SPECIAL ARTICLE
Mercury Urinalysis in Perspective. Sam Ziff

REVIEWS/ABSTRACTS
The Effect of Galvanism on Accumulation of Bacterial Plaque In Vivo. Koivumaa K.K., and Makila E.
The Effect of Dental Amalgam Restorations on Blood Mercury Levels. Abraham J.E., Svare C.W., and Frank C.W.
The Effect of Removing Dental Amalgams on Mercury Blood Levels. Svare C.W., and Peterson L.L.
Heat From Curing Lights. Bodkin J., and Share J.
Smear Layer

EDITORIAL
Urinalysis

TECHNIQUE TIPS

MATERIALS

CASE HISTORIES

EVENTS
Personal Observations on the NIDR/ADA Workshop on Biocompatibility of Metals in Dentistry. Ziff M.
November meeting Greater NY Dental Society.

FORUM

Owned, Published, and Copyrighted, 1984 By Bio-Probe, Inc.
The Bio-Probe Newsletter is published eight times annually
Editorial office located at 4401 Real Ct., Orlando, FL 32808
Subscription price $95.00 per year. Postage paid at Orlando
Postmaster: Send address changes to above address
The value of urinary mercury analysis in determining the level of exposure or total body burden of mercury is as controversial as the question of dental amalgam's role in disease.

Utopia would be utilization of a simple urinalysis to determine those individuals at risk from their mercury body burden, regardless of the source. Unfortunately, scientific data clearly indicates urinary tests to be unreliable as a test for mercury body burden or tissue/organ damage. There is no question that, if done properly, the test will indicate mercury content of the urine from that particular sample. However, utilizing the proper testing protocol and then trying to determine what the results mean in relation to an individual's health is entirely another matter.

Most research on mercury urine content was originally undertaken in an effort to determine safe levels of exposure in the work place. The primary goal being to correlate urinary blood and air levels with established symptomatology of mercury intoxication. Therein lies the basic problem. Fairly acceptable correlations were achieved between urine mercury levels (ug Hg/l) and atmospheric mercury (mg Hg cu/m) (Friberg and Nordberg, 1972) and between mercury air concentrations and blood levels (Smith et al., 1970; Goldwater et al., 1964). The ratio of approximately 0.3 between blood and urinary mercury level appears in agreement with data from different researchers, Smith et al., 1970; Benning, 1958; Friberg and Nordberg, 1972.

The ability to relate urine levels to overt symptoms of mercury toxicity presents problems of much greater complexity and variability. It appears to have a degree of validity only when urine mercury concentrations exceed a specific level.

Henderson et al., 1974. presented a biochemical theory based on urine mercury concentrations greater than 0.5 mg/l. The theory was that mercury concentrations above 0.5 mg/l were capable of causing increased central nervous system absorption which would manifest as clinically observable neurotoxic effects.

Langolf et al., 1978, used quantitative measurements of neurological function to evaluate 143 chlor alkali workers. Monthly urine mercury determinations were routinely performed as part of the safety programs at the plants where these workers were employed. Langolf and his associates using these historical records in conjunction with their quantitative measurements of EMG, tremor, tapping, tracking and reflex found that "Peak historical levels beyond 0.5 mg/l urine mercury appeared to be most significant in predicting minimal effects." They went on to conclude: "Because of wide variability among individuals, a test score from a single individual can only be meaningfully compared to his own baseline score established prior to exposure."
I consider that conclusion extremely significant when viewed in context with the ADA position paper on the safety of dental amalgam (JADA, 106:519-520, 1983) in which they cite the Langolf study as proof that there is no danger until urinary mercury levels reach 500 ug/l. To my knowledge I do not believe the ADA has established baseline data on any dental personnel).

In a follow-up study in 1981, Langolf and his associates provided the results of behavioral studies, with the same group of workers, carried out over a six year period. Their findings were quite significant. Some of the results and conclusions were: "Throughout the six year study, conventional medical examinations failed to detect any neurotoxic effects in these mercury cell chlor-alkali workers. Behavioral tests however, were consistently able to detect mercury related effects of a subtle subclinical nature. Regression analysis showed changes in tremor spectra as a function of workers increasing urinary mercury. -------- The tremor changes however, were associated with those workers whose urinary mercury exceeded 0.5 mg/l in two or more months of the previous year."

"Psychological tests of short term memory also showed high sensitivity in detecting subtle effects of mercury exposure. Results showed an increase in memory scanning time and a decrease in short term memory capacity as a function of workers' increasing urinary mercury. These changes resemble those which occur with aging. In fact, the changes in memory function associated with an increase in twelve-month average urinary mercury of only 0.1 mg/l may be functionally comparable to the effects of 10 years of aging. The relative size of these mercury related changes in memory functions was therefore surprising. Unlike tremor results, statistical analysis showed that memory effects may occur in worker groups whose urinary mercury is consistently maintained below the 0.5 mg/l limit."

The results of the psychological tests of short term memory serve to focus attention to the real problems of urine mercury concentrations as a measure of toxicity. Short of evaluating tissue samples there does not appear to be any accurate way of assessing subclinical long term effects of mercury utilizing urinalysis as a basis.

