

Asbestos Fibres in Indoor and Outdoor Air AND The Epidemiology of Asbestos-related Diseases in Quebec *

SUMMARY AND RECOMMENDATIONS OF THE REPORTS



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ABSTRACT

In 1997, in light of international developments with respect to asbestos, particularly after its banning in France, Quebec's *ministère de la Santé et des Services sociaux* (department of health and social services) set up a *Comité aviseur sur l'amiante* (asbestos advisory committee). The aim of this committee was to make recommendations about appropriate measures to inform the public and to protect public health in relation to the asbestos situation in Quebec. The advisory committee then created two sub-committees: the first to document asbestos exposure and the second to examine the epidemiology of asbestos-related diseases in Quebec. The sub-committee on exposure was mandated to assess the pertinence and the feasibility of assessing asbestos exposure in the general population, particularly in public buildings such as schools. The sub-committee on epidemiology was mandated to review epidemiological studies available in Quebec on mesothelioma, pulmonary cancers, and asbestosis; evaluate the trends of these diseases; compare data from Quebec to those of other regions; and summarize current scientific knowledge on the effects of asbestos on health. Each sub-committee produced a report, the summaries and recommendations of which are presented here.¹

* Data presented here are taken from the scientific reports "Fibres d'amiante dans l'air intérieur et extérieur" ("Asbestos Fibres in Indoor and Outdoor Air") and "Épidémiologie des maladies reliées à l'exposition à l'amiante au Québec" ("The Epidemiology of Asbestos-related Diseases in Quebec"), available on the website of the *Institut national de santé publique du Québec*: <http://www.inspq.qc.ca>.

¹ Please note that all references consulted may be found in the integral versions of the reports.

ASBESTOS EXPOSURE IN QUEBEC

The available information on asbestos exposure in public buildings, other than schools, is incomplete. Some specific situations have been assessed, often on an emergency basis, for example in one university, in certain municipal recreation centers, and in some hospitals. These situations mainly involved workers who were exposed during work, but in some cases students or the public could also have been exposed.

In March 1998, a preventive program was undertaken with regard to sprayed asbestos in Quebec's elementary and secondary schools. This operation comprised three stages: identifying school buildings with sprayed asbestos, qualitatively evaluating the condition of the sprayed asbestos, and deciding on the corrective measures to be implemented. Of the 3,300 buildings used for teaching in the 72 existing school boards, 508 buildings owned by 55 school boards were identified as "a place where there is sprayed asbestos." Excluding some fifty buildings whose premises were used for purposes other than teaching, we ascertained that approximately 12% of all the school buildings in Quebec contained sprayed asbestos. The rooms evaluated were ranked using an assessment grid having three possible ratings: 1) The materials have not deteriorated; 2) The materials are beginning to break down and require periodic surveillance and preventive maintenance; or 3) The materials have broken down and require corrective measures as soon as possible, based on a target schedule established by the school boards.

Among the 508 buildings, 125 had rooms rated 1, 13 had rooms rated 2, and 292 had rooms rated 3. To date, 60% of the work has been carried out.

In the workplace, for asbestos exposure among workers in the mining sector, the existing standards have been generally complied with at the different work areas sampled during the last twenty years. A study was conducted using the 1988, 1990, and 1997 environmental surveillance data from two mining companies. Results showed that where standards were exceeded, it was often for the specific tasks of certain workers, for example in the repair of sieves, unclogging of conveyor belts, or in underground drilling. Important variations were reported in workers' exposure in the same work area during the different years of the study. More in-depth analyses might help identify the factors that lead to such varying levels of workers' exposure. At present, the number of workers sampled does not meet the guideline provided for this purpose by the *Institut de recherche Robert-Sauvé en santé et en sécurité du travail* (Occupational Health and Safety Institute Robert Sauvé). The feasibility of applying current sampling guidelines seems to be a serious problem for the industries concerned.

