

Dental Amalgam

– a Danish tale of restrictions and exceptions

Contributed by:

Mette Sikjaer, Denmark

mettesikjaer@gmail.com

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In the beginning, the inhabitants on the small island only wondered slightly at the strange occurrences that started taking place around them. Birds literally started dropping from the sky, cats committed suicide by jumping into the sea where the fish were having trouble swimming straight. Little did they know that this was only the beginning symptoms of one of the world's most shocking environmental disasters caused by mercury poisoning. A disaster that could have been avoided, if those with the knowledge and the power had been more resolute and uncompromising. This article is not only about mercury pollution and dental amalgam. It is also about conflicts of interest and postponed decisions. About choosing what to sacrifice and about the cost of compromise.

A mysterious disease

Several years passed after the initial symptoms, before a group of doctors at a local hospital discovered a new disease among the inhabitants of Kyushu Island in the Minamata Bay.

The symptoms of this mysterious disease included severe neurological defects. Patients would be numb, paralyzed, have trouble speaking etc. In the final stage, the disease would develop into cramps and eventually result in death.

Researchers discovered that all patients suffering from this mysterious disease ate large amounts of fish, but it would still take them three years to figure out the exact cause of the disease:

Methyl mercury poisoning.

Mystery solved

A factory producing acetaldehyde of which mercury was a key component had been dumping organic mercury in the Minamata Bay for decades. Approximately 27 tonnes of it. Local fishermen had protested over the pollution of their fishing environment but had been paid to keep quiet. In 1959 the factory was forced to start using mercury filters but was not very diligent about it. In fact, the pollution continued until 1968, at which time the factory stopped using mercury in their production. Not out of concern for the environment, but because the method was out-dated and was replaced by a more cost-effective alternative.

It gets worse...

When people finally realised the extent and effect of the pollution of their bay, many stopped eating the seafood from the waters hoping this would solve the problem. But it was already too late. The damages caused by the poisonous methyl mercury could not be reversed. And it was only getting worse.

In the following years, a new kind of victims of 'Minamata Disease' started appearing. Children of mothers who had been exposed to the mercury were born with serious neurological defects. The symptoms of these children were much stronger than those of their mothers. They would suffer from severe cerebral palsy, blindness and profound mental retardation. By 1992 there were around 2300 recognised cases of Minamata Disease of which half were already dead.



Did we learn the lesson?

Pictures of the Minamata victims travelled around the world as a lesson on the importance of putting the protection of ecosystems and of human lives above economy and hopes of profit. But did we learn the lesson? Would respect for our environment and thereby human lives always take first place before economy? Did history manage to teach us the resoluteness and uncompromising decisiveness so necessary, if we are to protect the ailing remains of our planet?

More than half a century has passed since the Minamata disaster, but recent decades have made the questions raised back then more relevant than ever. Today, it is not only the inhabitants of a small Japanese island that face the threats from mercury pollution. We all do...

Mercury pollution in Denmark

For many years, mercury was widely used in Denmark – as in most other countries – as a component in the production of paper, sowing seeds, batteries, chloralkali etc. By the beginning of the 80s there was a growing concern about the effect of mercury on the environment. Tests of the Danish soil showed that in many places the content of mercury was above the recommended levels. Although health effects were still not clear, laws were decided upon and new procedures adapted by the industry, which lowered the usage and emissions of mercury considerably. The ultimate goal: To completely eliminate all use of mercury in Denmark.

By 2001 the use of mercury in Denmark had already been reduced to about 20% of the numbers from 1982/83. Laws that prohibited import/export and sale of mercury especially contributed to this development.

As the general numbers were falling, though, a certain source of mercury pollution started to stand out. The use of mercury in dental amalgam fillings suddenly comprised around 75% of the total purposeful use of mercury in the country. In contrast, dental amalgam had only contributed with 20% in 1982/83. The story behind these figures and the use of mercury in dental fillings is a long and controversial one, which started almost 200 years ago.

Mercury in teeth – a controversial history

Mercury has been used in dental fillings for almost 1500 years, although the Western world only accepted the use in the 1830s.