Some of the variables that enter into the basis of the foregoing statement are reflected in the findings and conclusions of the following researchers:

The National Academy of Science in their 1978 study titled An Assessment of Mercury in the Environment, considered proper collection, laboratory techniques and analysis instrumentation so important they included a 27 page appendix on the subject. Some of the critical points brought out were:

1. Possible loss of mercury compounds by volatization during chemical processing.
2. During storage, mercury can be leached into solution from the laboratory or container materials or be lost to container walls by sorption (Campbell et al., 1972).
3. Urine samples must be preserved by the addition of potassium persulfate at the time of collection (Trujillo et al., 1974).
4. "Techniques for trace metal analysis have undergone considerable improvement in the past 10 years, leading to a need for assessment of earlier analyses."

5. "If earlier analyses were in error, they were more likely to have reported concentrations lower than the true value. Mercury was reported absent because of poor instrument detectability."

6. "The crucial instrumental operation often is the limiting factor in an analysis. ------ The sensitivity is largely instrument dependent, experimentally determined and variously defined by different authors. Essentially, the threshold of sensitivity is the smallest quantity of substance that can be determined reliably by the instrumental technique."

7. Volatile mercury compounds can be lost in the hot digestion of samples, or mercury was not totally recovered because of inefficient oxidizing reagents.

The type of container used to collect and store the sample until the analysis is done is critical. Rosain and Wai, 1973, tested adsorption losses with stoppered polyethylene, PVC, and soft glass containers and concluded that up to 50% of the original amount of mercury could be lost in 1.5 days without acidification.

Trujillo et al., 1974, and Lo and Wai, 1975, demonstrated that acid washed glass containers are preferable to bottles of polyethylene and that addition of an oxidizing agent such as potassium dichromate or potassium persulfate to the bottle is essential to prevent adsorption and volatilization.

Then there is the very significant problem of diurnal variation. The mercury concentration in the urine sample will fluctuate widely based on biochemical individuality, time of day, and will also vary from day to day. (Molyneux, 1966 and Piotrowsky et al., 1975). The findings of Molyneux and Piotrowsky et al. were confirmed by Araki et al., 1983. In their study Araki and his associates demonstrated the increased excretion of mercury and zinc during the morning hours and suggested that the mercury and zinc circadian rhythms resulted partly from increased reabsorption during the night hours.

Women have a higher mercury excretion than males. Mercury excretion also seemed to be age dependent, in that there was a gradual reduction in mercury excretion with advancing age. (Lie et al., 1975)

Friberg and Vostal, 1972, stated that in regard to inorganic mercury "Urinary mercury levels cannot be predicted on an individual basis even if exposure is measured as a time-weighted average."

"The cumulative urine and fecal excretion over the 7-day period amounted to approximately 11.6% of the retained dose. Fecal excretion accounted for approximately 80% of the retained dose." "There is little correlation between either the urinary excretion and plasma radioactivity of mercury, or the specific activities of urine and plasma mercury, suggesting a mechanism other than direct glomerular filtration involved in the urinary excretion of recently exposed mercury. These studies suggest that blood mercury levels can be used
as an index of recent exposure, while urinary levels may be an index of renal concentration of mercury. However, there is no reliable index for mercury concentration in the brain." (Cherian et al., 1978). In their 1983 paper Araki and his associates concluded: "It is suggested the Hg is not filtered by the glomerulus, as already shown by Cherian et al., but is reabsorbed by the distal tubules and collecting ducts under the water-restrictive condition. As Hg excretion and urinary flow rate were significantly lower during the night hours under the water-restrictive condition, the circadian rhythm of Hg may reflect increased reabsorption of Hg by the distal tubules and collecting ducts during the night hours. Alternatively, circadian rhythms in tubular mechanisms (e.g. desquamation of tubular epithelial cells or Hg secretion across the tubular wall) should be evaluated as possible causal factors influencing the Hg rhythm."

High doses of inorganic mercury seem to cause an increase in urinary mercury without change in fecal excretion. (Piotrowski et al., 1969)

Mercurials may reach tubular lumen by means of transport across the tubular wall. However the precise mechanisms of tubular excretion are still not known. (Chang, 1980)

"Reabsorption of mercury from tubular urine may also be a factor in the low urinary clearance of mercury. ------ In view of the present knowledge about mechanisms responsible for mercury concentration in the blood and urine, a close correlation between them and the concentration in any critical organ should not be expected. The level of exposure can be expected to be reflected approximately in body fluids, but because great variation in concentrations can depend on metabolic factors, no direct relationship occurs in individual cases. Thus, in an individual case neither urine nor blood may indicate the degree of risk of intoxication." (Report of an International Committee. Maximum Allowable Concentrations of Mercury Compounds)

In a study of mercury body burdens of dentists and auxiliaries compared against controls Gordon and Gordon, 1980, reported 66% of dentists and 32% of auxiliaries had blood mercury levels higher than controls and 20% of both groups had urine mercury levels higher than controls.

