NEW AMALGAM RESEARCH + CLASS ACTION SUIT STIMULATES MEDIA INTEREST & ADA RESPONSE

The latest in dental amalgam research, clearly demonstrating harmful effects of mercury from dental amalgam fillings, has generated considerable interest in the medical scientific community and in the media. In addition, the recent class action suit filed against the American Dental Association (ADA) by a group of its members has added further fuel to the amalgam controversy.

THE RESEARCH

Research teams at the University of Calgary and the University of Georgia have detected harmful effects from mercury exposure in animals provided with mercury/silver amalgam dental fillings. [See Bio-Probe Newsletter. 6(5). Sept 1990.]

A dramatic reduction in kidney function, within one month after placement of the amalgam fillings, was found in one study. Control animals, receiving glass ionomer dental fillings, did not exhibit any reduction in kidney function.

In the other study, a significant alteration in the normal status of gastrointestinal microorganisms was found in the animals with mercury amalgam fillings implanted in their teeth. The observed alterations could have a dramatic impact on the health status of the recipients as well as certain aspects of medical therapy.

Another research team, at the Royal Dental College in Denmark, has also been conducting studies on animals (monkeys) with mercury amalgam dental fillings. One year after placement and utilizing a different analytical determination technique, they have also found a significant transfer of mercury from dental amalgam fillings into body tissues. In a report just published, also using monkeys, researchers at the University of Calgary have confirmed the Danish study and their own previous sheep studies, demonstrating the wide spread distribution of amalgam mercury throughout the body. Abstracts of these newly published studies are included elsewhere in this issue.

As a result of the dental amalgam research published in highly respected medical scientific journals within the past year, the potential impact of patient mercury exposure from dental amalgam fillings has become a topic of high interest to physicians and medical scientists. A number of researchers have shown interest in investigating the influence of this mercury exposure on their specialty area. Moreover, the medical scientific community is carefully observing and evaluating the response of organized dentistry to this revealing
information. Publication of additional controlled scientific research, some of which is already in progress, could have a further dramatic impact on the dental amalgam controversy.

THE CLASS ACTION SUIT

On Thursday, 20 September 1990, a group of dentists who are members of the American Dental Association filed a class action suit against the ADA for "Breach of Contract". The suit alleges two causes of action.

First, dentists who become members of the ADA enter a contract with the ADA. In return for the payment of dues, the ADA becomes obliged to provide certain services to the member dentists. One of these obligations is to provide accurate and truthful information on areas within dentistry. Such obligation is clearly defined in the ADA's own Principles of Ethics and Code of Professional Conduct.

This Code defines that statements on information concerning the practice of dentistry shall be "competent"; shall not be "false or misleading representations to the public in a material respect"; shall not be designed "to give rise to questionable expectations"; must avoid any statement which contains "a material misrepresentation of fact" or which omits "a fact necessary to make the statement considered as a whole not materially misleading"; or which is "likely to create an unjustified expectation about results"; and, when applicable, shall be of "service to the public".

The suit alleges that the ADA has failed to provide accurate and truthful information related to mercury amalgam fillings and fluoridated water.

The second aspect of the class action suit is that the ADA provided misinformation in these two areas, knowing that the information they provided was inaccurate, false, or materially misleading and incomplete. Knowing that member dentists would rely on representations provided by the ADA as being accurate and responsible, such (mis-)representations have had a substantial effect on member dentists and their dental practices.

For more than eight years Bio-Probe has devoted considerable time and effort to gathering scientific information on the biocompatibility of materials used in dentistry. We have done so with extremely limited manpower and financial resources. The ADA has virtually unlimited resources. The information we have gathered has been equally accessible to the ADA.

There is absolutely no doubt that the ADA's representations on mercury amalgam fillings and on fluoridated water have been incomplete and misleading. Although our emphasis has admittedly been on mercury amalgam fillings, we have encountered significant information on potential harmful effects of fluoride, even in concentrations of 1 part per million or less.

Neither Bio-Probe nor the class action suit are calling for a ban on either product. We at Bio-Probe do not challenge, at this time, the effectiveness of either material. That is not the issue! The issue is what price, in terms of health effects on patients and the public, is being paid for the supposed effectiveness of these materials? Further, does the ADA have an obligation to consider, and report on, documented potential harmful health effects of the materials it advocates and promotes? Even more acutely, does the ADA have the right to denigrate or encourage punishment of dentists who question the safety of these materials advocated and promoted on the basis of incompletely reported knowledge?

The responsibility for the use of mercury amalgam fillings and fluoridated water rests with the dental profession. Incumbent with this responsibility is the obligation to investigate and be aware of all aspects, pro and con, of the widespread application of these materials to public use. It can be easily documented that the American Dental Association exerts a profound influence on activities of the dental profession in the United States.

