SB

123

COMM.

RM 427

STATE OF ALASKA
1991 LEGISLATIVE SESSION

Bill Version: SENATE BILL 123
Publish Date: 2/13/91

REQUEST: FISCAL NOTE

Revision Date:
Agency Affect: Health & Social Serivces
Title: Informed Consent for Dental Fillings
BRU: State Health Serivces
Sponsor: Rodey
Components: Public Health Administration
Requester: Senate HESS

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants, Claims						
Miscellaneous						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0
REVENUE	0.0	0.0	0.0	0.0	0.0	0.0

FUNDING: (Thousands of Dollars)

General Funds	0.0	0.0	0.0	0.0	0.0	0.0
Federal Funds						
Other						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS

Full-Time		0				
Part-Time		0				
Temporary		0				

ANALYSIS: (attach a separate page if necessary)

No fiscal impact.

Prepared By: Alfred G. Zangri
Phone: 465-3090
Division: PUBLIC HEALTH
Date: 02/27/91

Approved By Commissioner: Theodore Mala, M.D., MPH
Date: 3-5-91
Agency: HEALTH & SOCIAL SERVICES

Distribution (by preparer):
Legislative Finance, Legislative Sponsor, Requestor,
Office of Management & Budget, Impacted Agency(ies)

FISCAL NOTE

STATE OF ALASKA
1991 LEGISLATIVE SESSION

BILL NO. SB 123

Revision Date: _____ Department Affected: Commerce & Economic Dev.

Title: An Act requiring a dentist to obtain informed consent for dental fillings BRU: Occupational Licensing

Component: Administration

Sponsor: Senator Rodey

Requestor: Senate HES COMPONENT SERIAL NO. 0356

Expenditures/Revenues: (Thousands of Dollars)

OPERATING	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0	0	0	0	0	0
CAPITAL						
REVENUE	0	0	0	0	0	0

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	0	0	0	0	0	0

POSITIONS:

FULL-TIME	0	0	0	0	0	0
PART-TIME	0	0	0	0	0	0
TEMPORARY	0	0	0	0	0	0

Estimate of current year impact: None

ANALYSIS: (Attach a separate page if necessary.)

New funds are not required to implement SB 123.

Prepared By: Jennifer Strickler, Admin. Officer Phone: 465-2144

Division: Occupational Licensing Date: May 2, 1991

Approved by Commissioner: Glenn A. Olds

Agency: Commerce and Economic Development Date: 5-2-91

Distribution (by preparer): Legislative Finance, Legislative Sponsor, Requestor, OMB, & Impacted Agency(ies).

STATE OF ALASKA

FISCAL NOTE

BILL NO. SB 123

1992 LEGISLATIVE SESSION

Revision Date. 02/26/92

Department Affected: Commerce & Economic Development

Title: An Act requiring a dentist to obtain informed consent for dental fillings.

BRU: Occupational Licensing

Component: Administration

Sponsor: Senator Rodey

Requestor: Senate HES

COMPONENT SERIAL NO. 0 3 5 6

Expenditures/Revenues: (Thousands of Dollars)

OPERATING	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
PERSONAL SERVICES	0.0	0.0	0.0	0.0	0.0	0.0
TRAVEL	0.0	0.0	0.0	0.0	0.0	0.0
CONTRACTUAL	0.0	0.0	0.0	0.0	0.0	0.0
SUPPLIES	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0
LAND & STRUCTURES	0.0	0.0	0.0	0.0	0.0	0.0
GRANTS, CLAIMS	0.0	0.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0
REVENUE	0.0	0.0	0.0	0.0	0.0	0.0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0.0	0.0	0.0	0.0	0.0	0.0
FEDERAL FUNDS	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME	0.0	0.0	0.0	0.0	0.0	0.0
PART-TIME	0.0	0.0	0.0	0.0	0.0	0.0
TEMPORARY	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of current year impact: None

ANALYSIS: (Attach a separate page if necessary)
New funds are not required to implement SB 123.

Prepared By: Jennifer Strickler Phone: 465-2144

Division: Occupational Licensing Date: 02/25/92

Approved by Commissioner: Glenn A. Olds

Agency: Commerce & Economic Development Date: 2-25-92

Distribution (by preparer): Legislative Finance, Legislative Sponsor, Requestor, OMB, & Impacted Agency(ies).

Rev 10/90

Patrick M. Rodey
Senator

Alaska State Legislature

311 C. St., Suite 510
Anchorage, Alaska 99503
(907) 561-7618

During Session:
P.O. Box V
Juneau, Alaska 99811
(907) 465-3793

Senate

MEMORANDUM

DATE: February 7, 1992

TO : Senator Arliss Sturgulewski, Chair
Senate HESS Committee

FROM: Senator Patrick Rodey

RE : Scheduling Senate Bill 123 - An Act requiring a dentist to obtain informed consent for dental fillings

I respectfully request that the Committee schedule SB 123 for a hearing.

As you know, the proposal establishes a statutory requirement for informed consent regarding dental fillings. I have provided the members material relating to this issue and believe there are sufficient consumer concerns which warrant establishing a responsible state policy on certain dental procedures.

I would appreciate your consideration of this request.

Patrick M. Rodey
Senator

Alaska State Legislature

310 C. St., Suite 510
Anchorage, Alaska 99503
(907) 561-7618

During Session:
P.O. Box V
Juneau, Alaska 99811
(907) 465-3793

rec'd 4/12/91

Senate

MEMORANDUM

DATE : April 9, 1991

TO : Senator Arliss Sturgulewski, Chair
Senate HESS Committee

FROM : Senator Pat Rodey Pat

RE : Senate Bill 123 - An Act requiring a dentist to obtain informed consent for dental fillings

I respectfully request that the Senate HESS Committee consider scheduling Senate Bill 123 for consideration in the near future.

The proposal establishes a statutory requirement for informed consent relating to dental fillings.

The legislation is an outgrowth of increasing concern nationwide as well as internationally concerning the use of mercury in amalgam fillings. While some dispute the alleged health problems associated with the use of mercury in amalgam, I believe there have been sufficient concerns raised nationwide which justify establishing a basic "right-to-know" policy regarding the use/alternatives/effects of certain dental treatment on clients.

Since the biological safety of silver amalgam remains a subject of controversy within the dental profession and the general public, **I believe this is a step in the right direction to provide a prudent and responsible state policy as well as being a good piece of consumer protection legislation.**

Offered: 2/13/90
Referred: Rules

Original sponsor(s): SEN. RODEY

IN THE SENATE BY THE HESS COMMITTEE

CS FOR SENATE RESOLUTION NO. 12 (HESS)

IN THE LEGISLATURE OF THE STATE OF ALASKA

SIXTEENTH LEGISLATURE - SECOND SESSION

Relating to the use of informed consent by dentists when they insert dental fillings.

BE IT RESOLVED BY THE SENATE:

WHEREAS it is a common dental practice in the state to use a variety of materials for dental fillings; and

WHEREAS some components of the fillings may infrequently cause allergic or adverse reactions in some persons; and

WHEREAS dental patients should have the right to choose which materials are used for their dental fillings; and

WHEREAS they often lack basic information that would help them make an informed choice;

BE IT RESOLVED that the Senate respectfully requests the Governor to direct the Board of Dental Examiners to report to the legislature by the 10th day of the First Session of the Seventeenth Alaska State Legislature its recommendations on whether dentists should inform their patients

(1) about the materials that are used for dental fillings;

(2) that there is a variety of materials that could be used for dental fillings; and

(3) that it is possible that alternative material can be used.

Department of Commerce & Economic Development / POSITION PAPER

SB 123: An act requiring a Dentist to obtain informed consent for dental fillings.

If there exists a wide spread problem with dentist's failing to inform patients of their options in regards to the types of filling materials available and the possible harmful effects on health by specific materials, then the department supports the intent of this bill.

The department agrees with holding Dentists to a reasonable standard of care for their patients. If, however, there are only isolated incidents of a Dentist failing to explain all of the above, we question the need for an extra layer of red tape. We question how the Department or the Board of Dental Examiners can effectively enforce this statute.

Glenn A. Olds

Glenn A. Olds, Commissioner

4-2-91

Date

Good morning Senator Sturgeluski and esteemed members of the HESS committee.

My name is Dr. Burton A. Miller, a practicing dentist of 16 years in Anchorage, Alaska.

Thank you for this opportunity to share this information with you and to voice my opinion on Senate Bill 123.

Dental amalgam consists of 48 to 52% mercury. Mercury is a poisonous metal that has been utilized in dentistry for over 160 years. During that entire time the dental establishment has not produced one scientific experiment that proves the safety of dental amalgam.

As of May of 1991 there has been 8 scientific studies actually measuring the amount of mercury vapor being released from dental amalgam fillings under various conditions. The most recent evaluation of all existing data from around the world is contained in the World Health Organizations 1991 document titled."Environmental Health Criteria 118 - Inorganic Mercury". The W.H.O. task group, comprised of the worlds class mercury toxicologists and scientists, concluded that dental amalgams were the greatest source of mercury vapor exposure to humans causing the daily intake and retention of 3 to 17 micrograms of mercury. This far exceeds the amounts attributable to seafood of 2.3 micrograms per day of methyl mercury and derived from food other than fish of 0.3 micrograms per day of inorganic mercury.

There are thousands of case histories testifying efficacy of amalgam replacement with non-mercury containing fillings. At present, there have been almost 500 Amalgam Adverse Reaction Reports filed with the FDA during the last 6 months. Of this number, approximately 96% are indicating some degree (10-100%) of improvement of pre-existing health conditions after dental amalgam replacement.

The entire medical profession has reacted to the potential of lead poisoning in children based, essentially, on one large scale study demonstrating learning deficits in children exposed to lead. Mercury has been shown to cause similar learning deficiencies in children. Mercury and lead work synergisticly in the human body, the effect being greater when both are present.

The medical profession stopped using mercury therapeutically over 25 years ago because of adverse side effects. The EPA has banned the use of mercury in paint. The FDA is proposing that mercury be banned in all over-the-counter, non-prescription anticeptic products.

Our rivers and our lakes have become polluted with mercury to the point the EPA wants to impose strict regulations on the amount of mercury from dental offices permitted in waste water effluent.

In conclusion, any prudent person presented with this information must seriously question the validity of the dental establishments position regarding the safety of dental amalgam fillings. This same prudent person is entitled to all relative information to arrive at an informed decision and allow him freedom of choice based on knowledge.

There are published scientific reports documenting periodontal disease in humans as a direct result of dental mercury amalgam fillings. Animal studies (both sheep and monkey) document kidney disease resulting from mercury from amalgam fillings. There is published documentation of mercury from amalgam fillings that induced anaphylactic reaction to exercise. Published clinical evidence demonstrated theraputic efficacy of amalgam filling removal in 22 patients with multiple severe sensitivities. Additionally, studies from all over the world confirm alarming rates of allergies to mercury and other components of amalgam fillings.

Exciting research in progress at the University of Kentucky on the causes of Alzheimer's Disease has documented mercury as a probably cause and has noted dental amalgams as the most likely source of mercury in the A.D. brain tissue.

Research in progress in Sweden is showing a positive correlation between the presence of dental amalgam fillings and suppression of immune function.

Research in progress in Norway is investigating a relationship from dental amalgam fillings and mental disease.

Research in Sweden with patients having Crohn's Disease have demonstrated high levels of mercury in the gut lining.

Research from the University of Georgia at Athens, GA demonstrated that dental amalgam fillings provoked an increase in mercury and antibiotic resistant bacteria in the mouth and intestinal normal flora.

It is the function of established dentistry to serve the public and not to dictate to it.

Honorable Senators -- I want to go on record in support of Senate Bill 123. Thank you again.

SB123

Sheila Anderson
strongly urges
you to move this
bill. Very important
!!

14 May 1105 | LEFT MSG W JOANN

De Paine

561-2475

SB123

1120 14 May

4x phone ring once 1x hold 5 min

Rowen
344-7778

Omni Medical Center

Payne 561-2475
272-1029

Walsh Miller 258-1390

ALASKA DENTAL Society
State 277-4675

South Central Dist
279-9144

Clinics & Services
Insurance Providers

OMNI MEDICAL CENTER

Robert Jay Rowen, M.D.
Diplomate, American Boards of Family Practice, Emergency Medicine, Chelation Therapy

"Biologic Alternatives to Drugs and Surgery"
907-344-7775

Sandra Denton, M.D.
Diplomate, American Boards of Emergency Medicine & Chelation Therapy

May 6, 1991

Madam Chairperson and Members of the HESS Committee:

I waited patiently, as did others, to testify on SB123, but, alas, you ran out of time. I hope that I will be available to testify when the bill next comes up, but I wanted to give you some information that you will find useful.

The only opposition you will have from this bill is from mainstream dentistry. For years they have been telling us that the mercury in the fillings is inert and does not come out. After years of promulgating these falsehoods, they had acknowledged that the mercury does come out but refuse to acknowledge there could be any harm in it. In fact, as part of my supporting materials I am sending you a copy of an ad that appeared in the Anchorage Daily News "Straight Talk About Dental Amalgam". In it the dental establishment declared to the public that the fillings were safe.

Neither the American Dental Association nor any other dental establishment has been able to provide any original scientific research on the safety of mercury amalgam. In fact, there is none. All of it is propaganda and hearsay based on the fact that they have used it for 100 years. Well, I can say that for hundreds of years Europeans thought the earth was flat. For scores of years, it was felt that radiation did not hurt people, and the government lied to us about the hazards of that. We have been using pesticides for years only to find out that it was, and is, hazardous. That type of logic just doesn't hold.

I am enclosing for you a copy of the warnings about mercury from the American Dental Association itself. It is entitled "Hazards Communication Program" sponsored by the ADA and reprinted from ADA News April 25 and September 19, 1988. It explains hazards of various compounds including mercury. Examples include bulk mercury, precapsulated alloy, and scrap amalgam. The latter is most significant since scrap amalgam is the same thing as amalgam mixed by the dentist and not implanted in the person's mouth, or amalgam that is drilled out of a person's mouth.

The dentist is to store this scrap amalgam under a photographic fixer solution in a closed container. All such scraps are to be disposed of in a proper manner. The Environmental Protection Agency has recently declared that scrap amalgam is a hazardous waste substance and cannot be buried in a common landfill but must be handled by a toxic disposal site. The dentist is warned to avoid direct skin contact with mercury. Somehow, however, when the dentist places it in our mouths, it suddenly becomes safe. The ADA's guidelines and how it promulgates the usage of mercury are inconsistent. If the dentist is warned by the ADA about the hazards of scrap amalgam, then a patient needs to be warned about the hazards of the non-scrap amalgam that is deliberated implanted within his body.

615 E. 82nd Street, Suite 300 • Anchorage, Alaska 99518
Members, American Academy of Advancement in Medicine, American Academy of Environmental Medicine, American Society of Bariatric Physicians

I am also enclosing for you a copy of an article written by my former associate, Dr. Sandra Denton, M.D., who departed to Colorado to lend more study to the mercury issue with a principal researcher, Dr. Hal Huggins. Her article about the hazards of mercury is well referenced .

My only disagreement with this bill is that it is not adequate. I feel there should be a ban on mercury without any hesitation. Under the assumption that the HESS committee will not allow that through, then at the very least, informed consent should be obtained from the patient. Throughout the other testimony I heard on Friday morning, everyone was concerned about protecting the public. This bill has no fiscal consequence. It is merely a public protection measure and does not take away anybody's rights. If the dentists had nothing to hide about mercury, then there should not be any objection to this bill. If they do object to it, then they simply wish to keep the public in the dark and not give their patients the same warnings the ADA has given them with regard to the hazards of amalgam.

That mercury escapes and escapes in toxic amounts is no longer questioned. There are ample reference in the literature showing that the more amalgam someone wears, the more mercury shows up in the brain and other tissues. Mercury crosses the placental barrier and is actively concentrated in the fetus compared to maternal blood. There is a epidemic of anxiety and depression in this country. It has clearly paralleled the rise of amalgam implantation in people.

The public has a right to know what the dentist is placing in their mouths. In my opinion, any dentist who does not give duly informed consent is negligent, and I have let it be known that I would testify to that in court. Most of my patients had no idea that what was going in their mouths was mercury. They seemed to know more about the hazards of the substance than the dentist themselves. It is time that the dental profession was forced to come out of the dark.

If you have any further questions of me, please to do hesitate to contact me.

Sincerely,

Robert Jay Rowen, M.D.

RJR/fdl

Enclosures

Bio-Sketch — Sandra Denton, M.D.

KUP'S KOMMENT:

I had the indeed pleasure of being with Sandra Denton, M.D. at the World Congress on Alternative Medicines in Athens, Greece this spring. I asked Sandy if she would honor HC by being on the cover and writing a feature story for you. Her most beautiful photo appears on the cover and her most dynamic, high impact writing *The Mercury Cover-Up* appears here!!!

There is an aura of love, calmness, caring, compassion, and balance about Sandy that is immediately perceived. She is also a very powerful, effective, truthful and well documented speaker and writer; and from the feedback that I have received from HC readers and patients of hers, a superb physician. What a treat you have in this issue of HC with Sandra Denton, M.D.

The Mercury Cover-Up is a paper to be read by all the members of the health profession as well as the medical/allopathic profession and as many lay people as possible. Extra issues will be available for a while and I am planning on having printed reprints of this article. Thanks, Sandy! God bless you!

Dr. Denton received her medical degree from the University of Tennessee in 1971 and completed an internal medicine internship at St. Luke's Episcopal Hospital in Houston, Texas. She then specialized in emergency medicine for almost 14 years, becoming board certified in 1981. Serving as director of two hospital emergency medical services in Louisville, Kentucky for five years, Dr. Denton gave many lectures in her field of expertise, "poisoning and toxicology."

Dr. Denton made a career change in 1985 when she became convinced of the benefit of nutritional and preventive medicine. By learning many of the therapies taught by the American College of Advancement in Medicine, she felt she could prolong and improve the quality of life of her patients — and yes, keep them out of the emergency room.

She became board certified by the American Board of Chelation Therapy. Chelation therapy is an accepted therapy for the treatment of heavy metal poisoning and recognized by some for its efficacy in improving arterial circulation throughout the body.

Keeping in line with her interest in toxicology, Dr. Denton became aware of the presence of mercury in dental fillings and immediately recognized the potential health problems. Having majored in chemistry in college, she saw that anything having such a strong affinity for sulfhydryl groups could cause major disruption of normal cellular functions in the body. It occurred to her that many of those people who used to frequent the emergency room with strange, bizarre, unexplained, undiagnosed symptoms, finally being labeled as "crazy", could instead be suffering from chronic mercury toxicity. She began to investigate this possibility and has collected numerous articles (almost 3000) and several books on the subject of mercury toxicity. She spent four months at Huggins Diagnostic Center reviewing patient charts, answering phone calls from patients worldwide, going through the files adding to her documentation, and doing research.

Dr. Denton has since treated hundreds of patients whose health problems have definitely improved when toxic dental materials were properly removed and detoxification procedures followed. She, of course, works closely with dentists trained in this area.

Realizing that most physicians are not aware of even the presence of mercury in the dental fillings, much less its effects, Dr. Denton lectures to interested professional organizations. In fact, she recently had the privilege of lecturing at the World Congress of Complementary Medicine in Athens, Greece, to physicians from 44 countries. Dr. Denton also gave two lectures at the International Conference on Biocompatible Materials, November 1988: 1) Clinical Pointers on Detoxification of Mercury 2) Infertility and Birth Defects — the Mercury Connection. The proceedings are being published by Life Sciences Press in Tacoma, Washington (206 / 272-0530) and tapes are available through Huggins Diagnostic Center (800 / 331-2303). Dr. Denton also lectured at the International Academy of Oral Medicine and Toxicology meeting September 1988.

Dr. Denton has studied the various treatment modalities for mercury toxicity extensively. While raising awareness of the problem both at the public and professional level, she endeavors to teach the solution as well. She is a frequent radio and television guest.

Dr. Denton has become involved with dental personnel, treating their health problems and fighting their battles for disability from their occupational exposure to a known poison.

Her professional memberships include:

American College Advancement in Medicine — chelation therapy and nutritional medicine

American Academy of Environmental Medicine — allergies and toxic substances in the environment

International Bio-Oxidative Medicine Foundation

International Ozone Association

Consultant for Toxic Element Research Foundation

Board of Directors for International Academy of Oral Medicine and Toxicology

Fellow, American College Emergency Physicians

Dr. Denton and her dental colleague, Dr. Paul Rubin of Seattle, Washington, made a professional cassette tape "Mercury Detoxification — Patient Instructions" which has been of great assistance in outlining general procedures for the patient to speed the healing process. To order call 206 / 328-0221.

Dr. Denton is in private practice with Dr. Robert Rowen at *Omni Medical Center*, which is a total holistic health center. Chelation therapy, oxygen therapies, applied clinical nutrition, acupuncture, neural therapy, sclerotherapy, counseling, a weight loss program, and mercury toxicity evaluation and treatment are only a few of the services offered at OMNI. For further information write Dr. Denton at:

Omni Medical Center
615 E 82nd Ave., Suite 300
Anchorage, AK 99518

. . . In 1988, scrap dental amalgam was declared a hazardous waste material by the Environmental Protection Agency . . . Once a doctor removes an amalgam filling from your mouth and places it on the tray, it once again becomes a hazardous waste material . . . I ask the reader — what is it about the mouth that makes this same item non-toxic?

The Mercury Cover-Up

By SANDRA DENTON, M.D.

Sandra Denton, M.D.

Absolutely Amazing ! ! ! ! !

In just a few minutes I can present the "facts" to most lay people, and they can immediately grasp the significance that a poison has been implanted in their mouth without their knowledge or consent. Naturally, they are unhappy about this and would like to see the practice stopped.

Why is it then, that trained, educated professionals still ignore and discount these "facts" and even go so far as to place paid advertisements in the newspapers to assure the public of the safety of this poison??? The legal opinions right now seem to be indicating that this is frank negligent misrepresentation, possibly consumer fraud, and this action may have serious consequences.

What are some of the "facts" I tell my patients?

- Mercury comprises over 50% of the "silver" dental filling.
- Researchers from all over the world have measured mercury vapor coming off the filling, particularly after stimulation through chewing, bruxism, hot and/or acidic food and tooth brushing.[1,2,3,4] (For many years the American Dental Association maintained that once mercury was placed with the other ingredients of the dental filling — silver, tin, zinc, copper — it was tightly bound and did not escape.) In the face of voluminous research they were forced to change their position and admitted that although mercury does come out of the filling, the amount is "insignificant."
- Everyone knows that mercury is a poison. It is in fact, as Sharma and Obersteiner stated, ". . . a strong protoplasmic poison that penetrates all living cells of the human body. Mercury is a powerful biological poison with no necessary biological function."[5]
- Mercury is extremely toxic. Sharma and Obersteiner at Utah State University discovered mercury is the single most toxic metal that they investigated (even in such minute concentrations as 3.47×10^{-7} moles). Mercury is even more toxic than lead, cadmium and arsenic![5] It has been stated by world regulatory agencies that the smallest amount of mercury that will not cause damage is UNKNOWN! How then can we be so certain that the amount coming out of our dental fillings is insignificant?
- The world's foremost researchers on mercury toxicity, Drs. Thomas Clarkson and John Hursh of the University of Rochester School of Medicine, Department of Toxicology and Drs. Magnus Nylander and Lars Friberg of Karolinska Institute in Stockholm, Sweden, concluded from their research[6] that "the release of mercury from dental amalgams makes the predominant contribution to human exposure to inorganic mercury including mercury vapor in the general population."[6]
- The International Conference on Biocompatibility of Materials was held in November 1988 in Colorado Springs, Colorado. Many of the world authorities on mercury met to discuss the issue of dental amalgam and other materials commonly used in dentistry. (The proceedings of this meeting are being published by Life Sciences Press in Tacoma, Washington (206/272-0530) and audio-visual tapes are available through Huggins Diagnostic Center, Colorado

Springs, Colorado (1-800 / 331-2303). On the last day of the meeting, the doctors in attendance drafted and signed their official conclusion, which read: "Based on the known toxic potentials of mercury and its documented release from dental amalgams, usage of mercury-containing amalgam increases the health risk of the patients, the dentists, and dental personnel."[7]

- Autopsy studies show a positive correlation between the number of occlusal surfaces of dental amalgam and mercury levels in the brain[8] and kidney cortex.[9]
- Research has shown mercury dental amalgam to have an adverse effect on the T-lymphocyte count (a very important part of our immune system). In one patient, Dr. David Eggleston of the University of California, found a T-lymphocyte count of 47% (ideal levels are between 70-80%). After removal of the amalgams the T-lymphocyte count rose to 73%. Reinsertion of four amalgam restorations on top of the composite fillings, not even in direct contact with the teeth, resulted in a decrease to 55%. The amalgams were removed and the T-lymphocyte count measured 72%.[10] Dr. Eggleston's important research is ongoing and even more startling results are being published now. With all the concern about the immune system diseases of today, does it make sense to continue using a dental material that might have such a drastic effect on one's defense system?
- Multiple Sclerosis patients have been found to have 8 times higher levels of mercury in the cerebrospinal fluid compared to neurologically healthy controls.[11] Inorganic mercury is capable of producing symptoms which are indistinguishable from those of multiple sclerosis.
- In 1988 scrap dental amalgam was declared a hazardous waste material by the Environmental Protection Agency.[12] Scrap amalgam, the portion that remains, after placing a filling in your mouth, must be handled with great care. According to the Materials Safety Data Sheet for mercury, which OSHA mandates be present in every dental office, the dentist is told to handle scrap amalgam in the following manner:

1. *Store in unbreakable, tightly sealed containers, away from heat.*
2. *Use a no touch technique for handling amalgam.*
3. *Store under liquid, preferably glycerin or photographic fixer solution.*

Once a doctor removes an amalgam filling from your mouth and places it on the tray, it once again becomes a hazardous waste material and must be handled in the same manner described above. If this scrap amalgam should find its way into the ground, one may be fined a sizable amount.[12] I ask the reader — what is it about the mouth that makes this same item non-toxic? Or is it possible that the mouths of some 80% of Americans with amalgam fillings are in actuality "toxic waste dumps."

In Alaska, during April and May, 1989, the state dental association appropriated money for a paid advertisement titled "Straight Talk About Dental Amalgam." Let's compare facts.

"FACT": <u>The fillings in your teeth are safe</u>. For more than 100 years dentists have used, observed and tested amalgam filling materials, and we have found them to be both safe and effective. No other material has been so thoroughly tested, nor found to be as cost effective as dental amalgams.

This statement is very misleading. Amalgam fillings have been tested for their strength but not for their safety. Although asked several times to do so, the ADA cannot produce these "studies" showing safety. On the other hand the research pointing out its toxicity is voluminous. Prior to the use of mercury fillings, lead fillings had been customary for many years and had been considered safe. For years radiation was considered safe. Remember the days of shoe fluoroscopy? Does the routine use of pesticides for many years reduce their toxicity?

Prior to the use of mercury fillings, lead fillings had been customary for many years and had been considered safe. For years radiation was considered safe. Does the routine use of pesticides for many years reduce their toxicity?

"FACT": <u>The dental profession has complete confidence in the safety of dental amalgam</u>. The members of the dental team, who work with amalgam everyday, are as healthy as their peers in the general population. And most of us have — and would accept — amalgam fillings in our own mouths. Over 100 million Americans have amalgam fillings.

If this statement is true, as the Alaska Dental Association would have us believe, then why do dentists have the highest suicide and divorce rate among professionals? Why was neuropsychological dysfunction present in 90% of dentists tested by Joel Butler, Ph.D., professor of psychology, University of North Texas? This information was presented at the ICBM conference November 1988. His abstract reads "Areas of suboptimal function were evident in shifting tasks - attention span, ability to concentrate - recent memory deficits - visual recall, control dyspraxia - tremor and perceptual accuracy in judgment.

