

# What Patients Don't Know:

*Dentists' Sweet Tooth for Mercury*



February 14, 2006

# Acknowledgements

The authors would like to thank the Garfield Foundation, the John Merck Fund the Orchard Foundation, and the International Academy of Oral Medicine and Toxicology for their generous support.

Co-releasers of the Report include:

Mercury Policy Project  
Consumers for Dental Choice  
New England Zero Mercury Campaign\*  
Sierra Club California  
Clean Water Action California

\*New England Zero Mercury Campaign partners include:  
Clean Water Action New England, Clean Water Fund New England,  
Mercury Policy Project, A Project of the Tides Center, Natural Resources Council of Maine,  
National Wildlife Federation

The contents of this report are the sole responsibility of the report co-releasers

## On the Web

For a copy of this report, go to [www.mercurypolicy.org](http://www.mercurypolicy.org) or [www.cleanwateraction.org/mercury](http://www.cleanwateraction.org/mercury).

# Introduction

For over 150 years, mercury-containing fillings (often called “silver” or “amalgam”) have been used extensively to fill dental cavities. Four metals—mercury, silver, copper and tin—primarily comprise amalgam, with mercury being approximately 50 percent by weight.<sup>1</sup> While use of mercury-free fillings<sup>2</sup> is becoming more prevalent, most dentists in the United States still use mercury-containing amalgam.<sup>3</sup>

Mercury use in health, consumer, and industrial products has declined precipitously in all products over the past thirty years. But in dentistry, this decline has been slight, such that dental fillings jumped from 2 percent of all mercury products two decades ago to over 20 percent in 2001.<sup>4</sup> That dentistry still uses a health care product containing mercury is increasingly an anomaly among health care professionals. Organizations ranging from the American Public Health Association to the California Medical Association have called for a ban on all mercury-based products,<sup>5</sup> and the American Hospital Association has agreed to “virtually eliminate” all mercury waste.<sup>6</sup>

While mercury use is declining or being eliminated in other health care products,<sup>7</sup> the continued use of dental mercury warrants further attention.

This report sets out to examine what the American public knows about mercury-containing fillings, mercury pollution, and current dental mercury practices – as well as to make recommendations for reducing the use and release of mercury from dental fillings.

To find out, a Zogby International poll conducted for the Mercury Policy Project/Tides Center, and paid for by the International Academy of Oral Medicine and Toxicology, sought to answer the following questions:

- Are consumers aware that “silver” fillings are mainly mercury?
- Would they choose otherwise if they knew?
- Do people think mercury is a serious environmental problem?
- Do they believe dentists should advise them about the mercury content of amalgam fillings?
- Would they favor laws mandating such notification?
- Would they support a ban on the placement of mercury amalgam in pregnant women and children? (*asked only of New Englanders*)

## Poll Results Summary

---

Last year, a poll by Zogby International suggested that Connecticut consumers don’t know about the mercury content of amalgam, and they would pay more to get a different filling material. Following up on that survey, Zogby International conducted a national telephone survey and region-specific interactive surveys in New England and California on consumer attitudes on dental fillings and mercury for this report.

What follows is a summary of the poll’s results. (See Appendix A for the questions that were asked in the poll and an analysis by Zogby International of national, New England and California poll results.) The margin of error is +/- 2.9 percentage points, with margins of error higher in sub-groups. Zogby International’s sampling and weighting procedures also have been validated through its political polling: more than 95 percent of the firm’s polls have come within 1 percent of actual election-day outcomes.

The major findings of this new national poll are as follows:

- Most Americans (76 percent) don’t know mercury is the primary component of amalgam fillings;
- Americans overwhelmingly (92 percent) want to be informed of their options with respect to mercury and non-mercury dental filling materials prior to treatment;
- The majority (77 percent) of Americans would choose higher cost fillings that do not contain mercury if given the choice;
- Close to half (47 percent) of all Americans think mercury pollution poses a serious problem for the environment;
- More than two-thirds (69 percent nationally) of New Englanders would support a ban on mercury amalgam fillings for pregnant women and children.

The poll results indicate that most Americans don't know that mercury is the largest single component of amalgam fillings. On the other hand, close to half of all Americans think mercury pollution poses a serious problem for the environment. Therefore, it is not surprising that Americans overwhelmingly want the freedom to choose between mercury and mercury-free dental fillings and to be informed about this choice

prior to treatment. Given the choice, the poll indicates that the vast majority of Americans would choose higher cost fillings that do not contain mercury. These poll results are important for several reasons, especially when placed into a broader societal context, as explained in more detail in the remainder of the report.

## Environmental Concerns of Dental Mercury Pollution

Dental clinics are the third largest users of mercury in products in the United States. Dental procedures involving mercury-containing fillings can result in significant mercury releases from clinics, contributing to the build up of this toxic heavy metal in the local and global environment. In 2004, the U.S. Environmental Protection Agency (EPA) estimated that dental clinics used 34 tons of mercury annually, or 14 percent of the total annual mercury consumption in products (see Figure 1). The American Dental Association (ADA) estimates that over 100,000 dental clinics place approximately 70 million mercury-containing fillings in people's mouths each year and that each one may contain 0.5 to 0.75 grams of mercury, depending on the size of the filling.<sup>8</sup> About 70 percent of these are replacements for old fillings, according to the ADA.

