

**National Specialty Society for Community Medicine  
Position Statement on Chrysotile Asbestos**

**June 2010**

**Background**

The adverse health effects associated with exposure to asbestos exposure have been well established. Epidemiological, clinical, and laboratory studies have shown that asbestos is capable of causing lung cancer, mesothelioma, and a range of asbestos-related diseases (International Agency for Research on Cancer [IARC], 1987). Asbestos is one of the most important occupational carcinogens causing about half of all deaths from occupational cancer. Currently, about 125 million people in the world are exposed to asbestos in the workplace, and at least 90,000 people die each year from lung cancer, mesothelioma, and asbestosis resulting from occupational exposures (Driscoll et al., 2005). In addition, it is believed that thousands of deaths can be attributed to other asbestos-related diseases as well as to non-occupational exposures, and the global burden of disease is still rising (World Health Organization [WHO], 2006).

Asbestos is a commercial term used to describe minerals whose crystals occur in fibrous forms. There are two major species of asbestos: the serpentines comprising the curly and soft chrysotile fibres (white asbestos) and the amphiboles, which include a series of subvarieties such as crocidolite (blue asbestos), amosite (brown/grey asbestos), anthophyllite, tremolite, and actinolite, presenting as hard needle-shaped rods. Chrysotile is mined for use in a wide range of manufactured products, mostly in building materials, friction products, and heat-resistant fabrics. Over 99% of the world's current asbestos production is chrysotile, and with 8.1% of the world production, Canada is the fourth-largest producer of chrysotile in the world next to Russia, China, and Brazil (Natural Resources Canada, 2009).

Knowledge of the associations between asbestos and adverse health effects has resulted in mounting public pressure against the further release of asbestos into the environment. New use of asbestos has almost completely ended in most developed nations as the result of government bans and market pressures. In contrast to this, and despite criticism from an international community of health professionals (Burki, 2009; Chaturvedi & Chaturvedi, 2001; Joshi & Gupta, 2004; Karzan-Allen, 2002; Karzan-Allen, 2004; Landrigan, 1998), Canada continues to export and extensively market chrysotile and chrysotile-based products to more than 70 countries around the world (Asbestos Institute, n.d.; Chrysotile Institute, 2005; Natural Resources Canada, 2006).

**Rotterdam Convention**

The Rotterdam Convention is an international treaty intended to promote cooperative efforts and shared responsibilities among member countries in relation to international trade and environmentally-sound use of hazardous chemicals.<sup>1</sup> Through a legally-binding Prior Informed

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<sup>1</sup> The text of the Convention was adopted on 10 September 1998 by a Conference of Plenipotentiaries in Rotterdam, the Netherlands. Canada became a Party to the Convention in 2002. The Convention entered into force with 50 Parties on 24 February 2004.

Consent (PIC) procedure, the Convention promotes information exchange and provides a means for all nation Parties to make informed decisions as to whether they will consent to future imports of hazardous chemicals listed in Annex III of the Convention. Parties decide whether to accept import, refuse import, or allow import under certain conditions, and all Parties are required to ensure that their exports do not take place contrary to an importing Party's import decision (Rotterdam Convention Secretariat, n.d.).

Along with other exporting nations, Russia and China, Canada opposed addition of chrysotile asbestos to Annex III at the Convention's Council of Parties meetings in 2004 and 2006 (Collier, 2008; Stayner, 2008). At the last meeting in Rome in October 2008, Canada abstained from discussions (Collier, 2008), but Parties were unable to reach consensus on amendment of Annex III. The agenda for the next meeting in 2011 will include further consideration of the issue and another opportunity to amend Annex III to include chrysotile asbestos (Rotterdam Convention, 2008). Although listing of a substance does not amount to a ban on trade, with this decision, Canada has an opportunity to change direction of its policy regarding export of this hazardous product.

### **National Specialty Society for Community Medicine**

Community Medicine physicians are public health experts uniquely qualified to evaluate the scientific literature and advocate for evidence-based decision making on matters that concern the health of populations. In this position statement, we are proposing that the NSSCM take a policy position on Canadian mining, use, and export of chrysotile asbestos. Advocacy is of particular importance now because this issue will again be addressed by the Government of Canada at the Rotterdam Convention Council of Parties in June 2011. The attention of a national and international community of concerned health professionals, politicians, policy-makers, industry representatives, and members of the public is directed towards the issue, and response requires careful and credible physician analysis of the issue.