Without any doubt, it can be established that the ADA exerts strong influence on its membership and that this influence must be accurate, complete, and not misleading. It is also easily proven that the ADA has, indeed, breached its contract to its membership. This class action suit is not only sound, it is absolutely
imperative. It is the only way to stop the vicious and unwarranted attacks on dentists who question the safety of widespread application of dental mercury and fluoride and to stem the flow of potentially harmful misinformation to the public. As a result of this class action, the legal process of "discovery" now demands that both sides present their evidence supporting their position.

One final word to members of the ADA. Many of you have been misled. At the very least, you may find yourselves in a very embarrassing position when the truth is revealed on these two issues. You are the ADA! Your dues provide the resources for the functioning of the ADA. If you do not object to the ADA policies on mercury amalgam and fluoride, than you are responsible. Nobody wants to destroy the ADA. Quite the contrary, responsible action is now the only way to save the ADA. These destructive policies must be stopped, before it is too late. The only way you can do this is to support and join this class action suit. Legal minds have also noted that by doing so, you will also protect yourselves from being held responsible for the actions of the organization financed by your dues. You will not be opposing the ADA, only its policies on these two issues.

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THE MEDIA

There is no doubt that the media has grasped the impact of recent developments in the mercury amalgam controversy. The first break was an article on the front page of the Chicago Tribune on 15 August 1990 with the headline "Two studies suggest risk from silver fillings." This article reported on the two newly published research studies demonstrating harmful effects of mercury from dental amalgam fillings. It was picked up by a syndicated news service and repeated across the country in various papers.

On the 8th of October a full page article on the amalgam controversy appeared in Newsweek magazine (15 October 1990 issue). The next day, 9 October 1990, USA Today featured a front page excerpt on the issue.

On the 9th and 10th of October, the authors of these two studies reported their findings at the Annual Meeting of the American Physiology Society (APS) in Orlando, Florida. A number of media representatives were present at the meeting.

On October 17, 1990 the Lexington Herald-Leader carried a story with the headline "Alzheimer's may be linked to mercury, UK scientists say." UK is the University of Kentucky. Dr. William R. Markeberg, director of the Sanders-Brown Center on aging at the University of Kentucky, reported finding striking elevations of mercury in the brains of 180 Kentuckians who had died of Alzheimer's disease over the last five years. The researchers used Neutron Activation Analysis in determining their autopsy findings. (It should be noted that four studies have previously been published in Germany, Sweden and the U.S. showing a direct correlation between brain mercury levels and the numbers and surfaces of mercury/amalgam dental fillings).

On October 18, 1990 the New England Journal of Medicine had a major article on mercury released from interior latex paint and an editorial citing mercury fillings as "possibly the chief source of exposure of a large segment of the U.S. population." And it notes, "many important medical questions concerning mercury toxicity remain to be answered."

On October 24, 1990 USA Today followed with a half page feature with the headline "FDA may take closer look at silver fillings' safety." These publications reported on the new documented research findings and included the ADA response.

Meanwhile, in Sweden, a full hour prime-time debate on the amalgam issue was presented on television in late September. Over 30 people participated in the discussion but, interestingly, the government Minister of Health declined to appear. The government's position was represented by an empty chair labelled with
the Minister’s title. Forceful opposition to the use of mercury amalgam dental fillings was presented by physicists, scientists, and dental researchers: Dr. Birger Andersson, immunologist at the State Bacteriological Laboratory in Stockholm disclosed that immunological techniques, using markers for cytokines and a flow cytometer, showed that amalgam in patients teeth activates the immune system with a production of interferon. Interferon injection is known to produce tiredness, muscle pain, headache and fever, much as a virus infection. Similar immune stimulation has been observed in animals dosed with mercury. All persons with amalgam fillings had a 15-20% activation of their immune system compared to amalgam-free controls. Persons who considered themselves amalgam poisoned had a 2-3 times higher activation of their immune system compared to healthy persons with amalgam fillings. The test does not give a positive answer in all "amalgam patients" but a statistically significant result that a third of these have an activated immune system which can explain all or part of their symptoms. The test was developed in collaboration with Dr. A. Lindvall at the infection clinic, University Hospital of Uppsala. The test group was selected by exclusion criteria to give a group with similar symptoms.

Another test, developed by Dr. Vera Strejskal at Astra Pharmaceutical Co., shows that at least 20% of the population with amalgam is allergic to mercury. The test is expected to be commercially available in the beginning of the next year. The test is a development of the previously known lymphocyte transformation test and is more reliable for mercury allergy than the presently used patch-tests.

