EVIDENCE-BASED DENTAL CARE
In the previous issue of this newsletter [Vol. 15, Issue 5, 1999], we discussed the innovative approach to dental practice called “Evidence-Based Dentistry [EBD]”, in comparison to “Tradition-Based Dentistry” [TBD]. Articles on this topic have now appeared as a feature article

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The AGD article notes that TBD has been taught in dental schools has the effect of providing “information which may be based on science or may be anecdotal without any clear guidelines for discriminating which is which.” Students, then, base future clinical decisions on information that “may or may not be scientifically valid.”

EBD, on the other hand, stresses making clinical decisions based on “sound scientific evidence” found in the literature. AGD stresses using “a critical appraisal of research, a skill not commonly taught in dental schools.” It is further pointed out that the type of training dentists receive, both graduate and post-grad, “may lead to inappropriate outcomes.” A number of examples are given. AGD also points out accepted treatment practices where “no compelling scientific evidence exists to support them.”

AGD then describes the EBD approach, beginning with a “systematic critical review of the dental literature” and emphasizing utilization of “the best available scientific studies.” It is further pointed out that there may never be absolute evidence for every aspect of dental practice, in which case the concept of “best practice” is emerging, which utilizes the best
available evidence to date, including personal experience and the observations of others. In conclusion, AGD points out that the EBD model is not taught in dental schools, but that "dental patients have a right to have treatment based on the best available evidence."
The JDR article emphasizes the need to rely on VALID scientific evidence, stating: "The methods for conducting systematic reviews are different from the approaches that dental educators and researchers currently follow in conducting reviews of the literature. Traditional reviews of the literature are conducted using expert opinion defining the questions and in selecting and summarizing the evidence." JDR points out that "systematic reviews are conducted by a collaborative team of experts in a clinical discipline and methodologists trained in searching, appraising, and summarizing all evidence, whether published or unpublished."

With this explanation, it is easy to see how raging controversies in dentistry, such as the use of mercury fillings, would be affected. An EBD directed investigation of the safety of mercury fillings would be determined by experts in medical physiology and mercury toxicology, not clinical dentistry. Published studies on the subject would be critically evaluated based on their scientific validity, rather than their journal of publication and/or selective promotion. Further, clinical evidence derived from patient care would be included.

Both journals point out the lamentable lack of translation of scientific research to clinical practice in dentistry, as well as the direction of dental research not focusing on studies providing relevance to clinical care. In spite of the billions of dollars spent on dental research, there have been relatively few randomized controlled trials or outcome studies provided.

The JDR article states: "Dental schools are important players in accomplishing these steps" (building the evidence for scientifically based dental therapy) and "schools can, and must, instill a healthy skepticism of empiricism and expert opinion in lieu of evidence." To this, one must point out that dental schools in the United States are accredited by a committee from the American Dental Association! If the schools wish to graduate students that are eligible to practice dentistry in the USA, than they MUST adhere to standards set by the ADA! So if the ADA sets an unalterable policy, such as they have on mercury fillings, the schools have no choice but to follow the ADA policy, regardless of the evidence. For EBD to succeed in dentistry the first, and most important step, must be to ensure independence for the dental schools, and their research sections, from the influence of the ADA.

To be sure, there is room for abuse within the concept of EBD, especially given the lack of sound clinical research throughout the realm of dental practice. Arguments can be made based on existing studies, without regard for the validity of those studies. A good example is that of the reliance on the Swedish epidemiologic studies concluding the supposed safety of dental mercury. None of these studies had any control patients without amalgams. This is unacceptable in sound science. However, the abuses can be readily argued if the dental profession does indeed move towards EBD, emphasizing valid scientific evidence. Further, the abuses of TBD are readily apparent and have been draconian in their application. To legally limit the performance of dentists based on the limitations of all dentists through the doctrine of "standard of care" and "general acceptance" is not only undesirable for patients and the profession, but is downright pathetic. Enough already of "it must be all right since we have been doing it for over 100 years!"