Psychological problems were concentrated in the areas of irritability, impatience, tension, frustration and conflict. Notably absent was calmness. Observation of data suggest that the longer a dentist practices, the less ability he has to pass the entrance exams into dental school. Dr. Butler is alarmed at the implications of his studies and wants to inform dentists of the damage that is undermining their personalities and motor skills."[7]

If the above "FACT" is true, why then do female dental personnel have a higher spontaneous abortion rate, a raised incidence of premature labor, and an elevated perinatal mortality?[13] This has been substantiated by the Environmental Protection Agency to be characteristic of women chronically exposed to mercury vapor.[14] Recent studies in pregnant women indicate that elemental mercury does cross the placenta and incorporate into the fetus. ". . .the placenta, the chorioallantoic membrane, the amniotic membrane, and the neonatal blood of women who were exposed to

Why . . . do female dental personnel have a higher spontaneous abortion rate, a raised incidence of premature labor, and an elevated perinatal mortality?

mercury while working in dental offices were found to contain significantly higher mercury levels than in control women with no occupational exposure to mercury."[15] Sikorsky's work in Poland studied 81 females (45 dentists and 36 dental assistants). Sikorsky found hair mercury levels much greater than in 34 non-exposed controls. There was significant positive correlation between total mercury levels and reproductive failures and also with a prevalence of menstrual cycle disorders.[15] This is a very recent and significant study. There was a high incidence of spina bifida births that occurred in the Sikorsky study population (5 out of 117 pregnancies). The normal ratio of occurrence is 1 in 1000 births. Folic acid deficiency has been associated with spina bifida and mercury is known to block the function of folic acid in the body. Other articles with similar information abound in the literature.[17, 18, 19, 20, 21] I also encourage the reader to get Sam and Michael Ziff's book Infertility and Birth Defects - Is Mercury From Silver Dental Fillings An Unsuspected Cause?[22]

If dentists and dental personnel are so "healthy", why do dentists, according to the insurance industry, have one of the highest utilization rates of medical insurance? Another reason to consider why more dental personnel are not diagnosed as mercury toxic may be explained by an incident reported by Macdonald[23] who stated "Since symptoms vary greatly, improper diagnosis may result. Failure to consider mercury as a causative factor in digital numbness resulted in two exploratory surgical procedures for a 40 year old dentist. He was treated in several prestigious medical facilities for 16 years before a 'long shot' test for urine mercury was taken." One must also remember that the diagnosis of mercury intoxication is extremely difficult because of the insidious nature of the onset and because of most physicians' unfamiliarity with proper testing techniques.

Most physicians would like to be able to diagnose mercury toxicity by finding a high urinary level of mercury. High levels may be found in acute exposures (macromercurialism). However, they are rarely present in the chronic low-dose exposures (micromercurialism). The chapter on mercury of the fifth edition of Clinical Toxicology of Commercial Products by Robert Gosselin, M.D., Ph.D.; Roger Smith, Ph.D.; and Harold Hodge, Ph.D., D.Sc., makes this clear. "Urinary mercury levels are characteristically low in chronic exposure suggesting a hypersensitivity reaction." Another article by L.J. Goldwater, "The Toxicology of Inorganic Mercury"[24] says that urinary mercury levels may give some indication of the degree of exposure. However, they are of limited value

Why do dentists, according to the insurance industry, have one of the highest utilization rates of medical insurance?

in the diagnosis of poisoning. High levels can be found in human subjects who are symptom free, and low levels in those exhibiting marked evidence of micromercurialism. It has been suggested that, in some cases, failure to excrete mercury is a factor in the development of poisoning. T.W. Clarkson in Biological Monitoring of Toxic Metals,[6] discusses the significance of urine mercury values. "Urinary excretion of mercury is used widely in monitoring workers exposed to mercury vapor (see U.S. EPA, 1984). However, the relationship between urinary excretion and absorbed dose is not well understood; urinary excretion may be directly related to the kidney burden of mercury unless renal damage has occurred." This point was also made by Lamm and Pratt in their 1985 study when they discovered a clear, negative and significant correlation between time on the job and the level of mercury in the urine. These researchers found that the longer a worker was on the job, the less mercury is excreted in his urine.

Blood levels are not helpful in the diagnosis of mercury poisoning since mercury only remains in the blood for a

One must also remember that the diagnosis of mercury intoxication is extremely difficult because of the insidious nature of the onset and because of most physicians' unfamiliarity with proper testing techniques.

few minutes. Mercury quickly finds its way into the various tissues of the body, depositing in the brain, adrenals, thyroid, and other organ systems. Only at high levels of exposure will this parameter be of any value.

Another point to be considered is Dr. Magnus Nylander's report which appeared in Lancet describing the increased uptake of mercury in the pituitary gland of dentists.[17]

There are not enough words to describe the dentists and dental assistants I have seen whose lives have been devastated by the effects of chronic mercury exposure. It is truly heartbreaking - and preventable!

The last part of the above "FACT" indicates that since over 100 million people have mercury fillings in their mouth, it must be right. The majority is not always right. Reports indicate that every one of us has measurable residual amounts of pesticides in our body. Does that reduce the degree of toxicity?

"FACT": Any dentist who encourages you to remove amalgam fillings in order to "remove toxic substances from the body" is guilty of a breach of ethics. In addition to the ADA, the United States Public Health Services, the National Institute of Dental Research and the Consumers Union have all investigated the allegations about amalgam — and have found them to be useless.

Remember, the ADA formerly maintained that mercury did not come out of the filling. It may interest you to know that the same dentist subject to breach of ethics for suggesting toxicity may remove the fillings for cosmetic reasons without threat of disapproval, censure, or removal of his license. If it is unethical to remove a documented biological known poison from the mouth, are we to assume that it is ethical to place this poison in the mouth? Is it

proper ethics to be allowed to replace an amalgam for cosmetic reasons, but to be reprimanded because replacement of amalgam for any other purpose may jeopardize the health of the tooth? Is it considered proper ethics to withhold the information that mercury is present in the restoration and to use amalgam indiscriminately? In the American legal system the judge always directs the jury that it can not return a verdict of guilty if there is any reasonable doubt.

Alaska State Senate majority leader Pat Rodey, has recently stated "there is enough evidence to establish REASONABLE DOUBT as to the safety of dental amalgams in any prudent person's mind. Senator Rodey followed his words with action by introducing a senate resolution which will be voted on in the next session. It reads thus:

"SENATE RESOLUTION NO. 12
IN THE LEGISLATURE OF THE
STATE OF ALASKA
SIXTEENTH LEGISLATURE
FIRST SESSION

Relating to the use of informed consent by dentists when they insert dental fillings that contain mercury.

BE IT RESOLVED BY THE SENATE:

WHEREAS it is a common dental practice in the state to use an amalgam of materials for dental fillings; and

WHEREAS this dental amalgam is thought by most persons to be made only of silver, but its composition is actually 50 percent mercury; and

WHEREAS some studies have shown that toxic mercury vapors can leak from the fillings into a patient's blood system and lead to mercury poisoning, particularly in chemically sensitive or allergic persons; and

WHEREAS dental patients should have the right to choose which materials are used for their dental fillings, but they often lack basic information from the dentist that would help them make an informed choice;

BE IT RESOLVED that the Senate respectfully requests the Governor to direct the Board of Dental Examiners to report to the legislature by the 10th day of the Second Session of the Sixteenth Alaska State Legislature its recommendations on the manner in which dentists should inform their patients that

(1)mercury is contained in most dental filling material;

(2)mercury in fillings can have toxic effects on some persons;

(3)there are alternative materials that could be used for dental fillings that could have other effects on the person; and

(4)they have the right to insist that an alternative material be used."

It is hoped that other states will follow this recommendation in passing similar legislation.

In a "Concept Paper" the Alaska Department of Health and Social Services on January 17, 1989 stated: "Those persons who have had a large number of amalgam fillings, who have experienced symptoms commensurate with chronic low level mercury exposure and who have tried traditional treatments may wish to consider replacement therapy". The Alaska Public Interest Research Group investigated information presented in this paper and is now supporting efforts to introduce legislation that will mandate the provision of full information about these potential health effects from mercury amalgams. The group is also supporting additional legislation to "hold harmless" dentists who provide this information (in rejection of ADA guidelines which prohibit even telling patients about these concerns).

There are not enough words to describe the dentists and dental assistants I have seen whose lives have been devastated by the effects of chronic mercury exposure. It is truly heartbreaking — and preventable!

"FACT": The Board of Dental Examiners of the State of Alaska supports the position of the American Dental Association that "there is no scientifically documented evidence of a cure or improvement of a specific disease due to the removal of (silver) amalgam restorations from a non-allergenic patient."

This is true because poisoning is not a specific disease. Nonetheless, I have documented cases of seizure disorders, chronic fatigue, memory loss, menstrual disturbances, depression, neurological symptoms, various eye problems, headaches, muscle tremors, joint pains, intestinal problems, irregular heart beats and/or unexplained chest pains, agitation and irritability, suicidal thoughts, and many many more conditions disappearing after amalgam removal.

The Alaska paid advertisement goes on to say "Decisions about fillings, like all decisions about your dental health, should be made in your dentist's office within the bounds of the doctor/patient relationship." This may be somewhat difficult if the reader experiences what many of my patients tell me happens when they either inquire as to what material is being placed in their mouth or if they should request non-mercury fillings be placed in their mouths or that of their children. In many cases the dentist has gone into an absolute rage and stormed out of the office. In several other documented instances, the dentist, despite the request for non-mercury fillings, deliberately placed mercury amalgam fillings. What does that do for the doctor/patient trust and relationship????

If the dentists of Alaska, or any dentist, care about our health, as the advertisement claims, they would give serious consideration to the evidence that is mounting at an alarming rate proving mercury is detrimental to our health and well being. When the report appeared in a Swedish newspaper May of 1987 stating that the Swedish government health board declares amalgam toxic and unsuitable as a dental filling material it was quickly disregarded. Headlines in the ADA literature read "Amalgam ban reports are bogus." I think it is quite significant that public hearings occurred in Sweden toward the end of 1988 and the previous ruling was upheld and reinforced.

Fortunately, there are dentists who have seriously questioned the information being propagated by the establishment. They can no longer, with a clear conscience, continue placing a poison in unsuspecting patients who trust their dentist. Especially now that we have suitable alternatives which, according to pro-amalgam dentist Dr. George Freedman, may be stronger than amalgam. (*Dentistry Today, Feb. 1989*). These concerned dentists are attending meetings

to learn more about the materials they are using and how to properly remove unsuitable ones. There are two such meetings in the near future. The International Academy of Oral Medicine and Toxicology will hold its annual meeting September 15-17, 1989, in Detroit, Michigan. For information call 313 / 627-4934. Huggins Diagnostic Center will host an intensive five day course October 18-23, 1989, on Biocompatible Materials and treatment protocols. Call 1-800 / 331-2303.

Clinical observation seems to indicate that serum biocompatibility testing through Huggins Diagnostic Center is very valuable. Immunologic reactions to various dental materials are identified and quantified, providing guidance in determining the need for removal and replacement with appropriate materials. For information about this test call (1-800 / 331-2303). Some patients who have not had the benefit of this test have had to replace their dental materials a second or third time before finding compatible restorations.

An excellent reference text for the health professional and victim interested in learning more about mercury toxicity is Chronic Mercury Toxicity — New Hope Against an Endemic Disease. Doctor's Guide for Lifestyle Counseling by H.L. Queen (1988). For your copy call 1-800 / 2 HEART 2. The book describes the insidiousness of the problem and, more importantly, outlines protocols for proper use of intravenous vitamin C and other treatment modalities.

In subsequent issues of *Health Consciousness* I will discuss patient instructions for someone going through detoxification and helpful clinical pointers for both physicians and dentists.

I trust this article has caused some to have "second thoughts" about the safety of amalgam, and others to stand up and end what was referred to by Dr. Alfred Stock in 1926 as a "terrible sin against humanity."

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What does public think of amalgam?

By Daniel McCann

Chicago—Overall, American adults are basically divided when asked if they're concerned about dental amalgam, water fluoridation or the chance of contracting the AIDS virus from a dentist.

"Over 40 percent [of those polled] express individual concerns about all three issues," says the executive summary of the survey, "National Attitudes Toward Dental Issues," conducted last month by KRC/Communications Research.

The ADA-commissioned study, which has a margin of error of plus or minus 3 percent, involved telephone interviews of 1,083 adults (543 men and 540 women) across the country.

Taking as its focus three issues that have received wide media attention lately—amalgam, fluoridation and HIV infection control—the survey will serve as the foundation of an extensive ADA consumer education campaign.

"What the survey indicates," said Lorna Mitchell, director of the ADA's division of communications, "is that in an era of negative media publicity on each of these issues, we really need to be aggressive and proactive in trying to get our messages and our positions out there to the media and the public."

The prime sources of health care information for those questioned were: television, 26 percent; magazines, 21 percent; newspapers, 16 percent; physicians and dentists, 14 percent; family and friends, 12 percent; other, 7 percent; and the remaining 2 percent either couldn't cite a source or refused to answer.

Some of the more striking results of the survey were: 80 percent of those surveyed were aware that dentists should wear a mask, surgical gloves and protective eyewear while treating patients; 63 percent said they would say something to dentists if they were treating without gloves, masks and eyewear; 83 percent knew that a patient may have contracted AIDS from a dentist; 68 percent said that if a dentist had the AIDS virus, the dentist should inform the patient; and 83 percent said they would inform the dentist if they had the AIDS virus.

Other survey questions and responses included:

● Does the drinking water in your community contain fluoride?

Yes, 48 percent; no, 27 percent; and don't know, 25 percent.

● Do you want your drinking water to contain fluoride?

Yes, 52 percent; no, 28 percent; and don't know, 20 percent.

● Do you think people should have any concerns at all that they might develop health problems from fluoride in drinking water?

Yes, 45 percent; no, 40 percent; and don't know, 15 percent.

● Have you ever heard anything about people possibly developing health problems caused by silver fillings in their teeth?

Yes, 48 percent; no, 51 percent; and don't know, 1 percent.

● Do you think people should have any concerns at all that they might develop any health problems from silver fillings in their teeth?

Yes, 48 percent; no, 37 percent; and don't know, 15 percent.

● Have you had your fillings removed or have you ever considered such a procedure?

No, haven't considered it, 53 percent; no, because I have no fillings, 25 percent; yes, had them removed, 4 percent; yes, considered having them removed, 16 percent, and don't know, 2 percent.

● Are you aware that a dentist should wear a mask, surgical gloves and protective eyewear while treating patients?

Yes, I am aware, 80 percent, not aware, 19 percent; don't know, 1 percent.

● Have you read or heard anything about the possibility that a dental patient may have contracted the AIDS virus from a dentist?

Yes, I have, 83 percent; no, I haven't, 16 percent; and don't know, 1 percent.

● With regard to contracting the AIDS virus from a dentist, would you say that you are concerned that this is something that could happen to you?

Yes, I'm concerned, 43 percent; not very concerned, 52 percent; somewhere in between, 3 percent; and don't know, 2 percent.

● If a dentist had the AIDS virus and you were the patient, how important would it be to you that you were told about the dentist's condition?

Very important, 88 percent; somewhat important, 8 percent; not very important, 4 percent; don't know or refused to answer, 2 percent.

● If you had the AIDS virus, do you think you would tell your dentist?

Yes, I would, 83 percent; probably wouldn't, 8 percent; depends on the circumstances, 4 percent; don't know, 4 percent; and refused, 1 percent.

Survey respondents were drawn from a range of adult age groups: 18-29, 22 percent; 50-49, 24 percent; 30-39, 19 percent; 50-64, 19 percent; 65 and over, 16 percent; and 1 percent refused to state their age.

Paid Advertisement ADN + A.T. 1989

STRAIGHT TALK ABOUT DENTAL AMALGAM

The people of Alaska are too wise to buy the mercury poison scare some people are trying to sell.

But just for the record, we, the dentists of the Alaska Dental Society and our peers in the American Dental Association, want you, our patients, friends and neighbors, to hear the facts.

FACT: The fillings in your teeth are safe. For more than 100 years dentists have used, observed and tested amalgam filling materials, and we have found them to be both safe and effective. No other material has been so thoroughly tested, nor found to be as cost effective as dental amalgams.

FACT: The dental profession has complete confidence in the safety of dental amalgam. The members of the dental team, who work with amalgam everyday, are as healthy as their peers in the general population. And most of us have -- and would accept -- amalgam fillings in our own mouths. Over 100 million Americans have amalgam fillings.

FACT: Any dentist who encourages you to remove amalgam fillings in order to "remove toxic substances from the body" is guilty of a breach of ethics. In addition to the ADA, the United States Public Health Service, the National Institute of Dental Research and the Consumers Union have all investigated the allegations about amalgam -- and have found them to be baseless.

FACT: The Board of Dental Examiners of the State of Alaska "supports the position of the American Dental Association that 'there is no scientifically documented evidence of a cure or improvement of a specific disease due to the removal of (silver) amalgam restorations from a non-allergenic patient.'"

Decisions about fillings, like all decisions about your dental health, should be made in your dentist's office within the bounds of the doctor/patient relationship.

If you don't have a dentist and would like to speak to one, please feel free to call the Alaska Dental Society at 277-4675. Because we're the dentists of the Alaska Dental Society and we care about your health.

Paid Advertisement

Flammable Gases

Examples: Nitrous oxide and oxygen, liquified petroleum gas (LPG).

Hazards: Fire

DO:
- Test periodically for leaks.
- Avoid contact between compressed oxygen gas and lubricants or grease.
- Avoid having sparks or flames near flammable gases

Flammable Liquids

Examples: Solvents such as acetone and alcohol.

Hazards: Fire or explosion.

DO:
- Store flammable liquids in tightly covered containers.
- Provide adequate ventilation.
- Have fire extinguishers available at locations where these liquids are used.
- Avoid sparks or flames in areas where flammable liquids are used.

METALS

Beryllium

Examples: Beryllium dust and fumes arise from the melting, grinding and milling of some base-metal alloys.

Hazards: Contact dermatitis, corneal burns, inflammation and scarring of respiratory tissues.

DO:
- Wear gloves, eye protection and NIOSH-approved mask when casting, polishing or grinding these alloys.
- Provide adequate local exhaust ventilation for all operations in casting areas.
- Use power suction methods rather than air hoses to remove dust from clothing and to clean machinery.
- Dispose of wastes, storage materials or contaminated clothing in sealed bags.

Mercury

Examples: Bulk mercury; precapsulated alloy; scrap amalgam.

Hazards: Fine tremors, nausea, loss of appetite, diarrhea, depression, fatigue, increased irritability, allergic manifestations, contact dermatitis, pneumonitis, nephritis, headache, insomnia, dark pigmentation of marginal gingiva, loosening of teeth.

DO:
- Work in well-ventilated spaces.
- Avoid direct skin contact with mercury.
- Store mercury in unbreakable, tightly sealed containers away from any source of heat.

- Salvage amalgam scrap; store under photographic fixer solution in a closed container.
- Clean up spilled mercury using appropriate procedures and equipment; do not use a household vacuum cleaner.
- Place contaminated disposable materials in polyethylene bags and seal.

Nickel

Examples: Nickel-containing dental alloys, gold alloys, solders. Particles released during fabrication and grinding of nickel-containing alloys.

Hazards: Allergic manifestations Irritation to eyes and respiratory systems.

DO:
- Use protective eyewear and NIOSH-approved mask when grinding nickel-containing alloys.
- Use high-velocity evacuation systems.

Nitrous Oxide

Hazards: Based on laboratory animal studies, high exposure may cause adverse health effects.

DO:
- Steps should be taken to minimize the vapor concentration of nitrous oxide in the dental suite.
- Use a scavenging system.
- Check nitrous oxide machines, lines, hoses and masks for leakage.
- Maintain adequate ventilation.

Other Metals

Examples: Casting alloys and alloys for amalgam.

Hazards: Metal dusts and fumes may irritate eyes and respiratory systems. Contact dermatitis

DO:
- Wear protective eyewear and NIOSH-approved mask while grinding metal prostheses.

Organic Chemicals

Examples: Alcohols, ketones, esters, solvents, and, monomers such as methyl methacrylate and dimethacrylates. The halogen-containing organic liquids used in dental offices primarily include chloroform and carbon tetrachloride and some solvents and cleaners.

Hazards: Fire, allergic manifestations, contact dermatitis, irritation to mucous membranes, respiratory problems, central nervous system depression, headache, drowsiness, loss of consciousness, nausea, liver and kidney damage, possible mutagenesis.

DO:
- Avoid skin contact.
- Avoid excessive inhalation of vapors.
- Work in well-ventilated areas.
- Use forceps or gloves when handling contaminated gauze or brushes.

Hazards Communication Program

American Dental Association

Handle With Care - A Hazards Communication Program for Dentistry

Reprinted from ADA News, April 25 and September 19, 1988

OMNI MEDICAL CENTER

Robert Jay Rowen, M.D.
Diplomate, American Boards of Family Practice, Emergency Medicine, Chelation Therapy

"Biologic Alternatives to Drugs and Surgery"
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Sandra Denton, M.D.
Diplomate, American Boards of Emergency Medicine & Chelation Therapy

FAX

DATE: May 8, 1991
TO: Hess Committee
FAX NO.: 466-3810
FROM: Robert Rowen
RE: 30123

Total number of pages (including cover page): 14

If there is a problem or if you do not receive all pages, please call at (907) 344-7775, ext. 115 for Fay, or _____ ext. _____

OUR FAX NUMBER IS: (907) 522-3114

615 E. 82nd Street, Suite 300 • Anchorage, Alaska 99518
Members: American Academy of Advancement in Medicine, American Academy of Environmental Medicine, American Society of Bariatric Physicians

December 27, 1991

Dear H.E.S.S. Committee Member:

I am submitting this response to clarify some of the misinformation that was heard in testimony on Friday, November 22, 1991 on SB 123.

I will specifically respond to the Calgary Sheep Study on mercury from dental amalgams and to dietary mercury.

Sheep were selected as an animal model for the mercury amalgam vapor studies because:

1. they chew with their molars.

2. it has been acknowledged by the researchers that sheep may chew more than the average human but the purpose of this animal model was to demonstrate whether a phenomenom is valid under what may be exaggerated conditions such as bruxist (people grind/clench their teeth incessantly), habitual gum chewers, etc.

3. they were less expensive than primate studies (monkeys)

4. they are an excellent model to initiate the study

5. their availability for tissue biopsy and autopsy studies.

After the mercury amalgam contamination was discovered in the sheep model, experiments were then initiated in monkeys and humans.

INTRODUCTION TO THE SHEEP AND MONKEY STUDY

Please refer to the original 1989 **sheep** study "Dental silver tooth fillings: a source of mercury (Hg) exposure revealed by whole-body image scan and tissue analysis". Notice photograph on page 2643, figure 2.

Please refer to "Whole-body imaging of the distribution of mercury (Hg) released from dental fillings into **monkey** tissues." Turn to page 3258 figure 1.

Please note the simularities of research findings on the sheep study, page 2644,table 1 and page 3258 table 1 from the monkey study of mercury (Hg) contamination from amalgam fillings.

You will also see a copy of "Mercury from dental silver tooth fillings impairs sheep kidney function". Please note figure 1 on page R1011.

Both published sheep studies where critiqued as "flawed" on Friday, November 22 1991, testmony on S.B. 123.

The monkey study was never mentioned by the SB 123 antagonists because monkeys are excellent animals to study correlations with humans and, therefore, must be ignored by the opposition to improve their position.

Dietary Mercury as Compared to Dental Amalgam Mercury

As of May of 1991, there have been over 8 scientific studies actually measuring the amount of mercury vapor being released from amalgam dental fillings under various conditions. The most recent evaluation of ALL EXISTING DATA FROM AROUND THE WORLD is contained in the World Health Organization 1991 document titled *Environmental Health Criteria 118 - Inorganic Mercury*. The W.H.O. task group comprised of world-class toxicologists and scientists concluded that dental amalgams were the greatest source of mercury vapor exposure to humans. Dental amalgams are responsible in causing the daily intake and retention of mercury vapor.

Dental amalgam = 3.0 to 17.0 micrograms per day (mercury vapor)
Fish and seafood = 2.3 micrograms per day (methyl mercury)
Other foods = 0.3 micrograms per day (inorganic mercury)
Air and water = negligible traces

The committee also noted that, for mercury vapor, a specific no-observed-effect level (NOEL) could not be established, meaning that no level of exposure of mercury vapor can be considered harmless.

According to Craig's textbook on dental materials, the average amalgam contains 780 miligrams of mercury. So, if we accept the published research of the highest daily dose of mercury vapor, which is 27 micrograms per day, that would provide 9855 micrograms per year. 780 miligrams equates to 780,000 micrograms. If we divide 9855 into 780,000 we get 79.15. That means one amalgam dental filling could provide a human with 27 micrograms of noxious mercury vapor for 79 years!

Please review the enclosed article named "The Relationship between Mercury from Dental Amalgam and Mental Health" by Robert L. Siblerud M.S.. The mercury amalgam is the filling of choice at A.P.I.,our penal institutions, Public Health Service Dental Clinics, all Native Dental Clinics and Welfare Medicare Clinics.

These results were peer reviewed and published in prestigous scientific journals and are in marked contrast to *opinions* recently pronounced by the spokespeople for the dental profession and the American Dental Association.

I believe dentists have the responsibility to the dental consumer to make certain that they are aware of these facts. Our responsibility as health care professionals are to those that are most susceptible including women of conceptual age, pregnant women, nursing mothers, children, and those of compromised health.

We all have the **right to know** and the **right of freedom of choice** as American citizens and consumers.

I would, again, voice my support for SB 123.

Respectfully,

Burton A. Miller DDS

Burton A. Miller, D.D.S.

Encl: Dental "silver" tooth fillings:...
Whole-body imaging of the distribution....
Mercury from dental "silver" tooth....
The Relationship between Mercury....
Letter from University of So. Florida
Tape Cassette "The Quicksilver Smile"
Video Cassette "CBS News 60 Minutes "Is There Poison In Your Mouth" Airdate 12/16/90

SMILE
ALASKA

Burton A. Miller, DDS
Health Centered Dentistry

Office (907) 258-1390
Res. 338-5609

550 West Seventh Avenue, Suite 1390, Anchorage, Alaska 99501

SB 123 OPPOSED

November 27, 1991

Senator Arliss Sturgulewski
3111 C Street
Anchorage, Alaska 99503

Dear Senator Sturgulewski:

You are currently serving on a Senate committee that is reviewing SB 123, sponsored by Senator Pat Rodey. This bill states, "A licensee may not provide a dental filling without first obtaining written permission..."

I oppose this legislation for a number of reasons. First of all, targeting the dental profession, and specifically a filling material that has been used successfully for 150+ years is narrow minded. Every health care provider should inform his patients. Patients should be educated to question any and all treatment they receive.

The few dentists who are proponents of this legislation, I believe have faltering practices and see the amalgam controversy as a way to raise their productivity. These dentists test the levels of mercury in the amalgam fillings and charge for this service. Then, to counteract the supposed ill effects of the mercury, while removing the amalgam, they run an IV of Vitamin C which costs approximately $150.00 for each quadrant of the mouth that is done. These dentists advocate composite restorations, which do cost much more than amalgam fillings, because they take twice as long to place and the materials cost more. Composite restorations have a much higher instance of post-operative sensitivity, as the filling expands and contracts with temperatures at a different rate than the tooth. Composite restorations have improved greatly over the years, but the ADA states that removal of amalgams with a promise of curing physical ailments is unethical.

I hope that Alaska does not receive the distinction of being the first state to pass this far-reaching legislation through our Senate.

Sincerely,

Cheryl A. Ginn

Cheryl A. Ginn
3700 Carleton Avenue
Anchorage, Alaska 99517
(907)562-2512

4/65 3810

Alaska State Legislature

Please enter into the record my testimony to the HESS
committee name

committee on SB 123 , dated 5/17/91 .
bill/subject

I am sending current scientifically based article summaries concerning dental materials safety - specifically mercury amalgams.

