Welcome

Dr. Dominique Galli, INAADR President

Mr. Matthew Wall, IUSD Research Group President

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April 12, 2006

Dear Participants and Guests,

On behalf of the Organizing Committee and the Indiana Section of the American Association for Dental Research, I would like to welcome you to the Indiana University School of Dentistry’s Fourteenth Annual Research Day.

Dental research involves the use of scientific experimentation and observation to acquire new knowledge in the field of dentistry and ultimately facilitate the development of new clinical techniques, materials and treatment modalities. Student and faculty involvement in dental research has become an increasingly important mission in dental education. Research Day is designated to showcase advances in basic and clinical dental research here at IUSD, with an emphasis on encouraging our students to present their work. This event fosters the dissemination of the latest research findings in the form of poster presentations and table clinics in the hope that new research collaborations and multidisciplinary alliances will be formed. Accordingly, I encourage all of you to interact with our presenters. Another highlight of the afternoon will be the keynote address given by Dr. Dianne Rekow, the current president of the American Association for Dental Research.

I want to offer a special word of thanks to our event and award sponsors, and also to all of the exhibitors for their generous contributions and their commitment to IUSD’s Research Day. The success of Research Day depends on their continued support. I encourage you to visit with our exhibitors and inform yourself of the latest and greatest in products and services that they have to offer. We look forward to continue our relationship with every one of our sponsors and vendors, who make this exciting event possible.

This year a link to Research Day has been added to the IUSD internet site. You will now be able to download and print this year’s abstracts. After the event, the names of all award winners will be proudly displayed online. In addition, an archive has been created that lists all past award winners and invited keynote speakers.

I want to thank all the members of the Research Day Committee for their hard work and dedication. We are most grateful to Chad Beckner for setting up the online registration and abstract submission process, and Amer Hussein for creating the Research Day site on the internet. Another special thank you goes to all the award judges who stayed after hours to evaluate the work of our student and staff presenters.

Last, but not least, I also want to thank all of you for attending this important event. I know that each and all of you will enjoy what promises to be a most exciting afternoon.

Sincerely,

[Signature]

Dominique M. Galli, Ph.D.
President, Indiana Section of the AADR
April 12, 2006

Dear Research Day Participants and Guests,

As president of the IUSD Student Research Group, I would like to welcome you to the 14th Annual Research Day.

Research is an essential element of the evolving field of dentistry. Discoveries made in labs today will impact our practices in the future. Research Day is a unique opportunity for students, faculty, and staff to present these recent discoveries.

It is our responsibility to diligently seek new innovations in our field to better address the problems and concerns of our patients. By doing so, our quality of care increases and the treatment and quality of life of our patients is enhanced. Today you have the opportunity to support your colleagues in their endeavors to broaden our understanding of dentistry through research.

It is our pleasure to welcome Dr. Dianne Rekow, the 2006 president of the American Association for Dental Research, as our keynote speaker. She will address the topic “Multidisciplinary Science: Discovering How and Why Posterior All-Ceramic Crowns Fail.” It is an honor to hear from someone so dedicated to the ongoing development and improvement of dental care.

IUSD provides students with a great opportunity to participate in a research project. Many students have taken advantage of this opportunity and are presenting posters and table clinics today. By personally selecting an experienced faculty mentor, you have the opportunity to research any topic you have found interesting during your studies at IUSD. Your mentor will walk you through the process of designing a project. Many of these faculty mentors are internationally known in their respective fields. It is also possible to receive a National Institutes of Health (NIH) grant to fund your research. Upon completion, all researchers have the opportunity to present their findings at a future Research Day. They are also eligible to compete for academic recognition and monetary prizes.

Though many of you will not elect to conduct dental research, I hope that you appreciate that research is the driving force behind new advances and technological discoveries in dentistry.

Sincerely,

[Signature]

Matthew Wall
President
IUSD Student Research Group
On the Cover

The cover image was submitted by Dr. Robert L. Karlinsey, who joined the IUSD faculty as a visiting clinical assistant professor of preventive and community dentistry in 2005. In his research, Dr. Karlinsey develops nanomaterials that can be used to remineralize dentin and enamel that has been damaged by dental caries or erosion. In this cross-sectional scanning electron microscope image (magnification 5000x), the three conical-shaped structures in the foreground are bioceramic microcones, a nanomaterial that shows promising behavior as a mineralizing agent for the repair and healing of the dentition. The material forming around the microcones in this image is porous hydroxyapatite, a principal mineral found in bone and teeth.

Research Day monograph prepared by the IUSD Office of Publications and printed by Printing Partners of Indianapolis. Cover design by Mark A. Dirlam, IUSD Dental Illustrations supervisor.
Research Day Organizing Committee

Dominique Galli, Chair

Judith Chin
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Susan Crum
Hafsteinn Eggertsson
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Nadine Florek
Margherita Fontana
Richard Gregory
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IUSD Student Research Group

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Future Research Day Event: April 10 and 11, 2007
Program

(During Wednesday afternoon’s program, all award competitors should be seated in lecture hall S116. The program can also be seen and heard in lecture halls 114, 115, and S117.)

Tues., April 11

5:00-7:00 p.m. Judging

Wed., April 12

12:30-1:00 p.m. Registration

1:00 p.m. Opening Remarks Lawrence I. Goldblatt
Dean of Dentistry

1:05 p.m. Welcome and Introduction of Keynote Speaker Domenick T. Zero
Associate Dean for Research

1:15 p.m. Keynote Address E. Dianne Rekow
Chair, Department of Basic Science and Craniofacial Biology, New York University College of Dentistry; and President, American Association for Dental Research

2:00 p.m. Presentation of Awards Margherita R. Fontana
Immediate Past President, Indiana Section, AADR

2:25 p.m. Acknowledgment of Special Sponsors and Announcements Dominique M. Galli
President, Indiana Section, AADR

2:30-4:00 p.m. Commercial Exhibitions and Research Presentations:

Posters
2:30-3:15 p.m.: Odd-Numbered Posters (coded red)
3:15-4:00 p.m.: Even-Numbered Posters (coded blue)

Table Clinics
2:30-3:15 p.m.: Odd-Numbered Clinics (coded red)
3:15-4:00 p.m.: Even-Numbered Clinics (coded blue)

4:00 p.m. Removal of Posters and Table Clinics
2006 Keynote Address

Multidisciplinary Science: Discovering How and Why Posterior All-Ceramic Crowns Fail

By

E. Dianne Rekow, D.D.S., Ph.D.

Dr. E. Dianne Rekow was inducted as president of the American Association for Dental Research during the AADR’s 35th annual session and exhibition in Orlando, Fla., in March 2006. She chairs the Department of Basic Science and Craniofacial Biology at New York University College of Dentistry, and directs the college’s Translational Research program.

At NYU, Dr. Rekow is stepping up efforts to close the gap between basic science and clinical researchers. She is committed to encouraging basic scientists and clinical researchers to share information as a means of increasing the prospects for translational research — so called because it translates novel basic science findings into testable hypotheses that may ultimately be integrated into clinical practice.

Dr. Rekow holds a dental degree, master’s degree in mechanical engineering, orthodontic certificate, and Ph.D. in biomedical engineering from the University of Minnesota. She also earned an MBA from the College of St. Thomas.
Posters
2:30-3:15 p.m.: Odd-Numbered Posters (coded red)
3:15-4:00 p.m.: Even-Numbered Posters (coded blue)

**Aesthetic Dentistry (P1)**

*Effects of Fluoride on Tooth Whitening: An In Vitro Study.* P. RAVEN,* B. MATIS
(Indiana University School of Dentistry, Doctor of Dental Surgery Program)

Many manufacturers now add fluoride (as a desensitizing agent) to their whitening gels. It is also available and widely used over the counter (OTC) and by prescription to prevent tooth decay. The objective of this study is to determine if fluoride has any effect on tooth whitening. 100 human premolars were selected and randomly divided into groups A-E: A- control group, received no whitening or fluoride; B- received 10% carbamide peroxide (CP) whitening gel without fluoride; C-received 10% CP whitening gel with fluoride; D- received 10% CP whitening gel without fluoride; E- received 10% CP whitening gel with fluoride. Groups D and E received additional fluoride, applied daily during the first 14 days of the experiment, using OTC mouthwash and prescription toothpaste. The teeth were treated for two weeks (using custom trays) with Opalescence 10% CP gel with and without 0.11% phosphate fluoride and potassium nitrate. The teeth were evaluated for 49 days to assess their color change. Teeth were stored in artificial saliva when not being whitened. Color evaluations were determined using a colorimeter. At day 14 Groups B and D had lower delta E values than group C (p<0.02). At day 49 Groups B and D had lower delta E than groups C and E (p<0.03), B had lower delta L* than C and E (p<0.005), and Group D had a lower delta L* than C (p<0.004). Ten percent carbamide peroxide whitening gel containing 0.11% phosphate fluoride significantly increased tooth whitening and color stability. Neither fluoride mouthwash nor fluoride toothpaste effected overall whitening or color stability.

**Behavioral Science (P2)**

*Utilization of Stainless Steel Crowns: General Dentists Versus Pediatric Dentists.* D. KOZLOWSKI,* J. KOWOLIK (Indiana University School of Dentistry, Doctor of Dental Surgery Program)
Dentistry has adopted the practice of an evidence-based approach. A recent review of the literature supports the evidence that stainless steel crowns (SSC’s) are a far superior choice for Class II restorations in primary teeth indicating that using SSC’s would be taking a step toward an evidence-based practice philosophy. **Objective:** To evaluate the use of SSC’s by general dentists and pediatric dentists. **Methods:** Questionnaires were sent to general and pediatric dentists in the state of Indiana. Questions included frequency, indication for use, child’s age, esthetics, financial status of patient and previous educational exposure of dentist to SSC’s. **Results:** Of the 60 general dentists surveyed 22% replied they would use a SSC instead of a large amalgam or resin, 29% indicated they would use a SSC in a child with rampant decay, and 30% would use a SSC in a child with enamel defects, however only 10% are using SSC’s as part of their practice often. Conversely, of the 60 pediatric dentists surveyed 95% would use a SSC in place of a large amalgam or resin, 100% would use a SSC in a child that had rampant decay, 78% would use a SSC crown in a child with enamel defects, and overall 90% of surveyed pediatric dentists use SSC’s often in their practice. Of the general dentists surveyed 49% felt that if their exposure to SSC’s had been increased in their predoctoral program it would have influenced the frequency that they utilize SSC’s, however only 32% would be interested in continuing education about SSC’s. **Conclusion:** The results imply SSC’s are being significantly under utilized as a restorative option in general practice. It is suggested that an increased amount of exposure to SSC during the predoctoral programs and/or programs in continuing education about SSC’s would increase the usage by general dentists.

**P3**  Inevitability of Dental Disease: Beliefs of Young Mothers. R. JACKSON,¹*  M. FONTANA,¹  M. TORO,¹  S. KELLY,¹  G. ECKERT²  (¹Department of Preventive and Community Dentistry, Indiana University School of Dentistry; ²Division of Biostatistics, Department of Medicine, Indiana University School of Medicine)

The dental beliefs of parents may impact on the resultant oral health of their children. If it is believed that the development of dental caries or tooth loss are inevitable, parents may be less receptive to the initiation of preventive care. As a result, the caries experience of their children may be increased. **Objective:** These data were derived from a larger study designed to determine associations between caries risk behaviors, dental knowledge and perceptions of health of primary caregivers (PCG) and their toddlers, with their level of caries incidence. These data summarize the dental health beliefs of the PCGs based on self-reported race/ethnicity related to caries development and tooth loss. **Methods:** 375 white, black and Hispanic PCGs of 396 young children (26.4±5.6 months-of-age) were interviewed. Six questions were formulated to measure their dental health beliefs; of which two were meant to gauge perceptions concerning the development of dental disease as related to dental caries and tooth loss. An answer of either True (T), False (F) or Do Not Know (DK) was recorded. **Results:**

The responses were as follows:

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* p value =0.028

Most adults will lose all their teeth as they get older
** p value=0.0001

**Conclusion:** Preliminary analyses indicated that the belief in the inevitability of the development of dental disease and resultant tooth loss was found to differ significantly based on race/ethnicity. Comparative analyses of these data to the collected caries examination data of the children are being performed. Supported by NIH R21 48-745-00.