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A CALL TO ACTION!
In the previous article, the Journal of Dental Research emphasized the importance of the dental schools in developing and promoting dental therapy based on sound evidence. *Bio-Probe* pointed out that dental schools in the United States are accredited by, and therefore totally under the control of the American Dental Association (ADA)! As membership in the ADA is voluntary and, as such, represents only the interest of its dentist members, a very small percentage of the U. S. population dictates dental therapy in the country. Non-ADA dentists have no voice! Patients have no voice! Clearly, a voluntary dental organization should not have control over dental schools, most of which are funded at least partially with citizen tax dollars. Shouldn’t the dental schools, with their research sections, be directing dental therapy to the ADA and the rest of the country? This situation in dentistry, if not unique, at least certainly defies logic and propriety!
The ADA derives its authority to dictate to the dental schools from the U.S. Secretary of Education, with advice from The National Advisory Committee on Institutional Quality. The ADA first received the authority in 1952; was re-appointed in 1995; and is due for review in the year 2000. Interestingly, there are a number of regional Commissions for various types of educational institutions. For dentistry, however, the Secretary has given the ADA the right to Accredite virtually all aspects of care - including pre-doctoral, dental auxiliary, and advanced dental in the various specialties.
This demands a call for action! *Bio-Probe* hereby calls on everyone, whether as an individual or as a public or professional organization, to request the United States Congress to pass legislation designating an independent board - representing, the dental profession as a whole, the medical scientific community, and the public - for the formal Accreditation of dental schools in the United States!
This is the right thing to do, whether or not you are satisfied with the direction of dental treatment in this country. There is absolutely no valid argument to have the ADA performing this function, totally free of any balancing influence. There can be no doubt that the independence of dental schools, and their research sections, is in the best interest of the U. S. public.

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MERCURY IN THE ENVIRONMENT
Specialty Conference Focuses on Amalgam
[Provided for *Bio-Probe* by Paul G. Rubin, DDS]
The risk of mercury contamination in the environment, derived from dental amalgam waste, continues to draw increasing attention. Municipal waste water agencies, environmental scientists, EPA officials, private industries, representatives from the Department of Energy and the U.S. Navy were among the participants in a recent conference, “Mercury in the Environment Specialty Conference,” held in September in Minneapolis. The Conference, sponsored by Air and Waste Management Association, Water Environment Federation, and several other agencies, focused a significant part of the meeting on the dental amalgam mercury issue. Attending the conference on behalf of IAOMT were Drs. Marcia Basciano and Paul Rubin.
Mercury levels in municipal waste water treatment facilities have raised strong concern in the Great Lakes region. Peter Berglund, of the Minneapolis area Metropolitan Council Environmental Services, has estimated that 70-80% or more of the mercury entering the facilities is coming from dental offices. Such facilities are not designed to handle heavy metals, which, for the most part, settle out in the sludge or “biosolids” in waste treatment. These are then incinerated or used as fertilizer. In either case, the mercury is deposited into the
environment.
There are strict EPA standards on levels of mercury (and other heavy metals) allowable in biosolids that will be incinerated or used as fertilizer. It is the responsibility of the municipalities to meet these standards. The options are to remove the mercury from the sludge (not feasible), or reduce the input by limiting or regulating the sources of discharge. Since dental offices are such a major contributor, collectively, the effort is in place to reduce amalgam waste discharge into the sewer systems. Typically, dental offices have not previously fallen into the same category as other industries, whose mercury discharges are already strictly regulated and controlled.
The conference highlighted the research and investigation that has already been done in this area. Characterization studies have been done on dental office waste water in several parts of the country. Strategies for removing both amalgam particulate and dissolved mercury were discussed. There are ongoing studies to assess the effectiveness of commercially available mercury separator units for dental offices. The consensus of the scientists at the meeting was that dental amalgam is not a compound, but a “solid solution” and therefore fairly unstable. Even if the argument were followed that amalgam waste does not break down and release mercury (a highly unscientific argument), the fact that many parts of the country incinerate this waste renders such an argument moot. The mercury vapor will be completely released into the environment, falling back to the ground or lakes and waterways.
Dr. D. Aernholt-Bindslev, at the University of Aarhus Dental School in Denmark, reported on her research, which has been ongoing for several years. Denmark is very concerned about mercury in the environment and came very close to a nationwide ban on the use of amalgam this year. Nearly all dental offices in Denmark now have mercury separators.
Captain Gordon Jones, USN, reported on efforts of the Navy to reduce amalgam wastes. Naval facilities in various parts of the country are held to stricter standards on waste water discharge limits than are private dental offices. A Navy policy statement from 1993 states: “The Navy Medical Department needs to assure that the practice of dentistry within the Navy does not add to the environmental burden of mercury.” The Navy has also found that certain vacuum line cleaners (bleach, VacuSol) actually increase the dissolved mercury significantly, as does centrifuging (found in some mercury separator devices).
As Bio-Probe readers may recall, several years ago the IAOMT adopted a recommended protocol for all members to install effective mercury separator equipment in their offices. One presentation addressed the evaluation of properties for sale that may have mercury contamination. There may be significant liability issues in such a property that could affect the sale or transfer. The buy-sell agreement must reflect the responsibility for bearing the cost of cleaning up the mercury contamination. Drs. Basciano and Rubin were of the opinion, upon hearing this presentation, that dental offices could fall into this category.