Thank you

Signed: Patsy J. Hayes R.N.
Testifier

Representing (Optional)

3331 E Huffman Rd. Anchorage
Address

345-2772
Phone No.

restorations were reinserted, there was a 24% reduction in T-lymphocytes and when they were again replaced with nonmetal fillings there was an improvement of over 30% in T-lymphocytes. The author concludes, though this study is small, that dental amalgam and nickel alloys can adversely affect the quantity of T-lymphocytes. Both nickel and mercury are toxic agents. The author suggests further research is needed for the frequency and magnitude of T-lymphocyte reduction and their alterations by dental materials. 9799

"Effect of Dental Amalgam and Nickel Alloys on T-Lymphocytes: Preliminary Report", Eggleston, David W., DDS, The Journal of Prosthetic Dentistry, May 1984;51(5):617-623. (Address: Dr. David W. Eggleston, 1441 Avocado Ave., #508, Newport Beach, CA

This letter is a rebuttal to the work by Larsson and Sagulin (Lancet, Nov. 17, 1990:1251) downplaying the role of fetal mercury exposure from maternal mercury amalgams. From sheep and monkey studies blood and urine concentrations of mercury from dental amalgams are poor indicators of higher tissue mercury concentrations. Comparably higher levels of mercury from amalgams are absorbed in the lung, intestinal tract and jaw bone and with chronic low dose exposure of four to 20 weeks mercury from amalgams in sheep show high concentrations of this metal in the kidneys and liver. The authors note that the fetus may be more sensitive to mercury toxicity than the adult and therefore less exposure could still have a higher risk. Comparing acute mercury exposure to chronic low dose mercury from amalgams may be not be valid. Chronic low dose exposure from mercury vapor may be more efficiently absorbed than higher acute doses. Higher acute doses may not be transferred to the fetus as efficiently as low dose chronic exposure. These authors doubt that the fetal liver can render mercury unavailable for uptake by other organs. Fetal mercury stored in the fetal liver may be shunted to other tissues such as the kidney and the brain. The authors refer back to their primate studies showing that dental amalgams release more mercury vapor and more mercury is absorbed in other tissues than was previously thought. They state that experimental evidence suggests that dental "silver" mercury amalgams should not be put in pregnant females. 11248

"Mercury From Dental Amalgams", Lorscheider, F.L. and Vimy, M.J., The Lancet, December 22/29, 1990;1578-1579. (Address: F.L. Lorscheider, Departments of Medical Physiology and Medicine, Faculty of Medicine, University of Calgary, Calgary, Alberta Canada T2N 3N1)

Mercury and Brain Tissue

Examination of cadaver dentition and collection of brain tissue was done in a nonrandomized trial of sudden death subjects in routine autopsy procedures at the Los Angeles County Coroners Office. Control cadavers had zero to one occlusal surface of dental amalgams and a minimum of 14 posterior teeth while analyzed subjects had a minimum of five occlusal surfaces and a minimum of ten posterior teeth. Only occlusal surfaces were considered because of the effects of mastication on mercury release from dental amalgams. Their data showed a positive correlation between the number of occlusal surfaces of dental amalgams and mercury levels in the brain. Exposure of a seven month old fetus to mercury from a gravid cadaver containing 14 surfaces of dental amalgam of which nine were occlusal surfaces showed brain mercury content though to a lesser degree than the mother. The authors note that they do not know the toxic or teratogenic levels of mercury in human fetal brain tissue but recommend against the removal or insertion of dental amalgams from gravid patients or women of childbearing age with the possibility of pregnancy whenever possible. One trauma victim had

severely high levels of mercury in the brain and it was suggested that emergency room physicians might check blood levels of mercury in survivors of major trauma to the oral cavity with the presence of dental amalgams. Mercury was also found in the kidney and in the liver which indicates a general systemic contamination. 9970

"Correlation of Dental Amalgam With Mercury in Brain Tissue", Eggleston, David W., DDS and Nylander, Magnus, DDS, The Journal of Prosthetic Dentistry, December 1987;58(6):704-707. (Address: Dr. David W. Eggleston, 1441 Avocado Avenue, #508, Newport Beach, CA 92660, U.S.A.)

Mercury and Dental Personnel

Dental personnel with high urine mercury levels were compared with personnel in the same clinics with low urinary mercury levels. It was found that among professionals handling mercury amalgams urinary mercury was related more to the number of amalgam surfaces than the general environmental contact. Plasma selenium and erythrocyte glutathione peroxidase levels were unchanged by mercury levels. 6161

"Mercury, Selenium and Glutathione Peroxidase in Dental Personnel", Molin, Margareta, et al, Acta Odontol. Scand., 1989;47:383-389. (Address: Margareta Molin, Department of Prosthetic Dentistry, University of Umea, S-901 87, Umea, Sweden)

Mercury and Health

Mercury comprises over 50% of silver dental amalgams. Mercury vapor is released from fillings particularly after chewing, bruxism, hot and/or acidic food and tooth brushing. Mercury is a powerful biological poison and extremely toxic. It is more toxic than lead, cadmium and arsenic. The release of mercury from dental amalgams is probably the most significant cause of human exposure to inorganic mercury. Autopsy study shows positive correlation between the number of occlusal surfaces of dental amalgams and mercury levels in the brain and kidney cortex. Mercury amalgams have been shown to affect T-lymphocyte function. Upon their removal T-lymphocytes have improved in number and have decreased upon reinsertion. Multiple sclerosis patients have been found to have up to eight times higher levels of mercury in their CSF than neurologically healthy controls. Scrap dental amalgam was declared a hazardous waste in 1988 by the Environmental Protection Agency. Outside of your mouth it has to be: 1. Stored in unbreakable, tightly sealed containers away from heat. 2. It is not to be touched. 3. Stored under liquid glycerine or photographic fixer solution. So the paradox is once it is taken out of the mouth it is toxic and when it is placed in the teeth it is "nontoxic". Amalgam fillings have been tested for their strength but never for their safety. The American Dental Association has not produced studies showing their safety. Just because they have been used so prevalently over the years, does not mean they are safe. The author equates the same analogy for radiation being considered safe for so many years in the days of shoe fluoroscopy. Dentists have the highest rates of suicide and divorce among professionals. At the University of North Texas, Gerald Butler, Ph.D., found neuropsychological dysfunction in 90% of dentists tested. Female dental personnel have higher rates of spontaneous abortion, raised incidence of premature labor and elevated perinatal mortality. Elemental mercury does cross the placenta. A Polish study of 81 females, 45 dentists and 36 dental assistants found that hair mercury levels were much greater than in 34 nonexposed controls. There was a positive correlation between

total mercury levels and reproductive failures as with the prevalence of menstrual cycle disorders. There was a high incidence of spina bifida births in his study (5 out of 117 pregnancies). Folic acid deficiency has been associated with spina bifida and mercury is a known inhibitor of folate metabolism in the body. Dentists have one of the highest utilization rates of medical insurance according to the industry. Since chronic mercury exposure is subtle rarely do dentists and dental personnel get assessed for mercury for their medical complaints. Unfortunately, low level mercury excess is difficult to diagnosis. Urinary mercury levels can be low in chronic exposure. Blood levels are not helpful since mercury remains in the blood for only minutes. Mercury is usually deposited in soft tissue such as the brain, adrenals, thyroid and other organs. There has been a documented increased mercury uptake in the pituitary gland of dentists. Over 100 million people have mercury fillings in their mouth. Public hearings regarding the toxicity of amalgam fillings by the Swedish Governmental Health Board were upheld stating that amalgams are toxic and are unsuitable for use in dental fillings. 8799

"The Mercury Cover-Up: Controversies in Dentistry", Denton, Sandra, M.D., Townsend Letter For Doctors, July 1990;488-491. (Address: Sandra Denton, M.D., 615 E. 82nd Street, #300 Anchorage, AK 99518, U.S.A.)

Mercury, Selenium and Glutathione Peroxidase

Ten healthy individuals' amalgam fillings were replaced by gold inlays. Ten evaluations in a 16 month period, four months before and 12 months after amalgam removal showed a strong statistically significant correlation between plasma mercury values and the total number of amalgam surfaces, and the total surface area of fillings. In the immediate post removal phase plasma mercury rose three to four fold whereas urinary and erythrocyte mercury rose 50%. These values declined to preremoval levels at about one month. Twelve months after removal of the amalgams plasma and urinary mercury levels were significantly reduced to 50% and 25% respectively from the initial values in the experimental group. There was no significant change in selenium status except at five and ten days after removal. These results show that mercury from amalgam fillings can contribute significantly to mercury concentrations in the plasma and urine. No biological effects from this mercury were noted. 10623

"Mercury, Selenium, and Glutathione Peroxidase Before and After Amalgam Removal in Man", Molin, Margareta, ACTA Odontol. Scand., 1990;48:189-202. (Address: Margareta Molin, Department of Prosthetic Dentistry, University of Umea, S-901 87, Umea, Sweden)

Eight healthy individuals who had no amalgam restorations developed serious caries and amalgams were put in place. The mean number of restored surfaces were 16.1 and the mean amount of mercury inserted was 2.9 gm. There was no change in plasma mercury one and three months after placement. Urinary mercury after placement increased continuously compared to the mean preplacement value. No correlations were found between plasma and urinary mercury concentrations and the number of amalgam fillings. Selenium and erythrocyte glutathione peroxidase levels did not change. These results show that mercury amalgams are an important source of exposure from inorganic mercury resulting in elevated urinary levels without affecting selenium status in man. 10622

"The Influence of Dental Amalgam Placement on Mercury, Selenium and

Glutathione Peroxidase in Man", Molin, Margareta, et al, ACTA Odontol. Scand., 1990;48:287-295. (Address: Margareta Molin, Department of Prosthetic Dentistry, University of Umea, S-901 87 Umea Sweden)

Mercury Tissue Concentrations

Mercury vapor is released from amalgams after chewing and even with brushing of the teeth. There is a positive correlation between the amount of mercury vapor in the mouth and the number of amalgam surfaces. Mercury has been demonstrated in sheep models, using radioactive isotopes, to be deposited in organs and other tissues within 29 days. Areas of uptake include the lung, gastrointestinal tract and jaw tissue. The mercury from the amalgams localizes in the kidneys and liver. Amalgams remain in human teeth on the average eight to ten years. The author discusses these findings and concludes that mercury amalgams are a major source of chronic mercury exposure. Since in North America 100,000 kgs are used each year in dentistry the health effects need to further be studied. It has been estimated that 5.4% of the population of North America has a contact hypersensitivity to mercury. 10810

"A Source of Mercury Exposure Revealed by Whole-Body Image Scan and Tissue Analysis", Lorscheidar, Fritz L., Townsend Letter For Doctors, December 1990;840-841. (Address: Fritz L. Lorscheider, Department of Medical Physiology, Faculty of Medicine, Health Sciences Center, University of Calgary, 3300 Hospital Dr. N.W. Calgary, Alberta T2N 4N1, Canada)

Mercury Vapor

This is an in vitro study of the rate of mercury vapor release from different types of amalgam fillings. Polished, oxidized and corroded amalgams were evaluated. There were differences in vapor released between polished amalgams stored in air and amalgams coated in artificial saliva. Single composition type amalgams release more mercury than conventional or disbursed ones. Increased temperatures raised and water lowered vapor rates. Amalgam surfaces brushed with toothpaste resulted in an instant increase of mercury vapor. 6518

"Mercury Vapor From Dental Amalgams, an In Vitro Study", Derand, Tore, Swedish Dentistry Journal, 1989;13:169-175. (Address: Tore Berand, Institutionen For Odontologisk Teknologi, Tandlakarhogskolin, S-214 21 Malmo, Sweden)

Placental Transfer of Mercury

These authors refute the idea that placental transfer of mercury amalgam to the fetus is a health problem and do not recommend the restriction of amalgam placement in pregnant patients or work limitations for dental staff who have good hygiene. They report that the fetal exposure to mercury does not exceed that of the mother. The daily uptake of mercury from amalgams is low at 2-5 ug, as is occupational exposure. 10864

"Placental Transfer of Mercury From Amalgam", Larsson, K.S. and Sagulin, G.B., The Lancet, November 17, 1990;336:1251. (Address: K.S. Larsson/G. B. Sagulin, Department of Odontological Toxicology, Karolinska Institute, S-141 04 Huddinge, Sweden)

Primate Organs and Mercury Concentrations

In this primate study three subjects received occlusal amalgam fillings, three bone implants of amalgam and three untreated monkeys served as controls. After one year they were sacrificed and

evaluated for organdeposition of mercury. Amalgam fillings were associated with mercury deposition in the spinal ganglia, anterior pituitary, adrenal medulla, liver, kidney, lungs, and intestinal lymph glands. In the animals that had the silver amalgam bone implants the mercury was found in the same organs except for the liver, lungs and intestinal lymph glands. The three control animals were devoid of mercury. These results strongly support that dental fillings in primates result in absorbed mercury. The absorption of mercury probably occurs through the lungs and intestinal tract, and depending on the degree of exposure, is distributed to most organs and will eventually be found in the nervous system. The silver release from the amalgams was not absorbed. 9395

"Traces of Mercury in Organs From Primates With Amalgam Fillings", Danscher, Gorm, et al, Experimental and Molecular Pathology, 1990;52:291-299. (Address: Gorm Danscher, Department of Neurobiology, Institute of Anatomy, University of Aarhus, Royal Dental College, Aarhus, Denmark)

Swedish Ban and Assessment

It was reported in the Swedish Newspaper Dagens Nyheter, October 6, 1989 by the director of chemical inspection that mercury amalgam will be banned in Sweden by 1991. Recently in Tuscon, Arizona seven dentists' offices were closed by the EPA due to mercury in the sewage treatment plant whose primary source came from the drains of these dentists' offices. The EPA documented by a standard two molar acid technique that mercury in the dentists' suction pumps was being released. It is interesting to note that teeth covered with plaque have a significant amount of acid production and this is a possible explanation of why old amalgams have lost 25% to 50% of their mercury. In Berlin 13% of mercury discharged at sewer treatment plants comes from dental clinics. In Japan several dental schools have had problems complying with their EPA standards for mercury disposal and have stopped using mercury fillings. A recent report by Dr. Mats Hanson, PhD in neurobiology and specialist in mercurial poisoning sheds new information on body-burden mercury assessment. He translated a German article by M. Daunderer, M.D. for the diagnosis and treatment of mercurial poisoning which utilizes Dimaval (DMPS). This is a chelator which has been used in the USSR since 1957 and West Germany for heavy metal poisoning. A urine sample is taken before treatment followed by an IV injection of IV DMPS 3 mg/kg body weight and after 30 minutes another urine sample is taken. Less than 4 mcg/L of mercury are seen in the urine normally. If urinary mercury increases to more than 50 mcg/L this is definite proof of accumulation of mercury in organs and the brain. He has found values up to 2565 mcg/L in the urine and the build-up is related to the number of mercury/silver fillings. Neurologic problems can occur in values greater than 50 mcg/L. This drug is not currently available in the U.S.. 6915

"Sweden Bans Amalgam After 1991", Kennedy, David, D.D.S., Health Consciousness, February 1990;49-54/Mobilization Tests For Environmental Metal Poisoning, Daunderer, M., M.D., Forum Des Praktischen Und Allgemedn-Aarztes, 1989;28(3):88. (Address: David C. Kennedy, D.D.S., 2425 3rd Avenue, San Diego, CA 92101, U.S.A.)

T-Lymphocytes

This was a review of 3 patients between the ages of 20 and 35 who had T-lymphocyte studies done before and after amalgam removal. In all 3 cases there was a significant increase in the number of T-lymphocytes ranging from 18% to 55%. In one case, when the amalgam

Cynthia Clinkscales
P.O. Box 1043
Homer, AK 99603

April 23, 1991

Senator Paul Fischer
Alaska State Legislature
P.O. Box V (MS 3100)
Juneau, AK 99811

Re: Senate Bill 123
Informed consent for the use of mercury in dental fillings

Dear Senator Fischer:

Well, a lot has happened since last year and the campaign to pass S.R. 12 (legislation similar to S.B. 123). A recent "60 Minutes" segment on the dangers of mercury/silver fillings generated the greatest response received by the program to date. The scientific data and research are now in. Mercury does migrate from the teeth and it does deposit in the brain, liver, kidneys and other organs.

Did you know that autopsy studies correlate the amount of mercury in internal organs to the number of mercury amalgams in the mouth? Mercury can also pass the placental barrier and is introduced to the baby through mother's milk. Dentists and dental personnel in Sweden were found to have twice the incidence of brain tumors as non-dental personnel.

It is undeniable that citizens should have the right to choose the type of dental materials to be used in their mouths. However, suppose people are unaware that they have a choice or that there is any need to make a choice? This situation is the equivalent of being denied that right of choice.

Even many dentists are largely unaware of the amount of research and evidence which has been gathered. This research concludes that mercury is not as safe as claimed by the American Dental Association (ADA). David Kennedy, D.D.S. recently stated in a magazine article that "To this day, few of the facts reviewed in this presentation are common knowledge among dentists. New graduates are equally unfamiliar with the problems I have discussed". (Health Consciousness, April 1991)

When those in a position of power refuse to take a realistic view of a problem, and those who deal with the issue on a daily basis (practicing dentists) are unaware of the dangers or the results of legitimate research, what happens to the patient? Does anyone care about the patient? This is why citizens and health practitioners are asking

for this legislation. Those of us who know about the mercury problem are suggesting that the majority of the population which doesn't know should be informed. Once informed, they have been given the right of choice. Is that too much to ask?

Sincerely,

Cynthia Christensen

Enclosure: Letter dated Feb. 20, 1990

cc: Representative Mike Navarre

Representative Gail Phillips

Senator Arlis Sturgulewski, Chair, HESS Committee

HESS Committee: Senators Sam Cotten, Lyman Hoffman, Curt Menard

Senator Patrick Rodey

Governor Walter Hickel
P.O. Box A
Juneau, AK 99811

Bob Stephenson
DAMS (Dental Amalgam Mercury Syndrome of Alaska)
1837 No Way Lane
Fairbanks, AK 99709

Jim Roderick
Cook Inlet Vigil
P.O. Box 916
Homer, AK 99603

Cynthia Clinkscales
P.O. Box 1043
Homer, AK 99603

February 20, 1990

Senator Paul Fischer
Chairman, Senate HESS Committee
P.O. Box V
Juneau, AK 99811

Re: Senate Resolution 12
Informed consent regarding the use of mercury in dental fillings

Dear Senator Fischer:

I participated in the teleconference on February 12 before the Senate HESS Committee regarding Senate Resolution 12. I must express my extreme disappointment in the committee's decision not to pass S.R. 12 as written. I hope that through your efforts, or the efforts of others, S.R. 12 will be supported and passed in its original form.

Dental patients have the right to know that a significant amount of mercury (about 50%) is being used in "silver" fillings. Even the American Dental Association agrees that mercury does not remain completely inert in the tooth. But they claim that this is only a problem for a small percentage of people who have an "allergy" to mercury.

I believe this ADA position is ludicrous because 1) the percentage of people sensitive to mercury has been shown to be significantly higher than the percentages claimed, and 2) <u>one does not have to be allergic to a poison to be harmed by it</u>. I'm not allergic to arsenic, so does that mean I can safely have arsenic implanted in my teeth and let it slowly leach out into my body? Of course not. But this is what is happening with the mercury filling.

People who have suffered with mercury toxiciy from dental fillings, and the health professionals who help them, find it exasperating and distressing that unwarranted opposition continues to even just informing a patient about mercury in amalgams. And now that alternative materials are available, patients have every right to know about the potential hazards of mercury, so that an informed choice can be made.

It is imperative that the government take action now on this problem because the profession appears to be unwilling or unable to deal with it. It is often difficult for human beings to admit mistakes. Even an honest mistake can progress from a molehill to a mountain until it is almost too late to make any changes.

But the time for change is now. The situation humankind has gotten itself into with mercury in fillings boggles the mind. It is so mind-boggling that it is easier for some people to deny that a problem exists than to try to solve it.

I hope that you will have the courage to take one small step toward solving this problem by supporting S.R. 12. Very few people are aware that so-called "silver" fillings actually contain more mercury than silver. Otherwise, the public outcry would be much greater.

Sincerely,

Cynthia Clinton

cc: Senate HESS Committee: Jim Duncan, Tim Kelly, Al Adams, Lloyd Jones

Rep. Johnny Ellis
Chairman, House HESS Committee

Governor Steve Cowper
P.O. Box A
Juneau, AK 99811

Myra Munson
Commissioner, Dept. of Health & Social Services
P.O. Box H
Juneau, AK 99811-0601

Rep. Mike Navarre

Rep. C.E. Swackhammer

Robert Stephenson
DAMS (Dental Amalgam Mercury Syndrome) of Alaska
1837 No Way Lane
Fairbanks, AK 99709

STATE OF ALASKA

LEGISLATIVE AFFAIRS AGENCY

DIVISION OF PUBLIC SERVICES

DATE: November 22, 1991

Please accept the enclosed original(s) of written testimony for the Ft. Health, Education & Social Svcs teleconference hearing that was scheduled on November 22, 1991.

A copy of this testimony was transmitted to your committee via fax on November 22, 1991.

Thank you,

Christi Shedde
Info Assistant
Fbks. AK.

Alaska State Legislature

Please enter into the record my testimony to the Senate Hess
committee name

committee on S.B. 123 , dated November 22, 1991.
bill/subject

I strongly support the passage of SB 123 and think such a measure is long overdue. It is abundantly clear that certain dental materials, notably mercury, pose serious health risks, at least to some people. It has been scientifically established that mercury amalgam fillings, for example, are the primary source of exposure to mercury for the general population. Most recently, the World Health Organization has published this conclusion based on research done by world recognized experts in the toxicology.

In recent years organized dentistry has displayed a tremendous resistance to meeting what should be a professional and fiduciary duty to their patients to advise them of treatment options and potential risks. This is not something that should be left to chance, and should have been done all along. It is not right to leave this matter solely to the dentists choice, since dentists differ in their willingness and ability to provide accurate information to patients, and their trade union, the NEA, has taken a stand against that.

Dental patients should be accorded the same "right to know" as people using prescribed or OTC drugs, or handling hazardous substances in other situations. Dentistry is the only profession that routinely implants foreign substances in the human body, and it is now clear many of these substances are by no means, benign. Please take action in the interests of the public, and one that will help move the dental profession into an era of enlightment.

Thank you.

Signed: _____
Testifier Bob Stephenson

Self
Representing (Optional)

1837 Ho Way Lane, Fairbanks, AK. 99709
Address

907-455-6401 (H) 456-5156 (wk)
Phone No.

9/88 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the Senate/House Health, Ed, SS
committee name

committee on SB 123 , dated 11/22/91 .
bill/subject

I support adoption of SB 123 and ask that your committee recommend it's passage by the full legislature. I have read a great many of the published, refereed scientific papers on the deleterious effects of mercury from amalgam fillings. Unfortunately, the general public is largely unaware of these effects, consequently a special effort should be made to insure that the public is made aware of potential health problems arising from dental filling materials, especially amalgam fillings. The facts are (1) amalgam fillings release mercury vapor, (2) this mercury is absorbed by the body, especially in critical organs like endocrine glands and the kidney and (3) this mercury (in small amounts) accumulates and disrupts or damages normal functioning of these tissues.

Signed: HERBERT R. MELCHIOR
Testifier

SELF
Representing (Optional)

2721 HORSETAIL TRAIL
Address FAIRBANKS, AK 99709

455-6615
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the Pupil-Teacher RATIO
committee name

committee on _____ bill/subject . dated 11/20/91 .

KEEP or Do WHAT EVER NESS & GARY ~~LEGISLATE~~
~~TEACH~~ To LIMIT 25 pupils to each
TEACHER, NO MORE.

Signed: Hugh Keogan
Testifier

Representing (Optional)
359 STATE ST. JUN 99701

Address
465 1869

Phone No.

Alaska State Legislature

P.O. BOX V
ROOM 427
STATE CAPITOL
JUNEAU, ALASKA 99811
(907) 465-3762

Senate Committee on
Health, Education and Social Services

March 3, 1992

Dr. Robert Warren
625 E. 34th Avenue
Anchorage, Alaska 99503

Dear Dr. Warren:

I wanted to let you know that SB 123 "An Act requiring a dentist to obtain informed consent for dental fillings" is currently in the Senate Health, Education, and Social Services Committee of which I am chairman. With the consent of the sponsor, SB 123 will not move out of this committee during this legislature and that means the legislation is dead--at least for this time around.

I appreciate your interest in SB 123. Again, I am sorry about the video tape loss.

