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THE USE OF CHRYSOTILE ASBESTOS IN QUEBEC

INSTITUT NATIONAL DE SANTÉ PUBLIQUE DU QUÉBEC

ADVISORY

THE USE OF CHRYSOTILE ASBESTOS IN QUEBEC

DIRECTION RISQUES BIOLOGIQUES,
ENVIRONNEMENTAUX ET OCCUPATIONNELS

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1 INTRODUCTION

In 1997, in light of international developments with respect to asbestos, the *ministère de la Santé et des Services sociaux* (Québec's department of health and social services) set up the *Comité aviseur sur l'amiante* (asbestos advisory committee) to make recommendations concerning appropriate measures for informing the public about the asbestos situation in Québec and protecting public health in this regard. To carry out this mandate, the committee conducted a number of studies. These were synthesized in three documents that may be consulted on the website of the *Institut national de santé publique du Québec* (INSPQ) (De Guire et al., 2003; Lajoie et al., 2003; De Guire & Lajoie, 2003).

In 2002, the Québec government adopted a *Politique d'utilisation accrue et sécuritaire de l'amiante chrysotile* (Policy concerning the increased and safe use of chrysotile asbestos). As the name indicates, the objective of this policy is to increase the use of chrysotile asbestos in Québec by stimulating the processing of and the demand for chrysotile asbestos products (MNRQ, 2002).

Since the publication of the INSPQ documents, contradictory messages about asbestos and its safe management have been circulating in the media and the general population. For this reason the INSPQ has decided to prepare an advisory statement on the use of chrysotile asbestos in Québec. The objective of this advisory is to provide an update on these issues.

2 WITH REGARD TO HEALTH

Asbestos-related diseases generally appear from 20 to 40 years after the start of exposure to this product (INSERM, 1997). The diseases that we will discuss in the paragraphs that follow are therefore the result of exposures that go back several years in the past, to a time when the exposure standards were higher than they are now.

The work done by the advisory committee described the epidemiology of the principal asbestos-related diseases in Quebec: mesothelioma of the pleura and peritoneum, asbestosis, and lung cancer. Other diseases are also associated with exposure to asbestos, but they were not studied by the advisory committee.

Several studies have shown the presence of asbestos-related diseases in the Quebec population.

The data of a study of the **mesotheliomas of the pleura** in the general population in Quebec showed an increase of this cancer between 1982 and 1996. The average annual rate of increase during this period was 5% among men (statistically significant) and 3% among women (not statistically significant). In all, 832 Quebec men and women suffered from this cancer during the observation period (Lebel et al, 2001a). Another study showed that this increase could level off around 2010 (Camus, 2001a). Mesotheliomas of the peritoneum are rare in Quebec. Because of this fact, they are not included in this advisory. Interested reader may consult the reference De Guire et al, 2003, to learn more about this disease.

The results of a study on **asbestosis** showed that 116 Quebec men and women died from this disease between 1981 and 1996. During the period from 1987 to 1996, 1,386 people in Quebec were hospitalized with a primary or secondary diagnosis of asbestosis for the first time (Lebel et al, 2001a).

The results of another study showed that between 1988 and 1997, 691 **male and female workers** in Quebec had asbestos-related diseases recognized to be of occupational origin; of these, 378 persons were diagnosed with asbestosis, 209 were diagnosed with lung cancer, and 191 were diagnosed with mesothelioma. An analysis of this data shows that the workplace most often associated with these diseases is mines (35% of the total 691 cases; 32% of the asbestoses and 62% of the lung cancers). However, if we consider together the workers exposed to asbestos in the construction industry (17% of cases) and the industry involving the maintenance and repair of asbestos-containing products and structures (25% of cases), these two industries grouped together have 42% of the total 691 cases and 53% of the mesothelioma cases, thus surpassing the mining industry (Provencher & De Guire, 2001). Although asbestos-related diseases generally result from exposures that go back 20 to 40 years (HEI-AR, 1991), some of these diseases have appeared after a shorter than expected period of time (16 years on average instead of 27 years), among Quebec workers with a mesothelioma who were exposed to asbestos in asbestos processing plants, or have appeared at a younger age (60 years on average instead of 65 years), among construction workers with the same cancer. This study also showed that mesotheliomas were observed among workers exposed to asbestos through their colleagues' work with this substance, which suggests a lower exposure than that in persons working directly with asbestos (Provencher & De Guire, 2001).