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NORWAY ACTS ON AMALGAM
Norway can now be added to the growing list of countries that have issued advisories for contraindications to the use of mercury dental fillings. This list now numbers: Sweden, Germany, Canada, The United Kingdom, France, and Norway, with Denmark considering action for strictly environmental reasons. There are also possibilities in several other European countries, but these have not been confirmed by document.
The new document from the Norwegian Board of Health (IK-2675, August 1999), is titled “The
use of Dental Filling Materials in Norway."
Although concluding that ill health caused by
dental amalgam is not, at this time, verifiable by
scientific methods, the document states in the
forward: "Amalgam has some advantages and
many disadvantages," and "dental health data
and data on use of dental filling materials
indicate that amalgam is in the process of being
phased out."

As a "Professional Recommendation," the Board
states (page 19): "Amalgam shall not be the first
choice as a filling material in treating children
and young people up to the age of 18 years
under the auspices of the Public Dental Health
Service." The Board also recommends (pp.17-
18): "Measures for persons with symptoms and
reactions assumed to be related to dental
restorative materials," including "health services
for those who have symptoms assumed to be
related to dental materials should be continued
and improved."

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EMDOGAIN
At the 1999 meeting of the American Academy
of Periodontology, European and American
periodontal specialists presented clinical
experiences and supporting data of positive
effects of utilizing Emdogain.
Dr. David Cochran, Professor and Chair of the
Department of Periodontics at the San Antonio
branch of the University of Texas, described new
research on the cellular action of Emdogain. Dr.
Stuart Froum, Clinical Professor of Periodontics
at New York University, described research
showing how Emdogain regenerated supporting
tissues, including new bone, over a 12 month
period.
The Food and Drug Administration (FDA) has
now approved Emdogain for use as an adjunct
to a minimally invasive surgical technique. This
indicates that Emdogain can be utilized in
conjunction with scaling and root planing
procedures for the treatment of periodontal
intrabony defects in esthetic zones to optimize
tissue height.
Emdogain was launched in Europe in 1996 for
surgical treatment of severe periodontitis, in the

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SCIENCE

Predominant Obligate Anaerobes Invading the
Deep Layers of Root Canal Dentin.
Ando, N; Hoshino, E.
ABSTRACT: This study was carried out to
investigate the presence and types of bacteria
invading the deep layers (0.5-2.0 mm from the
surface of the root canal wall) of infected
dentine of human root canals by sampling with
an anaerobic glove box system the split surfaces
of eight freshly extracted teeth.
More bacteria were recovered after incubation
in an anaerobic glove box than after aerobic
incubation in air with 30% CO2. Out of 256
predominant bacteria isolated, 205 isolates
(80%) were obligate anaerobes. These findings
suggest that the environment of deep layers of
endodontic dental lesions is anaerobic and
favours the growth of anaerobes.
Among the obligate anaerobic isolates, strains
belonging to Lactobacillus (30%) and
Streptococcus (13%) were predominant,
followed by Propionibacterium (9%). No
strains of obligate anaerobic gram-negative rods
were isolated. The microflora of deep layers of
infected root dentine is somewhat similar to that
of the deep layers of carious lesions in coronal
dentine.

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Endodontic Pathogens:Propagation of Infection
Through Patent Dentinal Tubules in
Traumatized Monkey Teeth.
Ehnevid, H; Jansson, L; Lindskog, S;
Weintraub, A; Blomlof, L.
ABSTRACT: Periapical pathology indicating
endodontic infection, when present in marginal periodontitis affected teeth, has recently been shown to be an aggravating factor in progression of marginal destruction. This has been associated with patency of dentinal tubules in the tooth cervix, an area normally devoid of cementum following periodontal therapy. These studies are, however, hampered by that only circumstantial evidence such as presence of periapical destruction have been applied as criteria of endodontic infection.

The purpose of the present investigation was to study to what extent a predefined selection of endodontic pathogens inoculated in the root canal can influence periodontal pathology and healing in areas of the root covered by or devoid of cementum, using root resorption as a histomorphometric marker.

Exposed dentine surfaces, in the present study showed significantly larger areas of resorption in infected roots compared to non-infected roots, while cementum surfaces showed an almost identical distribution of tissue reactions regardless of root canal infection or not.

