



Mercury Reduction Project – Crematoria Outreach and Consultation: Final Summary Report



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Project Overview

Project scope

The initial goals of the Crematoria Outreach and Consultation project were:

- to engage and educate owners, operators and employees of crematoria throughout Toronto about the role their industry has in reducing atmospheric mercury emissions;
- to work with this industry to develop information and guidelines for industry members; and,
- to develop a public-facing information brochure that could be used to educate the public and/or family members of the deceased about the importance of removing mercury-containing fillings before cremation.

Upon commencing stakeholder interviews, it immediately became clear that a slight change of scope was necessary; remains are sent from funeral homes to crematoria in sealed caskets, and the operators and staff of the crematoria are not legally permitted to open the casket for any reason. Thus, it became clear that primary stakeholders in removing mercury-containing fillings would instead be the owners, operators and employees of funeral homes. As the project progressed, it also became apparent that outreach to the dental industry would be valuable to close some knowledge gaps, so this industry was included in the stakeholder consultation phase.

We also intended to reach out to Toronto Police Services and/or morgues to explore the opportunities to implement a short-term pilot project to field-test the program resources and develop on-the-ground logistics. Further research determined that this facility would not be a good fit, as remains would be transferred to a funeral home for final preparations, and this is where family consent for any procedures would need to be obtained. Other options were explored, as will be described in the section [Pilot Project](#), below.

Further, as will be elaborated upon in the section [Additional Stakeholder Consultation](#) below, through the course of the stakeholder consultations it became clear that a robust industry guide will be a more valuable tool than a public-facing brochure.

In order to develop a good understanding of the scope of the problem, the industry, and the challenges in addressing dental mercury in the funeral services industry, the project was developed through the following phases:

- Initial research
- Industry outreach and information gathering
- Additional stakeholder consultation
- Pilot project investigation

The work that was done in each of these phases will be described in the following sections.

Initial Research:

The tasks undertaken during the initial research phase were as follows:

- Develop an initial overview of the problem
- Identify all stakeholders
- Investigate impact of mercury collection program on business operations
- Assess learnings from other jurisdictions

To complete these tasks, research was conducted to gain a better understanding of the funeral services industry, and interviews were conducted with stakeholders from several key industry associations. This initial research helped the program team to realize that the scope would need to shift from crematoria to funeral homes, as described above. Research also determined that the Funeral, Burial and Cremation Services Act requires the removal of pacemakers prior to cremation, as these can explode and damage the equipment. This procedure seemed comparable to the removal of teeth; therefore the procedure and waste disposal processes were included in interviews with additional stakeholders in the following phases of the project.

Research was also conducted to determine whether similar projects had been undertaken in other jurisdictions, and if so, what could be learned. Research determined that the removal of teeth prior to cremation had been considered in several international jurisdictions, as well as several states. The international jurisdictions opted for emission restrictions through abatement technologies. In Minnesota and Maine, bills were put before legislature, but were rejected. In most cases, public backlash, or concerns about public backlash were cited as significant contributing factors to opt against the removal of teeth prior to cremation. The key learnings from this research indicate that while there is precedent to consider such a procedure, public perception is a very significant factor that must be addressed. A more detailed overview of the landscape in other jurisdictions is included in the section [Other Jurisdictions](#) below.

A list of stakeholders was developed during this research phase, and further developed as research progressed. The complete list of stakeholders is as follows:

- Registrar for Ontario Board of Funeral Services
- Industry associations
 - Ontario Association of Cemetery and Funeral Professionals (OACFP)
 - Ontario Funeral Services Association (OFSA)
 - Cremation Association of North America (CANA)
- Individual funeral homes in Toronto
 - (from list provided by Toronto Public Health & additional research)
- Individual crematoria in Toronto
 - (from list provided by Toronto Public Health)
- Waste management facilities
 - Stericycle
 - Aevitas
 - Progressive Environmental
- Dental industry

- Royal College of Dental Surgeons of Ontario
- Ontario Dental Association
- Environment Canada
- Patterson Dental (dental amalgam supplier)
- Individual dentists
- Training colleges
 - Humber College

These stakeholders were then engaged through the following phases of the project.