The advisory committee's studies also established that only 22% of Quebec men and women with mesothelioma and 0.3% of those with lung cancer presented a claim for compensation to the *Commission de la santé et de la sécurité du travail* (CSST-a workers' compensation board) during the period of the study (Lebel et al, 2001b). Yet most international studies show that the proportion of mesothelioma cases associated with occupational exposure to asbestos fluctuates between 70% and 90% (HEI-AR, 1991). Similarly, the percentage of lung cancers attributable to occupational asbestos exposure among men varies between 0.5% and 15% depending on the prevalence of the exposure in the populations studied (INSERM, 1997). A rough comparison shows that the number of cases of asbestosis diagnosed in Quebec men and women during their hospitalization is almost four times higher than the number of cases of asbestosis recognized to be of professional origin, during the same years, by the committees of experts set up for this purpose by the CSST. (De Guire et al, 2003). One of the possible explanations of these findings is under reporting to the CSST due to a lack of awareness of a prior exposure to asbestos by the workers and the physicians who treat them.

3 WITH REGARD TO ASBESTOS EXPOSURE

3.1 WORKPLACES

Since 1990 the asbestos exposure **standard** is 1 fibre per cc for chrysotile and 0.2 fibre per cc for amosite and crocidolite where the use of these two latter types of asbestos is permitted. In addition, exposure to asbestos must be reduced to a minimum, due to its carcinogenicity (Québec, 2001). This standard is high compared with exposure standards in effect elsewhere, notably in the United States where it is 0.1 fibre per cc (OSHA, 1994).

The data on asbestos exposure in Quebec are incomplete and difficult to obtain.

The report on asbestos exposure in Quebec's **mines** shows that the standard has generally been complied with during the last 20 years and that where the standard is exceeded, it is often in relation to the specific tasks of certain workers, such as repairing screens, unclogging conveyor belts, or underground drilling. However, the report also shows that the number of workers sampled does not meet the guideline provided for this purpose by the *Institut de recherche Robert-Sauvé en santé et sécurité du travail*. The feasibility of applying the sampling guideline seems to be a serious problem for the industries concerned (Lajoie et al, 2003).

It is difficult to document asbestos exposure in the **construction** industry due to the nature of the work in this sector. The data presented above on the diseases of construction workers show that there has been heavy exposure to asbestos in the past. But there is reason to believe that the exposure conditions persist, as evidenced by the Safety Code for the Construction Industry non-compliance notices issued by the CSST (Auger, 2001), not to mention the calls received by the public health departments and undeclared work that is by definition difficult to quantify. A screening for asbestosis in construction workers at the end of the 1990s showed that 23% of them presented pleural abnormalities on pulmonary radiography, so attesting to a prior exposure to asbestos. These workers also reported substantial current exposure to asbestos (De Guire et al, 2000). An intervention program (Programme, 1998) for construction industry workers was set up to address this problem, but it proved to be difficult to contact the workers and identify the worksites. However, the main difficulty in this industry is the lack of awareness of the presence of asbestos in the public and private buildings where work must be done. The *Comité technique* set up by the CSST to overcome this difficulty has not yet proposed a regulation that would make it possible to identify workplaces where there is exposure risk. For civil engineering projects that also involve construction work, only the traceability of asbestos-asphalt paved highways is in the process of being organized. Roads in urban areas are not affected by this proposal.

A study carried out in 23 asbestos **processing** plants in Montreal indicated strong possibilities that standards were being exceeded in 7 (30%) of these establishments during the 1990s (Simard, 1998). Asbestos processing plants are also present in other regions of Quebec, but their number is unknown. An intervention program will nevertheless be set up in these plants in 2005 to better document and monitor the situation.