### **Review of Recent Literature**

The focus of the ongoing controversy regarding the association between asbestos and adverse health effects has shifted from occupational to non-occupational exposures and to the differential risk of various asbestos fibre types, particularly chrysotile asbestos. Recent publications have proposed that: (1) chrysotile asbestos has minimum, if any, potential to cause mesothelioma, and the overall carcinogenicity of chrysotile is much lower than that of amphiboles; (2) the dose-response relationship between asbestos and lung cancer may be less steep at low doses than previously assumed, and therefore, a safe level of exposure exists; and (3) controlled use is an effective approach to managing the risks associated with asbestos exposure. Each of these considerations is examined here:

#### **(1) Chrysotile as a cause of mesothelioma and other cancers**

The opinion is held by some that chrysotile asbestos is much less hazardous than other types of asbestos, particularly with respect to causation of malignant mesothelioma (Bernstein & Hoskins, 2006; Gibbs & Berry, 2008; Yarborough, 2007). The two hypotheses used to support this opinion are the "Stanton hypothesis" and the "amphibole hypothesis." The Stanton hypothesis is based on animal

studies that suggest that long and thin asbestos fibres ( $\geq 8 \mu\text{m}$  in length and  $\leq 0.25 \mu\text{m}$  in width) are strongly carcinogenic, inducing pleural malignant mesothelioma, while shorter, thicker fibres pose a lesser risk. The amphibole hypothesis states that amphibole fibres are responsible for causing mesothelioma, since these fibres are found in the lungs of mesothelioma cases at autopsy, but chrysotile fibres are not.

Suzuki et al. (2005) tested the validity of the Stanton hypothesis through direct pathologic analysis of lung and mesothelial tissues taken from 168 cases of human malignant mesothelioma. Among the different fibre types detected in the samples, chrysotile was both the most common asbestos type to be categorized as short, thin fibres and the predominant fibre type detected. The authors conclude that “it is not prudent to take the position that short asbestos fibres convey little risk of disease.”

Although Suzuki et al. (2005) found chrysotile to be the predominant fibre type detected, chrysotile fibres are not commonly found in large quantity in human tissues at necropsy (McDonald et al., 1989). This is because chrysotile fibres may break down in the tissue and can subsequently be cleared from the lungs. Fibrils of fragmented chrysotile fibres may be small enough to avoid detection by electron microscopy (Smith & Wright, 1996). Alternatively, chrysotile fibres are preferentially ignored: Methods used in tissue fibre studies generally exclude short asbestos fibres less than  $5 \mu\text{m}$  (Yarborough, 2007). Finally, finding of a small amount of chrysotile and a significant number of amphibole fibres would likely indicate a major exposure to chrysotile, given chrysotile fibres are cleared from the lung with time and amphiboles are only a minor contaminant of chrysotile.

Recent research has helped narrow the scope of debate with increasing recognition that there may be differential risk between the dose-response for chrysotile and the amphiboles. However, the exact potency of chrysotile, per dose needed to cause mesothelioma, when compared to amphiboles remains controversial. In their analysis of epidemiological cohort studies examining the risk of asbestos exposure, Hodgson and Darnton (2000) report the relative potency for causing mesothelioma by crocidolite, amosite, and chrysotile in the ratio of 500:100:1, respectively. Conversely, Smith and Wright (1996) looked at the 25 cohort studies followed for more than 20 years having the highest ratios of pleural mesotheliomas per 1,000 deaths and concluded that crocidolite may be only 2-4 times more potent, and that no valid evidence supports the conclusion that amosite is more potent than chrysotile. This conclusion is supported by Nicholson's (2001) summary of more than 40 studies of different fibre exposure circumstances and direct calculations of risk. All available data suggest that chrysotile dominates the risk in those circumstances where it is the principal fibre in a mixed-fibre exposure setting.