### CARIOLOGY

**P4** Establish a Relationship Between Visual Assessment/Tactile Sensations and Surface Roughness. M. ANDO,* G. ECKERT, D. ZERO

We performed a study establishing a relationship between visual assessment (VA) / tactile sensations (TS) and surface roughness using standard metal references. Five examiners experienced with visual examination (have trained with Ekstrand and/or Nyvad examinations) participated. In order to define a “surface,” two surfaces [Average roughness (Ra): 0.13 and 2.04 µm] were used for training. VA and TS were performed independently with three standard references [Ra: 0.49, 0.92, and 1.54 µm]. Examiners evaluated the roughness using two different ends of explorers (TU 17 SE, and 23 SE, Hu-Friedy Mfg. Co., Inc., USA) with two different handles [Standard Handle, and #6 Handle-Satin Steel (larger diameter), Hu-Friedy Mfg. Co., Inc., USA; a total of four explorers] and one WHO periodontal probe (Hu-Friedy Mfg. Co., Inc., USA). A 5-point scale was used to evaluate both appearance and roughness. Examiners performed three evaluations to establish repeatability. For VA, examiners scored Ra: 0.49 significantly lower than both Ra: 0.92 and Ra: 1.54, and Ra: 0.92 significantly lower than Ra: 1.54 (all p<0.05). Overall, examiners could distinguish among three roughnesses visually. For TS, overall examiners did not score Ra: 0.49 differently than Ra: 0.92 (p=0.19). Ra: 0.49 and Ra: 0.92 were scored lower than Ra: 1.54 (both p<0.05). Some examiners could not differentiate between Ra: 0.49 and Ra: 0.92 with all explorers/probe. Overall intra-examiner intraclass correlations were 0.85 for VA and 0.93 for TS, and no differences were found between handles except for one of the thicker handled explorers. There are positive associations between VA / TS and roughness. VA may be more sensitive in distinguishing different roughnesses than TS. With a thicker handle explorer examiners may be able to distinguish small ranges of surface roughness.

**P5** ICDAS Criteria and Experience: An In Vitro Study with Histological Validation. S. AL-SHIHA, A. FERREIRA ZANDONÁ,* H. EGGERTSSON, C. GONZÁLEZ-CABEZAS, G. ECKERT

In an effort to achieve higher sensitivity and precise quantification that would allow monitoring lesions at an early stage (pre-cavitation), a group of international researchers have developed a new visual criteria, ICDAS (International Caries Detection and Assessment System). **Objective:** The aims of the present study were to assess intra-examiner agreement using ICDAS severity and activity criteria, and to assess sensitivity, specificity, and agreement of the participant’s severity scores with histology, and the agreement of the participant's activity scores with the expert’s activity scores. The null hypothesis was that experience would not affect any of the parameters examined.

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**Methods:** Predoctoral dental students, graduate dental students and faculty from IUSD were invited to participate in the study. Thirty participants were selected. After a lecture and hands-on training session on the ICDAS criteria the participants examined sixty teeth, representing all scores of the criteria mounted on 10 models in phantom heads. For intra-examiner reliability calculations, all teeth (60) were examined a second time. All teeth were initially scored using the severity and activity component of the ICDAS criteria by two expert examiners with these criteria. This was used as the expert’s severity and activity scores. The teeth were sectioned and analyzed under a stereomicroscope. Caries lesions were categorized according to Ekstrand et al. (1998) criteria.

**Results:** All groups achieved substantial to almost perfect intra-examiner agreement for severity scores (0.80-0.84 wtk) and substantial agreement for activity scores (0.62-0.65 K). Agreement with expert’s severity scores ranged from 0.69-0.74 wtK; while agreement with expert’s activity scores ranged from 0.45-0.56 K. Agreement with histology was in the moderate range (0.55-0.59 wtk). Specificity ranged from 82.9 to 87.1 and sensitivity ranged from 88.3 to 91.1. **Conclusions:** There were no significant differences between the groups for intra and inter-examiner agreement for ICDAS activity or severity as measured by kappa. These results suggest that experience does not play a role on learning ICDAS.

**P6** Caries Predictors in a Cohort of Mothers and Their Infants. M. FONTANA, M. TORO,* A. FERREIRA ZANDONÁ, H. EGGERTSSON, R. GREGORY, R. JACKSON, J. DEAN, S. KELLY, A. HAIDER, G. ECKERT, D. ZERO (Indiana University School of Dentistry and School of Medicine)

Dental caries is a multi-factorial disease. This report contains partial baseline data of a 1-year longitudinal study to evaluate the use of xylitol gum by mothers on acquisition of mutans streptococci (MS) in their infants. The objective of this report was to determine the association between caries prevalence in the mothers, cariogenic bacteria (in the mother and child at baseline), caries risk behaviors, and cultural-socio-economic factors. 96 mothers with high levels of MS, as measured using the Caries Risk Test (Ivoclar, Vivadent), and their infants (under 5 months of age at study initiation) enrolled in this study. Mothers completed a questionnaire which included topics related to their own oral health and behaviors, and their infant’s health and feeding habits. Mothers received a dental examination using a modified DMFT index (D was modified to indicate lesion severity), as follows: D\(_1\)MFT: ICDAS >= 1; D\(_3\)MFT: ICDAS >= 3; and D\(_5\)MFT: ICDAS >= 5.

Saliva was collected from the mothers and infants and then plated for MS and *Streptococcus mutans* (Sm) counts. Preliminary significant (p<0.05) baseline findings include: Sm of mothers was weakly associated with mothers’ D\(_1\)MFT (correlation r=0.31), but was not associated with D\(_3\)MFT (r=0.00) or D\(_5\)MFT (r=-0.01). Income was weakly associated with D\(_3\)MFT (r=0.22), and mothers’ age was weakly associated with D\(_3\)MFT (r=0.22) and D\(_5\)MFT (r=-0.31). Income was weakly associated with the mothers’ Sm (r=-0.37). No correlation was found between any of the variables and the mothers’ MS. The Sm of the infant was higher when breastfeeding stopped earlier, but this association was weak (r=0.22). **These results suggest there are some weak associations between caries prevalence and cariogenic bacteria, as determined in this study. Supported by the American Academy of Pediatric Dentistry.**

**P7** Caries and Dental Fluorosis Diagnosis Using QLF and Visual Examinations. E. MARTÍNEZ-MIER,* A. SOTO-ROJAS, H. EGGERTSSON
The purpose of this study was to evaluate the ability of the QLF (Quantitative Light Fluorescence) system to aid in the differential diagnosis of DF (dental fluorosis). Extracted permanent molars were used. Teeth were divided as sound (S), white spot lesions (WSL), mild to moderate DF (MDF), and severe DF (SDF). The sample size was of 37 per group. An independent examiner collected teeth that were classified according to presence of a WSL or DF using the TSIF index. Specimens were scored and analyzed using QLF. 25% of the samples were reanalyzed using all methods and indices in order to calculate repeatability. Fluoride content was measured using microdrill fluoride analysis (MFA). Histological examination using stereomicroscopy was used as gold standard for validation. Specimens were sectioned through the lesions and analyzed using stereomicroscopy differentiating S and WSL from DF. For S specimens QLF values (dF): were 5.58 ± 0.78, for MDF they were 8.56 ± 2.38, for SDF 9.78 ± 3.90, for WSL 18.24 ± 4.85. QLF (dQ) values were 7.77 ± 13.62, 57.28 ± 75.94, 124 ± 110.132, and 248.43 ± 137.26 for S, MDF, SDF, WSL, and MFA, respectively. There was good correlation between QLF and visual exams (Pearson’s Correlation, 2-tailed, r=-0.784, p<0.004). QLF was able to break the groups, according to histology, showing a large difference between sound, WSL and DF lesions. A moderate to weak correlation was found between the results of the QLF and visual examination to the mineral content of the dental tissues determined through MFA (Pearson’s Correlation, 2-tailed, r=-0.584, p<0.05). Results of the current study indicate that examination using QLF was able to detect DF and WSL and differentiate between them.

P8 Standard Fluoride Analytical Methods Development: Precision/ Trueness Testing for Diffusion Techniques. A. SOTO-ROJAS, J. CURY, J. HEILMAN, S. LEVY, Y. LI, A. MAGUIRE, J. MARGINEDA, A. MARTINEZ-MIER, D. O’MULLANE, P. PHANTUMVANIT, G. STOOKEY, A. VILLA, J. WEFEL, G. WHITFORD, D. ZERO, W. ZHANG, V. ZOHOURI (Indiana University; State University of Campinas; University of Iowa; Loma Linda University; University of Newcastle; Autonomous University of Barcelona; University Dental School, Cork; Thammasat University; University of Chile; Medical College of Georgia)

As part of a larger investigation that is aiming at developing standardized methods for fluoride (F) analysis, the current study aimed at assessing the precision, bias and trueness of an F diffusion technique using a certified reference material (RM). Fifteen samples of RM with a concentration of 0.662 ± 0.01 ppm were sent to each of the participating laboratories. Analysis was performed using an agreed upon standard operation procedure developed by the group to analyze F using the diffusion method. The trueness of the measurement process was assessed based on confidence intervals that used both the within-and between-laboratory error terms. The assessment of between-laboratory precision variances was estimated using an analysis of variance. The reported average of F was 0.61 ± 0.05 ppm. The pooled within and between laboratory standard deviations were 0.081 and 0.069 respectively. Mean values for each laboratory were: 0.55, 0.49, 0.56, 0.66, 0.65, 0.59, 0.73, 0.63 and 0.60, respectively. Standard deviations ranged from 0.01 to 0.09. The 95% confidence intervals for each laboratory were: 0.408 - 0.698, 0.344 - 0.626, 0.418 - 0.704, 0.521 - 0.801, 0.513 - 0.788, 0.453 - 0.731, 0.586 - 0.876, 0.482 0.784 and 0.463- 0.739, respectively. The precision and trueness analyses for RM based on the parameters established by ISO 2000, Guide 33, in which the required within laboratory precision is of 5%, was fulfilled by all laboratories. However, the results of one of the laboratories failed the trueness test. All participating laboratories were able to obtain precise results, and eight of the participating laboratories obtained true results, as defined by ISO, using an agreed upon standard operation procedure. Supported by NIDCR grant R21 DE 14716-1.

Dental caries is a chronic infectious disease, common in lower socioeconomic groups. Objective: To determine the association between caries risk behaviors, dental knowledge, and perceptions of health of primary caregivers (PCG) and their toddlers, with their levels of cariogenic bacteria. Methods: 396 children (26.4±5.6 months-of-age) were examined for Streptococcus mutans (Sm) levels by plating pooled plaque samples. Their PCG were examined for mutans streptococci (MS) and lactobacilli (LB) levels using the commercial salivary Caries Risk Test. A range of cultural, socio-demographic, dietary and biological factors, health beliefs and perceptions that may affect caries transmission and development, general-dental health, and access to care were collected through a structured interview. Significant (p<0.05) predictors were identified using logistic regression. Results: A higher-percentage of PCG who had: perceived current cavities (Odds Ratio-OR=2.2), dry mouth during a meal (OR=2.9), lack of dental (OR=1.9) or medical insurance (OR=2.2), high levels of LB (OR=6.9), difficulty understanding the doctor/dentist (OR=3.0), and low income (OR=2.5 for $25K vs. $65K), amongst other factors, had higher MS counts. In addition, a higher-percentage of PCG who had: a cariogenic diet [by snacking (OR=1.9) or drinking (OR=1.8) in between meals], perceived current cavities (OR=3.9) and dental treatment need (OR=2.4), high levels of MS (OR=6.9), low income (OR=2.2, $15K vs. $65K) and education level (OR=2.7, high-school-graduates vs. college-graduates), amongst other factors, had higher levels of LB counts. Factors associated with high Sm counts in the child included: the PCG’s cariogenic diet (OR=1.8), high levels of cariogenic bacteria (OR=2.8), dry mouth during a meal (OR=2.4), perceived current cavities (OR=2.0) and dental treatment need (OR=1.8); and the child’s cariogenic diet (OR=2.1) and perceived current cavities (OR=3.7), amongst other factors. Conclusion: Several perceptions, behaviors and socioeconomic variables were associated with high levels of cariogenic bacteria in the PCG and the child. Supported by NIH-R21-DE16451-01.

P10  Evaluation of a Caries Risk Assessment and Management Program. P. LEY,* M. FONTANA, A. FERREIRA ZANDONÁ, G. ECKERT (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

An accurate diagnosis and management plan for dental caries requires caries risk assessment (CRA). CRA identifies caries risk factors and then determines the probability that there will be a future change in the number of carious lesion and/or in the size or activity of currently present lesions. Objective: 1) To evaluate the effectiveness of the CRA program at Indiana University School of Dentistry (IUSD) and 2) to evaluate if caries management and treatment plan decisions are related to the CRA. Hypothesis: 1) There is a correlation between the management plan provided and the caries risk factors and risk status identified during the CRA; 2) patients received at least 1 follow-up visit, in which the CRA/management plan was evaluated again (and most patients did not get worse); and 3) all charts examined had a faculty-signed CRA form. Methods: 350 charts, seen in 2003 and 2004, were randomly chosen and audited. Results: The CRA screening form was filled out and signed in 46% of charts, 11% were filled out but not signed, and 43% of the charts had forms that were not filled out. Less than half of the charts (44%) included a re-evaluation of caries risk, despite the majority of patients (70%) being moderate to high risk. Out of the patients
P11 Effect of Different Sugars on Secondary Caries Development. P. TOTIAM,* M. FONTANA, D. ZERO, C. GONZÁLEZ-CABEZAS (Indiana University School of Dentistry, Department of Preventive and Community Dentistry)

Objectives: To investigate the effect of glucose vs sucrose and 3 different gap sizes on secondary caries development in vitro. Methods: Ninety pairs of tooth-composite resin specimens were mounted on gap-model stages with a gap size of 25±10, 254±10, or 1016±10 μm (n=30). Three stages of each gap group were attached to 10 petri plates, a total of 9 stages per plate, and gas-sterilized. Petri plates were inoculated with *Streptococcus mutans* (TH16), grown overnight with either glucose or sucrose (n= 5 plates), for 2 h. Specimens were then exposed to Trypticase Soy Broth supplemented with either 1% glucose or 1% sucrose for 1 h, 4x/day, and the rest of the day, the plates were incubated in a mineral buffer solution. After 8 days, tooth specimens were sectioned, stained overnight with a 0.1 mM Rhodamine B solution, and analyzed using a confocal microscope. Digital images were analyzed for area of enamel wall lesion (E-WL-A), area of dentinal wall lesion (D-WL-A), depth of the enamel outer lesion (E-OL-D), and depth of the dentinal outer lesion (D-OL-D). Results: Two-way ANOVA showed that gap size affected E-WL-A and D-WL-A, with wider gaps associated with bigger lesions (p<0.05). Sugar type was found to affect E-OL-D, D-OL-D, and D-WL-A, with sucrose being associated with deeper and bigger lesions (p<0.05).

