DENTAL TREATMENT

without mercury is becoming the norm

The traditional use of mercury in dental amalgam is diminishing in some parts of the world due to environmental concerns. In 2005 amalgam fillings constituted a global mercury consumption of about 310-410 tonnes annually, thus being among the largest consumer uses of mercury in the world. The alternative filling materials today have a quality that makes them viable substitutes for amalgam in almost all cases. The Nordic countries now have nearly amalgam-free dental care.

PHOTO: ISTOCK

The well known silver coloured amalgam fillings are now being substituted around the world with tooth coloured mercury-free filling materials. In 2005 amalgam fillings constituted a global mercury consumption of about 310-410 tonnes annually, thus being among the largest consumer uses of mercury in the world, and representing about 10 percent of total mercury consumption. It is also among the major non-industrial sources of mercury releases to water.

In Denmark, dental amalgam has been the number one mercury source to wastewater discharges for many years. The lifecycle of mercury in dental amalgam is complex; the mercury ends up in the environment by many different routes as illustrated by the mercury flow in Denmark in 2001 due to the use of amalgam fillings [Figure 7].

Nordic countries have nearly eliminated the use of amalgam fillings

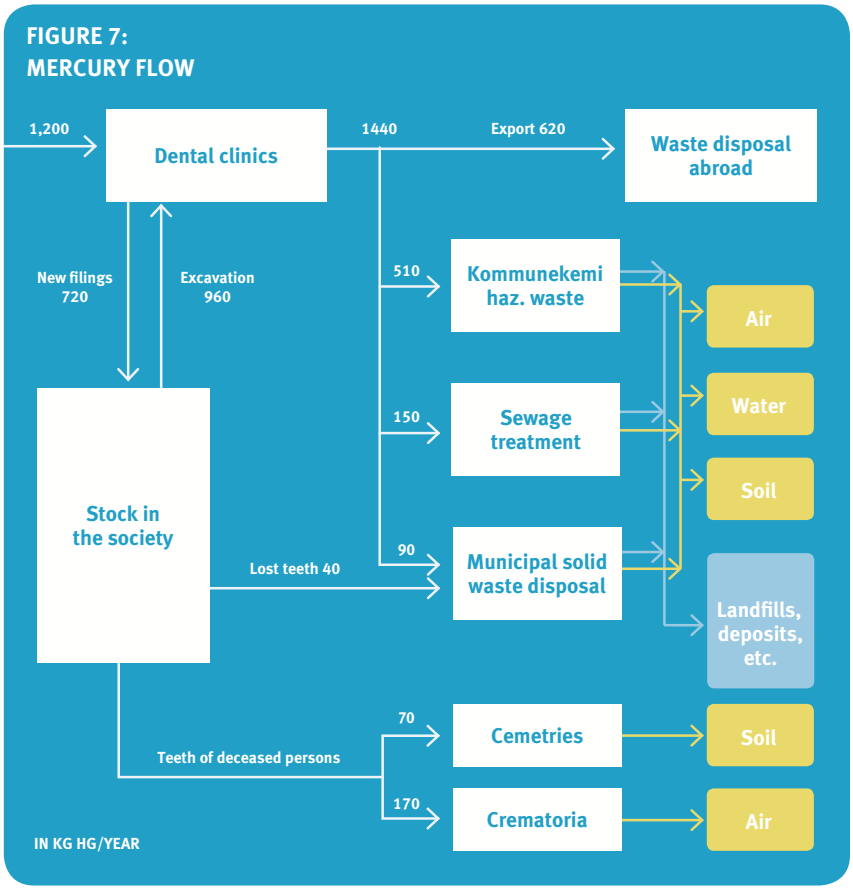
The mercury pollution of Nordic waters has made the reduction of mercury releases a priority for at least two decades.

Regulatory pressure and voluntary initiatives have driven substitution, and this movement has enhanced the introduction of alternative filling materials and filters called amalgam separators installed in dental clinics. These filters can capture most of the mercury discharges from clinics to the sewage system.

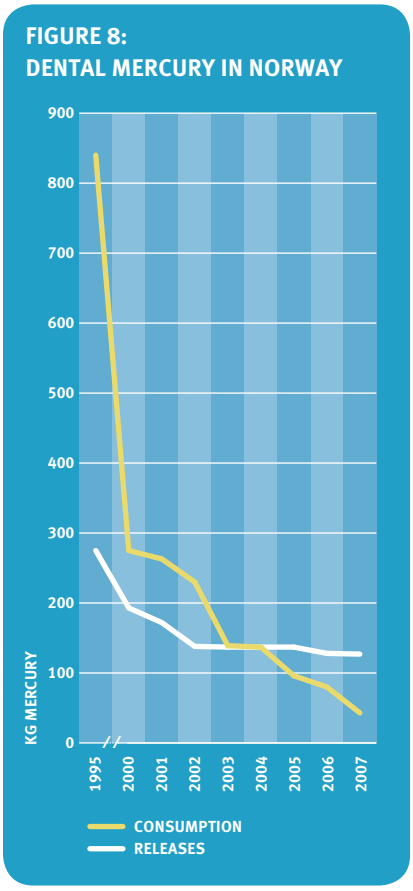
In Norway the consumption of dental amalgam has declined steeply and the consumption in 2007 was only five percent of the 1995 level [Figure 8]. The decrease was a result of a voluntary phase-out of amalgam fillings and clearly demonstrates that acceptable alternatives are available for nearly all applications.

The corresponding mercury releases to the environment tend to decline more slowly because people still have older amalgam fillings in their teeth.

A prohibition of amalgam use in Norway was introduced in 2008. The prohibition has an exemption for the treatment of patients who must be treated under



Mercury flow in Denmark in 2001 due to the use of amalgam fillings.