The standard (time-weighted average exposure value) currently in force in Quebec is 1 fibre/ml for chrysotile and 0.2 fibre/ml for amosite and crocidolite where the use of the latter two types of asbestos is permitted. Given its carcinogenic potential, asbestos exposure must be reduced to a minimum. In the United States, the standard enacted for mines by the Mine Safety and Health Administration (MSHA) in 1978 was 2 fibres/ml using the membrane filter, phase contrast microscopy method. However, a

recent report from the U.S. Office of the Inspector General recommended lowering the standard (to 0.1 fibres/ml), concentration measured by phase contrast microscopy, as in other workplaces.

With respect to the asbestos processing industry, a study was conducted in Montréal in February and March 1997 with the aim of describing asbestos exposure in this sector. Its goal was to identify the presence of workers in situations where standards were exceeded at the time of the survey and over the five preceding years. The results identified 29 establishments as being above the standards. The building and public works sector was subsequently eliminated due to its distinctive situation, as were 5 businesses where asbestos was identified but was not being processed. Manufacturers of transportation equipment and metal products represented 40% of the establishments. Some other industries were also identified as being likely to cause significant asbestos exposure, namely industries that produce insulation, gaskets, and other asbestos-based products. Seven of the 23 processing plants (30%), were identified as not complying with the standard. Three of these plants manufactured brake pads. Several stages in the manufacturing process were above the standard. Exposure in the other establishments was more limited. The authors report on the limitations inherent in this type of study with regard to measuring exposure levels and compliance with standards. Nevertheless, they point out, we ought to be concerned by the strong possibilities that standards are being exceeded in the processing industry.

In the building and public works sector, the results of a screening for asbestosis among more than

1,500 workers (insulators, plumber-pipe fitters, tinsmiths and sheet metal workers, elevator mechanics, fire protection mechanics, and boiler-makers) indicate that for several years these workers have experienced significant exposure to high concentrations of asbestos fibres in the ambient air. These results will be presented below.

With respect to outdoor air, the concentrations measured in recent years in mining towns are generally very low. The background concentration measured in 1984 in rural areas was far lower than in urban areas. However, there are no recent measures of background concentration. An ambient air surveillance program overseen by the Asbestos Institute provides data from mining towns as far back as 1973. Originally measured by light microscopy, concentrations have been measured by electron microscopy since 1983. Concentrations have decreased substantially. Since 1981, mean concentrations for mining towns have always been less than 0.04 f/ml. In 1996 and 1997, mean concentrations in mining towns varied between 0.003 and 0.005 f/ml.

Asbestos waste taken to waste disposal or landfill sites may represent another significant source of exposure. Currently in Quebec, asbestos is a solid waste according to the definition in the Regulation Respecting Solid Waste. While there is no specific provision concerning asbestos, operators of sanitary disposal sites are required to keep records identifying the nature and the origin of the waste. A draft regulation on the disposal on land and incineration of waste, which includes the requirement that operators of sanitary disposal sites cover friable waste such as asbestos, was published in 2000.

Finally, another potential source is asbestos-asphalt. So far however, asbestos-asphalt has seldom been used. Some studies have been conducted to measure its impact on ambient air. A more precise analysis of airborne concentrations is required to conclusively judge the real impact of this new use. This analysis should be done for any new large-scale use of asbestos.

ASBESTOS-RELATED DISEASES IN QUEBEC

Asbestos has three main effects on health: mesothelioma of the pleura and peritoneum, pulmonary cancer, and asbestosis. All these diseases appear after a latency period varying between 20 and 40 years depending on the pathology. Moreover, all types of asbestos have been associated with the three diseases.

In Quebec, from 1982 to 1996, 832 people (655 men and 177 women) were newly diagnosed with mesothelioma of the pleura. This corresponds to an average annual incidence rate of 1.49 per 100,000 person-years among Quebec men and 0.32 per 100,000 person-years among Quebec women. These rates are respectively 9.5 and 2 times higher than the rates observed among women in the rest of Canada considered to have little or no exposure to asbestos, and these differences are statistically significant. In comparison to the international community, the situation among Quebec men is only surpassed in several counties in the United Kingdom, several states in Australia, and several regions in the Netherlands.

