

RESEARCH DAY

INDIANA UNIVERSITY
SCHOOL OF DENTISTRY
23RD ANNUAL
APRIL 13, 2015
IUPUI CAMPUS CENTER

DAY

3D IMAGING

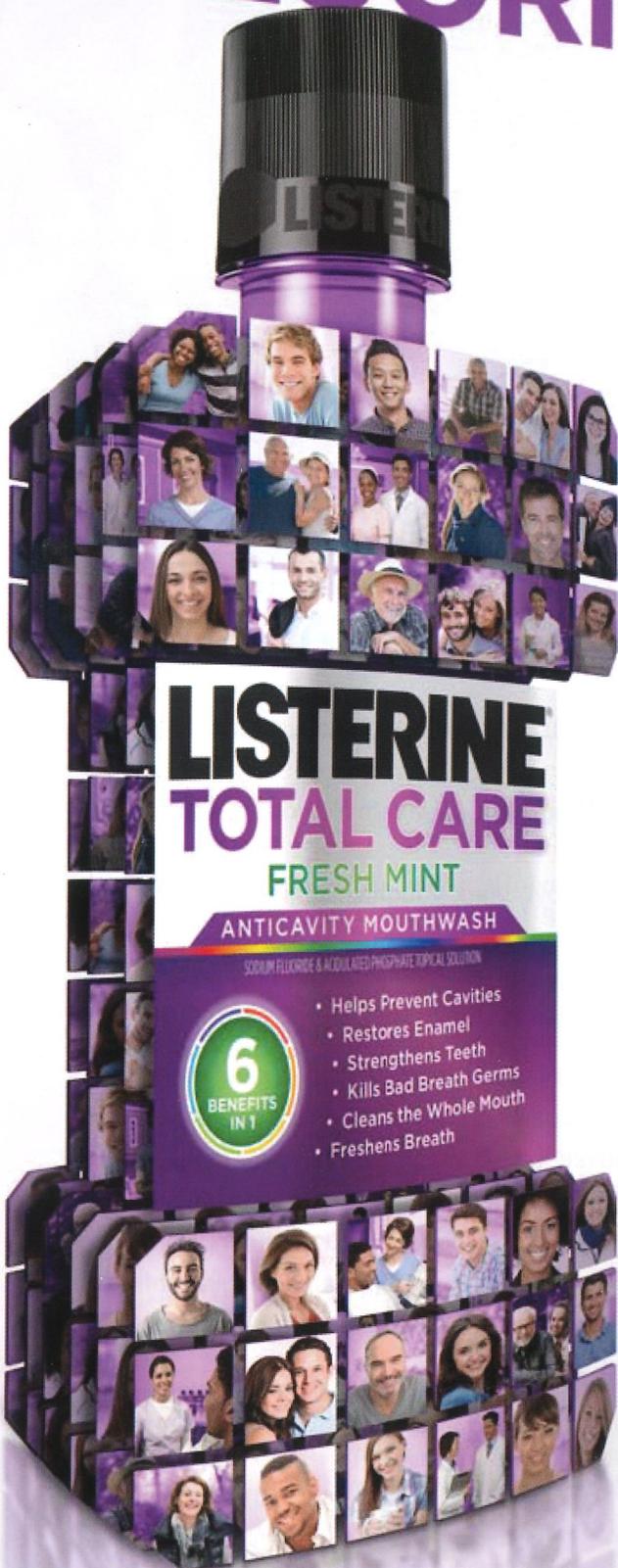


Congratulations!



Delta Dental of Indiana would like to congratulate the Indiana University School of Dentistry students on their Research Day presentations. Your hard work and dedication to dentistry are an inspiration to us all.

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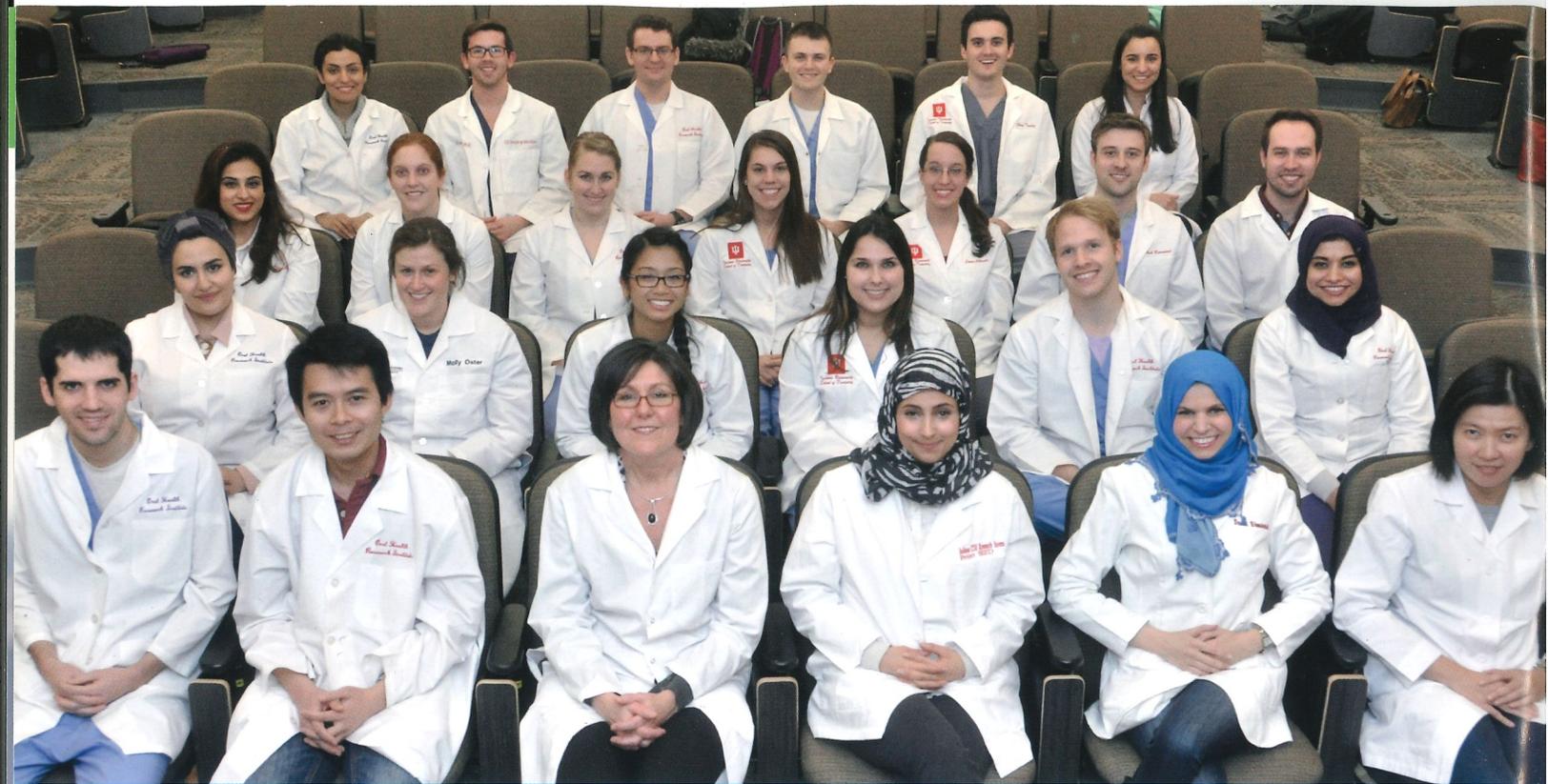
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IUSD Student Research Group

FIRST ROW (L to R): Michael Daetwyler, Jadesada Palasuk, Dawn Wagenknecht, Sarah Al-Angari, Afnan Al-Zain and Sumana Posritong

SECOND ROW: Rawan Alrasheed, Molly Oster, Chau Leminh, Nadine Ferbinteanu, Josh Evans and Hadeel Ayoub

THIRD ROW: Laila Al Dehailan, Allison Scully, Corrie VanWanzeele, Elisabeth Nicholson, Laura Albrecht, Nicholas Brassard and Eliseu Munchow

FOURTH ROW: Parand Sorkhdini, Blake Ballenger, Phillip Hoyt, Mark Vaughn, Stuart Ryan and Tereza Albuquerque

NOT PICTURED: Azza Ahmed, Amnah Algarni, Maryam Alghilan, Zachary Bozic and Grace Gomez.

FACULTY ADVISOR: Richard Gregory



ON THE COVER: 3D upper airway superimposed on a skull volume.

The 3D Imaging Lab at the Department of Orthodontics and Oral Facial Genetics uses the most advanced 3D imaging systems for many research and clinical applications. These systems allow visualization of the true 3D anatomy of the patient for enhanced diagnosis and treatment planning.

The department now also uses the most sophisticated imaging software for airway analysis which advances the assessment of this critical

anatomical region and provides clinical useful information.

Image provided by Ahmed Ghoneima, BDS, MSD, PhD

Assistant Professor of Orthodontics, Department of Orthodontics and Oral Facial Genetics, Indiana University School of Dentistry

**Indiana University School of Dentistry
Research Day Proceedings
Volume 23, 2015**

<i>Contents</i>	<i>Page</i>
Organizing Committee and Research Group Officers	2
Letter of Welcome INAADR	3
Letter of Welcome Dean Williams	4
Program	5
Introduction of Keynote Speaker	6
Awards	7
Poster and Clinical Case Presentations	8
Exhibitors and Sponsors	48
Index to Presenters	50

A special welcome to our guest presenters:

**University of Detroit Mercy
School of Dentistry**

**University of Louisville
School of Dentistry**

Research Day Organizing Committee

Ahmed Ghoneima, Chair

Masatoshi Ando
Marco Bottino
Angela Bruzzaniti
Timothy Centers
Judith Chin
Tien-Min Gabriel Chu
Mark Dirlam
Ygal Ehrlich
Dominique Galli
Richard Gregory
Sue Kelly
Melissa Mau
Lisa Maxwell
Sheryl McGinnis
Sivaram Prakasam
Stuart Ryan
Keli Schmidt
Allison Scully
Jeannie Vickery
Ned Warner
John Williams
Terry Wilson
Domenick Zero

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American Association for Dental Research

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Vice President: Ygal Ehrlich

Secretary/Treasurer: Ned Warner

Councilor: Tien-Min Gabriel Chu

Chair Research Award Judging Committee: Marco Bottino

Chair Staff Award Judging Committee: Angela Bruzzaniti

Officers

IUSD Student Research Group

President: Allison Scully

Vice President: Stuart Ryan

Secretary and Newsletter Editor: Philip Hoyt

Faculty Adviser: Richard Gregory

Future Research Day Event: April 11, 2016



April 13, 2015

Dear Participants and Guests,

It is with great pleasure that we welcome you to the 23rd Annual Research Day of the Indiana University School of Dentistry. This annual event was established in 1993 to provide a forum for IUSD researchers, faculty, staff and students, including undergraduate, predoctoral and graduate students to present their research work and clinical case studies to the IUPUI community. Additionally, it fosters many opportunities for research collaborations aiming for the advancement of oral, dental and craniofacial research with the ultimate goal of prevention and treatment of oral diseases. We also welcome student representatives from dental schools at the University of Detroit Mercy and the University of Louisville who will share their research findings with us and participate in the interschool research competition.

This year, we are honored to have Dr. Janice Blum, Chancellor's Professor of Microbiology & Immunology at IU School of Medicine, Associate Vice Chancellor for Graduate Education IUPUI, and Associate Dean for the University Graduate School, Indiana University provide opening remarks. We are also privileged to have as our keynote speaker Dr. Paul Krebsbach, Professor of Dentistry and Professor of Biomedical Engineering and Chair of the Department of Biologic and Materials Sciences and Division of Prosthodontics at the University of Michigan. His Research Day talk is titled "Pluripotent Stem Cells: Opening another Avenue for Craniofacial Regeneration."

We would like to offer a special word of thanks to our event and award sponsors, namely the American Student Dental Association, Indiana Dental Association, Delta Dental, Johnson & Johnson, Procter & Gamble, and Shofu. We also wish to extend our gratitude to all the exhibitors for their participation year after year. The success of IUSD Research Day depends on the continued support of our sponsors and exhibitors. We encourage everyone to visit our exhibitors and become acquainted with the dental products and services they have to offer.

We thank all the members of the Research Day Committee for their hard work and dedication. We also thank all the award judges for their dedication to evaluate all research projects. On behalf of the organizing committee, the Indiana Section of the American Association for Dental Research (IN-AADR) and the Student Research Group (SRG), we thank you all for participating in Research Day 2015 and sincerely hope that you will enjoy the scientific program.

Sincerely,

A handwritten signature in black ink that reads "Ahmed Ghoneima".

Ahmed Ghoneima, DDS, MSc, MSD, PhD
President
Indiana Section of the AADR

A handwritten signature in black ink that reads "Allison Scully".

Allison Scully
President
Student Research Group, IUSD



IUPUI

SCHOOL OF DENTISTRY

OFFICE OF THE DEAN

Indiana University-Purdue University
Indianapolis

April 13, 2015

Indiana University School of Dentistry Colleagues,

Welcome to the 23rd Annual Indiana University School of Dentistry Research Day. IUSD has a long history and proud tradition devoted of the creation of new knowledge through research. I commend our faculty, students and staff, along with our guests from the other schools, for their diligent commitment to supporting the vital activity of “scientific discovery” by hosting this annual event. Since 1993, Research Day has been an opportunity for the School of Dentistry to highlight the substantial collaborative research that is underway through programs sponsored by and affiliated with the school.

This Research Day monograph highlights a variety of research focus areas of IUSD, and we are confident that you will find it a valuable resource. The printed monograph helps preserve the educational experience unfolding here today and inspires us to learn from the promising work of our colleagues. After the event has concluded and the posters have been taken down, the research continues. This monograph is a way to ensure we keep in mind the extraordinary variety of research in progress at our dental school and the many ways this pursuit helps the practice of dentistry continually evolve. Scientific discovery is a journey, not just a destination.

We are extremely delighted to have Dr. Janice Blum, Chancellor’s Professor of Microbiology & Immunology at IU School of Medicine, Associate Vice Chancellor for Graduate Education IUPUI, and Associate Dean for the University Graduate School, Indiana University to share the Opening Remarks. We are also honored to welcome Dr. Paul Krebsbach, Professor of Dentistry and Professor of Biomedical Engineering and Chair of the Department of Biologic and Materials Science and Division of Prosthodontics at the University of Michigan, as our featured keynote speaker. His outstanding career attests to the innovation, hard work and tenacity that are the underpinnings of excellent research. I know you will embrace his messages as well as attend the other events the Research Day planning committee has helped make possible. I sincerely thank the committee and the Indiana Section of the American Association of Dental Research for their distinctive efforts in organizing this event. I also thank our many sponsors who assist us in underwriting Research Day each year.

Thank you for being a part of this celebration and for the many ways you contribute to the Indiana University School of Dentistry’s missions of education, research, patient care and service. Our vision is to be “one of the best dental schools of the 21st century” – an active research program is one marker of progress to achieve this vision.

With best wishes to all IUSD Research Day participants,

John N. Williams, DMD, MBA
Dean

Program
IUPUI Campus Center 3rd and 4th Floor

Thursday, April 9

5:00 p.m. – 8:30 p.m. Poster Judging (Dental School)

Monday, April 13

8:00 a.m. – 11:00 a.m. Interschool Student Research Competition (CE 406)

12:00 p.m. Registration (4th floor lobby)
Commercial Exhibitions (CE 450C)

12:30 p.m. Welcome Remarks
(CE 450A-B) **Dr. John N. Williams**
Dean, IU School of Dentistry

12:35 p.m. - 12:45 p.m. Performance by Vertical Dimension

12:50 p.m. Opening Remarks **Dr. Janice Blum**
Chancellor's Professor,
IU School of Medicine

1:00 p.m. Introduction of Keynote Speaker **Dr. Gabriel Chu**
Interim Associate Dean for
Research, IU School of Dentistry

1:05 p.m. Keynote Address **Dr. Paul Krebsbach**
Professor and Chair,
University of Michigan

2:05 p.m. Announcement of Faculty Awards **Dr. John N. Williams**
Dr. Michael Bennett
Alumni President, IU School of Dentistry

2:15 p.m. Announcement of Poster Awards **Dr. Ahmed Ghoneima**
President, Indiana Section AADR

2:30 p.m. - 4:30 p.m. Commercial Exhibitions (CE 450C)
Interschool Poster Presentations (CE 406)

Research Presentations (CE 305-310, 405, 409)

2:30 p.m. - 3:30 p.m. Odd-numbered Posters and Clinical Case Reports

3:30 p.m. - 4:30 p.m. Even-numbered Posters and Clinical Case Reports

4:30 p.m. Removal of Posters

Introducing the Keynote Speaker



Dr. Krebsbach is the *Roy H. Roberts* Professor of Dentistry and Professor of Biomedical Engineering, and Chair of the Department of Biologic and Materials Sciences in the School of Dentistry. Dr. Krebsbach holds B.A. degree from the University of St. Thomas and a DDS degree from the University of Minnesota. He received a certificate in Periodontology and Ph.D. in Biomedical Sciences from the University of Connecticut Health Center. Prior to joining the faculty at the University of Michigan, he was a Senior Staff Fellow for 3 years at the National Institute for Dental and Craniofacial Research. His research program focuses on the cell and molecular biology of mineralized tissues with an emphasis on cell signaling and the balance of self-renewal and differentiation in stem cells.

Dr. Krebsbach has served on many local and national committees, including chairing the AADR William J. Gies Award Committee and the AADR and IADR Hatton Award Committees, a term on the AADR Constitution Committee and serving on the AADR Board of Directors for 3 years as Treasurer. He is currently President-elect of the AADR. He served on the American Association for the Advancement of Science Electorate Nominating Committee and completed a term as Member at Large and is currently Chair of AAAS Section R. He is the chair and chartered member of the Moss IRB Musculoskeletal Tissue Engineering NIH study section. Dr. Krebsbach is an elected fellow of the American Association for the Advancement of Science and the American Institute for Medical and Biological Engineering.

Presentation

Pluripotent Stem Cells: Opening Another Avenue for Craniofacial Regeneration

Recognizing Excellence

2015 List of Awards

Dental Hygiene

Elizabeth A. Hughes Dental Hygiene Case Report Award

Undergraduate Students

Johnson & Johnson Undergraduate Student Award

Predoctoral Dental Students

American Dental Association/Dentsply International Student Clinician Award

INAADR Interschool Dental Student Research Award

ASDA-sponsored IUSD Student Research Group Award

Procter & Gamble Award for Excellence in Preventive Oral Health Care

Cyril S. Carr Research Scholarship

Graduate Dental Students

Delta Dental Award for Innovation in Oral Care Research

Indiana Dental Association Best Clinical Case Report Award

Shofu Ph.D. Student Oral Presentation Award

Maynard K. Hine Award for Excellence in Dental Research

Staff

INAADR Research Staff Award

Faculty

IU School of Dentistry Alumni Association Distinguished Faculty Award for Teaching

IU School of Dentistry Alumni Association Distinguished Faculty Award for Research

Poster Presentations

All posters will be available for viewing from 2:30 p.m. to 4:30 p.m.

Presenters will be at their posters to discuss their research at the following times:

2:30 p.m. to 3:30 p.m. Odd-numbered Posters and Clinical Cases

3:30 p.m. to 4:30 p.m. Even-numbered Posters and Clinical Cases

CARIOLOGY

P1 Evaluation of the International Caries Detection and Assessment System (ICDAS). C. REECE*, M. METZ (University of Louisville)

Our objective was to evaluate clinical experience in regards to understanding and implementing training modules for the ICDAS system within ULSD DMD curriculum. D2 dental students were compared to both D4 dental students and faculty within the department of general dentistry and oral medicine to determine if clinical experience is key for adapting training modules into the curriculum. Server space from Amazon.com was obtained allowing creation of a Wordpress webpage to create an online, track-able ICDAS quiz. A six-minute PowerPoint (Microsoft Corp) presentation was given to the D2 (n=25) and D4 students (n=25) as well as the ULSD GDOM faculty (n=25) to instruct them on how to complete the ICDAS online training module. After completing the training module on the ICDAS website, participants were asked to access quiz.toothgenius.com website and perform an ICDAS quiz. The data was expressed as group means \pm standard deviations and compared with analysis of variance (ANOVA). According to the analysis of variance (ANOVA), both the D4 students (66 ± 3) and the ULSD GDOM faculty (80 ± 4) scored statistically significantly higher ($\alpha = .05$) on the quiz than did the D2 students (50 ± 5). Additionally, the ULSD faculty scored statistically significantly higher ($\alpha = .05$) than the D4 students. We rejected null hypothesis and accepted alternative hypothesis. Implementation of the ICDAS system within the ULSD DMD curriculum is directly related to clinical experience. Clinical experience seemed to yield a higher understanding following the training modules. It may be more beneficial to expose students to the ICDAS training after some clinical training versus during pre-clinical curriculum.

P2 Assessment of Caries Excavation Techniques Using Visual Examination and QLF-D. P. HOYT*, A. SOTO (Indiana University School of Dentistry)

Objective: This pilot study is to assess the extent of caries removal of Atraumatic Restorative Treatment (ART) versus complete excavation in occlusal International Caries Detection Assessment System (ICDAS) 5 lesions in extracted posterior teeth using Quantitative Light Induced Fluorescence camera (QLF-D). Methods: Ten extracted teeth were selected with occlusal lesions using the ICDAS index code 5. Visual assessment, radiographs and QLF-D images of teeth were taken before and after caries excavation. In five teeth, caries was removed using a #4 carbide bur. In the other five teeth, soft dentinal caries was removed using a spoon excavator until hard dentine was found. QLF-D images were analyzed later by two examiners for the presence or absence of demineralization. Measurements were correlated between ART, complete excavation, and QLF-D using Spearman's correlation, visual examination, and QLF-D ΔF and ΔF_{Max} values. Results: After excavation, eight out of ten (80%) teeth were visually determined to be caries free. Two teeth had extensive caries reaching the pulp and were not completely excavated. However, utilizing QLF-D technology, all teeth samples (100%) were found to still have caries.