It was concluded that endodontic pathogens or their products were not able to penetrate the cementum barrier. The significantly larger areas of resorption on exposed dentine surfaces in infected roots compared to non-infected roots indicated that endodontic pathogens or their products could spread through dentinal tubules to a root surface devoid of cementum. Extrapolated to the marginal situation this indicated that endodontic pathogens in the root canal might be able to aggravate marginal infection in areas of root devoid cementum.

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Observation of Bacteria and Fungi in Infected Root Canals and Dentinal Tubules by SEM.
Sen, BH; Piskin, B; Demirci, T.

ABSTRACT: The aim of this study was to observe the root canal flora and possible penetration of microorganisms into dentinal tubules in teeth with necrotic pulps. Ten infected maxillary and mandibular molars with periapical lesions were extracted and fixed with 2.5% phosphate-buffered glutaraldehyde solution for nine days. After separation from the crowns, longitudinal grooves were cut in the roots, and they were split into two halves. The specimens were prepared for SEM.

The root canals and the dentinal tubules of the fractured dentin were scanned systematically from the cervical to the apical area of the root. Cocci and rods were seen in 6 specimens. Penetration of bacteria into the dentinal tubules ranged from 10 to 150 microns. In 4 specimens, the root canals were heavily invaded by yeasts. The antimicrobial effect of routinely used endodontic disinfectants also on yeasts may be considered in persistent root canal infections.

Bio-Probe Comment: These three studies, along with the Berutti study presented in the previous issue [Vol. 15, Iss. 5, 1999], are clear examples of research emphasizing the need to consider the dentinal tubules in endodontic therapy. Addressing only the root canals, including the multiple apical openings, is simply not enough to provide proper treatment to patients with devital teeth.

The last of these three studies, along with the following study, points out the need to consider microorganisms other than bacteria in providing endodontic therapy.

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Fungi in Therapy-Resistant Apical Periodontitis.
Waltimo, TM; Siren, EK; Torkko, HL; Olsen, I; Haapasalo, Mp.

ABSTRACT: The occurrence of yeasts in 967 microbiological endodontic samples taken from root canals in persistent endodontic infections was studied. The sampling was done by general practitioners in various parts of Finland from
root canal infections which did not respond favourably to standard conservative therapy. The samples were cultivated aerobically on a non-selective enriched horse blood agar medium, on TSBAV agar medium in 5% CO2 and anaerobically on horse blood agar medium. Microorganisms were found in 692 of the samples while 275 showed no growth. Forty-eight fungi were isolated from 47 samples which is 7% of the culture-positive samples. Twenty yeast strains were identified further by their colony morphology, growth and cellular characteristics and patterns of carbohydrate assimilation. All isolates except one belonged to the genus Candida. Candida albicans was the most common species. C. glabrata was found together with C. albicans in one sample. C. guilliermondii, C. inconspicua and Geotrichum candidum were each isolated once. Yeast were found in pure culture in six samples and together with bacteria in 41 samples. Anaerobic bacteria were isolated together with yeasts from 12 root canals. They included both gram positive species such as Peptostreptococcus micros, and gram negative species such as Fusobacterium nucleatum.

The regular isolation of yeasts, also in pure culture, indicates that yeasts may have an important role in cases of apical periodontitis persisting after conventional treatment.

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Effects of Mercury on the Arterial Blood Pressure of Anesthetized Rats.

Rossoni, LV; Amaral, SM; Vassallo, PF; Franca, A; Oliveira, EM; Varner, KJ; Mill, JG; Vassallo, DV.


ABSTRACT: The available data suggests that hypotension caused by Hg2+ administration may be produced by a reduction of cardiac contractility or by cholinergic mechanisms. The hemodynamic effects of an intravenous injection of HgCl2 (5 mg/kg) were studied in anesthetized rats (N=12) by monitoring left and right ventricular (LV and RV) systolic and diastolic pressures for 120 min. After HgCl administration the LV systolic pressure decreased only after 40 min (99 +/- 3.3 to 85 +/- 8.8 mm Hg at 80 min). However, RV systolic pressure increased, initially slowly but faster after 30 min (25 +/- 1.8 to 42 +/- 1.6 mm Hg at 80 min). Both right and left diastolic pressures increased after HgCl2 treatment, suggesting the development of diastolic ventricular dysfunction.

Since HgCl2 could be increasing pulmonary vascular resistance, isolated lungs (N=10) were perfused for 80 min with Krebs solution (continuous flow of 10 ml/min) containing or not 5 muM HgCl2. A continuous increase in pulmonary vascular resistance was observed, suggesting the direct effect of Hg2+ on the pulmonary vessels (12 +/- 0.4 to 29 +/- 3.2 mm Hg at 30 min).