Incidence rates of mesothelioma of the pleura rose significantly between 1982 and 1996 in Quebec's male population with a 5% average annual rate of increase. The cohort of Quebec men born between 1930 and 1939, therefore those who started to work during the period when asbestos use was increasing, show higher cancer rates than other cohorts of Quebec men. Two regions in the province, Chaudière-Appalaches and Montérégie, show statistically significant excesses of mesothelioma of the pleura. They both have shipyards or had them in the past, and in Chaudière-Appalaches, asbestos mines were also in operation in Thetford Mines and environs.

Mesothelioma of the peritoneum is even less frequent than mesothelioma of the pleura and is associated with exposure to amphibole asbestos. Between 1984 and 1996, 63 Quebec men and 45 Quebec women were newly diagnosed with this cancer. Rates remained stable during the period of the study and no region showed excesses of this cancer.

The mortality associated with these two cancers cannot be evaluated directly because Quebec's death certificates do not distinguish mesotheliomas from other histological types of cancer of the pleura and peritoneum. However, we note that there was a statistically significant increase in death rates from cancer of the pleura among Quebec men between 1981 and 1996 and that an excess of deaths from this cancer was observed in the Chaudière-Appalaches region.

Cases of mesothelioma and lung cancer whose occupational origin has been recognized by the

committees set up by the *Commission de la santé et de la sécurité du travail* (CSST—a workers' compensation board) represent respectively only 22% and 0.3% of the cases recorded in the *Fichier des tumeurs du Québec* (Quebec's tumour registry). Yet the medical literature shows that asbestos exposure is found in 70% to 90% of mesothelioma cases among men. The literature also shows that the percentage of lung cancer cases attributable to asbestos exposure among men varies between 0.5% and 15% depending on the prevalence of the exposure in the populations studied. We also observed that the 1,333 Quebec men and 53 Quebec women hospitalized for a first time between 1987 and 1996 with a primary or secondary diagnosis of asbestosis represented four times the number of cases of this disease recognized by the CSST during the same time period.

A series of recent studies has documented some aspects of exposure and the health of women in regions with asbestos mines. Their cumulative level of exposure to asbestos over the last 50 years has been estimated on average at about 25 fibres/ml-years. These data were used to test the U.S. Environmental Protection Agency's risk assessment models for mesothelioma and lung cancer deaths. These models were found to overestimate mesothelioma risk by a factor of approximately 60 and lung cancer risk by a factor of at least 10.

A case-control study of women diagnosed with mesothelioma in Thetford Mines between 1970 and 1989 showed a very high risk (approximately 30) of developing this cancer following occupational exposure to asbestos. This risk was statistically significant but included a considerable margin of

uncertainty. The study also showed that mesothelioma risk would increase from 2% to 5% per fibre/ml-year of exposure among these women with any measure used to estimate their exposure to asbestos (occupational, domestic, or residential).

We have relatively complete information on asbestos-related diseases among workers exposed in Quebec's asbestos mines. However, data are incomplete for workers in asbestos processing and construction industries.

The respiratory health of Quebec's asbestos miners has been studied since 1958 and has been the subject of much scientific, political, and social debate. A cohort of nearly 11,000 workers in asbestos mines and mills and in one products fabrication factory located in the mining region was followed up for mortality to 1992. These workers showed an excess of mesothelioma deaths in comparison with the Quebec population and pulmonary cancer risk rose to 2 among workers exposed to greater amounts of asbestos and for a longer time. Many cases of asbestosis were also documented among these workers. The workers in these regions are currently subject to mandatory screening for asbestosis. However, data from these studies have not yet been analyzed by the sub-committee.

Data are more scarce for asbestos processing workers. Previous studies identified only four processing plants in Quebec. All these enterprises generated asbestos-related disease cases.

The study mentioned above of 23 asbestos processing plants in the Montréal area showed that seven of them (30%) presented problems related to

exceeding asbestos exposure standards. The screening for asbestosis carried out among 304 workers from four of the five problem plants revealed one confirmed and one possible case of asbestosis. In addition, a third worker had been diagnosed with this disease in 1990.