Sincerely yours,

Arliss

Senator Arliss Sturgulewski, Chairman
Senate Health, Education and Social Services Committee

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: TORIE HEART
TITLE:
ADDRESS: 3214 MURIEL PLACE
CITY: ANC ZIP: 99517
PHONE: 272-3416
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: VOTE IN SUPPORT OF SB 123. /LD

POMID: 03120010
DATE: 91/05/15
TIME: 12:00:10
LIONAME: ANCHORAGE LIO

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ULMER	ZAWACKI	

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: BRIAN HALL
TITLE:
ADDRESS: 3805 IOWA, #2
CITY: ANCHORAGE ZIP: 99517
PHONE: 248-7916
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: PLEASE SUPPORT SB 123. I THINK THIS IS A GOOD FIRST STEP. I BELIEVE THE AMALGAM SHOULD BE BANNED ALTOGETHER. THERE ARE OTHER FILLINGS THAT CAN BE USED WITHOUT EXPOSING PEOPLE TO HAZARDOUS MATERIALS. /BN

POMID: 03134611
DATE: 91/05/15
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GRUSSENDORF	HANLEY	HALFORD
HUDSON	IVAN	HOFFMAN
JACKO	KOPONEN	JONES
KUBINA	LARSON	KERTTULA
LEMAN	LINCOLN	MENARD
MACKIE	MACLEAN	PEARCE
MARTIN	M.A.MILLER	POURCHOT
M.W.MILLER	MOYER	RODEY
NAVARRE	PARNELL	SHULTZ
G.PHILLIPS	R.PHILLIPS	UEHLING
SHARP	TAYLOR	ZHAROFF
ULMER	ZAWACKI	

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: ERIKA MAHANEY
TITLE:
ADDRESS: 608 N. PINE
CITY: ANCHORAGE ZIP: 99508
PHONE: 274-9492
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I STRONGLY SUPPORT SB 123 AND PLEASE MOVE OUT OF COMMITTEE. I WOULD LIKE TO HAVE YOUR COMMENTS REGARDING SB 123. /BN

POMID: 03142544
DATE: 91/05/10
TIME: 14:25:44
LIONAME: ANCHORAGE LIO

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B.DAVIS	HOFFMAN
C.DAVIS	MENARD
HANLEY	
M.A.MILLER	
GONZALES	

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: CATHY WOOD
TITLE:
ADDRESS: 3902 IOWA
CITY: ANC ZIP: 99517
PHONE: 243-6660
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I SUPPORT SB 123. /LD

POMID: 03131855
DATE: 91/04/30
TIME: 13:18:55
LIONAME: ANCHORAGE LIO

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SHARP	TAYLOR	ZHAROFF
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PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: JOY ANDERSON
TITLE:
ADDRESS: 6242 W. DIMOND BLVD.
CITY: ANC ZIP: 99502
PHONE: 243-5474
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I SUPPORT THIS BILL. AND I FEEL IT'S OUR RIGHT TO KNOW. /LD

POMID: 03085652
DATE: 91/05/03
TIME: 08:56:52
LIONAGE: ANCHORAGE LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: GLENDA BRUNDIDGE
TITLE:
ADDRESS: 505 FISCHER,#1
CITY: ANCHORAGE ZIP: 99518
PHONE: 562-2269
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I WOULD LIKE TO SEE THIS LEGISLATION GO FORWARD BECAUSE THE MERCURY TOXICITY HAS BEEN PROVEN TO BE A DANGER TO OUR HEALTH. /CME

POMID: 03090015
DATE: 91/05/03
TIME: 09:00:15
LIONAME: ANCHORAGE LIO

COPIES: SENATOR

RODEY

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: HILDA MELCHIOR
TITLE:
ADDRESS: 2721 HORSETAIL TRAIL
CITY: FAIRBANKS ZIP: 99709
PHONE: 455-6615
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: PLEASE SUPPORT SB 123 INFORMED CONSENT BILL. PEOPLE SHOULD HAVE KNOWLEDGE OF, AND A CHOICE OF WHAT IS PUT INTO THEIR BODIES. THANK YOU.
EOM/CLS

POMID: 07085906
DATE: 91/05/03
TIME: 08:59:06
LIONAME: FAIRBANKS LIO

COPIES:

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KOPONEN	FRANK
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MOYER	FISCHER
SHARP	COTTEN
	HOFFMAN
	MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: HOMER DOTY
TITLE:
ADDRESS: PO BOX 75207
CITY: FAIRBANKS ZIP: 99707
PHONE: 451-2241
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: PLEASE PASS THIS BILL AND MAKE THE DOCTORS AND DENTISTS AND MEDICAL PEOPLE TELL YOU WHAT THEY ARE GOING TO DO TO YOU BEFORE THEY DO IT. EOM/MJO

POMID: 07090412
DATE: 91/05/03
TIME: 09:04:12
LIONAME: FAIRBANKS LIO

COPIES: SENATORS

FAHRENKAMP
FRANK
SHULTZ
FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: ROSALEE RUSSELL
TITLE:
ADDRESS: P.O.BOX 141892
CITY: ANCHORAGE ZIP: 99514
PHONE: 248-7533
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I AM IN SUPPORT OF MANDATING THAT DENTISTS INFORMED THEIR PATIENTS EXACTLY WHAT MATERIALS WILL BE PLACED IN THEIR MOUTHS AND THE POTENTIAL COMPLICATIONS AND WHAT ALTERNATIVES ARE AVAILABLE. /CMR

POMID: 03091253
DATE: 91/05/03
TIME: 09:12:53
LIONAME: ANCHORAGE LIO

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NAVARRE	PARNELL	SHULTZ
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PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: SHAUN GROSE
TITLE:
ADDRESS: 637 CLOUD ROAD
CITY: NORTH POLE ZIP: 99705
PHONE: 488-8956
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: BECAUSE OF THE AMOUNT OF TRUST THAT WE PUT IN OUR DENTISTS, IT IS IMPORTANT THAT WE HAVE THE OPPPORTUNITY OF INFORMED CONSENT IN DENTAL MATERIALS. THANK YOU. EOM/CLS

POMID: 07094553
DATE: 91/05/03
TIME: 09:45:53
LIONAME: FAIRBANKS LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: KENT MONROE
TITLE:
ADDRESS: 1977 WESTON DRIVE
CITY: FAIRBANKS ZIP: 99709
PHONE: 474-4692
BILL NO:
SUBJECT:
MESSAGE: I SUPPORT SB 123. I THINK DENTAL PATIENTS SHOULD BE MADE A AWARE OF POTENTIAL HAZARDS ASSOCIATED WITH AMALGAM FILLINGS AND INFORMED OF THE AVAILABLE OPTIONS SO THAT THEY CAN MAKE AN INFORMED CHOICE. EOM/MJO

POMID: 07102110
DATE: 91/05/03
TIME: 10:21:10
LIONAME: FAIRBANKS LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: HERBERT R. MELCHIOR
TITLE:
ADDRESS: 2721 HORSETAIL TRAIL
CITY: FAIRBANKS ZIP: 99709
PHONE: 455-6615
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: PLEASE SUPPORT AND VOTE FOR SB 123. RECENT RESEARCH SHOWS SOME DENTAL MATERIALS ARE OR MAY BE HAZARDOUS TO HUMAN HEALTH. DENTAL PATIENTS SHOULD BE TOLD ABOUT POSSIBLE PROBLEMS AND GIVEN A CHOICE. DENTISTS CAN RECEIVE SOME POSSIBLE PROTECTION FROM LEGAL ACTION IF PATIENTS SIGN CONSENT FOR MATTERS USED. THANK YOU. EOM/CLS

POMID: 07143027
DATE: 91/05/03
TIME: 14:30:27
LIONAME: FAIRBANKS LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: MARY BOYD
TITLE:
ADDRESS: PO BOX 72666
CITY: FAIRBANKS ZIP: 99707
PHONE: 455-6265
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I SUPPORT THIS BILL. I WOULD LIKE INFORMED CONSENT ON WHAT HAPPENS IN MY MOUTH. DOCTORS AND PHARMACISTS ARE REQUIRED TO INFORM US OF THE DOWN SIDES OF THE THINGS THEY PRESCRIBE AND I THINK DENTISTS SHOULD TOO. I AM ONE OF THOSE PEOPLE THAT WAS POISONED BY MERCURY AMALGAM FILLINGS. I'M HAPPY NOW.
EOM/MJO

POMID: 07153236
DATE: 91/05/03
TIME: 15:32:36
LIONAME: FAIRBANKS LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: MARY COUTTS
TITLE:
ADDRESS: POB 45
CITY: ESTER ZIP: 99725
PHONE: 479-3645
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I REALLY AM IN SUPPORT OF YOUR PASSING THIS BILL. ITS A GOOD IDEA T
GIVE PEOPLE ALL THE INFORMATION POSSIBLE BEFORE THEY MAKE A DECISION. EOM/MW

POMID: 07165422
DATE: 91/05/03
TIME: 16:54:22
LIONAME: FAIRBANKS LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: DALTRICE D. BOEHMER
TITLE:
ADDRESS: 5911 DENALI ST,BLD A,APT 1
CITY: ANC ZIP: 99518
PHONE: 563-5782
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: THIS IS A VOICE OF SUPPORT FOR SB 123 . I'M HOPING THAT EACH OF YOU WILL CAREFULLY CONSIDER HOW IMPORTANT IT IS THAT EACH PERSON HAS THIS INFORMATION./ LW

POMID: 03113954
DATE: 91/05/06
TIME: 11:39:54
LIONAME: ANCHORAGE LIO

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PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: JOYCE KARCZMARCZYK
TITLE:
ADDRESS: P.O. BOX 752
CITY: DELTA JCT. ZIP: 99737
PHONE: 895-4340
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: IT IS IMPORTANT THAT WE BE INFORMED OF THE POSSIBLE EFFECTS MERCURY AMALGAM MAY HAVE ON US AND BE AWARE WE HAVE ALTERNATIVES TO AMALGAM. THEN WE CAN DECIDE FOR OURSELVES WHAT WE WANT TO USE.

POMID: 02105702
DATE: 91/05/09
TIME: 10:57:02
LIONAME: DELTA JUNCTION LIO

COPIES: SENATORS

SHULTZ
FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: CARMEN CARPENTER
TITLE:
ADDRESS: P.O. BOX 765
CITY: DELTA JCT. ZIP: 99737
PHONE: 895-4071
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: WE HAVE THE RIGHT TO BE INFORMED AND THE RIGHT TO DECIDE.

POMID: 02112542
DATE: 91/05/09
TIME: 11:25:42
LIONAME: DELTA JUNCTION LIO

COPIES: SENATORS

SHULTZ
FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: DR. CHARLES CONNELL
TITLE:
ADDRESS: 2702 GAMBELL ST.
CITY: ANC ZIP: 99503
PHONE: 279-7491
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I SUPPORT SEN. RODEY'S LEGISTATION ON CONSENT FOR DENTAL MATERIALS. HOWEVER, AFTER WORKING WITH PATIENTS INJURED BY DENTAL MATERIALS FOR THE PAST TWO AND A HALF YEARS, I DO NOT FEEL THAT IT GOES FAR ENOUGH. I THINK THAT THE SILVE R AMALGAM SHOULD BE LEGISLATED OUT OF EXISTENCE IN THIS STATE. I REALIZE THAT THIS MAY SEEM TO BE AN EXTREME VIEW, BUT THE CLINICAL EXPERIENCE OF THE PAST TWO AND A HALF YEARS HAS CAUSED RESULTS THAT CAUSE ME TO BE TERRIFIED./ L

POMID: 03140255
DATE: 91/04/15
TIME: 14:02:55
LIONAME: ANCHORAGE LIO

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PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: HEIDE GARRETT
TITLE:
ADDRESS: P.O.BOX 190988
CITY: ANCHORAGE ZIP: 99519
PHONE: 345-7205
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I SUPPORT SB 123. /BN

POMID: 03140417
DATE: 91/04/15
TIME: 14:04:17
LIONAME: ANCHORAGE LIO

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PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: RAND T. WALLS
TITLE:
ADDRESS: 8720 BLACKBERRY
CITY: ANCHORAGE ZIP: 99502
PHONE: 248-4047
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: AS A CONCERNED REGISTERED VOTER IN ALASKA, WE MUST INFORM THE PUBLIC OF ALL TOXIC SUBSTANCES IN THEIR LIVES. IN POINT, WHEN DENTIST PUT MERCURY IN THE MOUTHS OF OUR CHILDREN AND SODIUM FLORIDE IN THE WATER WE DRINK. I MUST VOICE MY CONCERNS FOR THE SAFETY OF OUR CHILDRENS FUTURE. /BN

POMID: 03120409
DATE: 91/04/15
TIME: 12:04:09
LIONAME: ANCHORAGE LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: ANN ANDERSON
TITLE:
ADDRESS: 2831 BENNETT AVENUE
CITY: ANCHORAGE ZIP: 99517
PHONE: 267-2342
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: VOTE YES ON SB 123. REMOVE FLUORIDE FROM ANCHORAGE WATER. /JSM

POMID: 03111142
DATE: 91/04/15
TIME: 11:11:42
LIONAME: ANCHORAGE LIO

COPIES:

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LEMAN	PEARCE
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GRUENBERG	FISCHER
	COTTEN
	HOFFMAN
	MENARD

PUBLIC OPINION MESSAGE

BEAR: SENATOR STURGULEWSKI

NAME: ANITA HIGGINS
TITLE:
ADDRESS: 148 MICHAEL COURT
CITY: ANCHORAGE ZIP: 99504
PHONE: 338-0148
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I AM FOR SB 123. /JSM

POMID: 03113332
DATE: 91/04/15
TIME: 11:33:32
LIONAME: ANCHORAGE LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: WILLIAM SCHUITT
TITLE:
ADDRESS: 1510 CENTERVALE DRIVE
CITY: EAGLE RIVER ZIP: 99577
PHONE: 696-3383
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I AM IN SUPPORT OF SB 123. /JSM

(NOTE: THIS GENTLEMAN WAS ON A VOICE BOX AND WAS DIFFICULT TO UNDERSTAND. I AM NOT SURE THAT THE ADDRESS IS CORRECT - HOWEVER, THE PHONE NUMBER IS CONFIRMED SHOULD YOU NEED TO CONTACT HIM.)

POMID: 03100536
DATE: 91/04/15
TIME: 10:05:36
LIONAME: ANCHORAGE LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: PATSY HAYES
TITLE:
ADDRESS: 3331 E. HUFFMAN ROAD
CITY: ANCHORAGE ZIP: 99516
PHONE: 345-2772
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I SUPPORT SB 123. I BELIEVE DENTIST SHOULD ADVISE THEIR PATIENTS WHEN USING A TOXIC SUBSTANCE FOR FILLING MATERIAL AND ALSO INFORM THE PATIENT CONCERNING THE POTENTIAL COMPLICATIONS OF MERCURY AMALGAMS IN TEETH. /BN

POMID: 03142145
DATE: 91/04/18
TIME: 14:21:45
LIONAME: ANCHORAGE LIO

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ULMER	ZANACKI	

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: MR. GARY MCMICHEAL
TITLE:
ADDRESS: HC 01 BOX 6185-T
CITY: PALMER ZIP: 99645
PHONE: 745-8274
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I AM IN FULL SUPPORT OF THIS BILL.

POMID: 14122731
DATE: 91/04/16
TIME: 12:27:31
LIONAME: MAT-SU LIO

COPIES: SENATORS

FISCHER
COTTEN
HOFFMAN
MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: ROBERT J. ROWEN, M.D.
TITLE:
ADDRESS: 615 E. 82ND AVENUE,SUITE 300
CITY: ANCHORAGE ZIP: 99508
PHONE: 349-7775
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: PLEASE RALLY TO THE BASIC HUMAN RIGHTS OF ALASKANS TO BE INFORMED AS TO WHAT MATERIALS THEIR DENTISTS ARE IMPLANTING IN THEIR BODIES. SUPPORT SB 123. /CMR

POMID: 03114127
DATE: 91/04/19
TIME: 11:41:27
LIONAME: ANCHORAGE LIO

COPIES: SENATORS

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HOFFMAN
JONES
KERTTULA
MENARD
PEARCE
POURCHOT
RODEY
SHULTZ
UEHLING
ZHAROFF

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: CHRISTI A. VINCENT
TITLE:
ADDRESS: P.O. BOX 473, 1213 S. NORDIC DR.
CITY: PETERSBURG, AK. ZIP: 99833
PHONE: 772-9202
BILL NO: SB 123
SUBJECT: INFORMED CONSENT
MESSAGE: PLEASE SUPPORT SB 123. IT IS VERY IMPORTANT AND AFFECTS ALL OF US. I HAVE SUFFERED MANY HEALTH PROBLEMS BECAUSE OF THE MERCURY IN MY MOUTH AND WOULD LIKE TO SEE PEOPLE GIVEN A CHOICE AND TO BE INFORMED OF THE POSSIBILITIES OF HEALTH PROBLEMS WHEN CERTAIN MATERIALS ARE USED FOR FILLING TEETH.

POMID: 15161659
DATE: 91/02/28
TIME: 16:16:59
LIONAME: PETERSBURG LIO

COPIES:

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TAYLOR	FISCHER
	COTTEN
	HOFFMAN
	MENARD

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: MARIE MCENTIRE
TITLE:
ADDRESS: 6400 E. 15TH COURT
CITY: ANC ZIP: 99504
PHONE: 274-4741
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I WOULD LIKE TO SEE THIS PASSED. /LD

PCMID: 03085415
DATE: 91/03/19
TIME: 08:54:15
LIONAME: ANCHORAGE LIO

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MARTIN	M.A.MILLER	POURCHOT
M.H.MILLER	MOYER	RODEY
NAVARRE	PARNELL	SHULTZ
G.PHILLIPS	R.PHILLIPS	UEHLING
SHARP	TAYLOR	ZHAROFF
ULMER	ZAWACKI	

PUBLIC OPINION MESSAGE

DEAR: SENATOR STURGULEWSKI

NAME: DR. JOHN WALSH
TITLE:
ADDRESS: 550 WEST 7TH AVE, STE 1390
CITY: ANCHORAGE ZIP: 99501
PHONE: 258-1390
BILL NO: SB 123
SUBJECT: INFORMED CONSENT FOR DENTAL FILLINGS
MESSAGE: I URGE YOU TO PASS SB 123. /JSM

POMID: 03085846
DATE: 91/03/19
TIME: 08:58:46
LIONAME: ANCHORAGE LIO

COPIES:

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SHARP	TAYLOR	ZHAROFF
ULMER	ZANACKI	

11-22-91
12:12

To:
Sen. Stanguslewski
From:
Martha Reinbold

I was here this morning with
1) Dr. John Sparaga who is pres of local dental society
2) Dr. Richard Pauli
3) Dr. David Nelson
4) Dr. Gerald Stranik

These people may not be able to come this afternoon to testify.

In June
Phillip Moritz
Michael McKrill

over

In Fairbanks
Dr. Joseph Corning

could be others
coming in tho.

Estelle Ledbetter
430 E. 45th Ave
Anch, AK 99503

SB 123

12/2

Supports SB 123 - she has allergic reactions to amalgum. Wants to know of dangers. People should be notified of possible problems.

FROM HARVARD MEDICAL SCHOOL

Harvard Health Letter

VOLUME 16 • NUMBER 11 • SEPTEMBER 1991

DENTAL AMALGAM

Heavy Metal

Fatigue. High blood pressure. Mental and neurological illness. Dental amalgam — the most common material used for filling teeth — has been accused of causing a variety of woes. Some people worry that they should have their silver fillings removed and replaced with composite plastic or other materials (see the *HMS Health Letter*, November 1985).

Public concern about the risk of mercury in dental amalgam had declined somewhat in recent years, but it was inflamed once again by a controversial segment of CBS's program *60 Minutes* that ran last December, and by various newspaper and magazine articles. Behind the renewed coverage was a report from researchers at the University of Calgary implying that fillings placed in sheep's teeth released large

amounts of mercury that accumulated in various organs and in some animals allegedly caused severe kidney damage.

Fuzzy thinking?

The authors first announced their results in a press release, rather than following the usual route of publishing them in a scientific journal or presenting them at a professional meeting. The press release gave reporters access to these alarming claims before the work could be reviewed by other scientists.

These results are questionable for several reasons. To begin with, the amalgam placed in the sheeps' teeth contained far more mercury than a dentist would ever really use. This could have biased the researchers' findings in two ways. First, if too much mercury is present it can't bind properly with the other metals in the amalgam, permitting free mercury to be released in unusually large quantities. Second, improperly constituted fillings wear down easily, and the animals appear to have been ingesting considerable amounts of them.

On *60 Minutes*, videotapes of the experimenters at work showed them placing the fillings with poor technique, perhaps causing free mercury to linger on the amalgam surface. They also put in a dozen fillings at once — a blessedly uncommon practice in human dentistry.

Additionally, sheep may not be an accurate model for studying mercury exposure in humans. Although some of us clench our teeth in the night or in stressful situations, sheep are cud-chewers, and their flat teeth grind and wear nearly around the clock.

Thus it was not surprising that the researchers claimed to have found unusually high levels of mercury in the animals' bodies. What astonished experts was the claim that mercury exposure caused kidney failure in some of the animals, because the type of kidney damage reported was not the type that mercury is known to cause. This finding was also undermined by the fact that the researchers failed to take the next obvious step: if they thought mercury from amalgam caused kidney failure, they should have exposed other sheep to mercury alone to see if the problem recurred.

Results of some of the Calgary sheep studies have appeared in print. But concerned scientists say these papers are plagued by flaws that inflate estimates of mercury exposure. And the accounts ignore similar research carried out on dogs and humans during the 1950s, which generated very different results.

The bottom line is that findings from the Calgary studies give us no reason to revise earlier conclusions about the safety of dental amalgam in humans:

- Such fillings consist of mercury salts with no free metallic mercury.
- There is no credible evidence that any human illness or poisoning is caused by having amalgam fillings.
- This 100-year-old material is probably safer and more durable than the more modern alternatives.

Baah!

A trace amount of mercury vapor is present in the air we breathe out. This appears to come both from the lungs and from decomposition of the amalgam when its temperature rises by several hundred degrees. Drinking hot liquids or eating can't produce this increase. Grinding one's teeth can, but only for fractions of a second.

Since mercury is found in air, food, and water, people with fillings get about the same daily exposure from their teeth as people without fillings get from a combination of breathing, eating, and drinking tap water. People who spend a lot of time in high-mercury environments, including dentists, dental technicians, and factory workers who make thermometers or mercury-vapor lamps, have been extensively studied. They have shown no discernible health effects, even at exposures 100 times greater than those attributed to amalgam fillings.

People obsessed with the idea that amalgam is a health hazard have promoted their cause with faulty assumptions and flawed measurements. For their estimates of mercury exposure to be true, fillings would have to be vaporizing fast enough to disappear from people's mouths.

The only documented health problem associated with dental amalgam is an allergy to one of the metals — more often copper or silver than mercury. Although many people are allergic to nickel in jewelry, such difficulties with dental amalgam are exceedingly rare. Composite plastic fillings are actually more likely to spark allergic reactions.

Finally, what television didn't tell us: taking out a filling releases much more mercury than does putting one in or leaving it alone. A patient in the *60 Minutes* segment reported that her multiple sclerosis–like symptoms disappeared completely the day after her fillings were removed. However, such results indicate that her difficulties could not have been caused by dental amalgam, because levels had to be much higher the day she miraculously recovered than they were the day before her fillings were removed.

—ROBERT BARATZ, D.D.S., PH.D., M.D.

Dental "silver" tooth fillings: a source of mercury exposure revealed by whole-body image scan and tissue analysis

LESZEK J. HAHN, REINHARD KLOIBER, MURRAY J. VIMY,* YOSHIMI TAKAHASHI,† AND FRITZ L. LORSCHEIDER[1]

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ABSTRACT

Mercury (Hg) vapor is released from dental "silver" tooth fillings into human mouth air after chewing, but its possible uptake routes and distribution among body tissues are unknown. This investigation demonstrates that when radioactive ^{203}Hg is mixed with dental Hg/silver fillings (amalgam) and placed in teeth of adult sheep, the isotope will appear in various organs and tissues within 29 days. Evidence of Hg uptake, as determined by whole-body scanning and measurement of isotope in specific tissues, revealed three uptake sites: lung, gastrointestinal, and jaw tissue absorption. Once absorbed, high concentrations of dental amalgam Hg rapidly localize in kidneys and liver. Results are discussed in view of potential health consequences from long-term exposure to Hg from this dental material. — HAHN, L. J.; KLOIBER, R.; VIMY, M. J.; TAKAHASHI, Y.; LORSCHEIDER, F. L. Dental "silver" tooth fillings: a source of mercury exposure revealed by whole-body image scan and tissue analysis. *FASEB J.* 3: 2641–2646; 1989.

Key Words: dental amalgam • mercury • tooth fillings • mercury vapor • mercury exposure

MERCURY (HG) HAS BEEN THE major component of tooth filling materials for the past 150 years (1) and its use has met with continuing controversy, as clear experimental evidence regarding its safety has not been demonstrated (2). Dental "silver" tooth fillings typically have a weight composition that is approximately 50% pure elemental Hg, 35% silver, 13% tin, 2% copper, and a trace amount of zinc when mixed as an amalgam (3). A newly placed multisurface dental silver filling involving an occlusal (grinding) surface of a molar tooth contains between 750–1000 mg of Hg and has an average serviceable life span in the human mouth of 7–9 years (4, 5). Approximately 80% of all tooth restorations employ this Hg/silver dental amalgam (6).

The traditional view in dentistry maintains that the Hg component of dental amalgam becomes inert once the fillings have been allowed to set for several days, and that long-term danger to the patient from Hg vapor is therefore remote (7). However, more recent clinical studies in subjects with amalgam fillings who chewed gum for 10 min have demonstrated that quite substantial amounts of Hg vapor are released into intra-oral air from dental amalgam, being sixfold higher than prechewing levels (8). The intra-oral Hg vapor concentration remained elevated during 30 min of continuous gum chewing; and after cessation of chewing, the mouth Hg vapor concentration declined slowly to prechewing levels over a period of 90 min (9). Control subjects with no amalgams had insignificant intra-oral air Hg vapor levels that did not change as a function of chewing (8). Brushing the teeth with commercial toothpaste will also stimulate the release of Hg vapor from amalgam surfaces (10). Although a positive correlation has been demonstrated between the number of dental amalgams and the levels of Hg vapor in the mouth (8, 9), it remains uncertain how much of this Hg is absorbed into body tissues. A current review, addressing whether Hg usage in dentistry constitutes a potential public health hazard, has concluded that further experimental evidence is needed, particularly regarding the metabolic fate of Hg vapor (2). The objective of this investigation was to determine possible sites of uptake and patterns of tissue distribution for Hg released from in situ dental amalgams. Qualitative information by whole-body scanning and quantitative tissue measurements by scintillation detection were determined using radioactive ^{203}Hg in a sheep experimental model.

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0892-6638/89/0003-2641/$01.50.

METHODS

In the present study a 4-year-old ewe that weighed 61 kg was anesthetized with halothane administered through an endotracheal tube fitted to a Narkovet-2 gas anesthetic machine. Dental surgery was performed with the preparation and placement of occlusal amalgam fillings according to standard procedure (11) into 12 molar teeth (3 molars on each side of the upper and lower jaws). This particular number of teeth was chosen because previous attempts to estimate the daily dose of Hg and body burden in humans had focused on subjects having 12 or more teeth with occlusal amalgam fillings (9, 12). The amalgam mass placed in each finished molar tooth of this ewe was approximately 850 mg, of which 50% was elemental Hg. **Figure 1** shows the placement of nonradioactive dental amalgam fillings in teeth of a sheep from a preliminary study with a lateral view of the skull (*A*), an occlusal view of amalgam restorations in the right lower jaw (*B*), and radiograph images of the upper and lower right jaws before (*C*) and after (*D*) amalgam placement. Before mixing the amalgam, 7.5 mCi of radioactive ^{203}Hg (New England Nuclear, Boston, Mass.), which had a specific activity of 12 mCi/g, was diluted 11-fold with nonradioactive Hg. At the conclusion of the dental surgery, the oral cavity was flushed with H_2O and rinsed several times by vacuum aspiration to remove any amalgam particle trimmings.

After surgery the ewe was provided free access to water and fed fresh hay twice daily for 29 days. During the course of the study intra-oral Hg vapor measurements were taken intermittently after chewing as previously described (8). On day 29, the animal was killed with sodium pentobarbital/saturated KCl. The tooth structure above the gum line containing the entire amalgam filling was individually sectioned and removed intact from each of the 12 molars to reduce the high background from ^{203}Hg remaining in the fillings. The animal was then imaged using a Technicare Omega-500 large-field-of-view gamma camera equipped with a medium energy collimator (13, 14). An image of the sheep was obtained in the right lateral projection, using the 279 ± 28 KeV gamma rays of ^{203}Hg. In addition, transmission images were obtained using a flat 30-cm diameter ^{57}Co source that outlined the contour of the sheep's body. A posterior projection image was repeated after removal of the gastrointestinal tract. Tissue and fluid specimens were weighed at autopsy and analyzed for radioactivity. Isotope measurements were taken for

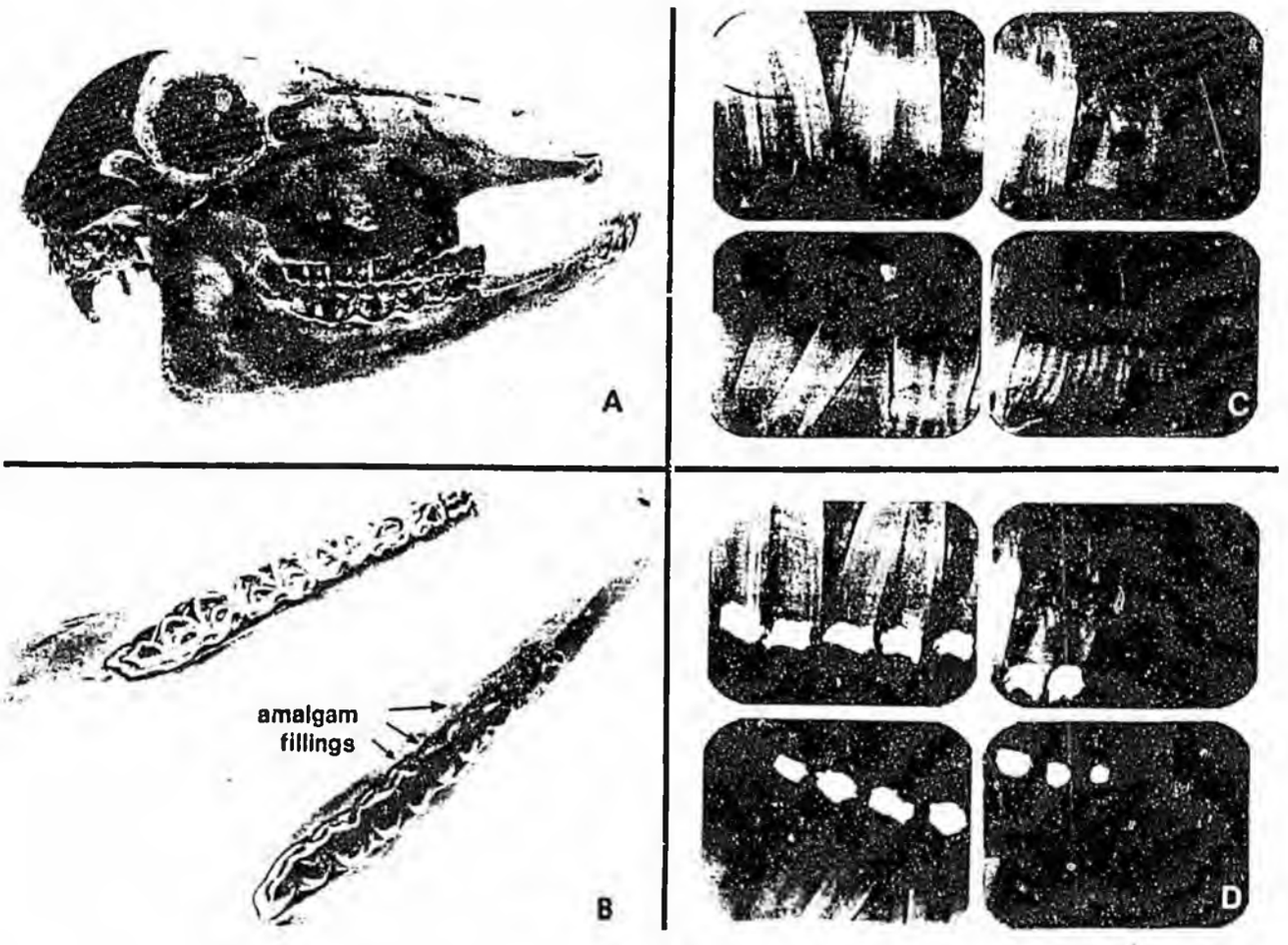

Figure 1. Placement of dental amalgam fillings in sheep teeth: *A*) lateral view of sheep skull; *B*) occlusal view of sheep mandible showing occlusal amalgam restorations in the mandibular right quadrant; *C*) periapical radiographs of the upper and lower right quadrants before amalgam placement; *D*) periapical radiographs of the upper and lower right quadrants after amalgam placement. The x-ray views indicate that anchorage of these fillings has been achieved with appropriate undercuts.