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<tr>
<th>Gap</th>
<th>Sugar</th>
<th>E-WL-A (μm²) (Mean ± SD)</th>
<th>D-WL-A (μm²) (Mean ± SD)</th>
<th>E-OL-D (μm) (Mean ± SD)</th>
<th>D-OL-D (μm) (Mean ± SD)</th>
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<tr>
<td>25 μm</td>
<td>Glucose</td>
<td>6,942±3,006</td>
<td>3,247±3,281</td>
<td>58±10</td>
<td>78±9</td>
</tr>
<tr>
<td></td>
<td>Sucrose</td>
<td>9,236±5,783</td>
<td>4,619±4,212</td>
<td>58±11</td>
<td>92±14</td>
</tr>
<tr>
<td>254 μm</td>
<td>Glucose</td>
<td>8,150±5,753</td>
<td>25,293±10,248</td>
<td>47±16</td>
<td>82±12</td>
</tr>
<tr>
<td></td>
<td>Sucrose</td>
<td>7,398±3,154</td>
<td>32,509±7,295</td>
<td>60±19</td>
<td>94±13</td>
</tr>
<tr>
<td>1016 μm</td>
<td>Glucose</td>
<td>8,827±4,754</td>
<td>38,021±12,885</td>
<td>53±19</td>
<td>84±12</td>
</tr>
<tr>
<td></td>
<td>Sucrose</td>
<td>12,349±3,762</td>
<td>52,549±11,919</td>
<td>61±15</td>
<td>101±19</td>
</tr>
</tbody>
</table>

Conclusion: The results suggest that wider gap sizes allow for bigger wall lesions, whereas, sucrose produce deeper outer lesions and bigger dentin wall lesions compared to glucose.

CRANIOFACIAL BIOLOGY

P12 Correlation of an IL-1B SNP with External Apical Root Resorption. B. SHANK,* R. CAUDILL, S. ABASS, K. SHANK, J. MACRI, J. HARTSFIELD JR. (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

External apical root resorption (EARR) is a possible sequela of orthodontic treatment. Approximately 33% of patients treated orthodontically experience at least 3mm of EARR. In one sample, an interleukin-1 beta (IL-1B) polymorphism has been shown to explain 15% of the cases of re-evaluated there was no change in risk for 61% of patients, 37% of patients improved, and 2% of patients got worse. Although significant associations were observed between the presence or absence of a caries risk factor and the presence or absence of a management plan for that factor, the presence of a risk factor was not always associated with a management plan to control it.

Conclusion: The results indicate work still needs to be done to obtain 100% integration of CRA into clinical practice at IUSD.
EARR. IL-1B is a proinflammatory cytokine that is involved in the maturation and function of osteoclasts. Decreased levels of IL-1B may affect alveolar bone remodeling, leading to longer periods of stress on the roots of teeth and triggering a series of events leading to root resorption. Single nucleotide polymorphisms (SNP) within the IL-1B gene have the potential to affect IL-1B expression, and or act as markers for association. In this study we wanted to determine if the IL-1B SNP rs13032029 is associated with the occurrence of external apical root resorption (EARR) > 2mm concurrent with orthodontic treatment. Buccal cell swabs were collected from patients who are undergoing full orthodontic treatment. Whole genomic DNA was isolated and PCR was carried out to genotype each sample. Fluorescence of reporter dyes was measured as part of this process, indicating the amounts of DNA present for the specific probe. At the time of abstract publication, 70 samples had been genotyped and their corresponding radiographs had been measured to determine EARR status. Among 20 individuals homozygous for the C allele, 40% were shown to be affected by EARR. 21.4% of 17 individuals homozygous for the T allele were shown to be affected by EARR while 36.3% of 33 heterozygous individual were affected. Currently, more samples are being genotyped, but it appears that there is a correlation between the presence of the C allele (both homozygous and heterozygous) and an increased incidence of EARR. Supported by the IUSD Student Research Grant, and the IU Foundation Bixler Fund.


It has been shown that about one third of the individuals treated orthodontically can get more than 2mm of irreversible external apical root resorption (EARR). Receptor activator of NF-κB ligand (RANK-L) plays an essential role in the differentiation and activation of osteoclasts. The working hypothesis is that decreased osteoclast activity and function affects bone remodeling negatively during orthodontic tooth movement which can put more stress on the roots and lead to EARR. A single nucleotide polymorphism (SNP) in the RANK-L gene (rs922996) resulting in an adenine/guanine replacement at chromosome position 42076671 causes the formation of a unique 5’ end region affecting the translation start codon. In this study, we wanted to look for a correlation between the rs922996 SNP and the incidence of EARR. Whole genomic DNA was isolated and purified from buccal swabs of 72 patients undergoing orthodontic treatment. PCR amplification and analysis was performed using validated rs922996 primers from Applied Biosystems. Of the 72 patients analyzed, 20% of those homozygous for coding of the guanine amino acid (allele 2) were affected by EARR > 2mm. Fifty percent of those homozygous for coding for the adenine amino acid (allele 1) were affected, and 31.5% of the heterozygous patients were affected. This preliminary data indicates that individuals with the SNP for allele 1 (adenine variant) have an increased likelihood of EARR > 2mm concurrent with orthodontic treatment, while those with the allele 2 (guanine variant) have a decreased likelihood of EARR. Supported by the IUSD Student Research Grant and the IU Foundation Bixler Fund.

P14 Susceptibility to Root Resorption Associated with Orthodontic Force in Mice. S. ABASS,* J. HARTSFIELD JR., T. FOROUD, W. ROBERTS (Indiana University School of Dentistry and Indiana University School of Medicine)

External apical root resorption (EARR) is a common clinical complication of orthodontic treatment. Genetic factors account for 50% of the variation in EARR observed in humans. Two genes have
been identified as possible candidates explaining part of the variation in EARR. Other contributing genes are yet to be identified. Inbred strains of mice offer means to control the environmental factors and genetic heterogeneity that complicate human genetic studies. Data have indicated variation in histological root resorption associated with orthodontic force (RRAOF) among different inbred strains of mice. In this study we examined the mode of inheritance, influence of parental sex and further delineation of strain on RRAOF susceptibility in genetically distinct inbred mice and their F1s. RRAOF was determined histologically for male and female mice of the A/J, DBA/2J and BALB/cJ strains, as well as A/J X DBA/2J and A/J X BALB/cJ crosses (20 males and 20 females/strain). RRAOF was induced by applying a 25 gm of force to tip the maxillary first molar mesially for nine days under strict environmental control. Sex differences were observed among the BALB/cJ strain only, with females being more resistant to RRAOF compared to males. Two patterns of inheritance were observed. F1s from the A/J X BALB/cJ strain were resistant suggesting that the A/J have dominant resistance alleles, while F1s from the A/J X DBA/2J strains showed RRAOF intermediate between their parental A/J and DBA/2J mice, suggesting a polygenic trait. These results provide evidence of a traceable and heterogeneous genetic component affecting RRAOF in mice. Thus, inbred mice are a valuable model for identifying genes that modulate the susceptibility to RRAOF, and for ultimately defining the mechanism of RRAOF. Supported by Public Health Service grants T32 AR07581-60 (D. Burr) and F32 DE16543-01A1 (SKA).

**DENTAL MATERIALS**

**P15**  Ca-P Mineral Formation on Niobia Microcones from Salivary Solutions.
R. KARLINSEY, A. HARA, K.YI, C. DUHN (Indiana University School of Dentistry; Seoul National University, School of Earth and Environmental Sciences, Seoul, Korea)

Opportunities exist in developing novel biomaterials that can expeditiously and efficiently mineralize weakened or damaged dentin and enamel due to dental caries or erosion. We propose a self-assembled ceramic exhibiting extraordinary primary nucleation behavior as a promising mineralizing agent for the repair and healing of the dentition. The ceramic is formed through rapid oxidation of niobium metal in an electrolyte, a process that ultimately produces polycrystalline Nb$_2$O$_5$. The Nb$_2$O$_5$ material is known to encourage cell adhesion, is thermally stable, and is resistant to acid attack; however, hard-tissue formation (i.e. bioactivity) has eluded researchers. Here we report on the bioactivity of a specific arrangement of Nb$_2$O$_5$ crystals when immersed in several supersaturated solutions including two simulated saliva formulations and pooled human saliva at 37°C. The simulated saliva formulations had a molar Ca/P ratio of 1.45:5.4 to mimic the ion content in stimulated human saliva, with one containing porcine mucin and the other without. 21 hour immersion periods produced substantial mineral deposits 100 to 150 μm in diameter and 90 μm in height on the ceramic microstructures. The mineral morphology varied from polycrystalline when immersed in protein-free simulated saliva to amorphous when immersed in mucin-containing simulated saliva and pooled human saliva as shown in the corresponding scanning electron micrographs and x-ray diffraction patterns. X-ray energy dispersive analyses revealed Ca-P mineral composition. The mineral phases were probed with x-ray diffraction, Raman spectroscopy and electron microprobe spectroscopy and were identified as hydroxyapatite (HAP), amorphous calcium phosphate, and calcium-deficient and poorly crystalline apatite, depending on the nature of the saliva. Additionally, the presence of large glycoproteins (e.g. mucin) and HAP inhibitors in human saliva (e.g. histatin-1 and statherin) most likely accounts for the contrasting mineral morphologies. In conclusion, these preliminary results indicate the self-assembled ceramic is an efficient
heterogeneous nucleator of apatite and Ca-P mineral, and therefore is an excellent biomaterial candidate for mineralizing applications in preventive and restorative dentistry.

P16  Effects of Cotton Pellets on Endodontically Treated Teeth. B. PETERSON,* M. VAIL, R. GREGORY (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

Most clinicians place a cotton pellet between the temporary restorative material and the obturation. Although placing a cotton pellet as a spacer is clinically convenient and safer, there is a concern surrounding the wicking factor of the cotton. The fibers from the cotton pellet get trapped in the restorative material and allow a path for bacterial contamination to reach the obturated canals. The aim of this project was to evaluate whether the use of a cotton pellet in a canal after obturation had an effect on the sealing property of the temporary restorative material such as Cavit. The project used a test tube with an alligator hook sealed to the inside of the cap. Rubber tubing sealed around a tooth was attached to the alligator clip and the bottom of the tooth was immersed in bacterial growth medium. The research compared obturated teeth that had a sponge, cotton pellet or nothing sealed in the chamber with Cavit. The teeth were then challenged with previously collected pooled saliva as a source of bacteria for up to ninety days and any turbidity changes recorded in the growth medium indicating bacterial passage through the canal. Any positive tubes exhibiting turbidity were confirmed by plating. The results from the study indicated that the teeth with nothing in the pulp chamber demonstrated the longest time before becoming contaminated. These teeth (n=5) had a mean turbidity change of 26±7.0 days as compared to the cotton pellets (n=5) which demonstrated a mean of 15.6±13.5 days and the sponges (n=5) that had a mean of 7.6±8.3 days. The positive control (n=2) took a mean time of 12±14.0 days before they indicated positive results. From the results we can conclude that the cotton pellet and the sponge both show an increase in the speed of contamination of endodontically-treated teeth.

P17  Dental Resin-Matrix Interactions with 4 Different Types of Media. K. GREGSON,* A. BEISWANGER, J. PLATT (Indiana University School of Dentistry, Dental Materials Laboratory)

The aim of this study was to evaluate the effects of four different types of media on core resin materials. Two core materials, Ti Core and Core Restore, and one control composite material were stored in distilled water (DW), artificial saliva (ASL), buffered artificial saliva (ASB) or artificial serum (ASM) for 30 days at 37 °C. The specimens were examined for changes in surface microhardness, appearance with scanning electron microscope, and composition with chemical analysis. Changes in the pH of the media were monitored. Both inorganic and inorganic eluants were identified and quantified using inductively coupled optical emission spectroscopy (ICP) and high pressure liquid chromatography (HPLC) respectively. Two way analysis of variance (ANOVA) were performed on all data sets with a p,0.05. The storage media did not impact the surface microhardness for the control material or for Core Restore. Ti Core showed a decrease in microhardness when stored in each media. Materials stored in either DW, ASB or ASM showed no observable surface changes. The presence of a precipitate was seen on the surface of specimens stored in ASL. Elemental analysis was used to determine that the precipitate is calcium phosphate. The pH of each medium rose after material storage. ICP analysis showed differences between the quantity of calcium, magnesium, potassium and phosphate were not statistically significant for ASL and DW, but for all other combinations of media the differences were significant. Triethylene glycol dimethacrylate (TEGDMA) and camphorquinone (CQ) were the major organic eluants found
in the media from the materials. The changes seen in both the materials and the media are dependent on the identity of the media, rather than the material. Specific chemical properties of the individual media are responsible for the extent of each of the changes.