Screenings undertaken in 1995 and in subsequent years of approximately 1,500 workers from various construction trades identified more than twenty cases of radiological abnormalities compatible with a diagnosis of asbestosis and close to 25% of the workers had pleural abnormalities.

The *Comité spécial des présidents* is a committee composed of three chest physicians charged with determining, in the case of a worker presenting a claim to the CSST for an asbestos-related disease, if the disease is of occupational origin. Between 1988 and 1997, the committee recognized an occupational origin to asbestos-related diseases among 691 workers (378 asbestosis, 191 mesothelioma and 209 lung cancer cases). On analyzing these data, we learn that the mining sector still generates most cases of these diseases combined (35%), including most asbestosis (32%) and most lung cancer (62%). The high percentage of pulmonary cancer cases originating in mines suggests there may be a poor recognition of asbestos exposure in other sectors, by workers and doctors. This poor recognition may be due to the fact that it is easier to attribute a lung cancer to tobacco use, in a smoker, than it is to recognize asbestos exposure outside the mining sector. However, if the workers from construction industries (17% of cases) are pooled with the workers involved with maintenance and repair of asbestos-containing products and structures (25% of

cases), these two groups together account for 42% of the total 691 cases and 53% of the mesothelioma cases, thus surpassing the mining sector. The number of claims increased between 1988 and 1997, particularly in the construction and maintenance and repair industries.

Finally, compensation costs to the CSST for the 691 workers studied amount to at least 66.2 million dollars, undiscounted. It would be worthwhile to conduct a more in-depth study to document the direct and indirect costs generated by asbestos-related diseases in Quebec.

CONCLUSION

The prevention program conducted in schools identified 12% of buildings in which sprayed asbestos is present. The percentage of these sprayings (57%) given a score of 3 is relatively high. However, in general, students' and teachers' exposure risk is low. As well, the exposure risk of workers assigned to the maintenance and repair of schoolrooms is, theoretically, also rather low, if the work is done according to regulations. Consequently, it is important that the presence of asbestos be identified ahead of time. For this reason, the committee advises that other categories of public buildings should be systematically evaluated. These buildings are CEGEPS (college-level schools), universities, municipal buildings (especially those used by the community), and hospitals.

With respect to the workplace, although the situation in the mines has improved notably in recent decades, the committee found weaknesses in the

prevention programs in the processing industry and in construction, as well as in environmental surveillance in the mines. In the outdoor environment, airborne concentrations have decreased significantly in recent years, but careful environmental monitoring of current sources and prudent management of new sources are required.

Epidemiological studies show a statistically significant increase in the incidence of mesothelioma of the pleura among Quebec men between 1982 and 1996. Quebec citizens also show significantly higher rates of mesothelioma of the pleura than men and women in the rest of Canada and in several other countries. This clearly points to the necessity of monitoring the evolution of this cancer in Quebec in the coming years, especially to see whether or not the increase levels off and to describe the geographic distribution of cases. Moreover, cases of occupational origin may be considerably underestimated and Quebec does not have an adequate system for monitoring asbestos-related diseases. The number of workers with an asbestos-related disease of recognized occupational origin has also increased in the last decade. Claims in this time period were made mainly by construction industry workers and workers in industries involving the repair and maintenance of asbestos-containing products and structures.

All these findings lead the sub-committees to make the following recommendations.

RECOMMENDATIONS

With respect to public buildings

Safe management: Need for regulatory control

That the *ministère de la Santé et des Services sociaux* (department of health and social services) recommend to the Government of Quebec the adoption of a regulation requiring owners of public buildings to identify premises with asbestos-containing materials and to set up a program for the safe management of asbestos. This regulation, essential to the safe management of asbestos in Quebec, should be under the jurisdiction of the CSST and the *Régie du bâtiment* (Quebec building board).