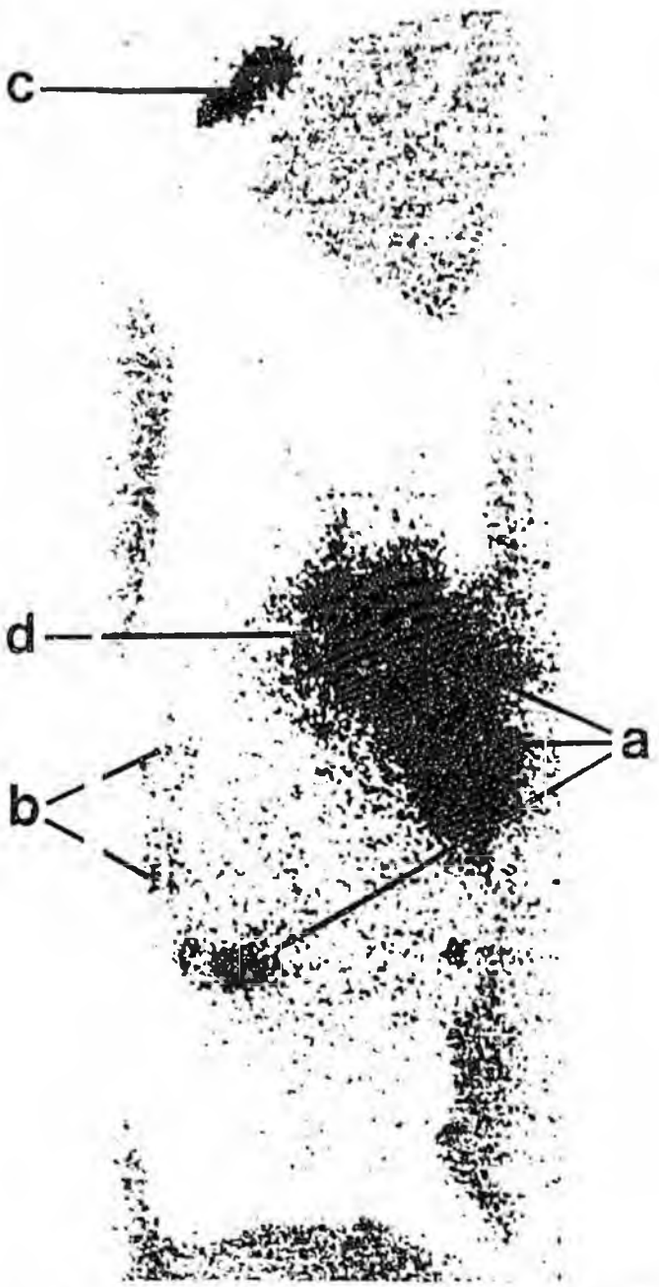

Figure 2. Right lateral image of amalgam ^{203}Hg distribution in the intact sheep, after removal of the dental amalgams, with superimposed transmission scan showing the body contour. The greatest concentrations of ^{203}Hg are in the gastrointestinal tract (*a*), kidneys (*b*), and in the gum and alveolar bone of the jaws (*c*). Liver activity (*d*) is obscured by large quantities of Hg in the gut on this image.

10 min per specimen (approximately 2% SD counting error) or 100 min per specimen for tissues with low counts (<10% SD counting error) in a Picker gamma well-counter calibrated to an energy range window of 249–309 KeV. Background counts +15% were set automatically for subtraction after a blank reading was taken for 100 min. This instrument subtraction level was sufficiently high so that no net counts were detectable during a repeat 100-min background measurement. At an 80% instrument counting efficiency, 1 μCi equals 1,776,000 cpm. Data, initially expressed as net radioactive cpm, were corrected for the physical half-life (47 days) of ^{203}Hg decayed to 29 days (65% remaining), for the specific activity of ^{203}Hg (83,300 ng/μCi), and for the dilution of ^{203}Hg with nonradioactive Hg (11-fold). The final calculation represented the total amalgam Hg (ng) per g (wet wt) of tissue or fluid as follows: (cpm/65%) × (83,300 ng/μCi × 11)/1,776,000 cpm/μCi/g.

RESULTS

Figure 2 demonstrates the ^{203}Hg distribution from amalgam within the body of the sheep as viewed from the right side. The transmission image obtained without moving the animal is superimposed to facilitate orientation. Primary sites of Hg concentration are in the abdominal cavity, specifically in the gastrointestinal tract, liver, and kidneys. A second major site is in the upper and lower jaws, even though the tooth structure containing the radioactive amalgam has been removed in its entirety.

Figure 3 is the posterior image of ^{203}Hg distribution from amalgam in the sheep's abdomen after removal of the gastrointestinal tract. The left kidney is clearly identified. The larger area of activity on the right side of the animal represents the liver and the right kidney, from which some tissue had been removed for well-counting.

Table 1 lists the total concentration of amalgam Hg in various tissues at autopsy 29 days after placement of dental amalgam fillings. Whole blood and urine contained 9.0 and 4.7 ng Hg/g, respectively. Muscle concentration of Hg was similar to blood, but concentration in fat remained low. In the oral/nasal tissues, Hg was concentrated primarily in gum mucosa (323 ng/g) and tooth alveolar bone (318 ng/g). In the gastrointestinal tract the washed stomach lining (929 ng/g) and

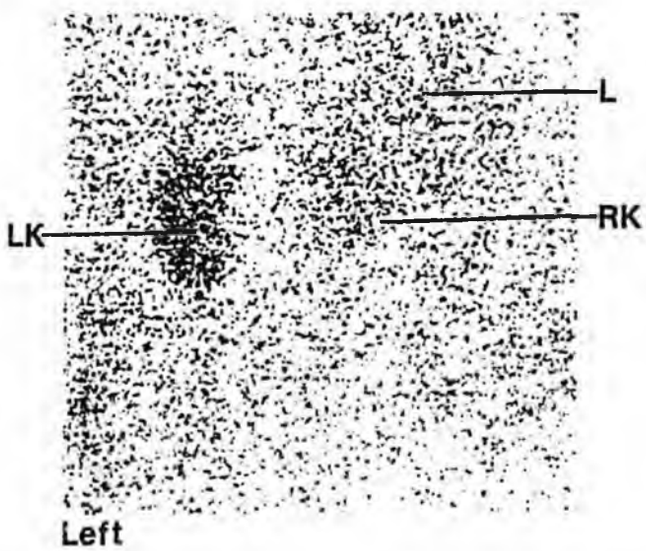

Figure 3. Posterior image of amalgam ^{203}Hg distribution in the abdomen after removal of the gastrointestinal tract which demonstrates Hg within the kidneys and liver. The left kidney (LK) is clearly identified. The large area of Hg deposition on the right side of the animal represents a combination of liver (L) and right kidney (RK). Some tissue had been removed from the right kidney, which had been mobilized and placed further from the detector, explaining the lower intensity compared with the left.

TABLE 1. *Concentration of amalgam Hg in sheep tissues 29 days after placement of dental amalgam fillings*

Tissue	ng Hg/g
Whole blood	9.0
Urine	4.7
Skeletal muscle (gluteus)	10.1
Fat (mesentery)	0.9
Cortical maxillary bone	3.6
Tooth alveolar bone	318.2
Gum mucosa	323.7
Mouth papilla	19.7
Tongue	13.0
Parotid gland	7.8
Ethmoturbinal (nasal) bone	10.7
Stomach	929.0
Small intestine	28.0
Large intestine	63.1
Colon	43.1
Bile	19.3
Feces	4489.3
Heart muscle (ventricle)	13.1
Lung	30.8
Tracheal lining	121.8
Kidney	7438.0
Liver	772.1
Spleen	48.3
Frontal cortex	18.9
Occipital cortex	3.5
Thalamus	14.9
Cerebrospinal fluid	2.3
Pituitary gland	44.4
Thyroid	44.2
Adrenal	37.8
Pancreas	45.7
Ovary	26.7

feces (4489 ng/g) contained the most Hg, although Hg concentration in other washed intestinal tract tissues was three- to sixfold higher than in blood, and bile concentration was more than twice that of blood. Heart muscle contained Hg levels that were similar to skeletal muscle. However, lung concentration of Hg (30 ng/g) was threefold higher than blood, and tracheal lining was much higher at 121 ng/g. Abdominal organs demonstrating the greatest concentration of Hg were kidney (7438 ng/g) and liver (772 ng/g). Spleen contained 48 ng Hg/g, which was fivefold higher than blood content. In the central nervous system the brain frontal cortex and thalamus concentrations of Hg were higher than in either blood or cerebrospinal fluid. Endocrine gland concentrations of Hg were three- to fivefold higher than blood. There is not a direct correlation between the intensity of Hg-203 localization on the whole-body scan and absolute radioactivity counts in autopsied tissues because of attenuation and geometry factors that affect the image.

DISCUSSION

The results of this study clearly demonstrate that substantial quantities of Hg from amalgam will appear in various body tissues as early as 29 days after placement of amalgam fillings in teeth. This Hg can be readily visualized by scintigraphy and can be easily quantified by analysis of tissue radioactivity. The experimental design of this in vivo isotope study has the advantage that all of the Hg measured originates only from dental amalgam and cannot be attributed to food, water, or background environmental sources.

Our findings indicate at least three principal sites for absorption of Hg from amalgam. First, the lungs absorbed Hg as did the cilia lining the trachea because of continual breathing of intra-oral air that had a Hg vapor concentration ranging from 19–50 $\mu g/m^3$ throughout this study. In humans, approximately 80% of inhaled elemental Hg vapor is absorbed into blood and becomes available for tissue retention (15). Second, the gastrointestinal tract contained a large amount of Hg likely due to mixing of intra-oral Hg vapor, amalgam microparticles, and dissolved mercuric ions with saliva and food before swallowing. About 10% of the elemental Hg in the human gastrointestinal tract can be absorbed into blood (16). Even though the efficiency of Hg absorption in the gut is low, large amounts of Hg in feces seen in the present study may signify a substantial pathway for uptake of Hg in its elemental or vapor forms. Amalgam microparticles containing Hg would not likely be susceptible to gut absorption. Third, some tissues in the jaw such as gum mucosa and the tooth root and surrounding bone also absorbed Hg. The Hg absorbed into the jaw could be transported from bone marrow directly into blood by venous routes radiographically demonstrated for human circulation (17). The highly vascularized oral mucosa may likewise afford a route for some Hg vapor transport directly into the systemic circulation.

We are confident that the Hg uptake observed in this animal was not the result of procedural contamination during dental surgery because serial blood measurements taken for 24 h after surgery had no measurable radioactivity. This indicates that the endotracheal tube prevented inhalation of Hg vapor. Any amalgam particles not removed from the mouth by surgical rinsing would have passed through the gastrointestinal tract well before 29 days when the imaging was performed.

After the Hg released from dental amalgam is absorbed into blood, the two principal target organs of rapid accumulation are kidney and liver. Based on organ weights for kidneys (250 g) and liver (1000 g) in the adult ewe, the total Hg concentrated in the kidney in this animal was 1.86 mg, and in the liver it was 0.77 mg, after only 29 days. Even during this relatively short time, the brain and several endocrine glands (pituitary, thyroid, adrenal, pancreas, and ovary) also showed evidence of Hg accumulation from the dental amalgams.

Since Hg/silver fillings remain in human teeth for 8–10 years, this would allow an extended opportunity for body tissues to be continuously exposed to Hg. Other investigators have recently reported that Hg concentrations in autopsied human brain and kidney are significantly higher in those subjects with dental amalgams than in subjects with no amalgams (18).

Each molar tooth of this sheep contained approximately 425 mg Hg, only one-half the amount of Hg used in the average human occlusally involved molar filling. In humans, occlusally involved Hg/silver dental fillings frequently encompass additional tooth surfaces such as buccal, lingual, mesial, and distal aspects. Thus, such complex human tooth restorations have a greater surface area exposed to grinding forces from which Hg may vaporize. This is in contrast to occlusal restorations in this sheep that are limited only to the occlusal surface and are totally supported circumferentially by solid tooth structure. The natural ovine molar is multiridged for forage grinding. Technical reproduction of these ridges to their original exact functional occlusal level in the amalgam fillings was not possible. Therefore, the restorations were purposely overcarved, which created a concave occlusal surface, ensuring that the amalgams would not be functionally too high and thus subject to abnormally rapid wear. None of the Hg/silver fillings were lost from the mouth during the course of this study.

We believe the sheep is a suitable experimental model for the purpose of our investigations because it exhibits molar chewing mechanics that are similar to those of humans. Moreover, intra-oral air Hg vapor levels in the sheep are very similar to those reported in humans with the same number of amalgams (9). Although sheep may chew more than the average human does, it is likely that humans who are chronic gum chewers or who exhibit bruxism (chronic grinding of teeth) would have daily periods of chewing that are comparable to sheep fed two meals per day. The sheep body weight also compares favorably with humans, and the sheep is the most widely used obstetrical model in research today.

In other studies of sheep that were not imaged (19), we have established that Hg vaporized from dental amalgam fillings will progressively accumulate in both maternal and fetal tissues as a function of time, and tissue Hg levels will remain elevated in experiments run for as long as 140 days. Exposure of newborn lambs to milk suckled from ewes with dental amalgams results in Hg uptake into tissues of the young.

In North America 5.4% of the population display contact hypersensitivity to Hg (20). The pathogenesis of a variety of immediate or delayed Hg-induced hypersensitivity responses by the immune system resulting in glomerulonephritis has been postulated (21). Experimental evidence supports this contention because Hg is capable of inducing autoreactive T lymphocytes and specific autoantibodies resulting in Hg-induced autoimmunity (22, 23), indicating a potential for Hg to precipitate antibody-mediated tissue injury and autoimmune disease. The kidney and endocrine glands are known sites of autoimmune disorders, which brings into question the long-term implications of Hg concentration in these tissues from dental amalgams as demonstrated by the present study.

Our laboratory findings in this investigation are at variance with the anecdotal opinion of the dental profession, which claims that amalgam tooth fillings are safe. Experimental evidence in support of amalgam safety is at best tenuous (2). From our results we conclude that dental amalgams can be a major source of chronic Hg exposure. As it has been estimated that in North America 100,000 kg of Hg are used each year in dentistry (7), continuing research in this area is essential and may have an effect on public health. [F1]

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

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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 ^{203}Hg and then placed into monkey teeth, the isotope appears in high concentration in various organs and tissues within 4 wk. 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. — HAHN, L. J.; KLOIBER, R.; LEININGER, R. W.; VIMY, M. J.; LORSCHEIDER, F. L. Whole-body imaging of the distribution of mercury released from dental fillings into monkey tissues. *FASEB J.* 4: 3256–3260; 1990.

Key Words: dental amalgam • mercury • tooth fillings • mercury vapor • mercury exposure

DENTAL "SILVER" AMALGAM TOOTH FILLINGS, which normally contain 50% mercury (Hg) metal by weight, release Hg vapor into human mouth air as a result of chewing (1–3) or tooth brushing (4). Levels of Hg vapor in intraoral air correlate significantly with the number of amalgam fillings (2, 3), and these Hg vapor levels remain elevated during prolonged chewing, declining slowly to basal levels 90 min after chewing ceases (3).

Estimations of the amount of amalgam Hg absorbed daily in humans vary from 1.2 to 27 μg Hg/day, with an average of approximately 10 μg/day; and individual subjects can receive daily doses of as much as tenfold higher than this average (5). Human autopsy studies demonstrate significantly higher Hg levels in the brain and kidney of adult subjects with aged dental amalgams than in control subjects with no amalgams (6). It is believed that dental amalgams constitute the major source of exposure to inorganic Hg in the general population (7).

Recently we used an experimental animal model in which sheep received dental amalgam fillings containing a radioactive Hg tracer. One study demonstrated, by whole-body imaging, that the sites of amalgam Hg uptake in sheep include oral tissues, jaw bone, lung, and gastrointestinal tract, with a subsequent high concentration of Hg in the kidney and liver (8). Another study, which used pregnant sheep, showed that both maternal and fetal tissues begin to accumulate Hg within several days after amalgam placement, and that this accumulation progressed along with gestation (9). It is unknown whether the frequency of eating, molar chewing pattern, or type of food influenced the degree to which Hg was released from sheep dental amalgams, or if the results were directly comparable to humans. Therefore the objective of the present investigation was to determine the bodily distribution of amalgam Hg in a primate species whose dentition is similar to that of humans, and whose diet, frequency of feeding, and chewing pattern closely resemble those of humans.

METHODS

A wild-caught male cynomolgus monkey (*Macaca fascicularis*), approximately 7 years old and weighing 5 kg, was obtained from Charles River Canada Inc. (St. Constant, Quebec, Canada). The animal was singly housed in a large squeeze-back cage and acclimated to its environment and diet for 2 wk before surgery. Twice daily the animal was fed Wayne 25% Primate Diet (no.

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8663, Teklad/Premier Laboratory Diets, Madison, Wis.) supplemented with apples, oranges, bananas, sunflower seeds, and peanuts. Fresh water was available ad libitum. Before dental surgery the monkey was fasted for 24 h and water was withheld for 12 h. Anesthesia was induced with an intramuscular injection of ketamine hydrochloride-xylazine mixture (Ketaset, 11 mg/kg, Austin Laboratories Canada Ltd., Joliette, Quebec, Canada; Rompun, 1.1 mg/kg, Haver/Chemagro Ltd., Etobicoke, Ontario, Canada). A 5.5-mm o.d. endotracheal tube (Portex Inc., Wilmington, Mass.) was inserted, and unassisted general anesthesia was maintained with a Narkovet 2 anesthetic machine (N. American Drager, Telford, Pa.) delivering a gas mixture of 0.6 l/min nitrous oxide, 0.4 l/min oxygen, and halothane (0.5–0.8%, MTC Pharmaceuticals, Cambridge, Ontario, Canada).

The preparation and placement of dental amalgam fillings was as previously described for sheep (8), with several modifications. Before the study, stone gypsum models of adult monkey teeth were constructed from alginate impressions of the maxilla and mandible of a monkey skull. Occlusal amalgam fillings were placed in the stone models, trimmed, and finished in three maxillary and three mandibular molar teeth, and then the fillings were removed and weighed. The average mass of these fillings (180 mg each) was used to determine the minimum amount of nonradioactive Hg needed to dilute the isotopic Hg and be sufficient to fill 16 teeth. Before mixing the amalgam, 15.5 mCi of radioactive ^{203}Hg metal with a specific activity of 17.37 mCi/g (Amersham Canada, Oakville, Ontario, Canada) was diluted 2.5-fold with nonradioactive Hg to a lower specific activity of 6.91 mCi/g.

At surgery, occlusal amalgam fillings were prepared (8) and inserted into 16 teeth (3 molars and the adjacent second premolar in each quadrant of the upper and lower jaws). After amalgam placement, an average occlusal amalgam mass of 186 mg/tooth (93 mg Hg/tooth) was estimated by correcting for both the remaining unused Hg and an estimated 25% amalgam loss during placement and carving. The total Hg in the monkey teeth (1488 mg) was labeled with 10.3 mCi ^{203}Hg. The amalgam fillings were limited to the occlusal surface; they were completely supported circumferentially by solid tooth structure, and were slightly overcarved to create a concave surface that would not be subject to abnormally rapid wear. At the conclusion of dental surgery, the oral cavity was flushed thoroughly several times with a water rinse that was removed by vacuum aspiration to clean the mouth of amalgam particle trimmings.

On day 28 after amalgam placement, the monkey was again anesthetized with ketamine alone (13 mg/kg) and then killed with an i.v. injection of sodium pentobarbital (Euthanyl, MTC Pharmaceuticals). Blood, cerebrospinal fluid, and urine specimens were taken for Hg analysis. Each of the 16 teeth containing amalgam fillings was individually sectioned in the horizontal plane immediately above the gingival margin, and the clinical crown was removed intact with the amalgam to reduce the high background from the ^{203}Hg. The animal was taped in the ventral position to a rigid cardboard support and imaged with a large field-of-view gamma camera to localize ^{203}Hg by planar scintigraphy as described for sheep (8), with several modifications. The ADAC GENESYS single photon emission computerized tomography and total body digital imaging system (ADAC Laboratories, Milpitas, Calif.) was used. Three imaging scans were obtained: one in the anterior (ventral), and two in the posterior (dorsal) projections before and after removal of the entire gastrointestinal tract. The data were acquired using the pulse height analyzer (PHA)[2] peaked at 279 ± 28 keV. To outline the body contour of the monkey in each projection, transmission images were obtained with a flat 30-cm diameter ^{57}Co source using a PHA setting of 122 ± 12 keV.

Tissue and fluid specimen weights obtained at autopsy were used in conjunction with radioactivity measurements to determine total Hg concentrations as described previously (8), with several modifications. A Canberra Nuclear Products Group (Canberra Industries, Meriden, Conn.) well-counter system was used with a SpecMate NaI preamplifier/amplifier, an Accuspec acquisition interface board, and a Bicron 2" NaI (Tl) scintillation detector operating on MS-DOS 3.3 based software supplied by the manufacturer for IBM PC XT/AT,386,PS/2 computers. This system counted ^{203}Hg with a 25% instrument detection efficiency, its multichannel analyzer was peaked to accept a 279 keV ± 10% energy range, and a stable low background count was subtracted from each tissue measurement. In this scintillation detection configuration 1 μCi equals 555,000 cpm, at 28 days of physical decay for ^{203}Hg approximately 66% of the isotope remains, and after a 2.5-fold dilution with nonradioactive Hg, the specific activity of ^{203}Hg in amalgam was 144,000 ng/μCi. Total amalgam Hg in tissue (ng Hg/g wet wt) was calculated by the equation: (cpm/66%) × (144,000 ng/μCi)/555,000 cpm/μCi/g.

RESULTS

Figure 1 demonstrates the bodily distribution of ^{203}Hg released from dental amalgam tooth fillings 28 days after placement as viewed from both ventral and dorsal imaging positions. The transmission image, obtained without moving the animal from each position, is superimposed to outline the body contour. Figure 1*A* is the ventral whole-body image projection, revealing that the primary sites of Hg concentration are kidney, gastrointestinal tract, and jaw. Figure 1*B* is a dorsal whole-body image projection revealing the same three sites of Hg concentration. The apparent lower activity of ^{203}Hg, particularly in the jaw, reflects the increased tissue attenuation between the gamma camera and the radioisotope locus in this projection. Figure 1*C* is the dorsal whole-body image projection after removal of

[2]Abbreviation: PHA, pulse height analyzer.

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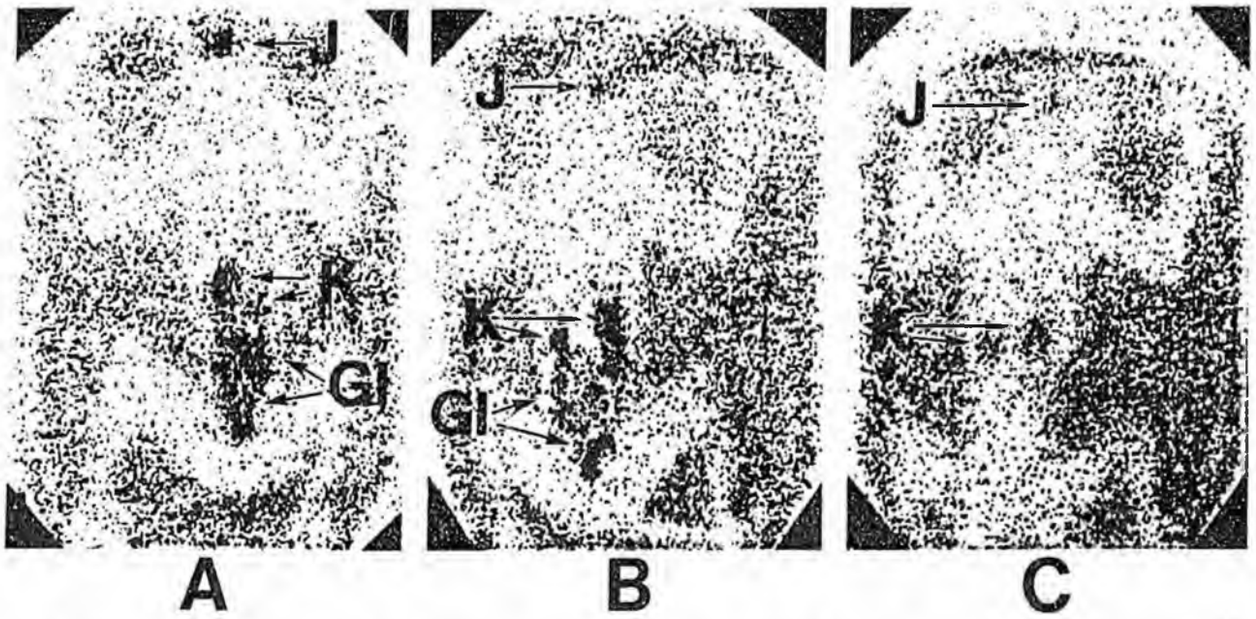

Figure 1. Whole-body image scan of amalgam ^{203}Hg localization in a 7-year-old male monkey (*M. fascicularis*) after removal of dental amalgams. A superimposed transmission scan with a ^{57}Co source outlines the body contour. *A*) Ventral image; *B*) dorsal image; *C*) dorsal image after removal of the gastrointestinal tract. J, jaw; K, kidneys; GI, gastrointestinal tract.

the entire gastrointestinal tract. The kidneys and jaw remain visible.

Table 1 lists the total concentration of amalgam Hg in various tissues obtained at autopsy 28 days after amalgam placement. Whole blood and urine contained 5.8 and 17.7 ng Hg/g, respectively. Synovial membrane had concentrated 31.6 ng/g, but Hg in skeletal muscle was very low and was not detected in fat. In oral tissues, Hg was concentrated primarily in tooth alveolar bone (7756 ng/g), gingivae adjacent to the amalgam fillings (4190 ng/g), and the tongue region in opposition to the filled teeth (253 ng/g). In the gastrointestinal tract, washed linings of the large intestine (983 ng/g) and colon (482 ng/g) contained the highest concentrations of Hg. Bile concentration of Hg (243 ng/g) was 40-fold higher than Hg concentration in blood. Feces contained 3490 ng Hg/g. Heart muscle levels of Hg were similar to that of blood, but Hg concentration in the lung was threefold higher than in blood, and in the trachea it was twofold higher. The abdominal organ with the highest concentration of Hg was the kidney (3053 ng/g). Liver, at 133 ng/g, had more than 20-fold the Hg levels found in blood. In the nervous system, all three regions of the brain concentrated Hg at levels greater than either blood or cerebrospinal fluid. However, no Hg was detected in either the spinal cord or sciatic nerve. Endocrine gland concentrations of Hg were highest for the pituitary (83 ng/g) and for other glands, except the thyroid, they were two- to fivefold higher than that of blood.