Spearman's correlation between QLF-D and visual examination was 0.71 for the complete caries removal, which is considered to be an acceptably high correlation between QLF-D and the treatment. While the correlation between QLF-D and Atraumatic Restorative Treatment (ART) was 0.35, which is considered to be a poor correlation. Conclusion: QLF-D was useful at detecting caries and could be used to assist dental professionals with caries evaluation and excavation. QLF-D was found to be more accurate than visual examination in caries detection. Complete excavation appears to have a better chance at removing more carious tissue than ART by itself. More studies are needed to determine QLF-D's efficacy as a tool in the excavation process.

P3 In-Vitro Investigation of Anti-Caries Efficacy of Fluoride Varnishes. L. AL DEHAILAN*, E.A. MARTINEZ MIER, F. LIPPERT (Indiana University School of Dentistry)

Objectives: The majority of currently marketed fluoride varnishes (FV) have not been evaluated for their effectiveness in preventing dental caries. The objective of this study was to investigate the anticaries efficacy, measured as fluoride release into saliva, change in surface microhardness of early enamel caries lesions, and enamel fluoride uptake (EFU), of 14 commercially available FV (and two control groups): CavityShield, Vanish, Duraphat, PreviDent, Sparkle, Nupro, Kolorz, MI, Duraflor Halo, Enamel Pro, Vella, Butler White, Flor-Opal and Waterpik. Methods: 216 bovine enamel specimens (5x5mm) were prepared and assigned to eighteen groups (n=12). Early caries lesions were created in specimens and characterized using Vickers microhardness (VHN_{lesion}). FV was applied to each group of specimens. Immediately afterwards, specimens were incubated in 4 ml of artificial saliva (AS), which were collected and renewed every hour for 6h, then for 18h. AS samples were analyzed for fluoride using an ion-specific electrode. Specimens were then brushed for 20s with toothpaste slurry and subjected to pH cycling consisting of a 4h/day acid challenge and one-minute treatments with Crest Cavity Protection for 5 days. Microhardness was measured following pH cycling (VHN_{post}). EFU was determined using microbiopsy. Acid resistance (8h demin challenge) was performed post-pH cycling and microhardness was measured (VHN_{art}) and compared to baseline values to test FV impact after pH cycling. One-way ANOVA was used for data analysis ($p < 0.05$). Results: FVs differed in their release characteristics (mean \pm SD ranged from $14.97\mu\text{g/ml} \pm 2.38$ to $0.50\mu\text{g/ml} \pm 0.15$), rehardening capability (mean \pm SD ranged from 24.3 ± 15.1 to 11.7 ± 12.7), and ability to deliver fluoride to demineralized lesions (mean \pm SD ranged from $3303\mu\text{g/cm}^3 \pm 789$ to $707\mu\text{g/cm}^3 \pm 238$). No statistically significant correlation was found between study variables. Conclusion: The in vitro anticaries efficacy of FVs varied greatly. This may be attributed to different compositions and physical properties of the tested FV.

P4 Erosion and Simulated Salivary-Flow Effects on Restorations and Adjacent Tooth. M.A. ALGHILAN*^{1,2}, N.B. COOK¹, J.A. PLATT¹, G. ECKERT³, A.T. HARA¹ (¹Indiana University School of Dentistry, ²King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia, ³Indiana University School of Medicine)

Objectives: The aim of this study was to investigate the effect of erosion on direct tooth-colored restorations and adjacent enamel/dentin under different simulated salivary flow rates. Methods: Bovine enamel and dentin specimens were prepared (n=16) and restored with the following restorative materials: resin composite (Filtek Z250), resin-modified glass ionomer (Fuji II LC), high-viscosity glass-ionomer cement (Fuji IX), and low-viscosity glass-ionomer cement (Fuji II). They were submitted to an *in-vitro* erosion-remineralization cycling model simulating different salivary flow rates (normal: 0.5 ml/min and low: 0.05 ml/min), for 5 days. The surfaces of restorative materials, enamel and dentin were evaluated with an optical profilometer and erosive loss calculated. Mixed-model ANOVAs and Sidak adjustment were used for statistical comparisons ($\alpha = 0.05$). Results: Low-salivary flow significantly increased erosive wear for all tested substrates ($p < 0.05$), except for Filtek Z250. Surface loss (mean \pm SD, in micrometers) under

low-salivary flow was significantly higher in enamel (19.75 ± 4.27) and dentin (23.08 ± 3.48) adjacent to Filtek Z250 compared to Fuji II LC (16.33 ± 2.30 and 20.47 ± 2.58 , respectively) and Fuji IX (15.79 ± 2.41 and 20.63 ± 2.34 , respectively). Fuji II (17.06 ± 2.61 and 22.30 ± 2.70 , respectively) did not differ from Filtek Z250. Restoration surface degradation was significantly lower for Fuji II LC (2.17 ± 0.73) than for both Fuji II (13.03 ± 6.79), and Fuji IX (16.74 ± 7.72) under low-salivary flow condition; whereas Filtek Z250 exhibited no meaningful surface loss (-0.35 ± 0.19). Conclusion: Limited to these *in-vitro* conditions, low-salivary flow promoted higher erosive conditions for teeth and restorations. Some fluoride-containing restorative materials (Fuji II LC and Fuji IX) may reduce erosive wear on adjacent enamel and dentin. The composite resin (Filtek Z250) resisted surface loss, even under simulated highly erosive conditions. The resin-modified glass ionomer (Fuji II LC) showed both reduced acid-degradation and protection of adjacent dental surfaces to erosion, being a suitable alternative for patients at higher risk of erosion with low exposure to fluoride. (Supported by the Delta Dental Foundation Dental Master's Thesis Award)

DENTAL MATERIALS

P5 Characterization of Magnesium/Dicalcium Phosphate Dihydrate Composite Scaffolds. B. BALLENGER*, N. TANATAWEETHUM, T.G. CHU (Indiana University School of Dentistry)

Objective: Magnesium (Mg) can potentially provide better pH balance and improve cell proliferation in dicalcium phosphate dihydrate (DCPD) cement. The objectives of this study are 1) to investigate the effects of Mg alloy addition on the mechanical properties of DCPD cements, 2) to characterize the phase composition, setting time and porosity of the cements, and 3) to evaluate the cytocompatibility of Mg/DCPD cements. Methods: 5% wt and 10% wt of Mg alloy WE43-B were mixed with TCP and MCPM at molar ratio 1:1. Sodium citrate was used as setting regulator. The cements were prepared at powder (P)/liquid (L) weight ratio 1.5. To fabricate Poly-L- lactic acid (PLLA)/Mg/DCPD composite, Mg/DCPD samples were coated with 5% wt of PLLA solution followed by drying. The mechanical strength and phase composition of the samples were characterized by a universal material testing machine (MTS) and X-ray diffraction (XRD), respectively. Setting time was evaluated using a Gilmore needle-like apparatus. The porosity was investigated using mercury porosimeter. Microstructures of the cements were investigated using SEM. Cytocompatibility of these cements were investigated using dog mesenchymal stem cells and XTT assay kit. Results: Mg alloy made the DCPD cement less acidic. PLLA coating significantly improved the initial compressive strength of 5%Mg/DCPD and 10% Mg/DCPD by up to 6-folds ($p < 0.05$). Both 5% Mg/DCPD and 10% Mg/DCPD showed less DCPD formation than the control group. In addition, these two groups showed residual B-TCP and newberyite. The cytocompatibility test showed that Mg/DCPD cements were non-cytotoxic and stimulated cellular proliferation. Conclusion: Though the synthesis of Mg/DCPD from Mg alloy and MCPM/BTCP formulation showed lower compressive strength than DCPD control group, incorporation of PLLA to Mg/DCPD groups allowed for greater compressive strength and cellular proliferation.

P6 Effects of TAP-mimic Antibiotic-Containing Scaffolds on *Actinomyces naeslundii*-Infected Dentin Biofilm. S.J. RYAN*¹, M.T.P. ALBUQUERQUE^{1,2}, M.M. KAMOCKA³, M.C. VALERA², R.L. GREGORY¹, M.C. BOTTINO¹ (¹Indiana University School of Dentistry, ²Indiana University School of Medicine, ³Science and Technology Institute – UNESP Sao Paulo)

Objectives: The regeneration of the pulp-dentin complex is highly dependent upon successful elimination/inhibition of bacterial overgrowth within the root canal system. Recent research has demonstrated that *Actinomyces naeslundii* is the most prevalent microorganism and early colonizer of traumatized necrotic immature permanent teeth. Antibiotic-containing electrospun scaffolds have shown great promise when compared to the currently used triple antibiotic paste (TAP=metronidazole-MET,

ciprofloxacin-CIP, and minocycline-MINO) from a cytocompatibility standpoint. Thus, the purpose of this study was to evaluate the antimicrobial effects of novel TAP-mimic antibiotic-containing scaffolds on *A. naeslundii* biofilm eradication using confocal laser scanning microscopy (CLSM). Methods: Antibiotic-containing (MET, CIP, and MINO) polymer (Polydioxanone-PDS) solution (25 mg of each drug/mL of polymer solution) was electrospun under optimized conditions into fibers to obtain the TAP-mimic scaffolds. Human canine teeth were vertically sectioned along the mid-sagittal plane to obtain 12 dentin blocks (4x4x1mm³). The specimens were sterilized, distributed into 24-well plates, and inoculated with *A. naeslundii* (ATCC 43146) for 7 days to allow biofilm formation. Infected dentin specimens were then exposed for 3 days to the TAP-mimic scaffolds or to TAP paste (50mg/mL, positive control). Infected dentin specimens were left untreated for comparison (negative control). CLSM (n=4/group) was performed (Live/Dead® Assay) to quantitatively assess the antimicrobial effectiveness. Significance was assumed at the 5% level. Results: CLSM analysis showed successful elimination of all viable bacteria exposed to TAP solution within the dentin surface. The TAP-mimic scaffolds showed significant (p<.05) reduction in the percentage of viable bacterial cells when compared to the control. Conclusion: Taken together, the novel TAP-mimic scaffolds promoted significant reduction in *A. naeslundii* biofilm formed on human dentin specimens. In conjunction with cell-based assays, higher concentrations of the three drugs used will be tested to optimize antimicrobial efficacy without jeopardizing cell compatibility. (Supported by IUSD, NIH/NIDCR Grant#DE023552, and an IDF Grant from IUPUI/OVCR)

P7 Novel ZnO-Loaded Polymer Membranes for GTR/GBR Applications. E.A. MÜNCHOW*, M.T.P. ALBUQUERQUE, B. ZERO, K. KAMOCKI, E. PIVA, R.L. GREGORY, M.C. BOTTINO (Indiana University School of Dentistry)

The purpose of this study was to synthesize/characterize the physical, chemical and mechanical characteristics, as well as the antibacterial activity and cytocompatibility of electrospun polymer-based membranes incorporated with zinc oxide/ZnO nanoparticles. Poly(ϵ -caprolactone) (PCL) and PCL/Gelatin (1:1, w/w) were dissolved in hexafluoropropanol and then loaded with ZnO at distinct concentrations: 0 (control), 5, 15 and 30wt.%. Electrospinning was performed using optimized parameters and the fibers were characterized via scanning/SEM and transmission/TEM electron microscopies, energy dispersive X-ray spectroscopy/EDS, Fourier transform infrared spectroscopy/FTIR, contact angle/CA (n=10), mechanical testing (n=8), antimicrobial activity (n=3) against *P. gingivalis* (*Pg*) and *F. nucleatum* (*Fn*), and cytotoxicity test (n=4) using human dental pulp stem cells/hDPSCs. Data were analyzed using ANOVA and the Tukey's test ($\alpha=5\%$). ZnO was successfully incorporated into the fibers. Within the PCL-based membranes, the higher the ZnO content, the greater the mean fiber diameter (276 \pm 187nm, 324 \pm 257nm, and 750 \pm 508nm, from the lowest to the highest ZnO content) and the lower the mechanical properties (except for group containing 30wt.% of ZnO). Overall, no significant differences were observed with regards to CA (p \geq 0.064). Within the PCL/Gelatin-based membranes, the higher the ZnO content, the smaller the mean fiber diameter (642 \pm 134nm, 372 \pm 297nm, and 258 \pm 111nm, from the lowest to the highest ZnO content) and mechanical properties, although the membranes displayed enhanced stretching ability (p<0.001). All gelatin-containing membranes showed lower CA than the PCL-based membranes (p<0.001). All ZnO-containing membranes demonstrated antibacterial activity against *Pg* and *Fn*, with inhibition halos diameter ranging from 6.3-14.3mm. Only the 30wt.%-ZnO incorporated PCL/Gelatin-based membrane was considered toxic to cells. PCL- and PCL/Gelatin-based membranes containing a low content of ZnO nanoparticles can be potentially used as GTR/GBR membranes since they demonstrated significant antibacterial properties and cytocompatibility. Moreover, the addition of gelatin can impair hydrophilicity to the membranes, without diminishing the antibacterial potential. (Supported by IUSD and the NIH/NIDCR Grant No. DE 023552)

P8 Development of Doxycycline-Encapsulated Nanotube-Modified Adhesives: Synthesis, Characterization and Drug Release. J. PALASUK*, J.A. PLATT, L.J. WINDSOR, M.C. BOTTINO (Indiana University School of Dentistry)

Failure of resin composite restoration is due in part to collagen fibril degradation at the hybrid layer by matrix metalloproteinases (MMPs). The objective of this study was to determine the encapsulation efficiency and doxycycline (DOX, an MMP inhibitor) release from adhesive by synthesizing DOX-encapsulated Halloysite nanotubes (HNTs) at various concentrations (10%, 25% and 50%). Physicochemical properties of a dentin adhesive modified with DOX-encapsulated HNTs were investigated. DOX was dissolved in phosphate buffer saline (PBS, pH 7.4) at 10%, 25% and 50% (w/v). Halloysite nanotubes (HNTs) were mixed with the DOX solutions and sonicated for 2h. Vacuum was applied and maintained for 1h. The 3 distinct DOX-solutions were stirred for 1h, and vacuum was reapplied. DOX-solutions were centrifuged and the supernatants were collected. The pellets were dried in an incubator for 72h. The drug release profile was investigated by placing 150 mg of DOX-encapsulated HNTs into PBS. DOX-containing PBS aliquots were periodically removed. High-pressure liquid chromatography (HPLC) was used to determine the concentration of DOX released from DOX-encapsulated HNTs and DOX in the supernatant. Degree of conversion (DC, 10s, 20s and 40s curing time) and Knoop microhardness of the modified adhesives (20s curing time) were evaluated for the following groups: SBMP (Scotchbond Multi-Purpose), HNT (SBMP+HNT), and SBMP-DOX-encapsulated nanotube modified adhesive at three concentrations (10%DOX, 25%DOX and 50%DOX). Data were analyzed at 5% significance level. Encapsulation efficiency was 65.33±6.77 (10%DOX), 34.51±5.72 (25%DOX) and 30.38±14.85 (50%DOX). No significant differences were found in DC (within the same curing time) or microhardness ($p>0.05$). DOX release peaked at 24h and substantially decreased overtime. Encapsulation efficiency decreased with increasing DOX concentrations. The incorporation of HNTs encapsulated or not with distinct concentrations of DOX-solutions did not jeopardize important physicochemical properties of the modified adhesives. DOX release peaked at 24h and substantially decreased overtime. (Supported by Delta Dental Foundation grant #358429)

P9 Effects of Air-abrasion Parameters and Aging Conditions on Zirconia Bonding. E. AL-SHEHRI*, A.H. SABRAH, S.S. AL-ANGARI, A. AL-ZAIN, L. AL DEHAILAN, J.A. PLATT, M.C. BOTTINO (Indiana University School of Dentistry)

Objective: This study evaluated the effects of distinct aluminum oxide (Al_2O_3) air-abrasion protocols on (1) Y-TZP zirconia surface roughness and (2) on the shear bond strength (SBS) durability of a resin cement to Y-TZP after a combined mechanical/thermal aging regime (CLT). Methods: Seventy-two Y-TZP (Diazir[®]-Ivoclar-Vivadent) specimens (10×10×2mm) were prepared and randomly assigned to 3 groups according to the air-abrasion pressure (1, 2, and 2.8 bars). Non-contact profilometry was used to evaluate surface roughness changes. PanaviaF-2.0 was used to build resin buttons on the treated Y-TZP surfaces and SBS testing was performed after 24h and after a combined aging regime involving cyclic loading (10,000 cycles, 10N, 1.0Hz) and thermocycling (5,000×). Failure mode was evaluated using optical and scanning electron microscopy (SEM). Data were analyzed using two-way ANOVA and chi-square tests ($\alpha=5\%$). Results: The 2.8 bar group had significantly higher surface roughness compared to the 1 bar group ($p<0.05$). The interaction between pressure and immediate-24h/CLT was not significant on SBS. Pressure did not have a significant effect on peak stress. Peak stress was significantly higher ($p=0.0064$) for 24h storage compared to CLT. The 2 bar-CLT group had a significantly higher percentage of specimens fail during cyclic loading than other groups. In general, mixed failure was predominant for all groups. Conclusion: Combining cyclic loading and thermocycling (CLT) led to a significant decrease in the peak stress compared with 24h. The combination CLT might be a better method to mimic oral environment conditions for bond strength testing and may be a substitute for long-term water storage.

P10 Evaluation of Various Properties of Novel Urethane-Based Resin Composites. A. AL-ZAIN*^{1,2}, J.A. PLATT¹, D. XIE³ (¹Indiana University School of Dentistry, ²King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia, ³Purdue School of Engineering and Technology at Indiana University-Purdue University Indianapolis)

Esterases have shown to negatively impact resin composites. The aim was to synthesize novel urethane-based oligomers and use them to develop novel urethane-based resin composites without compromising chemical, mechanical and physical properties relative to traditional Bis-GMA resin composites. Two novel urethane-based methacrylate monomers (M1 and M2) were synthesized, mixed with a diluent (triethylene glycol dimethacrylate-TEGDMA) at different weight-ratios (25/75, 55/25 and 75/25). Camphorquinone and ethyl-4-N, N dimethylaminobenzoate initiators and silanated barium borosilicate filler (70%) were used. Two resin composite controls [Bisphenol A glycidyl methacrylate (Bis-GMA) and urethane dimethacrylate (UDMA)] at 55/45 weight-ratio were also formulated. The degree of conversion (DC) of the composites was measured (n=3) at different curing times (20, 40 and 60 seconds). Furthermore, flexural strength (FS), diametral tensile strength (DTS), compressive strength (CS) and Knoop hardness (KH) were evaluated (n=5). One-way ANOVA was used for comparisons. Pair-wise group comparisons were made using Fisher's Protected Least Differences method ($\alpha=0.05$). The DC for each resin composite at 55/45 weight-ratio was not significantly different between the curing times. DC of M1/TEGDMA at 55/45 and 75/25 weight-ratio was not significantly different from Bis-GMA/TEGDMA control. FS of M1/TEGDMA and M2/TEGDMA at 55/45 and 75/25 ratios met the ISO 4049 requirement, and were not significantly different from the controls at 40 seconds curing time. FS, DTS and KH of M1/TEGDMA at 55/45 and 75/25 weight-ratios were not significantly different from Bis-GMA/TEGDMA at 20 seconds curing time. Additionally, CS of M1/TEGDMA at 55/45 weight-ratio was not significantly different from UDMA/TEGDMA control, whereas flexural modulus of M1/TEGDMA at 55/45 and 75/25 ratios was significantly higher than both controls. We concluded that M1/TEGDMA novel urethane-based resin composite at 55/45 and 75/25 weight-ratios showed comparable DC, FS, DTS and KH to the model traditional Bis-GMA resin composite. Additionally, further investigation is warranted relative to degradation resistance.

EDUCATIONAL RESEARCH

P11 Perceptions of Dental Academicians: Self and Colleagues' Motivations and Satisfactions. A. SCULLY* and J.E. KOWOLIK (Indiana University School of Dentistry)

There exists limited information about dental academicians' motivations and satisfactions. The Academic Dental Careers Fellowship Program (ADCFP) helped to lay groundwork for reflection by current dental faculty in a publication after the first year of the program. An unexplored area of investigation that might shed light on the overall satisfaction of faculty is the perception by academics of the satisfaction of their colleagues. Objectives: This pilot study quantifies the motivations and satisfaction of dental academicians as well as how they believe their colleagues would answer. Correlations and differences between different demographic populations were also compared. This investigation gives us a better understanding of how satisfied, and what motivates current dental academicians as well as the accuracy of what they perceive about their colleagues. This data can be used by future and current leaders in academia to better understand the workforce. Methods: This study was granted IU-IRB Exempt status. A five section, paper survey was distributed to all full-time faculty members. The five sections include: background/demographics, self-motivation, self-satisfaction, perceived colleague motivation and perceived colleague satisfaction. Statistical analysis using Spearman correlation coefficients, Cochran-Mantel-Haenszel and Mantel-Haenszel chi-square tests were completed. Results/Conclusions: 45 surveys were returned. Analyses showed that responses to the self-satisfaction sections were generally significantly higher than perceived colleague responses. 16 out of 20 questions have significant p-values

ranging from <0.0001 to .04. This could play a role in the possibility of a professor encouraging students to pursue a career in academics. Both satisfaction and motivation scores were generally weakly to moderately correlated between self-responses and perceived colleague responses. This means that professors who are more satisfied are also more likely to estimate that their colleagues are more satisfied. Future plans include gathering a larger sample size by distributing the survey to dental schools in the Big Ten conference.