In a very significant paper published in the Journal of Applied Toxicology Vol 1, No. 3, 1981, titled Selective Determination of Elemental Mercury in Blood and Urine Exposed to Mercury Vapor in vitro the authors Satoh, Hursh and Clarkson conclude: "At the present time, in order to ensure quantitative analyses of Hg\textsuperscript{0}, it is proposed that: (1) blood should be mixed with chilled ethanol solution immediately after collection; (2) the mixture should be stored at 0°C, and (3) Hg\textsuperscript{0} should be determined within 60 min and preferably within 30 min. In the case of urine, it is strongly suggested that (1) urine should be chilled, and (2) Hg\textsuperscript{0} should be determined as soon as possible probably within 10 min. These would minimize the escape of Hg\textsuperscript{0} from collected samples."
The heart of the matter was expressed quite succinctly by Goldwater and his associates in their 1964 article. They stated: "Those investigators who have studied the subject are in almost unanimous agreement that there is poor correlation between the urinary excretion of mercury and the occurrence of demonstrable evidence of poisoning. --- Mercury in the urine can no longer influence the living organism, since it has left the body. What it may have done in the course of its absorption, transport, metabolism and excretion is far more important."

REFERENCES


REVIEWS/ABSTRACTS

THE EFFECT OF GALVANISM ON ACCUMULATION OF BACTERIAL PLAQUE IN VIVO.

To make the clinical conditions as constant as possible, the test subjects were selected from patients having a set of full dentures. In this way, all metals other than those to be tested were omitted, and the denture materials were the same in all cases. There were 12 female and 8 male patients.

The test pieces consisted of 20 cast gold pieces made of the same gold stock, each 2 x 4 x 1 mm. The inlays were imbeded in cold polymerizing acrylic resin and an identically sized cavity was prepared in each resin section and filled with amalgam.

The complexes were imbeded into the right buccal flanges of the upper dentures above the first molar. The corresponding region on the left side of the dentures served as the control area. A test had been run to insure that there was no difference in plaque accumulation between the normal acrylic surface and the test surfaces cold polymerizing acrylic. No differences were found.

The galvanic potentials were measured with a Scalamp Galvanometer (W.G. Pye & Co. LTD., Cambridge, England). Readings were taken between gold and denture, amalgam and denture, and amalgam and gold. Duplicate readings were always made. Test subjects were requested not to clean their dentures at all during the experimental period of 3 days, after which the dentures were checked and findings concerning the accumulation of plaque were recorded.
Results & Discussion: On the third day after insertion no denture was free from accumulation of plaque on the test side. About half the cases showed no visible plaque accumulation on the control side. A comparison of the plaque accumulation on test sides and control sides revealed that the incidence of plaque was significantly higher on the side where metal pieces had been placed. Plaque occurred not only on the metal but also on the polished acrylic surfaces around the metal pieces. It was especially located on the amalgam areas.

A noticeable finding was that plaque was seen to accumulate several millimeters away from the test pieces. Under normal clinical oral conditions different metal components are frequently in contact with each other. This predisposes to plaque accumulation not only on metal surfaces but also on the adjacent teeth and gingival margin.

An intimate contact between amalgam fillings should be avoided. If a tooth prepared for crown coverage has previously been fitted with amalgam, it should always be blocked out so that no undesirable galvanic effect can arise from metal contacts. The same applies to filling a cervical cavity adjacent to a marginal border of a gold crown.

The galvanic effect of different metals may impair hygienic conditions to such a degree that a considerable deterioration in the periodontal and dental state may be expected.

The early onset of the changes found in this study was somewhat surprising to the authors.

***************

THE EFFECT OF DENTAL AMALGAM RESTORATIONS ON BLOOD MERCURY LEVELS

ABSTRACT: "Mercury levels in blood and in mouth air before and after chewing were measured in 47 persons with and 14 persons without dental amalgam restorations. Questionnaires relating to exogenous sources of mercury exposure were administered to both groups. Differences in the mouth air mercury levels before and after chewing were statistically significant in the group with amalgams, but not in the group without amalgams. Analysis of the data from the questionnaires indicated that little or no exogenous exposure to mercury occurred among the two groups. Blood mercury concentrations were positively correlated with the number and surface area of amalgam restorations and were significantly lower in the group without dental amalgams."

***************

THE EFFECT OF REMOVING DENTAL AMALGAMS ON MERCURY BLOOD LEVELS

ABSTRACT # 896: "A positive correlation between mercury blood levels and numbers of dental amalgams has been demonstrated (Abraham et al., J Dent Res in press). The purpose of this study was to preliminarily

8
examine the causal basis of that statistical relationship. The subject had six posterior amalgams which were 10 or more years old. Prior to the removal of her amalgams nine 20 cc blood specimens were obtained at intervals of one or more days over a 16 day interval to establish a baseline level. After amalgam removal eight blood specimens were taken at intervals of three or more days over a 34 day period. Same day whole blood mercury analysis was done using a modification of a technique described by Sharma and Davis (Clinical Chem 25 (5):769, 1979). At least six aliquots were run on each specimen.

The average preamalgam removal level was 2.0 ng/cc. Differences between each post removal level and the average pre removal level were tested for statistical significance as they became available. The 28 and 14 day post removal specimens were 0.85 and 0.70 ng/cc and a probability of less than 5 and 1 in 100 respectively of belonging to the preremoval population of mercury blood levels.

This data shows that mercury blood levels can be reduced by removing dental amalgams and indicates that a causal relationship between dental amalgam restorations and mercury blood levels may exist."

