Bates-Andrews Research Day

WEDNESDAY, MARCH 6, 2013
PREDOCTORAL & POSTGRADUATE STUDENT POSTERS
11:00 AM – 3:00 PM
DENTAL SCHOOL – 14TH & 15TH FLOORS

KEYNOTE SPEECH:
“Preservation of the Profession”
Kathleen O’Loughlin, DMD, MPH
Executive Director and Chief Operating Officer
American Dental Association
3:30 pm in Rachel’s Amphitheater, DHS 14

Awards Presentation/Reception
4:30 pm in 15th Floor Lounge
History of Bates Day

Since the 1930’s this day is held annually to honor George A. Bates, and alumnus of Tufts University School of Dental Medicine, who taught Tufts medical and dental students. He was regarded by his students as an inspiring instructor in Histology. Bates Day at TUSDM helps to promote student research and thereby enhance the opportunities for professional growth of our students, alumni and faculty.

The Robert R. Andrews society is a student-run organization which was formed in 1921 in honor of Dr. Andrews, an outstanding researcher and distinguished dental surgeon. The Andrews Society seeks to promote dental research and to honor those who excel in it.

Message from the Dean:

Welcome to Bates-Andrews Day 2013, a showcase of our predoctoral and postgraduate students’ research activities. This year’s event promises to be the largest yet, with over 70 student poster presentations!

We are very pleased to have as our Keynote Speaker, Kathleen O’Loughlin, D81, Executive Director & COO of the American Dental Association and a member of our Board of Advisors.

Bates-Andrews Day gives our students the opportunity to share with the rest of the Tufts community their accomplishments in fields of special interest. I applaud them for their initiative and achievements.

Strengthening and increasing research activity and creating an environment that supports research are integral parts of the School’s strategic plan.

I appreciate the dedication of the faculty advisors for their mentorship. Special thanks go to the judges and the participation of the commercial exhibitors who help make this event possible. Finally, Eileen Doherty’s leadership as director of predoctoral student research is highly valued as it enhances our students’ research experiences.

Huw F. Thomas, B.D.S., M.S., Ph.D.
Dean and Professor of Pediatric Dentistry
Dear Bates Day Participants and Guests,

On behalf of the Tufts University School of Dental Medicine’s Research Committee, I welcome you to Bates-Andrews Day 2013! This annual student research day was established in 1935. It is a testament to the School’s dedication to the various research endeavors of our faculty and students.

Each year a select number of dental students are awarded research fellowships based on proposals that are submitted to the School’s Research Committee. Tufts University School of Dental Medicine, with the assistance of corporate and private sponsors, subsidizes these students to conduct a research project with a faculty mentor. The result, as you can see in the following pages, is an impressive collection of high-quality dental research.

Bates Day provides predoctoral and postdoctoral students the opportunity to present their clinical and basic science research projects in the form of table clinics and poster sessions to the entire Tufts Dental community. Funded trips to regional and national dental conferences are awarded to those presentations judged to be most exemplary.

I am delighted to welcome to this year’s keynote speaker, Dr. Kathleen T. O’Loughlin. Not only is Dr. O’Loughlin the Executive Director and Chief Operating Officer of the American Dental Association, she is also a very involved TUSDM alumna, and we are thrilled to have her giving the Keynote speech at Bates Day this year.

I would like to thank all of the students and their mentors who have worked so hard, and are sharing their accomplishments with the Tufts community today. Each individual presentation represents months of effort. I would also like to thank our commercial exhibitors, who help make the day’s events possible. Please take the time to visit their displays as a way of educating yourselves of the latest in dental technology and services.

Once again, thank you for participating in this exciting event. I hope that you enjoy the 2013 Bates-Andrews Research Day.

Sincerely,

Eileen Doherty

Director of Predoctoral Student Research
The following commercial exhibitors and contributors helped to make this year’s Bates-Andrews Day successful:

<table>
<thead>
<tr>
<th>Exhibitors</th>
<th>Contributors</th>
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<tr>
<td>3M ESPE</td>
<td>Drs. Kane, Tesini, Soporowski &amp; Associates LLP</td>
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<tr>
<td>Dr. Chad Anderson, D04</td>
<td>Living Legacy Financial Group</td>
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<tr>
<td>Benco Dental Company</td>
<td>Massachusetts Dental Society</td>
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<td>Brasseler USA</td>
<td>Dr. Kistama Naidu, D02</td>
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<td>Dentsply</td>
<td>NCDR, LLC for Kool Smiles</td>
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<td>OraPharma</td>
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<td>Door to Door Dental</td>
<td>Patterson Dental</td>
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<td>Eastern Dentists Insurance Company</td>
<td>The Procter &amp; Gamble Company</td>
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Special thanks to the following Tufts faculty and students:
Research Committee:

<table>
<thead>
<tr>
<th>Faculty</th>
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<tr>
<td>Dr. Tofool Alghanem</td>
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<td>Dr. Addy Alt-Holland</td>
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<td>Dr. Jake Chen</td>
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<td>Dr. Wai Cheung</td>
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<td>Prof. Eileen Doherty</td>
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<td>Dr. Jonathan Garlick</td>
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<td>Dr. Michael Kahn</td>
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<td>Dr. Gerard Kugel</td>
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<td>Dr. Athena Papas</td>
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<td>Dr. HP Weber</td>
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<td>Dr. Pamela Yelick</td>
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Bates-Student Research Group and Andrews Society officers:

Jeremy Plourde – President
Julianna Bair – Vice President
Shruti Pore – Secretary
Courtney Michelson – Treasurer
Schedule of Events

11:00am – 3:00pm  Predoctoral and postdoctoral student posters on display
                  14th floor hallway, 1415, 15th floor hallway, 15th floor Boardroom
Commercial Exhibitors
                  14th floor hallway, 15th floor hallway, 15th floor Alumni Lounge

3:30pm – 4:30pm  Keynote speech – Rachel’s Amphitheater, 1414

4:30pm  Award presentation and reception
         Alumni Lounge

Keynote Address

3:30pm
Rachel’s Amphitheater

“Preservation of the Profession”

Kathleen O’Loughlin, DMD, MPH
Executive Director and Chief Operating Officer
American Dental Association

Dr. Kathleen O’Loughlin is Executive Director and chief Operating Officer of the American Dental Association. Prior to joining the ADA, Kathy served as the Chief Dental Officer for United Health Group, and President and CEO of Delta Dental of MA.

Kathy practiced dentistry for over 20 years in Medford and Winchester, MA, while serving as an assistant clinical professor at Tufts University School of Dental Medicine in the Department of General Dentistry as a course director. She received her bachelor’s degree cum laude from Boston University in 1974 and her doctorate from Tufts University summa cum laude in 1981. In 1998, Dr. O’Loughlin received a master’s degree in Public Health and Health Care Management from Harvard University. She currently serves as a Trustee of Tufts University and is a member of the Executive Committee and Board of Advisors for Tufts Dental School.

Kathy is a member of several dental organizations and has received numerous awards.
Predoctoral Student Presentations:

**Ivy Ahluwalia D14**  
Extracellular Matrix Components and Mesenchymal-Epithelial Transition in Lacrimal Gland Cells

**Kian Azarnoush D15**  
Epigenetic Therapy for Experimental Periodontitis in a Mouse Model

**Julianna Bair D13**  
Shear Bond Strength of Resin Cements to Dentin and Enamel

**Grant Beyer D15**  
Assessing Surface Roughness on Composite Restorations Using Different Abrasive Methods

**Sapan Bhatt D14**  
Shore Hardness and Temperature of VPS Materials during Setting

**Elizabeth Bingham D15**  
Effects of Dab2 on Endocytic Proteins in Squamous Cell Carcinoma

**Stephanie Brue D14**  
Microabrasion Techniques for Removal of In Vitro Enamel Demineralization

**Saad Butt D15**  
Functional Characterization of alk8 in Zebrafish Mineralized Tissue Development

**Diego Camacho D13, James Koehler D13 and Kimberly Kocak D14**  
Retrospective Evaluation of Parameters Associated with Dental Implant Failures at Tufts University School of Dental Medicine

**Matthew Cannavo D14**  
Microleakage of Dental Composites

**YooJung Chang D15**  
Microtensile and Shear Bond Strength on Dentin

**Dave Cho D14**  
The Relationship between Performance on Perceptual Ability Test Section of DAT and Clinical Success in Dental School

**Lindsay Fox D15**  
Marginal/Internal Fit of e.Max Impulse™ Versus e.Max™ CAD All-Ceramic Crowns

**Nicolas Freda D13**  
Comparison of Polymerization Stress using RMGI Bond and Resin Adhesive

**Ryan George D15**  
Compressive Strength of Bulk Fill Composite Materials

**Sung Hong D14**  
The Role of Medications on the Type of Periodontitis and Caries in the Intellectually/Developmentally Disabled (I/DD) Adults Treated under General Anesthesia
Jenna Hubacz D15
Student Opinions on Pre-Clinical Instruction at TUSDM: A Survey

Rajvir Jutla D14
Site-Specific Patterns of Gene Expression in Diabetic-Foot Fibroblasts

Dohyun Kim D14
Medications and Prevalence of Caries in Intellectually/Developmentally Disabled Adults

Alice Ko D15
Phenotypic Characterization of $Tft^{156N}$ and $Tft^{152N}$ Zebrafish Mutants

Michael Kreitzer D14
Microleakage Evaluation of Bulk-Fill Layering Techniques in Class II Restorations

Hemanth Kunduru D14
Depth of Cure of Different Shades of Bulk Fill Composite

Gregory Lane D13
Social Impact of Oral Health on Psychiatric Inpatients

Jamie LaPierre D14
Mortality Data Thirty Years after Nutrition and Oral Health Study

Chase Larsen D14
Fracture Toughness of Provisional Dental Materials

John Lee D14
Retrospective Study of Oral Health Program in Zambian Children’s Home

Joon Hee Lee D14
Effect of Chlorhexidine on Dentin Bonding Strength

Judyth Grace Lee D14
Effect of Loupes on Ocular Blue Light Hazard: Direct Viewing

Jennie Leikin D15
Geriatric Patients Dental Care and Eldercare Method: A Survey

Daniel Lim D15
Evaluation of Full Mouth Extraction and Selected Risk Factors in Intellectually/Developmentally Disabled Patients Treated Under General Anesthesia

Wei Liu D14
Microleakage Evaluation of Adhesives Thickness Based on Clinical Radiologic Appearance

Andrew Luccio D13
Prevalence, Diagnosis and Treatment of Peri-Implant Mucositis and Peri-Implantitis – A Survey of US Periodontists

Claire McCarthy D15
Wdr43, a Ribosome Biogenesis Factor, Regulated Zebrafish Neural Crest Development

Natalie McClain D15
Oral Health and Body Mass Index of Intellectually/Developmentally Disabled Adults

**Kyler McEwen D14**
Dentin Shear Bond Strength of RMGI Cements

**Amanda Merikas D15**
Contact Angle and Shear Bond Strength Tests of Silane Primers

**Courtney Michelson D14**
Optimal Silk Coating Parameters for Dental Implants

**Michael Neglia D13**
Comparing Composite Wear Rates in Simulated Oral Media

**Joann O’Brien D15**
Growth Factor Secretion and In Vitro Repair Potential of Diabetic Foot Ulcer Fibroblasts

**Austin Perera D15**
Adherence of Silk Coatings to Titanium Treatments

**Jeremy Plourde D13**
Using 3D Imaging Software to Measure Marginal/Internal Fit of All-Ceramic Crowns

**Shruti Pore D14**
E-Cadherin Suppression Alters Dab2-Mediated Endocytosis in Squamous Cell Carcinoma Cells

**Kasun Rajapaksha D14**
Remineralization Efficacy of Different Concentrations of Xylitol Gum

**Errol Ramos D13**
Effect of Loupes on Ocular Blue Light Hazard: Indirect Viewing

**Jaskaren Randhawa D14**
Analyzing the Trends and Associated Management Outcomes of Oral Lesions and Medication Regimens among the HIV-Positive Patient Population at Tufts University School of Dental Medicine

**Laura Rein D13**
Community Engagement in Global Oral Health Outreach Project Development

**Sepideh Sabooree D15**
Shear Bond Strength of Self-Adhesive Resin Cement Above/Below CEJ

**Tej Shah D15**
Automated Teeth Segmentation in Bitewing Radiographs using Various Algorithms

**Leslie Slowikowski D14**
Oral Health and Diet Scores in Preschool Asian Children

**Jesse Small D15**
In Vitro Studies of a New Zirconium Alloyed Titanium for Implant Dentistry

**Erica Stutius D13**
Developmentally Disabled Adults Treated under General Anesthesia: Periodontitis and Correlates
Dane Swenson D15
Microtensile Bond Strength to Ground Enamel by Sealant Materials

Tracy Tat D15
Evaluating the Utility of Salivary Biomarkers as a Clinical Tool in Diagnosing Patients with Temporomandibular Disorder-Related Pain

Ramesh Thondapu D14
Effect of Accent on Marginal/Internal Fit of CAD/CAM All-Ceramic Crowns

Michelle Tsao D14
Microleakage of All-Ceramic Crowns across Three Classes of Luting Cements

Bianca Velayo D15
Using Pre-Clinical Dental Performance as an Indicator of Clinical Performance

Michelle Webb D14
The Reporting and Recognition by Healthcare Providers of Child Abuse and Neglect in the Latino Population: Evidence Based Study

Esther Yun D14
Comparison between One versus Two Occlusal Appliances in TMD Population

Postdoctoral Student Presentations:

Mohammed Alasqah (Periodontology)
The Influences of Implant Geometry and Surface Composition on Bone Response

Jehan AlHumaid (Pediatric Dentistry)

Ghada Ali (MS)
Prevalence of Depression Symptoms among Patients with Obstructive Sleep Apnea: A Retrospective Analysis

Farrah Beg and Diran Balekian (General Practice Residency)
Incidence of Endocarditis in Down Syndrome Patients

Sanjeet Chaudhary (Oral and Maxillofacial Surgery)
A Prospective, Randomized, Controlled Clinical Trial of Two Different Sedation Sequences for Removal of Third Molars in Adults

Irina Dragan (Periodontology)
Comparison of the Prevalence of Missing Teeth among Different US Dental Schools

Rabie El Huni (Implant Fellowship)
The Effect of Different Dental Ceramic Systems on the Wear of Human Enamel: In Vitro Study

Harneet Grewal (Pediatric Dentistry)
Force Decay of Orthodontic Elastomeric Chains – A Product Comparison Study
Jamie Holden and Marion Hernon (General Practice Residency)
Dental Abscesses in the Non-Communicative Patient

Robert Reti (Oral and Maxillofacial Surgery)
Case of Spontaneous Gingival Bleeding

Eileen Saunders (Pediatric Dentistry)
General Pediatricians’ Knowledge and Involvement of Oral Health Promotion in New England: A Survey

Hitesh Tolani (General Practice Residency)
Dental Outreach in South End Churches

Aundrea Vereen (Prosthodontics and Operative Dentistry)
Assessment of Occlusal Stability with the Assistance of Wireless Electromyographic Tools
Extracellular Matrix Components and Mesenchymal-Epithelial Transition in Lacrimal Gland Cells

Ivy P. Ahluwalia*, Elizabeth Kaminsky, Victor P. Galli, Nour Kahlil, Samantha You, Claire L. Kublin, David L. Kaplan, Addy Alt-Holland, Driss Zoukhri

Objectives: To optimize in vitro culture conditions to induce mesenchymal-epithelial transition (MET) in lacrimal gland mesenchymal stem cells (MSCs).

Methods: Cryopreserved MSCs isolated from injured lacrimal gland explants were cultured under routine conditions. Cells were seeded on either silk scaffold or tissue culture plates coated with one of the following extracellular matrix (ECM) proteins: collagen type I, laminin, or fibronectin. Cells seeded without ECM gel served as controls. Cells were harvested and either snap-frozen in Optimal Cutting Temperature compound (Tissue-tek) for immunohistochemistry (IHC) or fixed in TRIzol reagent (Invitrogen) for reverse transcription polymerase chain reaction (RT-PCR). Histological samples were sectioned at 15μm on a cryostat. Mesenchymal cell marker primers used for RT-PCR included: N-cadherin, Vimentin, and Snai1. Epithelial cell marker primers used included: E-cadherin, Cytokeratin 8, and aquaporin 5. Expression of the housekeeping gene G3PDH was used as an internal control for RT-PCR.

Results: Histological sections demonstrate that the cells attached to the silk scaffolds. The cells frequently form a multilayer on the scaffold. Cells seeded on collagen 1 and fibronectin-coated plates showed increased expression of epithelial markers. After 14 days of culture, cells grown on laminin-coated dishes showed a modest increase in epithelial gene expression over control. N-cadherin expression displayed a slight decrease suggesting cells grown on laminin may be entering MET but expression of an additional mesenchymal marker, Snai1, was increased in these same cells.

Conclusion: Cells grown on laminin showed a time-dependent increase in the expression of epithelial markers, as well as a potential loss of mesenchymal markers. Longer in vitro incubations and incorporation of growth factors may help identify optimal conditions under which these MSCs would transition to epithelial cells.

Funded by NIH R01 EY012383

Epigenetic Therapy for Experimental Periodontitis in a Mouse Model

Kian Azarnoush*, Shu Meng, Lan Zhang, Leilei Zheng, Qisheng Tu, and Jake Chen

Objectives: BRD4 (Bromodomain-containing protein 4), a member of the BET family of proteins, plays a key role in epigenetic regulation of genes controlling cell cycle progression, cancer development and inflammation. A newly discovered, cell permeable molecule named JQ1 specifically binds to and displaces BRD4 from chromatin therefore down regulating its function. This present study aims to investigate the epigenetic regulatory effects of the BRD4 inhibitor JQ1, on the induced inflammatory response and bone destruction in experimental periodontitis.

Methods: Twelve week old male C57BL/6J mice were randomly assigned into control group (n=12), periodontitis group (n=11) and therapy group (n=8). Mice in periodontitis and therapy groups received periodontal ligature around the maxillary second molars and daily oral inoculation of P. gingivalis. Mice in the therapy group were subjected to JQ1 intraperitoneal injection daily (50mg/kg), while mice in periodontitis group were injected with vehicle (5% DMSO). After 10 days, gingival tissues were collected and inflammatory cytokines were analyzed by real-time PCR. The alveolar bone loss was measured at 6 sites around the maxillary second molars.