ENDODONTICS

P12 Ciprofloxacin-containing Scaffolds-Effects on *Enterococcus faecalis*-Infected Dentin Biofilm. M.T. ALBUQUERQUE*, M.C. VALERA, M. KAMOCKA, R.L. GREGORY, M.C. BOTTINO (Indiana University School of Dentistry)

Persistent root canal infection is the most common cause of endodontic treatment failure. Calcium hydroxide remains the most used intracanal medication; however, it is not effective against *Enterococcus faecalis* (*E. faecalis*) and has been associated with dentin weakening. Antibiotic-containing scaffolds have shown great potential to be used as intracanal medication based on antimicrobial properties. This study aimed to evaluate the effects of ciprofloxacin (CIP) - containing scaffolds against one-week *E. faecalis* biofilm after 3 and 7 days of scaffold exposure. Human teeth were vertically sectioned into two halves in a middle-sagittal direction to obtain 28 dentin blocks (4×4×1 mm³). Specimens were sterilized by autoclave, distributed in 24-well plates and inoculated with *E. faecalis* (ATCC 29212) for one-week biofilm formation. Infected dentin specimens were exposed for 3 and 7 days to the following scaffolds (15×15 mm²): pure PDS (no drug), PDS+25wt.%CIP (mean weight=10.85±0.52mg, which accounts for ~2.7mg of CIP). The clinically used triple antibiotic paste (TAP, 50mg/mL) was added (1mL) and served as the positive control. Infected dentin specimens were left untreated (bacteria only) to serve as the negative control. CLSM (n=4/group) (Live/Dead®) assessed the antimicrobial efficacy. Significance was assumed at the 5% level. CLSM analysis demonstrated that neither TAP nor the CIP-containing scaffolds were able to eliminate *E. faecalis* biofilm after 3 days. CIP-containing exhibited a significant (p<0.05) reduction of live bacteria after 7 days when compared to 3 days of CIP-scaffold treatment and pure PDS (at both time points). TAP solution was able to eradicate *E. faecalis* biofilm after 7 days. According to the data, it can be concluded that newly developed CIP-containing scaffolds provided increasing antimicrobial activity against *E. faecalis* biofilm after 7 days. Together, our scaffolds show great clinical promise, since it can reduce bacteria viability at significantly lower antibiotic concentrations (i.e., 18-fold, compared to TAP). (Supported by IUSD, the NIH/NIDCR (Grant#DE023552) and an International Development Funds (IDF) Grant from Indiana University Purdue University (IUPUI/OVCR))

P13 Impact of Bioactive Antibiotic-Containing Scaffolds on *Porphyromonas gingivalis*-Infected Dentin Biofilm. J.D. EVANS*¹, M.P. ALBUQUERQUE², M. VALERA², R.L. GREGORY¹, M.C. BOTTINO¹ (¹Indiana University School of Dentistry, ²Science and Technology Institute - UNESP, Sao Jose dos Campos, Sao Paulo, Brazil)

Objectives: Anaerobic bacteria are present in primary root canal infections and also in immature teeth with pulp necrosis. In recent years, antibiotic-containing polymer-based scaffolds have been deemed as a promising drug delivery strategy to disinfect the root canal system prior to regenerative endodontics procedures. This study sought to investigate, *in-vitro*, the effects of novel metronidazole (MET) and triple antibiotic (TA, metronidazole-MET, ciprofloxacin-CIP, and minocycline-MINO) polymer-based electrospun scaffolds against established *Porphyromonas gingivalis* (*Pg*) infected dentin biofilm. Methods: Human canines were vertically sectioned into halves in a middle-sagittal direction and then cut and polished to obtain 20 (4×4×1mm³) dentin specimens. The specimens were sterilized, distributed in 24-well plates,

inoculated with *Pg* (ATCC33277) and incubated for one-week for biofilm formation. Infected dentin specimens were exposed for 3 days to the following groups: polydioxanone-PDS scaffold (control-no drug), PDS+30wt.%MET (30 mg/mL of polymer solution) and PDS+25wt.%TA (25 mg of each drug/mL of polymer solution). The clinically used triple antibiotic paste (TAP, 50 mg/mL) served as a positive control. Infected dentin specimens were left untreated (bacteria only) to serve as the negative control. To determine the antimicrobial effectiveness of the novel scaffolds, the number of viable bacteria (colony forming units; CFU/mL) were measured (n=10/group). Comparisons were made at the 5% significance level. Results: PDS-based polymer scaffolds containing 30wt.%MET and 25wt.%TA as well as the positive control (TAP) led to complete bacterial elimination, differing statistically ($p < 0.05$) from the negative control. No statistical differences were observed for CFU/mL data between drug-free PDS-scaffolds (2.7 log₁₀ CFU/mL) and the negative control (5.9 log₁₀ CFU/mL). Conclusions: The obtained data revealed strong antimicrobial properties against *Pg*-infected dentin biofilm after exposure to the novel PDS-based antibiotic-containing scaffolds. Collectively, the data suggests that these scaffolds might be used as an alternative to the clinically advocated TAP for intracanal disinfection prior to endodontic regenerative procedures.

P14 A Novel Indentation-Device to Characterize Dentin Treated with Antibiotic Medicaments.
S.S. AL-ANGARI*, G. YASEEN, J.A. PLATT (Indiana University School of Dentistry)

Objective: The objective was to investigate the effect of intracanal antibiotic medicaments followed by ethylenediaminetetraacetic acid (EDTA) on the indentation properties and hardness of radicular dentin using a BioDent reference point indenter (RPI) and a traditional microhardness technique, respectively. Materials and Methods: Specimens with intact root canal dentin surfaces and polished radicular dentin specimens were obtained from immature human premolars. Each type of specimen was randomly assigned (n = 10 per group) and treated with either double antibiotic paste (DAP) for 4 week followed by EDTA for 5 min, triple antibiotic paste (TAP) for 4 week followed by EDTA for 5 min, EDTA for 5 min or Hank's balanced salt solution (control). The RPI and Vickers microhardness tester were used to measure the indentation properties of root canal surfaces and the hardness of polished dentin specimens, respectively. One-way ANOVA followed by Fisher's protected least significant differences were used for statistical analyses. Results: Both types of radicular dentin treated with antibiotic pastes and/or EDTA had a significant increase in the majority of indentation properties and a significant reduction in hardness compared to the untreated dentin. Furthermore, treatment of dentin with antibiotic pastes and EDTA caused significant increases in indentation properties and a significant reduction in hardness compared to EDTA-treated dentin. However, the RPI technique was not able to significantly differentiate between DAP + EDTA and TAP + EDTA-treated dentin. Conclusion: Dentin treated with antibiotic medicaments followed by EDTA had a significant increase the indentation properties and significantly reduction in hardness of radicular dentin.

P15 Biofilm Inhibition by Antibiotic Gels against Endodontic Pathogens. A. ALGARNI*, G. YASSEN, R.L. GREGORY (Indiana University School of Dentistry)

We explored longitudinally the anti-biofilm effect of gels loaded with 1 mg/mL of modified triple antibiotic (MTAP) or double antibiotic (DAP) against *Enterococcus faecalis* and *Porphyromonas gingivalis*. Methylcellulose based antibiotic gels of MTAP (ciprofloxacin, metronidazole and clindamycin) and DAP (ciprofloxacin and metronidazole) were prepared at a concentration of 1 mg/mL. Individually cultured *E. faecalis* and *P. gingivalis* bacterial suspensions were treated with MTAP, DAP, or placebo (vehicle only) gels at different dilutions and allowed to grow anaerobically in 96-well microtiter plates. Untreated bacterial suspensions served as a negative control. The biofilm formation was evaluated after 48-hours by measuring the optical density at 490 nm. The ability of the gels to inhibit biofilm formation was

determined immediately, one-month and three-months after the gels were prepared. Data were analyzed using a mixed-model ANOVA. MTAP and DAP gels significantly reduced biofilm formation of both bacteria at all time points regardless of the tested dilution. No significant differences in biofilm inhibitory effects were observed between MTAP and DAP gels at the majority of the tested dilutions through various time points. Gels loaded with 1 mg/mL of MTAP and DAP demonstrated a significant antibiofilm effect against *E. faecalis* and *P. gingivalis*.

P16 Endodontic Obturation: A Volumetric Analysis Using 3D Imaging Technology. M. DAETWYLER*, K. RIAD, A. GHONEIMA, Y. EHRLICH (Indiana University School of Dentistry)

Obturation of the disinfected root canal (RC) is the final step in RC treatment. A RC obturation that fully occupies that prepared canal space contributes to treatment success. Invasive methods that involve sectioning of treated teeth have been used to evaluate the quality of RC obturation. The aim of this study was to measure the amount of filling material in RC treated teeth using imaging methods: Cone Beam Computed tomography (CBCT) and 3D volumetric imaging software. This non-invasive approach may be a preliminary step for future in vivo research. Forty teeth with single canals were collected, decoronated and scanned using a Kodak 9000 CBCT. Total root volumes were then evaluated using Invivo dental imaging software v.5 (Anatomage Incorporated, San Jose, CA). Canals were prepared using Profile rotary files to a 35.04 Profile (Dentsply) and pre-obturation volumes were measured. Eighteen canals were filled with a warm vertical (WV) obturation method. Eighteen canals were filled with using the lateral condensation technique (LC) using gutta-percha cones and Roth's Sealer. The treated roots were scanned and measured as a volume to assess for the volumetric differences before and after treatment. A noninvasive 3D imaging method was able to measure volume of RC fillings. Canals filled using WV contained a greater percentage of empty space than canals filled using the LC method. This method could prove to be an efficient, cost effective tool for evaluating obturation material.

MICROBIOLOGY/IMMUNOLOGY/ORAL BIOLOGY

P17 Effects of Nicotine on *Lactobacillus casei* Growth. Z. BENNETT*^{1,2} and R.L. GREGORY²
(¹Purdue University School of Science, ²Indiana University School of Dentistry)

Nicotine varies in concentration between different tobacco products on the market. Previously, nicotine has been demonstrated to stimulate biofilm formation of other oral bacteria. This study exposed the oral cariogenic bacterium *Lactobacillus casei* to numerous concentrations of nicotine to observe the bacterial growth behavior. *L. casei* ATCC 393 was utilized to focus on the minimum inhibitory concentration (MIC) and minimum biofilm inhibitory concentration (MBIC) of nicotine. Nicotine concentrations above 8 mg/ml had significantly greater ($p < 0.05$) inhibition of growth and biofilm formation than the 0 nicotine control. Conversely, 8 mg/ml of nicotine significantly enhanced total growth of *L. casei*. The total growth and biofilm formation assays demonstrated a gradual increase of growth and biofilm formation with precise MIC and MBIC values of 8 mg/ml of nicotine. Planktonic cell growth of *L. casei* did not present any specific trend in regulation, but did reveal a significant inhibition beginning at 16 mg/ml. This study provided confirmation of the effect of nicotine on biofilm formation of oral bacteria. Smokers may experience an increase in oral biofilm because of the biofilm stimulatory effects of nicotine. These results are able to be used to relate the effect nicotine had on *L. casei* to other oral microorganisms.

P18 Effects of Nicotine on *Streptococcus Mutans* and *Streptococcus Sanguinis*. C. LEMINH* and R.L. GREGORY (Indiana University School of Dentistry)

Dental caries is one of the most prevalent chronic diseases that individuals are susceptible for throughout their lifetime. *Streptococcus mutans* (*S. mutans*) is the main causative agent in dental caries. *Streptococcus sanguinis* (*S. sanguinis*) is able to antagonize the growth of the more cariogenic *S. mutans*. Both *S. mutans* and *S. sanguinis* produce bacteriocins. *S. mutans* produces well characterized bacteriocins, particularly mutacin I and mutacin IV, and *S. sanguinis* produces sanguicin. A significant difference between *S. mutans* and *S. sanguinis* bacteriocin production is *S. mutans* mutacins are able to inhibit *S. sanguinis*, but *S. sanguinis* sanguicins are unable to defeat *S. mutans*. Smoking, particularly in the presence of nicotine, can increase biofilm formation in *S. mutans*. The purpose of this research was to determine if *S. mutans* inhibits *S. sanguinis* when grown in nicotine. Objective: to investigate the growth of *S. sanguinis* with and without the presence of *S. mutans* exposed to various concentrations of nicotine. Methods: *S. mutans* UA159 was cultured in brain heart infusion (BHI), incubated in nicotine dilutions, and pelleted to preserve supernatant. *S. sanguinis* was also cultured in BHI, and then inoculated into nicotine dilutions with or without *S. mutans* supernatant. The absorbance was read on a spectrophotometer at 595 nm. The samples were also diluted and analyzed via spiral plating grown on blood agar. Results: *S. sanguinis* grown in nicotine dilutions alone demonstrated more growth than when grown in conjunction with *S. mutans* and nicotine supernatant. As the concentration of nicotine increased, both *S. sanguinis* grown in nicotine with and without *S. mutans* demonstrated increased growth. Conclusion: *S. sanguinis*, in the presence of nicotine, has the potential to outgrow *S. mutans* defenses. Since the presence of nicotine demonstrated an increased growth in *S. sanguinis*, these results may suggest that people who smoke may up-regulate the ability for *S. sanguinis* to outgrow *S. mutans*.

P19 Comparison of Primary, Secondary and Tertiary Nicotine on *Streptococcus mutans*. L.L. ALBRECHT* and R.L. GREGORY (Indiana University School of Dentistry)

Streptococcus mutans is a well-studied bacterial species associated with the formation of dental caries. This correlation is a result of the ability of the bacteria to synthesize acid rapidly from sugar, produce extracellular polysaccharide that promotes adhesion to tooth structure, and grow at a low pH. There have been several studies indicating an association between smoking and increased caries and missing or filled teeth (DMFT) scores. The concentration of nicotine in smokers varies depending on several factors, including the quantity of tobacco, amount of saliva, and the length of time of tobacco contact. The purpose of this study was to compare primary, secondary, and tertiary nicotine exposure and the effects on *Streptococcus mutans* biofilm formation. Objectives: *S. mutans* was used to generate biofilm in the laboratory, to reproduce biofilm found in the oral cavity exposed to nicotine. Methods: Overnight cultures of *S. mutans* UA159 in tryptic soy broth (TSB) were diluted in 1:200 with TSB supplemented with 1% sucrose (TSBS), containing concentrations of nicotine between 0.25 and 32 mg ml⁻¹ to reproduce primary nicotine exposure. Reproduction of second hand smoke was accomplished by removing nicotine from the wells after 7 minutes (analogous to smoking 1 cigarette), and replacing it with fresh TSBS. Third hand smoke was simulated by coating the designated wells with nicotine for 30 min, then rinsing the wells and adding fresh TSBS and *S. mutans*. The dilutions were incubated in sterile 96-well microtiter plates for 24 h at 37°C in 5% CO₂. Results: Primary nicotine exposure demonstrates significantly higher biofilm accumulation than secondary (p<0.001) and tertiary (p<0.001) at nicotine dilution levels of 1.0-8.0 mg/mL. Conclusion: Long term nicotine exposure at concentrations of 1.0-8mg/mL significantly enhances biofilm formation, while short term nicotine exposure under these conditions, representing secondary and tertiary exposure, does not promote increased biofilm formation.

P20 Autofluorescence of Biofilm Caries Active *Streptococcus mutans* Strains. G.F. GOMEZ¹, G. ECKERT², R.L. GREGORY¹ (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

Objective: To determine whether *Streptococcus mutans* (UA159) grown in 0, 1 and 2% sucrose autofluoresces and compare clinical isolates of caries active (CA) and caries resistant (CR) *S. mutans* strains under biofilm growth conditions. Materials and Methods: *S. mutans* UA159 was grown for 24 h with 0, 1 and 2% sucrose at 37°C in 5% CO₂. CA strains 192 (<10⁵ CFU/ml in saliva from a CA subject) and A32-2 (>10⁵ CFU) and CR strains 314 (< 10⁵ CFU) and 317 (>10⁵ CFU) were grown similar to UA159. A stock solution of Protoporphyrin IX was prepared in 100% ethanol and diluted to a concentration from 1.6-3.1×10⁻⁴ g/ml. Emission spectra were measured using a spectrofluorometer by excitation at 385 or 405 nm with 10 nm steps with planktonic fluid on top of the biofilm (total biomass) and only with biofilm. ANOVA was conducted comparing UA159 vs. no UA159 or CA vs. CF strains for total biomass and only with biofilm, based on effects of sucrose concentration, and emitted wavelengths. The analysis was performed using ranked data, allowing sucrose-group combinations to have different variances within each experiment. Results: Emission spectra at 770 nm were observed with *S. mutans* strains UA159, CR (314 and 317), CA (192 and A32-2) and Protoporphyrin IX when excited at 385 nm, and 800 nm, and occasionally at 810 nm, when excited at 405 nm. UA159 was significantly higher than without UA159 for all combinations (p<.0005) except total biomass with 2% sucrose at 770 nm (no difference) and at 800 and 810 nm (UA159 lower). CA was significantly higher than CF for all combinations except biofilm only at 810 nm and 2% sucrose at 810 nm. Conclusion: *S. mutans* autofluoresces in the red and infrared regions of the electromagnetic spectrum. CA was significantly different than CF for total biomass.

P21 *Streptococcus mutans* Binding to Collagen and Fibrinogen in Nicotine. S.N. KRISTOFF¹, G.F. GOMEZ², R.L. GREGORY² (¹Indiana University-Purdue University Indianapolis, ²Indiana University School of Dentistry)

Introduction: Our overall goal is to find the mechanism for atherosclerosis. Smokers have increased incidence of atherosclerosis. Atherosclerosis occurs when there is a buildup of plaque in the arteries. There is evidence that *Streptococcus mutans* help cause this blockage. We have already proven that *S. mutans* produces more biofilm in certain concentrations of nicotine. Also, we have found that nicotine up-regulates *S. mutans* binding to proteins in certain concentrations; other labs have also demonstrated this. The intent of this study was to evaluate the binding of *S. mutans* to both collagen type I and fibrinogen, which are both proteins that are already present on the surface of endothelial cells lining arteries. Methods: *S. mutans* UA159 was cultured in 0.00-4.00 mg/mL nicotine. The cells were killed in formaldehyde and then coated with biotin. The proteins studied were plated (1 ug/ml) on 96-well microtiter plates. In order to block the empty spaces that the protein did not bind to, 1% BSA in sodium bicarbonate buffer was added to the plate. Each nicotine dilution of *S. mutans* was added to the plate and the amount of binding was assessed. Extra-avidin HRP and OPD were added to the plate and the intensity was measured at an absorbance of 490 nm using a spectrophotometer. Results: The intensity was directly related to the number of cells bound to the proteins. There was a significant increase in *S. mutans* binding when compared to the baseline for both collagen type I and fibrinogen. The binding was highest when *S. mutans* were cultured in 2 and 4 mg/mL nicotine. Conclusions: The data collected suggests that collagen type I and fibrinogen contribute to the mechanism of atherosclerosis. When *S. mutans* are cultured in moderately high concentrations of nicotine, more binding of the bacteria to these proteins occurs.

P22 Effects of Nicotine on Serotype K *Streptococcus mutans* Biofilm Formation. N. QUINT*¹, G.F. GOMEZ², R.L. GREGORY² (¹Indiana University-Purdue University Indianapolis, ²Indiana University School of Dentistry)

Atherosclerosis is a specific form of arteriosclerosis where the walls of arteries began to thicken as a result of bacterial invasion and accumulation of inflammatory white blood cells. There could be a direct correlation of atherosclerosis and the intake of nicotine. Nicotine has been reported to increase the amount of the cariogenic oral bacteria known as *Streptococcus mutans*; thus possibly leading to an increase of dental caries. Serotype K *S. mutans* has been associated strongly with atherosclerosis. Objective: This study focused on the biofilm formation of *S. mutans* serotype K when incubated in various dilutions of nicotine. Methods: *S. mutans* UA159 (stereotype C), and stereotype K strains 89, 52, and 51 were cultured in tryptic soy broth (TSB) overnight and then added to dilutions of TSB with 1% sucrose (TSBS) containing concentrations of nicotine between 0 and 32 mg/ml. Each dilution was added to 96-well microtiter plates, inoculated with bacteria and incubated for 24 hours aerobically at 37°C in 5% CO₂ and anaerobically. The plates were treated with formaldehyde, crystal violet, and isopropanol and biofilm formation was measured at an absorbance of 490 nm. Results: Strains UA159, 89, 52, and 51 all demonstrated significantly higher biofilm formation (p<0.05) at a nicotine dilution of 8 mg/ml. When comparing the anaerobic results to the aerobic results, anaerobic incubation increased the overall biofilm formation across the majority of nicotine dilutions. Conclusion: It was established that when *S. mutans* strains UA159, 89, 52, and 51 were incubated anaerobically and aerobically biofilm formation was enhanced. Smoking can lead to a higher population of *S. mutans* in the oral cavity that potentially has traits of significantly enhanced biofilm formation when presented with moderately high levels of nicotine which may lead to increased binding to endothelial cells contributing to atherosclerosis.