Decreases in amalgam consumption and mercury releases from dental clinics in Norway.

general anaesthesia or who are allergic to certain materials in mercury-free dental fillings.

Substantial reductions have also been seen in Denmark and Sweden over a longer time period. Denmark introduced a partial ban in 1994 and today the use is minimal, while Sweden has worked intensively for substitution for years, implementing a total ban in 2009.

It takes time to accept new alternatives

Alternative mercury-free fillings exist in a range of qualities, some more durable, others easier to use under low-tech conditions. The alternative fillings consist of a mix of sophisticated plastic materials and fillers made of ceramics or special types of glass.

The alternative filling materials sometimes take longer to apply, and may thus be more expensive than the traditional amalgam fillings. Today there is enough experience with these filling materials to show that the best of them have a durability comparable to the traditional amalgam fillings, but without the environmental effects of mercury.

Nevertheless, some dentists still consider amalgam to be the best solution for some types of complicated fillings, and the difficulty of substituting amalgam in complicated fillings has been carefully studied.

Real life studies affirm durability of mercury-free fillings

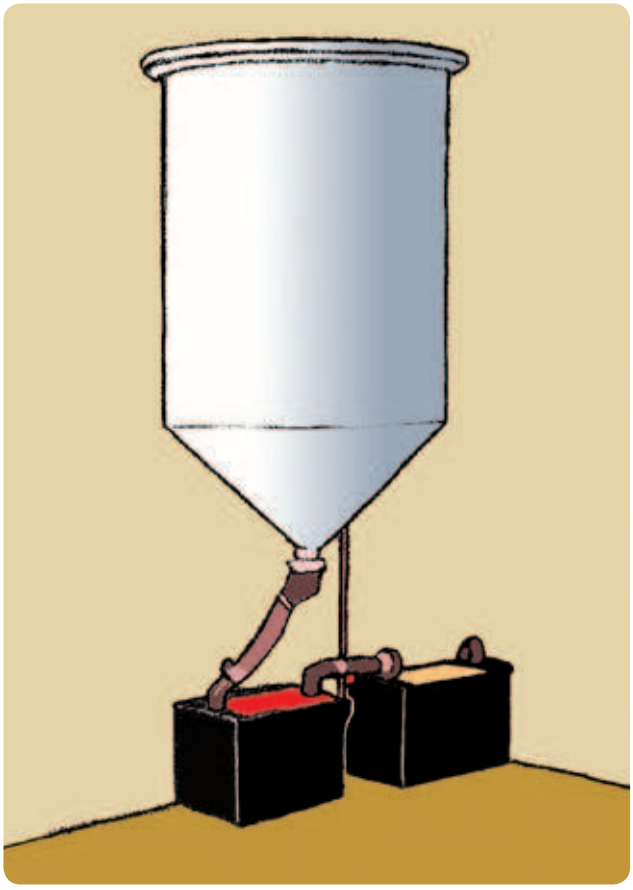
Simon Vidnes-Kopperud and his colleagues at the dental faculty of the University of Oslo, in Norway, investigated the quality of 4030 dental fillings made with some common dental filling materials 4-7 years after the fillings were placed.

The goal was to check how well the different filling materials performed under real life conditions with average dental care. 27 dentists in Norway had earlier placed the fillings in the teeth of 1912 young people.

The results of this study showed that amalgam and one alternative filling type called compomer had similar durability. Another alternative called a composite filling, which represented the majority of the fillings placed, lasted for a somewhat shorter time than amalgam fillings, whereas the so-called GIC fillings (glass ionomer cement) had a significantly shorter lifetime. Similar results were found in the Danish part of this project, led by Vibeke Qvist of the University of Copenhagen.

The primary reason for failure of the composite fillings was secondary caries, meaning new holes or cavities around the existing filling due to bacterial activity. According to Qvist, the metal mix in amalgam fillings has an antibacterial effect which reduces such caries. The compomer fillings generate a slow release of fluoride over time, which

The inside of a used amalgam separator.
PHOTO: ANDERS LINDVALL



Two amalgam separators (main and back-up) mounted under the separator tank of the suction system. DRAWING: EVA LINDH

reduces the dissolving effect of bacteria on the tooth enamel. Composites do not have either of these effects.

Amalgam separators cut mercury releases from dental clinics

As long as dental amalgam is still used in the teeth of consumers, mercury is released to the sewers from dental clinics. Amalgam separators, which are high-efficiency filters for dental clinics can, however, greatly reduce mercury discharges to the environment.

ISO-tested amalgam separators installed in the central suction system in dental clinics can cut mercury releases by 95 percent or more if correctly installed and maintained.

An amalgam separator is a filter device that can be introduced between the clinic's suction system and the sewer outlet. A separator can work with just one dental chair or it can serve up to 4-6 dental chairs if it is regularly maintained.

In the Nordic countries, a filter can be installed, regularly maintained and recycled for around 400 Euros a year. Because most of the cost is associated with labour, the price would likely be lower in other regions of the world.

"During the 1980s and 1990s most dental clinics in the Nordic countries have been equipped with amalgam separators", says Erik Petersen of Rectus, a Danish producer of amalgam separators.

"The other European countries are also well on the way, and we sell separators as far away as Iran and Korea," adds Mr Petersen.

In Denmark a significant impact on mercury discharges to the environment in wastewater has been observed. Here discharges to wastewater from dental clinics dropped by 80 percent to around 200 kg of mercury per year between 1983 and 1993.

The resulting filter residue has to be collected and treated separately to prevent it from being released to the environment via general waste management.

According to Mr Petersen, an effective way is to participate in a recycling system set up by the filter suppliers, who can reuse parts of the filter and ensure that the hazardous mercury containing residues are treated or disposed of properly.

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