

Dental Amalgam

Fact file

March 2008

Dental amalgam has been used as a safe, stable and cost effective restorative material for more than 150 years, but there has always been some controversy surrounding its use. A recent review by the EU Commission's Scientific Committee has concluded that no increased risks of adverse systemic effects exist and amalgam is not therefore considered to pose a risk of systemic disease. Alternative materials to dental amalgam do exist, and their use is increasing. This Fact File critically examines the evidence on dental amalgam, and explores the future of dental amalgam and its alternatives.

What is dental amalgam?

Dental amalgam has been used as a safe, durable, stable and cost effective restorative material for more than 150 years. Mercury is unique in its ability to form solid amalgams with other metals and dental amalgam comprises approximately 50% mercury, combined with silver and small amounts of copper, tin or zinc. There has always been a certain amount of controversy surrounding the use of dental amalgam as a restorative material. This has increased over the past 25 years and there has been much research into the health effects of amalgam over this time.

How widely is dental amalgam used?

Amalgam remains a valuable tooth restorative material in dentistry for practical and realistic reasons. Other filling materials are available but amalgam is cost effective and durable material with predictable outcomes and is still a commonly used filling material in many countries.

What other sources of exposure to mercury exist?

Human exposure to mercury is mainly from three sources:^{1,2}

- Methyl mercury in fish

- Mercury vapour from amalgam tooth fillings
- Ethyl mercury in thiomerosal (used as a preservative in vaccines).³

The main source of human exposure to methyl mercury is through the consumption of fish. The highest concentrations are found in long-lived predatory fish such as tuna, swordfish, shark and bass. Thiomerosal, which contains ethyl mercury, has been used a vaccine preservative since 1930. Ethylmercury has a similar toxicology pattern to methylmercury but is metabolised more rapidly and in 2002 WHO concluded that it was safe to use thiomerosal in vaccines.

What are the health effects of dental amalgam?

In the mouth, mercury is amalgamated with other metals and is therefore rendered inert. Chewing can release some mercury vapour but this is very minimal.¹

There have been concerns in the past of amalgam being associated with a variety of systemic conditions such as Alzheimer's, Parkinson's Disease, and Multiple Sclerosis. However, several major studies have failed to reveal such effects. A recent epidemiological assessment⁴ found that evidence for the role of dental amalgam in multiple sclerosis, Parkinson's disease and Alzheimer's disease was inconclusive. Evidence that dental amalgam can be a causative factor for effects on neuropsychological function, chronic fatigue syndrome and non-specific symptom complexes was also inconclusive. It is perhaps worth noting that many studies of patients with alleged "amalgam illness" have shown that these patients often have a tendency towards psychosomatic disorders, anxiety and depression, panic disorder and the inability to perceive and understand threatening situations.⁵ The recent preliminary report by the Scientific Committee on Emerging and Newly Identified

Health risks (SCENIHR)⁶ concluded that no increased risks of adverse systemic effects exist and they do not therefore consider that the current use of dental amalgam poses a risk of systemic disease.

Two recent studies on the health effects of dental amalgam in children concluded that it should remain a viable restorative treatment option for children. The first⁷ showed that there were no statistically significant differences in adverse neuropsychological or renal effects observed over the 5-year period in children whose caries were restored using dental amalgam or composite materials. The second⁸ indicated that children who received dental restorative treatment with amalgam did not, on average, have statistically significant differences in neurobehavioural assessments or in nerve conduction velocity when compared with children who received resin composite materials without amalgam. The SCENIHR preliminary report also concludes that the most recent studies have failed to find any association between the use of amalgam and neuropsychological development in children.

Allergic reactions to mercury in dental amalgam have also been reported but these are very rare.⁵ The SCENIHR report recognises that some local adverse effects are occasionally seen with amalgam fillings, including allergic reactions, but the incidence is low and normally readily managed.

Is amalgam safe?

The SCENIHR report concludes that dental amalgam is a safe material to use in restorative dentistry with respect to patients.

Should dental amalgam fillings be removed?