P23 Racial Differences in Neutrophil Response. D.R. WAGENKNECHT*, M.J. KOWOLIK, D.M. GALLI (Indiana University School of Dentistry)

Bacterial lipopolysaccharide (LPS), or endotoxin, is a mediator of inflammation. Repeated translocation of endotoxin from oral and intestinal bacteria into the bloodstream has been associated with low-grade systemic inflammation which in-turn increases the risk for systemic disease. A recent IUSD study linked experimental gingivitis to low-grade endotoxemia in both African-Americans and Caucasians. Interestingly, the study also reported differences in neutrophil numbers and oxidative burst activity between the two races. The aim of this preliminary study was to assess the *in vitro* neutrophil response to low dose LPS priming and subsequent activation with formyl-methionyl-leucyl-phenylalanine (fMLP) by Caucasian (C, n=6) and African American (AA, n=6) males 18 – 40 years of age. Following 6% polysucrose sedimentation of whole blood to reduce red blood cell contamination, fresh neutrophils were isolated by centrifugation over Histopaque[®] separation media. Neutrophils were resuspended in RPMI medium supplemented with 5% autologous serum, primed with 1 ng/ml LPS for 30 or 60 min and then activated with fMLP. Subsequently, cell-free culture media were collected, aliquoted and stored frozen until tested by ELISA for levels of myeloperoxidase (MPO), bactericidal permeability increasing protein (BPI) and acyloxyacyl hydrolase (AOAH) as markers of neutrophil activation. Activated neutrophils from C subjects released significantly higher levels of BPI compared to AA subjects (p=0.0077 & 0.0197, 30 and 60 minute prime, respectively). Similarly, the mean MPO levels in culture supernatants were higher for C males although the differences were not significant. AOAH was undetectable in the cell culture supernatants. In conclusion, neutrophils from C males displayed a stronger response (BPI and MPO) to LPS than neutrophils from AA male subjects suggesting a biological basis for the reported racial disparity in neutrophil response. (Supported by the IUPUI Office of the Vice Chancellor for Research)

P24 Synthesis and Functional Evaluation of Peptide-Modified Poly(Lactic-co-Glycolic Acid) Nanoparticles to Inhibit *Porphyromonas gingivalis* Biofilm Formation. P. KALIA¹, D.R. DEMUTH¹, J.M. STEINBACH² (¹School of Dentistry, University of Louisville, ²J.B. Speed School of Engineering, University of Louisville)

Objective: Periodontal disease is a biofilm associated oral inflammatory disorder that affects roughly half of American adults over the age of 30. Current treatment involves the physical removal of the biofilm and antibiotic treatment if necessary. There are no specific pathogen-targeted approaches to prevent the disease. The interaction of the pathogen *Porphyromonas gingivalis* with commensal streptococci is critical for initiation of periodontitis and represents a target for limiting *P. gingivalis* colonization of the oral cavity. Previous studies have shown that a synthetic peptide (BAR) derived from antigen I/II protein of *Streptococcus gordonii* potently inhibits *P. gingivalis* adherence to streptococci. However, BAR was less effective in preventing *P. gingivalis* adherence in a more complex three species biofilm model, suggesting that the potency of BAR against complex biofilms may be reduced. The objective of this study was to design surface-modified poly(lactic-co-glycolic acid; PLGA) nanoparticles (NPs) that are functionalized with BAR to increase its inhibitory potency by multivalent binding with *P. gingivalis*. Methods: Biotinylated BAR was conjugated to the surface of avidin-palmitoylated PLGA NPs. The physical characteristics of the NPs were determined and surface modification was verified using biotin-HRP binding, biotin-PEG FITC binding and microBCA assays. Results: We show that BAR-NPs bind to *P. gingivalis* in a dose-dependent manner. Further dose response studies will evaluate the binding affinity of NP interactions with *P. gingivalis*. Conclusion: These results suggest that enhanced peptide inhibition of *P. gingivalis* may be obtained by multivalent interaction of PLGA-BAR NPs and that this platform represents a potential therapeutic approach to effectively target an initial interaction involved in *P. gingivalis* colonization of the oral cavity.

P25 Effect of Probiotic *Bifidobacterium dentium* Species on *Streptococcus mutans* Biofilm. M.A. VAUGHN* and R.L. GREGORY (Indiana University School of Dentistry)

Objective: Consumption of probiotics is increasing and the route for ingestion nearly always involves passage through the oral cavity, research involving the effects that probiotics have on oral health is minimal. We examined *Bifidobacterium* and its effects on the oral microbiota. Specifically, we examined effects on *Streptococcus mutans* (*Sm*) biofilm formation in the presence of *B. dentium* (*Bd*), a probiotic species which is known to inhabit the human oral cavity. Methods: *Sm* was incubated in 6 well tissue culture plates for 24 h in TSBS. After 24 h, fresh TSBS media containing an inoculum of *Bd* was added to each well and incubated for 24 h. The resulting mixed biofilm was removed by scraping, the biofilm cells resuspended in sterile saline and the number of viable *Sm* and *Bd* cells quantitated by spiral plating on Mitis Salivarius Sucrose Bacitracin agar and blood agar plates (selective for *Sm* and both species, respectively). Direct competition of the *Bd* on *Sm* was assessed by inoculating them at the same time, incubating for 48 hours, and spiral plating to enumerate the number of each residing in the biofilm. Results: It was shown that when *Sm* and *Bd*, respectively, were inoculated at the same time, biofilm growth of *Sm* significantly decreased by 39%. When equal amounts of *Sm* and *Bd* were inoculated at the same time there was a 28% reduction in growth of *Sm*. To the contrary, when *Sm* was inoculated 24 h before *Bd*, *Sm* continued to grow in the biofilm. Conclusions: When both *Sm* and *Bd* are inoculated together, there is significant inhibition of *Sm* biofilm formation, suggesting that *Bd* is inhibiting growth of *Sm* if allowed to compete during the initial biofilm formation stage. This may have a profound impact on the probiotic foods industry, their product formulations, and advertising. (Supported, in part, by the Indiana University School of Dentistry Dental Student Research Fund)

ORTHODONTICS/IMAGING/CRANIOFACIAL

- P26 Comparing 3-D Scanning Methods for Generating Digital Orthodontic Diagnostic Models.** N. BRASSARD¹, G. ECKERT², K. KULA¹, A. GHONEIMA¹ (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

This study aimed to assess the accuracy of two methods of generating a digital 3-D orthodontic study model, either by scanning a positive representation of dental anatomy or by scanning a negative representation of dental anatomy, in relation to the plaster model of the same patients. Polyvinyl siloxane impressions were taken of the maxillary and mandibular arches of 16 subjects selected from Indiana University School of Dentistry. The impressions were immediately scanned using the Ortho Insight 3D laser scanner (Motionview Software LLC, Hixson, TN) to avoid any dimensional change and then were poured with orthodontic plaster within 24 hrs to create conventional study models. Each stone model was scanned using the same scanner to generate digital models. The same set of parameters was measured on the two types of digital models using the Ortho Insight 3D software (Motionview Software LLC, Hixson, TN) and on the stone model using a boley-gage caliper. Linear mixed effects models were used to compare the measurements among the gold standard, digital impression, and digital cast. In addition, intraclass correlation coefficients (ICCs) and Bland-Altman plots were calculated to evaluate reliability and the agreement of the two digital methods with the gold standard. Statistically significant differences were determined at $p \leq 0.05$. No statistically significant differences were found between the two digital methods, however nine measurements (Intermolar, Inter-second premolar, and Inter-first premolar arch widths; anterior right and posterior right arch lengths; Tooth 3, 19, and 25 widths; Tooth 3 length) were significantly different comparing either the positive (stone model) digital models and the negative (dental impression) digital models to the plaster models. There was no difference between the two methods of generating digital orthodontic study models, suggesting only a dental impression may be necessary for cataloguing digital models. (Supported by the IUSD Student Research Program)

- P27 Mucosal Thickening of Maxillary Sinuses of CLP vs. non-CLP patients.** K. KULA*, J. STARBUCK, L. HALE, S. THOLPADY, A. GHONEIMA (Indiana University School of Dentistry, Indiana University-Purdue University Indianapolis and Riley Hospital for Children at Indiana University Health)

Objectives: The objective of this retrospective radiographic study was to compare mucosal thickening of maxillary sinuses of patients with cleft lip and palate (CLP) vs. non-CLP. **Methods:** Following IRB approval, three-dimensional cone beam computerized tomographs (CBCT; i-CAT) of children with unilateral CLP and children without CLP (age and gender matched; 8-14yoa; n=15ea) were selected randomly from pre-existing orthodontic records. Following reliability studies, one investigator segmented both sinuses from each CBCT using Dolphin-3D Imaging software. The sinuses were separated coronally into .4mm slices antero-posteriorly. Bony sinuses and airspaces were outlined manually on each slice. Software calculated total sinus and airspace area. Areas were summed and multiplied by slice thickness to determine volume. Mucosal thickening was the difference between total sinus and airspace volumes. Percent mucosal thickening was calculated. Since no significant differences existed between cleft (left) and noncleft (right) sides of either patient group ($p > .05$), sinuses for each group were pooled (n=30 ea). Significant differences in total sinus, airspace, mucosal thickening volumes and % mucosal thickening were determined using paired t-tests, accepting $p \leq 0.05$ as significant. Principal Component Analysis (PCA) scatterplots were used to determine patterns of multivariate variation based on group, age, and sex. MANOVA was used to confirm PCA findings. Reliability was determined using Intraclass Correlations (ICC). **Results:** Reliability was excellent ($ICC > 0.99$). The CLP total sinus and airspace volume were significantly smaller and mucosal thickening and % mucosal thickening were significantly greater than

non-CLP sinuses (all $p \leq .024$). PCA showed that 89.6% of sample variance was explained by PC axis 1 and 2 (group and age). Age group 8-9yrs showed more separation with 13-14yrs than with 10-12yrs. MANOVA confirmed a significant effect of sample ($p = .001$) and age ($p = .007$). Conclusions: Children with unilateral CLP should be examined for potential problems related to sinus mucosal thickening. (Funded by the IUPUI Signature Center Initiative: 3D Imaging of the Craniofacial Complex Center/ Jarabak Endowed Professorship)

P28 Assessing Reliability of Digital Models: Comparing Plaster, Laser-scanned and CBCT. N. FERBINTEANU*, B. MOSER, K. KULA, A. GHONEIMA (Indiana University School of Dentistry)

The aim of this study was to evaluate the reliability and validity of digital models measurements by comparing plaster models, laser-scanned models and models generated from cone-beam computed tomography (CBCT) scans. Plaster models are considered the gold standard of diagnosis in orthodontic treatment, thus laser scanned models and CBCT model measurements will be compared to those of the gold standard. Methods: The sample of this study included 20 orthodontic subjects that were previously scanned with CBCT and had CBCT generated dental models (Anatomodel- Anatomage, San Jose, CA). Following IRB approval, stone dental models of the same subjects were scanned using Ortho Insight 3D laser scanner (Motionview LLC, Hixson, TN) to generate the laser-scanned models. The scan data of the models were exported in an STL format file extension. Dental arch parameters, including arch widths, lengths and tooth size were located and measured digitally on the laser-scanned models and on the Anatomodels. The stone models were measured using a boley gauge. Intraclass correlations (ICC) were performed on duplicate measures of 10 dental models for each type to assess reliability. ANOVA was used to assess the differences of the selected parameters among the dental models. Statistical significance was set at $p \leq 0.05$. Results: There was a significant difference between CBCT and plaster models in measures 1, 4, 6, 9, 10, 11 in the mandible, for measure 16 in the maxilla, in measure 5, 13, 14, 15 for both mandible and maxilla. There was also a significant difference between Laser vs. plaster models in measure 5 for the mandible. Digital dental models can be used for orthodontic diagnosis because they provide similar representations of dental arch anatomy. As statistically significant measures were found in some parameters this provides evidence that with more research and further technology digital representations can someday be used diagnostically. (Supported by IUPUI 3D Imaging of the Craniofacial Complex Center)

P29 Craniofacial Abnormalities and Airway Dimensions in Down Syndrome Patients. J. MNAYARJI*, A. GHONEIMA, R. ROPER, K. KULA (Indiana University School of Dentistry)

Objectives: To assess the skeletal structures and airway volumes in children with Down syndrome (DS) as compared to children without DS. Methods: Following IRB approval and reliability tests, 20 cone beam computed tomography scans (CBCTs) for children with DS and without DS (all male aged 10-15 years, $n=10$ per group) were compared in regards to a total of 22 parameters (7 airway volumes, 5 soft tissue thickness of airway and 10 skeletal). Measurements were recorded using 3D Dolphin Imaging Software. Intraclass correlations (ICC) were performed on duplicate measures of 10 CBCTs. Parameters were compared between DS and non-DS subjects using paired t-test. Statistical significance was set at $p \leq 0.05$. Results: ICC values were ≤ 0.90 for all parameters. Significant differences were detected in all parameters except for the mandibular length (Co-Gn). DS subjects showed significant decrease in airway parameters and increase soft tissue thickness of the airway as compared to control subjects. Maxillary sinus volumes of DS subjects were significantly smaller than normal subjects. The average size of the most constricted area of the airway in DS subjects was about 44% as compared to the control subjects. Statistically significant decreases were detected in Co-A, SNA, ANB° and A \perp N, while statistically significant increases were detected in Ba-S-Na, SNB, B \perp N, MP-SN and ANS-Me. Conclusions: DS

subjects showed significant decrease in airway volumes, most constricted area of the airway, increase in soft tissue thickness, hyperdivergent mandible, and increased lower anterior facial height compared to the control subjects. (Funding: IUPUI 3D Imaging of the Craniofacial Complex Center and the American Association of Orthodontists Foundation (AAOF))

P30 Heritability of Condylar Anterior, Posterior, and Superior Joint Spaces. B BOJI*, R. AL-QAWASMI, R. KULBERSH (University of Detroit Mercy School of Dentistry)

Objective: To test the hypothesis that condyle-fossa relationships are heritable. Methods: A sample of 30 sibships (62 subjects) was tested for heritability of TMJ joint spaces using Anatomage Invivo 5. The samples were obtained from the patient database at the University of Detroit Mercy School of Dentistry Orthodontic Clinic. CBCT images of skulls were oriented so that a plane perpendicular to the condylar long axis bisected the greatest medio-lateral diameter of the mandibular condyle. The following TMJ joint spaces were calculated employing Anatomage Invivo 5 software and using Ikeda's measurement method: Anterior Joint Space (AS), Superior Joint Space (SS), and Posterior Joint Space (PS). Results: ANOVA test results indicated the following: the h^2 estimates for AS = 41%, SS = 29% and PS = 87%. Conclusion: Environmental factors have more effect than genetic factors in the AS and SS relationships, while genetic factors have more control over the PS relationship. (Supported by an internal grant through the UDMSD Student Research Program)

P31 Three-dimensional Evaluation of Airway Volume Changes in Two RME Protocols. V LOTFI*, A GHONEIMA, K. KULA, K. STEWART, S. LIU, E. PARKS (Indiana University School of Dentistry)

Posterior crossbite is one of the most common types of malocclusion. It is typically the manifestation of a transverse maxillary deficiency. Rapid Maxillary Expansion (RME) is an orthopedic procedure, commonly used to expand the maxilla in the transverse dimension and resolve posterior crossbites. The rate of expander activation varies from one RME protocol to another. Research findings suggest that in addition to expanding the maxilla, expansion can affect the airway structure. The aim of this retrospective study was to evaluate the airway volume changes in two different RME protocols using three-dimensional computed tomography. 3D CT scans from completed cases utilizing two RME protocols were collected and analyzed. Sample consisted of two groups of twenty patients each: group A who had RME activation rate of 0.8mm per day and group B who had RME activation rate of 0.5mm per day. The initial scans were taken before treatment, and final scans were taken three months after expansion. Dolphin imaging software (Dolphin Imaging and Management Solutions, Chatsworth, CA) was used to identify landmarks and calculate airway volumes. Intraclass correlation coefficient (ICC) was used to confirm intra-rater reliability. Wilcoxon signed ranks test was used for comparison between the measurements. Inter-rater reliability was greater than 0.90 for all measurements. The increase in volume of nasal cavity and nasopharynx was significantly higher in the group with higher expansion rate. Nasal cavity volume increased significantly in both RME groups. The group with a more rapid activation rate experienced a greater increase in nasal cavity volume and nasopharynx volume.

P32 Prevalence of Overhanging Amalgam Margins in a Dental School Setting. S. HAN*, A. BALASUNDARAM, D. BYRAPPAGARI, L. CABANILLA JACOBS, M. WHEATER (University of Detroit Mercy School of Dentistry)

Amalgam restorations, if not properly finished, may exhibit overhanging amalgam margins when performed by novice dental students. Teeth containing overhanging amalgam margins are susceptible to recurrent caries and periodontal disease. The objectives of this study were to examine intra-oral bite-wing

radiographs to locate overhanging amalgam margins placed by dental students, presence/absence of periodontal disease immediately subjacent to the overhanging margins, and recurrent caries under restorations containing amalgam overhanging margins. Electronic charts of four hundred eighty patients were studied. Amalgam restorations on posterior teeth were reviewed for (i) presence/absence of overhangs, (ii) periodontal disease subjacent to overhanging restorations, and (iii) recurrent caries underneath overhanging margin. Chi-square tests and Pearson correlation were used to determine relationships between causative factor and disease. One thousand and fifty teeth were restored by dental students of which 9.4% (n=99) had overhanging amalgam margins. Of two-hundred and fifteen teeth which had overhanging amalgam margins, 46% (n=99) were placed by dental students and 54% (n=116) were performed by external dentists. 36% (n=78) of teeth were repaired at the dental school clinic during POE, 24% (n=52) had periodontal disease, and 28% (n=60) had recurrent caries. Overhanging amalgam margins of restorations placed by students were less likely to be repaired at POE ($p=0.001$). A statistically significant difference was noted between restorations done by students compared to those done by external dentists, particularly with reference to recurrent caries. There was no correlation between overhanging amalgam margins and periodontal disease when restorations performed by students were compared to external dentists. Quality assurance techniques can be implemented at dental institutions to mitigate the effects of overhanging amalgam margins on restorations placed by dental students.

P33 Anatomical Variations of Superior Thyroid Artery Location and Emergence Pattern R. IBRAHIM*, N. SHARIFI, M. AHMAD (University of Detroit Mercy School of Dentistry)

The goal of this study was to determine the distance between the Superior Thyroid Artery (STA) and the bifurcation point of the Common Carotid Artery (CCA) and to observe any anomalies that may occur in the STA emergence relative to the CCA in the North American population. Neck dissection was performed in 19 formalin-embalmed adult cadavers in the gross anatomy laboratory at the University of Detroit Mercy School of Dentistry. The carotid sheath was dissected to examine the bifurcation point of the CCA and the STA emergence. The distance (in mm) from the Common Carotid bifurcation to the STA branch was measured. Variations of STA emergence between different cadavers were observed. The average distance from Common Carotid bifurcation to the STA was 5.71 ± 5.04 mm. Furthermore, STA emerged directly from the CCA in two cadavers. This study demonstrated the existence of anatomical variations in the STA emergence pattern and the distance from the STA to the CCA bifurcation. These results agree with previous studies regarding the emergence of the STA directly from the CCA in some cadavers. Dental students should be aware of such anatomical variations that may exist in their future patients. (Supported by an internal grant through the UDMSD Student Research Program)

P34 Three-Dimensional Evaluation of Jaw Positions after Rapid Maxillary Expansion Using Two Different Activation Rates. J.K.A. ROSE*, K. KULA, K. STEWART, B. MOSER, A. GHONEIMA (Indiana University School of Dentistry)

Aim: The aim of the study was to determine the effect of two different rapid maxillary expansion (RME) activation protocols on the positions of the maxilla and mandible. Hypothesis: There will not be a significant difference in jaw positions following two different RME protocols. Materials and Methods: Study design consists of forty adolescent subjects in mixed dentition, treated with RME. Of these (20 subjects, (12 females, 8 males, average age at onset of treatment (T1) was 12.3 ± 1.9 years), followed an expansion protocol of 0.8 mm per day (Group 1), while 20 subjects ((10 females, 10 males, average age at onset of treatment (T1) was 13.8 ± 1.3 years)) followed an expansion protocol of 0.5 mm expansion per day (Group 2). RME was the only orthodontic/orthopedic treatment conducted for all subjects during this study. 3D cone beam computed tomographs (iCAT and CT) were collected at pre (T1) and post-RME (T2) treatment. All images were viewed using 3DMd software; 11 skeletal and 2 dental parameters were

used for comparison of jaw positions pre and post RME. ICC values were ≥ 0.8 for all measurements. ANOVA was used to assess the differences of the selected parameters among the two groups. Statistical significance was set at $p \leq 0.05$. Results: Statistically significant changes as treatment outcomes (T2-T1) were demonstrated for Group 1: Gonion (V) and Jugal point (T), Inter canine width and Intermolar width. Statistically significant differences were also noted for Group 2: Inter canine width and Intermolar width. Conclusion: The data demonstrates significant changes of all dental parameters for both Groups and two skeletal parameters for Group 1. Maxillary dental transverse expansion was significant in both groups. The null hypothesis that there would be no difference between RME protocols was rejected.

PEDIATRIC DENTISTRY

P35 Referring Child Patients in Indiana: A Survey of General Dentists. Z. BOZIC* and J.E. KOWOLIK (Indiana University School of Dentistry)

Dental caries is one of the most common chronic disease-affecting children in the United States with a majority of children having one or more carious lesions before age 5. General dentists may be a child patient's first exposure to the dentist and they are in a position to make referrals to a pediatric specialist for a variety of reasons. The object of this study was to evaluate the frequency of and reasons for referral of child patients from general dentists to pediatric dental specialists. Using an IRB approved (#1412951993) 12-question online survey of the active, general dentist members of the Indianapolis District Dental Society participants were informed of the goals of this study and were asked to complete the questionnaire. Three attempts were made via email to participants. Dentist responses were de-identified and organized using a numerical coding system. Results suggest that 80% of general dentists have at least 2 pediatric dental specialists to whom they refer to and a 78% of their referrals are based on the behavior of the child patient. Conclusion: In general, dental students mainly treat well-behaved children with minimal restorative needs. Due to dental school experiences, general dentists may not feel competent treating child patients with behavioral issues in their practices. Increasing the types/numbers of pediatric pre-doc experiences could help to increase the competence of general dentists.