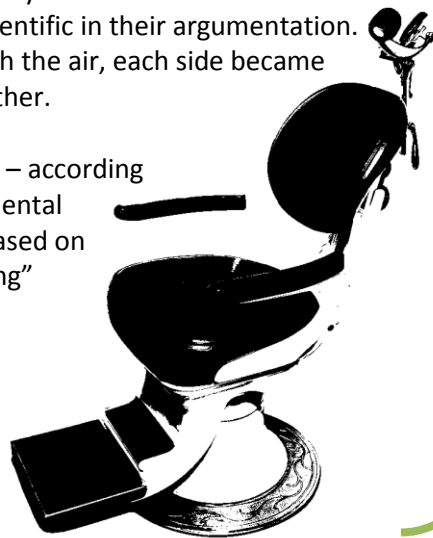
Mercury quickly became a popular material with dentists because of its qualities of being liquid at room temperature and at the same time having the potential to harden into a very strong metal. Not everyone was equally thrilled, though. Discussions of whether mercury was an appropriate material for dental fillings turned into heated debates and by the 1850s, dentists using mercury faced threats of lawsuits for malpractice. This early strife became known as the Amalgam War. It was calmed down somewhat in 1896, when a scientific report indicated that mercury fillings were harmless.

Since then, the Amalgam War has continued to flare up now and then and each time been calmed down with new scientific research guaranteeing the harmlessness of mercury in dental fillings.

Through the decades, this strife has split its participants into two camps. To the onlooker it has seemed to be a war between scientists and laymen, between the greater number of dentists supporting the use of mercury and a small number of dentists dreading the consequences. Scientists and dentists have been accused of being tyrannical, ignorant, dishonest, greedy. Opposers to mercury have been called emotional fanatics and criticised for being unscientific in their argumentation. While accusations were flying through the air, each side became less and less willing to listen to the other.

Although there has been times when – according to the media - a prohibition against dental amalgam has seemed unavoidable based on personal stories of “mercury poisoning” among dental patients, dentists and researchers have always managed to have the last say in the matter:

“Dental amalgam is here to stay.”



What do scientists say?

To many people, it might seem strongly illogical – not to say insensible – for humans to carry around one of nature’s most dangerous neurotoxins in their mouths. The fact of the matter is, though, that no (“respected”) scientist has ever managed to prove the alleged ill effects of mercury in dental fillings.

Large groups of persons with mercury fillings have been interviewed and examined for signs of diseases related to mercury poisoning. When later compared with people having no mercury in their mouths, the results showed no difference in the patterns of disease in these two groups. Similar research was done in different places and with different groups of people. Even dentists, whose level of mercury in blood and urin samples is generally double as high as the average population, were examined.

Results were always the same. Although mercury levels were higher in blood, urin and tissue of those with amalgam fillings, it did not seem to affect these persons’ health. According to some studies, people with amalgam fillings even seemed more healthy than those without – perhaps due to a generally higher concern for their own health.

Dental amalgam – why so harmless?

Of all the different sources of mercury in our environment, dental amalgam is for many people the main source of mercury intake. So why does this mercury not damage the body? The key to this paradox is in the form of mercury existing in dental amalgam. Mercury in dental amalgam is elemental mercury and not the same as the methyl mercury that caused Minamata Disease. Although dental amalgams constantly release mercury through corrosion or vaporizing, the form of mercury released does not seem to cause direct damage to the human organism.

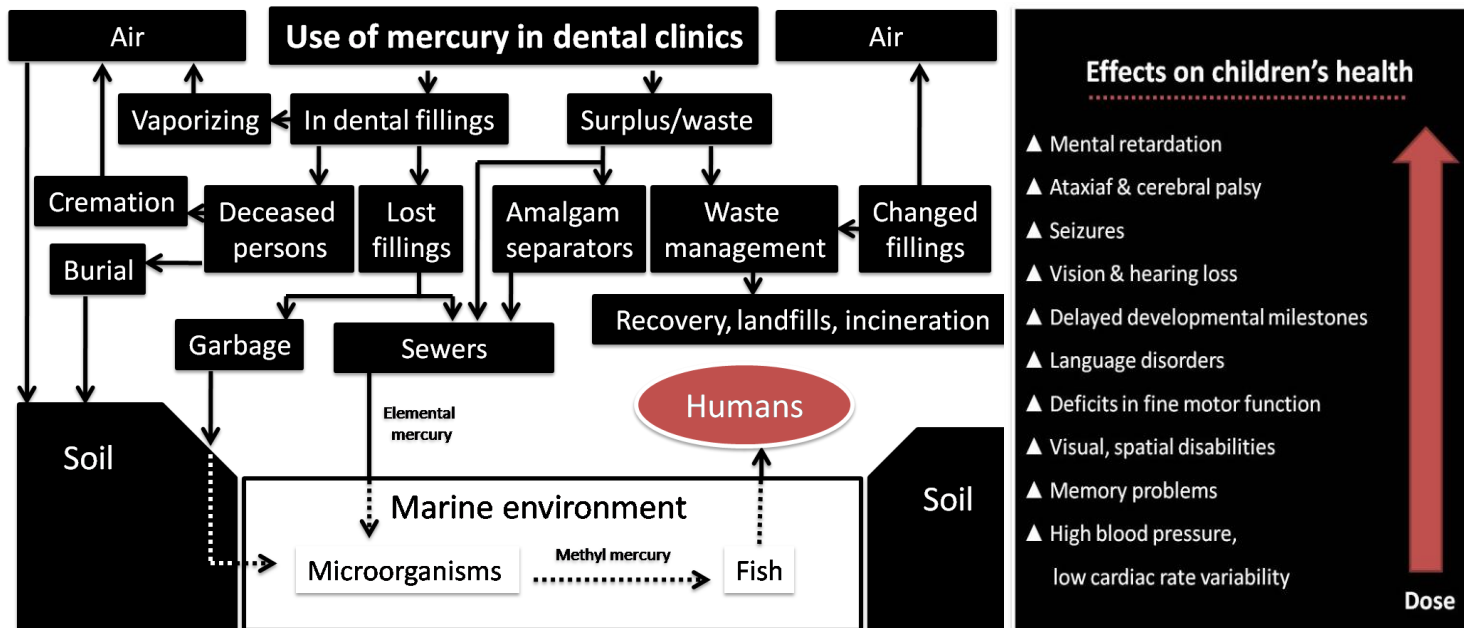
Dental amalgam – why NOT so harmless?