Results: The levels of inflammatory cytokines, including pro-inflammatory IL-1beta, IL-6, IL-17, TNF-alpha, and anti-inflammatory IL-10 and TGF-beta, were significantly increased in diseased gingival tissues. JQ1 administration significantly suppressed pro-inflammatory cytokine production. The increase of RANKL and MMP-9 levels in gingival tissues with periodontitis were inhibited by JQ1 therapy. The alveolar bone loss of control, periodontitis, and therapy group was 0.12±0.04mm, 0.31±0.06mm, 0.22±0.02mm, respectively. JQ1 treatment significantly suppressed periodontal bone destruction caused by inflammatory response.
Conclusions: This present study is the first to demonstrate that BRD4 inhibition by JQ1 significantly suppresses inflammatory cytokine expression and alveolar bone destruction in experimental periodontitis. These results suggest the potential of BRD4 regulation as a novel therapeutic approach in treating clinical periodontitis in the future. This project was supported by NIH grants DE16710 and DE21464 to JC.

Shear Bond Strength of Resin Cements to Dentin and Enamel
Julianna Bair*, Sapan Bhatt, Ronald D. Perry, Gerard Kugel

Objectives: The purpose of this in vitro study was to compare different adhesive resin cements regarding the degree of bond strength to dentin and enamel.

Methods: All materials were tested according to manufacturers’ instructions: Multilink Automix (MLA, Ivoclar Vivadent), Panavia F 2.0 (PANF, Kuraray), Calibra Handmix (CAL, Denstply), RelyX Ultimate Automix (RUA, 3M ESPE) and RelyX Ultimate Clicker (RUC, 3M ESPE). RUA and RUC are available in self etch (SE) and total etch modes (TE).

140 stainless steel cylinders with 4mm diameter were sandblasted, siliclated (Rocatec™-Plus) from 10mm distance for 15 seconds, and coated with silane (3M ESPE™ Sil). 140 bovine teeth were embedded in epoxy resin (SpeciFix) and the dentin and enamel surfaces were cut (diamond) and polished (320 grit sandpaper, wet). The metal cylinders were then cemented to each prepared surface (n=10) under pressure (20g/mm²) and according to manufacturers’ instructions. Cements were light cured (3M ESPE Elipar™ S10) according to instructions and specimens were stored 24h at 36ºC and 100% relative humidity. Shear bond strength (SBS) was tested with a universal testing machine (ZwickZ010, crosshead speed: 0.75mm/min) and results were analyzed. Statistical analysis was performed by Minitab (Fisher LSD Multiple Range Test, 95% confidence level, p-value < 0.05). Values with the same characters are statistically not different.

Results: SBS [MPa±Std Dev]

<table>
<thead>
<tr>
<th>Cement Materials</th>
<th>Dentin</th>
<th>Enamel</th>
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<tbody>
<tr>
<td>MLA</td>
<td>24.8±9.8b</td>
<td>42.5±6.4c</td>
</tr>
<tr>
<td>PANF</td>
<td>22.7±5.0bc</td>
<td>41.5±7.1c</td>
</tr>
<tr>
<td>CAL</td>
<td>17.3±9.7c</td>
<td>48.5±6.0b</td>
</tr>
<tr>
<td>RUA-SE</td>
<td>28.8±7.6b</td>
<td>45.1±5.4b,c</td>
</tr>
<tr>
<td>RUA-TE</td>
<td>40.8±4.1a</td>
<td>61.1±4.6a</td>
</tr>
<tr>
<td>RUC-SE</td>
<td>25.2±7.1b</td>
<td>43.6±4.3b,c</td>
</tr>
<tr>
<td>RUC-TE</td>
<td>38.1±5.4a</td>
<td>65.0±5.8a</td>
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</table>

Conclusion:
The adhesive resin cements RUA and RUC in total etch modes showed highest bond strength for both dentin and enamel. CAL showed relatively low bond strength to dentin. Higher bond strength may indicate better clinical performance.
Sponsored in part by 3M ESPE.

Assessing Surface Roughness on Composite Restorations Using Different Abrasive Products
Grant Beyer*1, Matthew Finkelman1, Masly Harsono1, James Vlahakis2, Gerard Kugel1, Ronald Perry1 (1Tufts University School of Dental Medicine, Boston, MA; 2Tufts University School of Engineering, Medford, MA)

Objectives: To evaluate the effect of different abrasive discs products on surface roughness of composite restorations.

Methods: Four groups of ten samples of composite discs were prepared in this study. The samples were made using a teflon mold 7.5 mm diameter by 2 mm thick. The mold was placed on top of mylar strip resting on a glass slide. After the mold had been filled with composite (Filtrek supreme Ultra, 3M ESPE) and packed with spatula,
another mylar strip was placed on top of the composite and a second glass slide was pressed on top. Samples were cured using a LED light (DEMI, Kerr) for 40 seconds. After being polymerized for 24 hours, all composite discs were polished down with Sof-Lex Medium grit (3M ESPE) to remove the surface glaze created from the mylar strip and to have a uniformly rough surface (Ra=0.3+0.05). Samples were then randomly divided into 4 groups and polished down with finishing and polishing discs for 60 second intervals. Slow speed contra angle handpiece with 18,000 rpm was used to polish all the samples. The Surface roughness measurements are then taken with a contact profilometer (Veeco Dektak 6m). A one-way ANOVA was used to test the mean roughness between groups. Statistical significance was predetermined at level p<.05.

**Results:**

<table>
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<tr>
<th>Group</th>
<th>Materials</th>
<th>Mean Ra ± SD</th>
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<tr>
<td>1</td>
<td>Sof-Lex Fine and Superfine (3M, ESPE)</td>
<td>0.08347 ± 0.021413</td>
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<td>2</td>
<td>Vortex 2 (3M, ESPE)</td>
<td>0.055845 ± 0.028003</td>
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<tr>
<td>3</td>
<td>Vortex 1 (3M, ESPE)</td>
<td>0.057873 ± 0.012608</td>
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<tr>
<td>4</td>
<td>Vortex 3 (3M, ESPE)</td>
<td>0.080196 ± 0.048293</td>
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The p value for one-way ANOVA was 0.099.

**Conclusion:** There were no significant differences within all groups in terms of mean Ra value.

Supported in part by 3M ESPE.

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**Shore Hardness and Temperature of VPS Materials during Setting**

Sapan Bhatt*, Julianna Bair, Ronald Perry, and Gerard Kugel

**Objectives:** To investigate the setting of vinylpolysiloxane (VPS) materials through shore hardness A and the temperature change during setting.

**Methods:** 4 VPS materials (3M ESPE Experimental, Kerr Take 1, Dentsply Aquasil, Heraeus Flexitime) were prepared in metal rings with a diameter of 4.25cm and height of 0.5cm. Shore hardness A was measured with a device according to ASTM D2240. Values were recorded every 15 seconds for 10 minutes, with the value at 10 minutes representing complete setting. Each VPS material showed a linear behavior between 0 and 80% final hardness. This range was used to determine the slope at which setting occurred. Mean slope value for each material (n=6) was calculated. The core temperature for each sample was observed every 15 seconds for 10 minutes (Testo110). The maximum temperature from each sample was recorded (n=6) and the mean for each material was calculated.

**Results:** One-way ANOVA tests were conducted on the rates of setting for each product and maximum temperatures (p<0.05, CI= 95%).

<table>
<thead>
<tr>
<th>VPS materials</th>
<th>Avg. Slope of Shore A Hardness</th>
<th>Avg. Max Temp (°C)</th>
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<tr>
<td>3M ESPE Experimental</td>
<td>50.3&lt;sup&gt;A&lt;/sup&gt;</td>
<td>33.1&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Take 1</td>
<td>36.8&lt;sup&gt;B&lt;/sup&gt;</td>
<td>27.7&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Aquasil</td>
<td>17.3&lt;sup&gt;C&lt;/sup&gt;</td>
<td>28.3&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Flexitime</td>
<td>19.4&lt;sup&gt;C&lt;/sup&gt;</td>
<td>25.4&lt;sup&gt;C&lt;/sup&gt;</td>
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<sup>A</sup>Materials with the same letter are not significantly different from each other.

**Conclusion:** While no strict relationship exists between setting rate and maximum temperature, 3M ESPE Experimental showed the fastest setting rate and achieved the highest temperature while Heraeus Flexitime showed the slowest setting rate and lowest maximum temperature. The data suggests that temperature is only one of several factors that affect setting rate.

Supported in part by 3M ESPE.

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**Effects of Dab2 on Endocytic Proteins in Squamous Cell Carcinoma**
Elizabeth Bingham*, Shruti Pore, Anna G. Maione, Jonathan Garlick, James Baleja and Addy Alt-Holland

**Objective:** Loss of the tumor suppressor E-cadherin is a hallmark of the advanced stages of squamous cell carcinoma (SCC). Nevertheless, how loss of cell-cell contacts promotes cell invasion in the onset of SCC is only partially understood. Disabled-2 (Dab2) is a highly expressed adaptor protein that is involved in endocytosis of surface proteins, such as beta1 integrins. We recently found that E-cadherin loss is associated with Dab2 down-regulation and beta1 integrins up-regulation in SCC cells. Here we studied the correlation between E-cadherin and the expression of key endocytic proteins in SCC, cells and determined the consequence of Dab2 silencing on tumor cell behavior.

**Methods:** Dab2, Eps15, Intersectin, EEA1, and Rab5 protein levels were determined in lysates of E-cadherin competent (II-4) and E-cadherin suppressed (II-4-Ecad-) skin SCC cells by western blot (WB) analysis. Cultures were transfected with si-Dab2-RNA and imaged to analyze morphological changes. Dab2 depletion was confirmed by WB analysis.

**Results:** II-4-Ecad- cells demonstrated reduced expression of Dab2, Intersectin, EEA1, and Rab5 proteins in comparison to E-cadherin competent II-4 cells. Transfection of both cell types with si-Dab2 resulted in effective reduction of Dab2, Eps15 and Rab5 in II-4-Ecad- cells, while it caused an opposing increase of Eps15 in II-4 cells. Moreover, Dab2 depletion had a dramatic effect on E-cadherin competent II-4 cells; it reverted the phenotype of well-organized colonies and led to cell separation from each other -- a characteristic of E-cadherin suppressed II-4-Ecad- cell morphology.

**Conclusions:** Our study revealed that Dab2 plays a key role in the behavior of skin SCC cells, and that its expression correlates with E-cadherin levels. These findings imply that Dab2 may be a potential biomarker for other epithelial SCC, such as oral cancer, and may represent a novel target for SCC therapy.

“Tufts Collaborates!” grant awarded to Drs. Alt-Holland and Baleja funded this study.

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**Microabrasion Techniques for Removal on In Vitro Enamel Demineralization**

Stephanie Brue*, Matthew Finkelman, Masly Harsono, Gerard Kugel

**Objective:** This study serves to observe technique variations on depths of enamel removal in normal and early demineralization of enamel (white spots).

**Methods:** Intact non-carious anterior and premolar human teeth were obtained for this study. Teeth were sectioned into approximately 4mm x 4mm squares and embedded in resin. Samples were polished using 600-grit SiC paper to obtain a flattened enamel surface (Ecomet, Buehler). Samples were randomly assigned to two groups (n=24): normal (NE) and demineralized enamel (DE). The DE group was immersed in a demineralizing solution (2.2mM CaCl2, 2.2mM KH2PO4, 0.05M acetic acid, pH 4.4) for 96 hours at 37°C to create the artificial demineralized lesion. Each group was randomly divided into three subgroups (n=8) and treated with microabrasion material (Opalustre, Ultradent) with variation of techniques: using rubber cup with heavy pressure (HP), light pressure (LP) and cotton swab with heavy pressure (CS). Pressure was recorded using a digital scale. All samples were abraded for 60 seconds. The abraded samples were covered with resin and sectioned longitudinally (Isomet, Buehler). The removal depths were measured under stereo microscope (Olympus SZX16) with analysis software (Omninet9.0, Buehler). In addition, microscopic surface geometry of each group was captured using elastomeric sensor (GelSight). Statistical analysis was done using One-way ANOVA. Statistical difference was predetermined at P<.05.

**Results:**

<table>
<thead>
<tr>
<th></th>
<th>Normal Enamel</th>
<th>Demineralized Enamel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heavy Pressure</td>
<td>Light Pressure</td>
</tr>
<tr>
<td>Average</td>
<td>65.34±15.87</td>
<td>71.29±5.27</td>
</tr>
</tbody>
</table>

---

"Tufs Collaborates!" grant awarded to Drs. Alt-Holland and Baleja funded this study.
Conclusion: There was no statistically significant difference in using various techniques on normal enamel. However, HP and LP groups yielded statistically significant differences in removal depth of demineralized enamel when compared with CS group. When referencing these techniques on the amount of enamel removal, a more efficient microabrasion procedure can be clinically accomplished.

Functional Characterization of alk8 in Zebrafish Mineralized Tissue Development
Saad Butt*, Peter Kovach, Pamela Yelick

Objective: Alk8 is an important bone morphogenetic protein (BMP) receptor that is analogous to alk2 in mammals. It has been shown to play a significant role in early dorsal-ventral patterning of zebrafish embryos and to be active in calcified tissues (tooth and bone) later in development. We wished to determine more specifically its function in calcified tissue development, after the completion of early embryological development.

Methods: To perform functional characterizations of alk8 in bone and tooth development, we created heat-shock inducible, mCherry tagged constitutively active (CA), dominant negative (DN), and wild type (WT) alk8 transgenic zebrafish lines. Three transgenic zebrafish groups were heat-shocked for 2 hours a day, 3 days a week. Two groups, named LTE-5(1) and LTE-6(1), were heat-shocked for 1 month before being immediately euthanized. The other, LTE-3(3), was heat-shocked for 3 months, and allowed to grow for another month before euthanization. Mineralized tissues were evaluated using Alizarin Red/Alcian Blue staining, histological and immunohistochemical analyses.

Results: A total of 11 CA-alk8-mCherry(+), 7 CA-alk8-mCherry(-), 6 DN-alk8-mCherry(+) and 6 DN-alk8-mCherry(-) fish were analyzed. We found that CA-alk8-mCherry(+) zebrafish exhibited distinct increased mineralized tissue formation as compared to CA-alk8-mCherry(-), and DN-alk8-mCherry(+) and (-) groups. In particular, we observed increased calcification of the caudal vertebrae, caudal fin vertebrae, and fusion of the caudal vertebra and hypurals.

Conclusion: Our preliminary studies indicate that alk8 plays an important role in mineralized tissue formation, and more specifically that its activation leads to increased bone formation, while inhibition of alk8 signaling resulted in reduced mineralized tissue formation. Ongoing molecular characterizations are being conducted to determine the key signaling partners participating in this process.

Acknowledgements: We wish to thank all of the Yelick Lab members for their expert technical assistance and critical scientific input. This research was supported by NIH/NIDCR R01 DE018043 (PCY).

Retrospective Evaluation of Parameters Associated with Dental Implant Failure at Tufts University School Dental Medicine
Paul Levi, Diego Camacho*, James Koehler*, Kimberly Kocak*, Eduardo Marcuschamer

Objectives: The aim of the study is to retrospectively analyze a cohort of patients who had implants placed at Tufts University School of Dental Medicine (TUSDM) during the academic years from 2004-2010 and who sustained implant failure. This study investigates failure rates as well as possible causes of implant failure. The pre-implant findings will be reviewed: radiographs, medical history and habits, past and present dental information (e.g. the history of why the natural tooth was lost), bone graft materials (bone type), previous bone distribution, bone quality, the size, design and manufacturer of the implant(s), and other parameters that will be discovered in doing the research. Ultimately, through investigation and discovery of implant failure predictors (associated parameters), present therapies can be improved for future procedures.

The aims of this study are to:
1) Calculate the failure rate of implants placed at TUSDM
2) Determine factors that affect implant failure at TUSDM
Microleakage of Dental Composites
Matthew Cannavo*, Masly Harsono, Gerard Kugel

Objective: To compare microleakage between SonicFill\textsuperscript{TM} composite system and conventional composite technique.

Methods: Forty standard Class II preparations were prepared on sound extracted human third molar teeth by the same operator. Preparations were approximately 2.0 mm in depth at the occlusal floor and 4.0 mm in depth at the gingival floor. Samples were randomly assigned into two groups (n=20). Two composite systems were tested: Filtek Supreme Ultra (3M, ESPE) and SonicFill\textsuperscript{TM} (Kerr). OptiBond FL (Kerr) was used as a bonding agent in both groups. All materials were used according to manufacturer’s instructions. Samples were cured for 40 seconds with LED lights (DEMI, Kerr) and thermocycled for 2,500 cycles between 5°C and 50°C with a dwell time of 30 seconds. Samples were immersed in a 50% ammoniacal silver nitrate solution for three hours and exposed to a photodeveloping solution for six hours. Samples were embedded into acrylic and sectioned in the mesio-distal direction (Isomet, Buehler). Microleakage was evaluated with analyzer software (Omnimet 9.0, Buehler). A penetration score was used on the Proximal (P) and Gingival (G) walls; 0=no microleakage, 1=minor microleakage, 2=half-way to the axial/pulpal wall, 3=more than half-way to axial/pulpal wall, 4=at or beyond the axial/pulpal wall. Statistical analysis was conducted using non parametric Mann-!Whitney U Test. Statistical difference was predetermined at p<.05.

Results:

<table>
<thead>
<tr>
<th>Microleakage</th>
<th>Group 1 (Kerr) n=20</th>
<th>Group 2 (3M) n=20</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (G/P)</td>
<td>5/1</td>
<td>1/2</td>
</tr>
<tr>
<td>1 (G/P)</td>
<td>2/5</td>
<td>3/3</td>
</tr>
<tr>
<td>2 (G/P)</td>
<td>6/3</td>
<td>7/5</td>
</tr>
<tr>
<td>3 (G/P)</td>
<td>4/7</td>
<td>4/4</td>
</tr>
<tr>
<td>4 (G/P)</td>
<td>3/4</td>
<td>5/6</td>
</tr>
</tbody>
</table>

Conclusions: No statistically significant difference found between groups in terms of microleakage. P=0.967

Micro Tensile and Shear Bond Strength on Dentin
YooJung Chang*, Joon Hee Lee, Eunice D. Lee, Matthew Finkelman, Masly Harsono, Gerard Kugel

Objectives: The purpose of this study was to compare two bond strength-testing methods (shear and microtensile) for examining dentinal bond strength of two adhesive systems.