Magnus Nylander, D.D.S., Ph.D., of the Karolinska Institute reported during the TV debate on amalgam that the brains of deceased infants in some cases contained extremely high levels of mercury (up to 2 ppm, micrograms/gram tissue), much higher than those found in adults. Nylander considers it likely but not yet proven that much of the mercury originates from their mother’s amalgam fillings and that the findings are worrying since the fetal and infant brain is more vulnerable to mercury than adult brains.

Margaretha Molius, a former dental assistant and now a politician, presented a symptom survey of 130 dental assistants. In addition to severe health problems among the dental personnel, their children showed an unusual percentage of allergic, motor and neurological disturbances. Common among their mothers were infertility, pregnancy problems and miscarriages. Several of the dental assistants had normal pregnancies and healthy children when they were on sick leave during the whole of the pregnancy but children born during periods when they worked in dentistry had problems. M. Molius is convinced that the problems are caused by mercury.

Rumors continue to abound of intense media interest in the dental amalgam issue by the major TV networks. Some are probably valid; some may not be. Bio-Probe urges all readers to continue on the high road; focus on the known research ("controlled scientific study"), which is now confirming observation of results on patients ("clinical evidence"). The "scientific method" consists of clinical evidence supported by controlled scientific study. Claims that patient mercury exposure from dental amalgam fillings is totally harmless because the material has been used for over 150 years is an "anecdotal" position - it is not scientific; it is not professional; it is not even ethical, considering the highly toxic nature of mercury. At this point, no amount of name calling or mudslinging will succeed in covering up the scientific facts.

THE AMERICAN DENTAL ASSOCIATION (ADA) RESPONSE

Until very recently, the ADA response has been limited to total denial. The earlier attempts to defuse the anti-amalgam movement by labelling it "fraud" and "quackery" have now been displaced by the new published research and by renewed attention to previously published research. In view of the attention to the previous research, the role of the National Council Against Health Fraud (NCAHF) in the development of that campaign is generating interest.

After the appearance of the new research, the ADA policy of denial continued. The official ADA position included statements that what occurs in animals is not applicable to humans. The new research was not valid; it meant nothing. The medical scientific community has not found this response to be encouraging, to say the least. Medical practice is based on a foundation of animal research. One simply does not use humans for experiments with highly toxic materials. The ADA is now placing itself, and the entire dental
profession, in direct opposition to the validly published and adjudicated research and to the medical scientific community. It is now a matter of "review" articles and "opinion" papers published in dental journals versus critically reviewed controlled science published in medical scientific journals.

Enter now the "class action" suit against the ADA. Now the scenario changes. The legal process of "discovery" provides that both sides present their evidence supporting their position. If the ADA now admits their error and bows to science, it damages its position in the class action. Now the ADA must provide the scientific evidence it claims was available all of these years.

On 11 October 1990 the ADA provided an extensive press release entitled "ADA REAFFIRMS SAFETY & EFFECTIVENESS OF DENTAL AMALGAM". This release opened with: "The American Dental Association reaffirmed its position today that dental amalgam is a safe, effective restorative material and took exception to recent assertions that amalgam poses a health hazard to patients."

The ADA cited "several factors" in reasserting its position. None of these "factors" were accompanied by scientific references. One can, however, trace these statements to articles previously presented by the ADA. Presumably, these references will by revealed in the forthcoming "discovery" process.

One of these factors was: "Dentists, in fact, are healthier than the general public", pointing out that dentists have regular exposure to amalgam in their practices.

The ADA has published "morbidity and mortality" studies of dentists in its journal. None of these compared dentists with and without amalgam fillings to population groups with and without amalgam fillings. Neither do these studies separate dentists who use amalgam from those who do not. The claim is that dental personnel receive more mercury exposure from handling amalgam than do patients from having amalgam implanted directly into their bodies. This has not been proven to be so. Even if it is so, it only would apply to dentists who use amalgam. Given the dental education and economic status of dentists, chances are that dentists possess significantly fewer mercury amalgam fillings than does the average non-dentist. Furthermore, how many dentists actually handle the amalgam? In most offices, this task is relegated to dental assistants, bringing us to the next "factor" cited by the ADA.

The ADA states: "A study of pregnancy outcomes for female dental assistants and the wives of dentists found no difference in the rate of spontaneous abortions or congenital abnormalities between those women who had low and high exposure to mercury, based on the number of amalgam placements performed by the assistants or the husbands."

No doubt, this statement is in reference to a report by Brodsky et al. published in the JADA (Vol 111:779-80. Nov 1985). This "study" is actually a spin off from a previous report by Cohen et al. published in JADA in 1980. The purpose of the 1980 study by Cohen et al. was to investigate the effects of chronic exposure to trace anesthetic gases. Interestingly, although 83% of the female dentists getting the questionnaire responded, the authors did not consider their responses in developing their conclusions. Questionnaires were mailed to male dentists and female dental assistants with 21,634 of the dentists and 21,202 of the assistants responding. Respondents were asked to note spontaneous abortions and visible birth defects. [Note: Mercury has been shown to cause prenatal damage to the nervous system, not visible structural defects. Brodsky et al. and the "peer reviewers" of JADA should have known this!] One question on the 1980 questionnaire asked for the number of amalgams placed per week; none, less than 40, more than 40.