Dental clinics are the single largest polluters of mercury into municipal wastewater. Studies by the EPA and numerous municipalities document that

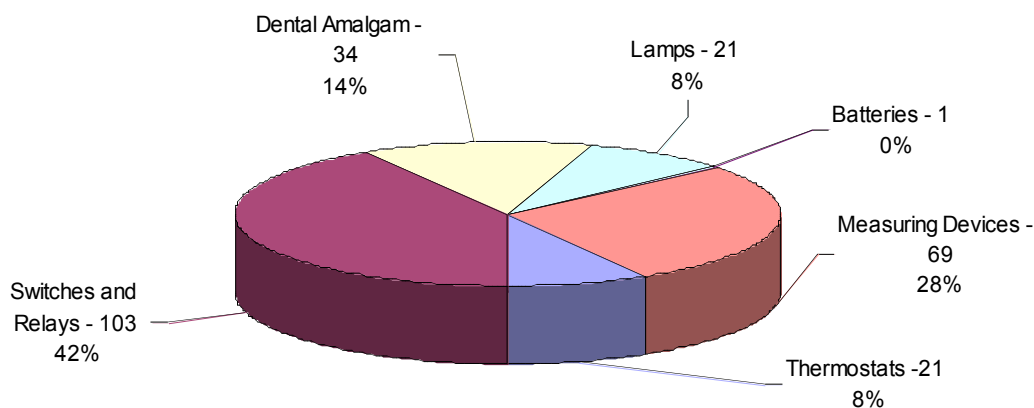
most municipal wastewater treatment plants have high levels of mercury with significant contributions from dental clinics.<sup>9 10</sup> The Association of Metropolitan Sewerage Agencies evaluated seven municipal wastewater treatment plants, and dental uses were identified as "by far" the greatest contributors to the mercury-load, accounting on average for 40 percent of the load.<sup>11 12</sup>

The amount of mercury amalgam discharged to wastewater is likely to be more than the amount used each year because many dentists remove mercury-containing fillings and replace them with mercury-free material. Thus, dentists currently discharge much more mercury amalgam than they purchase. In most cases, when mercury fillings are placed, removed, or repaired elemental mercury is washed down the drain, where it makes its way to a wastewater treatment plant, and then out into the environment.<sup>14</sup> Yet a small, but increasing number of dentists are following best management practices and installing amalgam

**Figure 1: U.S. Dentists Use 34 Tons of Mercury Each Year**

Total Annual Consumption = 276 tons

Estimated Annual Consumption of Mercury in Products<sup>13</sup>



Source: EPA 2004 International Mercury Market Study and the Role and Impact of US Environmental Policy.

separators, as a way to reduce environmental releases of mercury from fillings.

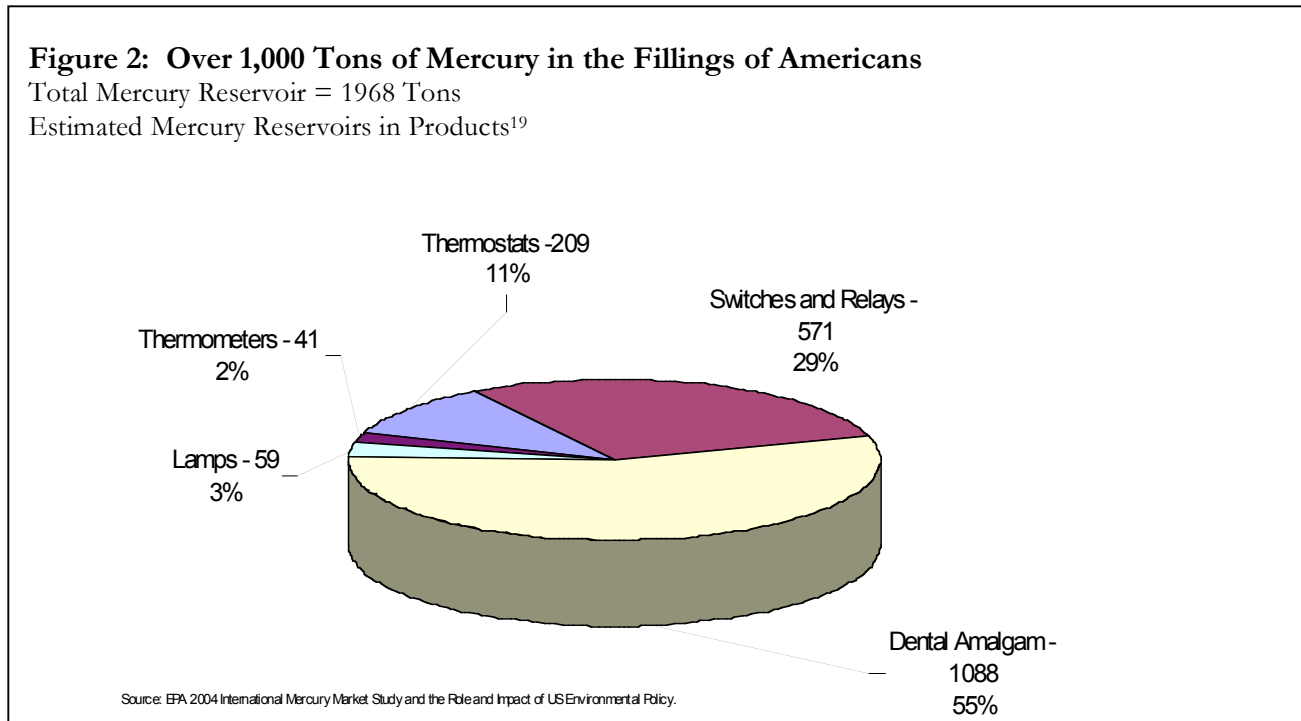
Significant amounts of dental mercury are deposited into the trash, biomedical waste containers or make their way into wastewater sewage sludge, with the finer particles often released into lakes, rivers, or oceans. Many municipalities either incinerate or land dispose of sewage sludge, resulting in the airborne release of mercury. When mercury is deposited into water bodies, it can be converted into its most toxic form, methylmercury, that accumulates in people through the fish they consume. When wildlife and humans eat mercury-contaminated fish, the exposure can cause damage to the functioning and development of the central nervous system.