Methods: Seventy-eight extracted caries-free human teeth were obtained for this study. Flat dentin surfaces were cut with diamond wheel (Isomet, Buehler) and polished using SiC paper up to 320 grit (Ecomet. Buehler). Samples were randomly divided into 12 groups. Two testing methods were used: Shear bond strength (SBS) and Micro-tensile bond strength (MTBS). Two adhesive systems were tested: total etch (Ultra-Etch, Ultradent Inc) and self-etch (Peak SE Primer, Ultradent Inc). Adhesives were applied according to manufacturers’ instruction. Those four groups were further split into: no chlorhexidine (control), chlorhexidine applied before etching (CHX before), and chlorhexidine applied after etching (CHX after). Filtek Supreme Plus (3M ESPE) composite was placed in a bonding jig (Ultradent Inc) for SBS testing, and placed incrementally for MTBS testing. Composite was cured for 40s with LED curing light (DEMI, Kerr). MTBS samples were sectioned in 1 mm increments in two directions to create beams with approximately 1mm\textsuperscript{2} (Isomet 1000, Buehler). All samples were aged in artificial saliva for 1 month at 37°C. SBS and MTBS testing were carried out using universal testing machine (Instron 5566A, Norwood, MA) and microtensile tester (Bisco, IL), respectively. The fracture mode of each specimen was observed using a stereo microscope (Olympus Japan). Only adhesive mode was included in the data. Statistical analysis was done by independent-sample t-test with Bonferroni correction.

Results:

<table>
<thead>
<tr>
<th>Bonding Tests</th>
<th>Adhesives</th>
<th>Control (MPa+SD)</th>
<th>CHX Before</th>
<th>CHX After</th>
</tr>
</thead>
</table>
The Relationship between Performance on Perceptual Ability Test Section of DAT and Clinical Success in Dental School
Dave Cho*, Paul Stark, and Yun Saksena.

Objectives: The purpose of this study was to determine if there is a relationship between Perceptual Ability Test (PAT) scores of admitted students and their subsequent clinical success in the 3rd and 4th years of dental school. Methods: Student records for one graduated class (class of 2012) from Tufts University School of Dental Medicine were examined in this study. PAT scores, clinic points, clinical competency exams and requirements completed of those students were collected from the Office of Student Services and de-identified. The data was then analyzed using SPSS software. PAT scores from the 2012 class served as the independent variable, while the clinic points, clinical competency exams and requirements completed of the same student population served as the dependent variable.

Results: A weak correlation was observed between students’ PAT scores and their average grade for competency exams in the 3rd and 4th years of dental school. Also, a weak correlation was observed between students’ PAT scores and their average grade for operative competency exams. No other correlations were observed between PAT scores of admitted students and the dependent variables in this study.

<table>
<thead>
<tr>
<th>Clinic Pts</th>
<th>Rqmts</th>
<th>Passed CE</th>
<th>CE Avg</th>
<th>Operative</th>
<th>Fpros</th>
<th>Dx/Tx</th>
<th>OMFS</th>
<th>Perio</th>
<th>Pedo</th>
<th>OMFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>.043</td>
<td>-.082</td>
<td>.010</td>
<td>.165*</td>
<td>.282**</td>
<td>.020</td>
<td>-.077</td>
<td>.069</td>
<td>.018</td>
<td>.152</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.581</td>
<td>.296</td>
<td>.901</td>
<td>.035</td>
<td>.000</td>
<td>.802</td>
<td>.326</td>
<td>.383</td>
<td>.823</td>
<td>.051</td>
</tr>
<tr>
<td>N</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>161</td>
</tr>
</tbody>
</table>

Conclusion: PAT scores of admitted students and their clinical performances in the 3rd and 4th year did not show a strong correlation. Further research may involve a larger sample size and more variables. With more data, it may be possible to discover a pre-dental criteria that shows a stronger correlation with clinical success.

Marginal/Internal Fit of e.Max Impulse™ Versus e.Max™ CAD All-Ceramic Crowns
Lindsay Fox*, Matthew Finkelman, Masly Harsono, Gerard Kugel

Objective: To evaluate in vitro marginal and internal fit of all-ceramic crowns milled with conventional e.max and impulse™ e.max lithium disilicate ceramic blocks made for CAD/CAM systems.

Methods: Typodont tooth #14 was prepared per standard specification to receive an all-ceramic crown restoration. The preparation had well-defined, 1 mm circumferential shoulder gingival margin, 2 mm occlusal reduction, rounded internal angles, and less than 20° total occlusal convergence. Forty-one #14 prep teeth were duplicated using VPS impressions material and poured in dental stone type V. Each duplicated prep tooth was
randomly divided between Group 1 (n=21) and Group 2 (n=20) and placed in a full-dentate typodont. The prep teeth were scanned and designed with the E4D system with the same operator per manufacturer's instructions. Group 1 was milled in conventional e.max™ CAD blocks and Group 2 was milled in Impluse™ CAD blocks. The milled CAD Crowns were crystalized and cemented onto the die using Multilink® Automix (Ivoclar Vivadent) under constant pressure of 100N and light cured on both sides for 20 seconds each. Samples were embedded in acrylic resin and sectioned buccolingually. Sections were evaluated under stereo microscope and measured on the occlusal aspect and 3 locations per buccal and lingual side of section: marginal-edge, mid-axial wall, and cusp-tip. The two groups were compared using t-tests with Bonferroni correction. Statistical differences were predetermined at (p< 0.007).

**Results:** No significant difference was found at the buccal and lingual margins in all groups.

<table>
<thead>
<tr>
<th>µm±SD</th>
<th>Lingual</th>
<th>Mid lingual</th>
<th>Lingual cusp</th>
<th>Occlusal</th>
<th>Buccal Cusp</th>
<th>Mid Lingual</th>
<th>Buccal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>n=21</td>
<td>116.66±54.55</td>
<td>150.64±78.65</td>
<td>170.93±59.33</td>
<td>144.41±37.22</td>
<td>136.59±39.46</td>
<td>166.60±103.32</td>
</tr>
<tr>
<td>Group 2</td>
<td>n=20</td>
<td>116.14±93.30</td>
<td>119.38±69.60</td>
<td>188.65±81.54</td>
<td>171.46±44.01</td>
<td>159.45±58.55</td>
<td>196.58±81.33</td>
</tr>
</tbody>
</table>

**Conclusion:** Based on the statistical results there was no statistical difference in marginal and internal fit between conventional e.max™ CAD blocks and e.max Impulse™ CAD blocks.

Comparison of Polymerization Stress using RMGI Bond and Resin Adhesive
Nicolas Freda*, Michael Neglia, Matthew Finkelman, Gerard Kugel, and Ronald Perry

**Objectives:** To compare maximum polymerization stress (MPa) and six hour polymerization stress (MPa) of a bulk filled composite bonded with a resin adhesive, a RMGIC bond, and co-cured with a RMGIC bond.

**Methods:** 20 mm Long, 5 mm diameter clear acrylic rods (n=3) were sectioned and one end of each section was polished using 1500 silicon carbide paper. Rods were then loaded on a Universal Testing Machine (Instron 5942) and a metal gauge (1mm Mitutoyo) was used to establish a distance of 1 mm between prepared rods. In groups 1 & 2 the adhesive systems, Optibond XTR (Kerr) and Riva Bond LC (SDI), were applied to both ends of the acrylic rods and light cured according to the manufacturer’s instructions. Composite was then placed and excess material was trimmed and light cured using a LED curing light (Radii Plus, SDI) for 40 seconds from one side. In Group 3, a further layer of RMGIC bond was applied to each rod followed by immediate composite placement. An extensometer (Instron) accurate to 10 nanometers was connected to the acrylic rods. At 90 seconds a plastic cup was moved into position on the lower rod and filled with distilled water. Additional water was added as needed. Maximum, average, and final polymerization stress (MPa) were recorded over 6 hours. The data was analyzed using one-way ANOVA analysis. A P-value <.05 was considered statistically significant.

**Results:**

<table>
<thead>
<tr>
<th>Group</th>
<th>Adhesive</th>
<th>Maximum Stress (MPa)</th>
<th>Average Stress (MPa)</th>
<th>Final Stress (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optibond XTR</td>
<td>-4.7262±0.235</td>
<td>-4.0316±0.481</td>
<td>-4.2000±0.619</td>
</tr>
<tr>
<td>2</td>
<td>Riva Bond LC</td>
<td>-1.4297±0.358</td>
<td>0.1622±0.715</td>
<td>0.2048±0.979</td>
</tr>
<tr>
<td>3</td>
<td>Riva Bond LC (co-cure)</td>
<td>-2.4841±0.235</td>
<td>-1.2982±0.420</td>
<td>-1.2292±1.162</td>
</tr>
</tbody>
</table>

**Conclusion:** All results between maximum and average stress were statistically significant with group 2 yielding the lower stress. Groups 2 and 3 yielded a statistically lower final stress compared to Group 1.

Compressive Strength of Bulk Fill Composite Materials
Ryan George*, Masly Harsono, Ronald Perry, Gerard Kugel
Objective: To compare the compressive strength, compressive deformation, and modulus of elasticity of three different bulk fill composite materials

Method: Three groups of twenty samples each of bulk fill composite materials were tested in this study. The samples were made using Teflon mold 4 mm diameter by 8mm thick. The mold was placed on top of a polyester (mylar) strip resting on a glass slab. After the mold had been filled with composite and packed with a spatula, another mylar strip was laid on top of the composite and a microscope slide was pressed on top. Composites were cured with LED light (DEMI, Kerr) every 3-4mm increment. Samples were removed from the mold and excess was removed from the samples. After 24 hours of polymerization, compressive strength was carried out using a Universal Testing Machine (Instron 5566A, Norwood, MA) at a cross head speed of 4 mm/min with 10K load cell. The compressive strength was measured according to DIN 53454 (ISO 9917 2001). Compressive deformation and modulus of elasticity were also measured. Statistical analysis was conducted with one way ANOVA. Statistical significance was predetermined at level p<0.05.
Results:

<table>
<thead>
<tr>
<th>Group</th>
<th>Compressive Strength (MPa)</th>
<th>Compressive Strain (mm/mm)</th>
<th>Modulus of Elasticity (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-tra base (VOCO)</td>
<td>149.79±26.15^a</td>
<td>0.09±0.01^A</td>
<td>1656.74±234.15^F</td>
</tr>
<tr>
<td>VENUS Bulk Fill (Heraous)</td>
<td>148.45±28.27^a</td>
<td>0.22±0.02^B</td>
<td>670.78±89.56^G</td>
</tr>
<tr>
<td>SDR Surefill (Dentsply)</td>
<td>74.31±26.9^b</td>
<td>0.22±0.17^B</td>
<td>447.86±207.06^K</td>
</tr>
</tbody>
</table>

Results with varying superscripts are statistically different (p<0.05)

Conclusion:
X-tra base group exhibited statistically higher Modulus of Elasticity and Compressive strength than all other groups.
Research sponsored in part by VOCO.

Usage of Different Pharmacologic Categories of Medications in Intellectually/Developmentally Disabled Adults Treated Under General Anesthesia.
S.H. Hong, Angel Park, and J.P. Morgan

Objectives: This study investigated medication usage by intellectually/developmentally disabled (I/DD) adults receiving dental treatment utilizing general anesthesia (GA). Associations between different pharmacologic categories of medications and untreated caries and periodontitis were explored.

Methods: This cross-sectional study utilized data from clinical information recorded at the time of treatment at the Tufts Dental Facilities (TDF) in the axiUm electronic health record (EHR). The study group consisted of 241 developmentally disabled adults ≥ 20 years of age who received dental treatment under general anesthesia between April 1st, 2009 - March 31st, 2010. Medications usage for each patient was collected from axiUm and recorded in an electronic spreadsheet program (MS Excel). The compiled database was converted to SAS data sets for analysis (Version 9.2).

Results: The mean (SD) age of this population was 45.27 (11.22) years. There were 176 males (76.70%) and 124 females (78.23%). Among different pharmacologic categories of medications, anticonvulsants were the most common, with 51.83% of the patients taking at least one, followed by antipsychotics (45.53%), then antidepressants (39.53%), and anxiolytic medications (37.87%). The untreated caries was most prevalent in patients taking antimuscarinics (90.91%), followed by those taking antipsychotics (90.00%), then by those taking anti-parkinson’s medications (86.36%). The periodontitis was most prevalent in patients taking antimuscarinics (100.00%), followed by those taking anti-parkinson’s medications (90.16%), then by those taking antiasthmatic medications (87.76%).

Conclusion: The prevalence of untreated caries among the study population was 81.67% and that of periodontitis was 77.33%. I/DD patients taking antimuscarinic medications had the highest prevalence of untreated caries and periodontitis. Also, patients on anti-parkinson’s medications had the second highest prevalence of periodontitis and third highest prevalence of untreated caries. It is important to note that some of these patients were concurrently taking medications in different pharmacologic categories of drugs. Therefore, they may have had either additive or decremental effects on their oral health. Follow-up studies are indicated to examine the impact of individual medication usage on the oral health of adults with I/DD requiring GA for dental treatment.

Student Opinions on Pre-Clinical Instruction at TUSDM: A Survey
Jenna Hubacz*, Joanne Falzone, Britta Magnuson, Steven Eisen

Objectives: Third and fourth year students at Tufts University School of Dental Medicine (TUSDM) were surveyed regarding the adequacy of pre-clinical training. The goal was to determine student perceptions of the
strengths and weaknesses of the pre-clinical course material in operative dentistry and fixed/removable prosthodontics.

Methods: 347 students of the 2012 and 2013 classes were surveyed using an online survey tool. The survey contained 12 questions (6 multiple choice, 6 open-ended). It included questions regarding learning style, which techniques and materials were suitably covered, which subjects were not, and which topics students found superfluous.

Results: 43 students responded, all from the 2013 class. 47% of students stated that their pre-clinical training adequately prepared them for the clinic, 28% were neutral, 14% were unsatisfied, and 12% selected "other". 86% of students stated that visual learning worked well in their pre-clinical education, and 93% of students indicated hands-on activities were beneficial. Regarding the knowledge and use of dental materials, 12% were very confident, 37% were somewhat confident, and 51% of students did not feel confident. 84% indicated inlays/onlays required more clinical instruction. Open-ended questions regarding materials/techniques that needed more instruction showed trending responses for caries identification, composite use, temporary-filling material use, and removable prosthodontics techniques.

Conclusions: Student responses indicated few topics should be taken out of the curriculum due to redundancy, but students would like to see several topics added. Students felt the level of pre-clinical instruction was insufficient in the use of dental materials. Caries identification, removable prosthodontics, and composite use were also topics students expressed were insufficient. Students indicated visual learning was most helpful. The results of this survey provided important information as to how pre-clinical courses can be better tailored in the future to meet the needs of students.

Site-specific Patterns of Gene Expression in Diabetic-Foot Fibroblasts

Rajvir S. Jutla*,†, Kyle Hewitt†, Anna Maione†, Julia Caine†, Elana Knight†, Avi Smith†, Behzad Gerami-Naini†, Aris Veves‡ and Jonathan A. Garlick† (†Department of Oral and Maxillofacial Pathology, Tufts University School of Dental Medicine, Boston, MA, ‡Department of Surgery, Beth Israel Deaconess Medical Center, Boston, MA)

Objectives: Diabetic foot ulceration impairs quality of life and leads to prolonged hospitalizations, demonstrating the need to develop novel sources of repair-competent, autologous cells. Our lab is developing a novel therapeutic approach, based on induced pluripotent stem cell (iPSC) technologies, whose goal is to reverse chronic wound fibroblasts from a non-healing to a healing phenotype. As a first step towards this goal, we characterized the gene expression profile of fibroblasts cultured from ulcers and normal skin from diabetic patients.

Methods: Fibroblasts were harvested from non-healing ulcers or normal skin from the feet of diabetic patients (DFU 1, 3, 6) as well as from normal plantar skin and palatal mucosa from non-diabetic patients. Microarray analysis was performed on diabetic fibroblasts and control oral fibroblasts, to identify genes from diabetic patients that were altered. Microarrays were then used to select RNA targets to compare plantar skin vs. oral fibroblasts from non-diabetic patients by RT-PCR to establish how site-specific expression patterns could compare to those seen in diabetic ulcer fibroblasts.

Results: Genes selected from the microarray relevant to wound repair included upregulated LOXL4, SFRP1, and IGF2 and downregulated CDH6. These microarray results were confirmed when DFU 1, 3, 6 were compared to oral fibroblast controls by RT-PCR analysis. However, DFU cells showed different patterns of gene expression when compared to plantar skin control fibroblasts, suggesting the existence of site-specific patterns of gene expression.

Conclusions: Site-matched, plantar fibroblasts displayed different patterns of gene expression compared to non-site matched, oral fibroblasts. Therefore, comparisons between DFU fibroblasts and those from different sites, such as the oral cavity, are of limited use to predict patterns of expression. These studies lay the groundwork for ongoing studies whose goal is to improve the repair potency of DFU fibroblasts following their reprogramming to iPSC and subsequent differentiation to repair-competent fibroblasts.
Medication and Prevalence of Caries in Intellectually/Developmentally Disabled Adults

Dohyun Kim*, Angel Park, John Morgan

Objective: Oral health studies in adults with intellectual/developmental disabilities (IDD) strongly support a high prevalence of caries. This study investigated the use of medications and the prevalence of untreated caries in IDD adults.

Method: Clinical and demographic data were collected from a convenience sample of axiUm electronic dental records of IDD adults (≥ 20 years of age) who received a dental exam between April 1, 2009 and March 31, 2010. Untreated caries and the number, type, and xerostomic potential of medications, were recorded for each subject. The compiled database (MS Access) was converted to MS Excel and analyzed using SAS, version 9.2. Associations were tested using chi-square analysis.

Result: 899 subjects (56.5% male) met the inclusion criteria. 719 (80%) were prescribed xerostomic medications and 180 were not. Mean (SD) age was 50.7 years (14.2); range 21 to 96 years. The mean (SD) and the median number of medications taken per subject were 9.5 (5.8) and 9, respectively. Xerostomic medications were prescribed for 67.8% of 90 edentulous and 81.3% of 809 dentate subjects, p=0.0023. Untreated caries prevalence in dentate subjects prescribed xerostomic medications was 34.0%; and 40.4% in those not prescribed xerostomic medications, p=0.1404.

Conclusion: Medications were prescribed for the vast majority of the study population with a median number of 9 medications per subject. Significantly more dentate subjects were prescribed xerostomic medications than edentulous subjects. Prevalence of untreated caries in subjects taking xerostomic medications was not significantly greater than in those not prescribed xerostomic medications. Medication usage is considered a contributory factor of oral disease prevalence in IDD adults, but not well understood. Further studies investigating the type, dosage, frequency and xerostomic effect of medications in relation to untreated caries may contribute to identifying the impact of medications on high caries risk adults with IDD.

This study was supported in part by grant 1RC1DE020396 from the National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, Md.
Phenotypic Characterization of $Tft^{156N}$ and $Tft^{152N}$ Zebrafish Mutants

Alice Ko*, Andrew Trent Taylor², Caitlin Stewart-Swift¹, Pamela C. Yelick¹ (¹Tufts University School of Dental Medicine, ²University of Massachusetts, Amherst)

Objectives: The objective of this study is to define and characterize developmental defects in the $Tft^{152N}$ and $Tft^{156N}$ zebrafish mineralized tissue mutants, identified in a forward genetic chemical mutagenesis screen.