P18  Esterase Activity in U937 Cells After Exposure to Dental Eluants. T. O’NEILL,* K. GREGSON, J. PLATT, L.J. WINDSOR (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

The goal of this project was to determine if monocyte derived macrophages (U937 cells) exhibit a foreign body response by secreting esterases when exposed to dental materials. Five 7x2mm disk shaped TiCore samples were separately immersed in 10mL of water and incubated at 37ºC for 60 days. The media was extracted with two 5mL portions of chloroform. The chloroform was allowed to evaporate and 200 µL of water was added. A portion of the water was injected into a high pressure liquid chromatography system and the resulting peak was compared to standards determined previously. U937 cells were cultured in Roswell Park Memorial Institute (RPMI) 1640 media with 2 mM Glutamine, 10% Fetal Bovine Serum (FBS) and antibiotics. Phorbol myristoleic acid (PMA) was used to activate the cells. Activated and unactivated cells were incubated at 37ºC in a humidified atmosphere of 5% CO₂. The cells were exposed to 0.75 mmol/L of triethyleneglycol dimethacrylate (TEGDMA). The media was collected from the cells after 2 days. Esterase activity was determined using p-nitrobutyrate. The cleavage product was quantitatively measured in a spectrophotometer at 400 nm. Readings at 400 nm were taken every 2 minutes for a total of 10 minutes for each sample. Each sample on average leached out a total of 373 µg of TEGDMA and 162 µg of camphorquinone (CQ). The U937 cells that were exposed to TEGDMA did not show an increased esterase activity compared to those cells that were not exposed to the TEGDMA regardless of whether they were activated by PMA or not. Composite resin materials did leach dental eluants, TEGDMA and CQ, into media. TEGDMA was not shown to elicit an increased production of esterases in the U937 cells at the concentration used.

P19  In-office Bleaching: Comparison of 2 Color Measuring Methods. B.K. MOORE,* M. FRANCO, B. MATIS, M. COCHRAN

The CR321 Chroma Meter (Minolta, Ramsey, NJ) has been frequently employed in in vivo bleaching evaluations of quantitative color change and is most often used with a custom positioning jig to ensure repeatability. Although this procedure has been shown to yield good results, it is expensive, time consuming and somewhat awkward for the patient. Objective: This study compared agreement of measurements made with and without a custom intraoral positioning device in an in-office bleaching study of 16 subjects utilizing the 6 maxillary anterior teeth. Methods: Ninety-six teeth were measured at 6 times over a 6 week period following in-office bleaching. Measurements were made in the L*a*b* D65 system using a Minolta CR321 colorimeter. Measurements were made with and without the use of the custom positioning device in triplicate at each time. Results: Intra-method ICCs ranged between .92 and .99 for each method indicating excellent repeatability. Inter-method ICCs ranged between .81 and .92 indicating good-excellent agreement between methods. Delta E values between baseline and each following measurement were calculated and compared and average differences between methods were less than 1.0. Conclusions: It was concluded that a custom positioning device provided no benefit in this bleaching study compared to measurements made without the device.
Inhibitor Concentration Effect on Contraction Stress and Degree of Conversion.
M. ALSHAMMARI,* J. PLATT, B.K. MOORE

Objectives: The aim of this study was to investigate the effect of inhibitor concentrations on polymerization contraction stress and degree of conversion (DC) of light cure composites.

Methods: An experimental composite was prepared as a blend of BisGMA: UDMA: TEGDMA (1:1:1 weight ratio) with 65 wt% silanated barium glass (0.7 μm) and 5 wt% silanated silica (0.04 μm). Eight groups were made by varying the concentration of the butylated hydroxytoluene (BHT) inhibitor (0.01, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4 wt %). Samples were light activated for 60 s at 648 ± 17 mW/cm². A tensometer was used to determine contraction stress, maximum stress rate, and time of stress onset. DC was determined with near infrared (NIR) spectroscopy on specimens cured under identical conditions. Results were analyzed by one-way ANOVA/Tukey’s test at the 0.05 level of significance.

Results: Up to 0.4 % of BHT did not have any significant effect on contraction stress even though the 0.4 % BHT composite showed significantly higher DC. Composites with 0.6, 0.8, 1.0, and 1.4 % BHT revealed significant reductions in contraction stress but DC was also significantly reduced. The 1.2 % BHT group exhibited a significant reduction in contraction stress without any reduction in DC. Also, this group showed significantly the lowest maximum stress rate and the longest time of stress onset compared to resins with similar DC (0.01, 0.2, and 0.4). Conclusion: When a higher degree of conversion is desired, a 0.4 wt% of inhibitor appears to be an effective method to increase conversion without increasing contraction stress. Meanwhile, a 1.2 wt% of inhibitor is an optimal level to reduce contraction stress without compromising degree of conversion.

Use of an Optical Detection System for Detecting Subgingival Calculus.
J. MASCARENHAS,* S. BLANCHARD, D. NEWELL, B. HANCOCK, M. KOWOLIK, G. ECKERT

Background: Accurate detection of subgingival calculus is a difficult skill. In spite of this difficulty, calculus removal and the subsequent determination of its removal are critical to the therapeutic goals of periodontology. Objective: The aim of this study was to determine if a commercially available optical detection system (ODS) has greater sensitivity and specificity than traditional clinical methods for the detection of subgingival calculus. Methods: Twenty quadrants in sixteen patients were selected from a group of patients scheduled for routine periodontal surgery involving at least three teeth per quadrant. The patients had undergone initial non-surgical therapy which included subgingival scaling and root planning. Both single and multi-rooted teeth were included, excluding third molars. Teeth were subdivided into 4 areas (MBDL), and scored for the presence or absence of calculus. Prior to flap reflection, patients were evaluated by two examiners using first a WHO probe and then the ODS for the presence or absence of calculus. One examiner was a faculty periodontist while the other was a 2nd year resident. Reproducibility between examiners was at least 80%. Following reflection of mucoperiosteal flaps and debridement of granulation tissue, teeth were scored by a third examiner, for the visual presence or absence of calculus using fiber optic illumination and magnification. Results: Generalized estimating equation (GEE) methodology for a binary response was used to compare the two methods. The ODS had significantly lower sensitivity than manual detection. (32% versus 83%) and significantly higher specificity than manual detection. (93% versus 61%). Both sensitivity and specificity were affected.

DIAGNOSTIC SYSTEMS
by area evaluated on the tooth. Sensitivity was affected by area on the tooth (p=0.0472 for examiner M, p=0.0369 for examiner N, and p=0.0048 for combined examiners), with the facial > distal. Specificity was affected by area on the tooth (p=0.0001 for examiner M, p=0.0006 for examiner N, p=0.0001 for combined examiners), with the buccal and mesial surfaces < distal and lingual. Specificity was significantly higher for anterior than posterior for examiner M (p=0.0073) and combined examiners. % correct was affected by area on the tooth (p=0.0012 for examiner M, p=0.0007 for examiner N, p=0.0005 for combined examiners), with the D > B and M (p<0.015 for examiner M, p<0.0005 for examiner N, p<0.001 for combined examiners) and with D > L for examiner N (p<0.001). Conclusions: The optical detection system relies on detecting the specific spectral signature of calculus. Even though it is a novel concept, limited maneuverability in deep pockets restricts its efficiency. Our study shows that, manual detection still remains the ‘gold standard’ for subgingival calculus detection.

EDUCATIONAL RESEARCH

P22 Prevalence of Dental Hygiene Mentoring Programs to Facilitate Transition to Clinical Practice. S. BLANCHARD,* J. BLANCHARD

Mentoring of students to assist them in the transition to clinical practice has been utilized in a number of health professions but is only now being introduced in dental and dental hygiene education. The objective of this study was to determine the prevalence of mentoring programs to facilitate the transition from student to practitioner among U.S. dental hygiene programs. A six question survey was sent to all 266 dental hygiene program directors by electronic mail to determine if this type of mentoring program was a part of the curriculum. Attempts were made to re-send any questionnaires that were returned as undeliverable (8%). The completed survey return rate was 57%. Results showed that less than 28% of dental hygiene programs are using this type of student mentoring. The main benefit of mentoring reported by hygiene program directors was that it provided “real world” experiences to their students (70%). Lack of formal structure to the mentoring program was the most frequently cited weakness of existing programs (33%). Programs not utilizing mentoring programs listed inadequate and lack of faculty and/or mentors as main obstacles for not implementing a mentoring program. Student mentorship in other health professions has been shown to enhance personal and professional growth and to increase job satisfaction and retention. The results of the study suggest that use of mentoring programs to facilitate the transition to clinical practice could be significantly increased in dental hygiene education.

P23 Indicators for Predicting Success on the Dental Hygiene National Board. J. HUDSON,* E. HUGHES (Indiana University School of Dentistry, Dental Hygiene Program)

Successful completion of the Dental Hygiene National Board Exam is a requirement to obtain licensure to practice dental hygiene in 49 states. Factors that may impact a student’s ability to be successful on boards include study skills, testing taking skills and student dedication. Educators look for indicators to assist them in identifying students who may need additional assistance in preparing for the exam. The purpose of this study was to determine if either a dental hygiene student’s program cumulative GPA at the end of the first year or the score he/she received on a mock national board exam served as an indicator to predict success on the Dental Hygiene National Board Exam. A total of 176 dental hygiene students enrolled at Indiana University School of
Dentistry who graduated between the years of 2002 and 2005 were included in this study. The dental hygiene faculty developed a mock board exam that was consistent in subject content with that of the actual exam. Second year dental hygiene students were given the exam in January of their last semester. The exam was administered using the same procedures and time constraints as the actual exam. An average cum GPA, mock board score and National Board score were calculated for each class. Statistical analysis of the relationship between the cum GPA and the national board score yielded a correlation coefficient of .66. Analysis of the relationship between the mock board exam score and the national board exam score yielded a correlation coefficient of .855. This number indicates a relatively strong correlation between these two variables. Administering a mock national board exam to 2nd year dental hygiene students can be a useful tool for identifying students who may need additional assistance in order to be successful on Dental Hygiene National Board Exam.

HEALTH SCIENCE

P24 Assessment of Nurses’ Knowledge and Practice of Oral Hygiene. H. KASHON, H. TOPPE, S. ZODY, E. HUGHES (Indiana University School of Dentistry, Dental Hygiene Program)

The literature suggests a connection between lack of oral care for critically ill patients and complications that affect morbidity and mortality. Nurses in hospital settings are responsible for providing routine oral care. This survey assessed nurses’ knowledge and practice of routine oral care in high risk patient populations. The content areas of assessment included nurses’ knowledge of oral anatomy and physiology and current oral care practices. An investigator developed questionnaire was distributed to nurses who are members of the local chapters of both the Oncology Nurse Society and American Association of Critical Care Nurses. They were invited to participate in completing the questionnaire during their monthly professional meetings. The participants were nurses who by membership in these professional organizations identify themselves as nurses who work with critically ill patients. The research project was explained and the questionnaire was distributed to those attending the meeting. Those who agreed to fill out the questionnaire were asked to do so and return it into a covered box. There were no consequences for those who did not participate. No names or other identifying information were on the questionnaire. Data was analyzed using frequency statistics and reported in aggregate. Answers to the questionnaire were transferred to a test scoring form and evaluated electronically by the IUPUI Testing Center. The ninety nurses surveyed had basic knowledge of oral anatomical landmarks. However, the nurses were not as knowledgeable of the dental disease process, the definition of dental plaque and oral manifestations of gingivitis. The nurses also did not feel they had the educational background (as students nor with their employment institutions) required to recognize oral disease and offer preventive care to patients. While 47.4% of Oncology Nurses felt there is a need for better oral care for critically ill patients and that better attention to oral care would reduce hospital time, enhance healing and prevent secondary infections, they also felt the employment institutions do not have standardized protocols for oral care for critically ill patients. 88% of the Critical Care Nurses believe they have adequate standardized oral care for patients. In conclusion, Critical Care Nurses caring for patients with these special needs may need additional education in the potential side effects of treatment regimens as they relate to oral health and remedies for these potential problems. The results of this study will be used to plan educational interventions for nurses working with critically ill patients.

MICROBIOLOGY/IMMUNOLOGY
Nicotine Increases the Collagen Degrading Ability of Human Gingival Fibroblasts.