In reality, naturally occurring chrysotile asbestos is typically contaminated with other types of asbestos. For example, amphibole contamination in Canadian chrysotile exported to a plant in Greece was measured to be 0.5% but sometimes approaching 3% (Sichletidis et al., 2009). Nevertheless, whether due to contamination with other asbestos fibres or not (Stayner et al., 1996; Yano et al., 2001), scientific evidence supports a causal relationship between chrysotile asbestos and mesothelioma (Lemen, 2004). Given the far wider use of chrysotile than of other types of asbestos, exposure to chrysotile products probably remains the leading cause of mesothelioma in the world (Smith & Wright, 1996; Cullen, 1998).

## (2) Dose-response relationships between chrysotile asbestos and adverse health effects

Reviews of the health effects of asbestos exposure have suggested that there is likely to be a cumulative chrysotile exposure below which there is negligible risk of asbestos-related diseases (Bernstein & Hoskins, 2006; Berry & Gibbs, 2008; Gibbs & Berry, 2008). These reviews reference Camus et al. (1998) who tested the United States Environmental Protection Agency's (EPA) model for predicting the risk of asbestos-induced lung cancer in a population of women living in townships in the province of Québec that have long been the major sites of asbestos mining in Canada. Camus et al. found no excess mortality due to lung cancer among women in the mining communities and concluded that the EPA's linear model overestimated the risk of asbestos-induced lung cancer by at least a factor of 10. The study is criticized by Landrigan (1998) who says that Camus et al. "go beyond their data" when they assert, without qualification, that the EPA's model overestimates the risk of lung cancer among persons with atypical, nonoccupational exposure to asbestos. The author also points out that observation by Camus et al. of a more than sevenfold mortality rate from pleural cancer in mining areas, as compared with nonmining areas, corroborates an enormous body of literature showing that Canadian chrysotile, like all forms of asbestos, is a potent carcinogen.

Little research has been conducted to identify an actual no-observed adverse effect level (NOAEL) for chrysotile-related lung cancer and mesothelioma. Meta-analyses of epidemiological cohort studies examining the risk of chrysotile asbestos exposure (Hodgson & Darnton, 2000; Berman & Crump, 2003) estimate that a worker exposed to 1 fibre per cubic centimetre per year (i.e. 0.1 f/cc-yr for 10 years) has an estimated probability in the order of 1 in 10 000 of dying of cancer due to exposure (Ogden, 2009). Pierce et al. (2008) summarize the cumulative exposure-response data reported for predominantly chrysotile-exposed cohorts in the published literature and report that the preponderance of the cumulative "no-effects" exposure levels for lung cancer and mesothelioma fall within a wide range of approximately 25–1000 f/cc-yr and 15–500 f/cc-yr, respectively. However, the authors identified numerous potential biases that could contribute to either over- or under-estimation of the risk and noted that many of the studies lack sufficient power to assess whether there could have been a significant increase in risk at the reported NOAEL. Furthermore, the analysis by Berman & Crump (2008) rejected the hypotheses that uncontaminated chrysotile asbestos caused no lung cancer or mesothelioma.

The conclusion that can be reached from the above analyses is that, while future research and meta-analyses may yet contribute to development of a non-linear, threshold model for chrysotile-related cancer risk, chrysotile exposure does carry risk, and no known safe threshold for chrysotile exposure currently exists.

## (3) Controlled use approach to managing asbestos exposure risks

Although the federal Government of Canada recognizes that all forms of asbestos fibres are carcinogenic, Canada's provincial and federal governments have adopted and advocate a controlled use approach for chrysotile (Government of Canada, 2004). The expression "controlled use" means that regulations to ensure safer handling of asbestos are in place and properly enforced in order to strictly control exposure to asbestos.

The controlled use approach is criticized by two main arguments. First, no known safe threshold for chrysotile exposure exists (Pierce et al., 2008). Second, the regulations and conditions critical to the approach do not exist (Kazan-Allen, 2002) or are impossible to enforce (Joshi & Gupta, 2004).

Joshi & Gupta (2004) note with concern that industries, like the asbestos industry, that are heavily regulated in the industrialized world due to their harmful environmental and health impacts are migrating to the developing world. They point out that the hazards of asbestos used in construction in developing countries are largely unappreciated and cite examples of related problems including: lack of government regulations for import, sale, and use; exclusion of asbestos-related diseases from national lists of notifiable diseases eligible for work-related compensation; inappropriate disposal of asbestos-containing waste posing risks to public health and safety; and the exploitation of unskilled, migrant, illiterate, and poor workers.