The authors stated: "The zero and low mercury exposure groups were combined for statistical comparison." In other words, the controls were eliminated from comparison. Moreover, no data was provided as to the actual numbers of amalgams placed in the low and high exposure groups. It could very well be that the low exposure group averaged 37 per week and the high exposure group averaged 41 per week. It will be interesting to see how well this "study" bears up to scientific scrutiny. (For a complete review and analysis of the Cohen and Brodsky studies see Bio-Probe Newsletter 5(3), July 1988). It will also be interesting to find out why the ADA authorities have failed to consider other published research investigating the health status of dental personnel. Valuable information can be obtained from such easily accessible sources as the USEPA document on mercury.
Another factor stated by the ADA was: "Research conducted on approximately 1000 dentists by the ADA Division of Scientific Affairs showed no correlation between measures of kidney function and urinary mercury concentrations." Could it be that the ADA spokesmen are not even reading their own journal? The following statement was published in JADA in 1984 (Vol 109:469-471): "There appears to be little correlation between levels (of mercury) in urine, blood or hair, and toxic effects." This knowledge, well established in the scientific literature, was repeated in JADA (Vol 115:873. Dec 1987) in a review article by ADA employees Langan et al. who stated: "Biologic monitoring of mercury concentrations in blood, urine, and hair has failed to produce an exact relationship between these parameters, organ concentrations, and toxicity."

The previous "factors" noted by the ADA have nothing whatsoever to do with the health effects of mercury fillings in patients, even if they were valid observations. The ADA went on to cite two epidemiological studies from Sweden, one on 1000 patients and the other on 1200 patients. In both of these studies, the existence of certain symptoms were compared to the number of amalgam fillings possessed by subjects. Neither of these studies utilized controls, subjects who did not have amalgam fillings. The use of controls is not always necessary in epidemiologic studies. However, if they are not utilized the investigators should then eliminate exposure to the substance being evaluated and note any changes in the subjects. This was not done in either study. Neither was any attempt made to separate subjects with other metals present in the mouth, a situation that clearly influences the subject's exposure to mercury. The only valid conclusion that can be drawn from these studies is that there was no correlation between few amalgam fillings or more amalgam fillings and the occurrence of the symptoms investigated. This conclusion certainly doesn't establish, let alone prove, that mercury exposure from dental amalgam fillings is harmless to patients.

SUMMARY

The controversy over the health effects of mercury exposure from mercury/silver amalgam dental fillings has entered a new phase, perhaps its final phase. Valid scientific research, published in highly respected medical scientific journals, has clearly given the advantage to those questioning the safety of mercury amalgam fillings.

The class action suit filed against the ADA has now obliged the ADA to produce documentation to support its oft repeated public statements, as well as its attacks and encouragement of actions against anti-mercury dentists. Their proffered "documentation" has been revealed to be flimsy, if not outright misrepresented.

The process of pinpointing the responsibility for the ill-advised position and actions of the ADA on the amalgam issue now begins.

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MEASURING ELECTRICAL CURRENTS OF AMALGAMS

Within the anti-amalgam movement, an obvious disagreement exists over the need for measuring the electrical currents emanating from amalgam fillings and removing the amalgams in a specific order as determined by these measurements. This procedure is termed "sequential removal."

Advocates of sequential removal claim that failure to observe this procedure will cause permanent harm to the patient, for some yet to be determined reason. These advocates also claim that the use of sequential removal will increase success rates to about the 80% level.

Opponents of the sequential removal requirement claim that it is impossible to accurately compare the electrical current of one amalgam to another within the mouth, because of a number of electrophysical factors that are present. These opponents claim that the important factor in amalgam removal is minimizing the patient's exposure to additional mercury during the procedure and also claim a success rate of at least 80%. 
There is no doubt that amalgam fillings generate electricity when placed in the oral environment; that fact has been well documented in the scientific literature for over 100 years. It is also difficult to imagine circumstances whereby these vagrant electrical currents would not have some influence on the living organism. These are not questions of debate in the controversy over sequential removal, which deals only with the comparison of the electrical status of amalgams compared to each other in the mouth.