Methods: Identified heterozygous adult $Tft^{152N}$ and $Tft^{156N}$ mutants were incrossed, and the resulting embryos were raised for 1, 2, 3, 4 and 5 weeks of age. We then utilized Alizarin Red and Alcian Blue double staining, and in vivo Calcein stain, to characterize mineralized tissue defects in developmentally staged mutant and wild type siblings.

Results: We determined that the earliest time point in which the mineralized tissue defects were observed in $Tft^{156N}$ mutants was at 4 weeks post fertilization (wpf). The observed $Tft^{156N}$ mutant phenotype appeared to recover at ~7 wpf. Ongoing studies are being conducted to confirm these results. Next generation sequencing efforts are being conducted to define the molecular nature of the $Tft^{152N}$ and $Tft^{156N}$ mutant loci. Ongoing molecular characterizations are being used to determine the effect of each mutation on osteoblast differentiation. We anticipate that these studies will inform and improve our understanding of mineralized tissue defects in humans.

(This research was supported by NIH/NIDCR R01DE018043 [PCY])

Microleakage Evaluation of Bulk-Fill Layering Techniques in Class II Restorations

Michael K. Kreitzer*, Masly Harsono, Matthew Finkelman, and Gerard Kugel

Objectives: The purpose of this study is to evaluate bulk-fill (BF) composites in Class II restorations.

Methods: Fifty standard Class II preparations were performed on non-carious human third molar teeth by the same operator. The preparations were approximately 3.0-mm deep at the pulpal floor and 5.0-mm deep at the gingival floor. All specimens were etched and then bonded using the same bonding agent (Scotchbond, 3M). Samples were randomly assigned and restored using approximately a 4.0-mm BF composite increment followed by a Filtek Supreme conventional nanocomposite veneer layer of 2.0-mm for improved esthetics and wear per the manufacturer’s instructions. Completed restorations were thermo-cycled for 5,000 cycles, immersed in 50% (W/V) ammoniacal silver nitrate solution for three hours and then photo-developing solution for sixteen hours. Samples were embedded in acrylic and sectioned longitudinally across the gingival floor. Microleakage scores for the gingival floor and proximal wall were measured under a light-microscope (Olympus SZX16).

<table>
<thead>
<tr>
<th>Group (n = 10)</th>
<th>Composites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Control</td>
<td>Filtek Supreme (3M ESPE)</td>
</tr>
<tr>
<td>2 – BF</td>
<td>Venus Bulk Fill, Flowable (Heraeus)</td>
</tr>
<tr>
<td>3 – BF</td>
<td>Filtek Supreme Plus Flow Restorative (3M ESPE)</td>
</tr>
<tr>
<td>4 - BF</td>
<td>Surefil SDR Flowable (Dentply)</td>
</tr>
<tr>
<td>5 - BF</td>
<td>Tetric EvoCeram Bulk Fill (Ivoclar Vivadent)</td>
</tr>
</tbody>
</table>

Results: Using the Kruskal-Wallis one-way ANOVA test, significant difference was found among the groups for both gingival and proximal microleakage (p-values = <.001 and .005, respectively). The Mann-Whitney U-test with the Bonferroni correction was used to determine the differences among the groups. For gingival microleakage Group-1 was significantly different from Group-2 (p < .001), Group-3 (p < .001) and Group-5 (p < .001). Group-3 was also found to be significantly different from Group-4 (p = .001) and Group-4 compared to Group-5 (p=.003). For proximal microleakage Group-1 was found to be significantly different from Group-3 (p=.002) and Group-5 (p<.001).
Dye Penetration (DP) Score

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
<th>Group 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = No dye penetration (DP)</td>
<td>0 / 0</td>
<td>4 / 5</td>
<td>7 / 7</td>
<td>1 / 3</td>
<td>6 / 6</td>
</tr>
<tr>
<td>1 = DP to 25% of gingival floor (GF) / Proximal Wall (PW)</td>
<td>0 / 2</td>
<td>4 / 1</td>
<td>3 / 1</td>
<td>1 / 4</td>
<td>3 / 3</td>
</tr>
<tr>
<td>2 = DP to 50% of GF / PW</td>
<td>0 / 2</td>
<td>1 / 1</td>
<td>0 / 0</td>
<td>2 / 2</td>
<td>0 / 1</td>
</tr>
<tr>
<td>3 = DP to 75% of GF / PW</td>
<td>2 / 2</td>
<td>0 / 0</td>
<td>0 / 2</td>
<td>2 / 0</td>
<td>1 / 0</td>
</tr>
<tr>
<td>4 = DP to axial wall / pulpal floor</td>
<td>8 / 4</td>
<td>1 / 3</td>
<td>0 / 0</td>
<td>4 / 1</td>
<td>0 / 0</td>
</tr>
</tbody>
</table>

**Conclusions:** Based on the statistical results there was a significant difference between using BF composites in three of the four groups as compared to using solely a non-flowable nanocomposite. It was also evident that using a BF layering technique provides better marginal adaptation on the gingival floor and proximal wall of the restorations.

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**Depth of Cure of Different Shades of Bulk Fill Composites**

Hemanth Kunduru*, Matthew Finkelman, Eileen Doherty, Masly Harsono and Gerard Kugel

**Objectives:** To evaluate the depth of cure of bulk fill composite materials using the scraping method.

**Methods:** Four bulk fill composite materials (Filtek, Surefil SDR, Tetric Evo Ceram and Venus) were tested in two different shades (except Venus). A total of seventy bulk composite rods were made using a stainless steel mold 5 mm diameter by 8 mm depth. After filling the mold with bulk fill composite, a mylar strip was placed on top of the composite and compressed with a microscope slide. Samples were cured using an LED Light (DEMI, Kerr) per manufacturer suggestion. After each test sample was cured, any uncured composite material was scraped off the bottom of the rod (ISO 4049). The remaining cured composite material was measured with a digital caliper to determine the depth of cure. Statistical analyses were accomplished using independent-sample t-tests with Bonferroni corrections. Significance for statistical tests was predetermined at p<0.002.

**Results:** The depth of cure values in mm are summarized below.

<table>
<thead>
<tr>
<th>Bulk Fill Material (n=10)</th>
<th>Shade</th>
<th>Curing Time (sec)</th>
<th>Depth of Cure (mm±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtek Bulk Fill (3M ESPE)*</td>
<td>U</td>
<td>10</td>
<td>6.37 ± 0.10&lt;sup&gt;b,c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Filtek Bulk Fill (3M ESPE)*</td>
<td>A2</td>
<td>20</td>
<td>6.52 ± 0.05&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Surefil SDR (Dentsply)*</td>
<td>U</td>
<td>30</td>
<td>6.36 ± 0.07&lt;sup&gt;b,t&lt;/sup&gt;</td>
</tr>
<tr>
<td>Surefil SDR (Dentsply)*</td>
<td>A2</td>
<td>30</td>
<td>6.32 ± 0.04&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Tetric Evo Ceram (Ivoclar)</td>
<td>IVW</td>
<td>20</td>
<td>6.28 ± 0.16&lt;sup&gt;b,n&lt;/sup&gt;</td>
</tr>
<tr>
<td>Tetric Evo Ceram (Ivoclar)</td>
<td>IVB</td>
<td>20</td>
<td>6.07 ± 0.23&lt;sup&gt;b,a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Venus Bulk Fill (Heraus)*</td>
<td>U</td>
<td>20</td>
<td>6.48 ± 0.06&lt;sup&gt;a,c,e&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Results with varying superscripts are statistically different (p<0.002)

* is a flowable bulk fill composites

**Conclusion:** Both shades of Tetric Evo Ceram showed the lowest depths of cure among this group. The highest value was for Filtek Bulk Fill (A2). However, all seven composites cured well beyond the manufacturers’ recommended curing depths of 4 mm or 5 mm.

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**Social Impact of Oral Health on Psychiatric Inpatients**

Sharan L. Schwartzberg, Gregory D. Lane*, Simon Levin, and Emery Sweeney

Psychiatric patients have significantly worse oral health than the general population and this can have an effect on their quality of life (Locker, Clarke, & Payne, 2000). Factors such as side-effect of medications, inadequate access to oral health care and dental phobias have been identified as mediating factors (Cormac & Jenkins, 1999; Mirza, Day, Phelan, & Wulff-Cochrane, 2001). The absence of oral health intervention increases likelihood that serious diseases are undetected. Given the short length of stay in acute psychiatric inpatient hospitalization, it is
imperative patients’ increase awareness of their oral health needs and resources are available. An oral health education group led by dental students in occupational therapy is one such attempt. A pilot study of 75 adult inpatients’ perceptions of their oral health was used as one step to inform the content and processes of the group. Physical pain, psychological discomfort, and psychological disability, measured by the Oral Health Impact Profile (OHIP-14) (Slade, 1997), had the highest impact on the total sample and the high impact group. These findings are similar to previous studies (Nuttall, Steele, Pine, White, & Pitts, 2001; Slade, Nuttall, Sanders, Steele, Allen, & Lahti, 2005). We recommend shaping oral health education to directly address these three dimensions and further studying a shortened version of the OHIP-14.

Mortality Data Thirty Years after Nutrition and Oral Health Study
Athena S. Papas, Pamela Corrado, and Jamie L. LaPierre*

Objective: Death records for a Metropolitan Boston population who had participated in a nutrition and oral health study (started in 1981) were searched to determine cause of death and to compare their pertinent study data to those still alive.

Methods: The subjects in the study had their periodontal attachment level determined at four sites per tooth with a UNC-15 periodontal probe. Number of teeth and amputated crowns due to circumferential root caries were recorded. Gender, race, and education were also recorded at baseline.

Results: The study population (n=391) had a mean age at baseline of 66 (40-80) 57% female, a mean number of teeth of 22±6, 89.7% were Caucasian, 8.4% African American and 1.9% other. 26 participants were smokers and the mean number of years of education was 13.4±2.5. Those with more teeth consumed a healthier diet. At 30 years post study baseline 46% (156) were deceased. (22% cardiovascular disease, 17% other, 7% died out of state), 54% (210) were still alive. ANOVA found race, gender, education, marital status, # teeth and # of amputated roots to be significantly associated with mortality. A binary logistic regression model for mortality including all these variables found race (p< 0.024), amputated crowns (p<0.006) and # teeth (p< 0.0001) to be significant. Those that had more than 23 teeth compared to those that had less than 23 were significantly more educated (p<0.007) and had less mortality (p<0.010). African Americans had fewer teeth and were less educated. Those that died of cardiovascular disease had more significant and more severe periodontal disease than those who died of other causes.

Conclusion: Loss of teeth, having amputated crowns affected diet at baseline and later affected mortality. (Funded in part by the Educational Foundation of America and the USDA)

Fracture Toughness of Provisional Dental Materials
Chase Larsen*, Masly Harsono, Matthew Finkelman, Ronald Perry

Objective: To determine and compare the fracture toughness of four provisional dental materials.

Methods: Four groups of ten samples each of provisional materials were tested in this study. The samples were made using a stainless steel mold 2 mm in height, 4.95 mm in width, and 25 mm in length. After 24 hours of polymerization, a notch (2.6 ± 0.05 mm) was inserted into the middle of each sample using a separating disc (thickness 320 µm) attached to an immobilized low speed hand piece. Samples were observed under the microscope for any defects. The three-point bending test was performed using a universal testing machine (Instron, 5566A) at a cross-head speed of 1 mm/min (load cell 500 N). The notch was positioned centrally beneath the contact and the distance between the two support rims was 20 mm. The radius of each support rim was 1 mm.

The fracture toughness (K_{1c}) was calculated according to ISO 13586. The Kolmogorov-Smirnov test was used to determine normal distribution and the homogeneity of the samples was checked using the Levene test. A one-way ANOVA was used to test the mean fracture toughness between groups. Statistical significance was predetermined at level p<0.05.
Results:

<table>
<thead>
<tr>
<th>Group (n=10)</th>
<th>Material</th>
<th>Mean Fracture Toughness (MPa · m(^{0.5}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protemp Plus (3M)</td>
<td>1.33 ± 0.13(^a)</td>
</tr>
<tr>
<td>2</td>
<td>Luxatemp Solar (DMG)</td>
<td>0.98 ± 0.04(^bc)</td>
</tr>
<tr>
<td>3</td>
<td>Integrity (Dentsply Caulk)</td>
<td>1.02 ± 0.07(^b)</td>
</tr>
<tr>
<td>4</td>
<td>Experimental (Heraus Kultzer)</td>
<td>1.38 ± 0.19(^b)</td>
</tr>
</tbody>
</table>

Conclusion: Group 2 exhibited a statistically lower resistance to crack propagation than all other groups, whereas Group 1 and Group 4 exhibited a statistically higher resistance than Group 3. No statistical difference is evident between Groups 1 and 4.

Research sponsored by Heraus Kultzer.

Retrospective Study of Oral Health Program in Zambian Children’s Home
John Lee*, Angel Park, Kerry Maguire, and John Morgan

Objective: Identifying the best program designs for preventive and treatment outreach in under-resourced environments is challenging. Oral health education, screening exams, fluoride varnish, sealants and atraumatic restorative technique were provided at a Zambian children’s home. This study aims to assess the oral health impact of this international collaborative dental outreach project over a 7 year period.

Methods: Data was collected from yearly visits to the orphanage from 2004-2010. Screening exams by dentists utilized the Association of State and Territorial Dental Directors Basic Screening Survey Tool (ASTDD BSS) to document oral health needs of the study population. 515 visits with a total of 259 different patients were documented. The mean age (SD) of each patient’s first visit was 7.8 (3.8) years (mixed dentition range), with 53.3% males. Among the data collected from each visit was treatment urgency score (TU) 0= No obvious problem; 1 = early dental problem; 2= urgent care [infection, toothache]. Dental records were de-identified, exported to excel and crude bivariate analyses were completed in SAS.

Results: On average, 73.6 visits (SD= 31.5) were recorded each year from 2004-2010. An average of 27.8 new patients (SD= 10.9) were seen each year except for the program’s first year in 2004. TU scores of 0 increased from 2004-2005 from 44.3% to 73.9% (Chi-square, p=0.0349). TU score analyses from 2005 to 2010 were not statistically significant (Kruskal Wallis, p=0.3876).

Conclusion: Crude results suggest that the proportion of TU visits with scores of zero increased significantly after the first year of the program. These scores did not return to first year levels for the remainder of study. This is consistent with a positive oral health effect by reducing disease urgency in the study population. Exploration of outcomes is consistent with the World Health Organizations’ recommendations for small-scale oral health demonstration projects.

Effect of Chlorhexidine on Dentin Bonding Strength
Joon Hee Lee*, Y. Chang, Matthew Finkelman, Masly Harsono, Gerard Kugel

Objectives: The purpose of this study was to evaluate the effect of using chlorhexidine on dentin bond strength with two types of adhesive systems: total-etch and self-etch.

Methods: Twenty extracted caries-free human teeth were sectioned horizontally with diamond blade precision saw (Isomet, Buehler) and polished using SiC paper up to 320 grit (Ecomet, Buehler). Two adhesive systems were tested: total etch (TE) (Ultra-Etch, Ultradent Inc) and self-etch (SE) (Peak SE Primer, Ultradent Inc). Adhesives were applied according to manufacturers’ instruction. For chlorhexidine (CHX) application, 0.2% CHX was applied for 1 minute on the dentin before or after the etching procedures for both TE and SE. Filtek Supreme Plus (3M ESPE) composite was placed incrementally of approximately 1.5-2mm thickness each increment and cured for 40 seconds with LED curing light (DEMI, Kerr). Samples were sectioned vertically in 1mm increments with the precision saw in .300 mm/s velocity. Samples were further sectioned by turning them 90\(^\circ\) to create beams with an adhesive area approximately 1mm\(^2\) (Isomet, Buehler). All specimens were aged in
artificial saliva for 1 month at 37°C. Micro tensile bond testing was carried out using Microtensile machine (Bisco, IL) with crosshead speed of 1 mm/min. The fracture modes of each specimen were observed using a stereo microscope (Olympus Japan). Only adhesive mode was included in the data. Statistical analysis was done by two-way ANOVA, with post-hoc analysis conducted via Tukey’s HSD. Statistical significance was predetermined at level p<.05.

Results:

<table>
<thead>
<tr>
<th>Adhesive systems</th>
<th>Control (MPa±SD)</th>
<th>CHX Before (MPa±SD)</th>
<th>CHX After (MPa±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 TE</td>
<td>12.6±6.5a</td>
<td>22.1±7.8b</td>
<td>28.0±15.7b</td>
</tr>
<tr>
<td>Group 2 SE</td>
<td>15.7±8.1a</td>
<td>24.6±13.5b</td>
<td>29.9±13.2b</td>
</tr>
</tbody>
</table>

Results with varying superscripts are statistically different (p<0.05)

Conclusion: There was no significant difference in bond strengths between TE and SE in the control group. Application of chlorhexidine, either before or after etching, significantly strengthened the bond strength of both total etch and self etch systems.

Effect of Loupes on Ocular Blue Light Hazard: Direct Viewing

Judyth G. Lee*, Errol N. Ramos¹, R.B. Price², Ronald D. Perry¹, Daniel Labrie³, and B. Sullivan², (¹School of Dental Medicine, Tufts University, Boston, MA, ²Dept. of Clinical Dental Sciences, Dalhousie University, Halifax, NS, Canada, ³Physics and Atmospheric Science, Dalhousie University, Halifax, NS, Canada)

Objectives: This study measured the effect magnification loupes have on the irradiance received by the eye from a dental curing light (LCU).

Methods: Loupes with 3.5x magnification (Design for Vision [DFV], Carl Zeiss [CZ], Quality Aspirator [QA]), and 2.5x magnification (DFV & QA) were tested over two days. The loupes were placed directly over the entrance to an integrating sphere connected to a spectrometer (USB 4000, Ocean Optics). A Sapphire Plus (Den-Mat) plasma arc LCU was fixed at a distance of 40cm pointing directly at the entrance to this integrating sphere. The spectral radiant power from this LCU was recorded 5 times both without and with each of the loupes focused at the entrance to the sphere. Using 0.02 radians as the angular subtense of the experiment, the maximum permissible cumulative blue light hazard in an eight-hour day was calculated using guidelines set by the American Conference of Industrial Hygienists (ACGIH). Weighted blue light irradiance values were compared between the brands of loupes using Fisher's PLSD, α=0.05.

Results:
The loupes increased the blue light weighted irradiance values received by the pupil by up to 8 times compared to without the loupes (p<0.05). However, since the resulting images on the retina were now 2.5x to 3.5x larger, according to the ACGIH guidelines, the maximum permissible cumulative ocular exposure to the blue light in an 8-hour day was increased to only 10 to 15s compared to that without the loupes (6 to 7s).