The Canadian Government admits that workplace health and safety is the responsibility of importing countries, and that Canada promotes its controlled use policy by providing information but has no legal authority to monitor use in other countries (Office of the Auditor General of Canada, 2007). Even in Canada where strict restrictions on the use of asbestos exist (Hazardous Products Act, 1985; Canadian Environmental Protection Act, 1999), the controlled use approach appears to be of questionable effect. The Asbestos Victims Association of Québec undertook an exploratory sampling of the air and soil in residential communities of asbestos mining towns between 2003 and 2004 and found evidence of significant chrysotile contamination in and around homes (Marier et al., 2007). In 2005, the Institut National de Santé Publique du Québec (Québec Institute of Public Health) released a report stressing statistically significant excess of pleural mesothelioma among residents of the Thetford Mine area (INSPQ, 2005).

### **Calls for an International Ban of Chrysotile Asbestos**

The World Trade Organization verdict of 2001 ruled against Canada's challenge to national asbestos bans and upheld the rights of the member states to ban chrysotile imports because of the non-threshold cancer risk of asbestos exposure, the practical impossibility of "controlled use" of asbestos products in construction, and the availability of safer substitute materials (Castleman, 2002). To date, more than 40 industrial countries, including all countries of the European Union, have banned asbestos (Burki, 2009; Kazan-Allen, 2010). The World Health Association (2006), International Labour Organization (2006), International Social Security Association (2006), World Federation of Public Health Associations (2005), International Commission on Occupational Health (2000), and the Collegium Ramazzini (1999, 2005) all support a global ban on mining and use of asbestos products.

Several Canadian medical and public health organizations are advocating for a ban on the mining, exportation, and use of chrysotile asbestos. Specifically, the Canadian Medical Association (2009) adopted a resolution that calls upon the federal government to: support the international designation of chrysotile asbestos as a hazardous chemical; eliminate the use and exportation of asbestos; and support the proper management of asbestos that has been used, including remediation.

The Canadian Public Health Association (2010) adds to these recommendations, whereby the Government of Canada is called upon to: support the listing of chrysotile asbestos under the

Rotterdam Convention; introduce legislation banning the mining, use and export of asbestos; cease funding to the Chrysotile Institute; increase surveillance of asbestos-related illnesses and compensation to those suffering from these illnesses; provide economic support to workers within the asbestos industry; and ensure safeguards with respect to asbestos exposure in public and commercial buildings.

Finally, l'Association des médecins spécialistes en santé communautaire du Québec (Association of Community Medicine Specialists of Quebec) (2010) recommends the following: that the federal government bans the mining, processing, and exportation of chrysotile asbestos; that chrysotile asbestos be listed as a hazardous chemical in the Rotterdam Convention; that the federal government ceases funding of the Chrysotile Institute; that the Quebec and Canadian governments support communities and workers who are dependent on the chrysotile industry; and that victims of asbestos exposure are compensated appropriately.

### **Recommendations**

Given that there is no evidence for a threshold for the carcinogenic effects of chrysotile asbestos; given that the “controlled use” approach endorsed by the Government of Canada is impossible to implement within developing countries that import Canadian asbestos; and given that the most efficient way to eliminate asbestos-related diseases is to stop using all types of asbestos, it is recommended that NSSCM adopt the following position statements:

- (1) That the mining and use of chrysotile asbestos in Canada be banned.
- (2) That chrysotile asbestos be included in Annex III of the Rotterdam Convention.
- (3) That the international sale and export of chrysotile asbestos and asbestos-containing products for use or disposal be banned.
- (4) That Canadian diplomatic influence be used with other exporting nations to support efforts for a legally binding treaty to ban asbestos mining and manufacturing around the world.
- (5) That workers and communities that are impacted by changed policies be supported through the transition to a ban.
- (6) That active reporting be encouraged for asbestos-related diseases in the general population.
- (7) That the public be educated about health issues related to asbestos exposure using current scientific knowledge about exposure risks and adverse effects.
- (8) That victims of asbestos-related diseases be appropriately compensated.

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