Mercury in amalgam also enters the environment directly from its human hosts. Mercury in fillings continually volatilizes, releasing small amounts of mercury into the body. Some of the mercury in amalgam is passed through the digestive system into wastewater. After releases from dental offices, human waste is the second greatest contributor of dental mercury to wastewater treatment plants.<sup>15 16</sup>

Crematoriums also emit significant quantities of mercury into the air when mercury-containing fillings are incinerated. Crematoria emission rates are expected to more than double over the next 20 years to reach 5 tons per year, due to the greater amounts of mercury in teeth, the significant increase in cremations in the United States, and the number of deceased cremated with amalgam fillings.<sup>17</sup>

Dental mercury is also released to groundwater and into the air from septic tanks and landfills. In addition, dental offices have been identified as a significant direct source of mercury vapor entering the atmosphere.<sup>18</sup>

Annual additions of mercury into cavities have added up over time. EPA estimated in 2004 that there are over 1,000 tons of mercury in the mouths of Americans – more than half of all mercury currently being used in the U.S. today (see Figure 2). This giant reservoir will eventually wind up in the environment if it is not captured and collected.



# Exposure Concerns from Dental Mercury Amalgam

---

Mercury is a heavy metal that exists in several forms, all of them toxic to humans and the environment. A World Health Organization (WHO) scientific panel concluded that “a safe level of mercury exposure below which no adverse effects occur has never been established.”<sup>20</sup>

Once released to the environment from a variety of sources—including dental clinics and human wastes—mercury persists in the environment, where it is converted into a form called methylmercury. Methylmercury accumulates in the bodies of fish and wildlife, so that people, larger fish and other animals at the top of the food chain tend to accumulate the most methylmercury.

Anyone eating fish contaminated with methylmercury is at risk from its potential to damage the brain, heart and other organ systems. It’s thought, however, that young children and developing fetuses are at the greatest risk from exposure to methylmercury. EPA scientists estimate that around 300,000 children—or one newborn in ten—are born at risk of neurological harm each year in the U.S. as a result of maternal exposure to methylmercury.<sup>21</sup>

Dental amalgam contains elemental mercury, rather than methylmercury. Experts from the WHO<sup>22</sup>, as well

as several U.S. federal health and research agencies,<sup>23</sup> agree that dental amalgam is the largest source of human exposure to mercury.<sup>24</sup> In addition to direct exposure, amalgam disposal can increase the load of mercury to both the local and global environment, as well as the levels of exposure to methylmercury through the fish that Americans eat.<sup>25</sup>

The main route of exposure to mercury from dental amalgam is through inhalation of elemental mercury vapor.<sup>26</sup> Approximately 80 percent of inhaled mercury vapor is absorbed by the lungs.<sup>27</sup> U.S. government studies indicate that inhaled elemental mercury is converted to inorganic mercury in the body<sup>28</sup> and that mercury from amalgam is passed to babies via the placenta and through breast milk.<sup>29</sup>

As much as 50 percent of the mercury in dental fillings can be vaporized after 5 years, and 80 percent after 20 years.<sup>30</sup> Depending on the number of fillings and other factors, the average daily absorbed dose of mercury from mercury-containing fillings is between 3 and 17 micrograms.<sup>31</sup> Common habits such as chewing gum,<sup>32</sup> drinking of hot liquids, tooth brushing, and grinding of teeth greatly increase the amount of mercury vapor released and thus individual exposure.<sup>33 34</sup>

## Use of Mercury Amalgam in U.S. Dentistry

---

While consumer knowledge about risks associated with mercury in mercury-containing fillings is low, the dental profession is well-informed. Starting in 1997, the second largest U.S. amalgam manufacturer, Dentsply, advised dentists against placing mercury-containing fillings in pregnant women or children. Although these warnings were subsequently withdrawn, they are still in place in other countries.<sup>35</sup>

The largest U.S. manufacturer, Kerr, warns dentists in its Materials Safety Data Sheet that, “The health authorities of the various countries, including Canada, Germany, France, the United Kingdom, Norway and Austria have recommended against the placement or removal of an amalgam in certain individuals such as pregnant and nursing women and persons with impaired kidney function.”<sup>36</sup>

Dentists are so well-advised about the toxicity of mercury amalgam use that they may not sue the manufacturers for neurological damage caused by constant workplace exposure to amalgam.<sup>37</sup> Dentists not only receive warnings from manufacturers, but they also receive the following recommendations from the ADA’s Dental Mercury Hygiene Recommendations: “...use care when handling amalgam... avoid skin contact with mercury or freshly mixed amalgam... recap single-use capsules after use... store them in a closed container... work in well-ventilated work areas, with fresh air exchanges and outside exhaust... periodically check the dental operatory atmosphere for mercury vapor... remove professional clothing before leaving the workplace.”<sup>38</sup>

Clearly, then, the ADA is well aware of human exposure concerns related to mercury-containing filling materials.