To examine the interactions of Hg2+ and changes in cholinergic activity we analyzed the effects of acetylcholine (Ach) on mean arterial blood pressure (ABP) in anesthetized rats (N=9) before and after Hg2+ treatment (5 mg/kg). Using the same amount and route used to study the hemodynamic effects we also examined the effects of Hg2+ administration on heart and plasma cholinesterase activity (N=10).

The in vivo hypotensive response to Ach (0.035 to 10.5 mg/kg) was reduced after Hg2+ treatment. Cholinesterase activity (muM h-1 mg protein-1) increased in heart and plasma (32 and 65%, respectively) after Hg2+ treatment. In conclusion, the reduction in ABP produced by Hg2+ is not dependent on a putative increase in cholinergic activity. HgCl2 mainly affects cardiac function. The increased pulmonary vascular resistance and cardiac failure due to diastolic dysfunction of both ventricles are factors that might contribute to the reduction of cardiac output and the fall in arterial pressure.
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Changes in the Nervous System Due to Occupational Metallic Mercury Poisoning.
ABSTRACT: At the Institute of Occupational Medicine and Environmental Health, during 12 years, chronic mercury intoxication was diagnosed in 34 persons. There were male workers tending technological processes in which Hg was used as a catalyst (synthesis of acetic aldehyde and obtaining chlorine). The length of professional exposure was 13-34 years (mean 20.6). The patients were removed from the contact with Hg after Hg intoxication case was confirmed. During the following 11 years, 24 of them were reexamined in the clinical department 2-4 times.
The clinical picture of the poisoning consisted mainly of neurasthenic, cerebellar (30 persons), psychogenic changes (20 persons) and behavioral changes (irritability, aggressive states). Headaches, sleep and recent memory disturbances, progressive behavioral changes, dizziness, were the most frequent complaints.
The authors stressed the irreversibility of central nervous disorders despite cessation of the exposure to Hg. The degree of cerebellar intensity changes did not handicap examined patients. This is especially important to show the difference betwen the above described clinical picture of Hg intoxication and multiple sclerosis.

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FORUM
IAOMT 2000 MID-YEAR MEETING
DATE: Friday-Saturday, 31 March-1 April, 2000.
SITE: Orlando, Florida.
HOTEL: Sheraton World Resort Orlando; 10100 International Drive, Orlando, FL 32821-8095 (adjacent to Sea World). T: (407) 352-1100, (800) 341-4292 [inside Florida], (800) 327-0363 [outside Florida]; F: (407) 352-3679. Specify IAOMT room rate: $119.00/night/1-2; $134.00/night/3-4. Suites $295-$495. [Book early or rent car!] 15 minutes from airport; transportation available to nearby attractions.
MEETING REGISTRATION: IAOMT, P.O. Box 608531, Orlando, FL. 32860-8531. T: (407) 298-2450; F: (407) 298-3075. Fee to be announced.
MEETING HOST: Dr. Janet Stopka.
WELCOME NO-HOST RECEPTION: Thursday, 30 March 2000, 7:30pm.
PROGRAM: Friday morning Clinical Theme: “Root Canals: Yes or No?” IAOMT Committee; Chair Stephen M. Koral, DMD.
J. C. Pendergrass, PhD: ALT findings on root canals.
Friday Afternoon Speakers:
Richard J. Chamin, DMD: “Managing the Biological Dental Practice.”
IAOMT Clinical Practice Committee: “Practice Tips, the Biological Way.”
Thomas E. Baldwin, DDS: “Biological Periodontal Therapy: Update.”
Saturday Speakers:
Louis W. Chang, Ph.D: “Developmental Mercury Poisoning.”
James E. Hardy, DMD: “Bio-Electromagnetism and Dental Metals.”

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A Dental and Scientific Conference on Sources, Diagnosis and Treatment of Oral Toxicities
PROGRAM: Ken Andrews, DO; Stephen R. Evans, DDS; Boyd E. Haley, PhD; J. Curt Pendergrass, PhD; John Roberts, BChd.
CONTACT: Dr. John Roberts; 141 Whitworth Rd, Rochdale, OL12 0RE, England. T: 441706-525905; F: 441706-712935.

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American Academy of Head, Neck and Facial Pain
7th Annual Mid-Winter Symposium
SITE: Scottsdale, Arizona.
HOTEL: The Radisson Resort. T: 480-991-3800. $185/night.
PROGRAM: Yoshiaki Omura, MD: “Diagnosis of Acute and Chronic Disease with a Cost Effective and Accurate Treatment Protocol.