3.2 PUBLIC AND RESIDENTIAL SETTINGS

For public and residential settings, information is sorely lacking, except in the sector that includes Quebec's elementary and secondary **schools**. An extensive program undertaken in 1998 and 1999 revealed that 508 of the school board owned buildings in Quebec contained sprayed asbestos. A qualitative evaluation of the condition of the sprayed asbestos was performed. Excluding the buildings not frequented by students, we found 125 schools with rooms rated 1, 13 with rooms rated 2, and 292 with rooms rated 3. Rating 3 indicated more severe deterioration, requiring corrective measures (De Guire & Lajoie, 2003). On completion in 2006, this work will have cost 61 million dollars (MEQ, 2005).

The available information for other settings is anecdotal. It comes from requests for one-time interventions or from complaints from workers or citizens. These settings include, for example, **government buildings, teaching** institutions other than elementary and secondary schools, **churches, shopping centres, office towers, public transportation**, and so on. The problem of vermiculite contaminated with asbestos and installed in **private residences** in Quebec is another example. The diversity of these settings raises questions of the magnitude of the problem, the impossibility of documenting it, and the lack of a "memory" of the places where this material was installed in the past.

4 WITH REGARD TO THE ADVISORY COMMITTEE RECOMMENDATIONS

Pursuant to its work, the asbestos advisory committee made recommendations, which are reprinted in the appendix. These recommendations target public buildings, the workplace, the outdoor environment, and health.

We will not reexamine all the recommendations, but we note the following: to date nothing has come of the recommendations to identify the public and private buildings containing asbestos and to introduce a prevention program aimed at the safe management of asbestos in educational and health institutions and in municipal buildings; that the recommendations to examine the relevance of lowering exposure standards in the workplace and to evaluate exposure in mines have not been undertaken; that there is no program for the environmental surveillance of airborne asbestos in Quebec's cities; that the assessment of asbestos-asphalt impact on population exposure and health risk in urban environments has not yet been carried out.

As regards health, the recommendations for training and prevention in connection with asbestos have only been partially implemented. Recommendations to answer research questions have not yet been considered.

However, the recommendations to introduce a monitoring program in asbestos processing plants, to monitor activities in Quebec's elementary and secondary schools, and to undertake studies aimed at better documenting asbestos exposure in the construction industry are being carried out. In the health sector, a system for the surveillance of asbestos-related diseases and exposures is in preparation and asbestos diseases are now notifiable diseases that must be reported to the public health directors of the different administrative regions in Quebec.

5 WITH REGARD TO CHRYSOTILE

According to the World Health Organization, the term asbestos refers to several silicate minerals with fibrous crystal structures. There are two basic families of asbestos: serpentines and amphiboles. The serpentines mainly include chrysotile, the type of asbestos Quebec extracts from its mines. Amphiboles include several types of asbestos, such as crocidolite, amosite, anthophyllite, and tremolite. The different types of asbestos share the following properties that distinguish them from other minerals: crystal structure, fibrous appearance, tensile strength, flexural strength, and resistance to heat and to strong chemical bases (Camus, 2001b).

The health effects of asbestos were initially demonstrated in epidemiological studies conducted among workers. Then, the effects were observed in laboratory animal experiments at much higher doses. The sources of information agree on **the identification of risks**. Opinions differ more on the **quantification of risks**. In general, researchers agree that the risk of developing a mesothelioma is higher when workers have been exposed to amphiboles rather than to chrysotile. Whether or not there is a risk differential for lung cancer based on type of asbestos is a subject of controversy in the scientific community (Camus, 2001b).

The International Agency for Research on Cancer (IARC) and the American Conference of governmental Industrial Hygienists (ACGIH) classify asbestos and chrysotile asbestos among the proven (IARC) or confirmed (ACGIH) human carcinogens (IARC, 1977; WHO, 1986; WHO, 1998; ACGIH, 2004). The National Toxicology Program, U.S. Department of Health and Human Services, classify them as “known to be human carcinogens” (NTP, 2005). The Occupational Safety and Health Administration, U.S. Department of Labor, considers all forms of asbestos, including chrysotile asbestos, to be cancer-causing substances (OSHA, 1994).

