

To the Deans of Dentistry

at all dental schools in all countries

July 2011

An open letter

From Robert Gammal BDS

Essential reading for all dental students

This open letter is addressed to the Deans and the Professors of Dentistry, who continue to teach dental students to use **dental mercury (Hg) amalgam** as part of their curriculum.

The information contained herein is of course pertinent to dental students.

No other university students are routinely poisoned, without their knowledge or consent, by mercury, the third most toxic non-radioactive substance known.¹ Only arsenic and lead are more toxic than mercury.

The continued teaching and use of mercury amalgam ensures that every dental student (and possibly every person in the dental hospital) will be exposed to massive levels of mercury vapour. The health of every dental student is at best compromised, if not irreversibly damaged by this practice. Dental mercury amalgam is neither safe nor effective.

Are the dental students informed that the mercury poisoning they receive is similar to that which the hatters of old were exposed to, and hence the name Mad Hatters. Sadly this is not Alice's Wonderland.

There are many hundreds of published articles which do NOT associate any disease states with the mercury that is released continuously from amalgam. This "lack of association" is then usually construed to mean that "amalgam is safe". A perfect example of this is in two studies published as recently as 2006, by the Journal of the American Medical Association.^{548, 549} These two studies are discussed at the end of this paper. The editor of the Journal of the American Medical Association (JAMA) in a special editorial in this journal, states clearly and with emphasis, that these studies should not be interpreted as a declaration of safety for amalgam. Dental associations around the world have ignored this advice and continue to point to these studies as proof of the safety of amalgam. (See Page 34)

There are also many hundreds of articles in the published science that clearly demonstrate serious health effects from mercury exposure, to both dental and non-dental personnel, mainly published in medical and environmental journals - journals that dentists tend NOT to read.

If there were only *one* article that demonstrated a problem then surely we deserve to give it some recognition. When there are *hundreds* then surely we are bound to react in a responsible and educated manner.

"The absence of evidence is not evidence of absence."

Carl Sagan

It seems incredible that the only group of people who cling to the desire to use mercury in their daily lives and implant it into other living humans is a health care profession. Only dentists think that mercury is "safe and effective". This is in line with the positions of the trade organizations called Dental Associations. This teaching is NOT in line with the published science. (Most of my patients are shocked to learn that dentists are still using amalgam and are incredulous that this practice is still being taught.)

I understand that as Deans and Professors of Dentistry you would have a heavy work load and may have missed some of these published scientific articles. At the same time you have a professional responsibility to ensure that the students are given accurate and comprehensive information and that the wellbeing of the students is of paramount importance. You also have the added responsibility of protecting the safety of everyone in the dental hospitals. This is particularly relevant at a time when mercury is being banned world wide. Perhaps you are genuinely unaware of some of this literature. I hope that this short letter will lead you to the references that allow you to make an informed choice for the protection of those you teach.

My intent is of course to stop the continued poisoning of dental students, dental personnel, patients and the environment by unnecessary exposure to mercury from amalgam fillings. Better alternatives are available, and if dentists do not know how to use these better alternative materials it is a damning reflection of the standard of education that the dental students are receiving. There have been literally hundreds of "Continuing Education" courses in Australia on the use of composite resin materials over the past 25 years, yet not one on the use of amalgam.

A simple decision to stop teaching and using mercury as an implant material is within your power.

About 50% of an amalgam filling is mercury which escapes from the mixture continuously in the form of elemental mercury, mercury vapour and mercury ions.

Mercury poisons everyone no matter what their race, religion, colour, nationality or profession. Even Deans and Professors are affected. Mercury does not differentiate or discriminate.

The Mechanics Myth

Dentistry has always taught that amalgam is a great filling material because it is strong, easy to use and cheap. It has been raised to the status of a great filling material by organizations that were built on its use – the dental associations. They have even declared that it is unethical to remove amalgam to affect an improvement in health.^{2,3}

The idea that alternatives to amalgam are not as good as a tooth filling material is an illusion. This view is NOT supported by the consensus of scientific research. Governments around the world acknowledge that

better alternatives are available. They have been for years. This is perhaps why so many dentists around the world have turned their backs on this antiquated filling material.

Even if amalgam were the great filling material that the teaching institutions like to claim, it would still not be a good enough argument to place mechanics above health effects. Perhaps thalidomide should be reinstated to stop 'morning sickness' for pregnant women. An equally ridiculous notion.

Dental amalgam is not just a bad restorative material. It is in fact the most tooth-destructive material we have. It should NOT be described as "restorative". It is more accurately described as an implant of mercury into living tissue.

In 1993 Dr Harold Loe, then the director of the National Institute of Dental Research in the USA stated:⁴

"That first filling is a critical step in the life of a tooth. Using amalgam for the first filling requires removing a lot of the tooth substance, not only diseased tooth substance but healthy tooth substance as well. So, in making the undercut you sacrifice a lot, and this results in a weakened tooth. The next thing you know the tooth breaks off and you need a crown. Then you need to repair the crown...and so it continues to the stage where there is no more to repair and you pull the tooth. With the first filling you should do something that can either restore the tooth or retain more healthy tooth substance. Use new materials - composites or materials you can bond to the surface without undercuts. You can do this with little removal of the tooth substance so that the core of the tooth is still there."

Amalgam weakens the tooth. Bonded restorations strengthen the tooth. It is easier to replace a worn filling than to replace missing bits of teeth. I am sure that most people would prefer to change a filling rather than loose a tooth.

In 1995 Dr Richard Simonsen the editor-in-chief of Quintessence, wrote:⁵

"Amalgam should never be used as a restorative material in paediatric dentistry." Why? Because better alternatives are available.

"Amalgam should never be used as a first time restorative material." Why? Because better alternatives are available.

"Move Over Amalgam - At Last."

Why are you, the Deans and Professors, teaching dental students to do mechanically destructive, antiquated, second rate fillings? Better alternatives have been available for years. Are they too difficult to teach to some of the brightest people on the planet? Why are you wasting the time of the dental students when they could be learning how to heal instead of poison people?

The 'Amalgam is Cheap' Myth

The proponents of amalgam claim that due to its cheap price it is an important filling material as it can be afforded by the poorer people in the community. This may have been true at the time of its introduction in the early 1800s. At that stage the main alternatives to amalgam were gold (far out of the reach of the average person) and molten lead (the second most toxic substance known). I can understand that dentists would have been delighted to have this as an alternative. The times have changed and we do have cheap, effective and safer alternatives which do not destroy teeth or poison their owners. Better alternatives have been available for years. It is time to get with the times.

I also find it hard to understand how it can remain 'cheap' as the price of silver increases almost by the minute and silver constitutes about 35% of the amalgam alloy which is mixed with mercury.

With respect to the actual dollar cost of a composite or amalgam filling there is not much difference in the patient's bill.

With respect to the fact that it cracks and destroys teeth, dental amalgam suddenly becomes a rather expensive 'restoration' as it will most likely need to be replaced by a crown, or an extraction and something to fill the gap. This compares unfavorably with the use of bonded composites which assist the integrity of the tooth.

Mechanically, amalgam is a destructive, and thus very expensive, implant which has no place in modern restorative dentistry.

Amalgam is the single greatest source of mercury to the general population. Since when should the cost of a treatment outweigh its potential to cause disease. This argument is nothing short of an insult to our intelligence and wellbeing. The cost of disease caused by mercury from amalgam is not included in the argument of its cheapness. This cost is not only carried by the patient but is in fact carried by the whole of the community. Banning the use of amalgam would immediately add many dollars/pounds/etc to the wealth of all communities. I would propose that medical research funding could be far better spent after we stop poisoning the people who have the diseases. Health is much cheaper than disease.

Waste amalgam

There is no argument that dental amalgam releases mercury all of the time. This is why such a great deal of fuss is made about the amalgam that we throw away and call "WASTE" amalgam. There are three sources – the bits that are left over after the cavity is filled, the bits that are cut out of a tooth when the filling needs replacing and the amalgam that remains in teeth that are extracted.⁶

Strict guidelines are in place for in-house storage of waste amalgam in dental surgeries, yet in 150 years of trying, dentistry has not found a way to prevent the release of mercury from waste amalgam.