While neither the ADA, state dental societies nor federal authorities have acted to reduce overall mercury amalgam use, Sweden, Germany, Denmark, Norway, Finland, Austria, and Canada have all sought to reduce or phase out mercury use by dentists<sup>39</sup> - especially in pregnant women, children and those with impaired kidney functions. Health Canada, Canada's federal health agency, has advised a precautionary approach whereby pregnant women, children under six, and persons with kidney problems should never receive mercury amalgam fillings.<sup>40</sup> The U.S. Agency for Toxic Substances for Disease Registry advises, "...pregnant women, children under the age of 6 (especially up to the age of 3), people with impaired kidney function, and people with hypersensitive immune responses to metals..." to "...discuss your medical condition with your dentist prior to any dental restoration work."<sup>41</sup>

Some countries discourage mercury amalgam use by eliminating insurance coverage for it, a strategy which has also been endorsed by the New Jersey Mercury Task Force.<sup>42</sup> In contrast, many U.S. dental insurance companies perpetuate mercury-containing filling use by *only* covering the cost of the mercury-containing fillings.

For reasons ranging from health, environmental and liability concerns to patient preferences (including cosmetic reasons), a large and growing number of dentists have ceased placing mercury fillings in favor of alternative materials. According to an informal survey, the percentage of general dentists still placing mercury amalgam has declined to 68 percent.<sup>43</sup> Indeed, the number of "mercury-free" dentists who pledge not to place amalgam in their patients, has increased in each informal survey by Clinical Research Associates over the past twenty years<sup>44</sup> and three national dental societies have been created whose mission includes promoting mercury-free dentistry.<sup>45</sup>

## Conclusion

---

In the past 30 years, U.S. government reports have documented the toxic effects of mercury resulting in this known neurotoxin being phased out of nearly every facet of manufacturing, consumer products and medical care. The U.S. Environmental Protection Agency estimates that total mercury use today is less than half of the amount used a decade ago, dropping from 436 tons used in 1995 to less than 218 tons in 2004.<sup>46</sup>

Meanwhile, the dental industry continue to place upwards of 70 million mercury fillings a year, accounting for some 34 tons of mercury annually used, according to the U. S. Environmental Protection Agency. Dental mercury emissions are the largest source of mercury pollution into the Nation's wastewater.

Despite the fact that the American Dental Association and the dental industry are well aware of the risks of mercury in the dental office, to pregnant women and children, and to the environment, warnings to dentists on the Material Safety Data Sheets<sup>47</sup> for dental amalgam are not routinely passed on to patients.

However, it's clear from the poll results that the overwhelming majority of Americans – 92 percent – want "informed consent" about potential risks from mercury dental fillings or alternatives before anything is put into their mouths. This polling result was not surprising given that many Americans also believe mercury pollution is a serious problem. Many dentists may also not tell patients of other affordable alternatives, even though according to the poll, 77% would choose higher-cost fillings that do not contain mercury, if given the choice.

As health professionals, the dental industry and dental associations have a professional and moral obligation to put the safety and welfare of their patients first. The following recommendations would help ensure that dental patients are educated about their choices in care and given adequate insurance coverage to afford the appropriate choice, and that essential steps are taken to reduce dental mercury use and releases to the environment.

# Recommendations

---

**1. The U.S. Food and Drug Administration should provide consumers with balanced information regarding the risks of mercury-containing fillings and the alternatives.** The FDA needs to provide information so that consumers have the necessary information to make informed choices. The government of Canada undertook a comprehensive review a decade ago, and recommended that dentists stop placing mercury amalgam in pregnant women, children, and people with kidney problems.<sup>47</sup> The governments of Norway and Sweden undertook extensive comprehensive reviews and indicated that mercury amalgam is being phased out for public health and environmental reasons.<sup>48 49</sup>

**2. States should require dentists to provide information about risks to human health and the environment from using mercury-containing fillings.** Dentists receive notices from manufacturers regarding health risks of amalgam, especially concerning children and pregnant women, but many are not passing on these warnings to their patients. Since most consumers aren't aware of the mercury in dental amalgam, action by the states is clearly needed if patients are to make an informed choice. California and Maine passed legislation that requires dentists to provide notices in clinics and information to patients.<sup>50</sup> (See information about the Maine brochure in Appendix B.) Other states should follow their lead.

**3. States should require dental clinics to collect and properly manage mercury waste.** There are affordable solutions available to prevent dental mercury releases. The technological changes required in dental offices to reduce mercury emissions are straightforward to install and operate, and are relatively inexpensive. For example, it costs dentists between \$37 to \$100 per month to prevent mercury releases down the drain. States should ban dental mercury disposal into all waste streams, and require dental clinics to adhere to best management practices in their offices. These practices should include: installing and properly maintaining amalgam separators to reduce dental mercury releases by at least 98 percent; cleaning and replacing mercury-laden pipes and plumbing fixtures; properly managing excess quantities of mercury; and submitting annual reports on dental mercury use and reduction initiatives.

**4. States should require that all state health insurance contracts award coverage for mercury-free fillings that is equal to or greater than that awarded for mercury fillings.** The State of Rhode Island has established procurement preferences that require state dental insurance to provide coverage for non-mercury fillings at no additional expense to the state employee. Other states should follow Rhode Island's lead and expand coverage to state employees and to the general population.



# Appendix A

---

## Results from nationwide poll and interactive poll in California and New England



**Date:** January 16, 2006

**To:** Michael Bender  
mercurypolicy@aol.com

**From:** Rebecca Wittman  
rebecca@zogby.com  
315-624-0200

**RE: Results from nationwide poll, and interactive poll in California and New England**

### Survey Methodology Zogby America 1/9/06 through 1/12/06

This is a telephone survey of adults conducted by Zogby International. The target sample is 1,216 interviews with approximately 72 questions asked. Samples are randomly drawn from telephone cd's of national listed sample. Zogby International surveys employ sampling strategies in which selection probabilities are proportional to population size within area codes and exchanges. As many as six calls are made to reach a sampled phone number. Cooperation rates are calculated using one of AAPOR's approved methodologies<sup>1</sup> and are comparable to other professional public-opinion surveys conducted using similar sampling strategies.<sup>2</sup> Weighting by region, party, age, race, religion, and gender is used to adjust for non-response. The margin of error is +/- 2.9 percentage points. Margins of error are higher in sub-groups.