MATERNAL AND CORD BLOOD BACKGROUND MERCURY LEVELS: A LONGITUDINAL SURVEILLANCE.

ABSTRACT: "Fifty-seven prenatal patients with no known exposure to the element mercury or any of its compounds, were observed for change in whole blood total mercury concentration from the initial prenatal clinic examination through delivery and postpartum hospitalization. On hospital admission for labor and delivery, whole blood total mercury averaged 1.15 parts per billion (ppb), compared to 0.79 ppb from the first prenatal clinic visit; these levels represent a 46% increase and significant difference in maternal concentration of a substance previously recognized for its peculiar ease at crossing the placental barrier. Previous stillbirths, as well as history of birth defects, exhibited significant positive correlation with background mercury levels. Search of the literature of the last 5 years revealed no other report of cohort heavy metal surveillance throughout pregnancy."

There are some factors associated with the work of Abraham et al., Svare et al., and Kuntz et al. that I personally would like to emphasize.

1. There are a number of recent studies that indicate that newer methodology and laboratory techniques are essential for accurate assays of blood mercury levels. These new protocols compensate for the loss of mercury from blood samples during their storage and analysis. It does not appear that the three studies abstracted above comp-
ensated for these potential losses. The point I am making is that as a consequence, the observed values reported in the studies may actually be LESS THAN THE TRUE VALUES.

2. It is of interest to note that the average blood mercury level reported by Abraham et al. 1984 was similar to that reported by Kuntz et al. 1982, for their group of 57 pre-natal patients. These blood mercury levels were measured with the same type of apparatus for both studies.

3. Kuntz and his associates found some significant correlations between the history of stillbirths and mercury levels in both maternal and cord blood. Perhaps more startling was the occurrence of malformed infants in previous births correlated significantly with pre-natal mercury blood levels. Bear in mind there was no known exogenous exposure to mercury reflected in any of the histories of these pre-natal patients, leaving only their amalgam fillings as the probable source of exposure.

4. Abraham et al. concluded their paper with the following statement: "Given these facts, the small increase in blood mercury levels that is statistically associated with dental amalgam restorations should be a matter of concern for dentists as well as for the recipients of these restorations."

***************

ABNORMAL NERVE FUNCTION IN DENTISTS WITH ELEVATED TISSUE MERCURY LEVELS

ABSTRACT #8: "The effects of chronic low-level mercury vapor exposure on human peripheral nerve function are unknown. Cumulative tissue mercury was measured noninvasively at the skull and wrist in 298 dentists using x-ray flourescence (Medical Physics, 1981:8:308). Mercury was not detected in 72% of skull and 69% of wrist measurements. Combined skull and wrist mercury levels greater than 40 ug/per gram were found in 19% (high mercury group). Peripheral nerve function was studied electrophysiologically by standard methods in three sensory and two motor nerves in 23 dentists with high mercury levels and in an age-matched control group of 22 dentists without detectable tissue mercury. The high-mercury group had significantly slower sural sensory and median motor conduction velocities (p < 0.05) and more prolonged median distal motor (p < 0.005) and F-wave (p < 0.01) latencies. Evidence of a polyneuropathy--defined as reduced motor or sensory conduction velocities or response amplitudes in two or more nerves--was found only in the high-mercury group (30%, p = 0.008), suggesting a special predisposition to local nerve entrapment. There may be a relationship between tissue mercury accumulation in dentists and peripheral nerve dysfunction."

***************
HEAT FROM CURING LIGHTS

It has been shown that a 10°F rise in pulpal temperatures can result in an irreversible pulpititis. The purpose of this study was to measure the thermal characteristics and ultimate temperature of 10 commonly used curing lights. The temperature at the end of the fiberoptic tube (exit window) was measured and recorded every 15 seconds to a maximum of 120 seconds (the optimal polymerization time for a large 3 surface restoration).

In-sight II (Midwest) 131°F
Sunlite (Kinatic Instr) 113°F
Fiber-Lite (Dolan-Tennor) 104°F
Prisma-Lite (Caulk) 95°F
Translux II (Kulzer) 95°F
Visilux (3M) 93°F
Elipar (Espe-Premier) 90°F
Visar I (Denmat) 90°F
Visible Curing Light (Healthco) 90°F
Lee U-V Light (Lee Pharm) 86°F

This study suggests that in two of the curing lights tested there is enough heat applied to the tooth surface to potentially damage the pulp. With new units, entering monthly temperature control should be a factor of utmost importance." Heat Generation by Composite Light Curing Units tested in vitro. J Bodkin and J. Share. Tufts Univ School of Dental Medicine, Boston, Mass.

SMEAR LAYER

We are seeing more and more research being done in this area and how its importance is related to dentin bonding.

"The smear layer consists of a layer of microcrystalline debris produced when the dentin matrix is cut, scraped, or polished. This crust of debris covers the dentin surface, occluding the orifices of the dentinal tubules. Its presence decreases dentin permeability. Removal of the smear layer increases dentin permeability and the potential for bacterial invasion of the tubules if microleakage occurs around restorations. Materials specialists are attempting to cross-link constituents of the smear layer and or chemically bond resins with the smear layer to increase adhesive and cohesive bonds between restorative materials and the smear layer." The Smear Layer: Physiological Considerations. D. Pashley. MCG, Augusta GA.