The Environmental Protection Agency state that waste dental amalgam is a "toxic waste disposal hazard".⁷

Waste amalgam must be disposed of by toxic-waste experts. It is illegal to dispose of it into the sewerage, waste water or garbage because it will pollute the environment. ^{8,9,10,11,12,13,14,15,16,17,18,19,20}

The mercury released from dental amalgam into the environment is significant. For example the mercury released from crematoria constitutes 16% of the UK's mercury pollution. ²¹ At least 11kg of mercury is spread into the environment per crematorium chimney per year. ^{22,23,24}

This does not include the pollution from burial, nor that which comes directly from dental surgery waste, nor from the urine and faeces excreted by every human who has amalgam in their mouths.

The dental profession seems to dissociate the human body from the rest of the environment as it does the 'oral environment' from the rest of the body. Mercury vapour levels in the mouths of people with amalgam fillings may exceed occupational safety maximum permissible levels. Amalgam constitutes the single greatest source of mercury to the non-occupationally exposed population.

100% of humans who are exposed to any level of mercury vapour are in fact being poisoned. (The No Observable Effects Level for mercury is ZERO). The environmental disaster is discussed later in this letter. For now I want to come back to the dental students.

Toxic waste is placed in mouths

The amalgam the dental industry calls "waste amalgam" is exactly the same as the amalgam placed in people's teeth. It is the same amalgam that dental students must mix and use, to graduate as a dentist. It is the same material that they may continue to use as registered dentists, thereby continuing to poison themselves, staff, patients and the environment.

Maximum Allowable Levels Of Mercury Vapour

OSHA Occupational Safety & Health Authority Time Weighted Average 40hr/week USA & Australia	50 mcg/m³ Includes dentistry
EPA Environmental Protection Agency USA & Australia	0.3 mcg/m³ All other humans
ATSDR Agency for Toxic Substances & Disease Registry USA	0.02 mcg/m³ Transient Exposure

Mercury in Dental Clinics

It is well accepted that dentists are exposed to much greater levels of mercury than the rest of the population. This is true for dental students as well. The exposure to mercury vapour that dental personnel receive is regarded as an 'occupational' exposure and is measured against the OSHA TWA of 50 mcg/m³.

The EPA regulates for all other non-occupationally exposed humans and has set the Maximum Allowable Mercury Vapour Levels (USA & Australia) at 0.3 mcg/m³. (166 times less than Occupational maximum levels)

The ATSDR state that a transient exposure of only **0.02** mcg/m³, will produce **observable physiologic change!** This level is 2,500 times below the OSHA maximum and 15 times below the EPA maximum allowable mercury vapour concentration.

The studies on levels of mercury vapour in dental environments use the OSHA figure of 50mcg/m³ as the reference. Many of these studies demonstrate that a large percentage of dental surgeries have levels far exceeding this. Normally OSHA levels are matched by a requirement that all occupationally exposed workers must have a medical every year and that the results of this medical examination be kept for thirty years after the exposure ends. Dental personnel are not required to have such examinations.

Considering that dentists, dental students, dental nurses, hygienists, receptionists and patients are human beings, we should really be using the EPA figures of 0.3 mcg/m³ as the base line against which dental surgeries are measured. The difference is a factor of 166 times less.

Very few dental surgeries or teaching institutions would comply. Why is dentistry immune from EPA regulations? Are reception and nursing staff told that they will be occupationally exposed to mercury? Are patients told that they too will suffer the same fate? Are the dental students made aware of this? Have you told anyone in a medical hospital where dental procedures are carried out, that they too may be poisoned during this procedure.

The only reason that dental students and most other dental personnel are exposed to these toxic levels of mercury is that you, the Deans and Professors, continue to teach this technique.

Better alternatives are available.

There is no need to continue to use mercury amalgam.

Actual Measured Levels

Dental students are particularly vulnerable. All they have for protection is a paper mask and blind trust in what they are taught! Mercury vapour passes through such masks as easily as if they were not there! They are not supplied with mercury vapour masks and neither they nor their

patients are supplied with separate air supplies. In fact they are merely told to wash their hands and not spill mercury. Considering this information, the thought of twenty dental students, all using or cutting amalgam in the same clinic makes for an amazing horror movie.

Every time a dental student opens a capsule of mixed amalgam, a mercury vapour cloud is released. Concentrations up to 1000mcg/m³ have been measured.²⁵ This is 3000 times greater than what the EPA standards allow and 50,000 times greater than what is known to cause observable physiological change.

A cloud of mercury vapour is also created when an amalgam filling is cut with a high speed bur. Levels as high as 4,000mcg/m³ have been measured 18 inches from the mouth.^{Error! Bookmark not defined.} This is well within the breathing zone of the dental student and dental nurse, let alone the patient. This is 200,000 times greater than what is known to cause observable physiological change, as a transient exposure.

Cutting amalgam will also create a cloud of microscopic, fully respirable particles. This will also cause a marked elevation in body burden of mercury.²⁶ Although these particles may be trapped in a paper mask, the combination of the vast surface area and the increase in temperature from the persons breath, may actually create an increased mercury vapour level on the inside of the mask which is of course inhaled.

One would think that proper mercury vapour masks should be a 'minimum requirement' for all people who must breath, in a mercury vapour environment. Why are dental students and other dental personnel being denied this basic protection? Perhaps the patients may get a bit nervous about having amalgam implanted into their bodies if proper mercury hygiene were observed and students were really given protective clothing and masks.

Why is it that Environmental Protection Agency & Occupational Health and Safety standards are not respected?

Exceeding the maximum allowable levels by HOW MUCH?

Maximum Allowable Hg Vapour Mcg/m ³ /m ³	6 amalgam fillings 30-120 mcg/m ³	Opening a mixed amalgam capsule 1000 mcg/m ³	Drilling amalgam fillings 4000 mcg/m ³
OSHA 50	2x	20x	80x
EPA 0.3	400x	3,333x	13,333x
ATSDR 0.02	6,000x	50,000	200,000

Spread of Mercury Vapour

Where does all of this mercury go? The answer is provided in a study published in the British Dental Journal in 2001.²⁷ Plasma mercury levels were measured in people who were directly exposed to mercury vapour in clinics and those who were nowhere near the clinics. They found that:

“There were statistically significant increases ($p < 0.001$) in plasma mercury concentration between measurements in all groups at the end of the academic year. Red cell mercury levels were also consistently elevated.”

“Although the highest levels of mercury were recorded in persons working with amalgam, increased levels were also found in subjects working in the teaching classrooms but not with amalgam (controls and first year students).”

This clearly shows that the mercury that was created in the actual clinics was spread throughout the building and poisoned even those who were not directly exposed to working with amalgam. Every person in that building was poisoned. Do you, as Dean in your dental hospital, have informed consent from all of the people who enter these premises, to poison them.

Many dental surgeries still have their suction motors inside the premises of the surgery and venting into these premises. There are no filters on suction motors which catch the mercury vapour. Everyone who is in the building will be inside a big fume cupboard. All suction motors should be vented to the outside of the building to protect everyone inside the building!

Mercury vapour is odorless, tasteless, and invisible.

80% of mercury vapour inhaled into the lungs will cross into the blood stream²⁸ and be transported to every cell in the body.^{29,30}

Mercury is also transported along nerve fibres toward the brain at a rate of 10mm per day.^{31,32,33,34,35,36}

Mercury vapour also adheres to and passes through the oro-nasal mucosa and the base of the skull, and gains direct entry into the brain.^{37,38}

Paper masks used by dental personnel do NOT stop mercury vapour.

Studies from 1989 & 1990 in sheep and monkey animal models demonstrate that “dental mercury accumulates in all tissues of the adult, and is at its highest in the kidney and liver. This accumulation is so extensive that it can be visualised on a whole-body image scan”^{39,40}

Mercury Release from amalgam fillings

Mercury escapes from amalgam in the forms of mercury vapour, elemental mercury and mercury ions. The rate of release of mercury is increased by an increase in temperature, friction and electrical currents. Elevated levels remain for about 90 minutes after such stimulation.⁴¹

Oral mercury vapour levels have been measured at between 30–120 mcg/m³ for a mouth with 6 amalgam fillings. Thus the oral environment of most people with amalgam fillings exceeds OSHA, EPA, ATSDR and WHO standards for mercury vapour.^{41,42,43,44,45,46,329,47,48,49}

In 1990 the daily uptake of mercury from amalgam was analyzed:

“It is estimated that the average individual, with eight biting surface mercury fillings, is exposed to a daily dose uptake of about 10 mcg mercury from their fillings.