Zogby International's sampling and weighting procedures also have been validated through its political polling: more than 95% of the firm's polls have come within 1% of actual election-day outcomes.

---

<sup>1</sup> See COOP4 (p.38) in *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates of Surveys*. The American Association for Public Opinion Research, (2000).

<sup>2</sup> *Cooperation Tracking Study: April 2003 Update*, Jane M. Sheppard and Shelly Haas. The Council for Marketing & Opinion Research (CMOR). Cincinnati, Ohio (2003).

## Interactive Survey Methodology

Zogby International conducted interviews of 2,590 adults in CA, CT, MA, ME, NH, RI, and VT. Panelists who have agreed to participate in Zogby polls online were invited to participate in the survey. The online poll ran from 1/13/06 through 1/16/06.

The margin of error is +/- 2.5 percentage points in the California sample of 1,643. Margins of error are higher in sub-groups. Slight weights were added to age, race, and gender to more accurately reflect the population.

The margin of error is +/- 3.2 percentage points in the Northeast states sample of 947. Margins of error are higher in sub-groups. Slight weights were added to state, age, race, and gender to more accurately reflect the population.

### Narrative Summary

**45. One of the materials used by dentists to fill cavities is amalgam. Amalgam fillings contain several metals. Do you know what the primary metal in amalgam is?**

**Table 1.**

	Nationwide	California	New England
Mercury	24	40	35
Silver	12	23	22
Zinc	8	4	6
Gold	2	1	0
Not sure	54	32	37

A plurality of people in each of the three groups identifies mercury as the primary metal in amalgam. This percentage is highest among California respondents (40%), with one-third in New England (35%) and one in four nationwide (24%) citing mercury.

Silver ranks second in each of the three groups, as is it mentioned more frequently in California (23%) and New England (22%) than it is nationwide (12%). Zinc ranks third in each of the three groups, being cited by 4% to 8%. Little to none (0% to 2%) think gold is the primary metal.

People are most uncertain in the nationwide group, as over half (54%) are not sure. One-third (32%) in California, and slightly more (37%) in New England, are not sure.

**46. Would you say that silver dental fillings does contain mercury or does not contain mercury?**

**Table 2.**

	Nationwide	California	New England
Does contain mercury	48	59	60
Does not contain mercury	21	10	12
Not sure	31	31	29

People are much more likely than not to say that silver dental fillings contain mercury. Three-fifths of respondents in California (59%) and New England (60%) say these fillings contain mercury, while nationwide, nearly half (48%) agree.

Nationwide, people are approximately twice as likely as those in California and New England to believe silver fillings do not contain mercury. Nationwide, one in five (21%) has this view. In California, one in ten (10%) feels this way, as does one in eight (12%) in New England.

*47. Do you think your dentist should be required to inform you about the various types of mercury and non-mercury fillings available before filling a cavity?*

**Table 3.**

	Nationwide	California	New England
Yes	92	94	87
No	6	3	6
Not sure	2	3	7

There is overwhelming opinion that dentists should be required to inform their patients about the various types of mercury and non-mercury fillings available before filling a cavity. Close to nine in ten or more in each of the three groups feel this way, while only 3% to 6% disagree.

**48. Which of the following would you be more likely to choose given the option – higher cost fillings that contain no mercury or lower cost fillings that are about 50% mercury?**

**Table 4.**

	Nationwide	California	New England
Higher cost/no mercury	77	80	76
Lower cost/with mercury	13	6	8
Not sure	11	14	16

Vast majorities (between three-fourths to four-fifths) would choose the higher cost fillings that contain no mercury.

While much fewer respondents choose the lower cost fillings containing about 50% mercury, people nationwide (13%) are about twice as likely to do so than those in California (6%) or New England (8%).

One in nine (11%) to one in six (16%) are not sure.

**49. How much of a problem do you think mercury pollution causes in the environment, on a scale with 1 being not at all serious and 5 being very serious?**

**Table 5.**

	Nationwide	California	New England
1 Not at all serious	5	4	4
2	11	8	9
<b>Less serious (1+2)</b>	<b>16</b>	<b>12</b>	<b>13</b>
3	22	19	23
4	19	24	29
5 Very serious	28	33	25
<b>More serious (4+5)</b>	<b>47</b>	<b>57</b>	<b>54</b>
Not sure	16	13	10

Close to half or more in each group ranks this as a more serious problem for the environment. Majorities in California (57%) and New England (54%) rate this as a 4 or 5 on the scale, with nearly half nationwide (47%) in agreement.

Approximately one in five (19% to 23%) in each group rates this as a 3, giving it a medium amount of seriousness.

In the three groups, one in six (16%) to one in eight (12%) thinks this is a less serious problem for the environment, ranking it as a 1 or 2 on the scale.

People are most unsure nationwide (16%), with one in eight (13%) in California and one in ten (10%) in New England also not sure of the environmental impact.

***(Asked in New England only)***

*50. Would you support or oppose a ban on putting dental mercury fillings in pregnant women or children?*

Support	69%
Oppose	9
Not sure	22

Overwhelmingly, New England respondents support a ban on putting dental mercury fillings in pregnant women or children. Approximately seven in ten (69%) are in support, while in contrast, just 9% are opposed to the ban. Over one in five (22%), however, are not sure.