The science of electricity is very complex, particularly when applied to an environment such as is found in the oral cavity. It is obvious and unfortunate that very few dentists are well versed, let alone expert, in the science of electricity. Opinions are only opinions; reality is something else. Bio-Probe is very fortunate to be affiliated with a number of outstanding scientists. One of these is Mats Hanson, Ph.D. Dr. Hanson and research metallurgist Jaro Pleva, Ph. D. have investigated oral electricity for many years. We are indeed privileged and grateful to be able to present the following commentary on this subject.

**ELECTRICAL PROBLEMS I. DENTAL FILLINGS**

**MATS HANSON, Ph. D.**

The origin or the concept "oral galvanism" is obscure. There are 100 year old scientific papers that clearly explain what happens with amalgam fillings in contact with an electrolyte: Corrosion! Faraday's law from 1833 gives a mathematical relationship between the amount of dissolved metal and the current produced. This is one of the foundations of modern technology and is explained in every basic chemistry textbook and in simpler terms even in science books for children.

Nobody talks about car-, boat- or bridge-galvanism but about corrosion or rusting. What would your response be if you brought your rusty car to a garage and the mechanic said: "Your car has car-galvanism, an electrochemical phenomenon and there is no scientific evidence that this is harmful!" You would probably consider him a nut.

The dental professors in Sweden did exactly as the above very hypothetical car mechanic 8 years ago, when they were confronted with angry patients who claimed they had health problems from their dental fillings. "Oral galvanism is an electrochemical phenomenon and not a sign of disease." (M. Bergman, Umea Dental School; P.-O. Glantz & K. Nilner, Malmo Dental School).

In 1981 I noticed the "phenomenon" in newspaper articles and remembering Faraday's law from chemistry, realized that the problem must be mercury. I had no idea that anyone else had ever noticed this but quickly found the earlier (1926-39) papers of chemistry professor Alfred E. Stock of the Kaiser Wilhelm Institute in the library of the chemistry department in Lund.

O. Redhe, an anti-amalgam dentist, sent some of the papers by the Bergman, Glantz and Nilner group to G. Wrangle'n, professor of Technical Electrochemistry and Corrosion Science, who was formerly president of the International Society for Electrochemistry. Wrangle'n immediately pointed out several measurement errors and misinterpretations of electrochemistry, e.g. the adding of measurement data with different surface dependence, equivalent to adding miles and miles per hour (Wrangle'n & Berendsen, 1983, in the following called W & B, 1983)). The dental establishment got a severe shock. It tried for some time to only measure currents between opposing fillings to "avoid short-circuit currents" e.g. ignoring gold in contact with amalgam. However, we have now got rid of the term "oral galvanism" and replaced it with mercury poisoning and the nonsense electrical measurements have largely stopped. (The manuscript by Wrangle'n and Berendsen had been sent to Glantz, Frykholm, some other dental professors, O. Redhe, J. Pleva and myself for comment, maybe because I had provided most of the dental and mercury literature. The "scientific" dental professors had thus every chance to defend themselves but the verdict was nevertheless: "one must question the diagnostic value of the currents calculated from these measurements."(W & B, 1983).

Wrangle'n wrote to O. Redhe and myself: "The history of science shows that new, revolutionary theories often are met by ignorance and even persecution by established science. This reflects a serious defect in
human intellect which someone ought to write a book about. The physicist Gustav Ohm, contemporary with Semmelweis, was dismissed from his work as a teacher after he had established his later so famous law for the electrical resistance of copper wires. The result, which is not without relevance for the present issue, should have been easy to verify but that did not suit some professors in Berlin with preconceived opinions."

Can anything useful be obtained from correct measurements? Are there any correct methods?

Wrangle' n & Berendson (1983) reviewed the amalgam corrosion process, how measurements should be done and some of the published papers. The discussion below will mainly be based on their review. Additional discussion of corrosion currents and actual dissolution in extracted fillings can be found in a paper by Pleva (1989).

In the test tube, corrosion of amalgam, amalgam+gold or any other metal can be studied and that has been done many times. Amalgam corrodes substantially under such conditions. The calculation of released metal from currents or current densities is always avoided in the dental literature. To measure the corrosion rate (corrosion current) of fillings in teeth is more complicated. Gentleman et al (1980) attempted to measure currents of dental alloys in baboons. However, the corrosion rates, calculated from the currents measured by Gentleman et al, gives 71 mg/cm² per year for gold and 423 mg/cm² per year for amalgam in vivo, which is quite unrealistic (Wrangle n & Berendson, 1983).

In the world of physics there are no absolute potentials. To get order and meaningful correspondence between scientists and engineers who measure potentials, some conventions are followed. The hydrogen electrode is defined as having 0 volts and other potentials are relative the hydrogen electrode. For amalgam components, zinc and tin are negative relative the hydrogen electrode and copper, silver and mercury positive. The absolute values will depend on saliva (and dentin fluid) composition and concentration and whether the metals will oxidize to oxides, chlorides or sulfides. The oxidation of tin and copper will produce hydrogen ions which lowers the Ph to 2-3 in crevices. The driving force for the corrosion will be the potential difference (EMF) between oxygen reduction on the cathodic surface (oxygen-rich) and the potential for the oxidation of the metals at the anodic surface.