J. ZHOU,* B. OLSON, L.J. WINDSOR

Tobacco use has been recognized to be a major risk factor for periodontal disease. The objectives of this study were to determine nicotine’s effects on human gingival fibroblast (HGF) mediated collagen degradation and to determine the effects that combining nicotine and Porphyromonas gingivalis supernatant has upon HGF-mediated collagen degradation. HGFs were cultured in media containing various concentrations (25–500 µg/ml) of nicotine in 6-well plates coated with reconstituted rat-tail Type I collagen. On day 1 through day 5, HGF cell culture media were collected for zymography and Western blot analyses of the matrix metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs). The cells were then removed and the collagen cleavage visualized by Coomassie blue staining. The mRNA levels of MMP-14 and TIMP-2 were monitored by RT-PCR. To examine the combined effect, 10% P. gingivalis supernatant and 250 µg/ml of nicotine were added in the cell culture media. Nicotine at 150 µg/ml or higher increased the HGF-mediated collagen cleavage. When treated with nicotine, the MMP-14 and MMP-2 produced by the HGFs more readily underwent activation. MMP-1 and MMP-3 were basically unaltered, while the TIMP-1 level was slightly decreased. The TIMP-2 level in the culture media was decreased, while the TIMP-2 in the cell membrane extracts was increased. MMP-14 and TIMP-2 mRNAs were not altered when the HGFs were treated with 250 µg/ml nicotine for 2 days. An additive effect was observed regarding the collagen cleavage when both 10% P. gingivalis supernatant and 250 µg/ml nicotine were added to the HGFs. Nicotine increases the collagen degrading ability of the HGFs, in part, through the activation of membrane-associated MMPs. Nicotine and P. gingivalis supernatant have an additive effect on HGF-mediated collagen degradation.

Conjugative Gene Transfer in Actinobacillus actinomycetemcomitans. G. BELL,* D. GALLI

The rapid increase of antibiotic resistance in bacterial pathogens has become a prevalent problem in the treatment of oral diseases. The most common source of the spread of antibiotic resistance in bacteria is the acquisition of new genes via conjugation of plasmid DNA. Thus, a detailed characterization of conjugative elements present in oral bacteria is warranted. The periodontal pathogen Actinobacillus actinomycetemcomitans (Aa) has a known conjugative plasmid, pVT745. Essential to the transfer of conjugative plasmids is the presence of an origin of transfer (oriT) region, which contains a specific site where one of the DNA strands is nicked in preparation for transfer. Previous work revealed that the pVT745-specific oriT was located in a 192-bp non-coding region of the plasmid. A putative nick site within this locus has been identified via interrupted mating experiments. The objective of the current study was to confirm the specific location and function of the nick site by the introduction of a 2-bp point mutation. A subclone of pVT745 with a modified oriT was constructed by use of the polymerase chain reaction and the splicing overlapping extension technique to change the putative nick site from AC to CG. An added benefit of this mutation was the creation of a new XhoI site, which allowed for an easy confirmation of the modified nick site in the subclone. Successful construction of the subclone in Escherichia coli and subsequent introduction into Aa was confirmed by rapid plasmid preparation and restriction enzyme digest. Currently, mating experiments are being conducted to assess the effect of the nick site mutation on plasmid transfer. A similar subclone, which is lacking the mutation, is being used as a control. Conclusion: Our results indicate that the pVT745-specific nick site has been successfully
mutated. It is expected that this mutation will result in a loss of plasmid transfer. Supported by NIH/NIDCR R01DE12107.

P27  *Streptococcus mutans* DnaK Stimulates Endothelial Interleukin (IL)-6, IL-8 and GRO Release. J. RENSCHLER,* R. GREGORY (Indiana University School of Medicine, Department of Pathology & Laboratory Medicine; Indiana University School of Dentistry, Department of Oral Biology)

DnaK (Hsp70) is a 70 kDa heat shock protein which we previously identified on the *S. mutans* surface and in culture medium. Hsp70 proteins from other bacteria have been shown to stimulate cytokine/chemokine production; for mycobacterial Hsp70, this activity is dependent upon CD40. *S. mutans*, the causative agent of dental caries, is also an important cause of infective endocarditis (IE). The *S. mutans* proteins that act as modulins during IE remain to be completely defined. The objective of this study was to define the role of *S. mutans* surface DnaK as an endothelial modulin. Methods: 0-10 μg/ml recombinant *S. mutans* DnaK (SmDnaK) was incubated with human umbilical vein endothelial cells (HUVEC) for 48 h. IL-6 and IL-8 in culture supernatant were measured by sandwich ELISA. A human cytokine antibody array was also performed. Adherence of SmDnaK to HUVEC was investigated through immunofluorescence microscopy and flow cytometry. HEK293 cells were transiently transfected with pCDM8 containing human CD40 cDNA, and the adherence of SmDnaK was assessed by flow cytometry. Results: A dose-dependent increase in IL-6 and IL-8 was demonstrated. Pretreatment of HUVEC with interferon (IFN)-γ enhanced cytokine production. The cytokine array revealed increases in IL-6 (6.8-fold), IL-8 (11.6-fold) and growth-regulated oncogene (GRO) (14.5-fold). Binding of SmDnaK to HUVEC was demonstrated, and increased binding was seen upon pretreatment of cells with IFN-γ. Adherence of SmDnaK to HEK293 cells was not increased following transfection of CD40. Conclusions: SmDnaK binds to endothelial cells and modulates proinflammatory cytokine release through an IFN-γ-inducible receptor other than CD40.

P28  The Effect of Caffeic Acid and Nicotine on Fibroblast Proliferation. M. WALL,* B. OLSON (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

Considerable evidence suggests that cigarette smoking is a major risk factor for periodontal disease, with nicotine being a potential mediator of these pathologic effects. Nicotine can increase the rate of reactive oxygen species (ROS)/free radicals formation in the body. Caffeic acid is an antioxidant and is found in coffee and tobacco as well as other plants such as fruits and tea. Although data is available examining nicotine's influence upon cell viability, little information has been published regarding the influence of caffeic acid and nicotine on specific cell types particularly upon human gingival fibroblasts. Thus, this research proposal is designed to evaluate the influence of caffeic acid and combinations of caffeic acid and nicotine upon the viability of human gingival fibroblasts. To first determine cell viability at different concentrations with each agent alone, human gingival fibroblasts were exposed to nicotine concentrations from 0 to 3000 ug/ml and to caffeic acid concentrations from 0 to 500 ug/ml for 24 hours. After 24 hours, cell viability was assessed utilizing a WST-1 assay. Initial results show a decrease in cell viability with nicotine at the higher concentrations tested and no change in cell viability with caffeic acid at the lower concentrations tested versus untreated cells. Thus, decreases in cell viability were noted with nicotine above 1000 ug/ml and with caffeic acid above 100 ug/ml. Further assays will determine if a combination or combinations of both nicotine and caffeic acid increases cell viability over nicotine alone.
Streptococcus mutans is the most important pathogenic bacteria in dental caries and colonizes the dental hard tissue via several main types of cell surface proteins. These include glucan–binding proteins, glucosyltransferases (GTF), adhesin protein P1 and Csh family proteins. Adhesin protein P1 is involved in the adherence of *S. mutans* to saliva-coated surfaces, while glucan-binding proteins help cells bind to glucans produced by GTF. But, from two different animal studies, conflicting observations were found in that rats infected with P1 defective mutant strains developed less smooth-surface caries than those infected with wildtype strains under low sucrose diets. However, they developed similar smooth-surface caries as those infected with wide-type strains under high sucrose diets. It is assumed that the role of P1 in biofilm formation is less important than that of GTF in the presence of sucrose. The purpose of this study was to compare biofilm formed by P1 defective *S. mutans* and its wild-type on solid surfaces in media with different concentrations of sucrose. *S. mutans* strain NG8 (wild-type) and its P1 isogenic mutant PC 3370 were cultured in saliva-coated polystyrene microtiter plates with different concentration of sucrose and trypticase soy broth (TSB) for 18 hours. The concentrations of sucrose ranged from 0% to 10% in undiluted TSB media or TSB media diluted 1:2 or 1:5. Biofilms were formed and quantified according to the biofilm formation assay adapted from the method of O’Toole & Kolter. Interestingly, in the absence of sucrose, there was no significant difference between the biofilm formed by NG8 and PC3370 in all TSB concentration groups. In the presence of sucrose, the ability of NG8 and PC3370 to form biofilm increased significantly with more biomass formed by NG8 than PC3370. However, with increasing amounts of sucrose, PC3370 formed less biofilm with no obvious change in the biofilm formed by NG8. The trend was consistent in all TSB concentration groups. The growth of PC3370 seemed better than that of NG8 with more non-adherent bacteria in the media with sucrose. Moreover, biofilm formed by NG8 and PC3370 demonstrated clearly different architectures. NG8 formed more confluent and smooth biofilm while PC3370 formed irregular and patchy biofilm. Thus, we conclude that in the early stages of biofilm formation (<48hr), the presence of sucrose can improve the biofilm growth of NG8 and PC3370. The level of sucrose has no effect on the biofilm formation for *S. mutans* (wild-type), but decreases biofilm formation for its P1 isogenic mutant in increasing sucrose concentrations.

Quantitative Estimation of TLR 2 and 4 in Oral Epithelium. B. LARGURA,* S. ZUNT, S. BLANCHARD, M. SRINIVASAN

Objectives: To characterize the expression patterns of Toll-like receptors (TLR) -2 and 4 in normal oral epithelium. The oral cavity has been shown to contain over 500 species of microorganisms living in relative equilibrium. These microbial populations elicit no significant host response despite intimate contact with host cells. The ability to avoid infection, and also to tolerate resident populations, depends on mechanisms of innate immunity. Our innate response consists of pattern-encoded recognition receptors (PRR) binding to the conserved pathogen associated molecular patterns (PAMP) on microbes in a very coordinated and dynamic process. TLR was first identified in the fruitfly (*Drosophila sp.*), and are members of an evolutionary conserved family of PRRs. Ten different TLRs which mediate recognition of diverse classes of PAMPs have been identified in humans. The TLRs are expressed on immune cells such as macrophages and lymphocytes as well as on epithelial cells and likely contributes an important role in local host defense. Methods: Using
human archival tissues, we investigated the expressions of TLR-2 and TLR-4 in normal gingiva by immunohistochemistry. The levels of TLR-2 and TLR-4 were quantitated by image analysis.

**Results:** We observed that there is increased expression of TLR-4 as compared to TLR-2 in normal gingival epithelium. Interestingly, the expression of TLR-4 was increased on the cell membrane in upper layers of stratum spinosum while it was cytoplasmic in the basal cell layer. Furthermore, there seemed to be a gradient in the expressions of both TLR-2 and TLR-4 from stratum germinativum to stratum corneum.

**Conclusion:** The expressions of TLR 2 and TLR 4 in normal gingival epithelium implicate an important role for the oral epithelium in the innate immune response, perhaps in maintaining oral mucosal health in the context of commensal oral flora.

**P31** Biofilm Formation of *Actinobacillus actinomycetemcomitans*. C. KELLY,* A. GUSTAVSSON, D. GALLI (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

*Actinobacillus actinomycetemcomitans* (*Aa*) is a Gram-negative coccobacillus that has been implicated as the etiological agent of localized aggressive periodontitis (LAP), an aggressive oral disease that causes rapid destruction of soft tissue and bone and subsequent tooth loss. Traditionally, studies on *Aa* have been performed with planktonic (free-floating) cells. However, cells of fresh clinical isolates of this pathogen are able to self-aggregate, a phenotype that has been associated with the ability of this organism to form tenacious biofilms on surfaces such as glass, plastic and saliva-coated hydroxyapatite. The objective of the current study is to determine if self-aggregation as displayed in broth culture is a requirement for attachment of *Aa* to surfaces and subsequent biofilm formation. A standard colorimetric assay based on crystal violet staining was used to measure *Aa* adhesion to wells of a microtiter plate. The study included strains of *Aa* with and without the ability to self-aggregate and an intermittent genetic mutant. After 2 days of growth at 37°C in 10% CO₂, planktonic cells were removed from the microtiter plates by repeated washing. Remaining attached cells were fixed with 95% ethanol and stained with 0.1% crystal violet. Cell-bound crystal violet was released with Triton X-100 and its concentration in solution was determined by optical density readings at 550 nm. At least eight replicas were performed for each culture. Furthermore, experiments were repeated by the addition of Oxyrase to the medium. Oxyrase is a commercially available enzyme that creates an anaerobic environment. Results indicated that both self- and non-aggregating cells of *Aa* were able to attach to the wells of the microtiter plate. Differences were noted for attachment patterns only with non-aggregating cells adhering to the wells more evenly. In addition, adherence was reduced in the absence of oxygen. Quantitative and qualitative differences in adherence and biofilm formation between strains are currently being assessed through the use of confocal scanning laser microscopy and image analysis software. Conclusion: The ability of *Aa* cells to self-aggregate does not appear to be a precondition to adhere to surfaces and form biofilms. However, efficient colonization seems to depend on the presence of oxygen.

