

# Dental amalgam: Anti-mercury movement pushes for shifts in dentistry

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Silver tooth fillings have been placed in the mouths of Americans since before the Civil War, an inexpensive, durable and reliable material that helped form the foundation of modern dentistry.

For nearly as long, they've been a source of controversy.

Because [elemental mercury](#) - a [toxic substance](#) - makes up about half of a silver filling, its use has been the subject of hundreds of scientific and academic studies examining their safety. The results have done little to settle the dispute.

What's not up for debate is that silver fillings, commonly called [dental amalgam](#), contribute [mercury pollution](#) to the environment.

[Global consensus](#) on that issue has led some anti-mercury crusaders, who long have sought to ban the material from dental products because of health concerns, to shift their focus to a fight they think they have a better chance of winning.

"The approach to getting to the end of amalgam is the environment," said Charlie Brown, president of the World Alliance for Mercury-Free Dentistry, a multinational group that lobbies to ban the use of mercury in dentistry.

Recent developments suggest momentum is building against silver fillings based on environmental concerns:

More than 140 nations agreed in January to a U.N. treaty calling for decreasing use of dental amalgam.

One major U.S. [dental school](#) announced it is putting less emphasis on teaching students about preparation and placement of silver fillings.

Two large, nonprofit Catholic hospital chains are waging proxy battles with the two leading American makers of dental amalgam. The hospital chains' investment arms are seeking a shareholder vote that would mandate each company detail plans to phase out mercury.

Norway, Denmark, Sweden, Japan and Finland have either banned dental amalgam or restricted its use within the last five years. (Other countries, such as Canada and Germany, recommend keeping amalgam out of the mouths of certain people - including pregnant women, children and those with kidney impairment - as a precaution.)

The Food and Drug Administration and the American Dental Association, which represents more than 150,000 dentists, maintain that silver fillings should remain an option, saying that they are safe and effective and that they often outperform other restorative materials.

"From a patient safety and efficacy perspective, the (ADA) takes the position that it should advocate for patients' overall oral health," said Dr. Dan Meyer, the association's senior vice president of science and professional affairs. "There is no reason, based on current scientific information, to do anything other than advocate ... to make all treatment options available that are safe and effective."

The ADA acknowledged that mercury waste is a problem but noted that as of 2010, about half of dentists were filtering out more waste mercury through the installation of relatively inexpensive equipment.

Twelve states have mandatory dental amalgam reduction programs. The Environmental Protection Agency is working with the ADA to draft a federal rule that would require dental offices that handle products containing mercury to install the equipment.

About half the mercury entering municipal wastewater treatment plants, or about 3.7 tons annually, comes from dental amalgam waste, according to a 2010 EPA estimate.

While treatment plants capture about 90 percent of amalgam, some mercury settles into sewage sludge that is deposited in landfills, incinerated, applied as fertilizer or flushed into waterways.

Once in water, it can transform into methylmercury, a neurotoxin that builds up in fish, shellfish and animals that eat fish, including humans, according to the EPA.

Although it's impossible to calculate the contribution of dental amalgam to mercury pollution in waterways, the EPA points to a 2002 New York Academy of Sciences study that estimates that as much as 40 percent of the total mercury load in the New York-New Jersey harbor and watershed may have originated in dental offices.

Several studies have linked methylmercury to health and developmental problems, especially in pregnant women, fetuses, infants and children.

While high exposure to methylmercury has been linked to permanent damage in children's brains and nervous systems and to increased risk of kidney problems in adults, there's no definitive scientific evidence that links the elemental mercury in dental amalgam to health problems, according to agencies like the World Health Organization, the European Commission and the FDA.

Research shows that the human body absorbs mercury vapor released from dental amalgam, though most studies suggest it's not at a level that could be linked with adverse health effects, except in rare instances of allergic reactions. Still, numerous studies raise concerns about mercury exposure from amalgam, especially in children and fetuses.

In toxic doses, elemental mercury breathed in as vapor can cause symptoms including tremors, mood swings, neuromuscular changes and cognitive deficits, according to the EPA.

Over the past three decades, U.S. dentists have moved toward using tooth-colored materials that are most commonly made of composite resins, largely because patients prefer the look and they require less destruction of the tooth.

An ADA survey found dentists completed 52.2 million amalgam restorations in a 12-month period ending in 2006, down about 30 percent from 71 million in 1999 and about 80 percent from 99.3 million in 1990.

Composite restorations, meanwhile, skyrocketed to 122.7 million in 2005-06 from 85.7 million in 1999 and 47.5 million in 1990.

According to a 2010 ADA survey, 38 percent of general practice dentists do not place amalgam fillings, a percentage that has risen steadily over recent decades. Still, a majority of dentists use amalgam for certain types of cavities because the material is easy to work with, quick to set, is more durable and less costly than composites.

When asked whether dentists who refuse to use amalgam are shortchanging patients in certain situations, Meyer demurred.

"There are a lot of different options, and we encourage patients to talk with their dentist, and if they have concerns they should go get a second

opinion or even a third opinion," he said. "The position of the ADA is that all treatment options that are safe and effective should be available."

In 2012, the ADA spent more than \$2.8 million lobbying the EPA, members of Congress and other federal agencies. A portion of that money went toward trying to limit restrictions on mercury in [dental products](#), including efforts to shape the State Department's stance on amalgam in the U.N. treaty.