Schrieber and Diamond (1952) calculated the currents produced in dental fillings from measurements of potentials and resistances. The researchers had considerable difficulties because the amalgam polarized rapidly. Polarization is the formation of an opposing voltage at the metal-liquid junction. Their first instrument was not a zero-current potentiostat. Manufacturers of batteries make every effort to prevent polarizations which would severely limit the current which the battery could provide.

To measure currents from amalgam fillings directly by pressing an electrode against the filling, having the electrode connected to a microamperemeter with an additional electrode placed in the saliva or other place will produce an immediate build-up of polarization and the reading will drop. The induction of the polarization by the measurement shows that the initial current the meter indicated was not present before the measurement but was introduced by the experimenter. Undoubtedly the filling always produces a current but of a much lower size. Amalgam fillings are, in a technical sense, useless batteries because of the polarization.

Ordinary batteries, when old, will produce a peak of current if they are shorted through a meter or a lamp. The next try will produce less or no current and the battery will take a long time to recover. A fresh battery recovers quickly. It is thus possible to determine the "freshness" of an amalgam battery, i.e. a measure of whether it has the capacity to corrode at a high rate. The question is if this gives any useful information. A fresh amalgam battery will mainly release tin (and/or zinc, if present) since this is the least noble metal but also the least toxic. Mercury will certainly be released but ionize to a small extent since it is the most noble component of the alloy. However, mercury evaporates but it is not at all evident that Hg evaporation should be worse from fresh amalgam batteries. My own subjective experience is that half-old fillings evaporate much more mercury, maybe because of porosities and increased surface area. Droplets of liquid mercury can also be found.
Technically, direct measurements of current production should be avoided since they give no information of true events. Amalgam changes surface properties by corrosion which then alters the EMF. Till & Wagner (1971) tested old amalgam fillings (washed and degreased and with a potentiostat) and found rapid potential changes (towards nobler potential values) because of dissolution of metal from the surface. Abrasion again changed the surface towards a less noble state. These changes can measure more than two hundred millivolts. Till & Wagner state that such changes will occur during abrasion by chewing.

To measure currents or potentials requires two electrodes, one pressed into the filling (which should be dried on the surface by washing with alcohol) and another placed somewhere else, e.g. in the saliva. For correct potential measurements a defined counter-electrode is required, e.g. a calomel electrode which has a defined potential in relation to the hydrogen electrode. The calomel electrode should be connected to the saliva by a KCl bridge. If another material is used for potential or current measurements, its properties must be known. If the electrode is nobler than all components in amalgam fillings, amalgam will always be negative and current flow is from saliva electrode to amalgam (if the meter is used to measure current). The display will be negative. If the electrode is less noble, all amalgam fillings will be positive and also the meter reading. An electrode somewhere between the potential of tin (zinc) and mercury, e.g. a copper alloy, will sometimes be positive and sometimes negative, depending on the present state of the amalgam filling. There is an additional problem with a metal saliva electrode since this might also change properties depending on the surface state. It seems very doubtful if simple measurements on fillings in teeth will give any relevant information. Correct procedures will be complicated and to some degree impossible since the undersurface of a filling can not be contacted with a KCl bridge (W & B, 1983). Till & Wagner established the basic electrical properties of dental alloys in vitro and with test specimens placed in the mouth (outside the teeth). They concluded that approximately the same processes will take place with fillings in the teeth. The data definitely showed that amalgam will always corrode and amalgam+gold much faster.

In Scandinavia we have consistently found that the most important factor is to avoid further mercury exposure of the patients. In addition to general ventilation, a high volume spot exhaust immediately in front of the patient during drilling efficiently protects both the patient and the dentist. A simple one can be made from a vacuum cleaner with an exhaust where a hose can be connected and led outside. Some PVC tubing can be made into a mobile intake side which can be placed directly in front of the patient. In addition, the normal suction in the mouth should be present and drilling made with sharp tools (drilling, not grinding) with an excess of water spray. Additional protection is a rubber dam over the tooth, fresh air for breathing through nose piece and covering as much as possible of the patient.

The difference between this procedure for amalgam removal and ordinary ones is like night and day. A physician reported to me that she got half her fillings out at one sitting with the extraordinary equipment with minor trouble. The dentist (B. Oppedal, Tonsberg, Norway) then sent her to her ordinary dentist to prepare a ceramic crown. To be helpful and before she could stop him, the dentist drilled out one small filling with ordinary suction. This rendered her a month in bed.