Several studies on the release of mercury vapour during the removal of dental amalgams have been carried out, including some of

patients who had all their amalgams removed in one session.⁵ Most studies showed a slight transient increase in blood and urine levels during removal. No evidence supporting amalgam removal for supposed health benefits has been found. There is no clinical justification for removing clinically satisfactory amalgam restorations, except in those patients suspected of having allergic reactions to one of the amalgam constituents.

Is amalgam safe for use in pregnant women?

It is known that mercury can cross the placenta from mother to foetus – but there is no evidence of any link between amalgam use and birth defects or stillbirths. In 1997 UK Committee on Toxicity report said that there was no reason to think that the placement or removal of amalgam fillings during pregnancy was harmful.⁹ Nevertheless, COT did say as follows:

“There is no available evidence to indicate that the placement or removal of dental amalgam fillings during pregnancy is harmful. We are of the opinion, however, that the toxicological and epidemiological data are inadequate to assess fully the likelihood of harm occurring in such circumstances. Until appropriate data are available we concur with the view that it may be prudent to avoid, where clinically reasonable, the placement or removal of amalgam fillings during pregnancy.”

Following the publication of advice from COT, the Chief Dental Officer and Deputy Chief Medical Officer (April 1998) produced concise precautionary advice with respect to amalgam fillings and pregnancy. It remains the Department’s advice that dentists should continue to avoid or delay any dental intervention or medication during pregnancy; however a dental emergency where treatment with dental amalgam is required can outweigh any, as yet, theoretical risk of systemic toxicity.¹⁰

The 2008 SCENIHR preliminary report states there is a lack of information about the effects of amalgam in pregnant women. There is no evidence to suggest that pre-existing amalgam restorations pose any risk as far as the health of such women and the developing foetus is concerned, and any removal of restorations during this time would present a greater exposure to mercury. Caution should be exercised when considering the placement of any dental restorative material in pregnant women.

What about the safety of dentists?

Dentists have far more mercury exposure than

the general populations. Health and morbidity studies, however, have indicated that dentists have no unusual diseases and live longer than physician colleagues who generally are not exposed to mercury in the workplace.⁵

What do the regulatory agencies say?

According to the Medicines and Healthcare Regulatory Agency (MHRA),¹¹ there are three major uses for mercury in medical devices:

- Blood pressure measurement devices
- Body temperature thermometers
- Dental amalgam

At present there are no plans to further restrict addition of mercury to dental amalgam. However, the MHRA suggests that it may be prudent not to remove or place fillings during pregnancy where clinically reasonable (although it points out that there is no evidence to suggest that this is harmful) and advises that alternatives should be used in cases of allergy and hypersensitivity. The MHRA considers that “the safety of dental amalgam has been reviewed nationally and internationally over last 10 years – concluding that it is safe to use.”

The SCENIHR report concludes that dental amalgam is a safe material to use in restorative dentistry with respect to patients. A report released at the same time by the Scientific Committee on Health and Environmental Risks (SCHER)¹² entitled Preliminary report on the environmental risks and indirect health effects of mercury in dental amalgam, states that the predicted indirect exposures of humans to methylmercury resulting from emissions due to dental amalgams are much lower than the tolerable limits indicating a low risk for serious health effects.

What do governing bodies say?

In 1997, the Department of Health’s Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) was asked to advise the former Medical Devices Agency (now the MHRA) on the toxicity of dental amalgam, in order to inform the UK’s response to the report of the Ad Hoc Working Group of experts established by the European Commission. COT saw no reason to revise the view of amalgam that it had taken in 1986: “that the use of dental amalgam is free from risk of systemic toxicity...”⁹

The World Dental Federation (FDI) and the World Health Organisation (WHO) consensus statement on dental amalgam¹³ was issued in 1997. This concludes that Dental amalgam restorations are considered safe, but

components of amalgam and other dental restorative materials may, in rare instances, cause local side-effects or allergic reactions. The small amount of mercury released from amalgam restorations, especially during placement and removal, has not been shown to cause any other adverse health effects.