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Loupes</td>
<td>DFV 2.5x</td>
</tr>
<tr>
<td>Weighted Irradiance (mW/cm²)</td>
<td>4.98</td>
<td>18.88</td>
</tr>
<tr>
<td>Max. Daily Exposure Time (seconds)</td>
<td>6.3</td>
<td>10.4</td>
</tr>
</tbody>
</table>

Conclusions: Under the extreme conditions simulating a high power PAC light shone directly at the eye from a distance of 40cm, without magnification the maximum permissible cumulative daily exposure was between 6 to 7 seconds. Through magnification loupes, the maximum cumulative daily exposure time was between 10 to 15 seconds. Further studies should be conducted on the effects of magnification loupes.
Geriatric Patients Dental Care and Eldercare Method: A Survey
Jennie Leikin*, Britta Magnuson, Matthew Finkelman

**Objective:** To assess and compare self reported personal dental habits and oral comfort of a geriatric population (age ≥65) in three types of residences: assisted/independent living, at home with home-care, and long-term rehabilitation facilities.

**Methods:** A 23-question survey was formatted including demographics, self-reported history of dental care, personal dental habits, and oral comfort. Questions were based on those used in Tufts University School of Dental Medicine (TUSDM) for incoming research subjects and General Oral Health Assessment Index (GOHAI). The survey was validated for clarity and conciseness by five volunteers. Three facilities were selected, fifty-two elders were surveyed. Fisher’s exact and Kruskal-Wallis tests were used to analyze the data.

**Results:** Living situation was assessed with 16 subjects in assisted/independent living, 31 at home with home-care, and 5 in long-term rehabilitation. The association between living situation and denture wearing/edentulism was not statistically significant (p=.188); with 80.8% subjects reporting having either full or partial dentures and/or being edentulous. The association between living situation and daily oral maintenance was not statistically significant (p=.848); with 86.5% reporting brushing teeth/cleaning dentures at least once a day. The association between living situation and regular dental visits was not statistically significant (p=.150); with 44.2% subjects reporting visiting the dentist at least once a year. The association between living situation and experiencing sensitivity in the past 3 months was not statistically significant (p=.401); with 65.4% subjects reporting no sensitivity. The association between living situation and using medication to alleviate oral pain was not statistically significant (p=.398), with 78.8% of subjects reporting no use of medication.

The association between living situation and limiting food due to oral problems was not statistically significant (p=.804), with 36.5% of subjects reporting no limiting of food.

**Conclusion:** In this geriatric population when comparing denture wearing, overall dental habits, and oral discomfort according to living situation, no statistically significant differences were found.

Evaluation of Full Mouth Extraction and Selected Risk Factors in Intellectually/Developmentally Disabled Patients Treated Under General Anesthesia
Daniel Lim*, Angel Park, and John Morgan

**Objectives:** This study investigated the prevalence of full mouth extraction and variables of age, gender, cooperation level, and periodontal disease in intellectually/developmentally disabled (I/DD) adults requiring general anesthesia for dental treatment.

**Method:** A retrospective record review was completed utilizing clinical information entered by dentists at the time of treatment at a state-supported system of dental clinics. Information was collected from axiUm electronic health records for I/DD adults aged 20 years and older and receiving dental treatment under general anesthesia between 4/1/2009-3/31/2012. Data regarding full mouth extraction, gender, age, cooperation level, and periodontal disease were compiled into a database and converted to SAS version 9.2 for analysis (SAS Institute, Cary, NC). Chi-square tests were used to test bivariate associations of proportions. Non-parametric tests were used to test severity of periodontitis.

**Results:** The records of 747 I/DD patients met the inclusion criteria. Their mean (SD) age (range 20–78 years) was 43.8 (12.6) years; 60.9% were male. All subjects were dentate at beginning of treatment. For 685 (91.7%) patients not receiving full mouth extraction (NFM), mean (SD) age (range 20–73 years) was 42.8 (12.3) years; 61.6% were male. For 62 (8.3%) patients receiving full mouth extraction (FM), mean (SD) age (range 28–78 years) was 55.1 (9.7) years; 53.2% were male. There was no statistically significant difference in cooperation levels between NFM and FM groups (p=0.538). There was a statistically significant difference in prevalence of periodontitis between NFM and FM groups (p=0.048). The severity of periodontitis differed statistically significantly between NFM and FM groups (Mann Whitney U, p<0.001). The severity of periodontitis varied statistically significantly by cooperation levels in FM group (Kruskal-Wallis, p=0.027) but not in NFM group (Kruskal-Wallis, p=0.664)
**Conclusion:** In the study population, cooperation levels were not statistically significant between non-full mouth extraction and full mouth extraction groups. Statistically significant differences regarding prevalence of periodontitis were noted between NFM and FM groups. Additional studies are recommended to further investigate risk factors for full mouth extraction in the study group. This study was supported in part by grant 1RC1DE020396 from the National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, Md.

**Microleakage Evaluation of Adhesive Thickness Based on Clinical Radiologic Appearance**

Wei Liu*, Angelica Levin, Matthew Finkelman, Masly Harsono and Gerard Kugel

**Objective:** To observe the microleakage of different adhesives thickness showed on appearance in dental radiographs.

**Methods:** Sixty-four extracted caries free human teeth were obtained for this study. Standard class II preparations were performed on the tooth with approximately 2.5mm deep at the occlusal and 4mm deep at the gingival floor. Samples were randomly divided into eight groups (n=8). Two commercially available dentin adhesive agents were used with variation in number of coatings (amount) and drying methods. Adhesives: Peak LC (PLC, Ultradent) and Scotchbond (SCT, 3M ESPE). Adhesives were applied according to manufacturers’ instruction with exception of using the various amount of coatings: one coat (OC) or three coats (TC) and drying methods: no stream air-dried (ND) or air-dried with a gentle stream of air (GD). Composite (Filtek Supreme, 3M ESPE) were used to restore the lesion. After the restorations were completed, radiographs were taken and samples were thermocycled for 5,000 cycles between 5°C and 55°C with a dwell of 30 seconds. Samples were submerged in 50% (w/v) ammoniacal silver nitrate solution for three hours followed by photo developing solution for sixteen hours. Samples were embedded in acrylic and sectioned longitudinally. Microleakage scores were assessed under stereo microscope. A penetration score was used on the Proximal (P) and Gingival (G) walls; 0=no microleakage, 1=minor microleakage, 2=half-way to the axial/pulpal wall, 3=more than half-way to axial/pulpal wall, 4=at or beyond the axial/pulpal wall.

**Results:** The pulpal thickness of products were compared using mixed model. P-values of microleakage for proximal and gingival walls were calculated using generalized estimating equations (GEE).

<table>
<thead>
<tr>
<th>Radiographic appearance (um+SD)</th>
<th>PLC, OC, ND</th>
<th>PLC, TC, ND</th>
<th>PLC, OC, GD</th>
<th>PLC, TC, GD</th>
<th>SCT, OC, ND</th>
<th>SCT, TC, ND</th>
<th>SCT, OC, GD</th>
<th>SCT, TC, GD</th>
</tr>
</thead>
<tbody>
<tr>
<td>221.25±79.13</td>
<td>811.25±20.31</td>
<td>170±33.17</td>
<td>222.5±51.17</td>
<td>280.0±95</td>
<td>1310.25±383.21</td>
<td>215.25±29.55</td>
<td>356.25±251.39</td>
<td></td>
</tr>
<tr>
<td>Cross-sectioned adhesive thickness (um+SD)</td>
<td>266.13±148.97</td>
<td>944.48±229.67</td>
<td>145.19±74.47</td>
<td>141.27±79.17</td>
<td>219.84±96.88</td>
<td>1057.40±295.78</td>
<td>195.76±144.73</td>
<td>207.14±152.37</td>
</tr>
</tbody>
</table>

**Conclusion:** Teeth samples with no air-dried showed more microleakage compare with gentle air-dried group in both proximal and gingival walls. Less amount of coating applied indicated less microleakage in the proximal wall.
Prevalence, Diagnosis and Treatment of Peri-Implant Mucositis and Peri-Implantitis – A Survey of US Periodontists
Andrew Luccio*, Evangelos Papathanasiou, Andreas Paraschis, James Hanley

Objectives: Despite the reported successful treatment outcomes of replacing missing teeth with dental implants, clinicians are increasingly challenged with the management of pathology of peri-implant tissues, namely peri-implant mucositis and peri-implantitis. Although, several studies have investigated their prevalence and proposed different treatment modalities, there is insufficient information and evidence in relation to the exact prevalence of peri-implant diseases and to the standard therapeutic protocol for their management. The purpose of this study was to survey practicing US periodontists in order to evaluate their attitudes towards prevalence, diagnosis and therapeutic management of peri-implant mucositis and peri-implantitis.

Methods: A twenty-three question survey has been developed based on a previous survey. Periodontists that currently practice in the United States, 3,500 subjects, were contacted by sending the survey and a reminder using the e-mail manager and a link via SurveyMonkey. The listed email addresses in the member directory of the American Academy of Periodontology (AAP) - accessible to all AAP members- were used. Upon collection and data analysis, descriptive and frequency analysis for all investigated fields was conducted.

Results: 250 US periodontists - 78.6% males, 62.6% with >10 years in practice, 75.4% in private practice - completed the survey. 95.4% of the participants were placing implants, 60.4% of them for >10 years and 33.7% >150 implants/year. The majority believes that the prevalence of peri-implant mucositis and peri-implantitis in their practices and in the US is up to 25% and that up to 10% of implants must be removed due to peri-implantitis. Most of the survey participants recognized bacterial biofilm as the main etiological factor of peri-implant diseases, and recommend oral hygiene instructions, an antimicrobial gel/mouth rinse, non-surgical debridement and control of occlusion/tensions in the suprastructure for their management. A significant heterogeneity was recorded in relation to the instruments used for debridement/detoxification, use of systemic antibiotics, use and type of surgical treatment (debridement/resective/regenerative), and materials used for regeneration. 78.1% believe that the best maintenance frequency for peri-implantitis is every 3 months and 60.2% that radiographic evaluation after treatment must be conducted at 6 months. 59.4% of US periodontists consider current management of peri-implant diseases as moderately effective, while only 5.1% believe that treatment is very effective.

Conclusions: The results of this survey provide further evidence that peri-implant diseases are a frequently encountered problem in clinical practice and that the absence of a standard therapeutic protocol results in significant empirical use of therapeutic modalities and a moderately effective treatment outcome. Further research in the pathogenesis and therapeutic management of peri-implant diseases is strongly encouraged.

Wdr43, a Ribosome Biogenesis Factor, Regulates Zebrafish Neural Crest Development
Chengtian Zhao1,2, Viktoria Andreeva1, Yann Gibert1, Melissa LaBonty1, Victoria Lattanzi1, Shubhangi Prabhudesai1, Yi Zhou3, Kathleen L. McCann2, Susan Baserga4,5, Leonard Zon3, Claire McCarthy*1 and Pamela C. Yelick1, (1Department of Oral and Maxillofacial Pathology, Division of Craniofacial and Molecular Genetics, Tufts University, Boston MA, 2Institute of Evolution and Marine Biodiversity, Ocean University of China, Qingdao, China, 3Children’s Hospital Boston and Harvard Medical School, Boston MA, 4Department of Genetics, Yale School of Medicine, 5Departments of Molecular Biophysics & Biochemistry and Therapeutic Radiology, Yale School of Medicine)

During vertebrate craniofacial development, neural crest cells (NCCs) contribute to most of the craniofacial pharyngeal skeleton. Defects in NCC specification, migration and differentiation resulting in malformations in the craniofacial complex are associated with several human craniofacial disorders including Treacher-Collins Syndrome, caused by mutations in Tcof1. It has been hypothesized that upregulated p53 signaling induced by ribosome biogenesis defects are the main cause of the observed cell death of NCC progenitors in mouse Tcof1mutants. However, the underlying mechanisms linking ribosome biogenesis and NCC development remain
poorly understood. Here we report a new zebrafish mutant, \textit{fantome} (\textit{fan}), characterized by early NC developmental defects and mutation of zebrafish \textit{wdr43}, the ortholog to yeast Utp5.

\textbf{Objectives:} 1) To characterize the role of wild type and \textit{fan} mutant Wdr43 on Tcof1 subcellular localization. 2) To determine the effects of \textit{fan} mutant Wdr43 on p53 signaling.

\textbf{Methods:} a) Wild type and \textit{fan} mutant \textit{wdr43-GFP} expression constructs were created using Gateway cloning approaches. 293-T cells were transfected with each, and with B23-RFP constructs to mark nucleoli. IHC analysis using anti-GFP, anti-Wdr43, and anti-B23 antibodies was then conducted. b) Y2H analysis was performed to determine the binding of wild type and \textit{fan} mutant Wdr43 to other nucleolar proteins. c) p53 signaling marker expression was quantified in \textit{fan} mutants and wild type siblings via qRT-PCR and immunohistochemistry (IHC) using the mouse monoclonal antibody ZFp53-5.1. d) Wild type and \textit{fan} zebrafish were treated with Roscovitine (a known p53 upregulator) or a DMSO control and visualized using immunofluorescent IHC.

\textbf{Results:} a) Wild type Wdr43-GFP localizes to nucleoli, while \textit{fan} mutant Wdr43-GFP protein mis-localizes to the entire nucleus. Full length and C-terminal Wdr43/Utp5 bind to Utp5 and Utp15. In contrast, \textit{fan} mutant Wdr43/Utp5 does not bind to either Utp4 or Utp15. b) p53RNAs are upregulated \textit{fan} mutants relative to their wild type siblings. c) \textit{fan} mutants exhibit ribosome biogenesis defects.

\textbf{Conclusions:} The C-terminus of Wdr43, which is absent in \textit{fan} mutant Wdr43, is both necessary and sufficient to mediate nucleolar localization and protein interaction in metazoans. Wdr43 plays a key role in ribosome biogenesis, and in nucleolar fusion. NCC defects observed in \textit{fan} mutants are associated with upregulated p53 signaling. Proper nucleolar localization of Tcof1 is dependent on that of Wdr43. Together, our findings provide new insight into roles for Wdr43 in ribosome biogenesis and craniofacial development, and also into ribosomopathy-induced craniofacial phenotypes including Treacher-Collins Syndrome. This research was supported by NIH/NIDCR R01 DE018043 (PCY) and NIH GM52581 (SJB).

\section*{Oral Health and Body Mass Index of Intellectually/Developmentally Disabled Adults}
Natalie McClain*, Angel Park, Kathryn Dolan, John Morgan

\textbf{Objectives:} National data support that intellectually/developmentally disabled (IDD) patients have disproportionately poor oral health. Limited data are available exploring body mass index (BMI), oral health and type of residence in IDD adults. The objective of this study was to investigate BMI and untreated caries, and BMI and type of residence in the IDD adult population.

\textbf{Method:} Demographic and clinical data (including height and weight) were collected from axiUm electronic health records of IDD adults aged 20 and older who received a dental exam between April 1, 2009 and March 31, 2010. Accepted formula BMI=(weight/height²) x703 was calculated to explore associations using chi-square tests of BMI (1=underweight, 2=normal weight, 3=overweight, 4=obese, 5=morbidly obese), untreated caries and type of residence (community setting, living with family, state facility, independently, nursing home, other).

\textbf{Results:} Data for 2714 individuals were available to calculate BMI. The prevalence of untreated caries by BMI category varied significantly (chi-sq. p<.001): underweight (27.3%); normal weight (27.3%); overweight (34.4%); obese (40.3%); morbidly obese (47.3%). Crude association of BMI categories and type of residence (chi-sq. p<.001) resulted in a “normal weight” prevalence of: (24.5%) living independently; (29.6%) living with family; (32.8%) other; (35.9%) community setting; (43.4%) state facility; (54.5%) nursing home. Obesity was most prevalent in people living independently (32.1%).

\textbf{Conclusion:} The prevalence of untreated caries increased with increasing BMI categories in the study population. Of the 5 BMI categories, morbidly obese patients had the greatest prevalence of untreated caries. Those living independently had the highest prevalence of obesity. Further investigation of BMI and type of residence may assist in identifying risk factors for dental caries in IDD adults.

This study was supported in part by grant 1RC1DE020396 from the National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, Md.
Dentin Shear Bond Strength of RMGI Cements

Kyler McEwen*1, Matthew Finkelman1, Chase Larsen1, Masly Harsono1, Angel Park1, R. Tuttle2, Gerard Kugel1

1Tufts University School of Dental Medicine, Boston, MA., 2Ultradent Products, Inc., South Jordan, UT.)

Objectives: To compare shear bond strength (SBS) of five resin-modified glass ionomer (RMGI) cements to zirconia and when used in conjunction with a self-etching bonding agent.

Methods: One hundred twenty non-caries extracted human molars were sectioned longitudinally to produce 240 specimens; each embedded in acrylic resin and polished with 600-grit grinder to expose dentin. A 3.24mm diameter sand blasted zirconia button was cemented onto the dentin surface. Five groups were created using a different RMGI cement for each group and the samples were incubated in water for 24 hours at 40°C. The process was repeated, and five additional groups were incubated for 72 hours. In five additional groups a layer of Peak Universal Bond (PUB), used as a self-etch, was applied and cured for 10 seconds (Valo Cordless, Ultradent) before cementing a zirconia button with a different RMGI cement for each group and incubating in water for 24 hours. SBS testing was performed on an Ultra Tester machine (Ultradent, 91043/KB3) at a crosshead speed of 1mm/min. Mode of failure was observed at the dentin-cement interface using a stereo microscope. Normal distribution among the samples was determined using the Kolmogorov-Smirnov test. A one-way ANOVA was used to test the SBS among the different cements. Pairwise differences were determined using post-hoc Tukey tests. An independent samples t-test was used to compare SBS of bonded and non-bonded samples. Statistical significance was determined at p<0.005.