TABLE 1. *Concentration of amalgam Hg in monkey tissues 28 days after placement of dental amalgam tooth fillings*

Tissue	ng Hg/g
Whole blood	5.8
Urine	17.7
Synovial membrane (knee joint)	31.6
Skeletal muscle (gluteus)	1.9
Fat (mesentery)	0.0
Tooth alveolar bone	7756.1
Oral mucosa	86.6
Gingivae	4190.4
Tongue	253.3
Parotid gland	1.6
Stomach	18.4
Small intestine	68.9
Large intestine	983.1
Colon	482.7
Bile	243.1
Feces	3490.2
Heart (ventricle)	6.6
Lung	15.0
Trachea	12.6
Kidney	3053.5
Liver	133.1
Spleen	15.6
Frontal cortex	7.2
Occipital cortex	12.6
Thalamus	9.9
Sciatic nerve	0.0
Spinal cord	0.0
Cerebrospinal fluid	1.9
Pituitary	83.6
Thyroid	4.1
Adrenal	31.3
Pancreas	15.6
Testes	12.7

DISCUSSION

This study clearly demonstrates that the phenomenon of high Hg accumulation in body tissues after dental amalgam placement which we previously reported in sheep

(8, 9) is not unique to that species, and is readily demonstrable in primates as well. The dentition, chewing pattern, and diet of this monkey were similar to that of humans. The surgical procedure and the use of isotopic Hg ensured that the only Hg detected was that which escaped from the amalgam tooth fillings during the 4-wk period after dental surgery. The routes of absorption of amalgam Hg and the potential significance of this phenomenon to dental and medical physiology have been discussed in detail in our earlier report on sheep (8).

Each amalgam tooth restoration in the monkey contained only 93 mg Hg, which compares with an average of 425 mg Hg/tooth in sheep (8). All 16 amalgam fillings remained intact for the duration of the present study.

A substantial amount of Hg was transported from dental amalgam to adjacent oral tissues, and is visualized in the monkey. This finding is consistent with earlier reports of other methods in humans which have demonstrated that Hg ions migrate from amalgam into gingivae (10), dentin (11, 12), dental pulp (13), tooth roots, and surrounding alveolar bone (14).

Concentration of Hg in the kidney of this monkey (3053 ng/g) contrasted to that in sheep kidney (7438 ng/g) (8). Such differences may reflect frequency and patterns of chewing in these species. Coincident with the present study, another laboratory reports that after prolonged exposure (1 year) to amalgam Hg, monkeys that had only eight nonradioactive occlusal amalgam fillings (containing one-third the total Hg used in the present study) will have kidney levels of Hg averaging 3900 ng/g tissue with dense Hg accumulations located in proximal tubule cells (15). As this is approximately 30% higher Hg concentration than we have observed in the primate kidney 4 wk after placement of twice the number of such fillings, this suggests that with longer duration of exposure to amalgam Hg the kidney will concentrate increasingly larger amounts of Hg. Moreover, the locus of Hg accumulation in the proximal tubule, which is the primary site of sodium reabsorption, would explain why such reabsorption is markedly impaired in animals after placement of dental amalgams (16). The significance of amalgam Hg accumulation in kidney on parameters of renal function will be communicated in full detail in another report.

Similarly, fecal Hg concentration was 3490 ng/g in monkey compared with 4489 ng/g in sheep (8). Fecal excretion of Hg in sheep was evident within 3 days after amalgam placement, and continued throughout a 140-day study (9); a similar Hg excretion pattern was observed in the monkey for the duration of this experiment. Full details of the effects of amalgam Hg excretion patterns on the populations and functions of bacterial species in the intestinal tract and on gingival surfaces will be reported elsewhere.

Now that it has been established that Hg vapor is continuously released from amalgam fillings in human teeth (2, 3, 5) and that specific tissue loci in the sheep and monkey will concentrate large amounts of this Hg (8, 9), the possible pathophysiological consequences of such Hg exposure must be addressed. Preliminary reports on two recent investigations indicate that kidney function (16) and intestinal and gingival flora populations (17) are significantly altered when animals are exposed to amalgam Hg dose accumulations delivered from 12–16 occlusal amalgam fillings for 1–2 months after placement.

Advocacy by the dental profession (18, 19) that Hg-based silver amalgam is stable and systemically biocompatible is not supported by our animal studies (8, 9) or by the pathophysiological consequences of amalgam usage that we demonstrated (16, 17). [F1]

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Mercury from dental "silver" tooth fillings impairs sheep kidney function

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BOYD, N. D., H. BENEDIKTSSON, M. J. VIMY, D. E. HOOPER, AND F. L. LORSCHEIDER. *Mercury from dental "silver" tooth fillings impairs sheep kidney function.* Am. J. Physiol. 261 (Regulatory Integrative Comp. Physiol. 30): R1010–R1014, 1991.—In humans Hg vapor is released from "silver" amalgam fillings that contain 50% Hg by weight. Previous studies show that when 12 such fillings are placed in sheep teeth, the kidneys will concentrate amalgam Hg at levels ranging from 5 to 10 μg Hg/g renal tissue 4–20 wk after placement. In the present study 12 occlusal fillings were placed in each of six adult female sheep under general anesthesia, using standard dental procedures. Glass ionomer occlusal fillings (12) were inserted in two control sheep. At several days before dental surgery, and at 30 and 60 days after placement of fillings, renal function was evaluated by plasma clearance of inulin and by plasma and urine electrolytes, urea, and proteins. An average plasma inulin clearance rate of 69.5 ± 7.2 ml/min before amalgam placement was reduced to 32.3 ± 8.1 ml/min by 30 days and remained low at 27.9 ± 8.7 ml/min after 60 days. Inulin clearance did not change in controls. After amalgam placement urine concentration of albumin decreased from 93.0 ± 20.5 to 30.1 ± 15.3 mg/l and urine Na^+ concentration increased steadily from 24.8 ± 7.7 to 82.2 ± 20.3 mmol/l at 60 days. Concentrations of K^+, urea, γ-glutamyl transpeptidase, alkaline phosphatase, and total protein did not change significantly from 0 to 60 days in urine. Plasma levels of Na^+, K^+, urea, and albumin remained unchanged from 0 to 60 days after amalgam. Renal histology remained normal in amalgam-treated animals. It is concluded that amalgam Hg levels in kidney are sufficient to significantly reduce the rate of inulin clearance by nondefined mechanisms and that electrolyte patterns in urine are consistent with impaired renal tubular reabsorption.

dental amalgam; renal function

IN HUMANS Hg vapor is continuously released from dental "silver" amalgam fillings (which normally contain ~50% Hg by weight), and this Hg release is increased by chewing activity (27, 28). The average absorbed dose of amalgam Hg is ~10 μg Hg/day for human subjects with varying numbers of aged amalgams, and some individuals can receive dose exposures as much as 10-fold higher than this average (29, 31).

Recent reports from our laboratory demonstrate that when 12 dental "silver" fillings are placed into sheep molar teeth significant concentrations of amalgam Hg will accumulate in kidney at levels ranging from 5 to 10 μg Hg/g renal tissue 4–20 wk after placement (11, 30). Similar results have also been demonstrated in monkey kidney (10).

Inorganic and elemental Hg from sources other than dental amalgam have been shown to have a variety of effects on renal function caused by a reduction in renal blood flow (25), onset of tubular necrosis (9), and induction of autoimmune glomerular nephritis (7, 14, 22). Because amalgam Hg can be readily visualized in sheep kidney by whole-body imaging (11), the objective of the present investigation was to determine if this Hg is sufficient to alter renal function as evaluated by inulin clearance and indexes of tubular reabsorption.

METHODS

Eight adult ewes (Dorset × Suffolk) of 3–5 yr of age, average body weight 48 ± 4 kg, were used in this study. Beginning 2 wk before experimentation and for the 60 days throughout the study, these animals were maintained on a diet consisting of fresh hay fed twice daily and supplemented with Lamb Grow-Finisher Ration containing 4 g/kg Na, 0.3 mg/kg Se, and other standard trace elements and vitamins (United Feeds, Calgary, Alberta). No other salt source was provided. Each animal consumed 1.8 kg of ration daily that provided a limited Na intake of ~7 g/day. Feed consumption remained constant throughout the study. Fresh water was provided ad libitum. On the days before renal clearance testing or dental surgery, the animals were fasted for 20 h but had access to water. All renal clearance tests and dental surgeries were performed between 0800 and 1100 h daily.

In each of six sheep, occlusal amalgam fillings (Dispersalloy, Johnson & Johnson, Montreal, Quebec) were placed in 12 molar teeth under halothane general anesthesia as previously described (11). In contrast to our previous studies (11, 30), these amalgam restorations did not contain any radioactive Hg. Amalgam fillings had an average weight of ~850 mg/tooth and contained 50% pure elemental Hg. Thus the total Hg mass in each animal was ~5,100 mg. In two additional control sheep, 12 glass ionomer occlusal fillings (Ketac-Fil, ESPE, Fabrik Pharmazeutischer Präparate, Seefeld/Oberbay, Germany) were similarly placed. All fillings remained intact for the duration of this study.

Renal clearance tests were performed several days before dental surgery and at both 30 and 60 days after amalgam placement and 30 days after glass ionomer placement. Under general anesthesia, bladders were catheterized using a Rüsch balloon catheter (size 12) that was connected to a Bard urine drainage bag (2,000 ml)

(Stevens Alberta, Calgary, Alberta) strapped to the flank of the animal. Immediately after catheterization, the animals were placed in individual metabolic carts where they were maintained for 25 h to measure total urine volume collected for 1 day. Within 30 min after catheterization, all animals had fully recovered from anesthesia and at this time were provided with hay and water. Approximately 30 min later, testing of renal function commenced for 3 h.

The inulin clearance rate from plasma was determined using a microanalytic method employing β-indolyl-acetic acid as the principle colorimetric reagent (13). Each animal received a primer dose of inulin (35 mg/kg) diluted in 5 ml saline and administered into the jugular vein. This was followed by a second inulin dose (0.75 mg/kg) diluted in 50 ml saline and infused at a rate of 5 ml/min. The inulin was then allowed to equilibrate in the animal for 80 min. Blood and urine specimens were collected before inulin administration and six times (at five 20-min intervals) after equilibration. Spectrophotometric analysis was performed on a Hitachi U-2000 spectrophotometer (Tokyo, Japan) set at 530 nm. Inulin clearance rate values were multiplied 10-fold to correct for the dilution and volume of both sample and reagents used in this analytical assay method.

After inulin clearance data were collected, it was evident that kidney filtration rate had been markedly altered. Because urine and plasma specimens from the amalgam-treated sheep had been stored frozen (−20°C), other biochemical analyses were performed on these specimens to assess functional indexes of filtration and tubular reabsorption. Analyses were performed on the pre-inulin specimens collected before and at 30 and 60 days after amalgam placement. The albumin content of sheep urine was determined using a Behring Nephelometer 100 analyzer (Hoechst Canada, Montreal, Quebec) and employed rabbit antisera to sheep albumin and purified sheep albumin (Cedarlane Laboratories, Hornby, Ontario). Urine total protein was measured on a Du Pont ACA III analyzer (Du Pont Instruments, Wilmington, DE). Urine sodium, potassium, urea, γ-glutamyl transpeptidase (γ-GT), and alkaline phosphatase were measured on an Astre-8 analyzer (Beckman Instruments, Brea, CA), and plasma sodium, potassium, urea, and albumin were assayed using a Kodak E700 analyzer (Eastman Kodak, Rochester, NY).

Renal tissue samples were fixed in 10% buffered Formalin and imbedded in Historesin (Reichert-Jung, Heidelberg, Germany). Sections were cut at 2 μm and stained with hematoxylin-eosin, periodic acid-Schiff (PAS), and periodic acid-silver methenamine. Microscope magnification for photography was ×200.

Statistical comparisons were performed by analysis of variance with repeated measures.

RESULTS

Figure 1 shows the average rate ± SE of inulin clearance from plasma in six sheep before and 30 and 60 days after placement of amalgam tooth fillings, compared with that in two control sheep before and 30 days after placement of glass ionomer fillings. In amalgam-treated sheep

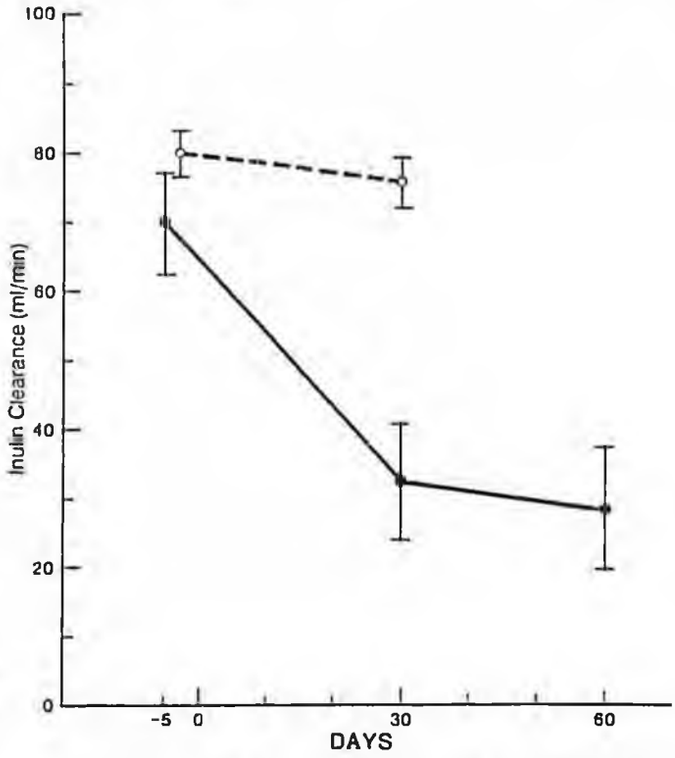

FIG. 1. Average plasma inulin clearance rate (± SE) in 6 sheep before and at 30 and 60 days after placement of "silver" amalgam tooth fillings (●) compared with inulin clearance in 2 control sheep before and 30 days after placement of glass ionomer fillings (○).

the inulin clearance markedly declined from a baseline of 69.5 ± 7.2 ml/min to 32.3 ± 8.1 ml/min by 30 days ($P < 0.01$) and remained low at 27.9 ± 8.7 ml/min by 60 days after placement of amalgam fillings ($P < 0.01$). This represented a 54% reduction in the rate of inulin clearance by 30 days, and all six animals displayed a decline (range 16–84%). By 60 days inulin clearance rate showed a 60% reduction with all animals continuing to have substantially lower kidney filtration rates (range 33–89%) than before amalgam placement. In sheep treated with glass ionomer fillings the baseline inulin clearance was 79.9 ± 2.2 ml/min, which remained unchanged 30 days later at 75.1 ± 2.6 ml/min ($P > 0.70$).

Table 1 shows the average (±SE) plasma electrolyte, urea, and albumin levels, and the urine electrolyte, urea, albumin, and total protein concentrations and enzyme activities in the amalgam-treated sheep. No significant changes were noted in plasma sodium, potassium, urea, or albumin levels after placement of dental amalgam fillings. However, urine concentration of sodium increased significantly from 24.8 ± 7.7 mmol/l before amalgam placement to 82.2 ± 20.3 mmol/l 60 days after placement ($P < 0.05$). By way of contrast, urine albumin concentration declined significantly from 93.0 ± 20.5 mg/l before amalgam placement to 30.1 ± 15.3 mg/l 60 days after placement ($P < 0.05$). Urea and potassium concentrations in urine gradually increased over the 60-day period, but these changes were not statistically significant, nor were differences in urine γ-GT, alkaline phosphatase, or total protein. Total urine volume collected during the 3-h test period after administration of inulin did not change significantly over the 60 days after

TABLE 1. *Effect of amalgam Hg on plasma electrolyte, urea, and albumin levels and on urine concentrations of electrolytes, urea, enzymes, and proteins in six sheep*

	Pre-amalgam	30 Days Post-amalgam	60 Days Post-amalgam
Plasma			
Sodium, mmol/l	156.8±6.4	150.4±2.9	141.3±10.6
Potassium, mmol/l	4.1±0.2	4.0±0.3	3.5±0.3
Urea, mmol/l	8.6±1.1	6.0±0.8	6.0±0.5
Albumin, g/l	34.0±2.1	31.0±0.9	33.3±2.3
Urine			
Sodium, mmol/l	24.8±7.7	67.5±26.2	82.2±20.3*
Potassium, mmol/l	70.2±25.1	88.0±23.0	104.4±42.1
Urea, mmol/l	324.6±117.5	378.0±73.4	401.0±50.1
γ-GT, IU/l	8.25±0.87	8.00±1.16	8.50±0.58
Alkaline phosphatase, IU/l	2.25±0.87	2.25±0.44	2.00±0.02
Albumin, mg/l	93.0±20.5	71.3±46.7	30.1±15.3*
Total protein, g/l	0.43±0.25	0.40±0.24	2.4±2.2
Volume (3-h test), ml	127.0±12.7	104.0±16.8	116.0±19.2

Values are means ± SE. γ-GT, γ-glutamyl transpeptidase; * $P < 0.05$.

amalgam placement.

Figure 2 shows the renal histology by light microscopy of tissue samples taken from two control sheep with glass ionomer fillings and two amalgam-treated sheep. No structural abnormalities of tubules, glomeruli, or renal vessels were evident in either group of animals.

DISCUSSION

The results of the present study demonstrate that Hg released from dental "silver" amalgam will significantly reduce the plasma inulin clearance rate of the kidneys by more than 50% within 1 mo after placement of these tooth fillings. By 2 mo after placement urine albumin concentration falls significantly. During this same period urine concentration of sodium increases significantly while urine volume output remains unchanged.

The values for the baseline (pre-amalgam) inulin clearance rate obtained in the present investigation agree with values previously reported for sheep of 72 ml/min, range 63–90 (20), and with other standard values for inulin clearance in sheep (12). Plasma sodium and potassium levels in samples obtained before amalgam placement agree with standard plasma electrolyte values reported for sheep of 139–164 mmol Na^+/l and 4.4–6.7 mmol K^+/l (1, 5). Urine sodium and potassium concentrations in samples taken before amalgam placement are also in agreement with mid range values derived for sheep on a sodium-limited diet that were 4–40 mmol/l for Na^+ and 40–200 mmol/l for K^+ (4). In the present study urine volume output averaged 0.64 ml/min, which agrees with flow rates obtained in similarly managed sheep of 0.5–1.0 ml/min (4). The limited daily intake of 7 g sodium in the ration provided during this study is somewhat below the recommended daily supplement of 9 g or more estab-

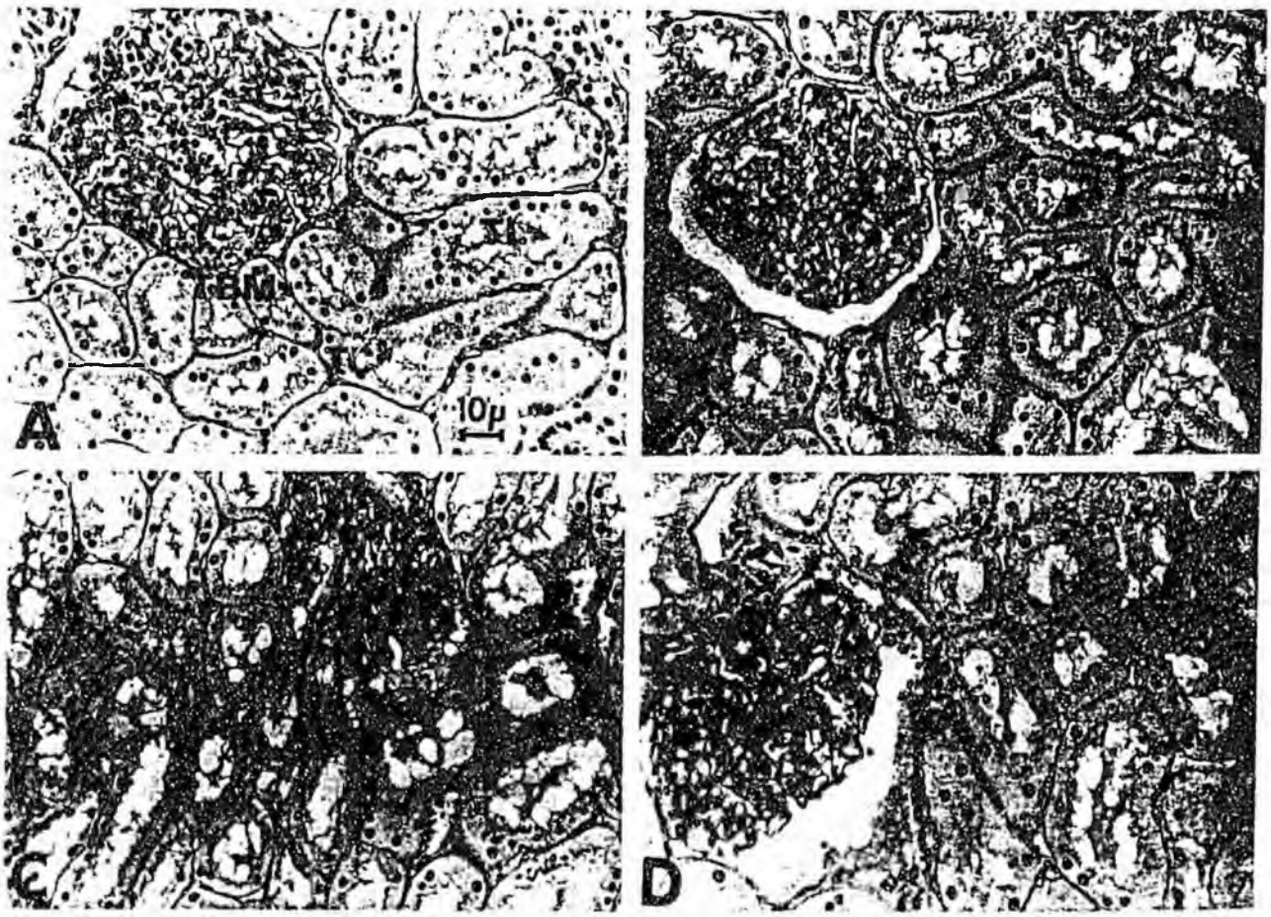

FIG. 2. Renal histology (periodic acid-Schiff stain) in 2 control sheep with glass ionomer fillings (*A* and *B*) and in 2 amalgam-treated sheep (*C* and *D*). TBM, tubular basement membrane; TC, tubular cell; G, glomerulus; TL, tubular lumen.

lished in dry lot feed tests for sheep (26).

It has been well documented that Hg from nonamalgam sources has a deleterious effect on kidney function both at the level of the glomerulus and also at the proximal tubule (7, 9, 14, 19, 22, 24, 25). The route of Hg absorption does not appear to be a factor, since both inhalation and ingestion of inorganic Hg can produce renal disease in rats (3). Our inulin clearance data clearly reveal a reduction of more than twofold in kidney filtration capacity after placement of dental amalgam. Because it is now established that large amounts of amalgam Hg will concentrate in sheep and monkey kidney tissue (10, 11, 30), the continuous release of Hg from this dental material is the likely cause of the marked reduction in inulin clearance observed in our experiments. This finding is consistent with reports by others that a single dose of mercuric chloride will reduce inulin clearance by 59% in rats (18).

There was no increase in plasma urea concentration (even though this might have been expected on the basis of decreased inulin clearance) because the data show that urea excretion was not reduced, indicative of impaired urea reabsorption. This could be a secondary effect due to reduced sodium reabsorption.

The threefold reduction in albumin excretion that was observed was not the result of an alteration in plasma albumin concentration, which remained unchanged. Albumin excretion may be influenced by an alteration in the ultrafiltration coefficient of the glomerular basement membrane and/or a reduction in renal blood flow, which has been found to reduce entry of albumin from the plasma into the glomerular filtrate (6). However, neither of these parameters was measured in the present study.

Sodium loss in the urine increased by more than threefold after placement of dental amalgams, a finding that is indicative of impaired tubular reabsorption. This is a characteristic feature of Hg toxicity and is considered to be the result of the interaction of Hg with membrane bound sulfhydryl groups, which affects tubular cell membrane permeability and cellular enzyme function (15). We believe that the increased urinary sodium excretion reflects a true decrease in tubular reabsorption, because we have no evidence of a compensating exchange mechanism operating for potassium reabsorption with sodium excretion. In fact, potassium excretion also gradually increased, although this increase was not significant. Rats acutely exposed to mercuric chloride likewise display increased fractional excretion of sodium (2, 9). Sodium is the predominant electrolyte excreted in human urine and is assumed to be a reflection of excess sodium in the normal diet. By way of contrast, sheep on limited sodium intake characteristically excrete very low levels of sodium relative to potassium (4, 8) and therefore provide a sensitive measure of reduced tubular capacity for selective conservation of sodium.

There was no increase in the urinary excretion of γ-GT and alkaline phosphatase after amalgam placement. These enzymes are located in the brush-border membrane of the proximal tubules and have been observed to be sensitive and prolonged indicators of acute Hg-induced renal damage in sheep (23) and rats (16, 17, 21). Our findings are, however, consistent with the observation that these enzyme markers may be of less value in subacute or long-term studies (17) and would indicate that the changes in tubular reabsorption of sodium that we observed are specific effects of Hg interactions with membrane proteins (15, 24) that are independent of significant cell damage. The histological data confirm the enzyme findings. No glomerular or tubular changes were evident by light microscopy after the 2-mo course of this study. This would suggest that the changes in renal function that we have observed are not due to an acute nephrotoxicity, but rather are the result of subtle subacute effects from chronic low-dose Hg exposure.

Based on the results of this study, we conclude that exposure to dental amalgam Hg, which is continuously released from routinely used "silver" tooth fillings, may have the potential to precipitate alteration in renal function. Although humans do not usually receive as many amalgam restorations at one time as have these sheep, daily amalgam Hg dose estimates for humans are nevertheless substantial (29, 31) and increase in magnitude with the number of amalgam fillings and as a function of chewing frequency (28). Individuals with 12 or more "silver" amalgam fillings comprise a significant portion of the human population. Thus the possibility of amalgam Hg-induced renal dysfunction should be considered.

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The Relationship between Mercury from Dental Amalgam and Mental Health*

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The findings presented here suggest that mercury poisoning from dental amalgam may play a role in the etiology of mental illness. Comparisons between subjects with and without amalgam showed significant differences in subjective reports of mental health. Subjects who had amalgams removed reported that symptoms of mental illness lessened or disappeared after removal. The data suggest that inorganic mercury poisoning from dental amalgam does affect the mind and emotions.

INTRODUCTION

Mercury Poisoning and Psychological Disorders

Evidence linking mercury exposure to psychological disorders has been accumulating over the past 60 years. Psychological symptoms of mercury poisoning are erethism[1] (irritability, excitability, outbursts of temper and quarreling), extreme shyness and avoidance of strangers, anxiety, tension, depression, and forgetfulness. In severe cases, hallucinations, suicidal tendencies, melancholia, and manic-depressive psychosis may occur.

Mercury poisoning disrupts the emotional sphere and produces psychological disorders as a result of mercury's strong affinity for brain tissue. This paper gives evidence that mercury from dental amalgam may be causing psychological disturbances.