“Select individuals may have daily doses 10 times higher (100 mcg) because of factors which exacerbate the mercury vaporisation.”⁵⁰

Galvanic Reactions

As mentioned briefly before, increases in temperature, friction and grinding will increase the output of mercury from amalgam fillings. Another important factor to consider is the practice of placing gold in a mouth with amalgam fillings or, as most prosthodontists in Australia still do, using amalgam as a core for gold crowns. Not only is this contraindicated by the manufacturer, Caulk (see MSDS for Dispersally p19), but this practice was warned against way back in 1964, in the most prestigious text book on dental materials by Skinner & Phillips⁵¹. This text book, used for teaching dental students, clearly states:

“It has been suggested that these electrical currents, or the metallic ions which are liberated from the restoration because of the galvanic current, could account for the many types of dyscrasias, such as lesions, ulcers, leukoplakia, cancer and kidney disorders.

“The insertion of an amalgam restoration directly in contact with a gold inlay would seem to be contraindicated.”

In fact a 1978 study⁵² which looked at the mercury levels in the roots of teeth found that there was a fourfold increase in the amount of mercury per gram tissue weight of dentine when a gold crown was placed over an amalgam filling compared to teeth with amalgam only. “Gold in contact with amalgam constitutes a short circuited, permanent galvanic cell, where the electrolytes are constantly renewed.”⁵³

Placing gold and amalgam in the same mouth will cause a dramatic increase in mercury from all of the fillings. "In the mouth, gold acts as a cathode and the less noble metal, mercury amalgam, functions as the anode, and a dissolution of the less noble metal takes place." ²⁹¹

Some other supporting literature can be found in these references.
54,55,56,57,58,59,60,61,62,63,64,65,66

The magnitudes of oral currents are in the same order of magnitude as those induced in the tissues of a human, standing directly under high-voltage transmission lines. ⁶⁷

The practice of placing amalgam and other metals in the same mouth is still being taught at most universities throughout the world. There is NO justification. There is NO legal defence for this practice which is warned against by the manufacturers and your own texts.

You may also like to know that a study published in 2008 showed that MRI, and microwave radiation emitted from mobile phones, cause a significant release of mercury from dental amalgam implants. ⁶⁸

The new fetish of bleaching teeth has a serious downside as well. Bleaching agents used to whiten teeth, when in contact with amalgam fillings, provoke an immediate and large increase in the release of mercury from these fillings. Are dentists or patients given this information? ^{69,70,71,72,73,74,75,76,77}

WHO Criteria 118, (1991)

Criteria 118 published by the World Health Organisation ⁷⁸ is the first WHO publication which included dental amalgam as a dietary source of mercury. They found that daily contributions to the body burden of mercury from various sources are;

Air and water	0 mcg/day
Foods generally	0.3 mcg/day
Seafood	2.3 mcg/day
Dental Amalgam	1-17 mcg/day

The figure for amalgam was reviewed in 2003 and raised to **27 mcg/day**.
²⁸

Dental amalgam is the single greatest source of mercury to the general population – staggeringly, to a value of **ten times** higher than all other sources combined, including seafood.

Criteria 118 also established a **No Observable Effects Level** for Mercury. **The NOEL for mercury is ZERO.**

In other words there is **NO** level of mercury vapour which is safe! Many other studies support this position.

79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,

111

With regard to all this evidence, it is remarkable that in 2011, dental students are taught to place mercury into living human bodies. This insanity is not shared by any other medical profession. It is in fact a criminal act to knowingly poison anyone with mercury (unless you are a dentist)!

Mercury Levels in Dentists and Students

In 1973 we were informed that there would be a dramatic increase in the body burden of mercury from inhaling amalgam dust.¹⁹⁷

In 1976 the following is published: "exposure to mercury during the preparation of silver amalgam definitely presents an additional occupational hazard as an allergen in the dentist".²⁹⁸

A 1977 study showed that a "clinical blood serum mercury test of 111 dentists and auxiliaries revealed that more than 50% had above normal serum mercury levels".¹⁹⁶

(The number of people above the normal serum level is now much higher since the level has been dropped. The same is true for urine levels of mercury. "The lowest exposure, in terms of urinary mercury secretion, that has been found to give rise to a demonstrable toxic effect has fallen from 30-50 mcg/l till 10-25 mcg/l" - Swedish Government Report 2003).

A 1980 study showed that the mercury concentration in the whole blood of the students (22 microgram/l) was the highest. (12 assistants and students, 27 dentists, and 42 dental assistants).²¹⁴

1982 saw the following published: "The high mercury group had mild visuographic dysfunction; they also had more symptom-distress than did the control group. These findings suggest that the use of mercury as a restorative material is a health risk for dentists".³⁸⁴

1987 sees "total and inorganic mercury levels in blood are significantly different between dentists and non-dental controls".¹⁶⁷

In 1989 "The factor most closely related to high urinary mercury levels was use of amalgam by the dentist."¹⁶⁴

Again in 1989 we read "The results revealed high mercury concentrations in pituitaries from the dental staff cases compared to controls" (from autopsies of 8 dental staff cases and 27 controls).¹¹²

In 1990 we read "Moreover, the excretion correlates not only to the number of placed restorations per week, but also to the number of polished and replaced amalgam restorations per week".¹⁵⁹

In 1995 research again shows "the urinary mercury levels of the tested dental professionals were significantly higher than those of the control group".¹⁵⁰

In 2003 we are told that "General dentists were found to have more than twice the level of mercury in toenails than non-dental health professionals and 60 percent higher than dental specialists".¹¹³

Another study from 2004 states: "the mercury content in all biological material was significantly higher in the dental workers than in the control population".¹¹⁴

Of 180 dentists in the West of Scotland, dentists were found to have, "on average, urinary mercury levels over 4 times that of control subjects...

"One hundred and twenty two (67.8%) of the 180 surgeries visited had environmental mercury measurements in one or more areas above the Occupational Exposure Standard (OES) set by the Health and Safety Executive.

"Dentists were significantly more likely than control subjects to have suffered from disorders of the kidney..."¹¹⁵

Another study from 2005 states: "Our results showed that dentists had significant exposure to Hg vapor compared to control subjects and therefore might be subject to possible adverse effects due to Hg toxicity."¹¹⁶

In 2008 the well respected Quintessence International, published a study which found a large statistical difference between mercury levels in dental students and dental nurses compared to non-dental controls.¹¹⁷

A study published in 2009 found that "The urinary and salivary mercury levels were significantly increased in the exposed group, ... Disposing of amalgam waste was inadequate in 94% of the cases."¹¹⁸

A study published in 2010 concludes: "Occupational exposure to dental amalgam poses a potential risk of increasing systemic mercury levels..."¹¹⁹

And so the list goes on. There is a plethora of literature that demonstrates that **dentists, dental students and dental nurses**, and **everyone else in the premises** have body burdens of mercury far greater than age-matched controls. These studies also demonstrate that many surgeries are above the OSHA maximum allowable of 50mcg/m³ for mercury vapour and thus above the EPA maximum allowable level.

120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210

One could therefore conclude that;

- **dental premises are environmentally hazardous!**
- **Warnings should be obligatory!**
- **Protective clothing should be obligatory!**

Levels of mercury in dental students are substantially higher than age-matched controls. ^{211,212,213,214,215}

How is it that a profession which cares for the health of people seems ignorant of the laws which regulate this exposure?

A study from 1991²¹⁶, was performed "to find out if the first professional contact of dental students with amalgam resulted in an increased mercury excretion." The study was conclusive. The longer the students were exposed to mercury in the clinic, the greater was their body burden of mercury.

The use of the term "professional contact" must surely put a new light on the idea of "professionalism". I would have called it the first poisoning of dental students.