"Microorganisms entrapped in the smear layer may survive and multiply under restorations. Toxins from these and other bacteria invading a contraction gap may cause the pulpal damage and inflammation previously ascribed to filling materials." Smear Layer:Pathological and Treatment Considerations. M. Brannstrum, Karolinska Institute Dental School, Huddinge, Sweden.

Dr. Vollmer also sent along this personal observation: I feel we are opening up into quite a significant area in advancements in dentin bonding. Research in this area hopefully will show us how to remove the superficial smear layer without causing pulpal damage. This initial work looks quite promising. D.E.V.

---

EDITORIAL

URINALYSIS

The summary issued at the conclusion of the recent (July 1984) NIDR/ADA workshop on the biocompatibility of metals in dentistry contained the following statement: "In addition, the distribution of mercury into body tissues is highly variable and there appears to be little correlation between levels in urine, blood or hair, and toxic effects."

It would appear from that statement that we may finally lay to rest the rationale that urinalysis can identify individuals at risk of mercury intoxication. Continued ADA defense of urinalysis as proof that dental amalgam is safe has to a great degree impeded the development of new and sophisticated biological indicators and testing protocols. Hopefully we may someday be able to identify those at risk from exposure to subclinical doses of toxic heavy metals as well as alternative dental materials.

The questions raised by an overwhelming array of scientific literature on the potential toxicity of mercury/amalgam can no longer countenance the blind defense of amalgam cloaked in the antiquity of 150 years of use. An objective open-minded approach would be more fitting for an organization as fine as the ADA.

It would certainly be of much greater benefit to the membership of the ADA. Who, when you strip away all the politics are the ADA. Each of you as a dedicated health care provider in the dental profession are the ADA. Without you and your support there wouldn’t be any ADA. Don’t you think that it is time for you all to demand of your association that the question of amalgams safety as a filling material be resolved by ORIGINAL scientific research and not secondary literature reviews and 19th century rhetoric?
WE NEED YOUR HELP. FOR THOSE OF YOU WHO HAVEN'T SUBSCRIBED YET, IF YOU LIKE WHAT YOU HAVE SEEN AND READ IN THE FIRST TWO ISSUES OF THE BIO-PROBE NEWSLETTER, WE NEED YOUR PARTICPATION NOW. THIS IS A MAJOR UNDERTAKING REQUIRING YOUR SUPPORT IF IT IS TO SUCCEED. IF YOU ARE A SUBSCRIBER NOW TELL YOUR COLLEAGUES ABOUT US. IF YOU ARE NOT A SUBSCRIBER WHY DON'T YOU BECOME ONE NOW? IT'S AN EASY WAY TO INSURE THAT BOTH SIDES OF THE QUESTION GET TREATED EQUALLY. MORE IMPORTANTLY YOU WILL BE INSURING THAT A VEHICLE EXISTS TO PROVIDE YOUR PROFESSION WITH SCIENTIFIC DATA UPON WHICH MAKE AN INDIVIDUAL JUDGEMENT ABOUT THE OTHER SIDE OF A CONTROVERSY.

---------------------------------

TECHNIQUE TIPS

Consistently sound contacts can be achieved with posterior ceramic interproximal restorations by following this procedure:

1. Utilize the CAULK AUTOMATRIX system. These matrix bands are designed to crimp at the cervical and flare at the contact area when tightened. NOTE: The bands need not be cut and discarded after one procedure. Simply loosen the band with an explorer for removal and sterilize for repeated use.

2. Wedge appropriately.

3. Select a condensible light cured material, such as SINTERFIL, SANTAY OR P-30.

4. Place restorative material in proximal box up to the cervical border of the contact area.

5. Cure this increment.

6. Burnish matrix band against adjacent tooth.

7. Fill remainder of the preparation, condensing the material laterally in the contact area.

8. Cure.

Contacts will be so consistently tight with this technique that at times it may be necessary to use orthodontic pliers for band removal.

Some operators prefer to use celluloid strips with Taffelmeyer matrix retainers.

(Bio-Probe thanks Michael F. Ziff, D.D.S. for this Technique Tip. If you have a technique or procedure that you have been using successfully, let us know about it so that we may disseminate the information to all Bio-Probe subscribers.)
Another new Light Cure Posterior Restorative may now be added to the list of available non-metallic posterior restorative materials.

The new material is "Sinterfil", marketed by Teledyne Getz. The company calls its product a "sintered" material, rather than a composite. It defines "sinter" as "to cause to become a coherent mass and "composite" to mean made up of distinct parts". Since composite failures have been due to the difference in chemical and mechanical properties between plastic bonding material and glass fillers, the objective was to develop a material with a more integral bond between fillers and resin, without sacrificing other properties.

Sinterfil is a Bis-GMA resin, highly (65%) filled with sub-micron sized particles which have been sintered to produce larger (3-5 millimicron) cellular particles, rich in retention sites for the bonding resin. Ultra fine (.04 millimicron or less) filler particles of Silicon Dioxide (SiO₂) are built into a larger agglomeration (3-5 millimicron) of homogenous material.