P36 Dental Students Providing Oral Hygiene Instruction and Supplies to Community Children. J. MCCORMICK* and J.E. KOWOLIK (Indiana University School of Dentistry)

Background: Lack of understanding of the need for oral care may be the cause of the high caries rate in inner-city children. IUSD "Kids Club" offers dental students an opportunity to provide oral hygiene Instructions and supplies to children around Indianapolis. The members of "Kids Club" travel to elementary schools and after-school programs in the Indianapolis area to educate children and their families. Education is provided in ways which engage the children via interactive puppet-use and stories. The ultimate goal of "Kids Club" is to aid in oral disease prevention by promoting proper oral hygiene. Methods: In two weeks' time, "Kids Club" members visited six pre-school classes in Indianapolis to promote proper oral hygiene, oral health care, and better understanding of oral disease. At the beginning of a session, the children were asked six questions regarding oral health care. Oral hygiene education was then performed using interactive puppet play and story-telling. After the oral hygiene demonstration, the same six questions were repeated. Results: The largest difference in correct answers prior to the lesson and after was 29% (from 71% to 100%). By comparing the responses before and after the lesson, it can be seen that "Kids Club" members are improving the oral health care knowledge of the children. Not only are these lessons positive learning experiences for the children, but they are also positive learning experiences for the "Kids Club" members. By assessing the effectiveness of the oral hygiene

lesson given at previous events, members are able to perfect their teaching abilities for future oral hygiene instruction. Conclusion: By providing oral hygiene education, "Kids Club" members are helping to increase the oral health care knowledge of school-aged children and helping to prevent future disease among the children of the Indianapolis.

PERIODONTICS

P37 Effects of Stannous and Sodium Fluoride on Human Gingival Fibroblasts. L. MUMMERT* and L.J. WINDSOR (Indiana University School of Dentistry)

Background: Periodontal diseases are inflammatory conditions of the tooth supporting tissues. Although bacterial byproducts have been linked to periodontal diseases, host responses have also been implicated. This includes the matrix metalloproteinases (MMPs) that are released from human gingival fibroblasts (HGFs) and induce connective tissue degradation. Fluoride has been shown to have inhibitory effects on MMPs in solution. The effects of fluoride on MMP expression from HGFs have not yet been examined. Methods: HGFs cultured from a sample of clinically non-inflamed gingival connective tissues were incubated with stannous fluoride and sodium fluoride to determine their effects on cell proliferation. HGFs were then incubated with or without stannous fluoride or stannous fluoride at the highest concentrations that did not affect cell proliferation and analyzed for MMP expression. Results: The highest concentrations that did not affect proliferation with respect to HGFs were 0.004% stannous fluoride and 0.0125% sodium fluoride. At these levels, MMP expression in HGFs did not differ significantly from untreated HGFs. Conclusions: MMP expression in HGFs was unaffected by treatment with stannous fluoride or sodium fluoride at the concentrations tested. Although these concentrations of sodium fluoride and stannous fluoride with respect to HGFs are lower than some fluoridated mouth rinses and dentifrices, the exact concentrations to which HGFs are exposed following exposure to a fluoridated medicament is unknown. This concentration is likely lower than the concentration of stannous fluoride or sodium fluoride in the medicament due to their position in the lamina propria.

P38 Evaluation of a Periodontal Disease Risk Assessment Tool. C. VANWANZEELE*¹, T. THYVALIKAKATH¹, K. VYAWAHARE¹, P. DARADE², R. PADMAN³ (¹Indiana University School of Dentistry, ²Morgan & Stanley, ³Carnegie Mellon University)

Objective: Severe periodontitis is the sixth most prevalent condition affecting about 11% people worldwide. At present, many at-risk patients are not identified at routine dental exam because they appear to be in good periodontal health, despite underlying risk factors that increase their risk for periodontal disease. Our objective was to study the extent to which the Previser Risk Calculator (PRC) (PreViser Corp., Mount Vernon, WA), a commercial risk assessment tool can help us predict an individual's periodontal disease risk. Methods: First, we created a limited data set of 300 patient records data of individuals 18 years or older who underwent comprehensive dental care at the Indiana University School of Dentistry (IUSD) between January 1, 2011 and January 1, 2012. The data (see Table 1) were entered into the PRC to estimate the each patient's disease state and output recorded in MS Excel. We then estimated the percent agreement between the PRC s' and IUSD student-providers' diagnosis. Results: The agreement between PRC and IUSD student-providers' diagnosis was 70% (209 patients). Specificity for disease severity (mild versus moderate periodontitis), was much lower, at about 47%. Although the IUSD faculty evaluated the student-providers' data entries, the use of free text may have introduced subjectivity and vagueness to certain factors such as assessing bone loss. Further, insufficient explanation of weightage assigned to risk factors in estimating risk in PRC makes quantitative

assessment of factors that influence the overall patient risk score difficult. Conclusion: This study provided a preliminary assessment of PRC's capability to assess an individual's periodontal disease risk. We plan to test whether the PRC systematically over- or under-estimates disease state using Wilcoxon rank sum tests to detect statistically significant differences between the disease state and risk produced by the PRC and that documented by the student- provider.

P39 Role of Peptidoglycan Recognition Proteins in Pathogenesis of Preeclampsia and Periodontitis. H. DUKKA*, V. JOHN, S. BLANCHARD, J. REITER (Indiana University School of Dentistry)

Preeclampsia (PE) is a pregnancy related disease and is the leading cause of maternal and fetal morbidity and mortality. Altered immune-inflammatory responses at the placental level in response to infectious agents (eg: periodontal pathogens) have been proposed to be etiological for this pregnancy complication. A new class of Pattern Recognition Receptors called Peptidoglycan Recognition Proteins (PGRP) constituting 4 distinct molecules PGRP 1-4 is emerging as key player in modulating host responses to peptidoglycan and its breakdown products. A critical knowledge gap exists on the role of PGRPs in the innate immune responses that occur at the maternal-fetal interface in response to pathogens and their components that may be present in maternal circulation secondary to chronic infections. The aim of this pilot study is to investigate the expression PGRPs in the placenta of pre-eclamptic women. This case control study consisted of subjects with: (1) normal term pregnancies (n=20) (2) pre-eclampsia (n=20). A real time quantitative PCR was used to analyze the relative mRNA expression of TLR2, TLR4, NOD1, NOD2, PGRP1, PGRP2, PGRP3, and PGRP4. Immunohistochemistry was performed to determine the cell type(s) expressing the PGRP proteins in the placental tissue. Summary statistics (mean, standard deviation, range, 95% confidence interval for the mean) were calculated for PGRP 1-4 expression for each group. The PCR data showed the expression of PGRPs 1, 3 and 4 when compared with positive controls such as liver, brain, skin and T-cells. This study demonstrated the expression of PGRPs 1, 3 and 4 by the placental samples. There was an up-regulation of PGRP-1 (1.4 fold) and down regulation of PGRP-3 (1.3 fold) and PGRP-4 (1.6 fold). TLR2, TLR4 and NOD2 mRNA were elevated in placental samples. The results from this novel research could lead to development of salivary and/or plasmatic biomarkers for early detection of PE and warrants further investigation. (This project is supported by the Delta Dental Master Thesis Award, No: 141031)

PRACTICE MANAGEMENT/ PUBLIC HEALTH

P40 Accessing Health Information: a Mexican-American and European-American Comparison. E. NICHOLSON*¹, O. AGUIRRE-ZERO¹, C. MEDINA-SOLIS², R. MARINO³, G. MAUPOME¹
(¹Indiana University School of Dentistry, ²Universidad Autonoma del Estado de Hidalgo, ³University of Melbourne)

This study utilized the Psychosocial-Behavioral Acculturation Study (P-BAS) questionnaire to help identify the unique socioeconomic factors that determine how the public uses the Internet for accessing general health and oral health information. Both the acculturation level and socioeconomic variables were investigated for 250 European-Americans and 250 Mexican-Americans to demonstrate these trends. The responses were compared cross-culturally using chi-squared tests, univariate analysis and bivariate analysis. The results of the questionnaires revealed that 25.3% of participants searched "frequently" for general health information on the Internet and 13.1% for oral health information. As anticipated, more acculturated individuals tended to "frequently" search the Internet for information on dental health and younger individuals were more likely to utilize the Internet than older individuals. Individuals who reportedly "never" used the Internet to access medical and dental information were 11.0% and 43.9%

respectively. 52.7% of European-Americans reported "never" making searches for dental health information, while only 35.1% of Mexican-Americans reported to "never" search. This suggests a growing trend of dental health related searching in the Mexican-American population. These trends suggest that considerable opportunities exist to enable easier access to information and to raise awareness about oral health. Increased use of the Internet by Mexican-Americans also opens new ground to explore new venues to improve disease prevention and patient education in this ethnic group.

P41 Behavior Diversity among Mexican Immigrants When Seeking Oral Health Advice. G. MAUPOME*¹, A. MCCRANIE², O. AGUIRRE-ZERO¹, E.R. WRIGHT³, D.C. BELL¹ (¹Indiana University School of Dentistry, Indiana University-Purdue University Indianapolis, ²Indiana University Bloomington, ³Georgia State University)

Objective. To characterize through Social Networks Analyses (SNA) the utilization of peer vs. health professional sources when seeking advice about oral health and dental care in an urban community of 1st/2nd generation adult Mexican immigrants (MA). Methods. A survey was adapted to MA themes, language/idioms, and literacy level, and administered to a well-bounded MA community. Saliency of network contacts for Important Matters in Life (IM) and Oral Health Matters in Life (HM) domains was ascertained through 1-on-1 interviews. We quantified the extent and characteristics of the personal networks cited by interviewees (egos) and describing whom they talked with to discuss IM and HM (alters). Results. 332 MAs (mean age 36; 63% female) became the egos of their personal networks. 90% were born in Mexico; 45% had completed elementary school or lower; 41% reported household income <\$30k/yr, and 37% did not know income. 332 egos named ~4(SD±1.9) alters in each personal network (range 1-17); 836 alters (mean age 39; 61% female) were cited as sources for IM only (32.5%), HM only (34.1%), or both IM+HM (33.4%). Only 7.8% of MA egos quoted alters who were dental professionals. Although only a minority of egos did not have an alter to discuss HM (8.4%), about one third had clearly differentiated network resources for HM, separate from IM; another third had substantial overlap between the personal network actors whose advice was sought for IM and for HM. Conclusion: SNA results indicate MAs seek advice about oral/dental issues within a narrow set of persons who are often significant for IM; MAs seldom report using professionals as sources of health information. Health advice/referrals in the MA community is still largely a matter of informal discussions. The limited use of health professionals may have consequences for community oral health, and for planning health promotion programs. (NIDCR DE022096-01A1 and Indiana University CTSA UL1TR001108, RR025761. IRB 1306011692)

PROSTHODONTICS

P42 Factors Associated With the Longevity of Dental Implant Placement. T. CZECHURA*, M.J. METZ, T.G. MAYFIELD (University of Louisville School of Dentistry)

Objective: To evaluate the rate and determine the factors associated with dental implant failure. Methods: 250 patients were analyzed in a retrospective review to determine the rate and the factors associated with dental implant failure for dental implants placed at the University of Louisville School of Dentistry between 2008 and 2013. Patient data such as age, gender, co-morbidities, diabetes status, placement in mandible or maxilla, placement in anterior or posterior, dental implant manufacturer, bone graft placement, and implant success was collected. A chi-square and logistic regression analysis was performed to determine which factors were statistically significantly associated with dental implant failure. Results: From the 250 patients abstracted, 207 (82.8%) patients received implants manufactured by Straumann, 18 (7.2%) patients received implants manufactured by Nobel, 11 (7.2%) patients received implants manufactured by Bio-Horizons (4.4%), and 14 (5.6%) patients received implants manufactured by International Team for Implantology. Of the 484 total dental implants placed, 6 implants failed with a success rate of 98.8%. Of

the 225 dental implants placed in the mandible, 3 implants failed with a success rate of 98.7%. Of the 259 dental implants placed in the maxilla, 3 implants failed with a success rate of 98.8%. Among the 5 patients with failed dental implants, 3 patients had 1-3 co-morbidities, 1 patient had 4-6 co-morbidities, and 1 patient had greater than 10 co-morbidities. Conclusion: Female patients older than 50 years old who had Straumann dental implants placed in the posterior mandible had the highest rate of implant failure.

SALIVARY RESEARCH

P43 Differential Cytokine Response of Normal and Periodontitis Salivary Epithelial Cells to *Porphyromonas gingivalis* and *Fusobacterium nucleatum*. S. SADDLER*, D. SCHMITZ, C. McCARTHY, R.L. GREGORY, M. SRINIVASAN (Indiana University School of Dentistry)

Chronic periodontitis is the most prevalent form of inflammatory periodontal conditions initiated by sequential colonization of a broad array of bacteria and perpetuated by host response to the changing biofilm. Periodontopathic bacteria have been detected at high frequency in oral mucosa covering the cheek, tongue and palate. It has been previously reported that while the expression of the proinflammatory cytokine IL-8 by oral epithelial cells increases after interaction with some periodontal pathogens (*F. nucleatum*), it is reduced after interaction with others (*P. gingivalis*). The objective of our study is to investigate the response of oral epithelial cells to simultaneous exposure to *F. nucleatum* and *P. gingivalis*. Saliva was collected from patients with periodontitis and healthy individuals after obtaining informed consent. Epithelial cells were isolated from saliva and stimulated with the periodontal pathogens *P. gingivalis* and/or *F. nucleatum* as biofilm formulations in varying proportions for 4 hrs. Culture supernatants were assessed for cytokines by ELISA. Results show that the IL-8 secretion was significantly increased with increasing proportion of *P.gingivalis*. Presence of *F.nucleatum* suppressed the IL-8 secretion by *P. gingivalis*. With respect to IL-12 secretion, at low to intermediate ratios of *F. nucleatum* to *P. gingivalis*, IL-12 secretion was decreased, while cells treated with a ratio of 1:1000 *F. nucleatum* to *P. gingivalis* showed higher levels of IL-12 than those treated with a ratio of 1000:1. This indicates that the inhibitory interaction of *P. gingivalis* may occur only when there is a balance of *P. gingivalis* with other bacteria such as *F.nucleatum*. Conclusion: Overall, differential cytokine response of the salivary epithelial cells of normal and periodontitis patients suggests a potential clinical application for salivary epithelial cells in periodontitis.

P44 Salivary Biomarkers for Type 2 Diabetes Mellitus Identified from Literature Search. M. MOHAMED¹, C. BLACKBURN¹, J.S. BLUM², M.SRINIVASAN¹ (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

The incidence of type 2 diabetes mellitus (T2DM) is increasing in geometric proportion worldwide. T2DM begins insidiously exhibiting extended period of development prior to diagnosis. Select protein biomarker profiles along the course of T2DM pathogenesis have been shown to diverge over time. Periodic evaluation of these markers will increase the predictive ability of the diabetes risk scores. Noninvasive methods for frequent measurements of biomarkers are increasingly investigated. Application of salivary diagnostics for T2DM has gained importance with the establishment of shared characteristics between the salivary and serum proteomes. The primary goal of this study is to identify T2DM specific salivary biomarkers by literature based search of T2DM serum proteins reported in human saliva. A serial interrogation of the PubMed database was performed using MeSH terms of specific T2DM pathological processes and associated factors in primary and secondary iterations to compile cohorts of T2DM specific serum markers. Subsequent search consisted of mining for the identified serum markers in human saliva. The information retrieved was validated by measuring select proteins from different pathological pathways

of T2DM. The concentration of adipokines (resistin and visfatin), inflammatory proteins (IL-6, TNF- α) and gut hormones (ghrelin) was determined in diabetic saliva by enzyme linked immunosorbent assay (ELISA). Greater than 60% of the serum proteins associated with T2DM have been measured in human saliva. Nearly 30% of these proteins have been reported in diabetic saliva. While the concentration of TNF- α was lower that of IL-6 and visfatin was higher in T2DM saliva as compared to control saliva. The concentration of ghrelin and resistin was equivalent between the two groups. Conclusions: A high percentage of T2DM serum proteins can be measured in human saliva. Use of saliva as a non-invasive bio-specimen for frequent assessment of biomarkers offers an attractive economic strategy for T2DM screening.

TISSUE REGENERATION AND REPAIR

P45 Partially-Demineralized Macroporous Allograft as a Tissue Engineering Scaffold. M. OSTER^{*1}, H. ARMAN², N. BHIMIREDDY², A. TOVAR², T.G. CHU¹ (¹Indiana University School of Dentistry, ²Indiana University-Purdue University Indianapolis)

Objective: There is potential for processing a partially demineralized macroporous (PDM) allograft to demonstrate appropriate mechanical properties as a stem cell-carrying scaffold for cranioplasty applications. The objectives of this project are to: 1) investigate the effect of degree of demineralization and porosity on mechanical properties of allograft, 2) model allograft deformation through finite-element analysis (FEA), and 3) evaluate biocompatibility and mineralization behaviors of mesenchymal stem cells (MSCs) cultured on PDM allografts. Methods: Macropores of 600 micrometers in diameter at 30% to 60% demineralization were created in porcine tibia-harvested bone disks, following demineralization in 1N HCl for 0.5 to 3.5 hours. Bone disk stiffness was measured on a material testing machine, and deformation behavior was modeled using FEA software LS-DYNA (LSTC, Livermore, CA). Bone disk cytocompatibility was investigated in dog MSCs using an XTT cell proliferation kit and an ALP assay kit. Results: In non-demineralized samples, stiffness decreased by 84% when porosity was increased from 30% to 60%. Samples demineralized in HCl at 0.5 to 3.5 hour showed significantly lower stiffness. Our results established a preliminary range of porosity and demineralization times in which the target stiffness of 0.1-5 N/mm can be achieved. Our analysis showed a logarithmic relationship between sample stiffness, porosity and demineralization time. FEA results showed the von Mises stress distribution with characteristic stress concentration in the contact area between the pushing rod and the bone allograft disk. The FEA model will be further refined with experimental results as a potential predictive tool. Conclusion: We have demonstrated that PDM allografts display suitable stiffness for cranial defects, and have established a preliminary range of porosity and demineralization time in which the target stiffness of 0.1-5.0 N/mm can be achieved. Further in vitro and in vivo study will be needed to establish the biological properties of PDM.

P46 Neurotrophins Expressions in Osteoblasts and Osteocytes. H. AYOUB*, S. POSRITONG, P. ELENISTE, V. PATEL, A. BRUZZANITI (Indiana University School of Dentistry)

Bone remodeling is characterized by the regulation between bone formation and bone resorption through the communication between osteoblasts, osteoclasts, and osteocytes. The communication between osteocytes and other bone cells occurs through their cytoplasmic membrane extensions known as dendrites. Kalirin, a GDP/GTP exchange factor (GEF) that is involved in the neuronal signaling that results, in part, from the binding of the nerve growth factor (NGF) with its receptor (TrkA). Importantly, we reported that Kalirin-deficient mice exhibit osteoporosis. Moreover, osteocytes from Kalirin-deficient mice exhibit fewer and shorter dendrites than wild-type mice. Based on these findings, it is hypothesized that the regulation of osteocyte dendrite elongation is potentially controlled through the neurotrophin signaling

proteins. Objective: The aim of this study was to determine the mRNA expression of the neurotrophin (NT) family of proteins, including the NT ligands (NGF, BDNF, NT-3 and NT-5) and NT receptors (NGFR, TrkA, TrkB and TrkC) during the differentiation of osteoblasts and osteocytes. Methods: Primary osteoblasts were isolated from the calvaria of neonatal wild-type mice and cultured in osteogenic media containing betaglycerophosphate (BGP) and ascorbic acid (AA). Cells were collected over 0-35 days. In addition, the pre-osteocyte cells (MLO-Y4) were cultured on collagen-coated plates in the presence or absence of AA+BGP, or on plates without collagen. Cells were cultured for 7 days. Messenger RNA was isolated, cDNA was generated through reverse transcription and polymerase chain reaction (PCR) was conducted to examine NT gene expression. Results: Several members of the neurotrophin family of ligands and receptors were identified in osteoblasts, with NGF expression declining during differentiation. In MLOY4 osteocytic cells, NGF, BDNF, NT-5, and TrkA were also detected. Similar to osteoblasts, NGF expression was reduced during osteocyte differentiation. Conclusion: The neurotrophins and their receptors may have an essential role in bone remodeling through regulating of signaling between osteoblasts and osteocytes.