Results:

<table>
<thead>
<tr>
<th>Group (n=24/group)</th>
<th>Material</th>
<th>Mean Shear Bond Strength (MPa±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>*1 Day</td>
</tr>
<tr>
<td>1</td>
<td>UltraCem (Ultradent)</td>
<td>7.55 ± 3.70a</td>
</tr>
<tr>
<td>2</td>
<td>GC FujiCEM Automix (GC Corp.)</td>
<td>4.87 ± 2.49b,c</td>
</tr>
<tr>
<td>3</td>
<td>GC Fuji Plus Capsule (GC Corp.)</td>
<td>6.69 ± 4.00a,c</td>
</tr>
<tr>
<td>4</td>
<td>Rely X Luting Plus (3M)</td>
<td>3.39 ± 2.88b</td>
</tr>
<tr>
<td>5</td>
<td>Meron Plus AC (VOCO)</td>
<td>4.89 ± 2.21b,c</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>Material</th>
<th>Mean Shear Bond Strength (MPa±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>*Non-bonded (n=24/group)</td>
</tr>
<tr>
<td>1</td>
<td>UltraCem (Ultradent)</td>
<td>7.55 ± 3.70</td>
</tr>
<tr>
<td>2</td>
<td>GC FujiCEM Automix (GC Corp.)</td>
<td>4.87 ± 2.49</td>
</tr>
<tr>
<td>3</td>
<td>GC Fuji Plus Capsule (GC Corp.)</td>
<td>6.69 ± 4.00</td>
</tr>
<tr>
<td>4</td>
<td>Rely X Luting Plus (3M)</td>
<td>3.39 ± 2.88</td>
</tr>
<tr>
<td>5</td>
<td>Meron Plus AC (VOCO)</td>
<td>4.89 ± 2.21</td>
</tr>
</tbody>
</table>

*Note that 1 Day values and Non-bonded values are the same data set

Conclusion: In the 1 day trial, groups 1 and 2 yielded higher SBS than groups 3, 4, and 5. In the 3 day trial, group 1 yielded statistically higher SBS values compared to all other groups. When PUB was applied prior to cementation, SBS values were statistically higher in all groups except group 2.

Research sponsored by Ultradent.
Contact Angle and Shear Bond Strength Tests of Silane Primers
Amanda M. Merikas*1, and L. Chen2,1Tufts University, School of Dental Medicine, Boston, MA, 2Research and Development, BISCO, Inc, Schaumburg, IL

Objectives: To investigate commercial silane primer efficacy through contact angle measurements, shear bond strength (SBS) test methods.

Methods: Five silane-containing primers were used (Porcelain Primer (Bisco), RelyX Ceramic Primer (3M ESPE), Monobond Plus (Ivoclar Vivadent), Kerr Silane (Kerr), Scotchbond Universal (3M ESPE)). Primers were applied to wet polished (320-grit-SiC paper), etched (Bisco Porcelain Etchant, 4%HF, 25sec) lithium disilicate (IPS e.Max), undisturbed (5min), cleaned by ethanol bath ultrasonication (2min), dried. Contact angles were measured with contact angle meter (NRL-CA Goniometer, NJ). SBS tests were completed on polished, polished/etched ceramics with dual-cure resin cement (Duolink, Bisco, light-cure, 40sec/500mW/cm²) with ultradent jig method (bonding area=4.5mm²), stored in de-ionized water (24hr/37 °C), tested until failure using Instron 4466 (speed=1mm/min).

Results:

<table>
<thead>
<tr>
<th>Primer</th>
<th>Contact Angle, degrees (SD), n=12</th>
<th>SBS-polished, MPa (SD), n=12</th>
<th>SBS-etched, MPa (SD), n=16</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Primer-Control</td>
<td>11.8 (2.1)d</td>
<td>2.8 (3.0)e</td>
<td>17.5 (4.2)c</td>
</tr>
<tr>
<td>3M-ESPE-ScotchBond Universal</td>
<td>11.3 (2.3)d</td>
<td>6.6 (1.2)d</td>
<td>24.6 (5.8)b</td>
</tr>
<tr>
<td>Kerr</td>
<td>14.5 (3.4)d</td>
<td>7.6 (4.3)c</td>
<td>22.5 (5.1)b</td>
</tr>
<tr>
<td>Ivoclar Vivadent</td>
<td>41.9 (7.3)c</td>
<td>12.3 (4.8)c</td>
<td>18.9 (8.5)b</td>
</tr>
<tr>
<td>3M-ESPE-RelyX</td>
<td>68.8 (7.9)b</td>
<td>30.0 (5.1)a</td>
<td>36.3 (10.7)a</td>
</tr>
<tr>
<td>Bisco</td>
<td>84.0 (7.5)a</td>
<td>21.0 (7.6)b</td>
<td>38.5 (7.7)a</td>
</tr>
</tbody>
</table>

Within columns, results with varying superscripts are statistically different (p<0.01).

Conclusions: Silane primers without additives (BISCO Porcelain Primer, RelyX Ceramic Primer) demonstrated the highest contact angle measurements. Silanes with additives (extra resin in Kerr Silane, Scotchbond Universal, or acidic monomer in Monobond Plus) demonstrated contact angles and SBS significantly lower than silane primers without additives, or results not statistically different from control samples. Contact angle and SBS results indicated that use of additives such as resins and/or phosphate monomers to silane appears to inhibit silane interaction.

Optimal Silk Coating Parameters for Dental Implants
Courtney Michelson1, R. Elia2, Austin Ferera1, Masly Harsono1, Gary Leisk3, H-P. Weber1, David Kaplan2, Matthew Finkelman1, and Gerard Kugel1 (1Tufts University, School of Dental Medicine, Boston, MA. 2Tufts University, Department of Biomedical Engineering, Medford MA. 3Tufts University, Mechanical Engineering Department, Medford, MA)

Objective: To assess reproducibility and adherence of a novel silk protein-based dental implant coating thickness via electrogel (e-gel) formation methods to devise standardized procedures for eventual use on dental implants.

Methods: Silk fibroin protein was extracted, purified, and solubilized as a biocompatible protein solution for coatings. Two procedures were used to coat stainless-steel shims: direct e-gel (electrogelation) formation on the devices or dip coating to form thin coatings. For direct gelation, e-gels were uniformly deposited onto shims for various times. For dip coating, e-gels were melted in a temperature-controlled oven maintaining the melted state of the e-gel while dip coating. Z-wick-universal-testing-machine was programmed to controllably dip the shims into silk solution. For both coating procedures two protein concentrations 5% and 10% (w/v) were evaluated. Gels were dried overnight prior to thickness measurement and analysis. In a concurrent study, Straumann SLActive implants were randomly divided into groups designed to mimic implant placement conditions: (1) placement into acrylic blocks; (2) dry BoneSim; and (3) wet BoneSim. Acrylic blocks and BoneSim were cut into two pieces and
the center drilled to 3.5mm using appropriate dental implant drill bits. Based on previous findings, e-gels were placed directly on the implants for 5 seconds creating a uniform coating layer. Coated implants were drilled into clamped blocks which when separated allowed undisturbed implant removal. Delamination of the coating was determined by comparing original coverage area to the remaining silk layer after implant insertion. Statistical analysis was calculated using One-way ANOVA with significance at p<0.05.

**Results:** (Mean ± SD)

<table>
<thead>
<tr>
<th>Direct E-Gel (n=5)</th>
<th>Silk Concentration</th>
<th>5sec</th>
<th>15sec</th>
<th>30sec</th>
<th>45sec</th>
<th>60sec</th>
<th>120sec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
<td>89±18.5um</td>
<td>271±44.5um</td>
<td>393±27.5um</td>
<td>465±32.4um</td>
<td>533±17.1um</td>
<td>1118±136um</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>171±55.3um</td>
<td>210±12.7um</td>
<td>358±62.7um</td>
<td>523±49.3um</td>
<td>646±65um</td>
<td>1654±148um</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Melted Dip Coating (n=3)</th>
<th>Silk Concentration</th>
<th>1 dip</th>
<th>5 dips</th>
<th>10 dips</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
<td>37±20.8um</td>
<td>90±26.4um</td>
<td>180±127.2um</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>35±5.0um</td>
<td>163±83.2um</td>
<td>450±181.9um</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Delamination of Coating (n=5)</th>
<th>% Silk Coating Remaining After Insertion (Mean±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acrylic Block</td>
</tr>
<tr>
<td>2</td>
<td>Dry BoneSim</td>
</tr>
<tr>
<td>3</td>
<td>Wet BoneSim</td>
</tr>
</tbody>
</table>

**Conclusions:** 5 seconds of direct electro-gelation in 10% silk concentration produced coatings with suitable silk thickness for eventual implantation. These parameters were then used to demonstrate the excellent adhesion of the silk coatings to the implant surface and minimal delamination after insertion into simulated sockets.

**Comparing Composite Wear Rates in Simulated Oral Media**

Michael Neglia*, Nicholas Freda, Gerard Kugel, Ronald Perry, Angel Park

**Objectives:** To investigate the early three bodied erosion wear often composites in a simulated contact free area (CFA).

**Methods:** Ten marketed composites were tested: Aura Dentin and Aura Enamel (AUD, AUE SDI), Durafill VS (DVS, Heraeus Kulzer), Esthet-X HD (EXHD, Dentsply), Filtek Supreme XTE (FSXTE, 3M ESPE), Kalore (GCK, GC Dental), Grandio (GRO, Voco), Herculite Ultra (HUE, Kerr), TPH³ (TPH3, Dentsply), Vivadent Tetric EvoCeram (VTEC, Ivoclar). The experiment was performed using the ACTA wear machine. The ten composites were mounted on a brass specimen wheel and sanded to proper accommodations. A wear tract to which tracings were to be measured was then established on each brass wheel via an antagonist wheel. Each brass specimen wheel was then exposed to a different medium with a spring force of 15N applied to the brass wheels. Mediums consisted of a neutral control solution, basic enzyme solution, and an acidic solution. Mixed in each medium was a solution consisting of slurry of rice and millet seed shells to simulate a bolus of food. Each specimen was exposed to 200000 cycles and then measured with Mitutoyo SJ-400 Profilometer. A repeated measures model was created with composite and solution predicting the measurement value along with Tukey HSD tests for multiple comparisons (SAS, version 9.2).
Results:
Wear Values at 200,000 cycles [Mean(SD)]

<table>
<thead>
<tr>
<th></th>
<th>AUD</th>
<th></th>
<th>AUD</th>
<th></th>
<th>AUD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>57.5(2.01)</td>
<td>59.5</td>
<td>59.5(2.77)</td>
<td>56.7</td>
<td>56.7(2.89)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>93.4(5.07)</td>
<td>94.4</td>
<td>94.4(5.23)</td>
<td>98.3</td>
<td>98.3(3.19)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>74.2(1.17)</td>
<td>73</td>
<td>73(2.16)</td>
<td>89.2</td>
<td>89.2(2.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>54.7(1.1)</td>
<td>54.8</td>
<td>54.8(2.35)</td>
<td>50.4</td>
<td>50.4(1.88)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28.7(0.54)</td>
<td>31.7</td>
<td>31.7(0.83)</td>
<td>29.5</td>
<td>29.5(0.87)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75.3(4.89)</td>
<td>76.5</td>
<td>76.5(3.93)</td>
<td>82.8</td>
<td>82.8(2.78)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>41.6(1.05)</td>
<td>44.2</td>
<td>44.2(0.71)</td>
<td>37.8</td>
<td>37.8(1.95)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55.6(2.42)</td>
<td>52.4</td>
<td>52.4(2.1)</td>
<td>59.1</td>
<td>59.1(3.35)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>63.9(2.13)</td>
<td>62</td>
<td>62(1.1)</td>
<td>72.7</td>
<td>72.7(2.72)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64.6(2.12)</td>
<td>72.4</td>
<td>72.4(4.38)</td>
<td>71.5</td>
<td>71.5(4.7)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Statistical analysis showed that the overall model and each composite compared to the full model were significant (p<.0001). Of all composites tested, 3M ESPE Filtek Supreme showed to have the lowest wear in all three mediums. The environment in the oral cavity may have an influence on how composite restorations wear over time.

Growth Factor Secretion and In Vitro Repair Potential of Diabetic Foot Ulcer Fibroblasts
Joann O'Brien¹, Yulia Shamis², Elana Knight², Vanessa Yazes², Avi Smith¹, Julia Caine¹, Behzad Gerami-Naini¹ & Jonathan A. Garlick¹,² (¹Department of Oral and Maxillofacial Pathology, Tufts University School of Dental Medicine, Boston, MA, ²Program in Cell, Molecular and Developmental Biology, Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine, Boston, MA)

Objectives: The long-term goal of this study is to develop stem cell therapies that are capable of treating diabetic foot ulcerations. The main aim of the current study was to determine which patient-derived diabetic foot ulcer fibroblasts might be repair-deficient based on their growth factor profiles. Following my study, repair-deficient fibroblasts will be reprogrammed to induced pluripotent stem cells (iPSCs) that may improve diabetic ulcer healing due to their enhanced biological signaling ability.

Methods: Skin biopsies were obtained from diabetic ulcers, non-lesional diabetics, and site-matched controls from Beth Israel Deaconess Medical Center with IRB approval. These types of tissues were sampled: diabetic foot ulcers (DFU), non-diabetic foot ulcers (DFF), and site-matched normal skin (NFF). Fibroblasts were expanded and banked. Serum free media was added to confluent cultures and cells were allowed to incubate for 24 hours until cell culture supernatants were collected. Cell lines were analyzed via ELISA in both biological and technical triplicates. A DuoSet ELISA Development kit (R&D Systems, Minneapolis, MN, USA) was used to test for growth factors that are secreted by fibroblasts including: HGF, PDGF-BB, IGF1, VEGF, IL-6, IL-8, G-CSF, FGF2, KGF, and TNF-a. Optical density was detected at A₄₅₀ in the ELISA plate reader machine and the average concentration readings were normalized to cell numbers prior to analysis.

Results: Three inflammatory growth factors, HGF (hepatocyte growth factor), IL-6 (interleukin-6), and IL-8 (interleukin-8), showed significant differences between DFU, DFF, and control NFF. These growth factors were
decreased in diabetic cell lines (DFU and DFF) when compared to the non-diabetic controls (NFF). DFU cell lines 7 and 8 were identified as repair-deficient fibroblast cell lines based on their decreased inflammatory growth factor secretion. DFF cell lines 4, 9, and 10 showed lower levels of cytokines than DFU, but higher than NFF. NFF cell line 12 had elevated amounts of growth factors on a consistent basis. Data from RT-PCR, flow cytometry, and migration assays were used in combination to help determine which cell lines would be best to reprogram into iPSCs.

**Conclusion:** Growth factors are well known to contribute to patterns of cell activation in healing wounds. We found that HGF, IL-6, and IL-8 secretion were decreased in diabetic ulcers and diabetic non-ulcers when compared to the non-diabetic controls. This decrease in growth factor production may contribute to the abnormal wound healing seen in diabetics since growth factors influence the cross talk that occurs between cells in wound healing. I expect that these studies will lay the groundwork for the translation of *in vitro* and animal studies into future clinical treatments. The next step is to reprogram these repair deficient cell lines from a non-healing to a healing phenotype.

Supported by NIH Grant #RO1 DK98055-06A1 and the TUSDM Dean’s Scholars Program

**Adherence of Silk Coatings to Titanium Treatments**

Austin Perera*,1, Courtney Michelson1, Roberto Elia2, Masly Harsono1, Gary Leisk3, Racquel Legeros4, David Kaplan2, and Gerard Kugel1 (1Tufts University, School of Dental Medicine, Boston, MA. 2Tufts University, Department of Biomedical Engineering, Medford MA. 3Tufts University, Mechanical Engineering Department, Medford, MA. 4New York University, College of Dentistry, Department of Biomaterials and Biomimetics)

**Objectives:** To evaluate techniques to maximize adhesion and integrity of a silk-based dental implant coating in an aqueous environment.

**Methods:** Fifty commercially pure 7mm diameter titanium studs were split into treatment groups, each consisting of 5 samples. Silk fibroin was extracted and purified to generate biocompatible protein solutions of either 5% or 10% (w/v). The solutions were pipetted onto one stud face, and a platinum wire was lowered into the droplet surface. A current was passed through the solution resulting in gel deposition on the stud. A second stud was adhered atop the gel and dried for 24 hours. The adhered studs were pulled apart in an Instron machine to test tensile strength.

To study protection against dissolution of the coating in saline, one treatment group was water annealed for 24 hours. Half of the group was tested in air and half submerged in saline for 5 minutes prior to testing. Additionally, adhesion strength was tested on varying titanium surface roughness and a fluorohydroxyapatite (FHA) coating. Statistical analysis was conducted through independent T-tests and one-way ANOVA tests. Significance differences were predetermined at p<0.5.

**Results:** (10% droplet deposition silk coating unless specified; superscripts indicate statistically significant differences.)

<table>
<thead>
<tr>
<th>Silk concentration</th>
<th>Tensile Strength (MPa ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>0.40 ± 0.10^a</td>
</tr>
<tr>
<td>10%</td>
<td>1.18 ± 0.32^b</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coating method</th>
<th>Tensile Strength (MPa ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Droplet deposition onto stud</td>
<td>1.18 ± 0.32^c</td>
</tr>
<tr>
<td>Melted gel onto stud</td>
<td>0.93 ± 0.30^c</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water annealing</th>
<th>Tensile Strength (MPa ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No annealing, no saline</td>
<td>1.18 ± 0.32</td>
</tr>
<tr>
<td>No annealing, 5 minute saline soak</td>
<td>0.12 ± 0.08^d</td>
</tr>
<tr>
<td>Water annealed, no saline</td>
<td>0.83 ± 0.29</td>
</tr>
<tr>
<td>Water annealed, 5 minute saline soak</td>
<td>0.40 ± 0.07^e</td>
</tr>
</tbody>
</table>

Tensile strengths based on titanium surface modification (MPa ± SD).

<table>
<thead>
<tr>
<th>Machined (0.1μm Ra)</th>
<th>Grit blasted (0.8μm Ra)</th>
<th>Grit blasted (1.5μm Ra)</th>
<th>FHA coated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.18 ± 0.32^t</td>
<td>1.57 ± 0.39^t</td>
<td>1.09 ± 0.15^t</td>
<td>1.09 ± 0.21^t</td>
</tr>
</tbody>
</table>
Conclusions: These new techniques increased tensile bond strength and protected against dissolution in a saline environment. The results show promise for the application of silk protein coatings on dental implants, including hydroxyapatite-coated systems.

Using 3-D Imaging Software to Measure Marginal/Internal Fit of All-Ceramic Crowns
Jeremy R. Plourde*, Masly Harsono, John Orfanidis, Gerard Kugel

Objective: To use 3-D scanning and imaging software to evaluate the in vitro marginal and internal fit of all-ceramic crowns produced using the E4D Dentist™ (D4D Technologies) CAD/CAM system.

Methods: Extracted mandibular first molar was prepared to receive an all-ceramic crown. Preparation had well-defined, rounded shoulder, ~2 mm occlusal reduction, rounded internal angles, and less than 20° total occlusal convergence. Small indentations were made on root of tooth as a plane of sectioning. Tooth was scanned 30 times using E4D CAD/CAM system and 30 all-ceramic crowns were milled. Thirty impressions of prepared tooth were taken using VPS and 30 die stone models poured. Dies and crowns were scanned separately and together using Activity 880 (smartoptics) optical scanner. Digital images of dies and crowns were aligned using DentalCAD (exocad GmbH) software. DentalCAD was used to section the digital samples buccolingually in a consistent plane using the root indentations as guidance. Measurements of the space between die and crown were taken on 3 locations per buccal and lingual side of section: Marginal-edge, mid-axial wall, and cusp-tip. One measurement was made on occlusal table. Mean measurements at each location were calculated.