Another study (1989) showed "a dramatic (doubling) of mercury in the urine of dental students after one year exposure to amalgam placement and cutting." ²¹⁷

Why are we stuck at 50 mcg/m³?

The World Health Organisation and the Agency for Toxic Substances and Disease Registry in the USA published their joint statement in 2003: ²⁸

"Mild clinical signs of nervous system toxicity can be observed among people who have been exposed occupationally to elemental mercury concentrations of **20mcg/m³**."

Why then are we still referring to 50 mcg/m³ as a safe standard?

50 mcg/m³ is 2,500 times above the level known to cause observable physiological change. Not only the people working in these clinics, but every patient that enters them, can and most likely will be, exposed to dangerous levels of mercury vapour.

We really should be questioning whether the current threshold limit value of 50 mcg/m³ provides adequate protection against adverse effects of mercury. Neurological and physiological studies of dentists call for a review of this figure as being too high. ^{387, 394,218,219,220,221,222}

What rationale can there be to allow anyone to be exposed to these levels of mercury?

What rationale can there be for the continued poisoning of dental students – without their consent?

DMPS

4,272 U.S. dentists who participated in the Health Assessment Programs held from 1975-1983 at American Dental Association Annual Sessions had a mean urine level of 14.2 mcg/l with a range of 0 to 556 mcg/l. The study showed;

- 19.1% were over the maximum normal measurement of 20 mcgHg/l

- 10.9% were over the C.D.C. maximum acceptable level of 30 mcgHg/l
- 4.9% were over 50 mcgHg/l, the level found to cause induced tremors
- 1.3% were over 100 mcgHg/l, the level found to cause tremors

(As the new standards allow for only 10-25 mcg/l we could almost double the numbers of dentists seriously affected by mercur.y)

Urine analysis is the most common assessment of mercury levels in dental personnel. Unfortunately all that urine levels can look at are the excreted levels of mercury. Mercury is a cumulative toxin. Much more is retained than is excreted. Urine levels are NOT a good predictor of body burdens of mercury. ^(Swedish Govt Report 2003) Blood is also of limited value as mercury only stays in the blood for about 12 hours before binding to cells.

The use of DMPS as a chelating agent and as a challenge test has demonstrated time and again that the real mercury body burdens are far higher than a simple urine test can show. ^{223,224,225,226,227, 228,229,230,231,232, 233,234} One study showed a five-fold increase for dental personnel using DMPS. ²²⁸.

A 1995 study ³⁸⁹ showed that urine mercury levels directly related to:

- Reduced concentration
- Emotional instability
- Impaired Fine Motor Function (seriously affected)
- Evidence of subtle pre-clinical changes in behavior were associated with mercury exposure

In 1995 the following reported: ³⁸⁸

"The mean urinary mercury level after the DMPS challenge was adversely and statistically associated with functions related to complex attention, psychomotor task, mood and symptoms in a linear dose-effect manner."

Risk Assessments

Canadian Risk Assessment 1995 ²³⁵

A Risk Assessment commissioned by Health Canada and published in 1995 addressed the number of amalgam fillings that would place a person above what is regarded as the Tolerable Daily Intake (TDI) for mercury. It found that the mercury released from four amalgam fillings in an adult would place them above the TDI. For teenagers the number drops to 3 and for children and the elderly only 1 amalgam filling is enough to push them over the TDI for mercury.

These findings are fully endorsed by Health Canada (P. 24) and underscore their Position Statement on amalgam.

These figures do not account for mouths with a combination of amalgam and gold with far greater releases of mercury.

German Risk Assessment 2005 ²³⁶

"Mercury from dental amalgam may lead to nephrotoxicity, neurobehavioural changes, autoimmunity, oxidative stress, autism, skin and mucosa alterations or non-specific symptoms and complaints. The development of Alzheimer's disease or multiple sclerosis has also been linked to low-dose mercury exposure.

"Mercury levels in the blood, urine or other biomarkers do not reflect the mercury load in critical organs.

"Removal of dental amalgam leads to permanent improvement of various chronic complaints in a relevant number of patients in various trials. Summing up, available data suggests that dental amalgam is an unsuitable material for medical, occupational and ecological reasons."

Australian Risk Assessment 2000

In 1999 the Working Party on Mercury and amalgam for the NHMRC (Australia) stated "the likely daily intake of mercury from dental amalgam fillings **encroached substantially** on a prudent safety margin between exposure and identified adverse health effects." ²³⁷ They also state that "Mercury can cross the placental barrier and can impair kidney function at sub-clinical levels of exposure." (*my emphasis*)

This Working Party also recommended that Australia carry out its own risk assessment. Point 8 of the executive summary of this Risk Assessment states: ²³⁸

"Amalgam removal has been shown to be effective in reducing mercury levels to the levels of those in people without amalgam fillings. Chelation treatment has also reduced levels in the short-term... in one case report, amalgam removal has reduced a very high urine mercury level to a normal level. This change was accompanied by a decline in symptoms...."

This risk assessment is NOT referred to in the final position paper of the NHMRC. Interestingly the NHMRC refers twice to the Australian Dental Association in its Position Statement. ²³⁹ Interestingly the Australian Dental Association refers to the NHMRC to support its position on amalgam. A curious merry-go-round.

I would also like to point out that another of the NHMRC references is to the "World Health Organization Consensus Statement on dental amalgam, 7 March 1997. Geneva: WHO, 1999." This Statement claims the safety of amalgam. It has been touted about as an official position of the World Health Organisation. For example from the Australian Dental Association: ²⁴⁰

"ADA Council on Scientific Affairs Revised: August 2009
... The FDI World Dental Federation and the World Health Organization concluded in a 1997 consensus statement: "No controlled studies have been published demonstrating systemic adverse effects from amalgam restorations ." Another conclusion of the report stated that, aside from rare instances of local side effects

of allergic reactions, "the small amount of mercury released from amalgam restorations, especially during placement and removal, has not been shown to cause any ... adverse health effects."

At the time there were many requests to the World Health Organisation regarding the validity of the statement.

WHO distanced themselves completely from this supposed consensus statement in the following response:

"28 October 1997
Ewa Carlsson Hopperger
Legal Officer
WHO Geneva

Expert Groups, whatever the form, are usually set up as ad hoc groups, and what they have in common is that they are only set up in order to provide advice to WHO.

This means that any statements or recommendations made by the group or the individual experts are not in any way binding for WHO, or any other body for that matter, they are only made as advice to WHO. Also, WHO is in no way responsible for the advice provided to it by the experts."

Australia's official government health organisation, the National Health and Medical Research Council, reference their position statement on an unofficial document which has nothing to do with the World Health Organisation and is little more than the opinion of an advisory body.

Amalgam Removal Lowers Body Burden of Mercury

It is now well established that removal of amalgam fillings will lower the body burden of mercury. Many symptoms and diseases will also resolve. Some do not. This is acknowledged by the Australian, Swedish, Canadian and German Governments. ^{241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283}

This alone begs the question why any intelligent Dean or Professor would ever consider teaching dental students to implant mercury into uninformed patients.

Effects of Mercury on Dental Personnel

The notion that amalgam is "safe" is not supported by the published literature. The use of amalgam will expose all dental personnel to mercury vapour. Mercury from amalgam will poison the dental students. One study from 1991 reported terrifying consequences²⁸⁴:

"... dental work involving mercury may be an occupational hazard with respect to reproductive processes, glioblastoma (brain cancer), renal function changes, allergies and immunotoxicological effects."

Sadly there IS a long list of detrimental effects of mercury on dental personnel. I would like to remind us all that all dentists are firstly

humans and will suffer the same way that everyone else does. All "female dental personnel" are women. Some are dentists and others are nursing or office personnel. Most enter this area of work at a prime child bearing age. The list that follows is a small sample of some of the published research.

The effects of mercury on women's health ²⁸⁵ have been known for many years. 1907

"In women, there will be inflammations of the outer genitals, vaginal catarrhs and disturbances of menstruation. That there is a tendency to miscarriage during chronic mercurialism is well known from the toxicology of mercury".

How many times must we reinvent the wheel?