What about the currents produced? A large number of people consider the currents disturbing acupuncture paths, bioelectric fields and similar, loosely defined terms, thereby causing pathological effects. An old philosophical tool is Occam’s razor which simply states: do not use unnecessary explanations. All the symptoms of amalgam poisoning have been described for mercury poisoning without any involvement of amalgam. The currents produced from fillings assist in transporting positively charged metal ions into the tissues by iontophoresis. The exposure is thus not only by inhalation and this fact must be considered when comparison is made to other mercury poisonings. A possible electrode effect is an anodic oxidation of biological components in the dentinal fluid in addition to a catalytic effect of the metals. I have seen detailed maps of teeth connected to various parts in the body through “meridians”. The idea is then that a particularly high “current” or “potential” of a filling could cause disease in a specific organ. Sometimes the connection seems to be present, sometimes not (own observations). A polysymptomatic poisoning can easily fit any such hypothetical network. Until substantiated by any acceptable anatomical,
biophysical, biochemical, theoretical or experimental data, such ideas should be subjected to Occam’s razor.

This does not mean that acupuncture is nonexistent. Pain from electrically stimulated teeth can be blocked or reduced by stimulating between the thumb and index finger (also in animals). It is quite clear that the effect is produced by endorphins in the brain and can be inhibited by chemical antagonists. Recently endorphins have been shown to have a much wider spectrum of effects than only as pain killers. They modulate the immune system, have a protective action against radiation and appear to act as antioxidants. However, in practice a person who is mercury poisoned must avoid any further exposure to mercury whether the mercury comes from outside, from "negative" fillings, from fillings which affect acupuncture meridians or from just plain amalgam fillings in the teeth. The only sensible action is to drill them away with a minimum of exposure.

Literature:


**BIO-PROBE COMMENT:** From the foregoing information it can be easily seen that the measurement of electrical currents emanating from amalgam fillings and the comparison of one filling to others within the oral environment is extremely complex. To claim otherwise is a betrayal of lack of knowledge and understanding.

Another factor might be added to those discussed by Dr. Hanson. Dental amalgam consists of at least four different metals. These metals combine in at least six different combinations, called "phases". Each phase, being a different metallic combination, has a different electrical potential than do the others. When an ammeter probe is placed on an amalgam filling, it may be reflecting only the phase it touches related to the surrounding phases and the oral environment. Placement of the probe on a different area of that amalgam may elicit an entirely different reading.

In any case, the issue here really isn’t the essential requirement of utilizing "sequential removal". Both proponents and opponents of the procedure find the same success rate from amalgam removal. The true issue is credibility!

Opposition to the use of mercury/silver amalgam dental fillings presents enough problems in itself for the dental practitioner. We MUST be able to support our beliefs and actions. Failure to do so inevitably results in attacks on our licensure. Without exception, every anti-amalgam dentist whose dental license has been challenged has utilized electrical measurement procedures or some other protocol that cannot be substantiated or defended.
ABSTRACTS/REVIEWS

Danscher, G., Horsted-Bindslev P., and Runghy J.
Traces of mercury in organs from primates with amalgam fillings

**ABSTRACT:** In order to trace possible accumulations of mercury, three vervet monkeys received occlusal amalgam fillings, three others maxillary bone implants of amalgam, and three untreated monkeys served as controls. One year later all animals were sacrificed by transcardial perfusion with glutaraldehyde. Tissue sections from different organs were subjected to silver amplification by autometallography and analyzed at light and electron microscopical levels. It was found that amalgam fillings (total, 0.7-1.2 g) caused deposition of mercury in the following tissues: spinal ganglia, anterior pituitary, adrenal medulla, liver, kidneys, lungs, and intestinal lymph glands. In monkeys with maxillary silver amalgam implants (total, 0.1-0.3 g), mercury was found in the same organs except for liver, lungs, and intestinal lymph glands. Organs from the three control animals were devoid of precipitate. To evaluate whether silver released from the corroding amalgam fillings added to the staining pattern, tissue sections were exposed to potassium cyanide prior to being autometallographically developed. This treatment removes all traces of silver, leaving mercury sulfide accumulation untouched. By comparing sections that had been exposed to cyanide with untreated parallels no difference was seen in the pattern confirming that mercury was the only catalyst present in the tissue. These results strongly support what has been suggested previously that dental fillings in primates cause absorption of mercury released from amalgam fillings through lungs and intestinal tract, and that, depending on the exposure route, mercury is distributed to most organs and will eventually be found in the central nervous system. The present data also show that silver released from the corroding fillings is not absorbed.

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Whole-body imaging of the distribution of mercury released from dental fillings into monkey tissues.