Recent studies have shown that Quebec chrysotile is less persistent than amphiboles in the lungs of exposed rats (Bernstein et al, 2003; Bernstein et al, 2005). The lower biopersistence of chrysotile asbestos has been reported in the literature for a number of years (Wagner et al, 1974). This observation is sometimes used to assert that chrysotile does not cause cancer. It is important to know that we do not yet understand the exact mechanisms of asbestos carcinogenicity; sometimes it arises from a direct action mechanism, other times from an indirect action mechanism (Pitot & Dragan, 1995). These mechanisms are dependent on several factors besides biopersistence, such as fibre length, diameter, potential for interference with cell division (mitosis), influence on cell proliferation, microsomal enzyme induction effect, cytotoxicity (possibly associated with magnesium content), and influence on apoptosis (cell death) (Jaurand, 1997; Lauwerys, 1999). The attribution of a causal link between exposure to chrysotile asbestos and cancer is based on several criteria in addition to biological plausibility (referred to in the previous sentence); these criteria include strength of association, consistency of results, temporal sequence, dose-response relationship, consistency with natural history and biology, and experimental evidence (Rothman & Greenland, 1998).

In the current state of knowledge, all these elements show that chrysotile asbestos is carcinogenic.

Finally, some messages being circulated say that the asbestos diseases currently observed among construction and renovation workers are due to past exposure to amphiboles and that chrysotile asbestos is absent from public buildings. We have little information on the composition of asbestos

products in buildings in Quebec. The only information we have been able to find comes from the evaluation of sprayed asbestos in Quebec's schools. In the Montreal region, 69% of the samples taken were composed of chrysotile only, the rest being a mix of amphiboles and chrysotile (29%) or amphiboles only (2%) (Forest et al, 2000).

6 WITH REGARD TO MANAGING ASBESTOS-RELATED RISKS

Let us start with a reminder that one of the mandates of the INSPQ is to support the ministry of health in its public health mission and to inform the population about health risks and prevention measures. The INSPQ also has to carry out work to support the decision making process. In this perspective, the INSPQ published in 2003 a document on risk management that the public health director of the ministry considers to be the reference tool in risk assessment and management (Ricard et al, 2003).

Although risk management is not in the jurisdiction of the INSPQ, the document can be used as a tool to facilitate management. Through a review of the seven governing principles set out in the document, various observations may be made with respect to asbestos management. The principles are the following: the **appropriation of their powers** by individuals and communities with respect to the risks that concern them; **equity** or in other words, the just distribution of the benefits and disadvantages of risks within communities; **openness**; and **primacy of the protection of human health**. Next is the principle of **prudence** which consists in advocating the reduction and the elimination of risks, each time it is possible to do so, and the adoption of a vigilant attitude so as to act in a manner to avoid any unnecessary risk. This attitude is practiced in contexts of relative certainty (prevention) and of scientific uncertainty (precaution). Risk management by public health is also based on **scientific rigour**, therefore on the best knowledge available and on the scientific opinions of experts from all the relevant disciplines. Finally, **transparency** is defined as the easy and rapid access to crucial information and to relevant explanations.

The last three principles (prudence, scientific rigour and transparency) will guide us in this advisory. The principle of prudence is perhaps the most important when we are talking about asbestos. Indeed, the carcinogenicity and fibrogenicity of asbestos and chrysotile asbestos reviewed above have been known for a number of years and have been corroborated by numerous studies in several countries and settings. The attitude to adopt in this context is to reduce and eliminate risks. Here, we are in the domain of scientific certainty, not uncertainty. As to the second criterion, the studies used to produce this advisory were conducted with due rigour and involved specialists in the field of asbestos both inside and outside of the public health sector. The various experts involved came to an agreement on the elements contained in the scientific reports published by the INSPQ despite some differences of opinion. The last criterion, transparency consists in disseminating the information available to us, which is based on solid evidence, even if it is awkward for the parties concerned with the subject of asbestos.

Does the concept of the safe use of asbestos still have a place in 2005? This concept was adopted by the governments of Quebec and Canada following a symposium on asbestos held in Montreal in 1982 and in view of the conclusions of the Ontario Royal Commission on Asbestos (Asbestos Institute). Its feasibility is now contested by regulatory agencies in Europe who emphasize the difficulties in identifying asbestos-containing materials in workplaces even if a notification system is in place. These same agencies also report problems related to the wearing of personal protective equipment (Comité, 2000). In Quebec, as seen earlier, the safe use of asbestos is difficult, perhaps impossible, in industries such as construction, renovation, and asbestos processing.