Industry Outreach and Information Gathering

The tasks undertaken during the industry outreach and information gathering phase were as follows:

- One-on-one meetings with industry associations (3-5)
- Validate research findings
- Discuss current practices
- Review potential options to expand & improve the practices for managing mercury waste from this sector
- Solicit feedback on potential brochure

To complete these tasks, interviews were conducted with representatives from the key industry associations in Ontario, and from several funeral homes, and representatives from the key waste management facilities. The outcomes were lists of key considerations and key concerns. These lists are as follows:

Key considerations

- Neither the Ontario Board of Funeral Services, nor the industry associations interviewed would recommend that teeth be removed prior to cremation without there being a regulation in place (regulation was just updated in July 2012, no changes are planned soon)
- Additional training would be necessary for funeral directors to be licensed to perform dental removal (if this were to be included as a policy in the Funeral, Burial and Cremation Services Act)
- Funeral directors would prefer to have a simple form with waiver (as with pacemakers) rather than info brochure (or have this content added to the standard cremation waiver)
 - Bereaved families are inundated with info, another brochure could be overwhelming rather than helpful
- Potential negative effects on mouth shape from tooth removal; would be problematic for viewings

- Cremation rates vary significantly at different funeral homes (will be difficult to get City of Toronto average)
- Artificial joints do not combust, and are removed post-cremation
- All funeral homes are required to have a contract with a waste management contractor; this contractor could also manage dental waste

Key concerns

- How to identify teeth with amalgam fillings
- Some funeral directors were not sure that they would be legally allowed to perform this procedure
- Procedure is invasive; many funeral directors said they would not be comfortable performing this procedure
- Several funeral directors questioned how much mercury is really in the fillings and whether it would be worth it to remove them
- Funeral directors also had concerns about the potential impact that removing teeth would have on face shape for viewings

Additional Stakeholder Consultation – Funeral Services Industry

The tasks undertaken during the additional stakeholder consultation phase were as follows:

- Synthesize all findings/info from initial research into summary document
- Set up meetings with additional 10-12 stakeholders
- Solicit feedback on potential brochure

During this phase, 12 additional stakeholders (representatives from funeral homes) were interviewed. These additional consultations echoed considerations and concerns from initial research, listed above. Additional findings are as follows:

- Virtually all stakeholders feel that this procedure is too invasive
 - Though many would feel more comfortable with proper training (and understanding of tools and techniques to make process easier)
- Stakeholders anticipate pushback from funeral directors and from the public
- General consensus is that legislation would be necessary to make this change happen
- Facilities with high cremation rate are most concerned about the time/cost implications
- Many families are moving towards “immediate disposition” (no viewing, no traditional funeral ceremony); move is towards less handling of the body and less cost. Tooth removal procedure would be at odds with this trend
- Recent policy changes from standardized training & testing every 5 years to customizable training every year (trainees can choose to focus on what is of interest)

Additional feedback about the necessity of a public-facing brochure was also gathered. This feedback was as follows:

- Brochure not necessary
- Industry guide type document would be more useful:
 - How to identify teeth that need removal
 - Tools/procedures
 - Key points to make a case to bereaved families (similar to how pace maker removal is handled)

Additional Stakeholder Consultation – Dental Industry

Following the stakeholder consultation with the funeral services industry, knowledge gaps emerged around the appropriate tools and techniques for removing teeth, and also the average number of fillings that a funeral could expect to see per mouth. Therefore an additional research phase was added; during this phase the following tasks were undertaken:

- Identify key stakeholders in the dental industry
- Determine best practices for tooth removal in a funeral home context
- Identify best practices for disposal
- Investigate average number of fillings per person

Outreach began with Environment Canada and the Ontario Dental Association, as both organizations have conducted research into the use and disposal of dental amalgam in the past. Further, calls were made to practicing dentists to gather practical advice and insight, and a supplier of dental equipment and supplies was consulted regarding trends in amalgam use and sales and appropriate tools for this application. It is worth noting that only 2 practicing dentists were willing to participate in this consultation;

As with the funeral services industry consultations, lists of key considerations and key concerns were compiled.