The company claims the following advantages:
1. Handles like amalgam - it can be condensed and carved.
2. Non-tacky - will not stick to placement instruments.
3. Tremendous resistance to expansion/contraction.
4. Greater compressive strength.
5. Extremely low water sorption.
6. Radiopacity - like a microfill.
7. Radiopacity.
8. Light cured.

The abrasion resistance of Sinterfil was compared to Dispersalloy in a two year study at a United States Dental School dental materials department. The study (unpublished) showed that the abrasion loss of Dispersalloy was twice that of Sinterfil. Further information may be obtained from Teledyne Getz, 1550 Greenleaf Ave, Elk Grove Village, Illinois 60007. Telephone (1-800-323-6650).

Bio-Probe Notes: If this abrasion resistance claim is correct and reproducible, the last major objection to the use of non-metallic posterior restorations has been eliminated. The continued use of mercury amalgam fillings in dentistry will be virtually indefensible. Recent studies have also shown that the abrasion resistance of 3M's P-30 compares favorably to amalgam. (AADR paper No. 759, I.L. Dogon et al., Harvard School, Dental Medicine, 1983).

One thing that you should all be aware of is the tendency of pro-amalgam advocates to compare abrasion resistance of amalgam to that of anterior composites used in posterior teeth. This is a practice we should no longer tolerate. Speak out everytime you see or hear this deception being utilized.
Sinterfil has been trial marketed under various names in Canada and West Germany. It is possible that Santay, marketed by Healthco of Canada, is one of those trial products of Sinterfil. The packaging and clinical characteristics of the two materials are identical. Bio-Probe is attempting to confirm this suspicion. We will let you know what we find out.

---

**CASE HISTORIES**

**Case 2**

Patient is a 48 year old caucasian female who was referred to this office by another dentist for determination of electrogalvanic potentials. The other dentist had administered a mercury patch test on August 26, 1983, which was positive but he did not want to remove the patient's amalgam fillings. On September 20, 1983, her first visit to the new dentist, there was still a red raised wheal at the site of the patch test area. The patient was examined and a health history taken that revealed the following information:

Patient had been diagnosed as having Lupus Erythematosus two years previously. She had just gotten over a bad staph infection in her left eye for which she had received treatment at a medical clinic. Since then she had become allergic to codeine and sulfa drugs. Her previous dentist had advised her that she was also allergic to nickel. (Examination revealed a nickle based porcelain to metal crown on the lower left 1st bicuspid).

Patient has had gastro-intestinal problems for the past 7-8 years: skin reactions for 15 years; far sightedness the last 6-7 years. No arthritis, no heart problems, no paresthesia, no tinnitus, and no headaches. Patient stated her skin rash had become worse 2 years ago, especially on neck, chest, stomach, and thighs.

Patient had 38 amalgam surfaces on 12 teeth. Dental diagnosis was possible mercury intoxication with a recommendation that all amalgam fillings be replaced with composites. First appointment was scheduled for November 2, 1983.

11/2/83: Area of mercury patch test still red and had a raised wheal. Amalgam fillings were removed from upper left 2nd molar (4 surfaces) and replaced with composite.

11/9/83: Patient reported she felt headachy after last appointment and the following day. Also had pain in lower right back the day following last appointment. Amalgam fillings were removed from 3 teeth on upper left (10 surfaces) and replaced with composites.

11/15/83: Amalgam fillings were removed from 3 teeth on lower left (9 surfaces) and replaced with composites.
11/30/83: Patient stated she has had intermittent dull headaches since last appointment but that they were beginning to ease. She also had a Lupus rash break out on the medial and dorsal left ankle and medial left flank. Amalgam filling removed from lower right (10 surfaces) and replaced with composites. Patient was feeling weak and nauseous after procedure. Blood pressure was 132/80.

12/7/83: Amalgam fillings removed on upper and lower right (9 surfaces) and replaced with composites.

1/11/84: Patient's Lupus Erythematosus symptoms much improved. No more skin rashes. Eye sight seems better and eyes are less sensitive and not red. Removed crown on lower left 1st bicuspid and place temporrary composite full crown.

1/17/84: Patient reported eyes were red and irritated for 3 days after crown was removed. Physical condition much improved. No more skin rashes. Mouth less and less sensitive every day.

6/27/84: I called the patient to confirm the information contained in the dental records. The patient stated that her diagnosed Lupus condition had manifested itself primarily as skin rashes and that since replacement of her amalgam fillings she had been symptom free. She also stated that her eyes, which had always been bloodshot and for which she continually had to use eye drops, were no longer red. More importantly she said that the pressure build-up behind her eyes had disappeared.

SOME OF YOU HAVE MENTIONED SOME OUTSTANDING CASE HISTORIES DURING OUR PHONE CONVERSATIONS. I SOLICIT YOUR COOPERATION. PLEASE SEND THOSE DOCUMENTED CASES ALONG SO THAT WE CAN PASS THE EXCITING RESULTS ON TO EVERYONE IN SUBSEQUENT NEWSLETTERS.