**P32** Quorum Sensing Regulates Antigen I/II Expression in *Streptococcus mutans*. Z. CHEN,* R. GREGORY

*Streptococcus mutans* is a major pathogen that causes dental caries. The initial attachment of *S. mutans*, in the absence of sucrose, is mediated by a major surface adhesin: antigen I/II polypeptide (encoded by *spaP* gene). The structure, function and immunogenicity of this adhesin have been well studied. However, little is known about how antigen I/II is regulated. In this study, we explored the
possible regulatory mechanisms of antigen I/II and the involvement of a quorum sensing system (protein components encoded by com genes). We used western blot assays and chloramphenicol acetyl-transferase (CAT) reporter gene assays to determine the expression of antigen I/II at both the translational and transcriptional levels. Serially-truncated spaP (encoding antigen I/II protein) promoter regions were engineered into shuttle vectors that contain a cat gene, and transformed into S. mutans UA159 cells. The wild-type UA159 cells, as well as com gene-knockout strains were serially diluted in culture media to generate different cell densities (OD$_{600}$=0.05-0.8), and antigen I/II expression levels were measured after a short incubation. The expression level of antigen I/II was inversely correlated to the cell density in bacterial culture. Specifically, the expression level of antigen I/II was the highest when cell density was the lowest, and decreased as the cell density increased. The change in expression was approximately 2 fold from the lowest to highest cell density, which is true for both translational and transcriptional levels. In the serially-truncated promoter assay, the shortest promoter fragment (-35 sequence to translational start site) maintained regulatory characteristics. However, such changes were not observed in those com gene-knockout strains. Our results indicated that the quorum sensing system is involved in the regulation of antigen I/II expression, although the definitive mechanism of regulation requires further study.

P33 Differential Expression of Toll-like Receptors (TLRs) in Saliva. S. MAILAPUR,* S. BLANCHARD, V. JOHN, M. SRINIVASAN

The oral cavity is the only area in the body where the hard tissue breaks through the epithelial surface. The periodontal epithelium surrounding the tooth is specialized to form an attachment and seal around each tooth. This unique function imparts special challenges to the tissue and leads to certain vulnerabilities associated with periodontal disease, especially in view of the continual exposure to the bacterial biofilm (dental plaque) that forms on the tooth surface at the junction of the soft tissue. Thus, this anatomical region is one where there is a significant risk of bacterially induced infection and inflammation. Periodontal pathogens were identified in saliva in healthy and diseased subjects. Toll-like receptors (TLRs) are evolutionarily conserved pattern recognition receptors (PRRs). TLRs act either independently or in concert to recognize specific pathogen associated molecular patterns such as peptidoglycan or lipopolysaccharides. Although TLRs are primarily membrane associated proteins, soluble forms of TLRs have been identified in milk and saliva. It has been suggested that these soluble TLRs act as scavenging molecules of bacterial products and help in bacterial clearance. The purpose of this study was to analyze if differential expression of Toll-like receptors (TLRs) in saliva could reflect the state of periodontal health or disease. Unstimulated saliva was collected from normal individuals and patients with periodontal diseases, clarified and stored at -20C until further analysis (IRB: 0503-88). Part of the saliva was mixed 1:10 in isotonic saline and centrifuged at 14000rpm for 10 minutes. The pellets were stored at -20C. Levels of soluble TLR-2, TLR-4, CD14 and TLR-5 were quantitated by modified ELISA and Western blot analysis. Periodontal pathogens namely Actinobacillus actinomycetemcomitans, Porphyromonas gingivalis and Fusobacterium nucleatum in the saliva will be identified by culture and PCR to correlate with the periodontal status. Preliminary results suggest presence of soluble CD14, TLR-2 and TLR-4 in the saliva of normal controls. In conclusion, our preliminary results show that in addition to the previously known antimicrobial agents, normal saliva also possesses soluble toll like receptor proteins.

P34 Role of Terminal Lysines in Streptococcus mutans Enolase Activity. J. GE, D. CATT, R. GREGORY*
Our previous research suggested that surface enolase is a major plasminogen and salivary MG2-binding protein of *Streptococcus mutans*. In addition, the last two C-terminal lysine residues of enolase are crucial for plasminogen-binding activity, but not important for salivary MG2-binding activity. **Objectives:** To determine the role of the presence or absence of the terminal lysines in enolase enzymatic activity. **Methods:** The gene encoding wild type enolase (w-eno) was cloned from *S. mutans* UA159, and a C-terminal mutation (m-eno) was constructed by replacing two C-terminal lysine residues (425ksfynlkk432) with threonine residues (425ksfynlTT432). After DNA sequencing and protein expression, the recombinant proteins w-eno and m-eno, expressed in *Escherichia coli* BL21, were purified by Ni-column from the soluble fraction or inclusion body, respectively. The cloned proteins were used to measure the enzyme activity of converting phosphoenopyruvate to 2-phosphoglycerate under various pH conditions. Purified yeast enolase was used as a positive control. **Results:** Both the recombinant proteins w-eno and m-eno demonstrated the ability to synthesize 2-phosphoglycerate with similar kinetics at pH 7.5, 7.75, 8.0 and 8.25. The proteins exhibited maximal velocity of 3.5 and 3.0 minutes at pH 7.5, respectively, indicating the terminal lysines were not crucial for enolase activity. **Conclusion:** These data indicated that the mutation of the last two C-terminal lysine residues of enolase, which inhibit plasminogen-binding but not MG2-binding, has no effect on enolase enzymatic activity.

**NEUROSCIENCE/TMJ**

**P35** Temporomandibular Synovial Fibroblast Mediated Collagen Cleavage. A. BERGDOLL,* L.J. WINDSOR, F. SONG (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

Millions of Americans suffer from degenerative joint diseases that affect the temporomandibular joint (TMJ). In these affected individuals, the collagen degradation is mediated in part by TMJ synovial fibroblasts. These fibroblasts produce matrix metalloproteinases (MMPs) that are able to cleave multiple components of the extracellular matrix. Recently, a novel non-MMP collagen degrading pathway has been identified in a TMJ synovial fibroblast cell line after 8-13 passages in culture and is referred to as the aggressive phenotype because of their increased collagen degrading ability. In earlier passages, these fibroblasts displayed a less aggressive phenotype and are referred to as the non-aggressive phenotype. **Objective:** The specific aim of this project was to determine the rate of collagen cleavage mediated by the conditioned media from the aggressive and non-aggressive fibroblasts. **Methods:** Rat-tail-tendon Type 1 collagen was labeled with fluorescein isothiocyanate and mixed with unlabelled collagen to form collagen gels. Aggressive and non-aggressive fibroblast media was added to the collagen gels, incubated overnight, and then the fluorescence released from the collagen was determined and the rate of collagen cleavage calculated. **Results:** The amount of collagen cleavage mediated by the aggressive conditioned media was greater than 5 fold more than that mediated by the non-aggressive conditional media. The collagen cleaving ability of the non-aggressive phenotype was effectively inhibited with 1,10-phenanthroline, an MMP inhibitor. The collagen cleavage mediated by the aggressive phenotype was more effectively inhibited by phenylmethylsulfonyl fluoride (PMSF), a serine proteinase inhibitor, than with 1,10-phenanthroline. **Conclusion:** The amount of collagen cleavage mediated by the aggressive cells was substantially more than that mediated by the non-aggressive cells. The ability of PMSF to more effectively inhibit the collagen cleavage mediated by the aggressive cells than that of an MMP inhibitor further demonstrated that the collagen cleavage mediated by the aggressive cells is serine proteinase(s) dependent.
Cytokine and Matrix Metalloproteinase Protein Expression from Temporomandibular Joint Synovial Fibroblasts. S. WEED,* L.J. WINDSOR (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

In chronic temporomandibular joint (TMJ) disorders, there is a breakdown of collagen containing structures of the TMJ. Matrix metalloproteinases (MMPs) and the tissue inhibitors of MMP (TIMPs) expressed by TMJ synovial fibroblasts play a role in regulating collagen turnover in normal and pathological conditions. Recently, a TMJ synovial fibroblast cell line demonstrated the ability to degrade collagen utilizing a novel serine protease mediated pathway, referred to as the aggressive phenotype. Another TMJ cell line that did not utilize this novel serine protease to cleave collagen was referred to as the non-aggressive phenotype. **Objectives:** The purpose of this study was to examine the cytokines and the MMPs produced by the non-aggressive phenotype and the aggressive phenotype. **Methods:** Conditioned media was obtained from each TMJ cell line. To identify the expression profiles of multiple cytokines from each cell line, the RayBio® Human Cytokine Antibody Array was used. The RayBio® Human Matrix Metalloproteinase Antibody Array was also performed on the conditioned media from both cell lines to examine the presence of select MMPs secreted into the conditioned media. **Results:** The cytokine array for the non-aggressive phenotype demonstrated the presence of GRO, GRO-α, IL-6, IL-8, MCP-1, MCP-2, RANTES, and TNF-β. The cytokine array for the aggressive type demonstrated the presence of GCSF, GRO, IL-6, IL-8, MCP-1, and TNF-β. The MMP array demonstrated that the non-aggressive phenotype expressed MMP-1, MMP-3, TIMP-1, and TIMP-2. The MMP array demonstrated that the aggressive phenotype expressed MMP-1, MMP-3, TIMP-1, and TIMP-2. **Conclusion:** These results suggest that the non-aggressive phenotype and the aggressive phenotype can induce tissue destruction by differentially regulating MMP, TIMP, and cytokine expression.

**ORAL BIOLOGY**

The Effect of Ethanol and Nicotine on Fibroblast Viability. R. BROWN,* B. OLSON (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

Consumption of alcoholic beverages and cigarette smoking are common in our society. Individuals who smoke frequently consume alcohol at the same time. Both ethanol and nicotine have been linked as risk factors to various cardiovascular diseases, cancer and other conditions. Although the combined influence of ethanol and nicotine upon various tissues in animals has been explored, little information has been published regarding the influence of ethanol and nicotine on specific cell types particularly upon human gingival fibroblasts. Thus, this research proposal is designed to evaluate the influence of ethanol and combinations of ethanol and nicotine upon the viability of human gingival fibroblasts. To first determine cell viability at different concentrations with each agent alone, human gingival fibroblasts were exposed to nicotine concentrations from 0 to 3000 ug/ml and to ethanol concentrations from 0 to 100,000 ug/ml for 24 hours. After 24 hours, cell viability was assessed utilizing the WST-1 assay. Initial results show a decrease in cell viability with nicotine and ethanol at the higher concentrations tested versus untreated cells. **Thus, decreases in cell viability were noted with nicotine above 1000 ug/ml and with ethanol above 30,000 ug/ml.** Further assays will determine if a combination or combinations of both nicotine and ethanol decreases viability over nicotine or ethanol alone.
ORTHODONTICS

P38 The Development of a Biomechanical Murine Model for Orthodontics. R. VIECILLI,*
T. KATONA, W. ROBERTS, J. HARTSFIELD JR. (Indiana University School of
Dentistry, Combined PhD-Orthodontics Program)

The developed approach allows multi-variable analyses of orthodontic responses to a newly
designed superelastic NiTi spring. The spring delivers a relatively low constant force to the mouse
molar crown. The load system is expressed as stresses and strains within the dental structures. To
control for differences in these structures, hence differences in the concomitant stresses and strains,
anatomical characteristics of bone, root and PDL were determined in the 9 week-old C57B6 mouse.
MicroCT imaging allowed non-destructive three-dimensional reconstruction and quantification of
these anatomical structures. We determined optimal microCT settings in conjunction with an
original alignment method that minimizes artifacts along the 80µm thick PDL region. MIMICS
bioengineering software was used for segmentation and 3-D reconstructions. Computer-based
alveolar bone morphometry allowed quantification of bone characteristics. Application of the
developed model allows logical and “fair” comparisons of mice with different genetically-
determined anatomical and immunological characteristics, which in turn are manifest as different
root resorption and tooth movement responses.

P39 Anterior Open Bite Associated with a Tongue Thrust Swallow: A Case Report.
M. NONDORF,* S. ISIKBAY (Indiana University School of Dentistry, Doctor
of Dental Surgery Program)

Anterior open bite with incisor protrusion is associated with a whole host of underlying etiologies
some of which include: muscle dysfunction, thumb sucking habits, and open mouth breathing. This
patient presented with an anterior open bite associated with a characteristic tongue thrust swallow
pattern which is considered by some to be an etiologic factor or a maintainer of anterior open bite.
The underlying reasoning behind this belief is that when the tongue is thrust between the incisors
over time it can allow for the movement of teeth. The treatment according to this view often
involves the use of behavioral modification or devices aimed at stopping the habit before
orthodontic therapy. The purpose of this case report is to present one position on tongue thrust
swallowing and its treatment.