Cases of Mercury-induced Psychological Disorders

During the last century, felt-hat makers were regularly exposed to mercuric nitrate. They became known as "Mad Hatters" because of the emotional problems they developed, including sudden anger, drowsiness, depression, loss of memory, timidity, insomnia, hallucinations, delusions, and mania. In 1941, brain damage due to mercury poisoning was identified as the cause of the Mad Hatter syndrome.[2]

Mayhazati[3] reported on the psychological evaluations of 6,530 Iraqi patients hospitalized after exposure to an organic mercury pesticide. Of 53 mercury-poisoned patients in one hospital, 26 revealed psychological disorders. They were

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depressed, lacked interest, manifested auditory or visual hallucinations, had deficient concentration and poor short-term memory. Of the 43 mercury-poisoned patients in another hospital, 31 were depressed and 19 showed irritability.[4]

Mercury poisoning at Minimata Bay in Japan (now called Minimata Disease) resulted in an increase in the number of babies who developed cerebral palsy and mental retardation. Of the 400 babies born during the time of the mercury poisonings, 24 developed cerebral palsy and many developed mental retardation.[2] Mercury passes easily through the placenta and accumulates in the fetus; therefore, neonates are more likely to suffer mercury toxicity than their mothers.[6]

A Russian study of prenatal mercury poisoning found that 7 of 10 new babies exposed to mercury in utero were mentally retarded, while a report from Sweden identified a mother who had eaten seed treated with alkyl mercury and was unaffected but her child was born with severe retardation.[7]

Workers exposed to mercury vapors in a thermometer factory exhibited a wide range of psychological abnormalities, including forgetfulness, headaches, irritability, poor concentration, and insomnia. They scored below established norms on tests of intelligence, personality, and motor skills. After the exposure to mercury had stopped, their test scores returned to normal within 20 months, except for short-term memory, which remained impaired.[8]

Three dentists who were exposed to mercury in their practices developed symptoms of irritability, excitability, fearfulness, restlessness, melancholy, depression, timidity, fatigue, weakness, indecisiveness, headaches, and hopelessness. These symptoms disappeared after their mercury levels were reduced by medication.[9]

Rats exposed to mercury vapor were found to increase their spontaneous aggressive behavior. Mercury levels as low as 0.002 mg Hg/m^3 were sufficient to induce behavior change.[8] Anger is a common symptom of mercury toxicity.

The evidence suggesting a relationship between psychological disorders and mercury poisoning led Alzheimer's disease researchers to compare post-mortem brain-tissue samples of Alzheimer's patients to a control group. They found elevated levels of mercury in the Alzheimer's samples. In fact, this mercury imbalance is the largest trace-element imbalance that researchers have observed to date. The source of the brain mercury is not known, but dental amalgam has been suggested as a possible source.[10]

Mercury Poisoning and Dental Amalgam

Four factors led us to study the relationships among dental amalgam, mercury poisoning, and mental health: (1) mercury's affinity for brain tissue, (2) the relationship between mercury poisoning and psychological disorders, (3) the proximity of mercury-laden dental amalgam to the brain, and, (4) the release of mercury vapor from the amalgam.

Mercury is one of the most toxic metals since it disrupts most biological systems as a result of its affinity for sulfhydryl groups, which are functional components of most enzymes and hormones.[11] Over a long period, small amounts of mercury exposure can produce the same devastating effects as a large dose in a short time. Insidious long-term exposure to mercury can produce damage after many years with no trace of the etiology of the problem.[12]

Stock[13] found that 3 $\mu g/m^3$ of mercury in the air during constant work did not cause noticeable health symptoms except for people with hypersensitivity to mercury. Daily mercury concentrations of 10–20 $\mu g/m^3$ in the work room produced physical and mental symptoms in the majority of employees. However, Stock reported that neurological symptoms associated with a mercury concentration of 2.1 $\mu g/m^3$ in expired air disappeared after amalgam removal.

In the United States and Europe, the maximum allowable mercury concentration is 50 $\mu g/m^3$ in the air.[12] This concentration is based on a daily exposure of 8 hours/day during a 5-day work week. In the Soviet Union and Sweden, the standard is 10 $\mu g/m^3$.

Nearly 80 percent of the world's dental caries are filled with dental amalgam (silver fillings). This unstable alloy is approximately 50 percent mercury and continuously releases elemental mercury.[14,15]

Inorganic mercury in amalgam may be methylated by bacteria, such as streptococcus mutans, which also cause dental caries.[16] Methyl mercury is one of the most toxic forms of mercury.

According to Gay[14] and Svare,[15] mercury vapors are released from dental-amalgam restorations. They found a direct correlation between the amount of mercury released and the number of amalgams. More mercury (up to 87.5 $\mu g/m^3$) is released during chewing. Newer fillings release four times as much mercury after chewing than before, and week-old fillings show a 17-fold increase in mercury released after chewing.

Vimy and Lorschneider[17] measured intra-oral mercury and calculated that subjects with twelve or more occlusal amalgam surfaces received an average daily dose of 29 μg of mercury. Subjects with one to four amalgams received an average daily dose of 9 μg. These levels exceed many countries' accepted standards for environmental mercury exposure. Radics et al.[18] analyzed the outer corroded area of an amalgam that was depleted of mercury. His calculations suggested that a mouth with many fillings could release up to 560 mg of mercury over several years. If the loss took place over ten years, the daily dose would be 150 μg., a very toxic dose.

Pleva[19] found that the chewing surface of a 5-year-old amalgam had lost almost half its mercury; a 20-year-old amalgam had no mercury left on the chewing surface. Pleva, a corrosion scientist in Sweden, described his multitude of health problems of 20-year duration. It was only after he had discovered the corrosion of his amalgams that he began to suspect mercury poisoning. Within

three months after amalgam removal, most of his mental health symptoms—anxiety, irritability, indecision, tiredness, loss of interest, feeling old, resistance to intellectual work, feeling stressed—disappeared.

Mercury's Path to the Brain

Mercury is released from dental amalgam as elemental mercury vapor. An average of 75 to 80 percent of the elemental mercury vapor can be inhaled and absorbed through the alveoli of the lungs where it passes into the blood stream rapidly and completely.[6,20] Elemental mercury (Hg^0) passes through the blood-brain barrier before it is ionized and is retained within the brain. Dissolved elemental mercury is detectable in the blood up to 15 minutes after exposure to mercury vapor. Mercury vapor can remain in the blood for more than one circulation and is oxidized by the catalase system to the toxic mercuric ion.[11]

In studies of rats exposed to elemental mercury vapor, 20 percent of the absorbed mercury remained in the brain after six months.[21]

Another avenue of mercury poisoning from dental amalgam may be by absorption through the valveless cranial venous system. Mercury vapor may settle down into the oronasal region and be absorbed directly into the venous system to the brain. Störtebecker[16] found evidence that mercury vapors are deposited in the upper nasal part of the ethmoid region. Mercury could be transported via the filia olfactory to the olfactory bulbs on the base of the skull, and then into the brain.

In animal experiments with mercury vapor, Stock[13] measured a high concentration of mercury in the olfactory lobe and frontal brain.

Eggleston et al.[22] confirmed this finding in humans by performing post-mortem analyses on various brain regions. He found higher concentrations of mercury in the olfactory region and pituitary gland in humans with amalgams compared to those without. He also found a direct correlation between the number of amalgams and the mercury concentrations in the brain.

METHOD

The strong evidence linking dental amalgam with mercury poisoning and associated psychological disorders led us to design a study that evaluated the mental health of subjects with and without dental amalgam.

SUBJECTS

We selected 70 subjects from respondents to ads in the local college newspaper; 23 subjects volunteered from student physiology labs; and 8 came from a local fraternity house. None was paid.

The amalgam and nonamalgam groups were matched for sex and age. Of the 101 subjects, 50 (30 females and 20 males) had amalgams and 51 (30 females and 21 males) had no dental fillings. The average age of the nonamalgam group was

22.35 compared to 23.28 for the amalgam group. The males averaged 10.1 amalgams and the females 9.8.

Mercury Tests

A hair sample from the nape of the neck and a urine specimen, the first upon arising in the morning, were obtained from each subject and analyzed for mercury content (Table I).

Mental Health Questionnaires

Volunteers completed two mental-health questionnaires designed to evaluate their subjective perception of their mental status. One survey was completed at home and the other while waiting for lab testing.

Health questionnaire I (Table II) asked subjects to rate their stress tolerance, stress level, emotional and physical health, their happiness, peace of mind, reading comprehension, and grade-point average.

Health questionnaire II (see Table III) asked whether the respondent experienced emotional or psychological symptoms, such as sudden anger, depression, irritability, suicidal tendencies, or frequent anxiety. It evaluated additional psychological distress symptoms, including lack of interest, shyness, nightmares, forgetfulness, lack of confidence, nervousness, fear, loss of memory, and indecisiveness.

In addition to the test groups, a mental-health questionnaire also was sent to nearly 300 subjects who had their amalgams removed by a Utah dentist. Eighty-six of them responded, including 60 females and 26 males who averaged 40.41 years in age. This aspect of the study was not controlled and the epidemiological information acquired did not account for any placebo effect. Subjects were asked to list any mental health symptoms they had within the year before amalgam removal. They were then instructed to evaluate such symptoms after amalgam removal by stating if they had improved, got worse, were eliminated, or did not change. The mean number of amalgams reported removed

TABLE I.

MERCURY IN TISSUE

	Amalgam	S.D.	Non-Amalgam	S.D.	% Difference	Significance (P)
Hair Mercury (ppm)	1.43	0.50	1.13	0.54	26.5%	0.008
Urine Mercury (ppb)	3.70	3.78	1.23	1.79	201%	0.0002

TABLE II

HEALTH QUESTIONNAIRE I

Question	Non-Amalgam	S.D.	Amalgam	S.D.	Significance (P)
MENTAL					
1. Stress Tolerance*	1.76	0.67	1.70	0.63	0.296
2. Amount of Stress*	2.30	0.55	2.41	0.54	0.157
3. Emotion Level*	2.13	0.49	2.26	0.61	0.122
4. Health**	8.36	1.50	8.15	1.03	0.220
5. Happiness**	8.48	1.09	8.02	1.41	0.047
6. Peace of Mind**	8.02	1.36	7.54	1.76	0.075
7. Reading Comprehension:					
Good	41		35		
Average	5		12		
Poor	0		0		0.04
8. Grade Point Average (on a 4.0 scale)	3.15	0.44	3.07	0.36	0.196

*(1 good, 2 average, 3 poor)
**(scale 1-10, 10 best)

was 10.77 and the last amalgam removal averaged 9.95 months before they completed the questionnaire.

Physical Assessments

A dental assistant and dental hygienist recorded the dental status of each subject. A complete blood count, which included a hemoglobin count, was taken for each subject.

Data Analysis

The data were analyzed by chi square, an analysis of variance, Pearson Correlation Coefficient, and Spearman Correlation Coefficient.

RESULTS

Mercury in Tissues

The tissue levels of mercury were 201 percent higher ($P = 0.0002$) in urine samples of the members of the amalgam group and their haar mercury levels were

TABLE III

HEALTH QUESTIONNAIRE II

Symptoms	Non-Amalgam n=48	Amalgam n=47	Significance (P)
EMOTIONAL AND MENTAL			
1. Sudden Anger	1	10	0.0046
2. Depression	7	18	0.008
3. Wish you were dead	2	4	0.327
4. Irritability	9	19	0.018
5. Suicidal Tendencies	1	4	0.173
6. Divorced	0	1	0.495
7. Frequent Anxiety	9	13	0.225
TOTAL	29*	69*	0.007

*.60 symptoms/subject
**1.47 symptoms/subject

145% more symptoms/subject in amalgams group.

26.5 percent higher (P = 0.008) in hair samples (Table I). Within the amalgam group, urine mercury correlated directly with the number of fillings (r = 0.46, P = 0.001) as did hair mercury (r = 0.23, P = 0.09). These findings support those of Abraham,[23] who found higher blood-mercury levels in amalgam-bearing subjects, and Svare and Peterson,[24] who measured a decrease in blood-mercury levels after amalgam removal.

Mental Health Questionnaire I

Amalgam subjects reported being significantly less happy and having less peace of mind; they rated their reading comprehension as being significantly lower (Table II). Although not at a significant level, they rated themselves as being less healthy, having more stress, and being more emotional than nonamalgam subjects.

Mental Health Questionnaire II

The amalgam subjects reported more emotional-distress symptoms (145%). They indicated significantly more episodes of sudden anger, depression, and irritability. Suicidal tendencies and anxiety were also found more frequently in

the amalgam group (Table III). They experienced more nightmares (amalgam = 7, nonamalgam = 4, P = 0.285), were more nervous (amalgam = 12, nonamalgam = 8, P = 0.26), experienced fear (amalgam = 6, nonamalgam = 3, P = 0.26), had poorer concentration (amalgam = 12, nonamalgam = 8, P = 0.26), lacked confidence (amalgam = 10, nonamalgam = 5, P = 0.15), had more difficulty making decisions (amalgam = 10, nonamalgam = 6, P = 0.196), had poorer attention (amalgam = 7, nonamalgam = 4, P = 0.285), and were more forgetful (amalgam = 10, nonamalgam = 8, P = 0.438). While these symptoms are not individually statistically significant between groups, when all these symptoms are totalled, the amalgam group reported 60.9 percent more symptoms.

When lifestyle was assessed, the amalgam group appeared to have a poorer lifestyle defined by these factors: They craved and ate more sweets (amalgam = 10, nonamalgam = 6, P = 0.21), smoked more cigarettes (amalgam = 6, nonamalgam = 1, P = 0.08), consumed more alcohol (>1 alcoholic drink daily, amalgam = 5, nonamalgam = 3, P = 0.38), and drank more coffee (>2 cups of coffee daily; amalgam = 14, nonamalgam = 9, P = 0.175) than the nonamalgam group.

Amalgam-removed Group Responses

Not all 86 respondents in the with amalgam-removed group responded to each question. Sixty-seven (80%) of 84 reported they felt better since removal; 78 (91%) of 86 were glad they had undergone the removal, and 76 (88%) of 86 said they would undergo the procedure again (Table IV). Only three subjects reported feeling worse after removal.

After removal, subjects reported they were 47.8 percent more tolerant to stress with 53 (68%) of 78 respondents of the group reporting better tolerance; 35 (44%) of 79 respondents felt they were less emotional. Health improved in 63.8 percent of the volunteers following amalgam removal and no one reported deterioration in health. The subjects in the whole group reported their health improved by an average of 26.2 percent. Happiness and peace of mind improved in 46 (58%) of 79 respondents. The overall group rated themselves as 26.4 percent happier and felt they had 27.6 percent more peace of mind.

The 86 subjects reported a total of 409 psychological symptoms before removal. Within an average of ten months after removal, 275 (67%) of the symptoms improved, 62 (15%) were eliminated, 61 (15%) did not change, and 10 (3%) got worse.

Of 31 subjects reporting sudden anger, 28 (90%) said that emotion had weakened or was eliminated. Depression was reported by 38 subjects before removal, and 32 (84%) of depressive symptoms were improved or eliminated. Irritability, a common result of mercury exposure, lessed in 29 (83%) of 35 subjects after removal. Many other symptoms associated with mercury toxicity improved after amalgam removal; frequent anxiety was lessened or eliminated in

TABLE IV

HEALTH QUESTIONNAIRE I
AFTER AMALGAM REMOVAL

A. Feeling Better: Yes - 67 (80%); No - 17 (20%)
On a scale of 0% to 100%, the subjects said they felt an average of 48% better after removal. The 67 subjects which felt better, felt 59% better.

B. Feeling Worse: Yes - 11 (14%); No - 70 (86%)
Of the 11 subject who said they felt worse, 9 said they also felt better after removal. Some said they felt worse immediately after removal, then felt better. Only 3 felt worse after amalgam removal than before. On a scale of 0% to 100%, the 11 subjects that felt worse said they felt 21% worse, but said they felt 47% better on the "feeling better" question.

C. Adverse Effects: Yes - 30 (37%); No - 52 (63%)
Most adverse effects were minor, and cleared up shortly after amalgam removal.

D. Are you glad you had your amalgams removed?
Yes - 78 (91%)
No - 1 (1%)
No Response - 7 (8%)

E. If you had to do it again, would you have your amalgams removed?
Yes - 76 (88%)
No - 8 (9%)
No response - 2 (2%)

F. Did you have any gold filling in your mouth at the same time you had amalgam fillings?
Yes - 32 (37%)
No - 50 (58%)
No Response - 4 (5%)

G. Do you crave sweets?
Before removal: Yes - 49 (60.4%); No - 32 (39.5%)
After removal: Yes - 32 (39.5%); No - 33 (40.7%);
Less - 16 (19.8%)

31 (89%) of 35 subjects; nervousness declined in 23 (82%) of 28 patients; nightmares got better in all 12 subjects; all 10 subjects who reported suicidal tendencies said that condition was improved or eliminated; forgetfulness improved in 20 (63%) of 32 subjects; while 19 (73%) of 26 subjects reported their memory improved; and confidence increased in 21 (84%) of 25 volunteers who had their amalgams removed. Before amalgam removal, 49 (60.4%) of the 81 respondents craved sweets and, after removal, only 30 (39.5%) did.

Subjects with amalgams tired more easily compared to nonamalgam volunteers (amalgam = 11, nonamalgam = 2, P = 0.007) and more amalgam subjects complained of being tired in the morning (amalgam = 25, nonamalgam = 10, P = 0.001). After amalgam removal, 18 (53%) of 34 subjects said their fatigue was improved or eliminated, and they were not as tired in the morning. Another 21 (54%) of 39 subjects said they did not tire as easily.

DISCUSSION

Dental Amalgam and Mercury Toxicity

The relationships between dental amalgam, mercury poisoning, and psychological disorders are provocative and may have significant implications for effective mental health treatment. Although the number of subjects in this study is small (50 subjects with amalgam and 51 subjects without), the results are statistically significant and warrant additional research.

Our data demonstrate that tissue levels of mercury are higher in amalgam-bearing subjects. Dental amalgam produces higher concentrations of mercury in the blood, which may be deposited in the brain, as Eggleston found in a post-mortem study.[22]

The toxicity of mercury in the brain and the psychological symptoms that result are well established in the cases reviewed here. The psychological symptoms of mercury poisoning occurred significantly more often in the amalgam group in our study, suggesting that mercury toxicity from the breakdown of dental amalgam could be a cause of psychological disorders. Amalgam subjects reported more irritability, depression, fatigue, suicidal thoughts, anxiety, sudden anger, fear, nervousness, and memory loss than subjects without amalgam.

If mercury toxicity from dental amalgam causes psychological distress symptoms, removal of the amalgam should alleviate the symptoms, a finding that is supported by reports from 86 amalgam-removal subjects. These subjects found that 82 percent of their psychological disorders were either improved or eliminated after amalgam removal within an average of 10 months.

Mercury and Stress

Stress is now recognized as one of the leading causes of health problems. Most of the mental health problems caused by mercury are stress symptoms such as anger, irritability, and anxiety. The ability to manage stress is directly related

to a person's mental health. More than 68 percent of the subjects reported their stress tolerance improved after amalgam removal. Perhaps their 48 percent greater tolerance to stress after amalgam removal would explain their increase in reported happiness, peace of mind, and improved mental health. This evidence suggests that the environmental stress of mercury from dental amalgam could be an unrealized burden, resulting in adverse mental-health effects.

Mercury and Fatigue

Fatigue is characteristic of mercury toxicity. The subjects with amalgam complained significantly more of tiring easily and feeling tired upon awakening compared to the group without amalgams. One hypothesis to explain this fatigue is the significantly lower hemoglobin counts of amalgam-bearing subjects found in this study. A significant correlation was found between high urine mercury levels and low hemoglobin levels ($r = 0.42$, $P = 0.003$).

This evidence suggests that mercury may impair hemoglobin's ability to carry oxygen, which would produce fatigue. Hemoglobin has a number of key sulfhydryl groups, which may attract mercury. We also found that mercuric chloride causes free oxyradicals in the hemoglobin molecule which contributes to an increased oxidation rate and the destruction of the molecule. This may explain why fatigue symptoms improved or were eliminated in 18 (53%) of 34 subjects after amalgam removal.

Mercury and Memory

Amalgam subjects reported poorer reading comprehension. Forty-five percent of the respondents whose amalgams were removed, felt their reading comprehension improved. Inorganic mercury toxicity causes a loss of short-term memory.[8] This mercury-related memory impairment may underlie the poor reading comprehension. Correlative evidence for this hypothesis comes from a Department of Education study that found children's reading comprehension had improved since 1971—a time of decreasing dental caries in children.[25]

Mercury and Pre-menstrual Syndrome

In this study women with amalgams reported significantly more menstrual difficulties than those without (amalgam = 16, nonamalgam = 10; $P = 0.09$). Of 12 women reporting menstrual disorders whose amalgams were removed, 9 said their problems were improved or eliminated after removal. Lamperti's study of the hamster found that mercuric chloride suppressed progesterone levels and affected the estrous cycle.[26] Mercury retarded the follicular development in the ovaries and damaged the luteal cell membrane of the corpus lutea, which is necessary for steroid production. Lamperti concluded that "mercury directly affected the responsiveness of the ovary and pituitary to hormonal stimulation." Many emotional and mental problems are associated with premenstrual syndrome.

Mercury and Lifestyle

The lifestyle questionnaire found the lifestyle of the amalgam group to be poorer than the nonamalgam group. They craved and ate more sweets, smoked more cigarettes, drank more coffee, and consumed more alcohol. Could this lifestyle contribute to the poorer health of the amalgam subjects or is it the result of mercury toxicity from dental amalgam? Maybe both. We hypothesize that if people are nervous, depressed, angry, and tired—as amalgam-bearing subjects are—they might drink more coffee as a stimulant to fight fatigue, smoke more cigarettes as a nervous habit, and drink more alcohol because they are depressed. Emotional problems can lead to substance abuse, and a link may exist between mercury toxicity and these problems.

SUMMARY

The most common symptoms of inorganic mercury poisoning are related to mental health. The data presented here suggest that the release of mercury vapor from dental amalgam may cause mercury toxicity and produce psychological distress symptoms. Dental mercury, which is universally used, may be a significant health hazard. Psychotherapists should consider mercury toxicity as a possible cause in the treatment of psychological disorders from mild stress-related complaints to cases of schizophrenia, paranoia, and the other severe psychological diseases.

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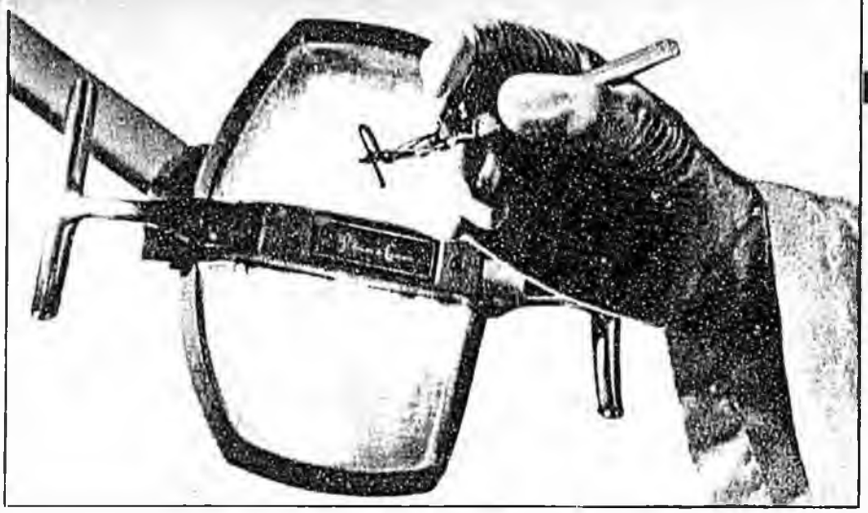


THE MERCURY IN YOUR MOUTH

You can avoid amalgam fillings or even replace the ones you have. But should you?

Last December, when the popular CBS-TV show "60 Minutes" suggested that the mercury in dental fillings is a perilous poison, thousands of viewers besieged their dentists about having their amalgams removed. Switchboards lit up at state dental societies, dental schools, and the American Dental Association (ADA). Groups opposed to dental amalgam were inundated with inquiries. And two New Mexico state legislators were moved to introduce a bill banning amalgam fillings.

The fear raised by the "60 Minutes" report is understandable. After all, dental amalgam is an intimate part of the American experience. Each year in the U. S., up to 100 million of the silver-colored fillings are used to restore decayed teeth. Almost half of each filling is mercury, which is combined with silver, tin, and other metals. If amalgam does cause ills ranging from migraines to multiple sclerosis, a possibility "60 Minutes" left wide open, the vast majority of the population is at risk.

Spinoffs from the "60 Minutes" program—local TV shows, radio interviews, newspaper articles—have kept public anxiety high. Local chapters of the grass-roots support group DAMS (for Dental Amalgam Mercury Syndrome) report that requests for information have continued, months after the network show.

Some patients contacting their dentists may have their worries confirmed. Dr. Louis Beaudette, president of the Vermont State Dental Society, told the Burlington Free Press that he'd recommend amalgam removal for people who have illnesses with no known cause. "I'd say, 'Take them out. You have nothing to lose,' " Beaudette was quoted as saying.

Faced with growing public concern, the National Institute of Dental Research (NIDR) is reluctantly discussing a large-scale investigation to look for a link between dental amalgam and assorted health problems. "We're not convinced we need a nationwide epidemiologic study," says Dr. Joyce Reese, an NIDR health scientist administrator. "We have no evidence that amalgam is a health threat. But we want answers that will put this issue to rest."

A running battle

The current skirmish is only the latest in what's come to be known as the Amalgam Wars. Amalgam drew fire in 1979, when University of Iowa researchers, using sensitive new measurement techniques, found that chewing releases tiny amounts of mercury vapor from fillings. This ran counter to the prevailing belief that no vapor escapes once amalgam has hardened, and scientists began to take a closer look. They found—in some but not all studies—that people with amalgam fillings had more mercury in their blood and urine than did those without, and that the levels seemed to correlate with the size and number of fillings. Further, a few autopsy studies showed more mercury in the brain tissue of people with amalgams. These suggestions that mercury liberated from fillings finds its way into body tissues became ammunition for amalgam foes.

It has long been known that mercury vapor can have toxic effects, particularly on the brain and nervous system. Exposed to high mercury levels for long periods, workers in thermometer factories and elsewhere have experienced severe tremors, confusion, vision and speech problems, and inflamed gums. Exposure to lower levels can cause weakness, fatigue, minor tremors, and other symptoms.

The question in the amalgam debate is whether the minute amount of mercury vapor thought to emanate from fillings has any health effect at all.

A tale of six sheep

Late last year it appeared a smoking gun had been found. Researchers at the University of Calgary in Alberta, Canada, placed 12 amalgam fillings in each of six sheep. Within two months, they reported, the test animals had lost 60 percent of kidney function, while two control sheep had lost none. The "60 Minutes" segment showed a seemingly alarming X-ray of a sheep's mercury-laced digestive tract while reporting on the study uncritically.

However, experts in biochemistry, toxicology, and veterinary medicine have been highly critical of the study. The first problem, say critics, is that sheep are an inappropriate model. Sheep have large, flat teeth that wear down and erupt anew. They are ruminants: They chew, swallow, and rechew their food 15 hours a day. And their diet of grass and grains is fairly abrasive. Those factors alone would cause dental fillings to erode and be swallowed in bits and pieces by the animal. But there's yet another factor: The amalgam placed in the sheep contained a higher proportion of mercury than that used in humans, giving it a softer, wetter consistency, like cake mix with too much water.

As a result, says one expert, when a sheep with radioactive amalgams was placed in a scanner, its gastrointestinal tract "lit up like a Christmas tree." The sheep were rapidly swallowing their fillings. But no one contends that people swallow fillings; the concern is over inhaled mercury vapor, not ingested mercury.

Moreover, experts doubt whether the sheep experienced any kidney damage at all. The changes reported in the animals' renal function were just the opposite of what happens

when kidneys are impaired, says Dr. Richard Malvin, a University of Michigan specialist in renal physiology who served on an ADA panel that reviewed the sheep study. For instance, damage to the kidney's filtering system typically causes blood levels of urea, a waste product, to rise. Instead, those levels fell, contradicting the researchers' claim of kidney damage.

More relevant to the issue of health effects on people are several recent population studies. In one, dentists with abnormally high concentrations of urinary mercury—attributable to occupational exposure—showed no evidence of kidney impairment on several key measures of renal function. Another study, which appeared in the March issue of the Journal of the American Dental Association, examined the claim that dental amalgam interferes with immune function. The researchers found that subjects with dental fillings had the same number of disease-fighting white blood cells as people who were amalgam-free. Similarly, a Swedish researcher found no differences between amalgam and nonamalgam groups in measures used to assess immune-system health, liver and kidney function, and skeletal-muscle status.