-----------------------------------------------

EVENTS

PERSONAL OBSERVATIONS ON THE NIDR/ADA WORKSHOP ON BIOCOMPATIBILITY OF METALS IN DENTISTRY

In the last issue of the Bio-Probe Newsletter we simply reported on the format and conclusions of the NIDR/ADA "Workshop on Biocompatibility of Metals in Dentistry" held at ADA headquarters in Chicago on July 11-13, 1984. We would now like to present some personal observations of Michael F. Ziff, D.D.S., who attended the workshop.

The Workshop Summary and Recommendations were formulated and issued by the "Planning Committee": Edgar W. Mitchell, Ph.D., John W. Stanford, Ph.D., John Autian, Ph.D., Carl W. Fairhurst, Ph.D., Nelson Rupp, D.D.S., M.S., Joseph P. Moffa, D.D.S., M.S., Joyce Reese, D.D.S., M.S. and James W. Miller, D.D.S.
It is interesting to note that even though about 200 individuals attended the workshop, the "Summary and Recommendations" were a "Consensus of Opinion" of only the eight members of the Planning Committee. If we examine the composition of the Planning Committee it would appear that vital decisions concerning the entire dental profession are being made by a committee devoid of the influence of even one practicing dentist. Four of the eight members of the committee are dentists, ie Dr. Reese works for the National Institute of Dental Research; Dr. Rupp is Chief Research Scientist for the ADA attached to the National Bureau of Standards; Dr. Moffa is a Capt. in the U.S. Public Health Service attached to the Letterman Army Inst. of Research; and Dr. Miller is listed as CDRP, FDA. How much actual clinical experience with patients these four members bring to the decision making process of the committee is unknown.

The planning committee of the workshop made 15 recommendations for future research. Three of these recommendations relate to investigations of Nickel, Beryllium and Chromium and the development of alternative restorative materials. The remaining 12 are related to the release of mercury from amalgams and the effects of that mercury on patients.

The same press release that outlined the 15 future research recommendations also contained the following statement: "In the judgement of the workshop as a whole, dental amalgam is a safe and effective restorative material for the majority of Americans." The obvious contradiction between the Planning Committee's judgemental ruling that amalgam is safe and the workshops identification of 12 research projects considered necessary to determine the safety of amalgam, will be very difficult for us to explain to our patients and to the public. How can a declaration of safety be justified if research is needed to determine the effects of the released mercury on patients? In addition the workshop was never polled for a consensus of opinion, so "In the judgement of the workshop as a whole" is actually the opinion of the 8 member planning committee.

The workshop summary also contains this statement: Although cases of allergy to mercury have been reported in the literature, the prevalence of mercury allergy is estimated to be less than 1%." At the press conference held on Friday afternoon, July 13th, a reporter asked ADA spokesman Dr. Edgar W. Mitchell how much less than 1% was the prevalence of mercury hypersensitivity. Dr. Mitchell replied that he didn't know. When asked about documentation for the 1% figure Dr. Mitchell responded by saying that there was no documentation to support the estimation of 1%. The reporter then asked how we know that the hypersensitivity prevalence wasn't 10% or more. Dr. Mitchell replied that the less than 1% figure was the "consensus of opinion" of the workshop.

Another reporter at the press conference asked Dr. Mitchell why the ADA had not done research on this vital subject. Dr. Mitchell replied that the ADA does not do research, that is the province of the NIDR and referred the reporter to Dr. Reese. Dr. Reese pointed out
that the NIDR only funds research and Dr. Mitchell had to retract his statement, admitting that the ADA does have research facilities. Dr. Mitchell also stated that the ADA didn’t have sufficient funds for such research. The reporter then pointed out that the ADA is assessing its membership an additional $125.00 per member per year for a media campaign promoting dentistry and why couldn’t the same be done to fund research on the mercury question. Dr. Mitchell had no answer for that.

In spite of these embarrassments at the close of the workshop considerable progress was made at the workshop. Dr. John Stanford of the ADA and Dr. Joyce Reese of NIDR were very cooperative and managed the workshop very well. Significant points were made at question sessions by audience participants Dr. Joel Berger and Dr. Ray Hoffman of New York City, Dr. Michael Thurman of Texas, Dr. Michael Ziff of Florida and several other participants. The surprise presentation by Dr. Rob Herber of the Netherlands concerning the validity of TLV’s was dynamic. Regardless of any other considerations, the workshop did validate that mercury is released from amalgams during function and that urine mercury studies are invalid. These are very significant steps in the on-going effort to have the ADA modify their rigid position on the safety of dental amalgam. With these issues not in serious contention any longer, it appears that toxicology, TLV’s and Immunology will be the next areas that must be resolved.

OTHER EVENTS

2. The Academy of Dental Materials (headquartered at Northwestern University Dental School) will be holding their first special conference October 18-20, 1984 at Callaway Gardens, Pine Mountain, Georgia. The subject of the conference is “Oral Metallic Interactions, The measurement and consequences of tarnish and corrosion of dental materials”. There are twenty speakers scheduled that will cover all important areas related to oral metallic interactions. The Academy is planning to have the formal presentations recorded and subsequently published as a special issue of their new journal, Dental Materials. Lawrence Gettleman. D.M.D., Gulf South Research Institute, P.O. Box 26518, New Orleans, Louisiana 70186-6518, Telephone (504) 283-4223 (M.W.F.) is the Program Chairperson if you desire more information. Dr’s. Joel Berger and Michael Ziff are planning to attend so we will be able to give you a first person report.