There is, however, an indirect effect of mercury in dental amalgam which has proved far more damaging. When dental amalgams are released into the environment, either as waste from dental clinics or when fillings are lost, their content of elemental mercury ends up in the marine environment, where microorganisms metabolize it into methyl mercury. When these microorganisms along with their methyl mercury content are eaten by fish, the mercury continues to accumulate as it travels up the food chain until it is consumed by humans.

The part we DON'T know

As our understanding of the toxicity of mercury and its complex health effects is increasing, the level of exposure to mercury that has previously been considered 'safe' continues to be lowered. There is substantial scientific research showing that certain doses of mercury can affect children's neurological development, but recent studies indicate that even very low doses – lower than what is presently considered 'safe' – can cause cardiovascular defects. In other words, we are not as safe as we thought.

Besides, because some people are more sensitive than others, it is hard to predict how much each individual will be affected by a given concentration of mercury in his or her body. However much is too much, the frightening realities facing us in these years are summed up in these words:



...our society is losing its intelligence – IQ points in our population are being chemically destroyed. The damage to developing brains, much of which is neurologically irreversible, arises from exposure to methylmercury as well as other neurodevelopmental toxicants during early foetal development. These toxicants cause brain injury at doses much lower than have been previously recognised, as they are much lower than those affecting adult brain function...

Prof. Philippe Grandjean,
University of Southern Denmark

The part we DO know

Although adults might not experience symptoms from their intake of mercury, there is growing concern over mercury's ability to cross placenta and enter the fetus, where mercury can accumulate in the brain and tissues of the unborn child. The effect of this phenomenon can already be seen at population level in many countries with smaller numbers of 'gifted' children and greater numbers with low IQ scores. But how much mercury is too much?

New knowledge – new discussions

It was increasing knowledge of the health effects of mercury exposure which in the beginning of the 90s caused the old amalgam strife to flare up again in Denmark. Analyses of the Danish soil from the early 80s had led to strict regulations in order to limit the emissions of mercury into the environment and as early as March 1989 a Danish news paper brought the following news:

"During March 1989 the Environment Protection Agency will send out a new announcement about mercury... this announcement will suggest a total ban on the use of mercury in order to stop the increasing pollution of the environment. Such a ban will for example have consequences for the dentists, who in such case will no longer be able to use mercury amalgam as a filling material".

Ingeriøren, 89/3

Time for action...

By 1992 dentists had still felt no restrictions. New soil analyses in the early 90s, however, showed a need for further regulations. Although earlier restrictions had already reduced the purposeful use of mercury from 16 to 6 tonnes per year, the results were still not satisfactory.

In a report by the Ministry of Environment from 1994 it said:

"The marine environment is polluted with mercury. There has been an increase in mercury content in the marine environment with an increase in methyl mercury in fish as a result. The Ministry of Environment and Energy therefore published an executive order (no. 520) in 1994 which, taking effect from 1999, contained a ban on the sale of mercury and mercury containing products for use in amalgam."

When taking effect, this ban would end the use of mercury in fillings completely. The Ministry of Environment would soon discover, however, that this was a decision with implications.