The American Dental Association (ADA) continues to believe that amalgam is a valuable, viable and safe choice for dental patients¹⁴ and in 2002 the Federal Drugs Administration (FDA) published a Consumer Update on dental amalgam which stated that “FDA and other organisations of the U.S. Public Health Service (USPHS) continue to investigate the safety of amalgams used in dental restorations (fillings). However, no valid scientific evidence has shown that amalgams cause harm to patients with dental restorations, except in the rare case of allergy”.

What are the alternatives to dental amalgam?

Alternatives to dental amalgam do exist and are often used for cosmetic reasons. These include resin composite materials, glass ionomer cements, ceramic inlays and onlays and gold alloys.

Issues to consider when looking at alternative restorative materials include longevity, durability, sensitivity, allergenicity and cost effectiveness. For patients desiring an alternative for cosmetic reasons, resin composites are usually the best choice, but glass ionomer cements have been advocated in patients prone to caries. Ceramic and gold restorations are also used in dentistry where an indirectly custom manufactured restoration is necessary or chosen.

Current research suggests that resin modified glass ionomer cements (and compomers) have comparable durability to amalgams for occlusal and moderate sized class II cavities in primary molars,¹⁵ while Preformed Metal Crowns are actually superior for larger restorations in primary molars.^{16,17} However, the evidence on restoration longevity from primary care settings is not as convincing with restorations failing more quickly.

What is the future of dental amalgam as a restorative material?

As dental amalgam is not tooth-coloured and does not adhere to remaining tissues, its use has been decreasing in recent years, and tooth-coloured filling materials have increased in popularity.⁶ This trend in restorations shows some variation within and between countries. There is a significant reduction of training in the



placement of dental amalgam restorations and a corresponding increase in training in the use of alternatives in a growing number of European dental schools. A sustained reduction in the use of dental amalgam in oral health care provision is expected across the European Union. This is dependant on trends in dental education towards increasing use of alternative materials in place of amalgam and the possible reduced availability of mercury products in general.

Are there mercury emissions from crematoria?

Crematoria are currently responsible for a rising proportion of UK mercury emissions to air. This is partly because the number of amalgam fillings present at cremation is rising and partly that other mercury emissions are falling or are steady.¹⁸ However, it has been predicted that mercury emissions from crematoria will only continue to increase until 2020. This will be followed by a slight rise or plateau until 2035 and then a decrease back to 2000 levels by 2055. These predictions have been made based on dental data to 1998¹⁹ and actuarial data and can be explained by considering the population of the UK as three cohorts:

- the very old with few or no teeth
- those with heavily restored teeth
- the fluoride toothpaste generation

The aim in the UK is to cut emissions of mercury from crematoria by half by the end of 2012. This figure was determined after extensive consultation by DEFRA to achieve a balance between costs to the sector and environmental benefits.²⁰ To help achieve this target, an experimental initiative called 'burden sharing' has been introduced. Under this initiative, crematoria operators can choose whether to fit mercury abatement equipment or contribute to the costs of others doing so. The scheme is being organised at a national level by the umbrella organisation CAMEO and more information about it can be found on the Federation of British Cremation Authorities website.²¹

All crematoria were required to notify their local authority regulator by 31 December 2005 whether they would be fitting abatement equipment, sharing the cost of abatement fitted by other crematoria (burden sharing), or using a combination of the two approaches. All new crematoria should be fitted with mercury abatement equipment but those conducting fewer than 750 cremations have until 2012 to do this.^{22, 23}

Is amalgam disposed of safely?

Article 4 of the Waste Directive (75/442/EEC) requires that waste must be disposed of without endangering human health or the environment. This includes amalgam waste from dental practices. In order to meet these requirements, DEFRA issued new guidance in December 2005 which stated that amalgam separators should be fitted in all dental practices in England where amalgam is used²². Dentists were asked to take steps to ensure that suitable separators were fitted as soon as reasonably practicable. The guidance also advised that amalgam waste would need to be kept separate from other waste and collected by a waste management facility with a licence or permit to handle amalgam waste. Similar guidance exists for Scotland, Wales and Northern Ireland.

**British Dental Association
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