7 CONCLUSION

Considering the following points:

- The observed increase of mesotheliomas of the pleura in the general population in Quebec in the past several years and the expectation of this trend continuing for several years to come;
- The occurrence of asbestos-related occupational pulmonary diseases among Quebec's workers in recent years, notably among miners and construction and renovation workers;
- The preponderance of the number of people with one of the asbestos-related diseases in the general population of Quebec in comparison with the number documented among workers;
- The problems of controlling asbestos exposure in the asbestos processing industry in the 1990s;
- The problems of identifying asbestos-containing materials in public buildings, which make it difficult to control asbestos exposure among construction workers;
- The lack of success in developing processes to ensure the traceability of public and private buildings containing asbestos in order to ensure the protection of workers and residents;
- The limitations of traceability for civil engineering projects that contain asbestos, notably other than highways;
- Chrysotile's carcinogenicity proven in humans and considered as such by international organizations, despite its lower biopersistence;
- The high occupational standard for chrysotile exposure in Quebec that should be reduced;
- The as yet non systematic management of asbestos-containing materials in public buildings other than elementary and secondary schools and in private residences;
- The application of the principles put forward by the INSPQ to manage risks;

because workers and the general public are exposed to asbestos (chrysotile and amphiboles) already on site, the INSPQ is of the opinion

- that we must first manage this asbestos, especially in the schools, hospitals, CEGEPS, universities, public and private buildings, workplaces, etc.;
- that all of the enacted safety measures must be brought into force to protect workers, especially in the construction, renovation and asbestos processing industries;
- that we must not ease any of the regulations or standards currently in force (especially the safety code for construction work and the asbestos exposure standards in the Regulation respecting occupational health and safety);
- that the occupational exposure standard for chrysotile asbestos must be lowered;
- that the Regulation respecting solid waste must be revised so we have a new regulation respecting elimination of residual waste that complies with the preceding items;
- that we must better protect workers and the general public by identifying the products that contain asbestos (chrysotile and amphiboles) and that this information must be preserved and it must be accessible;
- that we must continue to develop a system for the surveillance of exposure to asbestos and of asbestos-related diseases;

because chrysotile asbestos is a proven human carcinogen and causes asbestosis, and because in practice it is difficult to achieve safe use, especially in the construction, renovation and asbestos processing industries, the INSPQ is of the opinion that the promotion and increased use of chrysotile asbestos in its traditional forms should not be endorsed by the *ministère de la Santé et des Services sociaux*.

In addition, considering the distinctive characteristics of asbestos-containing products (such as asbestos cement and asbestos bituminous pavement) that the *Politique d'utilisation accrue et sécuritaire de l'amiante chrysotile* (Policy concerning the increased and safe use of chrysotile asbestos) intends to promote, an additional report will be prepared to examine more thoroughly the impact of the use of these products. Nevertheless it would be prudent to control their use until the health risk assessment and the evaluation of required precautions concerning their use are completed.

Finally, if the *Politique d'utilisation accrue et sécuritaire de l'amiante chrysotile* (Policy concerning the increased and safe use of chrysotile asbestos) is upheld, considering that it is founded on the enforcement of very strict safety regulations and conditions, as was the Canadian position on chrysotile asbestos at the Rotterdam Convention, the INSPQ reminds the government that the conditions listed above must be respected. In addition, all of the measures entrusted to various ministries for protecting workers and the general public from asbestos and for monitoring this substance must be carried out. Measures affecting the organizations not specified in the Policy and that could assume part of the surveillance and control of asbestos exposure in Québec in both public and private spheres should also be introduced.

