	Type	Size	Costo-phrenic angle	Site	Width	Extent			Diaph	Wall	Other	Grade	Symbols	Comments
			/			/		/														
			/			/		/														
			/			/		/														
			/			/		/														
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	+	p	0/- 0/0 0/1	Check zones involved	s	0/- 0/0 0/1	Check zones involved	0/- 0/0 0/1		0	0			0	0	0				0	ax bu ca cn co	
	±	q	1/0 1/1 1/2		t	1/0 1/1 1/2		1/0 1/1 1/2	wd	A	R	R	a	1	R	1	R			1	cp cv di ef em	
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	U/R		3/2 3/3 3/4			3/2 3/3 3/4		3/2 3/3 3/4		C			c			3				3	pq px rl tba tbu	

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