# Appendix B

---

The State of Maine has developed a brochure about the pros and cons of various dental filling materials. The Maine brochure is available online at:

<http://mainegov-images.informe.org/dhhs/boh/files/odh/25-108-02%20PTMIental%20Brochur.pdf>

or

<http://www.maine.gov/dhhs/boh/files/odh/AmalBrochFinal2.html>

**An excerpt from the Maine brochure follows:**

## **Fillings: The Choices You Have Mercury Amalgam and Other Filling Materials A Patient Education/ Information Brochure**

Prepared by the Maine Department of Human Services, Bureau of Health, 2002

In 2001, the Maine State Legislature passed a law telling the Maine Bureau of Health to make a brochure about the advantages and disadvantages to human health and the environment of using mercury amalgam fillings in dental work. The same kind of information is included for other filling materials, to help patients in choosing what will be best for them.

Mercury is a heavy metal. It is found in nature. Mercury is found in different forms. Too much mercury in your body can hurt you. Many years of burning coal along with using mercury in batteries, thermometers, fluorescent lights, electrical switches, and other products have caused too much mercury to get into the environment.

The State of Maine is concerned about the effects of mercury on human health and our environment. Maine's policy is to reduce how much mercury is released into the environment. Maine is a leader among states in removing mercury from products.

Because amalgam fillings mostly contain mercury, we are concerned about possible effects on human health and the environment.

Some people have allergic reactions to mercury. Too much mercury can damage the kidneys, nerves, and the brain. The brains of babies and infants that are starting to form and grow are most at risk.

To be careful, Canada and several countries in Europe recommend limits on the use of mercury amalgam. They advise that pregnant women should not have amalgam fillings placed in or removed from their teeth. Some of these countries issue the same warning for nursing women and people with kidney problems. Some countries advise limits on using amalgam fillings with young children and people with braces.

This booklet will tell you more about:

- \* Mercury in amalgam fillings
- \* Health and environmental concerns with using amalgam fillings
- \* Cavities and dental decay and what you can do to avoid fillings
- \* Talking with your dentist about getting a tooth filled
- \* Choices you have for filling materials

# Endnotes

- <sup>1</sup> “Environmental and Toxicological Concerns of Dental Amalgam and Mercury,” MVS Solutions, Inc., 2003; <http://www.myssolutions.com/mercury.pdf> (p.22-25).
- <sup>2</sup> In 2001, the Maine State Legislature passed a law telling the Maine Bureau of Health to make a brochure about the advantages and disadvantages to human health and the environment of using mercury amalgam fillings in dental work; [http://janus.state.me.us/legis/ros/lom/LOM120th/8Pub351-400/Pub351-400-72.htm#P11191\\_797452](http://janus.state.me.us/legis/ros/lom/LOM120th/8Pub351-400/Pub351-400-72.htm#P11191_797452). “*Fillings: The Choices You Have/Mercury Amalgam and Other Filling Materials*,” A Patient Education/Information Brochure Prepared by the Maine Department of Human Services, Bureau of Health, 2002; <http://www.maine.gov/dhhs/boh/files/odh/AmalBrochFinal2.doc>, and “*Mercury-free Dental Fillings: Phase out of amalgam in Sweden*,” Swedish KEMI, 2005; [http://www.kemi.se/upload/Trycksaker/Pdf/PM/PM9\\_05.pdf](http://www.kemi.se/upload/Trycksaker/Pdf/PM/PM9_05.pdf).
- <sup>3</sup> Clinical Research Associates Newsletter, vol 29, Issue 10, 2005 Provo, UT; <http://www.cranews.com/>
- <sup>4</sup> “Environmental and Toxicological Concerns of Dental Amalgam and Mercury,” MVS Solutions, Inc., 2003; <http://www.myssolutions.com/mercury.pdf> (p.18).
- <sup>5</sup> The CMA position, Resolution 115-00, “Preventing Human Mercury Exposure,” was adopted March 14, 2000; <http://www.apha.org/legislative/policy/policysearch/index.cfm?fuseaction=view&id=181>.
- <sup>6</sup> On June 24, 1998, the American Hospital Association and the United States Environmental Protection Agency signed a landmark agreement for the “Virtual Elimination of Mercury Waste” from Hospitals; <http://www.epa.gov/glnpo/toxteam/ahamou.htm>.
- <sup>7</sup> Wright, “Our Preferred Poison,” *Discover* magazine, Mar. 2005; <http://www.discover.com/issues/mar-05/features/our-preferred-poison>.
- <sup>8</sup> *Review and Analysis of the Literature on the Potential Adverse Health Effects of Dental Amalgam*, Life Sciences Research Office, 10/12/04; [http://www.innovations-report.de/html/berichte/biowissenschaften\\_chemie/bericht-37614.html](http://www.innovations-report.de/html/berichte/biowissenschaften_chemie/bericht-37614.html).
- <sup>9</sup> Arenholt-Bindslev, D.; Larsen, A.H. “Mercury Levels and Discharge in Waste Water from Dental Clinics,” *Water Air Soil Pollution*, 86(1-4):93-9. Association of Metropolitan Sewerage Agencies, “Evaluation of Domestic Sources of Mercury/Household Mercury Poses National Clean Water Compliance Concerns,” 1996; <http://www.amsacleanwater.org/pubs/mercury/mercury.cfm>.
- <sup>10</sup> “*Household Mercury Poses National Clean Water Compliance Concerns*,” Association of Metropolitan Sewerage Agencies, Evaluation of Domestic Sources of Mercury, August 2002; <http://www.amsa-cleanwater.org/pubs/mercury/mercury.cfm>.
- <sup>11</sup> Association of Metropolitan Sewerage Agencies, “Mercury Pollution Prevention Program, Draft Report,” submitted by Larry Walker Associates, 2001.
- <sup>12</sup> Association of Metropolitan Sewerage Agencies, “Mercury Pollution Prevention Program, Draft Report,” submitted by Larry Walker Associates, 2001.
- <sup>13</sup> United States Environmental Protection Agency, *International Mercury Market and the Role and Impact of US Environmental Policy*, 2004.
- <sup>14</sup> Stone, M. et al, *Determination of methyl mercury in dental-unite wastewater*, Naval Institute for Dental and Biomedical Research, Building 1-H, 310A B Street, Great Lakes, IL 60088-5259, USA.
- <sup>15</sup> O’Conner Environmental Assoc. Inc., “*Mass Balance of Dental Related Mercury Wastes in Canada, with a Discussion of Environmental Impacts and Alternative Dental Restorative Materials*,” Final report 10-5791, Prepared for: Office of Transboundary Air Issues and National Office of Pollution Prevention; Barron, T., *Mercury Headworks Analysis for 2000*. Prepared for: Palo Alto RWQCP, 2001.
- <sup>16</sup> Association of Metropolitan Sewerage Agencies, “Mercury Pollution Prevention Program, Draft Report,” submitted by Larry Walker Associates, 2001.
- <sup>17</sup> It is estimated that 700,000 bodies were cremated in 2003 in the U.S. with an estimated average amount of 2.9 grams of mercury per body, according to estimates in the Northeast Mercury Study, by the Northeast States for Coordinated Air Use Management, 1998. Multiplying these numbers out results in nearly 5,000 pounds of mercury emitted annually in the U.S. (700,000 x 2.9 grams = 4466 pounds of mercury.)
- <sup>18</sup> Rubin PG, Yu M-H “Mercury vapor in amalgam waste discharged from dental office vacuum units,” *Arch Environ Health* 1996 July-Aug; 51(4):335-7.
- <sup>19</sup> United States Environmental Protection Agency, *International Mercury Market and the Role and Impact of US Environmental Policy*, 2004.
- <sup>20</sup> World Health Organization (WHO), 1991, Environmental Health Criteria 118, Inorganic Mercury, WHO, Geneva and L.T.Friberg, “*Status Quo and perspectives of amalgam and other dental materials*,” International symposium proceedings, G.Thieme Verlag Stuttgart, 1995.