P47 Pyk2-Deletion Enhances Bone Formation Through Estrogen Signaling in Osteoblasts. S. POSRITONG*, P. ELENISTE, A. BRUZZANITI (Indiana University School of Dentistry)

An imbalance between osteoclast (OC) and osteoblast (OB) functions can lead to low bone mass and osteoporosis. The activity of the proline-rich tyrosine kinase 2 (Pyk2) has been shown to be important for OB function. Pyk2-deficiency (Pyk2-KO) leads to high bone mass and estrogen supplementation enhanced the bone mass of ovariectomized Pyk2-KO mice. Objectives: We determined the role of Pyk2 on OB function, and investigated the role of estrogen, the major sex hormone regulating bone mass in females, on Pyk2. Methods: Primary calvarial OBs from wild-type (WT) and Pyk2-KO mice were cultured for 4 days with and without estrogen. Cell proliferation assay, mRNA extraction and quantitative reverse-transcription-PCR (QPCR) were performed. All experiments were performed in triplicate and repeated multiple times. Data were analyzed using Student's t test ($\alpha = 0.05$). Results: We found that c-fos and ALP mRNA, which are important for OB proliferation and differentiation, respectively, were significantly higher in Pyk2-KO OBs than WT. Consistent with this, Pyk2-KO OBs exhibited higher proliferation activity than WT OBs, independent of estrogen treatment. Although the expression of the estrogen receptor ($ER\alpha$) was reduced in Pyk2-KO OBs, type 1 collagen mRNA was significantly increased in estrogen-treated Pyk2-KO OBs. Furthermore, we found that estrogen increases Pyk2 protein levels in WT OBs. OBs also secrete RANKL and OPG, and the ratio of RANKL/OPG regulates OC differentiation. Pyk2-KO OBs showed reduced RANKL mRNA expression than WT and the RANKL/OPG ratio was decreased by estrogen. Conclusion: These results suggest that Pyk2 plays an important role in the estrogen-signaling pathway in OBs to potentially control bone formation as well as OC differentiation. Targeting Pyk2 may be a novel strategy for bone tissue regeneration for the treatment of bone loss associated with periodontitis and osteoporosis.

P48 Investigating Chloride Channel Function in Autosomal Dominant Osteopetrosis-Type II Osteoclasts. V. PATEL*¹, R. O'RILEY², M. ECONS², A. BRUZZANITI¹ (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

The bone degrading osteoclasts, bone forming osteoblasts, and mechano-sensing osteocytes control bone mass. Any deviation in the bone remodeling cycle can lead to diseases of the skeleton, including osteoporosis (low bone mass) and osteopetrosis (high bone mass). Acidification of the subcellular compartment by osteoclasts is essential for their ability to degrade bone. Secreted chloride ions and protons regulate the acidic environment and disruption of chloride secretion leads to decreased osteoclast bone-resorbing activity. The heritable high-bone-mass disease, known as autosomal dominant

osteopetrosis type II (ADO2), is caused by mutation in the CICN7 gene, which encodes chloride channel-7 (CIC7). Objective: We are investigating the role of CIC7 in osteoclasts using a mouse model of ADO2, with a long-term goal of functionally rescuing the obstructed chloride channel activity of ADO2 patients. Methods: Osteoclasts were differentiated from the bone marrow of wild-type and ADO2 mice in culture media supplemented with MCSF and RANKL for 0-6 days, and treated with or without two chloride-channel activating drugs, forskolin or chloroquine. Mature osteoclasts were stained with TRAP and counted. In addition, osteoclasts were plated onto dentin and resorbing activity was determined by toluidine blue staining of pits or by ELISA assay of degraded collagen products. Results: ADO2 osteoclasts exhibit defective bone-resorbing activity on dentin. Chloroquine and forskolin both increased the bone resorbing activity of ADO2 osteoclasts in a dose-dependent manner, while also decreasing osteoclast differentiation. Furthermore, chloroquine was found to have a greater effect than forskolin on increasing bone resorption on dentin. Further studies will include examining the mechanism of action of these drugs on trafficking and function of the CIC7 in osteoclasts. Conclusion: We have identified new drug treatments that increase the activity of ADO2 osteoclasts in vitro, which may have clinical implications for reducing the high bone mass and associated health issues of ADO2 patients.

P49 Identifying the Mechanisms that Regulate Osteocyte Dendrite Elongation. S. KO*, P. ELENISTE, A. BRUZZANITI (Indiana University School of Dentistry, Indiana University-Purdue University Indianapolis)

Osteocytes are bone cells that are located within the mineralized bone matrix. They are known to orchestrate bone remodeling by regulating the activity of both osteoblasts (bone-forming cells) and osteoclasts (bone-resorbing cells). Osteocytes contain membrane extensions known as dendrites, which allow cell-to-cell coupling with other osteocytes, osteoblasts, and osteoclasts. However, the mechanism for dendrite formation is still uncertain. In this project, we investigate the role of Dynamin in regulating osteocyte dendritic elongation. Dynamin is an enzyme that hydrolyzes GTP to GDP and is involved in various cellular activities, such as clathrin-mediated endocytosis and actin remodeling. Previously, we demonstrated that Dynamin is crucial for regulating osteoblast migration and differentiation as well as bone resorbing activity by osteoclasts. To understand the role of Dynamin in osteocyte dendrite formation, MLO-Y4 osteocytic cells were treated with various concentrations of dynasore, a chemical inhibitor of Dynamin for 1-3 days. The cells were imaged each day using a Leica DMI 4000B microscope. The lengths of dendrites were measured using ImagePro software. In addition, lysates from dynasore-treated and untreated control cells were used for Western blot analyses. Statistical significance was determined using student t-Test ($p < 0.05$). Our results showed that the dynasore-treated cells exhibited a significant (150%) increase in dendrite length, which occurred in time-dependent manner. Furthermore, there was a significant increase in protein expression of Vav and PTP-1B, which are important for remodeling of the actin cytoskeleton. Overall, our results suggest that Dynamin may play a critical role in bone remodeling by regulating dendrite elongation in osteocytes.

TOBACCO RESEARCH

P50 Impact of a Tobacco CE Program for Indiana Healthcare Providers. S. HARVEY* and L.M. ROMITO (Indiana University School of Dentistry)

Purpose: To assess an evidence-based continuing education (CE) program for Indiana healthcare practitioners focusing on tobacco use and dependence which emphasized team-based tobacco dependence treatment. Methods: Program impact was assessed by changes in participants' self-reported knowledge and clinical application of course concepts and strategies via a 26-item immediate post-CE survey and a 19-item 3-month follow-up survey. Surveys included multiple-choice and 5-point

Likert-style scaled items. The three month follow-up surveys were mailed / delivered electronically to participants; non-responders were sent two reminders. De-identified data were analyzed in aggregate using descriptive statistics, Spearman correlation coefficients, and Mantel-Haenszel chi-square tests. Results: CE programs were held in Tell City, Madison, Lafayette, Goshen, Richmond and Vincennes with a total of 252 participants. Initial survey response was 98.4% (n=248): dental assistants (2%), dental hygienists (83%), dentists (8.5%), and other healthcare professionals (6.45%). Overall, participants reported less knowledge before than immediately after ($p<.0001$) and 3 months after ($p<.0001$) the CE program. Reported knowledge at 3 months was less than immediately after the program ($p<.002$). Participants planned to apply CE program communication strategies (99%), implement brief tobacco intervention strategies (85%), and refer patients to local cessation resources (95%) or the Indiana Quitline (96%). Response rate for the 3 month survey was 54% (n=136). Respondents reported currently playing an active role in team-based tobacco cessation (48%,78), applying CE communication strategies (85%,109), and implementing brief tobacco interventions (71%,90). Sixty-eight respondents reported referring patients to local counselors; eighty-three referred to the Indiana Quitline. Conclusion: Tobacco dependence CE may be beneficial to enhance health care practitioners' knowledge and willingness to integrate tobacco interventions in their healthcare settings. However, this does not assure that they will change their practice behaviors by utilizing the learned concepts and tobacco interventions with patients. (Funded by the Indiana State Dept. of Health)

Clinical Case Reports

AESTHETIC DENTISTRY

CC1 Esthetic and Functional Enhancement Using Anterior Implant Supported Cantilever Bridges. F.S. ALQUDAIHI* and N.B. COOK (Indiana University School of Dentistry)

Using implants to replace adjacent missing teeth in the anterior maxilla can be challenging. Maxillary lateral incisors have relatively small diameters and placing two adjacent implants commonly results in the implants being positioned close together compromising esthetics. Implant-supported cantilever FPDs to replace maxillary lateral incisors can be considered. Mesial cantilever prostheses have been perceived to be more favorable than distal cantilever prostheses as they induce less stress in the bone. This case presented with existing dental implants replacing the maxillary cuspids, missing lateral incisors, and endodontically treated central incisors with defective resin build-ups. The objective of treatment was to address the patient's chief complaint by restoring dental function and esthetics through a predictable interdisciplinary approach while maintaining oral health. Methods: Periodontal and Endodontic consultations were obtained. Comprehensive examination, smile analysis, and diagnostic wax-up were completed. #8 resin core build-up was repaired and #9 received a prefabricated post and resin core. A mockup was fabricated and placed intraorally to check final teeth appearance and phonetics. Desired results were thoroughly discussed with the patient and the dental laboratory. Provisional restorations were modified to meet the patient's expectations prior to final prosthesis fabrication. Implants #6 and #11 were restored with custom abutments and PFM cantilever FPDs with pontics replacing adjacent lateral incisors. #8 and #9 received single-unit PFM crowns. All the prostheses were fabricated using high noble metal veneered with feldspathic porcelain. Excellent esthetic and functional outcomes were achieved in this case. Comprehensive extra- and intra-oral assessments, treatment planning, and good communication are essential to attain pleasant results. Replacing a single missing small size tooth in the anterior area using implant-supported cantilever prosthesis is a viable treatment option, especially since minimum occlusal forces are expected on the cantilever, and might be considered as an alternative to many costly and invasive procedures including surgery.

CC2 Using Margin Elevation with Bonded Ceramics: A Case Report. M. ROUSE*^{1,2} and N.B. COOK¹ (¹Indiana University School of Dentistry, ²United States Navy)

Thirty years ago, glass ionomer was first used as a means of bonding resin matrix composite to dentin. Today this method is used to elevate the margin of a preparation to a level which gives the clinician more access to the operating field. This technique has been described in the dental literature with resin composites bonded with resin adhesives. There are still inherent problems with this approach, however, since resin adhesives are subject to hydrolysis, marginal leakage, and recurrent caries. Studies have demonstrated the ability of glass ionomer to chemically bond to dentin; glass ionomer can also be dissolved/etched by phosphoric acid and predictably bonded to resin composites, eliminating the problem of hybrid layer hydrolysis which occurs with resin bonding agents. Margin elevation takes advantage of the favorable properties of glass ionomer cements (adhesion through chemical bond to dentin, fluoride release, biocompatibility, coefficient of thermal expansion similar to tooth structure, and decreased interfacial bacteria penetration/caries activity) while allowing overlaying of a suitable direct or indirect restorative material. This technique should be utilized when a preparation stands an increased risk of contamination or has a gingival margin on dentin/cementum. This case describes restoration of a tooth with a deep subgingival margin located on cervical dentin. The tooth was prepared for a ceramic onlay. Resin-modified glass ionomer was then inserted into the mesial proximal box and re-prepared with the occlusal wall of the glass ionomer becoming the new gingival margin, allowing significantly increased access and isolation. The tooth was then restored with an e.max onlay and cemented with RelyX Unicem. The restoration has been examined at a 6-month recall. With proper case selection and attention to detail, glass ionomer margin elevation is an excellent technique for bonding ceramics to teeth which cannot be isolated adequately for impression and/or resin bonding.

CC3 Conservative Esthetic Approach for Crown Fracture with Pulp Exposure. N. ABOGAZALAH*, O.R. CAPIN, N.B. COOK (Indiana University School of Dentistry)

Objective: Treatment and management of complicated crown fracture of tooth #8 for a twelve year old patient with partial pulpotomy and tooth fragment reattachment. Case Summary: The patient presented with a complaint of a broken anterior tooth two days prior to the visit. Sensitivity to cold and hot was reported with no spontaneous pain. The broken fragment was kept in milk and brought to the appointment. Tooth #8 had a horizontal crown fracture at the middle one-third with pulp exposure; also active primary carious lesions were on the mesial and facial surfaces of the tooth. There was no mobility and no signs of tooth displacement. A periapical radiograph showed no signs of root or alveolar bone involvement. Treatment Procedure: The fragment was retrieved from the milk and rinsed copiously under running water, it was placed against the tooth to ensure fitting. Thereafter, it was kept in saline until used. Local anesthesia infiltration was applied and the shade was selected prior to rubber dam isolation. Facial and mesial primary cavitated carious lesions were excavated. A 2 mm depth preparation into the exposed pulp was performed using a high-speed diamond bur with copious water-cooling. After hemostasis was achieved calcium hydroxide paste (Dycal DENTSPLY) was placed on the pulp and covered with resin modified glass ionomer liner (Vitrebond 3M.) Then, the tooth fragment and the tooth were prepared for rebonding by using resin bonding (OptiBond Solo Plus) and resin composite (Herculite Kerr.) After ideal positioning was achieved, light curing was performed. The occlusion was checked and adjusted. The restoration was finished and polished using discs. Instructions were given and follow up was scheduled at 2, 6 and 12 months. Conclusion: This treatment approach is conservative, expedient, and affordable in order to maintain pulp vitality and to provide acceptable esthetic results.

CC4 Importance of Vertical Dimension in Facial Esthetics. N. SUPONPUN* and J. LEVON
(Indiana University School of Dentistry)

The objective is to discuss the importance in the determination of the vertical dimension of occlusion in prosthodontic treatment. Case I: A 43-year-old Caucasian female presented with chief complaints of both poor function and esthetics. The medical history revealed a history of cirrhosis, Hepatitis B and depression. In 2011, she presented edentulous with some lower impacted teeth. Three sets of complete dentures were fabricated and delivered. These dentures caused her various problems including complaint of the thick and overextended borders, unacceptable esthetics and ear pain. Due to lack of posterior inter-occlusal space, vertical dimension was increased so much that the resulting dentures were unsatisfying esthetically and auricular discomfort. Case II: A 75-year-old Caucasian male presented with a chief complaints of a broken denture, joint discomfort and esthetic concern. The medical history revealed a history of angina pectoris, hypertension and depression. He continuously complained about his joint pain and broken prosthesis since 2011. Repairs were done several times but they did not eliminate his problem. In 2013, he was diagnosed with a loss of vertical dimension. When his vertical was reestablished at its proper position, his joint discomfort was resolved and his esthetics was greatly improved. Conclusion: Determination of the proper vertical dimension of occlusion is a crucial factor in the overall success of a restorative case. For correct diagnosis and treatment, the restorative dentist should use past dental history, facial profile, past photographs, provisional prosthesis and mounted diagnostic casts.

DENTAL HYGIENE

CC5 The Effect of Uncontrolled Diabetes on a Periodontal Patient. M. MILLER*, N. HOEING, L. MAXWELL (Indiana University School of Dentistry)

Objective: To educate the public on the relationship between uncontrolled diabetes and its effect on periodontal disease. Background: A 44 year old male patient presented with a chief complaint of bleeding gums and in need of a teeth cleaning. The patient stated it had been seven months since his last cleaning. He presented with heavy supragingival and subgingival calculus. His periodontal charting indicated 4-7mm CAL with generalized bleeding. This patient has a history of uncontrolled diabetes with a blood sugar of 150 that morning and his most recent A1C level was 7.5. Clinical Examination: Revealed severe diffuse gingivitis as evidenced by dark red, bulbous, smooth and shiny gingiva with profuse bleeding. He presented with generalized chronic periodontitis as evidenced by 4-7 mm CAL and generalized radiographic bone levels of 3-4 mm from the CEJ to the alveolar crest. He had broken teeth and carious lesions throughout the mouth. Radiographic calculus was evident on every tooth. Treatment: A full mouth debridement (D4355) was performed, followed one week later by four quadrants of scaling and root planning (D4341). A tissue reevaluation was completed four weeks after the final scaling and root planning appointment. When providing periodontal treatment to a diabetic patient it is important to remember that diabetic patients demonstrate slower healing than non-diabetic patients. This is a result of impaired white blood cells causing blood vessels to thicken which then slows the flow of nutrients to and waste products from body tissues. The body's ability to fight infections is reduced. Results: The patient did not show significant improvements at the tissue reevaluation which in linked to the slower healing process related to his uncontrolled diabetes. The patient needs to control his diabetes in order to stabilize his periodontium. This patient needs further evaluation before we can assess whether the nonsurgical periodontal therapy performed was effective or if a periodontal referral is necessary

CC6 Dental Hygienist's Role in Assessing Peri-Implantitis. C. CREED*, A. SKINNER, J. BLANCHARD (Indiana University School of Dentistry)

The objective of this clinical case presentation is to discuss peri-implantitis due to its increasing prevalence in dental hygiene practice. Assessment: A 79 year old Caucasian female presented to the Dental Hygiene Clinic for periodontal maintenance and a dental exam. The medical history reveals a history of hypertension, atrial fibrillation, and the patient is taking Coumadin. The patient presented with generalized mild plaque-induced marginal and papillary gingivitis, however, the gingiva around the implant replacing #19 showed moderate gingival inflammation as evidenced by dark pink, bulbous, and spongy tissue with moderate bleeding on probing (BOP). The patient also presented with generalized chronic periodontitis as evidenced by 4-5mm clinical attachment level (CAL). Peri-implantitis was diagnosed on the implant with 6-9mm probing depths, 85% bone loss present on radiographs, and suppuration. DH Care Plan: Routine periodontal maintenance, oral hygiene instruction, and referral to the Graduate Periodontics Clinic for further evaluation of the implant. Follow up: The implant was diagnosed with a hopeless prognosis and scheduled for removal in the Graduate Periodontics Clinic. However, before the scheduled extraction, the patient reported that the implant had "fallen out" and it was not present at the 3 month periodontal maintenance appointment. Conclusion: Early recognition and intervention of peri-implant mucositis and peri-implantitis is crucial for the survival of the implant. Once peri-implantitis has reached an advanced stage, the prognosis of the implant is very poor and may require surgical treatment.

CC7 Dental Anxiety: The Effects on Oral Health and Dental Treatment. M. COBB*, C. HOUSE, P. RETTIG (Indiana University School of Dentistry)

Objective: The objective of this case presentation is to educate the dental professional on the management of a patient with dental anxiety. Assessment: A 20 year old Caucasian male presented to the dental hygiene clinic for a cleaning at the request of his grandmother. The patient reported a negative medical history with the exception of anxiety to dental care. Due to this anxiety, consent was obtained from the patient to speak with the grandmother in regards to his medical history. At this time, the grandmother disclosed that the patient had a traumatic dental experience as a child and has not been to the dentist since that event occurred. Clinically, the patient presented with generalized severe gingivitis as evidenced by red, rolled, spongy tissue with bleeding upon probing due to the presence of heavy calculus. Despite the inflammation present, bones levels are healthy. The patient reported never brushing his teeth due to pain and fear of causing pain to himself. DH Care plan: Patient received full mouth debridement, modified adult prophylaxis, and extensive oral hygiene instruction. Treatment: Experimental techniques were utilized throughout the course of treatment in order to ease anxiety while providing effective treatment. Results: Experimental methods that were used throughout treatment proved effective for the completion of full mouth debridement and adult prophylaxis. Conclusions: The patient presented with extensive gingivitis and heavy calculus deposits. For optimal success in the future, a short recall is necessary for the patient to receive continued extensive dental hygiene therapy.

CC8 Education on and Management of Patients Requiring Kidney Transplants. H. KINNEY*, M. WEHMILLER, N.A. YOUNG (Indiana University School of Dentistry)

Objective: The objective of this clinical case presentation is to educate dental providers on considerations for management of a patient with renal failure who is undergoing dialysis and preparing for a kidney transplant. Clinical Problem: A 53 year-old female with a medical history of renal failure, and undergoing dialysis treatment presented to the Dental Hygiene Clinic. The patient is in need of a kidney transplant. To be placed on the transplant list, the patient was medically required to have an oral exam and to undergo

needed dental treatment, including preventive and/or periodontal therapy. A search of the literature was performed to ascertain an evidence-based approach to treatment planning for this patient's oral and medical needs. Dental Hygiene Care Plan: Patient education was designed to address the following problems: ignorance of current oral hygiene status, lack of motivation regarding oral home care, and an attitude of neglect towards seeking professional oral care. Treatment modifications for proper and effective dental hygiene care were provided for educational purposes on patients with end-stage kidney disease. Conclusion: The results of this case study provide dental professionals information on management of a patient in need of a kidney transplant.

CC9 Providing Adapted Care for Patients with Immune-mediated Mucous Membrane

Conditions. S. BAILEY*, J. SCHLUMPF, H. TAYLOR, S. ZUNT (Indiana University School of Dentistry)

Background: Immune-mediated diseases frequently manifest in the oral mucosa, which may be the first clinical sign for many patients. Some of these diseases present in ways that are pathognomonic (specific) for the condition; however, others have signs and symptoms that may appear very similar to systemic conditions unrelated to immune-mediated diseases. Thus, differential diagnosis can prove difficult. This case study examines a 50-year-old African-American female with co-diagnoses of Lichen Planus and Mucous Membrane Pemphigoid. These immune-mediated diseases affect the oral mucosa, causing the patient pain and burning sensations within the mouth. The symptoms associated with these conditions make maintenance of good oral hygiene difficult for the patient. Objectives: The objective of this case study was to explore Mucous Membrane Pemphigoid and Lichen Planus: the clinical and histological presentations, the implications for dental treatment, and the best proven therapies for management. Methods utilized during treatment will be presented. Methods: The patient presented to the IU School of Dentistry Dental Hygiene Clinic for routine periodontal maintenance and examination. The sensitive nature of the patient's oral mucosa due to Lichen Planus and Mucous Membrane Pemphigoid required employment of alternative methods to routine dental care. Modifications to the patient's diet and home oral care routines were suggested. Conclusion: Oral health providers should be conscious of the clinical manifestations of Lichen Planus and Mucous Membrane Pemphigoid, in addition to and differentiated from other oral conditions. Likewise, providers should be adept at altering routine dental care methods to accommodate patients with these and other immune-mediated conditions. If clinical treatment and oral care are administered properly, the patient should experience alleviated symptoms and suffer less discomfort and sensitivity on a day-to-day basis and during dental assessment and treatment.