Key Considerations

- While crematoria mercury emissions are a known issue, there are currently larger sources of emissions on a National scale, so these emissions are not currently a regulatory priority
- Average number of fillings per person is very difficult to determine, as it will vary significantly from individual to individual depending on age, oral care, and access to dental care
- Similarly, it proved difficult to find any official information about trends in amalgam use; Patterson Dental (which has been selling amalgam for 100+ years) was able to provide the following anecdotal information (which was corroborated by other dental industry stakeholders):

- In urban areas there has been an almost exponential decrease in amalgam use (consumers don't want it) over the last 25 years
 - Related to improvements in composite quality/lifespan
- Change has been slower in smaller communities and rural areas
- Older dentists often prefer amalgam, as they are more experienced in using it, while younger dentists prefer composite
- Amalgam use is still prevalent in the Territories, on First Nation Reserves, and in some small towns
 - Due to lack of access to dental services; often a dentist will spend a few months traveling to remote areas performing dental services; amalgam is preferred due to both the lower cost and the longer life span as compared to composite alternatives
 - Anecdotal evidence suggests that many programs funded by the government specify that amalgam fillings be used, though no specific policy could be found
- While there is some acknowledgement of the risks of mercury amalgam fillings to both human and environmental health, there is also a reticence to publicly acknowledge these risks and discontinue the use of amalgam
 - Industry does not want to be seen as having endorsed potentially harmful substance
 - There is a desire to have options as to what materials can be used for restorations
 - Certain segments of the industry still highly value mercury amalgam for its long life span and low costs

Key Concerns

- While dentists have the expertise to perform an extraction or a filling removal, they do not have the same comfort level in dealing with the deceased that a member of the funeral services industry must have
- Tooth held in place by a ligament and surrounding bone; dentists wondered whether this ligament would change after death (making extraction easier or more difficult). No resources were available to determine what chance may take place
- It is also worth noting that depending on the individual's level of oral self care there could be varying levels of bone loss surrounding the ligament; in the case of moderate to advanced bone loss, the tooth would be loose and therefore extraction would be much easier. Typically older populations are not as compliant with oral self care, which makes moderate-advanced bone loss much more likely
- Some concern about the nature of the procedure as it relates to The Regulated Health Professions Act (http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_91r18_e.htm#BK29), which defines certain "Controlled Acts" that must not be performed by anyone unless that person "is a member authorized by a health profession Act to perform the controlled act"

- Controlled acts include: “Performing a procedure on tissue below the dermis, below the surface of a mucous membrane, in or below the surface of the cornea, or in or below the surfaces of the teeth, including the scaling of the teeth.”
- Fortunately this Act only applies to living patients, as it is intended to prevent harm to patients; the Royal College of Dental Surgeons was of the opinion that this Act would not apply to extracting teeth after death
- Research conducted by the dental industry has also suggested that stakeholders are opposed to removing teeth prior to cremation, as it is seen to be unduly cruel to mourning family members

Dental Extraction Considerations

- Extraction tools include:
 - Forceps
 - Elevator (optional)
 - Mouth props
 - Jaw opener (optional; could be useful for opening the mouth of the deceased)
- In dentistry specialized forceps and elevators are used for different teeth; in the case of a post-mortem extraction, non-specialized tools should be sufficient
 - In a typical extraction, precautions must be taken to ensure that neither the tooth nor the root are broken (primarily through use of the elevator for loosening the tooth in its socket); this would not be as necessary in post-mortem extractions

Pilot Project

Research determined that the initial goal of conducting a pilot with Toronto Police Services would not be a good fit. Remains that are claimed by families go through the funeral service industry and those that are unclaimed are buried, never cremated. This policy ensures that religious or cultural beliefs are not violated unintentionally, and that if a family is located, they are able to visit the burial site and have the remains relocated if they wish.