When the U.N. treaty was announced in January, the ADA celebrated its success in helping to strip "any restrictions on use" of amalgam.

The U.S. participation in drafting the U.N. treaty marked a major shift. For several years, the U.S. had opposed negotiating a legally binding agreement to limit the use of mercury.

Dan Reifsnyder, the State Department's deputy assistant secretary for environment, who helped negotiate the treaty on behalf of the U.S., said although the agreement does not ban amalgam, it contains measures to phase down its use and will likely spur the dental industry to begin making changes.

"An economist once told me to never underestimate the power of measures that will take effect in the future. The market reacts immediately and begins taking action today," Reifsnyder said

Students at New York University's College of Dentistry were told last summer that they would no longer have to place amalgam fillings in patients as part of final exams. The university cited concern for the waste stream, consumer demand for tooth-colored fillings and the less invasive nature of composite fillings.

"I took a lot of heat from a lot of people for it," said Dr. Mark Wolff,

chairman of the Department of Cariology and Comprehensive Care at NYU. Dentists can place amalgam in a quarter of the time it takes to place a composite, he said.

Wolff said amalgam still will be taught because there are cases in which it is impossible to keep the tooth dry to allow a plastic restoration. Saliva can cause such restorations to fail. But composite resins have advanced enough to be a better alternative in most cases.

Dr. Markus Blatz, chairman of the Department of Preventive and Restorative Sciences at the University of Pennsylvania School of Dental Medicine, said he thinks dental schools will follow NYU, as dentistry strives to be more aesthetic and less invasive.

Wolff and Blatz emphasized that studies have not shown mercury fillings to cause illness. But Blatz said patients are increasingly concerned about the cumulative exposure to environmental toxins, so "why be exposed when there are viable alternatives?"

At the University of Illinois at Chicago College of Dentistry, the largest in Illinois, the use of amalgam declined to 20 percent in 2011 from 42 percent in 2004, said Dr. Ana Bedran-Russo, director of the Laboratory of Applied Dental Biomaterials and Interfaces. She cited as reasons patient preference and less invasive alternatives.

Although it is no longer the first choice, the school still teaches amalgam preparation and placement, Bedran-Russo said, adding that amalgam has a surface life of 12 to 15 years, versus five to seven years for alternatives.

Blatz said innovations are improving alternative materials, and when placed properly composites can last as long as amalgam. However, placing composites requires more skill and they aren't ideal for larger

cavities. Ceramic inlays and onlays work well with larger cavities but cost more.

There are also some [health concerns](#). Most resin-based composite alternatives contain bisphenol-A, or BPA, a hormone disrupter that has been banned from some products like baby bottles and children's sippy cups.

"I'm more concerned about our reliance on plastic fillings because I don't think we have really studied BPA to the extent we have amalgam," said Paul Casamassimo, chief of dentistry at Nationwide Children's Hospital in Columbus, Ohio. He said he uses amalgam in young children, though increasingly he's placing stainless steel crowns.

Serap Erdal, associate professor in the Department of Environmental and Occupational Health Sciences at the University of Illinois at Chicago School of Public Health, did a health risk analysis of the alternatives for a nonprofit organization called Healthcare Without Harm.

BPA levels did not suggest a potential health concern, she said. A bigger player was the presence of methacrylates, a genotoxin with the potential to cause cancer, so further studies on the toxicity are needed, she said.

Still, her paper recommended a gradual global phase-out of amalgam, emphasizing that it should remain an option in communities without access to the new, more costly alternatives.

The FDA, which regulates dental amalgam, has been evaluating its stance on the substance for several years.

The agency in 2009 ruled amalgam safe for adults and children older than but reclassified the substance as a Class II, or "moderate risk," medical device, up from a Class I, or "low risk" device.

For children younger than 6, whose developing bodies may be more sensitive to the neurotoxic effects of mercury vapor, as well as pregnant women and their developing fetuses, the FDA said "very limited to no clinical information is available regarding long-term health outcomes." Still, the agency said, evidence suggests it's safe.

The FDA received several petitions asking it to reconsider the ruling and convened an advisory panel that held hearings in December 2010. The agency said at the time it expected to respond by the end of 2011.

A representative recently said the agency "is continuing to review and evaluate the safety of amalgam and will let the public know if there are any changes to our current recommendations."

While the mainstream view in the United States is that amalgam fillings have not been proved to cause health problems, some new research suggests otherwise.

A few years after a government-funded study on children concluded silver fillings did not cause harm, one of the investigators re-examined the data and found that boys with a certain genetic variant were more likely to exhibit neurodevelopmental delays if they have silver fillings than composite. The findings were published last year in the journal *Neurotoxicology and Teratology*.

In another study last year in the *International Journal of Statistics in Medical Research*, Yale University researchers examining the pharmacy claims of dentists estimated that the prevalence of neurological problems among general practice dentists is 7.6 times higher than in the control group. They attributed it to dentists' higher mercury exposure.

Anti-mercury activists say that people should at least be told their fillings contain mercury. Manufacturers are required to label their dental



amalgam with warnings of the potential health risks, but patients don't see those warnings. Four states require dentists to tell patients about the mercury content, though there is no national rule.

"That educational information does not get out to the public, so that choice is not being given," said Dr. Matt Young, past president of the International Academy of Oral Medicine and Toxicology, a 700-member group that opposes mercury in dentistry.

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