CC10 The Effects of Dilantin on the Oral Cavity Over Time. R. AMES*, S. RUDICEL, P. RETTIG (Indiana University School of Dentistry)

Objective: The objective of this case presentation is to discuss the long-term effects of Dilantin in causing gingival hyperplasia as seen in a patient. Assessment: A 54 year old African American male patient presented to the Dental Hygiene Clinic at Indiana University School of Dentistry (IUSD) with a chief complaint of "I need to get my teeth cleaned for my three month appointment." The patient was referred to our clinic from the IUSD Graduate Periodontal clinic for his three month periodontal maintenance appointment. Medical history indicates he suffers from epilepsy and has been taking Dilantin for over forty years. An intraoral examination revealed advanced localized periodontal disease in the lower right quadrant with probing depths ranging from 1-10mm and clinical attachment levels ranging from 1-8mm. Patient also presented with generalized healthy gingiva as evidenced by coral, firm, and stippled tissue. The intraoral radiographs reveal generalized mild bone loss as evidenced by 3-4mm from crest of bone to CEJ. The patient's oral hygiene habits include: brushing twice a day, flossing once a day, and using an antimicrobial mouth rinse once a day. DH Care Plan: periodontal maintenance, topical fluoride varnish,

review of oral hygiene, and review of the use of a water irrigator. Evaluation: The patient was referred to the Graduate Periodontal department for further evaluation due to the increase of gingival overgrowth on #31 distal and the presence of exudate. The dentist who performed the last dental exam in the Dental Hygiene Clinic feels the patient will need another gingivectomy. Conclusions: From the review of the evidence-based literature, the Dilantin is the cause of the gingival hyperplasia that this specific patient has been experiencing over the years and his need for continuous periodontal surgery.

CC11 The Negative Effects of Black Tea on *P. gingivalis* Growth. K. TRAORE*, A. ALSALAM, H. TAYLOR (Indiana University School of Dentistry)

Background: Recent research suggests that drinking a cup of tea (black, green, white, etc.) may have a negative impact on *P. gingivalis* growth in the oral cavity. Considering *P. gingivalis* is a major pathogen associated with periodontal disease, oral health professionals should be aware of tea's positive effect against the disease. Objective: The objective of this study was to observe any positive effects of drinking Taj tea (black tea) once a day and non-surgical periodontal therapy on a patient who presented to the Dental Hygiene Clinic at Indiana University. The patient presented with a history of smoking, poor oral hygiene, and lack of dental care at home. For years this patient has had one cup of Taj tea once per day. Treatment: The patient consented to four quadrants of scaling and root planning followed by prophylaxis. Probing depths and periodontal description were determined at the initial appointment. Conclusion: Despite the patient's poor oral health history and assessment, this patient did not have severe advanced periodontitis as expected. Since the patient drinks one cup of black tea every day, the anti-biofilm properties of tea may be inhibiting the progression of this patient's periodontal disease.

CC12 Motivational Factors for the Non- Compliant Patient. N. MILLER*, D. RANIS, L. MAXWELL (Indiana University School of Dentistry)

Objective: To evaluate the oral hygiene attitudes of non-compliant patients and find motivating strategies to improve their adherence to oral hygiene recommendations. Assessment: A 33 year old male Caucasian patient presented to our clinic with the chief complaint of "I need to get my teeth cleaned." He had not been to the dentist in 17 years. His medical history was positive for HIV/AIDS. The patient stated that he has smoked a half of a pack of cigarettes daily for the last 20 years and that he drinks socially. The patient stated that he brushes once a day with a manual toothbrush and rarely flosses. His gingival description was generalized mild plaque induced marginal, papillary gingivitis as evidenced by pale pink, bulbous, spongy gingiva with slight BOP. Localized moderate to severe plaque induced gingivitis on lingual mandibular tissue as evidenced by red, rolled, inflamed papilla with easy BOP on the mandible. His periodontal description was generalized 4-6 mm CAL most likely due to inflammation from pseudo-pocketing. Generalized healthy bone levels as evidenced radiographically by 1-2 mm measurements from the CEJ to crest of alveolar bone. DH Care Plan: Prophylaxis, extensive OHI that includes finding motivating factors for this patient to maintain effective plaque control at home. Evaluation: When evaluating this patient's success in treatment, we found he was not compliant 5 out of the 10 appointments that we had agreed to schedule. His behavior and attitude remained unchanged despite the efforts used to motivate the patient. His attitude reflected his desire for a quick resolution to improve his oral health, rather than making the commitment and effort to alter his lifestyle. Conclusion: Finding the right motivating strategies for your patient will determine how successful their treatment outcomes will be in achieving optimal oral health.

CC13 Recognition and Treatment of Amlodipine (Norvasc) Induced Gingival Hyperplasia. D. SILCOX*, N. THOMPSON, H. RACKLEY (Indiana University School of Dentistry)

Objective: The objective of this clinical case presentation is to help dental hygienist recognize and understand the treatment of gingival hyperplasia. Assessment: A 56 year old Caucasian male presented to the dental hygiene clinic with the chief complaint, "I want my teeth cleaned." The patient's last cleaning was in 2011 at Indiana University School of Dentistry (IUSD). The patient's medical history revealed that he smokes one pack of cigarettes a day and has been taking the calcium channel blocker amlodipine for approximately two months for hypertension. The patient's gum tissue presented clinically as pink, stippled, rolled, and bulbous with a hyperplastic appearance. The mandibular attached gingiva in particular, was firm and had an enlarged clinical appearance. Amlodipine is known to cause gingival hyperplasia. Drug-induced gingival hyperplasia was reclassified in 1999 by the APP as a dental plaque-induced gingival disease. Amlodipine is a commonly prescribed drug with the prevalence of gingival hyperplasia being reported as high as 33.3%. Gingival hyperplasia can manifest from mild to severe depending on modifying factors including the patient's ability to remove plaque biofilm and the length of time the patient is on amlodipine. DH Care Plan: Treatment for this patient at the IUSD hygiene clinic includes scaling and root planing on the maxilla, with full mouth debridement, and a tissue re-evaluation 4-6 weeks after treatment. Each case of gingival hyperplasia should be treated based on the individual's needs; this can include non-surgical therapy, surgical procedures, or a combination of both. Evaluation: Due to time constraints associated with this presentation, this patient has yet to be re-evaluated after treatment at IUSD. Conclusion: Hygienist must stress the importance of plaque control and spend quality time on oral hygiene instructions. If a patient is on a medication known to cause gingival hyperplasia it is important to note any changes at each visit.

CC14 Non-Surgical Periodontal Therapy on a Patient with Advanced Gingival Hyperplasia. H. BRIDGES*, E. BENTLEY, H. TAYLOR (Indiana University School of Dentistry)

Objective: The objective of this clinical case presentation is to evaluate the outcomes of nonsurgical periodontal therapy by a dental hygiene student on a patient with advanced gingival hyperplasia. Assessment: A 57-year-old African American female patient presented with a chief complaint of "teeth cleaning and swollen gums." The patient reported no dental care for over 5 years. Her medical history is comprised of a history of controlled hypertension and controlled psychiatric disease resulting from a combination of bipolar disease and schizophrenia. The patient reports taking amlodipine, olanzapine, and simvastatin. In addition, the patient smokes an average of 5 cigarettes per day, brushes once per day, and flosses about 3 times per week. Clinical examination revealed generalized moderate, plaque-induced and non-plaque-induced marginal and papillary gingivitis with generalized chronic periodontitis. The intraoral radiographs revealed generalized mild horizontal bone loss and localized moderate, horizontal bone loss radiographically as evidenced by 5-6 mm from the CEJ. DH Care Plan: Four quadrants of scaling and root planing (SRP), with comprehensive oral hygiene instructions (OHI), and periodontal tissue re-evaluation were completed. Evaluation: Periodontal re-evaluation revealed generalized 1-2 mm increase in probing depths and minimal improvement in bleeding. However the patient's oral hygiene consistently improved throughout treatment. The patient was referred to the Graduate Periodontal Clinic as a result of localized 9-10 mm probing depths and localized fibrotic gingiva following non-surgical periodontal therapy. Conclusion: Cause of consistent gingival hyperplasia may be due to patient's use of amlodipine as an antihypertensive medication. Additional surgical periodontal treatment may be needed following non-surgical periodontal therapy to rule out medication-induced causes of infection and to achieve periodontal health.

CC15 The Dental Hygienist's Role in Management in Oral Lichen Planus. J. LUCAS*, W. MAGANA, L. MAXWELL (Indiana University School of Dentistry)

Objective: To understand the dental hygienist's role in the management of patients with oral lichen planus (OLP). Signs of OLP are clinically seen as lacy white, raised patches of tissue and/or as red, swollen, tender patches of tissue. These lesions are most commonly visible on the buccal mucosa; other common locations are the gingiva, tongue, alveolar mucosa, and the palate. Patients with OLP typically experience a burning sensation or pain in the area. Our patient presented with generalized slight to moderate plaque induced and localized non-plaque induced gingivitis evidenced by hypersensitivity involving the papilla, white and pale pink gingiva, blunted, and sloughing papilla. Raised white patches were clinically noted on the left buccal alveolar mucosa, the left buccal mucosa, and with similar but fewer patches on the right buccal tissues. Patient indicated being more symptomatic a couple weeks prior to her visit, but she was unsure why. She expressed that the inside of her cheeks felt very painful and these symptoms "come and go." Patient reported no history of medication. Her oral hygiene habits consist of brushing once a day with an electric tooth brush, flossing once a day, and using Listerine mouth rinse once a day. While there is no cure for OLP, current treatment includes systemic and topical corticosteroids. Palliative care during a dental hygiene appointment would include the use of topical and local anesthetics. When treating a patient with OLP, it is important that the dental hygienist recognizes the signs and symptoms in order to determine an appropriate care plan while keeping pain and discomfort to a minimum; and to provide the patient with the knowledge to care for lichen planus at home.

CC16 Non-Surgical Periodontal Therapy in Patient with Stage 4 Kidney Failure. E. BROCK*, D. HARBISON, H. TAYLOR (Indiana University School of Dentistry)

Background: There is a growing body of literature that suggests an association between chronic kidney disease (CKD) and periodontal disease. Inflammatory responses in the oral cavity due to periodontal infection have been suggested to trigger an inflammatory response in the kidneys that may complicate CKD further. Objective: The objective of this case study was to observe the clinical response of non-surgical periodontal therapy on an individual with Stage 4 kidney failure and generalized moderate gingivitis and acute generalized mild periodontitis as evidenced by 4mm clinical attachment level on teeth #2, 3, 4, 6, 10, 11, 13, 14, 15, 18, 19, 20, 30, 31 and 5mm clinical attachment level on tooth numbers #6, 7, 19. Methods: A 42 year old Caucasian male presented to the Dental Hygiene clinic for four separate appointments for scaling of all four quadrants and prophylaxis and tissue re-evaluation. Results: At the tissue re-evaluation appointment, the patient presented with generalized healthy gingiva and generalized healthy periodontium with localized areas of 4mm pockets on tooth numbers: #2, 3, 10, 18, 19, and 30. Conclusion: Treating periodontal disease and gingivitis with non-surgical periodontal therapy in a patient with CKD may help reduce inflammatory responses in the kidneys.

CC17 Management Strategies for Patients with Xerostomia (Dry Mouth). M. CHRZAN*, T. MILLER, L. MAXWELL (Indiana University School of Dentistry)

Objective: To discuss management strategies for patients presenting in the clinical setting with xerostomia (dry mouth). Xerostomia is a multifactorial problem and many times it is disabling for the individual and challenging to manage. A 66 year old Caucasian female presented to the dental hygiene clinic with a chief complaint of "constant dry mouth." The patient's medical history indicated a previous habit of smoking along with a current history of asthma, chronic obstructive pulmonary disease, and oral candidiasis infection. Contributing factors to the patient's dry mouth include: the use of a CPAP machine at night, oxygen during the day, and two prescription medications whose side effects cause dry mouth (Zolof and Spiriva). Upon examination this patient was determined to be high caries risk and evidence of

a new carious lesion was found on the mesial aspect of tooth #27. The iteration of meticulous home care is an important role of the clinician in order to alleviate discomfort, taste disturbances, sore mouth, and to prevent future decay and candidiasis infections. Other recommendations that were given in order to combat dry mouth included: use of high fluoride toothpaste (PreviDent 5000), ACT dry mouth rinse, and ACT dry mouth lozenges. It is also important for this patient to drink eight glasses of water a day, avoid sugar containing beverages, and chew sugar-free gum to stimulate salivation. The patients' overall quality of life can be improved if clinicians are able to properly recognize xerostomia and recommend personalized management routines.

CC18 Diabetes and Periodontal Disease: The Need for Interprofessional Patient Care. E. ZHURAVLEV*, L. CHILMAN, R.H. RACKLEY (Indiana University School of Dentistry)

Objective: The objective of this clinical case presentation is to emphasize the importance of an interprofessional approach to health care. Specifically, this case will emphasize the importance of managing diabetes in a periodontal patient. Background: A 69 year old patient presented with the chief complaint of, "I want my teeth cleaned." The medical history revealed several medications and conditions that could potentially impact the oral cavity. The patient presented with type II diabetes mellitus, which became uncontrolled during the treatment; was taking a calcium channel blocker to control his high blood pressure, and was using a bi-pap machine for his sleep apnea. The patient also was obese and gave a history of bariatric surgery, GERD, and recent back pain. Assessment: The initial clinical examination of this patient revealed generalized mild bone loss as evidenced by 3-4mm from the CEJ radiographically (generalized moderate plaque induced gingivitis with dark pink spongy tissue with bulbous papilla that did not adhere tightly to the tooth with bleeding) and generalized mild chronic periodontitis as evidenced by 4-5mm CAL and 6mm CAL associated with swollen gingiva. Localized severe periodontitis of 8mm CAL on tooth number 19 was present. Dental Hygiene Treatment Plan: Scaling and root planing was performed for selective areas along with a periodontal tissue re-evaluation. Treatment: The treatment was performed throughout three separate appointments. At the beginning of treatment the patient's A1C was 8.5% and his blood glucose was 195 mg/dl. Results: The re-evaluation appointment revealed slight improvement in the health of the gingiva, but minimal to no improvement in probing depths. Conclusion: This case highlights the need for an interprofessional approach to patient care. Problems with diabetes management, as well as other contributing factors, have been known to impact periodontal therapy outcomes.

CC19 Maintaining Oral Health with Parkinson's disease and Arthritis. L. JONES*, C. MINETT, P. RETTIG (Indiana University School of Dentistry)

Objective: The objective of this case presentation is to discuss the modifications of dental care for a patient with Parkinson's disease. Background: A 72 year old Caucasian male presented to the dental hygiene clinic for a periodontal maintenance appointment. Significant findings in the medical history include current treatment of Parkinson's disease, arthritis in the hands and feet, and medications Omeprazole, Fluoxetine, Gemfibrozil, Gabapentin, Levodopa, and Clonazepam. Assessment: Patient presents with generalized moderate plaque induced gingivitis evidenced by reddish-pink gingiva, 60% BOP, bulbous, spongy papillae. Clinically the patient presented with generalized 4-8mm clinical attachment levels. Radiographically, the patient presented with generalized mild to moderate bone loss evidenced by 3-5mm from the CEJ. The primary contributing factor to the gingival inflammation was the plaque score of 97%. The patient struggles with oral hygiene due to his Parkinson's disease and arthritis in hands. DH Care Plan: patient received full mouth debridement, instruction on a modified floss holder with clay, product recommendations of xylitol gum and toothpaste to reduce xerostomia. Results: Oral health indicators from previous appointments showed minimal or no improvements due to the patient's

medical condition. Conclusions: Since last recall a few sites had improved including probing depths by 1-2mm. Patient was referred to a comprehensive care clinic for extraction of tooth number four, and an implant is treatment planned for replacement. It is recommended that the patient continue on 3 month intervals to monitor his oral health status and identify dental disease early

CC20 Effectively Communicating and Educating Anti-Fluoride Patients. A. MELCHER*, C. HEATH, P. RETTIG (Indiana University School of Dentistry)

Objective: To educate the dental professional on how to effectively communicate and convey the beneficial effects of fluoride when the patient is opposed to the topical use of fluoride. Assessment: A 64 year old Caucasian female patient presents for a periodontal maintenance recall and exam with certainty that fluoride is a topical and systemically harmful substance. She has denied fluoride treatment since her initial screening in 2009 and only uses dental products that are fluoride free. She states she brushes twice a day and flosses daily. Clinical examination revealed generalized periodontitis with generalized gingival recession and exposed roots. The intraoral radiographs revealed generalized mild bone loss and localized moderate bone loss. Caries Risk: Moderate due to generalized exposed roots and frequent fermentable carbohydrate exposures. The assessment indicates the recommendation for professionally applied fluoride. Approaches: Distinguish between systemic and topical uses of fluoride. Convey the evidence based findings regarding the effectiveness of fluoride modality in preventing and controlling dental caries. Evaluation: Patient will return for periodontal maintenance recall appointment in March and will provide evidenced based research articles of the disclaimers on fluoride consumption. Conclusion: The theory that fluoride is harmful is becoming more prevalent. Therefore, it is important that dental professionals are knowledgeable on the scientific facts about the beneficial aspects of fluoride and the adverse claims to counter them for preventative care.

CC21 Modification of Dental Hygiene Care in a Breast Cancer Patient. E. STANTON*, S. GUDGEL, P. RETTIG (Indiana University School of Dentistry)

Objective: The objective of this clinical case presentation is to evaluate the treatment of a patient undergoing chemotherapy for breast cancer and identify necessary modifications throughout the dental hygiene appointment. Background Information: A 72-year old, Caucasian female patient presented to the dental hygiene clinic with the chief complaint of "I want to get my teeth cleaned." The patient also reported symptoms of xerostomia and burning sensation of the gingiva. The patient receives regular periodontal maintenance care every three months at a private practice. The medical history revealed breast cancer, hypertension and history of myocardial infarction. The patient's breast cancer is currently being treated with chemotherapy and radiation. Clinical Examination: The patient presented clinically with generalized mild plaque-induced marginal papillary gingivitis as evidenced by red, rolled, spongy gingiva with bleeding on probing and generalized moderate chronic periodontitis as evidenced by 4-5mm clinical attachment levels. Radiographically, the patient presented with localized mild horizontal bone loss as evidenced by 3-4mm measured from the cemento-enamel junction to the crest of the alveolar bone around teeth numbers 4 (distal), 15 (mesial), 19, 27, 29 and 31. Oral hygiene habits consist of patient brushing at least once per day, but seldom flossing or using mouthwash. The patient is at high risk for dental caries due to active decay, medication-induced xerostomia and inadequate home care. DH Care Plan: Periodontal maintenance with extensive oral hygiene instructions were performed. Toothpaste and mouth rinse for dry mouth were recommended at the initial appointment. Evaluation: This patient will return for periodontal maintenance in March 2015. At that time oral hygiene and caries risk will be evaluated. Conclusion: In this case report, the complaints of a patient with a history of breast cancer, xerostomia, and burning of the gingiva were addressed.

CC22 The Effects of Poor Dental Knowledge on Oral Health. M. HELWIG*, K. ISON, P. RETTIG
(Indiana University School of Dentistry)

Objective: The objective of this clinical case report is to evaluate the effects of low dental knowledge and low socioeconomic status on the oral health of an individual. Background: A 32 year old Hispanic male presented to the dental hygiene clinic as a new patient with a negative medical history with the exception of untreated hypertension diagnosed at his last physical examination 5 years earlier. Patient reported smoking 2 to 3 cigarettes per day. Patient had received a prophylaxis 5 years ago in Mexico at a free clinic, but he has never been able to receive regular dental care due to his low socioeconomic status. Patient had limited oral health education prior to his visit to the dental hygiene clinic. Assessment: Patient presented with generalized moderate to severe plaque induced marginal gingivitis as evidenced by red, spongy, rolled gingiva, and a bleeding score of 74%. The periodontal description revealed generalized mild chronic periodontitis as evidenced by 4-5mm CAL and localized moderate chronic periodontitis as evidenced by 6-7mm CAL on #1, #4, #5, #11, #13, #14, and #18. Patient also presented with generalized mild horizontal bone loss on radiographs as evidenced by 2.6mm to 3.5mm measurements from crest of alveolar bone to the CEJ. The patient's plaque score ranged from 18% to 26% and generalized moderate to heavy supragingival and subgingival calculus was detected. Active decay was found on #2, #16, #17, #28, and #30. Dental Hygiene Care Plan: Patient received scaling and root planing in all four quadrants, a tissue re-evaluation and extensive oral hygiene instruction. Results: At the tissue re-evaluation, the patient's gingival health and probing depths were improved. Conclusion: The patient's positive response to treatment is the result of the thorough scaling and root planning therapy, extensive patient education, and patient compliance.

CC23 Non-Surgical Periodontal Therapy on a Patient with Uncontrolled Diabetes. S. BORDEN*, J. BROCK, H. TAYLOR (Indiana University School of Dentistry)

It is well understood that patients with uncontrolled diabetes have a higher risk of developing periodontal disease. Those with diabetic complications have increased chances of obtaining infections. Since the etiology of periodontal disease has bacterial origins, those with uncontrolled diabetes are at an increased risk for infections within the oral cavity. The objective of this case study was to evaluate the effects of non-surgical periodontal therapy on a patient with uncontrolled Type II Diabetes Mellitus. The patient's medical history, dental findings, and gingival observations are explained in this case study. Four quadrants of scaling and root planning, with extensive oral hygiene instructions, and periodontal tissue re-evaluation were completed on this patient. Additionally, post-treatment findings are compared with the patient's initial presentation of systemic and oral disease. Conclusion: This case study patient had substantial clinical improvements in overall gingival health and the periodontal status of the patient was stabilized following a dental hygiene care plan consisting of non-surgical periodontal therapy.