3. The founding meeting of the Academy of Biological Dentistry will be held at Banff, Alberta October 11-14, 1984. Banff is a mountain resort located in the Rocky Mountains approximately one hour from Calgary. If you desire additional information contact Dr. Murray J. Vimy’s office by phone (403) 266-2158.

4. The Greater New York Dental Meeting sponsored by the 1st and 2nd Dental Societies had originally planned to have a debate type presentation at their November meeting on the subject of Safety of Dental Amalgam. We are now informed that the debate has been cancelled and that Dr. Nelson W. Rupp will be making a presentation at the November meeting. It is interesting to note the topic and agenda for
Dr. Rupp's presentation: DENTAL AMALGAM—FACTS NOT FICTION. Dental Amalgam—An unusually safe biomaterial. Dr. Rupp is supposedly going to present scientific data which confronts the allegation that dental amalgam because of its mercury content is poisonous. He will present information on the following subject areas:

- amalgam stability
- corrosion
- galvanism
- mercury vapor in exhaled air
- multiple sclerosis
- mercurial antitoxin
- amalgam tattoo
- teratogenicity
- inversion of mercury through methyl mercury in the body
- incidence of hypersensitivity

The symptoms, diagnosis, and treatment of the rare hypersensitive patient will also be covered. Amalgam continues to be the material of choice for direct restorations in posterior teeth.

I am at a complete loss to understand the rationale behind canceling what would have been lively point and counterpoint presentations of scientific fact on a subject that cries out for the widest possible objective investigation at this time. It would seem to be a great disservice to the membership of this fine society to deny them the right to evaluate for themselves whether sufficient scientific data exists to raise a question of doubt about continued acceptance of amalgam as the "material of choice".

It is my understanding that in those areas of the country where anti-amalgam advocates have been presenting scientific facts and not empirical anecdotal evidence that dental supply house sales of amalgam have decreased approximately 35% and are continuing in a downward trend. I wonder what the situation is in the greater New York area??

It looks like the Greater New York Society will have an Alligator without an Alligator or is it vica versa?

5. Tom Beardon, an investigative reporter for Channel 7 TV in Denver Colorado has put together an outstanding 30 minute documentary on the subject of dental amalgam and its potential toxicity which was aired recently in the Denver area. Mr. Beardon was present at the press conference for the recent NIDR/ADA workshop and taped segments of it for inclusion in his documentary.

6. One of our new subscribers Anthony G. Roeder, D.D.S., of Paoli, PA is making a presentation to about 200 Multiple Sclerosis patients in October. Dr. Roeder said he would give us some feedback on the meeting which we will pass along in the next letter.

7. The International Academy of Microendocrinology will be holding a meeting at the Club Lake Villas, Lake Buena Vista, Florida on October 26-28, 1984. The IAM is a study group to foster the work of Melvin Page, D.D.S. using modern laboratory techniques. Membership is open to qualified health personnel. Details on the October meeting or on the IAM may be obtained from John S. Weiss, D.D.S., Secretary IAM,
IF YOU ARE PARTICIPATING IN ANY EVENTS RELATED TO THE AMALGAM PROBLEM PLEASE LET US KNOW SO THAT WE CAN KEEP ALL OF OUR SUBSCRIBERS APPRAISED OF WHAT IS GOING ON IN THE REAL WORLD.

FORUM

Martin C. Cuellar, D.D.S., Houston, Texas writes "I want to know if any scientific studies have been performed to determine long or short term possible systemic toxicities of composite materials?"

Dr. Cuellar poses an excellent question and one that we should all be concerned with. I am afraid I can't provide an adequate answer at this time. We have research papers that indicate cytotoxic reactions but these were well below those of amalgam and even below those of zinc oxide eugenol. Unlike mercury we have not as yet found any scientific data indicating any type of systemic reaction from composite materials.

However, because the question is so important we are doing a Medlars search and will have a complete answer based on available scientific research in the next issue of the Bio-Probe Newsletter. If any of our readers are aware of any research data on the question please let us know.

Dr. Herb S. Rubin, D.C., Jupiter, Florida requested a listing of dentists practicing mercury free dentistry. I haven't responded to Dr. Rubins' request as yet for the following reasons. 1. We are just compiling our list. Although our mailing list represents health care providers who have expressed interest in the subject of mercury toxicity, wishing to have your name on a referral list is another matter. We are getting requests from dentists to have their names added to the list but it is slow. I plan in the near future to discuss the problem with Dr. Roy Kupsinel, Dr. Jerry Mittleman, David and Tom Mays of Toxic Testing, Inc. and with Dr. Hal Huggins to see if there isn't some way we can all participate in the development of a single coordinated listing of not only dentists but physicians and other health care providers familiar with the overall mercury toxicity problems. Many dentists have asked me if I knew of any physician in their area who understood the problem and who would work with them on coordinated protocols on patients having their amalgams replaced.

2. The second problem I am confronted with in answering Dr. Rubin is do we provide a nationwide listing or just a listing associated with the practitioners local area? How about letting us know how your feel about the answer to this one!!!