Given the above finding, we attempted to identify a funeral home that would be willing to participate in a pilot project. However, as was discussed in the sections above, stakeholders expressed both technical and social concerns about participating. That is, stakeholders were uncertain about the actual tools and processes that would be necessary, and were also concerned about respecting the dignity of the deceased.

Further outreach was undertaken to attempt to identify a hospital that would be willing to participate by performing the extractions prior to releasing remains to the funeral home, or perhaps in conjunction with any organ donations that were occurring. Sunnybrook was recommended as a promising option. Unfortunately Sunnybrook was not interested and inquiries to other hospitals were not answered.

Key Findings

Overview of the Problem

Mercury has been used in dental amalgam for approximately 150 years, and composite has only been a viable option for approximately 25-30 years (early composites were prone to breakage). While mercury amalgam fillings are relatively stable and intact while intact, once exposed to the high temperatures used in cremation, the mercury is vaporized and emitted from the stack. Once in the atmosphere, mercury can travel a vast distance and make its way into water systems where a process called “methylation” occurs, converting the mercury to a much more toxic form, monomethylmercury. Therefore, it is important to reduce the amount of mercury that is being emitted into the atmosphere as much as possible.

Unfortunately, given current trends, mercury emissions from crematoria have been increasing, a trend which is likely to continue for the next 20 years. According to the Cremation Association of North America (CANA), in Ontario the cremation rate has been increasing steadily from 36% in 1995 to 54.2% in 2011 (the most recent year available), and is projected to continue to rise to 59.4% by 2016. In itself, this trend suggests that emission rates from cremation will increase. Coupled with this trend, improvements in dental care have meant that people are keeping a larger number of their teeth until death; among the older population, many of those teeth contain mercury amalgam fillings. As a result, mercury emissions from cremation are also steadily increasing. Studies conducted in the UK suggest that emissions will continue to increase until 2020 then plateau until 2035, at which point they will begin to gradually decline, reaching 2000 levels by approximately 2055.

Volume of mercury per cremation

Estimates as to the volume of mercury emitted per cremation vary significantly from study to study, and will also vary depending on the number and of mercury fillings present in the mouth of the deceased, as well as the size of those fillings, and the type of equipment that is used for the cremation. While the City of Toronto has adopted the EPA standard of 1 gram of mercury per cremation, it is worth noting that in certain circumstances the volume could be even higher. The study upon which the EPA based their assumption of 1 gram per cremation (the “Woodlawn Study”) has also been criticized for a lack of rigor (notably in “Dust in the Wind? The Bell Tolls for Crematory Mercury,” Batchelder). Studies from the UK have shown an average of 2-4 grams per cremation (see Batchelder and Reindl), whereas studies in Japan have shown a rate of only 31.7 mg per cremation (M. Takaoka et al). Factors impacting this emission rate include size of the fillings, number of fillings, composition of amalgam (percentage of mercury), and the crematory equipment itself. However, even one gram of mercury has a significant impact—one gram of atmospheric mercury deposited into a 20 acre lake is enough to render the fish inedible. This impact is then multiplied by the number of cremations that are performed annually at each facility.

Other Jurisdictions

Studies from other jurisdictions (UK, US) show that while mercury emissions from most sources are decreasing, emissions from crematoria are steadily increasing. Some other jurisdictions have taken action to address this issue. Three European countries have national mercury emission standards: UK, Norway, and Switzerland (Reindl).

In 2005 the UK Department for Environmental, Food & Rural Affairs (Defra) established a target of reducing mercury emissions from crematoria by 50% through the use of mercury abatement equipment. A “burden-sharing scheme” has been established to allow crematory operators to decide whether to install the equipment or to contribute to the cost of other crematoria doing so (see burden-sharing details here: www.cameoonline.org.uk). All new crematoria will be required to install the equipment. Prior to developing this scheme, the removal of teeth prior to cremation was considered, but ultimately rejected due to concerns of the impact on bereaved relatives.