ENDODONTICS

CC24 Caries Presentation in Illicit Drug Users and Excessive Soft Drink Consumers. E.D. PARKER*, Y. EHRLICH, J. BRINGAS, N. WARNER (Indiana University School of Dentistry)

Advanced cervical caries in anterior teeth is common to two different patient behaviors. Rampant cervical caries ("meth mouth") is a common presentation in drug users. Extensive consumption of soft drinks also presents a similar pattern of cervical caries. Two cases are presented and dental treatment considerations are discussed. Case One: excessive soft drink consumption. A young male presented to IUSD for evaluation and treatment of a painful #9. Clinical exam: #9 had extensive facial and cervical caries with a pulp exposure. Cervical caries on teeth #6, 7,8,10,11,12,13. Patient's history revealed frequent daily consumption of multiple sweet soft drinks. #9 had become increasingly painful and that

caused him to seek treatment. Pulpal and Percussion/Palpation testing and radiographic exam of #9 were conducted. Diagnosis: #9 Pulpal Necrosis with Symptomatic Apical Periodontitis. Treatment: Oral hygiene instruction to reduce the frequency of soft drink consumption. #9 was endodontically treated and restored. Caries in #6, 7,8,10,11,12,13 were treated and teeth restored. Case Two: cocaine abuse. A young female presented to IUSD for evaluation and treatment of a painful #9. Clinical exam: #9 had extensive cervical caries. Cervical caries on #7, 8, 9 and dental attrition. Patient reports having used cocaine for many years. Pulpal and Percussion/Palpation testing and radiographic exam of #9 were conducted. Diagnosis: #9 Pulpal Necrosis with Symptomatic Apical Periodontitis. Treatment considerations: Local anesthesia was achieved without the use of epinephrine due to possible occasional unreported use of cocaine. #9 was endodontically treated and restored. Patient did not return for continued treatment at IUSD. Conclusion: Cervical caries in anterior teeth associated with soft drinks demonstrate similar characteristics to those observed in patients with reported cocaine abuse. This should alert dental providers dentists to be aware of both illicit drug use and soft drink intake as part of the patient's medical, dental, and social history information.

CC25 Central Giant Cell Granuloma: Endodontic Considerations. A. MARU*, M. DATEWYELER, Y. EHRLICH, A. GHONEIMA, K.J. SPOLNIK (Indiana University School of Dentistry)

Central Giant Cell Granuloma (CGCG) is a non-neoplastic bony lesion of the jaws with unknown etiology. When the lesion encompasses the apices of teeth, surgical treatment may result in devitalization of these teeth. This report describes a case in which the mandibular anterior teeth involved were devitalized secondary to the surgical treatment. Case Report: A 54 year old female was diagnosed with a CGCG lesion in the mandibular anterior region. The patient was seen in oral surgery for a surgical treatment of the lesion. Prior to surgery, all teeth from #22-27 except #25 tested positive to pulp vitality tests. One month after surgery, the patient presented to the graduate endodontic clinic regarding a swelling in the mandibular anterior region. Pulp vitality testing results concluded that #23-27 were non-vital. Clinical exam revealed the patient had a small swelling present in the buccal mucosa near #23/24 and #27. CBCT scan reveals a significant amount cancellous bone and buccal cortical plate from the distal #27 to mesial #22 has been resorbed, leaving some of the lingual plate intact. Diagnosis: Pulp necrosis with acute apical abscess #23, 24, 25, 26, 27. Treatment: Root canal treatment (RCT) was initiated on #23 at the first appointment. Tooth #23 was medicated with CaOH for 2 weeks. The swelling near #23/24 and #27 was drained and fluid was aspirated using the 23-gauge needle. Peridex gauze hemostasis was obtained. At the second appointment, the patient was asymptomatic and RCT was completed on #23. RCT was initiated on #27 and medicated with CaOH. Since the patient was asymptomatic at the third appointment, RCT #27 was completed. RCT #25 and #26 was initiated and medicated with CaOH. Conclusion: Surgical treatment of CGCG can result in the devitalization of teeth involved. Endodontic intervention prior to surgery should be considered.

CC26 Decoronation of an Ankylotic Tooth: A Case Report. S. HILL*, K.J. SPOLNIK, Y. EHRLICH (Indiana University School of Dentistry)

In luxation/avulsion injuries tooth ankylosis and root replacement resorption can occur. Extraction of such a tooth may lead to loss of large parts of the alveolar ridge. Removal of the crown of an ankylosed tooth and treating the retained root to allow its resorption is termed decoronation. It can permit normal bone growth and development. This report describes the decoronation of an ankylosed #10 with replacement resorption. Case Report: A 12 year old female suffered multiple avulsed/luxated teeth after being kicked in the face by a horse in 2012. At the graduate endodontic clinic at IUSD in 2012 #10 was endodontically treated. In 2014 the patient was undergoing orthodontic treatment. Due to the lack of tooth movement the patient was referred back to the Graduate Endodontic Department. Tooth # 10 was ankylosed and root

replacement resorption was noted. Periapical intraoral radiograph revealed extensive replacement resorption of #10 in the middle third of the root. Diagnosis: #10 previously treated with normal apical tissues and root replacement resorption. Treatment: Anesthesia obtained (articaine 4% w/epinephrine 1:100k). The crown of the tooth was removed with a diamond bur. Gutta percha was removed with rotary and hand instruments. Canal enlarged and bleeding was induced within the canal. An envelope flap was reflected. The coronal tooth structure was removed to a level of 2mm below the crest of the ridge. Bone graft was placed within the canal and on the crest of the ridge. Calcium Sulfate was used as a barrier and the soft tissues were sutured into place with interrupted sutures. Six month post-operative examination revealed that an adequate crestal bone level was maintained and the ridge width was not compromised. Conclusion: Decoronation is an acceptable treatment for ankylosed teeth exhibiting replacement resorption in young patients. Ridge bone height and width can be maintained.

CC27 3D Imaging and Endodontic Management of Radix Entomolaris. J.B. ADAMS*, G.X. ZHOU, Y. EHRLICH, K.J. SPOLNIK (Indiana University School of Dentistry)

Objective: Radix Entomolaris (RE) is a rare morphological alteration in mandibular molars. Cone Beam Computed Tomography (CBCT) is used for the 3D imaging of teeth. This report presents the use of 3D imaging in the endodontic management of an infected Radix Entomolaris. Case Report: A 41-year-old Caucasian female presented in pain to graduate endodontics for emergency evaluation of #19. The patient reported a history of deep filling and crown placed 1 month ago, with pain starting a few days ago. A limited oral evaluation was performed. Periapical intraoral radiograph revealed a second distal root on tooth #19. Calcifications are present in the pulp chamber and canals. CBCT revealed the location and degree of curvature of the RE. Diagnosis: Pulpal: Symptomatic Irreversible Pulpitis. Apical: Symptomatic Apical Periodontitis. Treatment: First appointment: Anesthesia obtained (lidocaine 2% w/ epinephrine 1:100k) via a mandibular block, buccal infiltration and intraosseous injections. Access achieved through Porcelain fused to metal (PFM) crown. Apical patency was achieved with hand files in all four canals, verified using electron apex locator. The root canal system was disinfected via irrigation and by mechanical debridement. All canals were shaped to a 25.04 size at initial visit. On the second appointment, the interim restoration was removed. The master apical file sizes were 35.04 for mesial canals and 40.04 for the distal canal. Due to the extreme curvature of RE, this canal was taken to 30.04. The canals were obturated with gutta percha and Roth's sealer. Six month post-operative radiograph reveals permanently restored tooth #19 in full function. Conclusion: Endodontic treatment of RE is challenging. CBCT was utilized to confirm location of RE, degree of curvature and approximate length.

PERIODONTICS

CC28 Histomorphological Comparison of Platelet Rich Fibrin Combinations for Ridge Preservation. Y. HAMADA*, V. JOHN, S. BLANCHARD (Indiana University School of Dentistry)

Background: Most commonly used techniques to preserve ridge dimensions following tooth extraction involve bone substitutes and membranes to cover the graft. The use of autologous Platelet Rich Fibrin (PRF) is a recent introduction to be used as a membrane as well as mixed with the graft material. PRF is an inexpensive autologous gel enriched with platelets from venous blood that is easily processed in a clinical setting and contains growth factors including PDGF, TGF- β , VEGF, EGF and IGF1. The aim of this case report is to compare the histomorphologic results of various combinations of PRF, freeze dried bone allograft (FDBA) and polylactic acid membranes (Guidor) in extraction sockets in a single patient. Material and Methods: A 49-year old female patient with a 12 pack-year smoking history presented for extraction of maxillary teeth for an implant retained complete denture. On the day of surgery, 40ml of

venous blood was drawn and centrifuged to produce four PRF gels. Two PRF gels were minced and mixed with FDBA. Two clots were processed to be used as membranes to cover the sockets. Teeth #s 4, 6, 11, and 13 were extracted with minimal trauma and sockets were thoroughly debrided. Varying combination of FDBA, PRF, and Guidor membranes were used for ridge preservation grafting in the four sockets. Four and half months following extraction, trephine cores were taken at the time of implant placement and submitted for histological analysis. Results: Clinical healing was uneventful at all sockets but soft tissue healing appeared slightly rapid on sites covered with PRF membranes. However, histologic healing showed more vital bone formation around residual graft materials with Guidor membranes sites. Conclusions: Within the limits of this case report, although PRF membranes seemed to slightly enhance soft tissue healing, the use of Guidor membranes appeared to improve bone remodeling.

PROSTHODONTICS

CC29 Fabricating Tooth Supported Overdenture Using Locators® as a Method of Retention: Case Report. Y. ALZAYER* and J. LEVON (Indiana University School of Dentistry)

Tooth supported complete overdentures have been a treatment option for decades and they provide the patient with proprioception (the awareness of jaw-space relationships) which is normally lost when teeth are extracted. In addition, the overdenture provides the patient with improved biting force and neuromuscular control. The objective of this case presentation is to discuss a technique used to fabricate complete tooth supported overdenture. Assessments: 80 year old African American female presented to Graduate Prosthodontic Clinic at IUPUI complaining of difficulty in chewing food due to her partially edentulous mandible. Her medical history revealed a history of hypothyroidism, osteoarthritis, rheumatoid arthritis and hypertension. In 2013 root canal treatments were done to #22, 27 with post space preparations. Intraoral examination revealed a resorbed mandibular residual ridge. The prosthodontic treatment plan was to retain these two teeth and attach Locators® to them to improve the retention of the denture. Impression was made of both post spaces and posts were waxed up on the master cast. Cast-to-Locator® attachments were incorporated in the wax ups, which were invested and cast in Type III Gold Alloy. The final posts with Cast-to-Locator® attachments were cemented with resin cement. Finally, the mandibular complete overdenture was adjusted and delivered to the patient. Evaluation: the Locator® attachments were stable in the gold posts without any neither periapical pathology nor gingival inflammation. In addition, the patient was able to properly clean the remaining root and the internal surface of the denture. In conclusion: This technique resulted in a very satisfying and retentive denture for the patient while utilizing minimum invasive procedures.

CC30 A Review of Different Techniques of Designing and Fabricating of Auricular Prosthesis: Case report. N. AL-QAHTANI*, T. BELLICCHI, S. CHO, J. ROGERS, A. GHONEIMA, N. ALDERSON, J. LEVON (Indiana University School of Dentistry)

Maxillofacial defects can cause facial disfigurements resulting from congenital abnormalities, surgical resection of tumors, trauma, or a combination of these. Auricular prosthesis is an alternative option, when esthetic and functional demands cannot be surgically fulfilled. The purpose of this report was to discuss facial prosthetic workflow and fabrication by using available techniques. In this clinical case report, we discuss three different possible ways to fabricate auricular prostheses for a 70 years old patient, whose ear was resected due to a basal cell carcinoma, via three methods: traditional, digital, and combination of both. Methods and materials: PVS impression (GC America; Alsip, IL, Factor II; Lakeside, AZ), prosthetic wax (FactorII; Lakeside, AZ) for wax pattern ear prosthetic digital facial scanning (3dMD; Atlanta, GA), computed tomography for soft tissue digital modeling, digital design software (GeoMagic Design X; Cary, NC) to merge scanning and CT data, and 3-dimensional printing (Whip Mix Corp., Louisville, KY). Digital

technologies can improve prosthetic design, fabrication position, and esthetic. In addition, time and comforts factors for the patient and the specialists are more appreciated by using these technologies. In this case, a fully digital method utilizing 3dMD facial scanning data, contralateral ear digital mirroring and positioning design, 3-dimensional printed surgical guides and printed mold are highly promising and recommended to obtain high quality of work and less time consuming.

CC31 Mandibulectomy Prosthetic Case Report: Facial Scanning, Digital Design, 3-Dimensional Printing. T. BELLICCHI*, N. AL-QAHTANI, S. CHO, J. ROGERS, A. GHONEIMA, N. ALDERSON, J. LEVON (Indiana University School of Dentistry)

Maxillofacial silicone elastomer prostheses are used to replace facial features surgically removed due to disease or lost due to trauma. Traditional prosthetic fabrication (impression, intuitive wax-up, and silicone processing) can be streamlined using digital scanning, computer-assisted design and manufacturing, reducing cost, saving time, and improving prosthetic predictability. In addition, digital technology can eliminate the arduous impression process and reduce required office visits for patients. Current digital design software and 3-dimensional printing hardware is complex and expensive. This limits the viability and practicality of a fully digital workflow. Combining both traditional and digital techniques (hybrid process) overcomes limitations in digital design, improves patient experience, and provides more predictable outcomes. The purpose of this study was to improve traditional facial prosthetic workflow and fabrication using facial scanning and 3-dimensional prosthetic design and printing technology. In this clinical case report, we present multiple facial prostheses for a mandibulectomy patient via three methods: traditional, digital, and hybrid of both. Methods and materials included PVS impression (GC America; Alsip, IL), prosthetic wax (Factor2; Lakeside, AZ) and oil-based clay (NSP by Chavant; Farmingdale, NJ) for prosthetic mock-ups, digital facial scanning (3dMD; Atlanta, GA), computed tomography for soft tissue digital modeling (IU Health affiliate hospital; manufacturer unknown), digital design software (GeoMagic Design X; Cary, NC) to merge scanning and CT data, and 3-dimensional printing (Whip Mix Corp., Louisville, KY). We identified areas of improvement for traditional maxillofacial prosthetics using digital scanning and 3-dimensional printing technology. A hybrid method combining traditional impression, prosthetic mock-up, digital scanning / design, and 3-dimensional printing is recommended to overcome limitations in CT soft tissue data, facial scanning, and digital design software, as well as improve patient experience and provide more predictable prosthetic outcomes.

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Index to Primary Presenters and Mentors

Boldface names and numbers indicate primary presenters, posters (P) and clinical cases (CC).

ABOGAZALAH, N., CC3
ADAMS, J., CC27
AHMAD, M., P33
AL-ANGARI, S.S., P14
ALBRECHT, L.L., P19
ALBUQUERQUE, M.T., P12
AL DEHAILAN, L., P3
ALGARNI, A., P15
ALGHILAN, M.A., P4
AL-QAHTANI, N., CC30
AL-QAWASMI, R., P30
ALQUDAIHI, F., CC1
ALSHEHRI, E., P9
AL-ZAIN, A., P10
ALZAYER, Y., CC29
AMES, R., CC10
AYOUB, H., P46
BAILEY, S., CC9
BALASUNDARAM, A., P32
BALLENGER, B., P5
BELLICCHI, T., CC31
BENNETT, Z., P17
BLANCHARD, J., CC6
BLANCHARD, S., CC28
BOJI, B., P30
BORDEN, S., CC23
BOTTINO, M.C., P6, P7, P8, P9, P12, P13
BOZIC, Z., P35
BRASSARD, N., P26
BRIDGES, H., CC14
BROCK, E., CC16
BRUZZANITI, A., P46, P47, P48, P49
CHRZAN, M., CC17
CHU, T.G., P5, P45
COBB, M., CC7
COOK, N.B., CC1, CC2, CC3
CREED, C., CC6
CZECHURA, T., P42
DAETWYLER, M., P16
DEMUTH, D., P24
DUKKA, H., P39
EHRlich, Y., P16, CC24, CC25, CC26, CC27
EVANS, J., P13
FERBINTEANU, N., P28
GALLI, D.M., P23
GHONEIMA, A., P26, P28, P29, P31, P34
GOMEZ, G.F., P20
GREGORY, R.L., P15, P17, P18, P19, P20, P21, P22, P25
HAMADA, Y., CC28
HAN, S., P32
HARA, A.T., P4
HARVEY, S., P50
HELWIG, M., CC22
HILL, S., CC26
HOYT, P., P2
IBRAHIM, R., P33
JOHN, V., P39
JONES, L., CC19
KALIA, P., P24
KINNEY, H., CC8
KO, S., P49
KOWOLIK, J.E., P11, P35, P36
KRISTOFF, S., P21
KULA, K., P27
LEMINH, C., P18
LEVON, J., CC4, CC29, CC30, CC31
LIPPERT, F., P3
LOTFI, V., P31
LUCAS, J., CC15
MARU, A., CC25
MAUPOME, G., P41, P40
MAXWELL, L., CC5, CC12, CC15, CC17
MCCORMICK, J., P36
MELCHER, A., CC20
METZ, M., P1, P42
MILLER, M., CC5
MILLER, N., CC12
MNAYARJI, J., P29
MOHAMED, M., P44
MUMMERT, L., P37
MUNCHOW, E., P7
NICHOLSON, E., P40
OSTER, M., P45
PALASUK, J., P8
PARKER, E.D., CC24
PATEL, V., P48
PLATT, J.A., P10, P14
POSRITONG, S., P47
QUINT, N., P22
RACKLEY, R.H., CC13, CC18
REECE, C., P1
RETTIG, P., CC7, CC10, CC19, CC20, CC21, CC22
ROMITO, L.M., P50
ROUSE, M., CC2
ROSE, J.K.A., P34
RYAN, S.J., P6
SADDLER, S., P43
SCULLY, A., P11
SILCOX, D., CC13
SOTO-ROJAS, A., P2
SRINIVASAN, M., P43, P44
STANTON, E., CC21
SUPORNPUN, N., CC4
TAYLOR, H., CC9, CC11, CC14, CC16, CC23
THYVALIKAKATH, T., P38
TRAORE, K., CC11
VANWANZEELE, C., P38
VAUGHN, M., P25
WAGENKNECHT, D.R., P23
WINDSOR, L.J., P37
YOUNG, N.A., CC8
ZHURAVLEV, E., CC18

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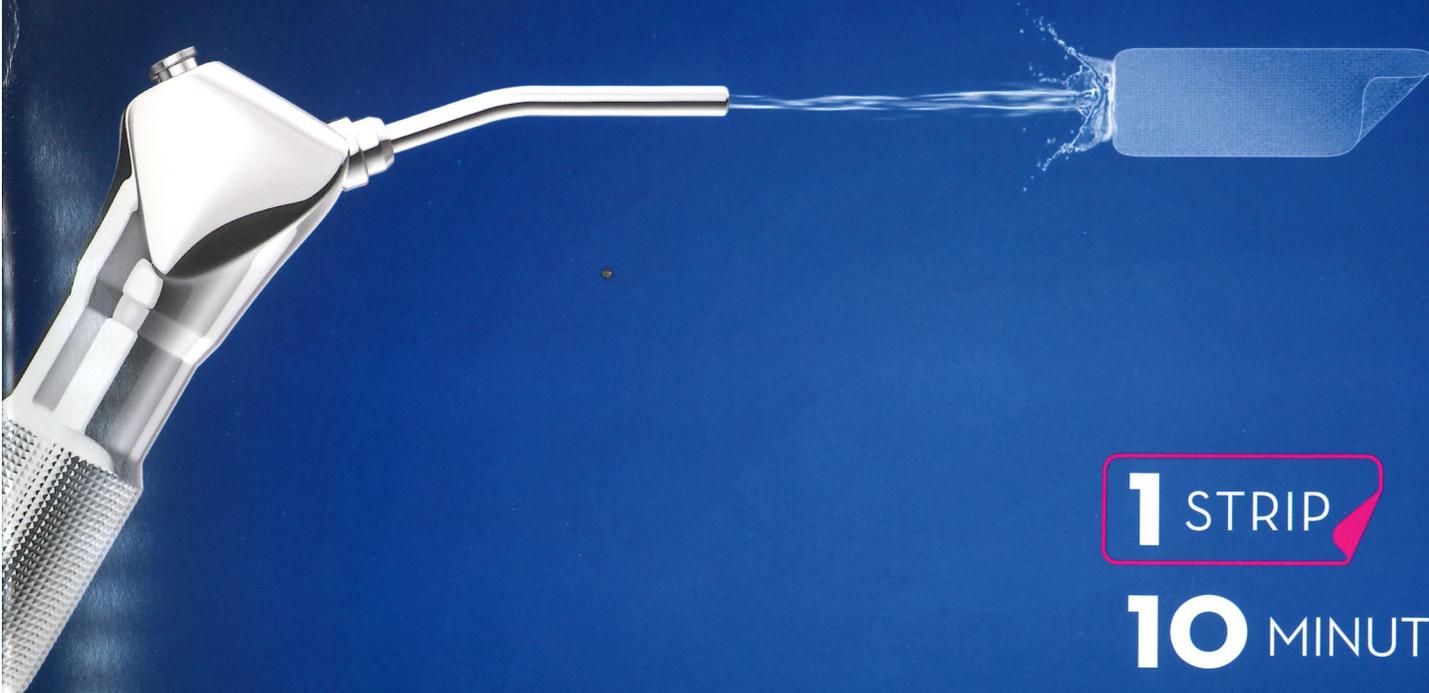
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