8 REFERENCES

- ACGIH. TLVs and BEI. Based on the documentation of the threshold limit values for chemical substances and physical agents and biological exposure indices. American Conference of Governmental Industrial Hygienists. Cincinnati. 2004.
- Asbestos Institute. Chrysotile asbestos: an overview. Science and the controlled-use policy. <http://www.asbestos-institute.ca/presskit/press-7.html> .
- Auger A. État de situation de l'amiante sur les chantiers de construction. Symposium sur l'amiante. 3 décembre 2001.
- Bernstein DM, Rogers R, Smith P. The biopersistence of canadian chrysotile asbestos following inhalation. *Inhal Toxicol*. 2003; 15(13): 1247-74.
- Bernstein D, Rogers R, Smith P. The biopersistence of canadian chrysotile asbestos following inhalation: final results through 1 year after cessation of exposure. *Inhal Toxicol* 2005; 17(1): 1-14.
- Camus M. Comparaisons et tendances de l'incidence des mésothéliomes de la plèvre et du péritoine au Québec et au Canada; décembre 2001a.
- Camus M. Document synthèse sur l'amiante préparé pour le Comité aviseur sur l'amiante du ministère de la Santé et des Services sociaux du Québec; octobre 2001b.
- Comité des hauts responsables de l'inspection du travail. Session européenne sur l'amiante : juin-décembre 2000. Document 12270/03 FR. <http://www.hvbg.de/d/asbest/euroinfo/onforfr.pdf> .
- De Guire L, Binet J, Boucher S, Rossignol M, Bonvalot Y. Prévalence des anomalies pulmonaires consécutives à l'exposition à l'amiante parmi un groupe de : tuyauteurs-plombiers, tôliers-ferblantiers, mécaniciens d'ascenseur, mécaniciens en protection des incendies et calorifugeurs. Montréal: Régie régionale de la santé et des services sociaux de Montréal-Centre, Direction de la santé publique; février 2000.
- De Guire L, Camus M, Case B, Langlois A, Laplante O, Lebel G, Lévesque B, Rioux M, Siemiatycki J. The epidemiology of asbestos-related diseases in Quebec. Montréal: Institut national de santé publique du Québec; July 2004. <http://www.inspq.qc.ca/pdf/publications/293-EpidemiologyAsbestos.pdf>.
- De Guire L, Lajoie P. Asbestos fibres in indoor and outdoor air and the epidemiology of asbestos-related diseases in Quebec. Summary and recommendations of the reports. Montréal: Institut national de santé publique du Québec ; 2004. <http://www.inspq.qc.ca/pdf/publications/292-ResumeAmianteAnglais.pdf>.
- Forest J, Gravel N, Simard R, Stock S, Simard JA. La démarche de prévention relative au flocage d'amiante dans les écoles de Montréal-Centre. Régie régionale de la santé et des services sociaux de Montréal-Centre. Direction de la santé publique. Mai 2000.
- HEI-AR. Asbestos in public and commercial buildings : a literature review and synthesis of current knowledge - Final report. Cambridge: Health Effects Institute - Asbestos Research; 1991.

IARC monographs on the evaluation of carcinogenic risks to humans. Volume 4 Asbestos. Geneva 1977.

INSERM. Effets sur la santé des principaux types d'exposition à l'amiante. Paris: Les Éditions INSERM; 1997.

Jaurand M-C. Mechanisms of fiber-induced genotoxicity. Environ Health Perspect 1997; 105(Suppl. 5): 1073-84.

Lajoie P, Dion C, Drouin L, Dufresne A, Lévesque B, Perrault G, Prud'homme H, Roberge L, Simard R, Turcot A, Tardif JM. Asbestos fibres in indoor and outdoor air. The situation in Québec. Montréal: Institut national de santé publique du Québec; January 2005.
<http://www.inspq.qc.ca/pdf/publications/342-AsbestosIndoorOutdoorAir.pdf>.

Lauwerys RR. Toxicologie industrielle et intoxications professionnelles. 4^{ième} éd. Paris : Masson, 1999.

Lebel G, Gingras S, Lévesque B. Épidémiologie descriptive des principaux problèmes de santé reliés à l'exposition à l'amiante au Québec. Beauport: Unité de recherche en santé publique, Centre de recherche du CHUL; octobre 2001a.

Lebel G, Gingras S, Lévesque B. Analyse de l'appariement des cas de mésothéliome de la plèvre et de cancer du poumon diagnostiqués par la CSST et par l'Institut Armand-Frappier avec le Fichier des tumeurs du Québec, MSSS. Beauport: Unité de recherche en santé publique, Centre de recherche du CHUL; octobre 2001b.