Results: Mean fits at various locations of prep are shown in Table 1.

Table 1: Space between die and crown measured at marginal and internal locations (n=30).

| Measurement Location | Buccal | | | Lingual | |
|----------|----------|----------|----------|----------|
|                      | Margin   | Mid-Axial | Cusp     | Occlusal Table | Cusp     | Mid-Axial | Margin   |
| Mean Thickness (µm ± SD) | 174.77 ± 80.46 | 66.50 ± 30.16 | 121.17 ± 64.66 | 193.07 ± 54.42 | 124.03 ± 50.62 | 103.37 ± 33.79 | 165.97 ± 43.09 |

Conclusions: Marginal and internal fits determined using the non-destructive digital scanning technique were comparable to values found in previous studies using a destructive sectioning measurement technique.

E-Cadherin Suppression Alters Dab2-Mediated Endocytosis in Squamous Cell Carcinoma Cells
Shruti Pore*, Elizabeth Bingham, Tanja Petnicki-Ocwieja, Jonathan Garlick, James Baleja, and Addy Alt-Holland

Objectives: Advanced stages of Squamous Cell Carcinoma (SCC) are linked to loss of E-cadherin-mediated cell-cell contacts; however, the mechanisms that direct the transition of premalignant lesions to carcinomas are still elusive. Disabled-2 (Dab2) protein is a candidate to regulate this transition by controlling the endocytosis of surface proteins involved in cell adhesion and proliferation. We have shown that Dab2 is down-regulated in human bioengineered epithelial tissues and tumors harboring E-cadherin-suppressed SCC cells. Here we investigated the effect of E-cadherin loss on the localization and expression of key proteins in Dab2-mediated endocytosis.

Methods: The cellular distribution and expression of endocytic proteins in fixed human E-cadherin-competent- and E-cadherin-suppressed SCC cell cultures was determined by immunofluorescence analysis. Localization of acidified vesicular compartments was visualized by Lysotracker Red-fluorescent probe in live tumor cells.
Results: We first examined the expression and localization of critical proteins involved in endocytosis of surface proteins, prior to integration with lysosomal compartments. Dab2, Rab5 and Rab11 showed a weak perinuclear staining in E-cadherin-suppressed SCC cells, and intense staining throughout the cytoplasm of E-cadherin-competent cells. We next analyzed the distribution of acidified vesicular compartments in live cell cultures. These compartments were found in proximity to the nuclei of E-cadherin-suppressed cells, whereas they spread from the plasma membrane to the perinuclear area in E-cadherin-competent cells.

Conclusions: This study provides new insights into the consequences of E-cadherin loss in epithelial cells with malignant potential. It indicates that the tumor-promoting effect of E-cadherin suppression is associated with altered Dab2-mediated endocytosis and trafficking of acidified compartments that can affect, at least in part, tumor cell adhesion, motility and invasion. Thus, Dab2 may be a biomarker for SCC development in the human skin and in life-threatening epithelial cancers, such as oral cancer.

A “Tufts Collaborates!” grant awarded to Drs. Alt-Holland and Baleja funded this study.

Remineralization Efficacy of Different Concentrations of Xylitol Gum
Kasun Rajapaksha*, Matthew Finkelman, Masly Harsono, Gerard Kugel, and Ronald D. Perry

Objective: To observe the efficacy of chewing gum with different Xylitol concentrations on demineralized enamel using hardness testing.

Methods: 45 extracted, caries free human teeth were obtained for this study. Teeth were sectioned into approximately 4mm x 4mm squares thickness and embedded in resin. Samples were polished up to 1um using texmet polishing cloth (Buehler,IL). All samples were immersed in 10mL of a 2.2 mM CaCl2, 2.2 mM KH2PO4, 0.05M acetic acid solution (Ten Cate) for 96 hours at 37°C to create the artificial demineralized lesion. Samples were randomly assigned to three groups (n=15). Two chewing gums products were tested: Gum 1 - Xylitol (Epic Industry) and Gum 2 - Orbit (Wrigley’s). Samples were place into the centrifuge tube with artificial saliva solution. The chewing gums and artificial saliva were changed daily for 14 days. The enamel hardness was carried out using Vickers indenter with 100 gf and 10 seconds dwelling time. Statistical analysis was conducted using one-way ANOVA. Statistical differences were predetermined at p<.05.

Results:

<table>
<thead>
<tr>
<th></th>
<th>(VHN+SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>44.51 + 18.87a</td>
</tr>
<tr>
<td>Gum 1</td>
<td>121.12 + 48.082b</td>
</tr>
<tr>
<td>Gum 2</td>
<td>65.26 + 27.64ab</td>
</tr>
</tbody>
</table>

Conclusion: Both chewing gums showed significantly better than the control group. However, there was no significant hardness difference between the Orbitol and Xylitol chewing gum groups.

Effect of Loupes on Ocular Blue Light Hazard: Indirect Viewing
Errol N. Ramos*1, Judyth G. Lee1, R.B. Price2, Ronald D. Perry1, Daniel Labrie3, and B. Sullivan2, (1School of Dental Medicine, Tufts University, Boston, MA, 2Dept. of Clinical Dental Sciences, Dalhousie University, Halifax, NS, Canada, 3Physics and Atmospheric Science, Dalhousie University, Halifax, NS, Canada)

Objectives: This study measured the effect magnification loupes have on the 'blue light hazard' when a curing light is viewed indirectly.

Methods: Loupes with 3.5x magnification (Design for Vision [DFV], Carl Zeiss [CZ], Quality Aspirator [QA]), and 2.5x magnification (DFV and QA) with were tested over three days. The loupes were placed at the entrance to an integrating sphere connected to a spectrometer (USB 4000, Ocean Optics). A typodont with human teeth was placed 40cm away and in line with this sphere. A Sapphire Plus (Den-Mat) curing light was positioned at a 45 degree angle from the facial of tooth #9. The spectral radiant power reflected from the teeth was recorded 5 times both with and without the loupes over the entrance into the sphere. The angular subtense of the experiment was 0.02 radians. The maximum permissible
cumulative exposure times in an eight-hour day were calculated using guidelines set by the American Conference of Industrial Hygienists (ACGIH). Weighted blue light irradiance values were compared between the brands of loupes using Fisher's PLSD, $\alpha=0.05$.

**Results:** Weighted blue irradiance values were significantly different for each brand of loupe ($p<0.05$) and were up to 8 times greater at the pupil than without loupes. However, since the resulting images are now 2.5 to 3.5x larger on the retina, the effective blue light hazard was reduced compared to without the loupes.

<table>
<thead>
<tr>
<th>Brand</th>
<th>No Loupes</th>
<th>QA 2.5x</th>
<th>DFV 3.5x</th>
<th>No Loupes</th>
<th>DFV 2.5x</th>
<th>QA 3.5x</th>
<th>No Loupes</th>
<th>CZ 3.5x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighted Irradiance (mW/cm²)</td>
<td>0.053</td>
<td>0.13</td>
<td>0.33</td>
<td>0.054</td>
<td>0.17</td>
<td>0.43</td>
<td>0.049</td>
<td>0.25</td>
</tr>
<tr>
<td>Max. Daily Exposure Time (seconds)</td>
<td>593</td>
<td>1508</td>
<td>1167</td>
<td>582</td>
<td>1153</td>
<td>895</td>
<td>1540</td>
<td>641</td>
</tr>
</tbody>
</table>

**Conclusions:** Without loupes, at 40cm distance, the maximum cumulative daily exposure time to light reflected from the tooth was approximately 10 minutes. This maximum is unlikely to be reached in the dental office. All the loupes increased the irradiance received at the pupil. Although the irradiance received by the eye was greater, the maximum cumulative daily exposure time was increased. Further studies are required on the ocular hazards of loupes and the effects of other curing lights.

**Analyzing the Trends and Associated Management Outcomes of Oral Lesions and Medication Regimens among the HIV-Positive Patient Population at Tufts**

*University School of Dental Medicine*

Jaskaren Randhawa*, Diana Esshaki, Paul Stark, Angel Park, Kanchan Ganda

**Objective:** The objective of the study was to determine the incidence and type of oral lesions at different levels of immunity, as well as oral lesions in the presence and absence of anti-retroviral (ARV) treatment among Ryan White HIV-positive patients at the Tufts University School of Dental Medicine (TUSDM) undergraduate clinic.

**Methods:** A retrospective analysis of HIV-positive patients that were Ryan White grant participants and received treatment at TUSDM undergraduate clinic from September 1, 2011 to September 1, 2012 was conducted. Axium electronic health records were utilized for data collection and all data was exported to SAS for analysis. The study population was analyzed based upon the following factors: demographics, lab values, medication regimens, oral conditions and co-morbidities; all of which were identified by reviewing the Comprehensive Health History, Record of Examination and Medical Consult forms on Axium.

Demographics included: age, sex, race, smoking status and type of insurance. Lab values, which were used as indicators of each patient’s level of immunity included: absolute neutrophil count (ANC), white blood count, viral load levels and CD4 lymphocyte count. The immunity status and stage of HIV of each patient was classified into three groups according to their respective CD4 count values: CD4 less than 200 cells/mm³, which indicated severe immunosuppression and the diagnosis of Acquired immune deficiency syndrome (AIDS), CD4 200-500 cells/mm³, which indicated moderate immunosuppression and CD4 500-1,000 cells/mm³, which represented a normal CD4 count.

Identified medication regimens consisted of anti-retrovirals (ARVs), anti-virals, anti-fungals and antibiotics. The incidence of the following most common HIV-associated oral conditions were assessed: oral candidiasis, hairy leukoplakia, kaposi’s sarcoma, HPV-associated warts, necrotizing stomatitis, lichen planus, herpes simplex lesions, and recurrent apthous ulcers. Co-morbidities that may influence a patient’s immune status were identified.

**Results:** The study population consisted of 89 Ryan White Grant recipients ranging from 20 to 64 years old with a mean age of 45 years old. Approximately 65.17% of patients were white and 83% were male. The insurance
distribution was as follows: 50.56% of the population received MassHealth benefits, 37.08% were self-pay and 12.36% had private dental insurance. Due to the lack of consistency and standardization in the reporting of ANC, WBC and viral load values, CD4 was used as the sole immunity defining criteria. As indicated by the CD4 count, 36.5% of the study population was immunocompromised, with 4.71% categorized as severely immunosuppressed and 31.76% categorized as moderately immunosuppressed. It was determined that 96.4% of all participants were undergoing ARV treatment with a mean of 2.26 ARVs. Of those receiving ARV therapy 4.76% had CD4 counts less than 200 cells/mm³, 30.05% had CD4 counts between 200-500 cells/mm³, and 51.85% had CD4 counts between 500-1,000 cells/mm³.

Oral lesions were observed in 24 of 89 (27%) of HIV positive patients. These oral lesions included: Herpes Simplex (7.87%), oral candidiasis (4.49%), kaposi sarcoma (4.49%), hairy leukoplakia (3.37%), HPV associated warts (2.25%), stomatitis (2.25%), lichen Planus (1.12%) and aphthous ulcers (1.12%). Among patients that were receiving ARV treatment 78.82% not experience any common HIV-associated oral conditions while 33% of those not receiving ARV treatment experienced these oral conditions.

Co-morbidities were observed in 75 of 89 (84.3%) of all study subjects. The mean number of co-morbidities each patient experienced was 4.12 with an interquartile range between 2 and 6. Depression (44%) was the most frequently observed co-morbidity among the study population. Other co-morbidities included: hypertension (35%), hepatitis (24%), anxiety (22.7%), AIDS (15%), history of cancer (17.3%), asthma (12%), anemia (12%), hypercholesterolemia (9.3%), herpes zoster (9.3%), bipolar disorder (8%), gastroesophageal reflux disease (6.7%), diabetes (5.3%), and genital herpes (5.3%).

Conclusion: Due to the small sample size the study served as a descriptive assessment of Ryan White patients during the given time period. Although it was not possible to determine if a statistically significant relationship existed between the presence of oral conditions and CD4 count, as well as ARV treatment, there were apparent trends, showing that the majority of patients receiving ARV treatment did not present with any HIV-associated oral lesions.

There were uncontrollable factors that may have influenced the results of the study including: methods of data entry in Axium, patients’ disclosure of existing medical conditions, and human error while conducting the chart review.

Future Implications: Further studies that analyze a larger population of Ryan White patients over a longer period of time are recommended in order to evaluate the relationship between oral conditions, ARV treatment, and CD4 values and assess changes over time.

In addition, it is recommended that changes to Axium forms be made so that entry for lab dates, medications, and oral conditions is standardized to ensure that consistent data can be extracted for research purposes. Furthermore, HIV-positive patients should be re-evaluated every 6 months by the medical consult team with updated medical history and new lab values as needed.

Community Engagement in Global Oral Health Outreach Project Development
Laura Rein*1, John Morgan¹, Kerry Maguire², N. Sayela³ (¹Tufts University School of Dental Medicine, Public Health and Community Service, ²Options for Children in Zambia, Belmont, MA, ³Dental Training School, Lusaka/ZM)

Background: Chronic diseases are primary health concerns in all but few parts of the world. Oral health diseases, specifically, qualify as chronic public health burdens due to the high prevalence and debilitating effects on one’s quality of life. In developing nations the limited oral health care infrastructure, as well as the societal and environmental risk factors exacerbate this disparity. Innovative oral health project development is challenging due to the lack of available resources and health infrastructure. To achieve a successful oral health program it is essential to incorporate the four main components of the primary health care (PHC) philosophy: palliative treatment, exposure to fluoride, oral health education (OHE), and atraumatic restorative treatment (ART). Utilizing the PHC philosophy, in conjunction with active community engagement and participation in project
development, has the potential to be an extremely effective tool in constructing, implementing, and evaluating a sustainable global oral health project demonstration.

**Materials and Methods:** Since 2006, a collaboration of a local community, the Dental Training School of the Zambian Ministry of Health, Tufts University, and Options for Children in Zambia (NGO) established a health project in rural Zambia strategically utilizing existing health care infrastructure and incorporating community feedback and participation in the program development. The program includes the four components of the PHC principles and incorporates input from the local community and the Zambian and United States teams.

**Results:** This unique collaboration relied heavily upon a strong community liaison who facilitated and enabled the U.S. team to build strong communications and relationships within the Zambian community. After establishing strong rapport and mutual trust, the communities comfortably approached the U.S. team and articulated community concerns that would improve overall wellbeing. Based on local community recommendations the project incorporated the involvement of local leaders, the recruitment and training of community volunteers to provide oral health education, a clean water project, involvement of women, and the integration of maternal/child health. Supervised by the local rural health center medical staff, the community volunteers receive educational assistance and individual mentoring to qualify for admission to the Dental Training School. Upon graduation, the community volunteers will return to their villages and practice within the rural communities to assure project sustainability.

**Conclusion:** Utilizing the principles of PHC and mobilizing community efforts contributes to the sustainability of an oral health project. The active involvement of the local community in program development provided the framework for an oral health project that was valued by the community and appropriately made use of available local resources.

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**Shear Bond Strength of Self-Adhesive Resin Cement Above/Below CEJ**

Sepideh Sabooree*, Austin Perera, Masly Harsono, Matthew Finkelman, and Gerard Kugel

**Objectives:** To test the shear bonding strength of three different self-adhesive cements incorporating selective etching technique above and below the CEJ (on enamel and cementum).

**Methods:** Twenty-eight caries-free human extracted teeth were sectioned at the CEJ and longitudinally to provide 2 enamel and 2 cementum surfaces. The samples were randomly divided into 12 groups (n=8, 6 groups above CEJ (enamel), 6 groups below CEJ (cementum)). Each sample was embedded in acrylic to facilitate mounting, flattened and polished with Sic paper up to 320-grit (Ecomet3, Buehler). Three self-adhesive cements were tested with variations in selective etch technique: SpeedCEM (Ivoclar Vivadent), Multilink (Ivoclar Vivadent), and RelyX Ultimate (3M, ESPE). Cements were applied according to manufacturers’ suggestion with the exception of using the total etch technique or pre-treating with etch (37% H2PO4). Lithium disilicate buttons, approximately 3mm in diameter, were cemented and cured for 40 seconds with LED light (DEMI, Kerr). After storage in water for 24 hours, the shear bond strength was carried out using a universal testing machine (Instron 5566A, Norwood, MA) with a crosshead speed at 1mm/min. Statistical analysis was done by one-way ANOVA, with post-hoc analysis conducted via Tukey HSD with Bonferroni correction.

**Results:**

<table>
<thead>
<tr>
<th></th>
<th>CEJ (MPa±SD)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Above</td>
<td>Below</td>
<td></td>
</tr>
<tr>
<td>SpeedCem</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Etched</td>
<td>17.56±5.84</td>
<td>5.53±3.37b</td>
<td></td>
</tr>
<tr>
<td>Un-Etched</td>
<td>8.09±3.14</td>
<td>11.72±6.09X</td>
<td></td>
</tr>
<tr>
<td>Multilink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Etched</td>
<td>11.35±5.77</td>
<td>10.24±3.75bc</td>
<td></td>
</tr>
<tr>
<td>RelyX Ultimate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Etched</td>
<td>26.98±6.55</td>
<td>17.11±6.32c</td>
<td></td>
</tr>
<tr>
<td>Un-Etched</td>
<td>18.53±10.32</td>
<td>17.64±3.75X</td>
<td></td>
</tr>
</tbody>
</table>

Results with varying superscripts are statistically different (P-value<0.0125).
Conclusions: For applications above the CEJ, etching prior to cementation yielded significantly higher SBS for SpeedCEM and RelyX Ultimate groups. Below the CEJ there is no conclusive benefit to etching prior to application of the cement.

Automated Teeth Segmentation in Bitewing Radiographs using Various Algorithms
Tej A. Shah*, Aruna Ramesh

Objective: The objective is to create software that will automatically segment teeth in a bitewing radiograph. Automatic segmentation is a process in which a two dimensional image (i.e. a radiograph) is marked by a computer as to which pixels represent which structure in the image. The human eye can already look at a normal image and be able to detect where a structure will start and end. However, due to the nature of radiographs and the anatomic variance between patients, it is very difficult to write an accurate segmentation program. There are various attempts at this problem, however, there are no known papers on per-pixel segmentation of teeth. Unlike other attempts, this software is free and open source to allow other researchers to modify and improve all algorithms used in this software. The software created in this project can also act as a generic radiograph viewer that is free for all doctors to download and use at no cost. The main advantages of having a computer segment an image include caries detection, radiograph quality detection, and research in public health. The segmentation software concentrated on bitewings due to the fact that bitewing radiographs are the standard of care for interproximal caries detection and a number of assumptions that can be made by the software.