...but not everyone agrees

The Ministry of Environment and Energy quickly learned, that the topic of mercury in fillings presented a number of conflicts of interest. In 1998, the Ministry of Health reacted with the following announcement:

"According to the Ministry of Health, there is at this time no satisfactory alternative to amalgam as a filling material. On this ground and for health related reasons, the Ministry of Health opposes the ban on mercury amalgam in molar fillings from 1999."

- National Board of Health, 1998

A compromise

So, in 1998 the following exception was added to the new law on mercury:

"...the use of products containing mercury is allowed for now... in dental fillings of molars where the filling is subject to wear."

A compromise had been reached, where dentists would limit their use of dental amalgam and thus reduce pollution, but would continue to use it to some extent in order to protect the nation's dental health.

The debate continues

But the debate did not end there. Dental clinics were still polluting the environment and many did not agree that dental health was to be given priority over environmental protection. After all, the environment affects our health as well. The following statements illustrate the conflicts of interest involved:

"For environmental reasons we wish to eliminate the use of mercury in dental fillings, because there is a loss of mercury into the environment along the way, from it is placed in the tooth until people die."

Civil engineer Henri Heron,
Environmental Protection Agency, 2003

"We would not enjoy the same level of dental health if we did not have the amalgam, because we do not have an alternative, which is as good for the permanent teeth".

Ph.d. and dr. odont Vibeke Qvist,
Copenhagen Dental School, 2003

"Why should we be on guard against mercury in batteries for example, and not against mercury used in humans – I cannot get that into my head. That kind of thing should not be put into people's mouths."

Birthe Skaarup, politician (DF), 2003

No alternatives to dental amalgam?

But was it true – as the Ministry of Health claimed – that there were no alternatives to amalgam? Already at the beginning of the debate in 1994, the Ministry of Environment had initiated a large scale project in order to examine the existing alternatives to amalgam and evaluate the possibilities of developing acceptable alternatives in the future. A report was published in 1998 with the following conclusion:

"For extended fillings in the molar region, dentists are generally warned against using resin composites instead of amalgam. ...People do not deny that resin composites can be used with success in the molar region. The concerns refer to lack of information suitable for judging the consequences of a general replacement of amalgam with resin composite as filling material."

Were there no alternatives apart from resin composites?

Same report acknowledges:

"For many purposes, amalgam can be replaced with cast restorations made of gold alloy, ceramic, or metal fused ceramic."

The problem with the alternatives?

"As cast restorations are costly, there is a need for a more inexpensive and direct filling material."

Alternatives existed. They just weren't 'inexpensive' enough...

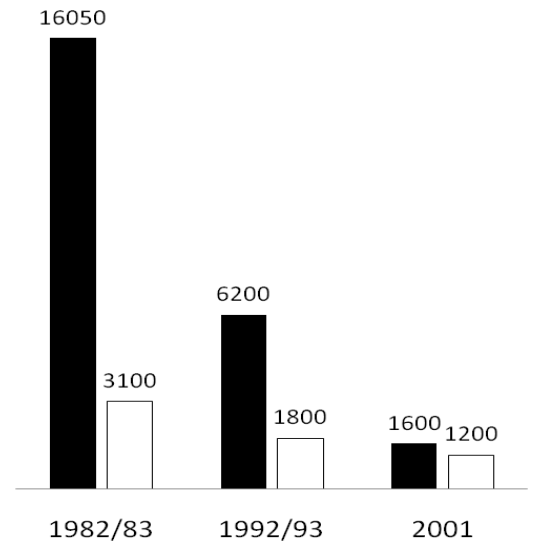
Positive developments

Although the Ministry of Environment had not succeeded in fulfilling their wish for a complete ban on mercury in dental clinics, the effects of the restrictions could still be seen on the country's total use of amalgam for dental fillings. In 1982/83 a total of 3,100 kilograms of mercury had been used in dental fillings, in 1992/93 the number had fallen to 1,800 kilograms and in 2001 it was just 1,200 kilograms. The number of amalgam fillings placed also decreased during this period from 2.7 mill. in 1982 to 1.8 mill in 1992 and 1.1 mill. in 2001.

The reduction in the number of fillings was in part due to a general improvement in dental health along with increased popularity of the more aesthetic resin composite fillings. The main factor, though, was probably the restrictions from the Ministry of Environment which only allowed the use of amalgam fillings in certain teeth.

Purposeful use of mercury 1982-2001 (in kilos)

■ Total purposeful use of mercury
□ Mercury in dental fillings



But...

Despite this development, however, dental amalgam was still responsible for the emissions of approx. 500 kilos of mercury into air and water every year.