- 
- 21 Mahaffey, K., "Methylmercury: *Epidemiology Update*," U.S. Environmental Protection Agency, Washington, D.C., Fish Forum—San Diego – 2004; See:<http://www.epa.gov/waterscience/fish/forum/2004/presentations/monday/mahaffey.pdf>.
- 22 World Health Organization, Environmental Health Criteria 118, Inorganic Mercury, WHO, Geneva, Switzerland, 1991.
- 23 *Toxicological Profile for Mercury*, Agency for Toxic Substances and Disease Registry, US Public Health Service, 1999; Kingman A., et al, National Institute of Dental Research, "Mercury concentrations in urine and blood associated with amalgam exposure in the US military population," *Dent Res.* 77(3); 461-71, 1998; National Research Council, Toxicological Effects of Methylmercury, pp.41 and 304-332: Risk Characterization and Public Health Implications, National Academy Press, 2000.
- 24 The U.S. Centers for Disease Control agrees that dental amalgam constitutes a major exposure to mercury ([www.cdc.gov/exposurereport/](http://www.cdc.gov/exposurereport/)), as does the U.S. Public Health Service ([www.atsdr.cdc.gov/toxprofiles/phs46.html](http://www.atsdr.cdc.gov/toxprofiles/phs46.html)). Further, the Congressionally-mandated July 2000 National Academy of Sciences report states that "The major source of exposure to elemental Hg in the general population is due to Hg vapors released from dental amalgam." (National Research Council, National Academy Press, 2101 Constitution Ave., N.W., Box 285, Washington, DC 20055; Library of Congress Card Number 00-108382).
- 25 Mercury Study Report to Congress, US EPA, 1997.
- 26 Mercury Study Report to Congress, Vol. IV, US EPA, p. 5-1; <http://www.epa.gov/ttn/oarpg/t3/reports/volume4.pdf>
- 27 Mercury Study Report to Congress, Vol. IV, US EPA, p. 5-1; <http://www.epa.gov/ttn/oarpg/t3/reports/volume4.pdf>. Toxicological Profile for Mercury, US ATSDR, 1999; p. 440; <http://www.atsdr.cdc.gov/toxprofiles/tp46-c5.pdf>.
- 28 National Research Council, Toxicological Effects of Methylmercury, Risk Characterization and Public Health Implications, National Academy Press, 2000.
- 29 Toxicological Profile for Mercury, US ATSDR, 1999; p. 442; <http://www.atsdr.cdc.gov/toxprofiles/tp46-c5.pdf>.
- 30 Pleva J, "Dental mercury - a public health hazard," *Rev Environ Health* 10(1):1-27 (1994); Pleva J, *Mercury from dental amalgams: exposure and effects*, *Int J Risk & Safety in Med*, 1992, 3: 1-22.
- 31 Concise International Chemical Assessment Document No. 50: Elemental mercury and inorganic mercury compounds: Human health aspects ([www.who.int/pcs/cicad/summaries/cicad\\_50.html](http://www.who.int/pcs/cicad/summaries/cicad_50.html)), September 2002, based on the Toxicological profile for mercury (update) published by the Agency for Toxic Substances and Disease Registry of the US Department of Health and Human Services (ATSDR), 1999.
- 32 Toxicological Profile for Mercury, US ATSDR, 1999; p. 440; <http://www.atsdr.cdc.gov/toxprofiles/tp46-c5.pdf>
- 33 Vimy MJ, Lorscheider FL: Serial measurements of intra-oral air mercury; Estimation of daily dose from dental amalgam. *J Dent Res* 64(8):1072-5, 1985.
- 34 Vimy MJ, Luft AJ, Lorscheider FL, Estimation of Mercury Body Burden from Dental Amalgam Computer Simulation of a Metabolic Compartment Model *J. Dent. Res* 1986 65(12):1415-1419, December, 1986.
- 35 The warning from amalgam manufacturer Dentsply/Caulk (38 W. Clarke Ave, Milford, DE 19963-0359) states: "The use of amalgam is contraindicated...in children 6 and under..." and "...in expectant mothers." The term "contraindicated," also called contra-indicated, means, according to Webster's on-line dictionary, "...to make (a treatment or procedure) inadvisable."
- 36 The Kerr warning reads: "The health authorities of the various countries, including Canada, Germany, France, the United Kingdom, Norway and Austria have recommended against the placement or removal of an amalgam in certain individuals such as pregnant and nursing women and persons with impaired kidney function."
- 37 *Barnes v. Kerr Corp.*, 418 F.3d 583 (6<sup>th</sup> Cir. 2005).
- 38 "Dental Mercury Hygiene Recommendations," *JADA*, Vol. 134, pp. 1498-99. (2003) [http://www.ada.org/prof/resources/pubs/jada/reports/report\\_mercury.pdf](http://www.ada.org/prof/resources/pubs/jada/reports/report_mercury.pdf).
- 39 Swedish National Dept. of Health, *Mercury Amalgam Review Panel*, 1987; Heavy Metal Bulletin, Dec 2000, Vol 6, Issue 3.
- 40 An FDA Consumer Update (December 31, 2002) informs consumers that Canada limits the use of mercury amalgam in pregnant women; <http://dsp-psd.pwgsc.gc.ca/Collection/H49-105-1996E.pdf>.
- 41 Public Health Statement, US ATSDR, p.7, downloaded from website Feb 7, 2006; <http://www.atsdr.cdc.gov/toxprofiles/tp46-c1.pdf>
- 42 New Jersey Mercury Task Force Report, Vol. III, p. 33. The task force recommended ensuring "state contracts provide equal insurance coverage for non-mercury fillings and consider not covering amalgam fillings," as part of their plan to phase out amalgam. <http://www.state.nj.us/dep/dsr/Vol3-chapter2.pdf>
- 43 Clinical Research Associates Newsletter, Vol. 29, Issue 10, 2005 Provo, UT; <http://www.cranews.com/>.
- 44 CRA Newsletter readers survey, December 2001; 3,865 responses: 73% place amalgam, 27% do not. Percentages of dentists who no longer use amalgam tripled from 1985 to 1995, and tripled again from 1995 to 2001: It was 3% in 1985, 9% in 1995, and 27% in 2001.
- 45 The International Academy of Oral Medicine and Toxicology; [www.iaomt.org](http://www.iaomt.org); the International Academy of Biological Dentistry and Medicine; [www.iabdm.org](http://www.iabdm.org), and the Holistic Dental Association; [www.holisticdental.org](http://www.holisticdental.org).
- 46 Personal communication between Michael Bender and Alexis Caine, U.S. Environmental Protection Agency Region 5, Feb 7 2006.
- 47 *The Safety of Dental Amalgam*, Canada, Published by authority of the Minister of Health, 1996; <http://dsp-psd.pwgsc.gc.ca/Collection/H49-105-1996E.pdf>.
-