PERIODONTICS

P40 Nicotine and N-Acetyl-L-Cysteine Effects on Gingival Fibroblast Proliferation. E. AMOS,*
B. OLSON (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

The use of tobacco products is a risk factor for oral disease with nicotine being a potential mediator
of these pathologic effects. Nicotine can increase the rate of reactive oxygen species and free radical
formation in the body. Glutathione (GSH) is a predominant defense against reactive oxygen species
and free radicals in different tissues in the body. The GSH precursor, N-acetyl-L-cysteine (NAC)
has been shown to increase intracellular GSH levels. Objectives: This study was designed to
determine the influence of the combination of NAC and nicotine on gingival fibroblast cell
proliferation: Methods: In this study, gingival fibroblasts were treated for 24 hours with NAC
concentrations from 0 to 25ug/ml, nicotine concentrations from 0 to 1500ug/ml and combinations of
nicotine and NAC. After 24 hours, cell proliferation was determined utilizing the colorimetric assay WST-1. **Results:** The data demonstrated that nicotine alone after 24 hours at concentrations of 500, 1000 and 1500ug/ml significantly decreased cell proliferation. After 24 hours, NAC alone at a concentration of 5ug/ml did not significantly reduce cell proliferation. The combination of 5ug/ml NAC and 500ug/ml nicotine after 24 hours did not significantly decrease cell proliferation. **Conclusions:** After 24 hours, nicotine concentrations of 500, 1000 and 1500ug/ml significantly reduced fibroblast proliferation. The combination after 24 hours of NAC at a concentration of 5ug/ml with nicotine at a concentration of 500ug/ml prevented a significant reduction in cell proliferation.

**PULP BIOLOGY**

**P41** Cytokines Alter Collagen Degradation and MMP/TIMP Expression from Pulp Fibroblasts. K. WISITHPHROM,* L.J. WINDSOR

Dental pulp destruction is believed to be mediated, in part, by matrix metalloproteinases (MMPs) and the tissue inhibitors of MMPs (TIMPs). Several cytokines identified in inflamed pulp are important in the pathogenesis of pulpitis. This study examined the effects that TNF-α, IL-1β, IL-6, and TGF-β1 have on the collagen degradation mediated by pulp fibroblasts utilizing a cell-mediated collagen degradation assay. Reverse transcriptase-polymerase chain reaction, Western blot analyses, and zymography were utilized to examine multiple MMPs and TIMPs. The collagen degradation mediated by these cells was stimulated by these cytokines. TNF-α, IL-1β, and IL-6 increased the mRNA and/or protein expression of MMP-1, MMP-2, and MMP-3. TGF-β1 decreased MMP-1 mRNA expression while only slightly affecting the MMP-2 and MMP-3 mRNA and/or protein. These cytokines basically did not affect the expression of TIMP-1 or TIMP-2. These results suggest that these cytokines affect pulp destruction, in part, by differentially regulating the MMPs and TIMPs.

**TOOTH WHITENING**

**P42** Clinical Evaluation of In-Office Bleaching With and Without Tray Bleaching. B. MATIS,* M. COCHRAN, G. ECKERT (Indiana University School of Dentistry, Department of Restorative Dentistry, Clinical Research Section)

It has been suggested that in-office bleaching should be followed by At-home bleaching but there is not evidence that such follow-up treatment is more effective. **Methods and Materials:** There were four cells: D1- 40 minute In-office treatment (FP 134 Dentsply, York, PA) without follow-up; D1+ same as D1 with 7 day follow-up using At-home overnight (NUPRO White Gold 15% CP, Dentsply) treatment; D3- three 15 minute In-office treatments without follow-up and D3+ same as D3 followed by 7 day follow-up treatment. Evaluations at baseline, immediately after bleaching, at 1, 4, 7 and 14 days, and at 3 and 6 months using objective and subjective methods. Sensitivities were patient reported. **Results:** 34 subjects attended all evaluations. 22 females and 14 males with youngest 35 and oldest 78. D1- / D1+ and D3- / D3+ treatments not significantly different immediately post-bleaching, but for all other follow-up examinations D1- and D3- had significantly less color change than D1+ and D3+. D1 treatments had significantly more change in L* and b* immediately post-bleaching than D3 treatments. D1+ had significantly less overall change (delta E) at 2 weeks and at 12 weeks than D3+. D1- had significantly lower gum and tooth sensitivity than
D1+ for day 1 and day 5, respectively. D3- had significantly lower gum sensitivity than D3+ for days 5 and 6. D3- had significantly lower tooth sensitivity than D3+ for days 4, 5, and 6.

**Conclusions:** Use of three applications of Dentsply FP 134 product significantly lightened teeth in L*, a*, b*, E and shade guide parameters. Use of At-home product after In-Office procedure lightened more in all parameters measured than any of the other cells. Dentsply FP 134 passes the clinical portion of ADA criteria for Seal of Acceptance with or without use of At-Home product with three applications of gel. Supported by Dentsply International.
Table Clinics
2:30-3:15 p.m.: Odd-Numbered Clinics (coded red)
3:15-4:00 p.m.: Even-Numbered Clinics (coded blue)

Behavioral Science (T1)
Cariology (T2)
Dental Materials (T3)
Ethics in Research (T4)
Health Science (T5, T6)
Healthcare System (T7)
Pain Management (T8)
Periodontics (T9, T10)
Pharmacology/Therapeutics/Toxicology (T11, T12)
Salivary Research (T13)

BEHAVIORAL SCIENCE

T1  Fact or Fiction: Are Dentists at Risk for Stress-Related Suicide? J. EDWARDS, B. KENEMER, D. PAMPEL, L. ROSEMAN, J. BLANCHARD (Indiana University School of Dentistry, Dental Hygiene Program)

There is a preconceived notion held by many people that dentists have a high suicide rate compared to the general population. The objective of this table clinic is to provide a literature review examining past research to determine the validity of the belief that dentists are more at risk for suicide. This topic has been debated since the 1960’s and prior, but most of the research available from the past twenty years concurs that the association between dentistry and high suicide is inconclusive. Problems with earlier studies include statistical bias, lack of scientific foundation, and research not reflecting current demographics in the dental profession. Most of the recent literature, however, agrees that dentistry is a high stress occupation, or that individuals drawn to the field have personalities at high risk for stress-related problems. A possible solution to protect dentists from susceptibility to occupational stress could be to add special training to the dental school curriculum and educate dental professionals in addressing and understanding the stresses related to their chosen profession. Practicing dentists could benefit from stress management workshops, learned behavioral techniques, and availability of support systems. For this table clinic a variety of peer reviewed journals, state dental association journals, and internet resources were used. A review of the available information reveals that there is no conclusive evidence to support the speculation that dentists are more prone to suicide; however, there seems to be a link to the profession and incidents of anxiety, depression, and burnout. A question to be considered for further research could be whether the dental occupation itself is at higher risk for stress, or is it that the individuals drawn to the field are predisposed by personality type to occupational stress-related problems.

CARIOLOGY

T2  Dental Caries Vaccination: The Future in Caries Prevention? S. BARNETT, T. BECKERING, M. FRAZIER, A. KIRK, R. GREGORY (Indiana University School of Dentistry, Dental Hygiene Program)
Dental caries is one of the most common infectious diseases found in humans. *Streptococcus mutans* and *Streptococcus sobrinus* has been identified as the major etiological agent in human dental caries. Prevention of medical complications resulting from dental caries for everyone has long been a goal of dental professionals. The objective of this literature review is to inform and educate dental professionals of the effectiveness of dental caries vaccination in controlling dental caries. For over forty years the concept of a dental caries vaccine has been researched and studied. Several studies performed in laboratories have demonstrated the possibility of immunizing experimental primates and rodents with protein antigens from *S. mutans* or *S. sobrinus* against oral colonization and the development of dental caries. Protection against these bacteria has been linked to salivary IgA antibodies which can inhibit sucrose metabolism of the bacteria or may interfere with the adherence to tooth structures. Currently two different types of vaccinations are being studied: active and passive immunization. Active immunization given subcutaneously, orally or intrasally administers high levels of antigens that establish a protective immune response. Passive immunization administered topically has been shown to protect against oral recolonization by *mutans streptococci*. Although no vaccination is being used currently in the population, recent animal and human trials provide strong evidence linked to the effectiveness of vaccinations. After reviewing the available information, the benefits of vaccinations for prevention and control of dental caries looks promising. Dental professionals should stay abreast of future study results.

**DENTAL MATERIALS**

T3 Extract or Not: One Use of Resin-Reinforced Fibers. A Case Report. M. SMITH,* B. MATIS (Indiana University School of Dentistry, Doctor of Dental Surgery Program)

Occasionally we come across situations where teeth have a significant loss of bone support and teeth become very mobile, even to necessitate extraction. The only problem is that most of the time these teeth are maxillary and mandibular anterior teeth which removal would compromise esthetics. These teeth are usually asymptomatic. Frequently, these periodontally treated teeth are too weak to clinically and financially justify placement of a conventional splinted fixed prostheses, but their condition doesn’t justify extraction. 84 year old white male presents with severe mobility in mandibular anterior teeth, exhibiting substantial bone loss. To avoid extraction of these asymptomatic teeth, it was decided to place a lingual periodontal splint from #22 - #27 using Kerr Connect Reinforcement Ribbon. The width of the teeth was measured with dental floss to determine the length of ribbon needed. Teeth were carefully immobilized using my fingers to cut interproximal slices between each tooth using an 1170 Carbide Bur. Interproximal wedges were placed and the teeth were etched, primed, and a thin layer of flowable resin was placed in the interproximal and lingual surfaces of the teeth. Before curing, the ribbon was wicked with dentin bonding agent, placed on the lingual, then cured. Another layer of flowable resin was placed to completely cover the ribbon. Excess resin was removed and the splint was polished. Teeth exhibited no mobility following the procedure, and extractions were avoided.

**ETHICS IN RESEARCH**

T4 Animal Research: Cruel or Science? You Decide. S. BOYLL, J. HAWLEY, S. PRICKEL, H. RACKLEY (Indiana University School of Dentistry, Dental Hygiene Program)
The idea of animals being used for the purpose of research has been controversial all over the world since the beginning of medical science and research. Animals have frequently been the center of research projects where humans are unwilling or unable to participate due to concerns of ethics. Using animals as a substitute for a human subject has caused much controversy in the medical and dental world causing consideration of whether or not it is necessary to use animals as a means of advancement in the fields. Often people are quick to make assumptions about the role of animal research before knowing all the facts. The objective of this table clinic is to show the pros and cons of animal research and to educate professionals in ways animals are treated within research facilities. This focus includes a review of the literature as well as web-based information as reported by animal activist groups. Another focus included interviews and reviewing materials obtained from members of the IU School of Dentistry Animal Research Department. Through this review, it was found that many facilities do not uphold minimal quality standards of care for the research animals. Nonetheless, animals remain important models to study disease, vaccines, and products. It is hoped that the information provided will assist the dental professional to form informed opinions on animal research. Further, it is hoped the information will be shared with clients and other dental professionals who question the value of animal research.

HEALTH SCIENCE

T5  The Dental Professionals’ Role in Sleep Apnea. S. KIRK, K. PAUL, S. PHILLIPS (Indiana University School of Dentistry, Dental Hygiene Program)

According to the National Institute of Health, 1 in 5 Americans are affected by a disorder known as Sleep Apnea. More than 40 million people are undiagnosed. There are three types of apneas: central, mixed, and obstructive. The objective of this table clinic is to inform dental professionals of the causes, risks, and treatments available for obstructive sleep apnea (OSA). A variety of literature was reviewed and then a survey for area dental professionals was developed. The survey revealed that general knowledge of OSA and the inherent problems associated with this condition was insufficient for practicing dental professionals. 15 dental offices in the southern district of Marion County were surveyed. Of these, 2 offices completed the entire survey. The 13 offices that did not complete the entire survey stated that lack of knowledge in the condition of OSA prevented them from being able to answer the questions completely. Responses received from the other 2 offices that did attempt to answer all of the survey questions also revealed a general lack of experience and knowledge in the condition of OSA. This disorder can be a precursor of a number of serious problems including high blood pressure, memory problems, and weight gain. Some problems have escalated to become fatal. Treatments available include nose or face masks, effective weight management, a variety of dental devices, and selective surgery procedures. Since a variety of dental devices are available as treatment options, the dental professional should be informed about them. Based on the reviewed evidence, many dental professionals remain uninformed of the problems and the dangers that can arise from obstructive sleep apnea. Due to the prevalence of this condition dental professionals should become familiar with treatment options available.