MEQ. État de situation au 24 janvier 2005 sur la démarche de prévention relative au flocage d'amiante. Ministère de l'éducation du Québec. Janvier 2005.

MRNQ. Politique d'utilisation accrue et sécuritaire de l'amiante chrysotile au Québec. Ministère des Ressources naturelles du Québec. Juin 2002. <http://www.mrn.gouv.qc.ca/publications/ministere/politique/politique-amiante.pdf>.

NTP. Report on carcinogens. Eleven edition; U.S. Department of health and human services. Public health service, National Toxicology Program. <http://ntp-server.niesh.nih.gov/ntp/roc/eleventh/profiles/s016asbe.pdf>.

OSHA. Occupational exposure to asbestos. Federal register. Final rules. No-59:40964-41162. OSHA, Department of labor. October 1994. http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=13404

Pitot III HC, Dragan YP. Chemical carcinogenesis. In: Casarett and Doull's toxicology, the basic science of poisons. Klaassen CD ed. McGraw-Hill, Montréal, 1995, p 201-67.

Programme d'intervention pour la prévention des maladies professionnelles reliées à l'exposition à l'amiante. Session de formation. Automne-Hiver 1998-1999. Direction de la prévention-inspection. CSST.

Provencher S, De Guire L. Étude des nouveaux cas de maladies professionnelles pulmonaires reliées à l'exposition à l'amiante au Québec de 1988 à 1997. Montréal : Régie régionale de la santé et des services sociaux de Montréal-Centre, Direction de la santé publique; mai 2001.

Québec (Province) *Règlement sur la santé et la sécurité du travail*. LRQ, chapitre S-2.1, r.19.01. Éditeur officiel du Québec, 2001, à jour au 20 novembre 2001.

Ricard S, Bolduc D, Delage G, Duval B, Plante R, Poirier A, Poulin M. Cadre de référence en gestion des risques pour la santé dans le réseau québécois de la santé publique. Québec : Institut national de santé publique du Québec; janvier 2003.

Rothman KJ, Greenland S. Causation and causal inference. In: Rothman KJ, Greenland S, eds. *Modern epidemiology*. 2nd edition. Lippincott-Raven, 1998 ; 7-28.

Simard R. Bilan de situation concernant l'exposition à l'amiante dans l'industrie de la transformation à Montréal-Centre. Montréal : Régie régionale de la santé et des services sociaux de Montréal-Centre, Direction de la santé publique; septembre 1998.

Wagner JC, Berry G, Skidmore JW, Timbrell V. The effects of the inhalation of asbestos in rats. *Br J Cancer* 1974; 29: 252-69.

WHO. Asbestos and other natural mineral fibres. International Programme on Chemical Safety (IPCS). Geneva: World Health Organization; 1986.

WHO. Chrysotile asbestos. Environmental Health Criteria 203. Geneva: World Health Organization; 1998.

APPENDIX

**RECOMMENDATIONS OF THE
ASBESTOS ADVISORY COMMITTEE**

APPENDIX RECOMMENDATIONS OF THE ASBESTOS ADVISORY COMMITTEE

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 *Commission de la santé et de la sécurité du travail* (CSST-a workers' compensation board) 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 *Commission de la santé et de la sécurité du travail* 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 *Commission de la santé et de la sécurité du travail* intervention program

That the *Commission de la santé et de la sécurité du travail* 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 Disposal¹ (under the authority of the *ministère de l'Environnement*), amended with regard to asbestos-containing materials.

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

¹ 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.

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 diseases², 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 *Commission de la santé et de la sécurité du travail*, 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 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 disease² 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 disease², thereby permitting epidemiological investigations to be conducted on the exposure characteristics of the cases.
- See the following paragraph.

² 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.

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 *Commission de la santé et de la sécurité du travail* and about the course of these diseases:

- That the *ministère de la Santé et des Services sociaux*, in consultation with the *Commission de la santé et de la sécurité du travail*, 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 *Commission de la santé et sécurité du travail*.

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 *Commission de la santé et de la sécurité du travail*, 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.