Safe management: Need for intervention

That the *ministère de la Santé et des Services sociaux* recommend to the public authorities concerned the introduction of a prevention program aimed at the safe management of asbestos in the premises of the following institutions:

- Daycares; CEGEPS; universities (under the authority of the *ministère de l'Éducation*);
- Health institutions (under the authority of the *régies régionales de la santé et des services sociaux*) (regional health and social services boards);
- Municipal public buildings (under the authority of the municipalities and the *ministère des Affaires municipales*) (municipal affairs department).

Safe management: Need for monitoring

That Quebec's *ministère de l'Éducation*, in collaboration with the school boards, produce, for the next three years, an annual report on the application of corrective measures in elementary and secondary schools where the presence of asbestos has been documented, and relay the information obtained to the public health departments concerned.

With respect to the workplace

Revision of the standard

That the *ministère de la Santé et des Services sociaux* ask the CSST to examine the relevance of revising the current standard for asbestos exposure in the workplace (Regulation Respecting Occupational Health and Safety), given the high level of risk to which workers are exposed.

Expansion of the CSST intervention program

That the CSST extend to the processing industry its intervention program for the prevention of asbestos-related occupational pulmonary diseases.

Environmental assessment in asbestos mines

That the *ministère de la Santé et des Services sociaux* recommend a study be undertaken to evaluate environmental surveillance programs currently in effect in asbestos mines; this study could be under the authority of the *Institut de recherche Robert-Sauvé en santé et en sécurité du travail*, in collaboration with asbestos industry groups and the public health departments concerned.

Environmental assessment in construction

That the *ministère de la Santé et des Services sociaux* oversee the implementation of studies aimed at documenting asbestos exposure in construction industries and industries involving the maintenance and repair of asbestos-containing products or structures.

With respect to the outdoor environment

Mining towns

That the *ministère de la Santé et des Services sociaux* request the implementation of a surveillance program for asbestos concentrations in the ambient air of mining towns in Quebec, under the authority of the *ministère de l'Environnement du Québec*. An evaluation of background concentrations in urban and rural environments should also be carried out.

Asbestos waste

That the Government of Quebec adopt, as soon as possible, the Regulation Respecting Solid Waste Disposal² (under the authority of the *ministère de l'Environnement*), amended with regard to asbestos-containing materials.

² A draft Regulation on residual materials disposal was published in the *Gazette officielle du Québec* in October 2000 but has not yet been adopted. It will require administrators of controlled waste disposal sites to accept materials containing more than 1% asbestos, and will require that asbestos waste be covered before compaction. Henceforward, it will therefore prohibit disposal in dry material disposal sites.

Asbestos-asphalt

That the *ministère de la Santé et des Services sociaux* request that an environmental and health impact study be conducted, before large-scale use of an asbestos-asphalt mix for road paving, said study to be under the authority of the *ministère des Transports*. An assessment of the long-term impact of asbestos-asphalt on population exposure and health risk in the urban environment should be included.

With respect to health

Surveillance of mesothelioma

In order to monitor the temporal and geographic trends of mesothelioma in Quebec and its risk factors, and this with the aim of guiding preventive actions:

- That the *ministère de la Santé et des Services sociaux* set up in Quebec a prospective surveillance system for mesothelioma of the pleura and peritoneum, ensuring compliance with good surveillance system criteria (accuracy and quality of diagnoses, completeness of ascertainment of cases (i.e. different sources for collecting all the cases), speed of reporting of cases, presence of additional information such as asbestos exposure, etc.).
- That a feasibility study be undertaken to determine both the kind of additional information to collect in order to set up a good surveillance system and the method for collecting this information as efficiently as possible for each new case diagnosed.
- That the data collected on mesotheliomas be analyzed on a regular basis and include national and international comparisons.

With the aim of being able to study mesothelioma trends in Quebec since 1990:

- That the data from the *Fichier des tumeurs du Québec* (tumour registry) on mesotheliomas of the pleura and peritoneum registered since 1990 be validated and harmonized with the prospective surveillance system, particularly in regard to the completeness of ascertainment of cases collected and the accuracy of diagnosis.
- That the *ministère de la Santé et des Services sociaux* consider recognizing mesotheliomas of the pleura and peritoneum notifiable diseases,³ thereby permitting epidemiological investigations to be conducted on the exposure characteristics of the cases.