Finally, a study of 1024 Swedish women looked at the prevalence of 30 symptoms often claimed to reflect toxic effects of amalgam, including fatigue, dizziness, irritability, and back pain. Women with more than 20 fillings were no more likely to complain of these symptoms than women with few or no amalgams.

In fact, the only documented health effect associated with amalgams is the rare case of mercury allergy, thought to affect fewer than one in a million people. An allergic reaction to amalgam usually includes local rashes and swelling of the mouth, face, or neck area, and often improves without intervention.

Crunching the numbers

A major focus in the amalgam debate has been just how much mercury we get from our fillings. That's critical because "dose makes the poison," says toxicologist N. Karle Mottet, a professor of pathology and environmental health at the University of Washington School of Medicine. Usually harmless substances needed for survival—like vitamin A—can be toxic in very large doses, while known poisons are often harmless in tiny amounts.

Early estimates of our daily mercury dose from amalgams, based on the amount of vapor measured in the mouths of volunteers after vigorous gum-chewing, were alarmingly high. But they failed to account for real-life conditions that limit the actual dose—for instance, the amount of nose-breathing as opposed to mouth breathing, and the length of time spent chewing each day.

Standards set by the Occupational Safety and Health Administration estimate the mercury-vapor concentration to which even the most sensitive workers can be chronically exposed without suffering adverse effects. Under OSHA guidelines, the maximum "safe" occupational dose approximates roughly 300 to 500 micrograms per day, depending on physical activity. Current estimates predict that people with a moderate to large number of fillings are exposed to 1 to 3 micrograms of mercury vapor daily, or barely 1 percent of the dose considered safe.

Our exposure to mercury from dental amalgams is also less than our exposure from foods such as tuna and swordfish, which contain methyl mercury, a more toxic form.

Most important, amalgams contribute far less mercury to our total body burden—as estimated by blood and urine levels and confirmed in autopsies—than the levels at which toxic effects are seen. For instance, the lowest level at which neurologic symptoms (tremors, muscle weakness, fatigue) have been noted is 100 micrograms of urinary mercury per gram of urinary creatinine. Effects not noticeable to the individual, such as a slowdown in the speed of nerve conduction, have appeared between 25 and 100 micrograms of mercury per gram of creatinine. By contrast, very extensive amalgam restorations are associated with a maximum level of only 4 micrograms of mercury per gram of creatinine (see the chart on page 318).

"From all the studies I know, most people who aren't occupationally exposed just don't have a body burden of mercury associated with adverse health effects," says University of Washington toxicologist Mottet. Environmental-health experts recognize that susceptibility to toxic effects varies among individuals and that some groups are more sensitive than others. Nevertheless, there's no evidence that even potentially vulnerable populations, such as pregnant women and young children, are at any risk from the low levels of mercury vapor from amalgams.

If you want to check your own mercury status, your doctor can run mercury tests. Blood tests measure recent exposure and look for signs of toxicity, such as liver or kidney impairment. A 24-hour urine test shows chronic exposure, the type that would be associated with inhaling mercury vapor from amalgams. Urine levels above 25 micrograms per gram of creatinine may indicate mercury poisoning. Levels below 25 micrograms have not been associ-

Verboten in Germany? "60 Minutes" somberly reported that legislation in Germany to ban amalgam would be "passed within the year." But the Institute of German Dentists says no such law is even pending.

Banned in Paint

WHY NOT IN FILLINGS?

Last summer, the U.S. Environmental Protection Agency banned mercury from interior latex paints after finding dangerously high levels of mercury vapor in a few recently painted homes. That scare has passed, thanks to good compliance with the new regulation (see the report on latex paints, page 335). But amalgam opponents—a small but vocal group of scientists, dentists, and grass-roots organizers—have seized upon the episode as support for their claims. Why put something in our mouths that's harmful in our homes, they argue.

The reason is that dose makes the difference. The Government action followed an incident in which a four-year-old Michigan boy developed acrodynia, a rare form of mercury poisoning marked by rapid heartbeat, profuse sweating, peeling skin, and severe pain. The illness was tracked to fumes from mercury-containing latex paint, used in the boy's house 10 days before. A subsequent study found that people living in recently painted homes had urine mercury levels as high as 118 micrograms of mercury per gram of creatinine.

Symptoms from inhaled mercury vapor can begin at about the 100-microgram level, and the risk grows with increasing exposure. (See the chart on page 318.) By comparison, urine mercury levels attributable to extensive amalgam fillings top out at 4 micrograms of mercury per gram of creatinine, far below the levels linked to overt symptoms or subtle subclinical changes.

Body basics
Given low doses, the human body can rid itself of toxic agents such as mercury or render them harmless.

ated with any adverse effects, noticeable or otherwise.

Prospecting for diseases

Lacking a sound scientific foothold, anti-amalgamists have nonetheless come up with diagnostic measures other than blood and urine tests to convince patients to part with their fillings. One is the symptom questionnaire, a lengthy list of inquiries about skin problems, digestion, blood diseases, depression, insomnia, and other difficulties. Almost any symptom may be amalgam-related, say some dentists, "because mercury goes to all tissues and organs."

A favorite diagnostic tool in the 1980s was a skin patch test for mercury allergy or "hypersensitivity." Besides blurring the distinction between allergy—a specific immune reaction—and mercury poisoning, the test used a highly irritating dose of mercuric chloride. "It's like scratching your arm with a nail and concluding you're sensitive to nails," says Dr. Robert Baratz, an authority on the amalgam issue.

Then came the mercury-vapor detector, still widely used and also featured in the "60 Minutes" report, lending an aura of "science" to the measurement of mercury vapor in the mouth. The detector is designed to measure mercury fumes in the workplace, not in the mouth. Used in the mouth, it sucks up a small volume of air and multiplies the mercury level to estimate the amount present in a cubic meter of air. That allows dentists to compare the amount of mercury detected in a patient's mouth with permissible levels in the workplace. The results are usually alarming.

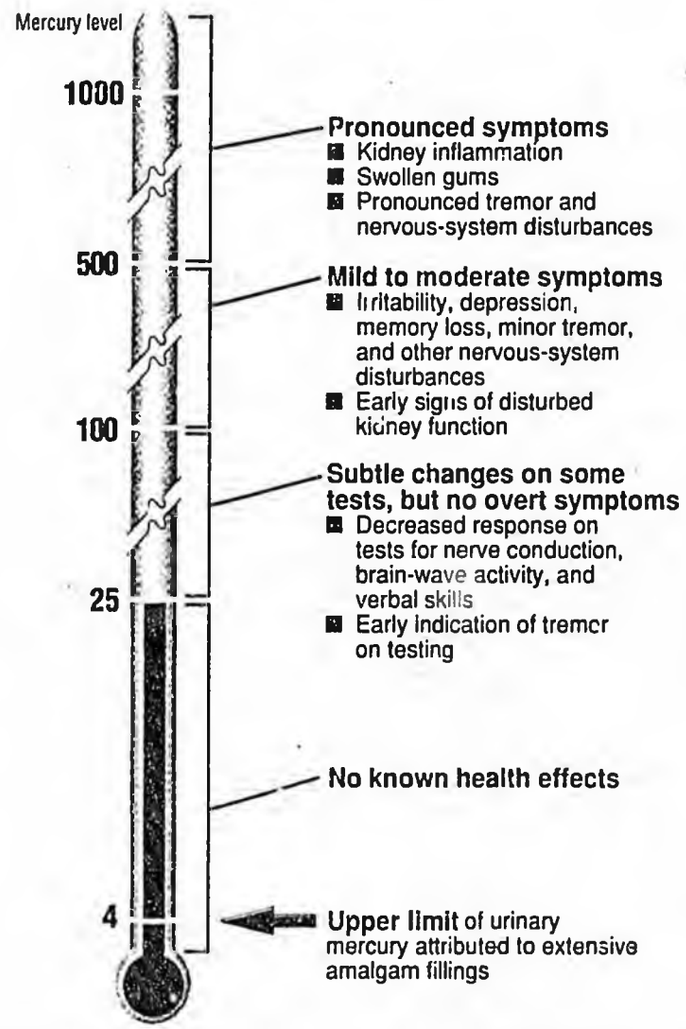
However, so are the flaws in this test. For one thing, the measurement is typically taken after 10 minutes of chewing, which maximizes the release of mercury vapor. But people chew only a few hours a day, at most, and inhale only a fraction of the vapor that's formed. Further, by measuring the air directly over a filling, the technique overestimates the mercury vapor in the rest of the mouth—an error that then becomes multiplied.

One thing amalgam opponents have gauged correctly is the power of speculation. Anyone with a chronic, baffling illness, such as rheumatoid arthritis or multiple sclerosis, could hardly ignore the possibility that mercury might be the key to the problem—or resist the hope that a simple cure was now possible. Others are worried that even the low levels released by amalgams might be hazardous in some way. Such speculation is behind the efforts of activists in Michigan, Illinois, and other states to pass informed-consent laws. The legislation would require dentists to inform patients of the possible hazards of mercury fillings, and to discuss alternatives to amalgam. The ADA opposes the laws because informed consent presumes the presence of risk. A risk from amalgam hasn't been demonstrated, even in pregnancy.

Although severe birth defects have occurred in cases of methyl mercury poisoning, none have been attributed to mercury vapor, especially at the low levels associated with amalgam. A study of 30,000 female dental assistants and the wives of 29,000 dentists, divided into high- and low-mercury exposure groups, found no difference between the two groups in the incidence of miscarriage or of birth defects in their offspring.

EFFECTS OF MERCURY VAPOR

The risk from mercury vapor depends on the amount and duration of exposure to it. A person's chronic exposure from all sources is reflected in the concentration of mercury excreted in the urine. If a problem is suspected, physicians can order a standard test for urinary mercury, with results expressed in micrograms of mercury per gram of creatinine. The chart below, also expressed in the same urinary measurement, provides an approximate gauge of typical health effects associated with various mercury levels.



But what about the dramatic recoveries reported by some people with migraines, multiple sclerosis, or other disorders after having their amalgams removed?

Recoveries reconsidered

"Ten anecdotes don't make one good experiment," notes University of Michigan physiologist Malvin. "Throughout history people have tried terrible 'cures' based on anecdote, from laetrile to bee stings." What appears to be a positive response to removing amalgams may actually be a placebo effect or spontaneous improvement in the course of the disease. Both are common in multiple sclerosis, rheumatoid arthritis, and other illnesses blamed on amalgam. Spontaneous remission of symptoms may sometimes last for several months or even years.

Some testimonials are suspect because the symptoms said to disappear are unrelated to any known effects of mercury poisoning. Other symptoms pinned on dental fillings, such as weakness, weight loss, and emotional changes, are indistinguishable from those of depression or other illnesses. And some claims—such as the woman crippled by multiple sclerosis who went dancing the night after her amalgams came out (featured on the "60 Minutes" segment)—are downright implausible. If a person regularly takes in more mercury than the body can excrete, the level in tissues increases slowly over time until symptoms of toxicity appear. Conversely, mercury is also eliminated from the body slowly, so it would take several months for symptoms to disappear. An overnight recovery indicates that something other than mercury was involved.

Notably absent among such testimonials (and from "60 Minutes") are the stories of countless people who've had their fillings out to no avail. Recently, an Iowa dentist was barred from practice for five years for advising a woman with multiple sclerosis to have her amalgams removed. Unable to pay $9000 to replace them with porcelain and gold, the woman had all her teeth extracted and replaced with dentures. A month later her illness worsened and she was hospitalized.

Dr. Thomas W. Clarkson, director of the Environmental Health Sciences Center at the University of Rochester, New York, and a leading authority on mercury toxicity, says the possibility that some people are unusually susceptible to the mercury in amalgams remains speculation. "There are diseases without any known cause, and it has to be left at that. To say that mercury is the cause of these diseases isn't reasonable. There's just not enough evidence for it."

Eyeing the options

The arguments in the amalgam debate come down to two opposing demands. Critics of amalgam want proof that it's safe; supporters want proof that there's a genuine hazard.

The ADA and other proponents are hoping a major study like the one envisioned by the National Institute of Dental Research will give a scientific stamp to their vast and positive experience with amalgam. But ultimately, "we can't prove anything is absolutely safe, not even drinking water," says Dr. John Stamm, dean of the University of North Carolina dental school in Chapel Hill.

Amalgam opponents view that uncertainty as an unacceptable risk. But all risks have to be measured against the alternatives. Amalgam has held sway for more than a century because it's strong and durable, able to withstand the tremendous pressures of chewing and grinding. It's also easy to place, relatively inexpensive, and has properties that protect against further decay.

The main alternative to amalgams are composite resin fillings—tooth-colored plastic materials that score high on cosmetic appeal. Although fine for front teeth, composites placed in back molars are slowly eroded by a combination of chewing stress and certain substances in food. Composites are also difficult to place precisely, and a poor fit can leave room for decay-producing bacteria. Newer formulations that chemically bond the composite to tooth enamel may overcome those problems, but the materials haven't been perfected. Composite fillings have been in only limited use for much of the last 20 years, and not enough experience has accumulated to assess whether long-term health problems may surface, according to Dr. J. Rodway Mackert Jr., associate professor of dental materials at the Medical College of Georgia.

Other amalgam alternatives include gold, which is very durable, and ceramic, which has a good appearance. However, both are expensive and have other drawbacks. (See the chart below.)

Removing amalgam in favor of an alternative material can be a risk in itself. With large fillings, the process can damage tooth structure and may injure the nerve, requiring a root-canal procedure. CU's dental advisors believe that, at present, the alternatives don't measure up. Given their solid track record and a risk that's still conjecture, amalgam fillings are still your best bet. ■

Cavities: not yet extinct
Despite great strides in prevention during the past two decades, half of all American schoolchildren still get cavities. The relatively low cost of amalgam fillings keeps dental care affordable for many families.

Reprints of this report will be available in bulk quantity. For information and prices, write CU Reprints Dept., 101 Truman Ave., Yonkers, N.Y. 10703-1057.

HOW DENTAL FILLINGS COMPARE

	Cost per filling [1]	Typical lifespan (years)	Visits to install	Matches tooth color	Resistant to wear	Risk of fracture	Increased risk of recurrent decay [2]
Amalgam	$51	10-20	1	No	Yes	Medium	No
Composite	64	3-10 [3]	1	Yes	No	Medium	Yes
Ceramic	404	10	2 or more	Yes	Yes [4]	High	Yes
Gold	361	20 or more	2 or more	No	Yes	Low	No

[1] *From CIGNA, national average charges for two-surface fillings*
[2] *Difficulty of achieving precise fit can leave room for re-entry of decay-producing bacteria.*
[3] *Based on limited data; lifespan of more than 5 years applies to small fillings only.*
[4] *Hardness of some ceramics tends to wear down opposing tooth.*

*by P.L. Fan, PhD

Safety of amalgam

Current analysis of scientific information indicates that amalgam restorations are safe

The trituration of mercury with an alloy for dental amalgam produces results in an amalgam restorative material that has a long-proven clinical performance record.

The formation of mercury-silver (gamma one) and mercury-tin (gamma two) phases are described in detail in dental materials textbooks. With the use of sensitive analytical instrumentation, investigators have reported that there were detectable nanogram amounts of mercury vapor in expired air of subjects after chewing.

This has stimulated extensive investigations and review of the safety of dental amalgam. This paper summarizes the positions on the safety of dental amalgam. It also discusses the Food and Drug Administration regulations on medical and dental devices used for diagnostic purposes.

Literature reviews

In 1982 a review by Bauer and First concluded that, "The use of mercury in dental amalgam is relatively safe. The potential for mercurial poisoning exists. However, its occurrence is negligible.

"Of concern to the dental patient and personnel is the occurrence of mercurial hypersensitivity, the allergic response to mercury in amalgam restorations and from restorative procedures. Since the allergic reaction is self-limiting, it may be necessary for the dentist only to be aware of its symptoms for an adequate diagnosis and palliative treatment."[1]

In 1987, Enwonwu, in a critical review of the literature on the potential hazards of use of mercury in dentistry, concluded that "while there is consistent evidence indicating release of mercury vapor from the restorations during chewing, tooth brushing, and other oral activities, proof of a casual link of this specific source of the heavy metal to any major human health problem is lacking."[2]

ADA

In 1983, the American Dental Association published a summary of scientific information then available.[3] It stated:

"There is no recorded scientific evidence of mercury vapor toxicity resulting from (10 ng/min) of mercury vapor. Further, none of these measured amounts of released mercury have been documented as being associated with various diseases or medical conditions, or both.

"Furthermore, and it is most significant to note that there is no documented scientific evidence to suggest that dentists and dental office personnel, who are exposed to much greater amounts of mercury vapor, have a greater incidence of certain medical conditions or higher mortality rates as compared with the general population."

The report also stated "the association wishes to emphasize that, except in individuals sensitive to mercury, there is no reason why a patient should seek to have amalgam restorations (silver fillings) removed. Indeed, the effect of such a procedure and further restorative operations could be detrimental to the patient's oral health, including the unnecessary loss of teeth, and cannot be justified."

Another report from the ADA[4] in 1984 considered the utilization and safety of patch testing for sensitivity to mercury and concluded that "patch tests for mercury. . .are not to be used indiscriminately for all patients. . .the validity of the patch test results and the suggested interpretation of the monitored patient reactions have not been well documented."

The report also stated that "a medical history of the patient and consideration of the benefit-to-risk should be included in the professional judgment on the use of patch tests. The decision rests with the dentist.

When a patch test is indicated, the informed consent of the patient should be obtained. Patch tests should only be performed by a professional trained in the administration and interpretation of these tests. Referral to physicians, such as allergists or dermatologists, who specialize in this testing is strongly recommended."

The ADA House of Delegates in 1986 passed a resolution on the use of amalgam as restorative material.[5] The resolution stated:

"Resolved that based on current documented scientific research, the conclusions of conferences and symposiums on the biocompatibility of metallic restorative material, and upon joint reports of the Council on Dental Materials, Instruments and Equipment and the Council on Dental Therapeutics of the Association, the continued use of dental amalgam as a restorative material does not pose a health hazard to the non-allergic patient, and be it further resolved that to advocate to a patient or the public the removal of clinically serviceable dental amalgam restorations solely to substitute a material that does not contain mercury is unwarranted and violates the ADA Principles

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of Ethics and Code of Professional Conduct, and be it further resolved that in those instances where state dental boards initiate proceedings on this question that the ADA cooperate in such proceedings by making available scientific personnel as expert witnesses."

NIDR

The National Institute of Dental Research (NIDR), in 1984, sponsored a workshop on biocompatibility of metals in dentistry.[6-10] The goal was to review existing scientific evidence and literature about metals used in dentistry and to pinpoint areas of interest or concern that warrant further research. The question as to whether the small levels of mercury released from amalgam surfaces can pose a possible risk for patients with amalgam restorations was also considered.

The summary on the workshop stated:

"Studies have demonstrated that patients are exposed to mercury vapor when amalgams are placed as a restoration, when existing amalgams are removed, and during chewing.

"Some studies suggest that blood levels of mercury are elevated in patients during these procedures and that the levels are correlated with the number of amalgams and the occluding surface area. Other studies have shown no difference in blood levels in patients with and without amalgam restorations. Additional studies in this area are required to more accurately assess the possible risk to patients.

"Health hazards of blood mercury levels associated with dental amalgams have not been documented. It is difficult, therefore, to interpret the relevance of blood and urine levels of mercury that are observed after placement or removal of amalgams, and chewing on amalgam surfaces. 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."

The summary also addressed the consideration of rare occurrences of possible allergic reaction to mercury and states that "although cases of allergy to mercury have been reported in the literature, the prevalence of mercury allergy is estimated to be less than 1 percent.

"In patients with a history or clinical symptoms (or both) of mercury allergy, patch testing may be indicated to confirm the allergy. Because of the infrequency of reports of mercury allergy, it is not recommended that patients be tested routinely for sensitivity.

"When patch testing is indicated, it is recommended that the patient be referred to a professional trained in the administration and interpretation of the test."

The conclusion of the workshop is stated in the summary: "On the basis of the information presented in this workshop, there is no documented evidence for recommending the discontinuation of the use of dental amalgams as a restorative material in dentistry. Additionally, the removal of dental amalgam can be recommended only in those patients who have a true hypersensitivity to mercury or other constituents."

USPHS

The United States Public Health Service (USPHS), in 1984, issued a statement on the safety of dental amalgam.[11] The statement, signed by the Assistant Surgeon General, Dr. Robert E. Mecklenburg, put forth the position that "Research on dental amalgam, as well as the total range of dental restorative materials used in the United States and accepted by the U.S. Food and Drug Administration and the American Dental Association's Council on Dental Materials, indicates no potential harm to the vast majority of dental patients receiving amalgam fillings.

"Additionally, no evidence exists to indicate that the health of individuals occupationally exposed to dental amalgams (dentists, dental hygienists, dental assistants) is compromised where approved materials and methods are conscientiously employed.

"As with any substance, the rare possibility of individual allergy does exist. However, individuals suspected of having such allergies may receive skin tests and, where necessary appropriate dental treatment alternatives can then be selected.

"Individuals should not seek replacement of amalgam fillings with alternate materials based on a fear of harm. To do so would result in unnecessary expenditures. Providers of dental care should be familiar with accurate scientific literature as well as the actions and recommendations of representative professional organizations, such as the American Dental Association, regarding dental restorative materials, and should not discontinue appropriate use of dental amalgam."

NMSS

The use of amalgam as a restorative material has been implicated by some as the cause of a number of medical problems such as neurological diseases and more specifically, multiple sclerosis (MS).

In response to this specific implication, the National Multiple Sclerosis Society (NMSS) issued a memorandum in 1983 to refute this implication.[12] The memorandum said:

"A review of the literature reveals that the question of mercury toxicity from silver fillings was raised in Europe in the mid-1960s by a Swiss neurologist, Ernst Baasch. However, later publications from the same area and during the same decade show the seemingly contradictory recommendation for the use of mercury as part of a salve compound to treat MS cutaneously.

"(This indicates the complex and inconclusive nature of these claims, and the difficulties faced when evaluating the theories which abound, concerning the causes of, and treatments for, multiple sclerosis.)

"There has been a related suggestion that a combination of gold and silver fillings in contact with saliva can create an 'electrogalvanic current' which adversely affects the cells of the body, causing neurological dysfunction. This claim is also questionable, as there are vast numbers of people with mixed dental metals, and there is no documentation of any adverse effects.

"Although the claim that removal of silver amalgam and replacement with alternative dental materials will alleviate the symptoms or cure neurological disease is based partly on the known toxicity of heavy metals, the toxic effects of mercury absorption occur only when this agent is in the form of elementary mercury vapor or as mercury compound dusts. The 'occasional incidental swallowing of metallic mercury is without harm' (Merck Index, 1976).

"If indeed there was a connection between silver amalgam dental fillings and multiple sclerosis, one might observe a much higher incidence of MS among the professional dental community, as well as

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among those who assist dentists. These individuals deal with mercury in its more elemental form and theoretically are exposed to greater risk.

"There is no indication that a higher incidence of MS exists among this specialized group. In addition, the incidence of multiple sclerosis has been documented in the literature long before modern techniques of dentistry were developed and thus it would be impossible to implicate dental amalgam in any of those cases.

"Several other factors need to be seriously appraised in relation to this therapeutic claim. First, there is a placebo response as high as 70 percent in patients with multiple sclerosis which makes defining the basis for improvement in any individual patient impossible unless subject of rigorously controlled trials.

"Second, while the effect of stress on the clinical course of multiple sclerosis can never be predicted in any specific instance, it is the consensus of experienced physicians that avoidance of unnecessary physical or emotional stress is an important consideration in maintaining optimal function. Such stress includes unnecessary surgery and anesthesia.

"Finally this therapeutic claim for multiple sclerosis involves economic implications, in terms of expense to the patient and great profit to the dentist.

"In evaluating this treatment, patients should recognize all of these issues and are advised to consult their physician before pursuing this dental therapy. It is the advice of the National Medical Advisory Board that replacement of silver amalgam fillings cannot be recommended for the treatment of multiple sclerosis."

Consumers Union

The Consumers Union investigated "the mercury scare" and reported its findings in a 1986 article.[13]

Its reporter visited a dental office and after undergoing a saliva test and a test for mercury vapor emission after chewing, was advised to have the fillings out by 9 o'clock that night at a cost of $580. The reporter then visited the office of Consumer Union's chief medical consultant and provided a blood sample and a urine sample for mercury testing.

The acidity of the saliva was also tested. The reporter also consulted with Dr. Clarkson of the University of Rochester School of Medicine, who is one of the world's leading authorities on mercury toxicity.

When the reporter notified Dr. Clarkson of the test results, the advice from Dr. Clarkson was that the reporter should hold on to his $580. The Consumers Union's view is stated in the article as "dentists who purport to treat health problems by ripping out fillings are putting their own economic interests ahead of their patients' welfare.

"Amalgam has been used for more than 150 years. Except for a few people with a genuine allergy to mercury, Consumers Union knows of no one who has been harmed by them. There is little danger of the U.S. becoming a nation of Mad Hatters."

FDA

The use of mercury vapor analysers or galvanic current meters as diagnostic devices for toxicity or allergy would place these items under the categories of medical and dental devices.

Government regulations require that medical and dental devices need to be approved for marketing before they are commercially available. The agency responsible for approving these devices is the Center for Devices and Radiological Health, Food and Drug Administration.

This agency can remove unapproved medical and dental devices from the market. This has been the case for an amalgameter.

Conclusions

The current analysis of scientific information indicates that amalgam restorations are safe. Exceptions may be the rare individuals who are allergic to mercury.

The incidence of mercury allergy is so rare that a percentage number cannot be assigned to its occurrence in the general public. Routine allergic testing to mercury should not be performed. If an allergy test is to be considered, the administration and interpretation by a professional trained in these areas are recommended.

There is no scientific basis to consider mercury from amalgam restoration is a causative factor for medical problems, especially neurologic diseases such as multiple sclerosis.

Apart from demonstrated allergic reactions, there is no reason for patients to have amalgam restorations removed. The practitioner should be aware that diagnostic systems are regulated by the Food and Drug Administration.

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TALK PAPER

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March 20, 1991

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FDA Panel Considers Safety of Dental Amalgams

FDA's Dental Devices Panel met today to discuss recent research and patient case reports related to the possible hazards associated with dental amalgam fillings. The panel was asked to address whether the mercury in amalgam fillings can pose a risk to patients and to advise the agency on the types of studies needed to further assess the safety of these devices.

The following may be used to respond to questions.

Several clinicians, patients, researchers, manufacturers and organizations, including the American Dental Association and the National Institute for Dental Research, expressed their views on possible hazards and research needs in this area. The panel reviewed recent animal studies and human case reports which have raised questions about the continued use of these devices.

The panel concluded that none of the data presented shows a direct hazard to humans from dental amalgams. However, the panel agreed that the studies presented did raise questions that warrant further research. The panel recommended that FDA establish a special working group to identify the kinds of animal and human studies needed to answer the question of amalgam safety. This group would work in collaboration with other research organizations such as the National Institute for Dental Research.

The panel's recommendations are not binding, but FDA will take them under consideration. FDA agrees with the panel that additional research is

-MORE-

needed to resolve unanswered questions about amalgam safety. In the months to come, FDA will decide on the best means of assuring that this research is undertaken.

In the meantime, FDA does not advise that individuals ask dentists to remove their amalgams. FDA agrees with the advisory panel that there is no valid data to demonstrate clinical harm to patients from amalgams, or that having them removed will prevent adverse health effects or reverse the course of existing diseases.

Dental amalgams, a mixture of silver and mercury, have been used for over 150 years. The mercury allows the amalgam to flow smoothly into the dental cavity. This material is ideal for cavities because it adheres tightly to the cavity, sets up hard and resists abrasion.

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SENATE HESS

DATE: May 3, 1991

Subject of meeting:
SB 123 - INFORMED CONSENT FOR DENTAL FILLINGS

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