In Norway the Pollution Control Authority (SFT) implemented air and water regulations for crematoria, which went into effect in 2003 for new facilities and 2007 for existing crematoria, and are aiming for a 95% reduction in mercury emissions. Here too the removal of teeth prior to cremation was considered but rejected.

In Switzerland there is less reliable info available, but a study cited by Reindl suggests that a regulation went into place at the end of 1991 limiting mercury emissions to 0.2 mg per hour of operation. The study suggests that since not all crematoria have abatement equipment (13 of 59 facilities), remains with a large number of mercury fillings are being directed to those facilities with the equipment in place.

In another attempt to address the issue of crematory mercury emissions, as well as public health concerns, Norway, Denmark and Sweden have enacted legislation that bans mercury amalgam completely in their countries. In Norway and Denmark legislation was enacted in 2008, with Sweden following in 2009.

In the US, several states (California, Minnesota, Maine and Virginia) have considered and/or recommended the removal of teeth with amalgam fillings prior to cremation, but no policy has been adopted. In Minnesota and Maine bills requiring the removal of teeth with mercury amalgam fillings were put before legislature, but were rejected. In Maine there was significant public backlash in the media. In California and Virginia, the removal of teeth prior to cremation was recommended, but no bills were ever put forward.

In Virginia, the recommendation to remove teeth prior to cremation was made by the Virginia state advisory Board on Air Pollution. Their study, conducted in 2006, calculated the cost of removing teeth with amalgam fillings. This cost was based on charge of \$25 per cadaver, assuming an average of 8 fillings and 3.2 grams of mercury per person, and was estimated to be approximately \$3,500 per pound of mercury captured. However, this figure may not be

relevant to this project; many of the funeral directors who were interviewed during the stakeholder consultation phase indicated that they do not charge for pacemaker removals and suggested that they would likely not charge for tooth extraction either.

The jurisdictional review also revealed that a project similar to the pilot that was attempted for this project was undertaken in Colorado in 2007. The “Pollution Prevention Crematoria Project” was intended to be a voluntary project undertaken with the crematoria industry to reduce crematoria mercury emissions by removing teeth with mercury fillings prior to cremation. A steering committee comprised of representatives from crematoria, funeral homes and trade associations was assembled to develop a voluntary system, similar to organ donation, in which families would choose to have teeth with mercury amalgam fillings removed from the deceased prior to cremation. This system would rely on public education and industry outreach to the bereaved. However, the funeral services industry withdrew from this project prior to implementation, opting for a regulatory approach.

Conclusions

While a long term solution to the problem of mercury emissions from crematoria is the elimination of mercury amalgam in favour of composite fillings, this solution does not address the amalgam fillings that are already in use. To address the current stock of mercury amalgam fillings, the alternatives are abatement technology, which is expensive, time consuming to install, and will not completely eliminate all mercury emissions, or the removal of teeth with mercury amalgam fillings. As this report has shown, tooth extraction is a viable option but there are significant obstacles.

All jurisdictions examined during this research agreed that removing teeth prior to cremation is the lowest cost and most effective way to reduce mercury emissions from crematoria; however, they also agreed that there are considerable obstacles to this approach in the form of public opinion and industry reticence. The stakeholder consultations conducted as a part of this project support the findings of these other jurisdictions with regard to public and industry objections. Public and industry facing education and outreach will be necessary to overcome public opposition to this approach. The industry guide that has been prepared in conjunction with this report is a first step to getting industry support, but may not be sufficient to change the minds of stakeholders who are opposed to this approach.

In order to truly address the issue of crematory mercury, a regulatory approach will likely be necessary. Due to the fact that a regulation favouring abatement equipment would impact crematoria, whereas a regulation favouring tooth extraction would impact funeral homes, extensive stakeholder consultations would be necessary. Perhaps an approach that combined a cost-sharing approach similar to that in the UK with a tooth extraction alternative could provide the flexibility to not necessarily impose mandatory high costs on the crematoria, but to present an option for those funeral directors who are firmly opposed to tooth extraction. In any case, both sectors of this industry would need to be engaged to find an appropriate regulatory solution.

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