- 
- <sup>48</sup> “Mercury-free Dental Fillings: Phase out of amalgam in Sweden,” Swedish KEMI, 2005; [http://www.kemi.se/upload/Trycksaker/Pdf/PM/PM9\\_05.pdf](http://www.kemi.se/upload/Trycksaker/Pdf/PM/PM9_05.pdf).
- <sup>49</sup> *Overview of Norwegian Federal Health Agency guidelines on amalgam - presented by: Liljan Smith Aandahl, Senior Advisor, Norwegian Directorate for Health and Social Welfare*, Advisory Committee on Mercury Pollution, Meeting #52: Thursday, May 13, 2004; <http://www.mercvt.org/acmp/minutes/2004/2004-05-13.htm>.
- <sup>50</sup> California, under Proposition 65, mandates a wall posting that states: “Dental Amalgam ... causes exposure to mercury, a chemical known to the state of California to cause birth defects or other reproductive harm.” California’s Law mandates every dental patient receive a fact sheet, which reads in part: “Mercury may harm the developing brain of a child or fetus. ... Dental amalgam is created by mixing elemental mercury (43-54%) and an alloy powder (46-57%) composed mainly of silver, tin, and copper.”; [www.cda.org/public/prop65cj.pdf](http://www.cda.org/public/prop65cj.pdf). Maine’s Law mandates a fact sheet likewise to be given to each patient, one that reads, in part: “Amalgam fillings are ... 40 to 50 percent mercury. These fillings give off mercury vapor. ... There is a lot of debate about health effects from the mercury in amalgam fillings. ... The brains of babies and infants that are starting to form and grow are most at risk. ... To be careful, Canada and several countries in Europe recommend limits on the use of mercury amalgam. They advise that pregnant women should not have amalgam fillings placed in or removed from their teeth.”; [www.state.me.us/dhs/boh/files/odh/AmalBrochFinal2.doc](http://www.state.me.us/dhs/boh/files/odh/AmalBrochFinal2.doc).