**ABSTRACT:** The fate of mercury (Hg) released from dental "silver" amalgam tooth fillings into human mouth air is uncertain. A previous report about sheep revealed uptake routes and distribution of amalgam Hg among body tissues. The present investigation demonstrates the bodily distribution of amalgam Hg in a monkey whose dentition, diet, feeding regimen, and chewing pattern closely resemble those of humans. When amalgam fillings, which normally contain 50% Hg, are made with a tracer of radioactive 203Hg and then placed into monkey teeth, the isotope appears in high concentration in various organs and tissues within four weeks. Whole-body images of the monkey revealed that the highest levels of Hg were located in the kidney, gastrointestinal tract, and jaw. The dental profession’s advocacy of silver amalgam as a stable tooth restorative material is not supported by these findings.

**BIO-PROBE COMMENT:** The two abstracts above clearly demonstrate and confirm the major contribution of amalgam mercury to total mercury body burden and distribution throughout the body. Taken together with the previous sheep studies and human autopsy studies there is no longer any validity what-so-ever to the establishment position that amalgam is a stable dental material and presents no health risks to patients. When viewed in context with the two animal studies recently published in the August 1990 Physiologist (See Bio-Probe Newsletter. 6(5), Sept 1990.) indicating that kidney function and intestinal and gingival flora populations are significantly altered by amalgam mercury, and the other research findings outlined in the lead article of this issue of Bio-Probe, the time has long passed for defending further use of amalgam. The continuing charade of implanting this poison in the human body under the guise of restoring teeth must be stopped immediately. Responsible caring dentists all over the country have been duped and denied the true facts through "controlled communication." Those who have been responsible must now be held accountable for their actions.
Zorn, N.E. and Smith J.T.  
A relationship between vitamin B12, folic acid, ascorbic acid, and mercury uptake and methylation.  

**ABSTRACT:** Ingestion of megadoses of certain vitamins appears to influence the in vivo methylation of mercuric chloride in guinea pigs. The addition of megadoses of vitamin B12 fed either singularly or in combination with folic acid resulted in increased methylmercury concentrations in the liver. Moreover, percent methylmercury levels were significantly increased with B12 treatment in the liver (B12 only and B12/folic acid) and brain (B12/vitamin C). Incorporation of high levels of folic acid into the dietary regime also increased the methylmercury concentration particularly in the liver and hair tissues. The addition of vitamin C in the diet, particularly in combination with B12 (brain) or folic acid (muscle) resulted in increased methylmercury levels in these tissues and percent methylmercury values with B12 in the muscle and brain tissue.

**BIO-PROBE COMMENT:** We are in the process of obtaining the complete article and will provide a complete analysis of the protocols utilized, especially with regard to vitamin C.

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Wilks M.F., Kwizera E.N., and Bach P.H.  
Assessment of heavy metal nephrotoxicity in vitro using isolated rat glomeruli and proximal tubular fragments.  

**ABSTRACT:** Nephrotoxic metals are thought to affect mainly the proximal tubule, but the pathophysiology of acute renal failure (ARF) caused by some of these compounds cannot be explained by damage to this part of the nephron alone. To compare toxic effects on different parts of the nephron, metabolic studies (de novo protein synthesis as assessed by amino acid incorporation and fatty acid oxidation) were performed in freshly isolated rat glomeruli and proximal tubular fragments (PTF) in the presence of increasing concentrations of mercury (Hg), chromium (Cr), and cadmium (Cd) salts. Glomerular protein synthesis was very sensitive to Hg (concentration to reduce protein synthesis by 50%: 3.4 microM) and Cr (15 microM), while in PTF amino acid incorporation was similarly affected by Cd and Hg (32 and 34 microM). Glomerular fatty acid synthesis was also more sensitive to Hg than that in PTF (3.2 vs 55 microM, p less than 0.005). In experiments to study the effects of reduced glutathione (0.5 and 1 Mm) on the metal toxicity, preincubation of the fragments with reduced glutathione failed to protect glomeruli against subsequent exposure to the metals, but partially protected PTF (greater than 100 microM for Hg and Cd). These data show that isolated glomeruli are more susceptible to those metals with the potential to cause ARF in vivo, with Hg being the most potent toxin. The results suggest that the glomerular sensitivity to Hg may indicate an important target region of the nephron in the development of ARF which has previously not been recognized.

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**FORUM**

The International Academy of Oral Medicine and Toxicology is meeting in Las Vegas, Nevada on February 2-3, 1991. The meeting will be held at the Las Vegas Hilton, telephone 1-800-732-2111 for reservations. Room rates are $89.00 per night, single or double occupancy. Be sure to mention that you are attending the IAOMT meeting. The scientific session will be Saturday February 2, 1991 and Sunday February 3, will be the Board meeting.