T6  The Dirt on Toothbrush Sanitizers. A. CRIM, S. ECKART, A. GRANT, M. TAHARA, K. LEACH (Indiana University School of Dentistry, Dental Hygiene Program)

Recent studies have demonstrated that contaminated toothbrushes could hinder the health of immunocompromised patients, re-inflect patients with chronic periodontal disease and may
reintroduce bacteria into the mouths of healthy individuals. The use of toothbrush sanitizers such as steam, ultraviolet light and post-brush soaking methods, may help decrease the chance of re-infection. Dental professionals need to be aware of the risks of contaminated toothbrushes. Dental hygienists are entrusted the task of patient education and can easily convey the importance of toothbrush sanitization to patients. A review of the literature was conducted. In addition, a study was designed. The objective of the study was to determine the effectiveness of various toothbrush-sanitizing methods. This study was conducted using a total of 120 BHI agar plates, 90 mitus salivarius agar plates, and 60 EMB agar plates. Each of the 5 participants was given an identical Oral- B toothbrush with instructions to brush for 2 minutes. All the participants were assigned to a designated sanitizing method and a control. The sanitizing methods used were; Listerine, Crest Pro-Health (PCP), or hydrogen peroxide all used as a post-brushing soak for 5 minutes, VIOlight® (ultraviolet light) made by Stark Inc., and GT 100® (steam) made by Germ Terminator Inc. At baseline toothbrushes were tested and revealed no growth. Each toothbrush was evaluated one time per week for four weeks to determine the amount of bacterial colonization present. Soaking each toothbrush in PBS and removing dilutions to be plated on a specific plate completed the evaluation. Evidence showed that the non selective BHI plates grew the most bacteria followed by the Mitis Salivarius plates at 48 hours, Mitis Salivarius at 24 hours, and lastly the gram negative selective plates. Data showed that each sanitizing method was effective in killing 89.4% of the bacteria on the toothbrush. It was determined that the Mitis Salivarius plates at 48 hours grew more bacteria than the Mitis Salivarius plates at 24 hours. This was expected due to the slower growth of Streptococcus mutans. In conclusion our study demonstrated that there are fewer gram negative bacteria in the mouth than gram positive bacteria. Results showed that all the methods were successful in killing bacteria; however, the GT 100® was the most consistent in killing an average of 99.5% of the bacteria.

HEALTHCARE SYSTEM

T7 To Be or Not to Be...ADHP. K. DUNLAP, T. GREIWE, B. JONES, B. WEBER, P. RETTIG (Indiana University School of Dentistry, Dental Hygiene Program)

The ultimate goal of dental professionals is to provide quality care. However there are more than 31 million Americans living in what the U.S. government considers “dental health professional shortage areas.” The American Dental Hygienists’ Association (ADHA) hopes to alleviate this problem by expanding the scope of practice of the dental hygienist. The purpose of this literature review and survey is to inform dental professionals of the emergence of the Advanced Dental Hygiene Practitioner (ADHP) and the curriculum and services this new position will entail. The ADHP will be a dental hygienist who has a graduated from an accredited dental hygiene program and completed an ADHA approved advanced curriculum. They will provide diagnostic, preventive, restorative, and therapeutic services in an independent practice setting. The ADHA released the preliminary Advanced Dental Hygiene Practitioner Framework at their annual session in 2005. According to this released curriculum, the objectives for this position greatly expand the typical Registered Dental Hygienists’ current responsibilities. This new occupation has generated views of both support and opposition throughout the dental community. In addition to reviewing the recently published literature regarding these opinions, our table clinic group conducted a randomly selected survey. A total of 102 surveys were sent to dental offices in 37 states. The survey asked both dentists and dental hygienists a variety of questions regarding their knowledge and opinions about the ADHP. The results of our survey revealed that there were 14 who are in favor of the development of the ADHP, 10 who were opposed, and 27 indicated they needed more information
before making a decision. In conclusion, the Advanced Dental Hygiene Practitioner is being established with the purpose to serve unmet public oral health needs and as shown by our survey, dental professionals need more education regarding this new career path.

PAIN MANAGEMENT

T8 Choose or Lose: Effective Anesthetic Selection for Periodontal Debridement. S. BENNETT-MOORE, M. FISHER, L. SACK, D. SANDERS, J. HUDSON (Indiana University School of Dentistry, Dental Hygiene Program)

The role of the dental hygienist includes treating patients who have periodontal disease to assist them in controlling the disease process. In order to do this successfully, routine dental visits involving periodontal debridement are necessary. The literature reports that effective pain management plays a role in the success of the periodontal treatment and can impact a patient’s compliance with a maintenance schedule. Several modes of anesthesia have been utilized for pain management during periodontal debridement including: topical gel, transmucosal anesthetic patches, and injection anesthesia. Periodontal debridement includes a variety of instrumentation techniques including scaling and root planing. Recently a new mode of intrapocket anesthesia, lidocaine/prilocaine periodontal gel (Oraqix®), has been compared to traditional local anesthesia for use in scaling and root planing. The objective of this literature review was to compare lidocaine/prilocaine periodontal gel (Oraqix®) and injectable local anesthetics for pain control during scaling and root planing. A study completed by Steenberghe, Bercy, Boever, et al. showed a significant preference for the gel over injection anesthesia in populations who received full mouth debridement. Ninety-six percent of the patients were satisfied or very satisfied with injectable anesthesia compared to eighty percent for the gel. Eighty percent of the patients reported preference for the gel over local anesthetic for debridement, and sixty-three percent reported that they would be more willing to return for a recall appointment if the gel were available. The literature shows both Oraqix® and infiltration anesthesia to be comparable in safety, and that the cost of Oraqix® can be managed when included in the treatment fee or paid out of pocket by the patient. Local anesthesia will always play an important role in pain management for periodontal debridement; however, dental practitioners can ease patient fear, apprehension, and the anxiety associated with injectable anesthetics by giving patients the option of an effective non-injectable mode of anesthesia. Additionally, incorporation of a non-injectable mode of anesthesia that has a quick on-set and may be administered by the dental hygienist can enhance time management for the dentist and dental hygienist and ultimately have a positive impact on office productivity.

PERIODONTICS

T9 Getting to the Bottom of Probing. A. BEISER, A. BLASCHKE, A. GAHIMER, K. SAVERINO, S. SCHAFER (Indiana University School of Dentistry, Dental Hygiene Program)

Periodontitis is a growing concern among patients nationwide. Periodontal probing assessments are crucial in detecting this disease. Different techniques of probing between clinicians can alter the actual probe reading. The use of an automatic probe versus a manual probe has made this issue less of a concern. The objective of this table clinic is to inform dental professionals of the necessity of probing and the benefits of the Florida Probe®. A survey was compiled asking subjects the
following questions: how often a full periodontal assessment is performed, whether a manual probe or an automated probe is used, reasons given for not routinely probing, whether individuals surveyed had been exposed to the Florida Probe®, whether or not it was more likely routine probing would occur if access to an automated probe were available, and lastly, whether or not all patients over the age of 18 were probed routinely. 200 surveys were sent to random dental offices in the surrounding Indianapolis area. Out of the 200 mailed, 110 replied to the survey. The responses were compiled and organized through an Excel document. Results from the survey showed 48% of hygienists performed a full periodontal charting one time a year with 98% percent using a manual probe. In the majority of the surveys (74%) the hygienist did not provide a reason for failing to probe routinely. Of those who did respond to the question, 18% stated it was related to time taken from the appointment, and another 8% reported the belief that it was not necessary to probe. Results from other questions included: 51% having heard of the Florida Probe®; 46% stated they would probe more often if an automated probe were available. Finally, 46% stated they probe all patients above the age of eighteen. It should be noted that although these are truthful responses, clinicians should not confuse these results with actual guidelines made by the American Academy of Periodontology regarding recommended frequency of probing. The review of the literature shows there to be no significance difference in accuracy while using an automated probe compared to a manual probe. However, the perceived benefits in efficiency using an automated probe such as the Florida Probe® may be of interest to the clinician, and result in more routine probing of all patients over the age of eighteen.

**T10** Amazing Lazing: Er:YAG All Tissue Laser. A. MICNERSKI, S. PROPES, M. THEISING, V. WAGONER, S. QUERRY (Indiana University School of Dentistry, Dental Hygiene Program)

Periodontal disease is a frequent and serious problem that affects a reported 48% of the population in the United States. It is estimated that one in four people will have some form of periodontal condition in their lifetime. Traditionally, root planning and ultrasonic scaling have been the treatment of choice for nonsurgical periodontal therapy. Today, laser assisted periodontal therapy has allowed hygienists and dentists to improve not only the patient’s periodontal status, but also overall systemic health. By using the Versawave™ or Er:YAG (an erbium; yttrium aluminum garnet) laser, professionals can provide a more effective treatment by decontaminating the pockets of harmful anaerobic bacteria, endotoxins and diseased soft tissue. A variety of resources were reviewed consisting of surveys, interviews and professional journals and literature. The objective of this table clinic is to introduce this technology as an adjunct to root planning procedures. Studies have shown that using the Er:YAG can be effective in reducing bleeding on probing, patient sensitivity, healing time, the need for anesthetics and can be effective in periodontal disease control. Increases in clinical attachment gain, patient comfort and compliance with home care have also been reported by many of the studies. Coupling laser technology with traditional root planning methods may effectively render root surfaces more biocompatible resulting in reduced bleeding, pocket depths and healing time. Dental professionals may find these benefits result in more effective management of patients with periodontal disease.

**PHARMACOLOGY/THERAPEUTICS/TOXICOLOGY**

**T11** Regeneration for a New Generation. C. CAROSELLI, C. SEKETA, K. SMITH, P. FABIANI (Indiana University School of Dentistry, Dental Hygiene Program)
Regeneration of the dentition through stem cell growth and gene therapy may someday become available as a standard dental procedure. The objective of our presentation is to inform health care professionals of current research being conducted to achieve this technology. Although not yet tested in humans, these procedures have been successful up to a certain developmental stage in laboratory animals. This has instilled hope into the researchers that the same success will be produced in humans. We obtained our information through correspondence and interviews with doctors performing these studies in conjunction with literature detailing the procedures. We will identify cell sources, growth mediums, the steps taken to initiate odontogenesis and lastly, the theory of how genetics may eventually be used to stimulate tooth regeneration. In conclusion, maintaining optimal oral hygiene will always be first priority, but in the event restorative procedures are necessary, these techniques could provide a biocompatible alternative resulting in a more natural oral environment.

T12 Mouth Rinses: Do You Really Need the Alcohol? D. SHARPE, S. TAYLOR, D. WRIGHT, C. PALENIK (Indiana University School of Dentistry, Dental Hygiene Program)

Mouth rinses are a very common adjunct to home hygiene care used to improve oral malodor, gingival health, and debridement of microorganisms. In 2002, it was estimated that 885 million dollars was spent on oral antiseptic rinses. Many companies have made therapeutic claims on products according to listed active ingredients. The most common of these is 19%-24% alcohol added to reduce many salivary microorganisms. Many people cannot use alcohol-based rinses due to conditions such as xerostomia, ulcers, alcoholism, or religious beliefs. There has been documented to be a possible link to oral cancer with continuous use of alcohol-based rinses. For these reasons, non-alcohol rinses are being introduced as an alternative. This study has been done to determine if non-alcohol-based rinses are as effective as alcohol-based rinses in reducing salivary microorganisms. The study design included using four rinses: one prescription strength (chlorhexidine gluconate and alcohol), two over-the-counter rinses, (alcohol and essential oils) and (CPC), and water (as the control). Each product was used by four volunteers at one week intervals for a single use. Normal oral homecare was performed; however, professional care was not permitted. Each rinser expectorated initially, rinsed for 15 seconds with one ounce of the assigned product and expectorated again. After 30 and 60 minute intervals each volunteer provided additional saliva samples. The results were analyzed by counting the CFU per milliliter of saliva from each person at each period. Comparison of the percent reduction of microorganism from pre-rinsing to post-rinsing was established. The results showed that the mechanical action of rinsing alone with the control had an average decrease of 52% immediately after rinsing, at the 30 minute interval there was a 38% average reduction and after 60 minutes there was a 19% average decrease of bacteria as compared to the pre-rinse value. The chlorhexidine gluconate and alcohol had an average decrease in bacteria of 87% following the 15 second rinse, 84% after 30 minutes, and 81% after one hour. The alcohol and essential oils had an average reduction of 74% immediately after rinsing, 70% at 30 minutes, and 64% 60 minutes later. CPC reduced bacteria an average of 73% immediately after rinsing, 65% 30 minutes after rinsing, and 60% 60 minutes after rinsing. Results of similar studies in the review of the literature showed the non-alcohol rinses being "as good as" over-the-counter mouth rinses containing alcohol. In conclusion, dental professionals should be aware that in this study non-alcohol based rinses were as effective in reducing salivary microorganisms as compared to other over the counter available rinses. These results are similar to results of other studies.
Saliva is well known to be a vital component in the oral environment. Saliva provides the means for mastication, caries prevention, speech, antimicrobial benefits, and mechanical removal of food debris. Unfortunately, a lack of saliva often goes undiagnosed, leaving patients susceptible to a multitude of problems, leading them to endure costly dental treatments that may have been avoided with proper diagnosis of xerostomia. Our objective is to see that patients are annually screened for salivary hypofunction by demonstrating a current testing kit. A variety of literature was investigated including peer reviewed journals, and internet sources. It has been well documented that many patients are unaware they have xerostomia and do not get the opportunity to have their saliva tested due to the cumbersome nature of testing, and time involvement. In the past few years, saliva testing has become more prevalent for diagnostic purposes as opposed to simply for research. With new testing methods available, such as the Saliva-Check kit by GC America, the dental hygienist is in the best possible position to assess a patient’s saliva flow. The hygienist is the member of the dental team that spends the most time with the patient, and will be most commonly asked for advice to maintain oral health. As many patients are taking a variety of medications, are under stress and continue to age, it should be recommended to test for saliva quality and quantity once a year. The dental hygienist is a qualified professional able to perform saliva tests on an annual basis for the benefit of these patients.
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