The EPA in 1984 (USA) warned: ²⁸⁶

"Women chronically exposed to mercury vapour experienced increased frequencies of menstrual disturbances and spontaneous abortions....A high mortality rate was observed among infants born to women who displayed symptoms of mercury poisoning."

The Agency for Toxic Substances and Disease Registry in the USA, stated in 1990: ²⁸⁷

"Long-term exposure to either organic or inorganic mercury can permanently damage the brain, kidneys, and developing fetuses....

"Short-term exposure to high levels of inorganic and organic mercury will have similar health effects; but full recovery is more likely after short-term exposures, once the body clears itself of the contamination."

In 1991, the Dean for Research School of Dental and Oral Surgery Columbia University New York, Dr Irwin Mandel DDS Assoc., wrote: ²⁸⁸

"rates of **spontaneous abortion** or **non-congenital abnormalities** in children during this period, were higher in respondents exposed to high levels of mercury **in the dental environment** than those exposed to low levels." (*my emphasis*)

A critical study from 1994 ²⁸⁹ (supported in '95 ²⁹⁰) shows that the level of mercury in the body of a fetus or new born infant is directly proportional to the number of amalgam fillings in the mother's mouth. These studies prompted the German Government to immediately issue warnings against the use of amalgam in pregnant women, children and women of child bearing age!

The earliest symptoms associated with long term, low level mercury exposure (micromercurialism) are usually sub-clinical and neurological, namely fatigue, headaches, forgetfulness, reduced short term memory, poor concentration, shyness and timidity, confusion, rapid mood swings, unprovoked anger, depression and suicidal tendencies. ^{291,292,293}

An abbreviated list of some of the effects of mercury on dental personnel include:

- Contact dermatitis ^{294,295,296}
- Increased hypersensitivity due to mercury as an allergen ^{297,298,299,300,301}
- Increased rate of infertility, miscarriage and birth defects ^{302,303,304,305}
- Increased rates of menstrual problems ³⁰⁶
- Mercury crosses the placenta and is found in breast milk ^{307,308,309,310,311,312,313,314,315,316}
- Increased rates of autism with increased levels of mercury ³¹⁷
- Male and female reproduction are affected ^{318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335}
- Genetic change ^{336,337,338}
- Irritability, cephalalgia, arthralgias ¹³⁵
- Damage to skeletal muscle ³³⁹
- Mercury causes micro-angiopathies ²⁹²
- Neuropsychological, muscular, respiratory, cardiovascular and dermal symptoms were more prevalent in dentists. ³⁴⁰
- Kidney disease ^{341,342,343,344,345,346,347,348}
- Immune system disturbances ^{349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379} with dramatic effects on immune systems of dental students ³⁸⁰
- Endocrine function is effected ^{381,382,383}
- Neurophysiological and neuropsychological effects (some may be irreversible) ^{384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424}
- Increased number of polyneuropathies ⁴²⁵
- Twice the rate of glioblastoma to the rest of the population (Study of 9241 people) ⁴²⁶
- Neural degeneration ⁴²⁷
- High suicide rate ⁴²⁸

The research associating mercury with major diseases is even more relevant for dental students and all dental personnel whose exposure to mercury vapour far exceeds that of the general population.

- There is an increasing association between mercury and Alzheimer's disease ^{429,430,431,432,433,434,435,}
- There is also an association with Parkinson's disease ^{436,437,438}
- Mercury has been associated with Motor Neurone Disease ^{439,32,440}
- Amalgam is cytotoxic ⁴⁴¹
- Dental amalgam itself has been found to be toxic to nerve cells ⁴⁴²
- There is a significant increase in mercury and antibiotic resistance within two weeks of mercury filling placement ^{443,444,445,446,447,448}
- Lichen Planus is strongly associated with amalgam fillings. The majority of lesions resolve when amalgam is removed. ^{449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467}
- Mercury binds to selenium and blocks its use for a large variety of actions ^{472,280,310,142,157,468,383,469,470,471,225}

- Heart attack, stroke and liver damage are strongly associated with mercury ^{31, 269,472}
- Low concentrations are mutagenic ⁴⁷³
- Hearing loss may be caused by mercury ⁴⁷⁴
- Kawasaki's disease may also be related to mercury ⁴⁷⁵
- Amyotrophic Lateral Sclerosis is associated with mercury ^{476,477,478,479,480,481,482,483,484,485,486,487,488,489,490}
- Sperm count and motility are affected by mercury ^{491,492,493,494,495,496,497,498,499,500}
- Colour vision and other visual disturbance caused by mercury. Colour vision may be permanently affected. ^{501,502,503,504}

Two studies from 1997 ⁵⁰⁵ and 2002 ⁵⁰⁶ demonstrate statistically significant correlations between mercury and the following symptoms:

bleeding gums, metallic taste, burning tongue, concentration problems, memory disturbances, sleep disturbances, lack of initiative, restlessness. Gastrointestinal: not specified. A statistically significant relationship between saliva mercury and the number of amalgam fillings was also demonstrated.

Another study ⁵⁰⁷ found that "as a group, dentists are, after a number of years, at least one standard deviation below the rest of the population in IQ levels. Considering that a dentist must be at least one standard deviation above the rest of the population to have passed dental school, this represents an enormous and significant drop!"

This is NOT a complete list. There are thousands of studies!

What justification can there be for exposing dental students to an increased risk of any one of these effects, without any warnings (written, verbal or otherwise) and without any basic protection like safe breathing masks? (Can we still believe that amalgam is 'cheap'?)

What justification can there be to teach dental students to do this to other human beings?

Is there no respect for the idea that we should first do no harm?

There are literally thousands of published studies demonstrating the toxic effects of mercury. Please allow yourselves to be informed!

MSDS for 'Dispersalloy' amalgam

The Material Safety Data Sheet from Caulk Co (Manufacturers of the dental amalgam "Dispersalloy"), published in 1997, clearly states that chronic inhalation of mercury vapour can cause: ⁵⁰⁸

"mercurialism, which is characterized by fine tremors and erethism. Tremors may affect the hands first, but may also become evident in the face, arms, and legs. Erethism may be manifested by abnormal shyness, blushing, self consciousness, depression or despondency, resentment of criticism, irritability or excitability, headache, fatigue, and insomnia. In severe cases, hallucinations, loss of memory and mental deterioration may occur. Concentrations as low as

0.03mcg/m³ have induced psychiatric symptoms in humans. Renal involvement may be indicated by proteinuria, albuminuria, enzymuria, and anuria. Other effects may include salivation, gingivitis, stomatitis, loosening of the teeth, blue lines on the gums, diarrhea, chronic pneumonitis and mild anemia. Repeated exposure to mercury and its compounds may result in sensitisation. Intrauterine exposure may result in tremors and involuntary movements in the infants. Mercury is excreted in breast milk. Paternal reproductive effects and effects on fertility have been reported in male rats following repeated inhalation exposures."

The MSDS also includes the following contraindications to the use of their amalgam:

1. In proximal or occlusal contact to dissimilar metal restorations.
2. In patients with severe renal deficiency.
3. In patients with known allergies to amalgam.
4. For retrograde or endodontic filling.
5. As a filling material for cast crown.
6. In children 6 yrs and under.
7. In expectant mothers.

Kerr Corporation manufacturers of Tytin amalgam state on their MSDS:
 "The placement of a dental amalgam in a patient will increase the levels of mercury in the body of the patient."

Remember the NOEL for mercury is ZERO!

Evidence Based Dentistry

The Australian Dental Association defines evidence-based dentistry as ⁵⁰⁹
 "... an approach to oral health care which requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences."

They go on to say that evidence based dentistry
 "applies to the science of dentistry. EBD relies on systematic reviewing of scientific literature and publishing the evidence relevant to specific clinical questions. The goal of EBD is to help practitioners provide the best care for their patients."

With such a broad and self-serving definition one might understand the contradictory positions held by the dental associations.

By continuing to support the belief that mercury amalgam is a safe and effective filling material, they are appearing to ignore their own advice.

Dental Association Positions

Note that the dental associations are nothing more than trade organisations. They are NOT scientific organisations nor do they represent all dentists. In Australia only about 70% of dentists belong to the Australian Dental Association. (I do not.)