Surveillance of asbestosis

In order to set up a surveillance system for asbestosis in Quebec:

- That the *ministère de la Santé et des Services sociaux*, in consultation with the CSST, oversee the matching of cases of asbestosis registered in the MED-ECHO hospitalization database and cases of asbestosis recognized by the *Comité spécial des présidents* to be of occupational origin.
- On the basis of the findings of the preceding proposal, that the *ministère de la Santé et des Services sociaux* oversee a study of hospitalization records in Quebec in which asbestosis is mentioned to determine the criteria on which this diagnosis is based; this study should distinguish cases in which

³ This has already been accomplished with the addition of mesothelioma, asbestosis, and lung cancer related to asbestos exposure to the list of notifiable diseases in Quebec in the *Gazette officielle* of November 5, 2003.

asbestosis is a principal diagnosis from cases in which it is a secondary diagnosis.

- That the *ministère de la Santé et des Services sociaux* consider asbestosis a notifiable disease,³ thereby permitting epidemiological investigations to be conducted on the exposure characteristics of the cases.

Surveillance of pulmonary cancers

- That the *ministère de la Santé et des Services sociaux* consider lung cancer associated with asbestos exposure a notifiable disease,³ thereby permitting epidemiological investigations to be conducted on the exposure characteristics of the cases.
- See the following paragraph.

Surveillance of the three diseases

With a goal of knowing more about the links between workplaces in Quebec where there has been asbestos exposure and the asbestos diseases recognized to be of occupational origin by the CSST and about the course of these diseases:

- That the *ministère de la Santé et des Services sociaux*, in consultation with the CSST, ensure regular statistical analysis of cases of asbestos-related diseases (mesothelioma, asbestosis, pulmonary cancer) whose occupational origin has been recognized by the *Comité spécial des présidents* for the CSST.

³ This has already been accomplished with the addition of mesothelioma, asbestosis, and lung cancer related to asbestos exposure to the list of notifiable diseases in Quebec in the *Gazette officielle* of November 5, 2003.

Training and prevention

- That the *ministère de la Santé et des Services sociaux* urge the faculties of medicine of Quebec universities to further emphasize, both at the continuing medical education level and in the training of new doctors, the importance of fully documenting occupational history in a medical history.
- That the *ministère de la Santé et des Services sociaux*, with the continuing medical education organizations, use continuing medical education sessions or any other mechanism deemed appropriate to further enable doctors to recognize the occupations and the workplaces in Quebec where there may be asbestos exposure.
- That the same procedure be undertaken, with continuing professional development organizations, among other health professionals likely to have a part in recognizing a link between asbestos exposure and the development of asbestos-related diseases.
- That the *ministère de la Santé et des Services sociaux*, in concert with partners such as the CSST, the *associations sectorielles paritaires* (joint sector-based associations), etc., take measures to empower workers and employers to recognize workplaces where there may be asbestos exposure, to know the risks associated with asbestos exposure, and to know how to handle asbestos safely.

Research

- That the *ministère de la Santé et des Services sociaux* oversee the evaluation of methods of relaying information to doctors and other concerned health professionals about the importance of gathering information on occupation and occupational

exposures in the medical history. In addition, that this research also document the most appropriate tools and mechanisms for gathering such information.

- That the *ministère de la Santé et des Services sociaux* oversee a study on the prevalence of asbestosis among workers in Quebec.
- That the *ministère de la Santé et des Services sociaux* evaluate the potential benefits that might be obtained by pooling the results of asbestosis screening activities among mine workers with the documented levels of asbestos exposure in these environments.
- That a study be undertaken of the mesothelioma files submitted to the *Comité spécial des présidents* and not recognized as occupational pulmonary diseases, in order to describe the characteristics of these cases and to provide guidelines for prevention measures.

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DISEASES IN QUEBEC

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