2003: Further restrictions

As research led to the development of better alternatives to amalgam, the laws on dental amalgam also became increasingly strict. In 2003, a total ban on the use of dental amalgam in primary teeth came into effect.

The reasons that amalgam was no longer considered necessary in primary teeth was that these fillings do not need to last very long and are not exposed to the same amount of strain compared to adult teeth.

And so, in 2003, the list of exceptions to the prohibitions against use of mercury was changed to:

“Products for dental fillings in permanent molars subject to wear.”

2008: A total ban! Or?

In 2008, international headlines suddenly announced that a total ban on mercury fillings in Norway and Sweden would be followed by a similar law in Denmark as of October 1, 2008.

This was not completely true, however. The sensational news was a reaction to new guidelines from the National Board of Health. The new guidelines had the following wording:

“Mercury amalgam can be used for filling permanent molars in cases, where it is obvious that a filling of this material would be the most lasting alternative.”

Effects of new guidelines

Although the new guidelines did not seem very different from the previous ones, their effect can already be seen on the overall use of dental amalgam in Denmark. According to a supplier, the sales of amalgam for dental fillings has dropped by 80% since the new guidelines came into effect.

What was the effect on the dental profession? Practicing dentist, Ole Toft-Hansen, explains: “We are definitely using less amalgam now than before. Using composites instead of amalgam means that it takes much longer time to make a filling – and the patients are paying the price in the form of larger bills. Some patients ask for amalgam fillings because they feel composite fillings are too expensive. Of course, they don’t have that option anymore. Some of them decide not to spend the money and end up not getting the treatment they need.

One of the strongest reactions to the new guidelines came from the state funded children’s clinics. Composite fillings are more expensive to make than amalgam fillings and many were worried whether they would be able to stay within their limited budget.

Whether or not the new amalgam guidelines will have an adverse effect on the Danish dental health, time will have to show.



Why not sooner?

So, why did it take 20 years to phase out amalgam? Apart from the supposed lack of alternatives, the role of the economy has also been suggested by many dentists. “Patients have always received subsidies for the amalgam fillings through the National Health Service and the state needed to figure out how to fund the much more expensive composite fillings”, comments one dentist. What would have happened, if amalgam had been taken off the market already when the debate first started? “We would probably have figured out something else”, is Ole Toft-Hansen’s guess “As it happened, we were just never forced to develop alternatives before.”

Efforts against mercury pollution – success or failure?

All things considered, the Danish efforts against mercury pollution have been quite successful. During the 27 years that have passed since politicians were made aware of the mercury pollution in Denmark, there has been an impressive reduction in the emissions of mercury into the country's environment. As regards the regulations of mercury in dental fillings, however, it is a process that already does and will probably continue to raise many questions.

Did we see the whole picture?

In a famous Danish tale, an emperor hires tailors to create for him a beautiful royal garb. His own vanity and fear of the opinions of others combined with his trust in the "expertise" of the tailors make him blind to the real character of their product and even makes him lose trust in his own senses – the most important of which being the common sense. He fails to realise that, instead of being respectable, decent and admirable, he is in fact exposed, vulnerable and humiliated.

In the end, it is a small child who – not blinded by any of the things that impair the judgment of adults – exposes the emperor's mistake. Do we risk seeing the same conclusion to the environmental tale that our generation is writing in these years?

Though we might not reasonably be called 'blind', we are nonetheless starting to realise that we did not always see the full picture before making our decisions. In the case of mercury – as with many other pollutants - experts told us that exposure would only be harmful in certain amounts. 'Safe levels' was one of the expressions used to calm us down. Other experts told us that there were no alternatives that could replace mercury and that a ban would have negative consequences for the nation's health. According to the facts at hand, continuing to allow mercury seemed to be the cautionary road. Did we have the facts straight? Were they showing us the whole picture? Although we are still not sure of what is the truth about mercury, we do know that what we used to regard as truth, needs modification. Did we do well enough?

How will we answer?

Will we be able to answer for our choices when, one day, our children raise their voices with the clear-sight of retrospect and ask:

Did you do the right thing? Did you try hard enough?

Were there really no alternatives? Was it a question of economy?

Would you have made the same choices, had you known back then what we know now?

Were the problems that you sought to avoid back then more serious than the problems you were causing for us?

What did you gain by compromising our health and our future? Was it worth it?

How will we feel then? Will we see ourselves as the uncompromising generation that saved the earth – or will we feel like H. C. Andersen's naked emperor: Exposed and indecent, regretful that we didn't listen to the voice telling us that something wasn't right.



What fairy tale ending are we choosing for ourselves?