The majority of dentists throughout the world take their direction from their dental associations. The dental associations however, do not represent the dental nurses, receptionists or any other ancillary staff who are also exposed to mercury vapour during the course of their normal work day. In fact it could be argued that the dental associations do NOT represent any of their membership when it comes to looking after their wellbeing.

Health Canada Response to the Canadian Dental Association

The Canadian Dental Association (CDA) had on their website some "questions" and "answers" about amalgam which was effectively their policy statement about amalgam. In 1996 Dr Richard Tobin, director of Health Canada's Medical Devices Bureau, has urged the dental association to correct wrong information about amalgam fillings it has been sending to dentists.⁵¹⁰

Canadian Dental Association (CDA)

Q. Is dental amalgam approved for use in Canada?

A. Yes, dental amalgam is approved for use in Canada by Health Protection Branch.

Dr Richard Tobin, Canada Health:

"This statement is categorically false. Dental amalgam has never undergone pre-market review in Canada because it was in use before the Medical Devices Regulations were established. The CDA previously published this misinformation in a paper in the CDA Journal in May 1995. At that time, we informed the CDA of this error, but CDA has repeated it here."

Canadian Dental Association (CDA)

A. Scientific literature on the topic, as a whole, supports the position that amounts released are generally less than mercury picked up from natural sources.

Dr Richard Tobin, Canada Health:

"This may be a misleading over-simplification. The World Health Organization states that dental amalgam is the largest single source of mercury exposure for persons not occupationally exposed (World Health Organization, 1991. Inorganic Mercury. Environmental Health Criteria 118. International Program on Chemical Safety. Geneva)."

Canadian Dental Association (CDA)

Q. Is the mercury which is released from fillings absorbed into the body?

A. Yes, but in extremely small amounts, i.e. in MILLIONTHS of a gram (this is very small amount, 0.000001 grams).

Dr Richard Tobin, Canada Health:

"This answer is rather condescending and insulting to the intelligence of readers. By emphasizing only how small a microgram is it implies that a microgram of toxic material could not be harmful. What is significant is not how many zeroes there are in a microgram, but how many micrograms of mercury are released by and compared to the number of micrograms required to cause illness. The fact is that a level of only one hundred millionths of a gram of mercury per gram of Creatinine in urine is considered to indicate clinical mercury poisoning."

The Australian Dental Association

The Australian Dental Association's position is well represented by one of its past spokespersons: ⁵¹¹

"I personally have no worry or concern about it, for either my patients or my own family," said Dr Patrick Dalton, spokesperson for the NSW branch of the Australian Dental Association (ADA). "This tends to be a very, very emotional issue, there's a lot of heat generated about this, but not a lot of light."

Sadly he undoubtedly believes and means what he is saying.

The British Dental Association position

The BDA's position was made clear in a 1994 Panorama Program interview.

The BDA fact sheet made available to dentists states "the scientific evidence "available" to the BDA does not justify banning the use of amalgam in young children." Says Hunt, "I've treated my children with amalgam and have no doubt that when they have their own children, they will do the same."

The reaction of the British Dental Association (BDA) to the 1994 Panorama program was predictable. The BDA told Panorama that they were unaware of the work of Haley and Echeverria, and also unaware of the work of Professor Aposhian at the University of Arizona, who discovered that 66% of the mercury deposits in the body come from fillings. They rejected the work of Dr. Drasch as "not proving that mercury deposits in the body are hazardous to health" - a position that is transparently ludicrous and scientifically false.⁵¹²

In fact, Mr. John Hunt, Chief Executive of the BDA told Panorama that he "believed amalgam was safe".

American Dental Association

"... the ADA has added to its Principles of Ethics and Code of Professional Conduct a provision declaring it unethical for a dentist to recommend the removal of clinically serviceable amalgam fillings..."⁵¹³

This statement redefines the concept of "Ethics" and "Professional Conduct".

One could wonder if there is a vested interest running this position. The American Dental Association has since 1977 owned two patents on amalgam Number 4018600 (1977) and Number 4078921 (1978).

Official Positions

**Dental Amalgam
has NEVER been approved
as a filling material by either
the TGA in Australia or
the FDA in America.**

The official positions of many international bodies are in stark contrast to what the dental associations claim.

WHO & ATSDR Joint Statement 2003²⁸

- Dental amalgam constitutes a potentially significant source of exposure to elemental Mercury.
- Estimates of daily intake range from 1 – 27 mcg/m³.
- 80% of inhaled mercury vapour is retained.
- Mercury may be absorbed through the skin in toxicologically relevant quantities.
- Mercury is soluble in human fat and easily penetrates biological membranes – including the blood-brain barrier.
- Metabolism of mercury compounds to other forms of mercury can occur within tissues of the body.
- A broad range of symptoms have been reported and these symptoms are qualitatively similar irrespective of the mercury compound to which one is exposed.
- Neurotoxic symptoms include tremors, emotional lability, insomnia, memory loss, neuromuscular changes, headaches, polyneuropathy, and performance deficits in tests of cognitive and motor functions. Some of these changes may be permanent.
- Mild clinical signs of central nervous system toxicity can be observed among people who have been exposed occupationally to elemental mercury vapour concentrations of **20 mcg/m³**.

California Proposition 65

On 7th Jan. 2003, the Superior Court in San Francisco approved the wording of the following warnings to be displayed in Californian dental surgeries in compliance with proposition 65:

"Dental Amalgam, used in many dental fillings, causes exposure to mercury, a chemical known to the State of California to cause birth defects and other reproductive harm.

Root canal treatments and restorations including fillings, crowns and bridges, use chemicals known to the state of California to cause cancer."

Health Canada

Health Canada's Position Statement on Dental Amalgam 1996

Health Canada advises dentists to take the following measures:

- Non-mercury filling materials should be considered for restoring the primary teeth of children where the mechanical properties of the material are suitable.
- Whenever possible, amalgam fillings should not be placed in or removed from the teeth of pregnant women.
- Amalgam should not be placed in patients with impaired kidney function.
- In placing and removing amalgam fillings, dentists should use techniques and equipment to minimize the exposure of the patient and the dentist to mercury vapour, and to prevent amalgam waste from being flushed into municipal sewage systems.
- Dentists should advise individuals who may have allergic hypersensitivity to mercury to avoid the use of amalgam. In patients who have developed hypersensitivity to amalgam, existing amalgam restorations should be replaced with another material where this is recommended by a physician.
- New amalgam fillings should not be placed in contact with existing metal devices in the mouth such as braces.
- Dentists should provide their patients with sufficient information to make an informed choice regarding the material used to fill their teeth, including information on the risks and benefits of the material and suitable alternatives.
- Dentists should acknowledge the patient's right to decline treatment with any dental material.

National Health and Medical Research Council (NHMRC) Australia

In Australia the teeth of children and pregnant women are routinely filled with mercury amalgam, contravening the current NHMRC (2002) guidelines which state that amalgam should not be used for children, pregnant women, breast feeding women or people with kidney disease.

They do not suggest who amalgam is actually safe for.

Swedish Government Report - June 2003

Summary and conclusions

"The past five years' research has yielded further evidence that amalgam can give rise to side-effects in a sensitive portion of the population. Thus: Research in molecular biology has elucidated mechanisms that may underlie the toxic effects of mercury.

- "Studies of the effects of mercury on the immune system in rodents have enhanced knowledge of the mechanisms whereby mercury affects the immune system. Clinical studies of occupationally exposed employees have objectively confirmed subclinical influence of mercury on the immune system at low levels of mercury exposure.
- "The thyroid has been identified as the target organ for the toxic effect of mercury in occupational exposure to mercury vapour in low doses.
- "Experimental studies of primates and rodents have revealed that mercury is accumulated and persists for years in the retina as a result of exposure to mercury vapour. The consequences of this accumulation are, however, unclear.
- "Clinical studies of the effects of mercury on occupationally exposed workers, using modern diagnostic methods, have elucidated the connection between dose and effect. They have also identified and quantified neuropsychological symptoms at low exposure levels.
- "The lowest exposure, in terms of urinary mercury secretion, that has been found to give rise to a demonstrable toxic effect has fallen from 30-50 mcg/l till 10-25 mcg/l.
- "Accordingly, **the safety margin that it was thought existed with respect to mercury exposure from amalgam has been erased.**
- "Studies Of Workers previously exposed to mercury have shown that prolonged exposure to mercury vapour, with mercury concentrations in urine of some 100 mcg/l, may result in symptoms emanating from the nervous system that persist decades after exposure has ceased. This suggests that **exposure causes lasting damage to the central nervous system**, which complicates the interpretation of results of low-dose studies of occupationally exposed populations.
- "Clinical reports of acute or subacute cases of mercury intoxication where modern diagnostic methods have been applied have revealed a remarkably high degree of polymorphism in human reactions to toxic mercury exposure.
- "Both animal experiments and clinical observations have demonstrated gender differences in the toxicokinetics of mercury.
- "Additional facts have come to light that may indicate that mercury vapour can affect human foetal development.
- "Clinical provocation studies, with exposure to small quantities of mercury through skin exposure or inhalation, have confirmed that individuals with deviant high sensitivity exist.

"With reference to the fact that mercury is a multipotent toxin with effects on several levels of the biochemical dynamics of the cell, **amalgam must be considered to be an unsuitable material for dental restoration.**

"This is especially true since fully adequate and less toxic alternatives are available.

"With reference to the **risk of inhibiting influence on the growing brain**, it is not compatible with science and well-tried experience to use amalgam fillings in **children and fertile women**. Every doctor and dentist should, where patients are suffering from unclear pathological states and autoimmune diseases, consider whether side-

effects from mercury released from amalgam may be one contributory cause of the symptoms.

The safety margin that it was thought existed with respect to mercury exposure from amalgam has been erased.” (*my emphasis*)

US EPA

Hazard Summary-Created in April 1992.

Revised in January 2000.⁵¹⁴

“Acute (short-term) exposure to high levels of elemental mercury in humans results in central nervous system (CNS) effects such as tremors, mood changes, and slowed sensory and motor nerve function.

“Chronic (long-term) exposure to elemental mercury in humans also affects the CNS, with effects such as erethism (increased excitability), irritability, excessive shyness, and tremors. Human studies are inconclusive regarding elemental mercury and cancer.”

“Elemental Mercury”

- “The CNS is the major target organ for elemental mercury toxicity in humans. Effects noted include erethism (increased excitability), irritability, excessive shyness, insomnia, severe salivation, gingivitis, and tremors.
- Chronic exposure to elemental mercury also affects the kidney in humans, with the development of proteinuria.
- Acrodynia is a rare syndrome found in children exposed to elemental mercury compounds. It is characterized by severe leg cramps, irritability, paresthesia (a sensation of prickling on the skin), and painful pink fingers and peeling hands, feet, and nose.
- EPA has not established a Reference Dose (RfD) for elemental mercury.
- The Reference Concentration (RfC) for elemental mercury is 0.0003 milligrams per cubic meter (mg/m³) based on CNS effects in humans. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur.”

It makes me wonder what the dental associations base their guidelines upon. Theirs is not a position based on scientific research. It is not a position supported by any of the world's main regulatory bodies. Surely the dental students should be given information from respected government organizations and the WHO, rather than from the self-serving interests of the dental (trade) association.

Environmental Effects

I have touched briefly on the environmental hazard that amalgam poses. It is a substantial hazard although the dental profession generally tries to underplay this.

From the BBC – 10 January, 2005, we read; ²¹

“Exposure to the metal is linked to damage to the brain, nervous system and fertility with crematoria responsible for 16% of the UK's mercury pollution...”

In July 2007 Reuters News agency reported: ⁵¹⁵

“Amalgam waste is the biggest source of mercury in EU waste water and dental use also leads to the widespread dispersal of mercury into the atmosphere from cremation.

“In the UK dental amalgam and mercury from laboratory and medical devices, account for about 53 percent of total mercury emissions and annually 7.41 tons of mercury from amalgam are discharged to the sewer, atmosphere or land.”

Other countries including Austria, Belgium, Germany, Holland, Norway, Sweden and Switzerland have taken steps to regulate mercury emissions from crematoria.

“Researchers in Northampton have discovered that crematorium workers have twice the level of normal mercury contamination in their bodies.” ⁵¹⁶

The total amount of mercury in dental amalgam sold in the U.S. during the calendar year 2001, as reported to the IMERC member states, was 61,409 pounds or 30.7 tons.⁵¹⁷ All of this mercury will of course be added to the environment.

“78% of American adults have dental fillings. If there are 200 million American adults that would mean that $.78 \times 200,000,000$ would give us 156 million American adults with dental fillings. If the average American adult has 8 fillings with 800 mg. of amalgam that gives us 3.2 grams of mercury (amalgams are 50% mercury) in their fillings per American adult. $3.2 \text{ g} \times 28\text{g/oz} \times 156 \text{ million} = 17,828,571 \text{ ounces of mercury} \times 1/16 \text{ (ounces per pound)} = 1,114,286 \text{ pounds of mercury or } 557 \text{ tons of mercury stored in our mouths.}$

This appears to be a much bigger problem than the mercury from the burning of coal.” ⁵¹⁸

Another paper puts a tentative monetary value on mercury (Hg) polluted food sources in the Arctic, where significant local sources of pollution are limited, and relates this to costs for strategies avoiding mercury pollution

"The cases we studied are relevant for point pollution sources globally and their remediation costs ranged between 2,500 and 1.1 million US dollars kg (-1) Hg isolated from the biosphere. Therefore, regulations discontinuing mercury uses combined with extensive flue gas cleaning for all power plants and waste incinerators is cost effective." ⁵¹⁹

The results from another study "demonstrate that humans, especially in populated areas, can be a significant source of mercury pollutants. As a consequence of mercury release, bacteria may acquire mercury resistance, as well as resistance to other antimicrobial agents, thus resulting in failure of antibiotic treatment." ⁵²⁰

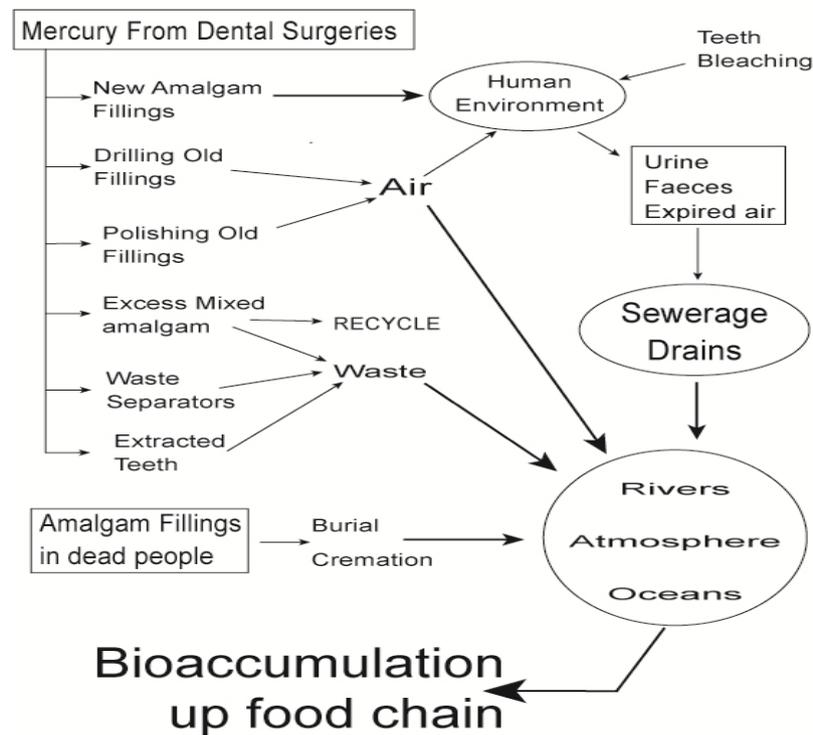
Even the Californian Dental Association acknowledges that mercury from dental amalgam is an environmental hazard; ⁵²¹

"Mercury in the form of amalgam is commonly introduced into dental wastewater as a result of amalgam placements and removals.
... In some localities, the sewage sludge generated by POTWs (publicly owned treatment works) from the treatment of wastewater is incinerated, resulting in the emission of mercury to the atmosphere. Some of the mercury emitted from the incinerators is deposited locally or regionally and will enter surface waters.
... The annual use of mercury in amalgam placements conducted in California was estimated to be approximately 2.5 tons. The annual discharge of mercury in the form of amalgam from dental facilities to POTWs as a result of amalgam placements and removals was estimated as approximately one ton."

The Canadian Dental Association also takes a leap into being environmentally conscientious;

"... recent studies by health and environment experts have shown that mercury is of great concern when it enters the biosphere as a contaminant. A rational approach to pollution prevention is mandatory." ⁵²²

The only rational approach worth anything would be an immediate ban on the manufacture and use of this toxic implant material.



Elemental mercury is converted to methylmercury in the bodies of humans.^{523,524,525,526,527,528,529,530,531} This is the same form of mercury as found in seafood.

Mercury bio-accumulates up the food chain. "Methylmercury is particularly dangerous because it bio-accumulates in the environment. Bio-accumulation occurs when the methylmercury in fish tissue concentrates, as larger fish eat smaller fish. A 22-inch Northern Pike weighing two pounds can have a mercury concentration as much as 225,000 times as high as the surrounding water.... These concentrations are significant when one considers the potential toxic effects of methylmercury. Methylmercury interferes with the nervous system of the human body and can result in a decreased ability to walk, talk, see, and hear. In extreme examples, high levels of methylmercury consumption has resulted in coma or death.... Mercury can interfere with an animal's ability to reproduce, and lead to weight loss, or early death."⁵³²

Mercury pollution is a persistent and increasing problem in the environment. Along with some natural sources of the metal, major man-made sources of mercury pollution include incinerators, fossil fuel plants and municipal sewage systems.⁵³³

The EPA estimated that in 1989 approximately 643,000 kg of mercury was discarded as municipal solid waste, with 84% of it landfilled.⁵³⁴

Dental personnel should be aware that amalgamators may be contaminated with mercury and produce minute amounts of mercury vapor. These contaminated amalgamators may require disposal as environmentally hazardous waste.⁵³⁵

Mercury (Hg) release from dental offices has become an acute issue for the dental profession and has resulted in efforts by regulators to mandate both the use of Best Management Practices (BMPs) as well as the installation of amalgam separators.⁵³⁶

Concerns over the persistence and effects of mercury in the environment⁵³⁷, particularly in wastewater, have increased significantly over the past decade.^{538,539,83} In recent years the concern has affected dental practices and even educational curricula in the dental schools.⁵⁴⁰

About 60% of the waste generated during the removal of amalgams escaped the primary and secondary solids collectors and was released into the wastewater.⁵⁴¹

It was estimated that dentists in Ontario removed 1,880.32 kg of amalgam (940.16 kg of mercury) during 2002, of which 1,128.19 kg of amalgam (564.10 kg of mercury) would have been released into waste water in Ontario if no dentists had been using a separator.⁵⁴²

It has been estimated that the practicing dentists in the State of Illinois (6455) have the potential to generate 947 kg of mercury per year which is recyclable, and 144 kg of mercury which has the potential to be discarded into the environment or be partially recycled. If this approach is applied to the total population of practicing dentist in the United States (123,641), then 18,159 kg of recyclable mercury may be generated per year, whereas 2,763 kg of mercury may be discarded into the environment or be partially recycled.⁵⁴³

Dental Associations are forever talking about "minimizing" the environmental impact of mercury from amalgam.^{544, 545,546.}

Why do they talk about "minimizing" rather than *eliminating this environmental disaster*? It is critical that the use of dental mercury amalgam must cease immediately.

**The only place on this planet
that this toxic waste
is considered safe and effective
is in the mouth of a living human being!**

Dr. Fritz Lorschieder, professor of physiology at the Calgary Medical School, stated;⁵⁴⁷

**“given the evidence,
the continued use
of mercury dental amalgam fillings
is indefensible.”**

The only solution to this disaster is for you the Deans and Professors to immediately stop the teaching of mercury amalgam to dental students. It is the only professional, moral and ethical thing to do.

As a final word to the dental students,

You do have the right to be informed
You do have the right to be protected
You do have the right to Occupational Safety Laws and regulations
YOU DO HAVE THE RIGHT TO SAY NO to MERCURY

Yours sincerely,

Robert Gammal BDS (Syd. Uni. 1974)

Comment on: Children's Mercury Studies

Journal of the American Medical Association 2006

In 2006 two papers were published which supposedly showed that mercury from amalgam fillings had no effect on IQ levels of children. Both were published in the Journal of the American Medical Association.^{548, 549}

Both are currently being used by the American Dental Associations to claim that amalgam fillings are safe;

"These studies support the existing scientific understanding that the minute amount of mercury released by amalgams during such common activities as eating and drinking does not affect health adversely. Both studies support the continued use of dental amalgam as an important treatment option."⁵⁵⁰

Both are currently being used by the Australian Dental Associations to claim that amalgam fillings are safe;

"Therefore, it would appear from the reports that (sic) were no statistically significant differences in neuropsychological and neurobehavioral effects among children who received amalgam fillings versus those treated with tooth-colored composite fillings."⁵⁵¹

Perhaps the dental associations did not read the editorial which accompanied these studies. The Editor of JAMA, Herbert L. Needleman MD writes:⁵⁵²

"Although the studies by Bellinger et al and by DeRouen et al provide important new data on the health effects of mercury containing dental amalgam in children, there are, as the authors clearly delineate, limits to the inferences that can be drawn from these data. It is predictable that some outside interests will expand the modest conclusions of these studies to assert that the use of mercury amalgam in dentistry is risk free. *This conclusion would be unfortunate and unscientific.*" (my italics)

These warnings seem to have no effect on the dental associations who have been charged with our wellbeing nor have they impeded them from "...expanding the modest conclusions of these studies".

Nine years (1997) prior though, a well respected study⁵⁵³ was published, that demonstrated the effect of mercury on the developing brain can cause neurological damage which may be irreversible.

"Postnatal mercury exposure up to adolescence, therefore also seems capable of damaging brain functions..."

"We have now found that mercury associated neurological changes are also linked to decreased nervous system control of the heart function. At higher mercury exposures, the children were less capable of maintaining the normal variability of the heart rate necessary to secure proper oxygen supply to the body and to maintain an appropriate blood pressure."

The importance of brain functions means even a small deficit, whether measured as a decrease in IQ points or otherwise, is likely to impact on an individual's quality-of-life, academic success and economic prospects in life." ⁵⁵⁴

Compared to what the Swedish Report, mentioned earlier, states, it is incredible that an ethics committee of any university would approve of such an abusive and destructive study.

Quoting Dr David Kennedy DDS;

"... exposing children to a known neurotoxin is wrong. Flat wrong." "The people who designed this study should be deeply ashamed of themselves."

**There is no longer any justification
to continue to poison people with mercury**

I urge all dental students to question their Deans and Professors and hold them accountable for truth and integrity. Do not become another statistic.

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- 6
http://www.dep.state.fl.us/waste/quick_topics/publications/shw/mercury/AmalgamBMPsBrochure.pdf
 "There are three sources of scrap amalgam from dental operations:
 - Excess amalgam which is mixed, but not used; damaged capsules.
 - Amalgam from the operatory. This can be unused mixed amalgam or amalgam retrieved from operatory drain traps. Amalgam from operatory drain traps can be handled as scrap amalgam as long as the traps contain little or no tissue.
 - Amalgam contained in extracted teeth. Extracted teeth that have no amalgam would be regulated as medical waste and cannot be placed in the same container as extracted teeth with amalgam."
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- Australian Dental Association website. It is a paper which they have published in their own journal entitled "The environmental effects of dental amalgam.
- The final paragraph states:
- "The problem of environmental mercury contamination will not be solved by banning amalgam. As medical professionals, we should consider the various possibilities that can satisfy both the application of dental amalgam as a restorative material as well as minimising the environmental effects. Tackling this problem by the application of simple guidelines for mercury waste handling will reduce the environmental concerns of dental waste to an insignificant level without compromising dental amalgam's important role in dentistry."
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