Methods: The first attempted algorithm used Bézier curves to estimate the “Curve of Spee”. Pixels along the curve of Spee were used to segment the background (the radiolucency) from the foreground (teeth and bone). Then, each tooth is analyzed to find the pixels associated with enamel, dentin and the pulp. The second algorithm is very similar to the first except it moves from the mesial to distal portion of the radiograph using a “Greedy Algorithm” to detect a line of occlusion.

Results: The software (named “GNU Dental Radiograph Program”) has shown a high accuracy for detecting the background versus the foreground parts of the radiograph. The software is not yet accurate enough to segment the enamel from the dentin in the radiograph.

Conclusion: More work needs to be done to perfect the segmentation of teeth. By having the software be free and open source, any researcher can help and improve the algorithms that are being used.

Oral Health and Diet Scores in Preschool Asian Children.
Leslie Slowikowski*, Wanda Wright, Cheen Loo, Matthew Finkelman

Objective: The purpose of this study is to compare cariogenic score, diet score, and number of decayed and filled teeth of Asian children ages 0-3 years, by gender and age.

Methods: This is a retrospective observational study of children treated at a dental training institution. Data for all children ages 0-3 referred for an initial exam by Tufts Baby clinic in aXium (electronic database for 2004 – 2012) were analyzed. Records of 75 patients met the inclusion criteria and were included in this study. Generalized estimating equations (GEE) were used to assess the association between decayed and filled teeth with gender and age, utilizing SAS version 9.2 software. The Mann-Whitney U test was used to assess the association of gender with cariogenic and diet score. The Kruskal-Wallis test was used to assess the association of age with cariogenic and diet score. P-values <0.05 were considered statistically significant.

Results: There was a significant difference (p<0.001) in caries prevalence between subjects with an initial dental visit at age 0-2 years (0.3%), compared to subjects who had an initial dental visit at age 3 (18%). There was no association between gender and caries or gender and diet.

Conclusion: Gender does not play a role in susceptibility to caries but age at initial exam is a statistically significant factor. This supports the recommendation of American Association of Pediatric Dentistry for establishing a dental home by the age of 1 year in order to provide pediatric dental care through anticipatory guidance, diet counseling, and treatment of dental disease.
**In Vitro Studies of a New Zirconium Alloyed Titanium for Implant Dentistry**

Jesse Small*, Liming Yu¹, Martin Schuler², Michel Dard³, Jake Chen¹,⁴ (¹Division of Oral Biology, Tufts University School of Dental Medicine, One Kneeland Street, Boston, ²Institut Straumann AG, Basel, Switzerland, ³Department of Periodontology and Implant Dentistry, College of Dentistry, New York University, New York City, ⁴Department of Anatomy and Cell Biology, Tufts University School of Medicine and Sackler School of Biomedical Sciences, Boston, MA)

**Objective:** Dental implants are becoming more and more frequently utilized to treat tooth loss. However, the inflammation that occurs around the implant after surgery is still a major issue. This *in vitro* study examines the inflammatory response of bone cells in response to a new titanium-zirconium alloy (TiZr) recently developed (Roxolid®, Institut Straumann, Basel, Switzerland).

**Method:** Mouse leukaemic monocyte macrophage cells (RAW264.7) were cultured comparatively with the two different materials (TiZr, Ti) in a 5% CO₂ atmosphere at 37°C in RPMI 1640 supplemented with 10% (v/v) FBS for 24h, 48h, and 72h, and exposed to either lipopolysaccharide (LPS) or RANKL. Total RNA extraction was performed and the resulting expression of inflammatory genes and osteoclastic markers were measured by real time qPCR.

**Result:** Expression of inflammatory cytokines IL-1, IL-6 and TNF-alpha highly increased after LPS treatment. Both TiZr and Ti groups showed less inflammation gene expression than the disc(-) LPS(+) group, while the TiZr group expressed less IL-6 and more anti-inflammatory cytokine IL-10 when compared with the Ti group. Furthermore, the osteoclastic differentiation genes CpxK, NFATC, TRACP and TRAF6 were highly expressed after RANKL treatment in the all groups; however, both TiZr and Ti groups showed less osteoclastogenic gene expression than the control group. There was no significant difference in gene expression pattern between the TiZr and Ti groups.

**Conclusion:** Although there was no significant difference in osteoclastogenic gene expression between the TiZr and Ti groups, less inflammatory reaction was observed in the presence of TiZr alloy compared to commercially pure titanium. Thus, TiZr proved to be a better implant material in this *in vitro* study. Further studies on the inflammatory molecular mechanisms of TiZr are currently underway in our laboratory.

**Developmentally Disabled Adults Treated under General Anesthesia: Periodontitis and Correlates**

Erica Stutius*, Angel Park, John Morgan

**Objectives:** The prevalence of periodontitis and associated risk factors in developmentally disabled adults are poorly understood. The purpose of this study was to investigate the severity of periodontal disease in a group of intellectually/developmentally disabled (I/DD) adults receiving dental treatment utilizing general anesthesia (GA) and report potentially related socio-demographic characteristics.

**Method:** This cross-sectional study utilized clinical and demographic information recorded at the time of dental treatment at a state-supported system of dental clinics. Data were collected from axiUm electronic records for I/DD adults ≥20-years-old receiving dental treatment utilizing GA between 4/1/2009-3/31/2010. Cooperation level, living environment, prevalence and severity of periodontitis, and number of preventative visits were compiled into an Excel database and analyzed (SAS Version 9.2).

**Results:** 347 I/DD dentate patients met the inclusion criteria. Mean (SD) age= 44.3±11.0 (range: 21-72-years); 62% male. Median cooperation level= 3 (0= least cooperative, 6= most cooperative.) Periodontitis was reported in 83% of patients (33.5%-Type II; 48%-Type III; 18.5%-Type IV). 89.72% of the population resided in community settings. 60.3% of patients met recommended 4 annual preventative visits. Those meeting the recommended number of annual preventive visits varied by cooperation levels as follows: cooperation level (5and 6)≈ 63.0%; cooperation levels (4 and 5)≈ 69.4%; cooperation levels (0 to 2)- 42.5%, p<.05.

**Conclusion:** Periodontitis was found to be a significant factor in the study group. An overwhelming majority had periodontal disease, most with Type III periodontitis. The population, in general, did not meet the recommended...
Microtensile Bond Strength to Ground Enamel by Sealant Materials
Dane Swenson*, Stephanie John, Masly Harsono, Gerard Kugel, Ronald Perry

Objective: To determine and compare the microtensile bond strength of four dental sealant materials on primary molar enamel.
Method: Thirty six extracted caries-free primary molar teeth were obtained for this study. Each tooth was created by preparing a flat enamel surface on the buccal or lingual side using a p1200 grit SiC polishing paper (Ecomet, Buehler). Samples were ultrasonic cleaned with deionized water for 10 minutes to remove all debris from polishing materials and then randomly divided and bonded into four groups of sealant materials according to manufacturer instruction. The sealants were placed incrementally of approximately 1.5-2mm thickness each increment and cured in between layers for 20 seconds with LED curing lights (DEMI, Kerr). After storage in de-ionized water for 24 hours at 37°C, samples were thermocycled for 5,000 cycles between 55°C and 5°C with 30 seconds dwell time. Each tooth sample was longitudinally sectioned in approximately 1 mm increments with a low-speed cutting wheel (Isomet1000, Buehler). Samples were then further sectioned by rotating them 90° to create sticks approximately 1mm² area. Micro tensile bond strength (MTBS) was carried out using a micro tensile machine (Bisco, IL). Maximum tensile load was recorded in Newtons and converted to MegaPascals by measuring areas of each cross-sectional stick using a digital caliper. The mode of failure of each specimen was observed under the stereomicroscope (Olympus, Japan). Only adhesives mode was included in the data. Statistical analysis was done by one-way ANOVA, Statistical significance was predetermined at level p<.05.

Result:

<table>
<thead>
<tr>
<th>Group</th>
<th>Material</th>
<th>Type</th>
<th>Enamel conditioner</th>
<th>MTBS (Mpa+SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BeautiSealant (Shofu)</td>
<td>Giomer</td>
<td>N/A</td>
<td>22.09 ± 5.21</td>
</tr>
<tr>
<td>2</td>
<td>ClinPro (3M ESPE)</td>
<td>Unfilled Resin</td>
<td>35% H₂PO₄ for 40 sec.</td>
<td>15.44 ± 4.82</td>
</tr>
<tr>
<td>3</td>
<td>Delton (Dentsply)</td>
<td>Glass Filled Resin</td>
<td>34% H₂PO₄ for 40 sec.</td>
<td>22.02 ± 10.32</td>
</tr>
<tr>
<td>4</td>
<td>Embrace (Pulpdent)</td>
<td>Glass Filled Resin</td>
<td>35% H₂PO₄ for 40 sec.</td>
<td>15.27 ± 5.77</td>
</tr>
</tbody>
</table>

Conclusion: Groups 1 and 3 yielded statistically higher micro tensile bond strength than groups 2 and 4. No statistical difference is evident between Groups 1 and 3 or between Groups 2 and 4.

Evaluating the Utility of Salivary Biomarkers as a Clinical Tool in Diagnosing Patients with Temporomandibular Disorder-related Pain
Tracy Tat*, Driss Zoukhri, Matthew D. Finkelman, Shuchi Dhadwal, Brijesh P. Chandwani, Noshir R. Mehta, Steven J. Scrivani

Background: Chronic temporomandibular disorder (TMD), head, neck, jaw, and orofacial pain is estimated to affect at least 12% of the U.S. population. As the exact symptoms of pain in various TMD conditions may not be easily distinguishable, the diagnostic accuracy of current testing methods is contingent upon subjective measures. This renders differential diagnoses particularly complicated and challenging to assess. Saliva analysis may offer an alternate insight into the patho-physiology of TMD conditions.
**Objective:** The purpose of this study was to evaluate the use of the salivary neuropeptides substance P (SP) and serotonin (5-HT) as a clinical tool to assess chronic pain in individuals with unresolved TMD.

**Methods:** Ten symptomatic patients from The Craniofacial Pain Center at TUSDM and 10 asymptomatic controls from the local community volunteered for this study. Unstimulated submandibular/sublingual saliva was collected from the Wharton’s duct during the fasting state between 8:30-10:30 AM. At the time of sampling, subjects’ ratings of pain intensity according to the 11-point Numerical Graphic Rating Scale (0-10) were obtained. Samples were analyzed using enzyme-linked immunosorbent assays (ELISA) to quantitatively determine the levels of SP and 5-HT. Student’s t-test, Mann-Whitney U test, Spearman’s rank-order correlation, and Pearson’s correlation were used for statistical analyses.

**Results:** The amounts of SP and 5-HT were elevated in saliva samples from patients when compared to those in controls. However, the mean concentrations for SP (37.48 pg/ml in patients, 29.15 in controls) and median concentrations for 5-HT (28.09 ng/ml in patients, 17.17 in controls) were not statistically significantly different. When the overall pain score values were compared to SP or 5-HT levels, there was no observed correlation (r=0.130, p=0.584; rho=0.290, p=0.214, respectively). We also did not observe a correlation between the levels of the two neuropeptides (r=-0.056, p=0.815).

**Conclusion:** Although salivary SP and 5-HT were increased in patients versus controls, the difference was not statistically significant. Studies using a larger sample size are warranted to further determine if these neuropeptides can be used for TMD-related pain disorders diagnosis.

*Presented at the 2013 International Headache Congress/American Headache Society Annual Meeting in Boston, MA.*

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**Effect of Accent on Marginal/Internal Fit of CAD/CAM All-Ceramic Crowns**

Masly Harsono¹, M.M. Beyari², H.A. Lamfon², Jeremy Plourde¹, Stephanie John¹, Lindsay Fox¹, Ramesh Thondapu³, Ronald D. Perry¹, John Orfanidis¹, and Gerard Kugel¹, (¹School of Dental Medicine, Tufts University, Boston, MA, ²Department of Prosthetic Dentistry and Oral Medicine, Umm Al-Qura University, Faculty of Dentistry, Makkah, Saudi Arabia)

**Objective:** To determine the effect of reflective liquid during scanning with the E4D Dentist™ (D4D Technologies) CAD/CAM system on the in vitro marginal and internal fit of all-ceramic crowns.

**Methods:** Extracted mandibular first molar was prepared to receive an all-ceramic crown. Preparation had well-defined, rounded shoulder, ~2 mm occlusal reduction, rounded internal angles, and less than 20° total occlusal convergence. Small indentations were made on root of tooth as a plane of sectioning. Tooth was scanned 10 times (Group1) with and 10 times (Group2) without reflective liquid (E4D Accent) using E4D CAD/CAM system and 20 all-ceramic crowns were milled. Thirty impressions of prepared tooth were taken using VPS and 20 die stone models poured. All crowns were cemented using Multilink® Automix (Ivoclar Vivadent) under constant pressure of 100N. Samples were embedded in acrylic and sectioned buccolingually. Sections were evaluated under digital microscope and measured on 3 locations per buccal and lingual side of section: marginal-edge, mid-axial wall, and cusp-tip. Statistically analysis was accomplished with one-way ANOVA. Significance was predetermined at p<.05.

**Results:** Mean fits at various locations of prep are shown in Table 1.

<table>
<thead>
<tr>
<th>Measurement Location</th>
<th>Buccal Margin</th>
<th>Mid-Axial</th>
<th>Cusp</th>
<th>Occlusal Table</th>
<th>Lingual Cusp</th>
<th>Mid-Axial</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (µm ± SD)</td>
<td>122.06 ± 41.85</td>
<td>87.31 ± 24.64</td>
<td>137.16 ± 42.66</td>
<td>194.07 ± 57.52</td>
<td>148.9 ± 54.35</td>
<td>118.77 ± 43.35</td>
<td>114.95 ± 43.86</td>
</tr>
<tr>
<td>Group 2 (µm ± SD)</td>
<td>144.63 ± 34.58</td>
<td>102.054 ± 17.3</td>
<td>170.99 ± 39.2</td>
<td>227.64 ± 43.8</td>
<td>180.38 ± 56.12</td>
<td>142.63 ± 43.18</td>
<td>126.04 ± 33.6</td>
</tr>
</tbody>
</table>

**Conclusions:** Marginal and internal fits were comparable between crowns regardless of whether reflective accent
Microleakage of All-ceramic Crowns across Three Classes of Luting Cements
Michelle Tsao*, Stephanie John, Eileen Doherty, Matthew Finkelman, Masly Harsono, Gerard Kugel

**Objectives:** To compare marginal microleakage of bonded IPS e.max lithium disilicate crowns prepared above the cementoenamel junction (CEJ) before and after treating with selective etch technique across 3 classes of self-adhesive resin luting agents.

**Methods:** Thirty-six (36) extracted human molars were prepared for all-ceramic crowns as follows: 1mm circumferential shoulder gingival margin, 2mm occlusal reduction, rounded internal angles, and less than 20° occlusal convergence. Teeth were placed in full dentate typodonts and scanned with E4D laser CAD/CAM system. Samples were randomly divided into three groups of twelve each, selectively-etched with 37% H$_2$PO$_4$ for 15 seconds on lingual surface and no etch on buccal surface. Three luting cements were compared: Group 1-Multilink (Ivoclar), Group 2-SpeedCEM (Ivoclar), Group 3-RelyX Unicem2 (3M ESPE). Crowns were cemented according to manufacturer’s instructions. Samples were thermocycled for 5,000 cycles between 5°C-55°C, immersed in 50% w/v ammoniacal silver nitrate solution for 3 hours, then exposed in photo developing solution for 16 hours. Samples were embedded in acrylic, sectioned buccal-lingually, and examined under magnification. A microleakage scale of 0–4 was used. 0=no microleakage; 1=up to 25% microleakage to axial wall; 2=up to 50%; 3=up to 75%; 4=100% penetration to axial wall. Data were analyzed via the Sign test, Kruskal-Wallis test and Fisher’s exact test. The Bonferroni correction was used to adjust for multiple comparisons. R 2.11.1 and SPSS version 19 were used in the analysis.

**Results:** The table below shows counts and percentages of the samples in each microleakage category across the six subgroups. All results were not statistically significant after adjusting for multiple comparisons.

<table>
<thead>
<tr>
<th>Group</th>
<th>CEJ</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Etch</td>
<td>6(50%)</td>
<td>4(33.3%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>2(16.7%)</td>
<td>12(100%)</td>
</tr>
<tr>
<td></td>
<td>Selective Etch</td>
<td>12(100%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>12(100%)</td>
</tr>
<tr>
<td>2</td>
<td>No Etch</td>
<td>3(25%)</td>
<td>0(0%)</td>
<td>3(25%)</td>
<td>2(16.7%)</td>
<td>4(33.3%)</td>
<td>12(100%)</td>
</tr>
<tr>
<td></td>
<td>Selective Etch</td>
<td>8(66.7%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>1(8.3%)</td>
<td>3(25%)</td>
<td>12(100%)</td>
</tr>
<tr>
<td>3</td>
<td>No Etch</td>
<td>6(50%)</td>
<td>1(8.3%)</td>
<td>3(25%)</td>
<td>1(8.3%)</td>
<td>1(8.3%)</td>
<td>12(100%)</td>
</tr>
<tr>
<td></td>
<td>Selective Etch</td>
<td>10(83.3%)</td>
<td>0(0%)</td>
<td>2(16.7%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>12(100%)</td>
</tr>
</tbody>
</table>

**Conclusions:** Results suggest that no definitive conclusions could be drawn from the data gathered. Supported in part by Ivoclar Vivadent Inc.

Using Pre-Clinical Dental Performance as an Indicator of Clinical Success
Bianca Velayo*, Steven Eisen, Gerard Kugel, Paul Stark

It is generally assumed that pre-clinical training is important in the maturation of the student's skill development as they transition into the clinic. However, these assumptions have not been subjected to empirical examination. Following previous research that has examined potential factors that may predict a student’s success in dental school, we here examine the pre-doctoral dental curriculum by using final grades in pre-clinical technique courses as indicators of clinical performance. The sample consisted of 301 students at Tufts University School of Dental Medicine who graduated in 2010 and 2011. We found that there was a statistically significant difference (p<.001) between the mean pre-clinic grades for the classes graduating in 2010 (M = 84.92, SD= 3.35) and 2011, (M =
There was also a significant difference (p < .001) in clinic final grades for the classes of 2010 and 2011 (88.38 (2.13) vs. 87.45 (2.06), respectively). As a result, we analyzed the correlations individually by graduation year. To examine the association between performance in pre-clinical technique training and clinical performance, we correlated each student’s pre-clinical average grade with his clinical average in Operative Dentistry and Fixed Prosthodontics. Results for the 2010 class showed that pre-clinical scores played a moderate role with regard to the final clinical grades (r = .380, p < .001). The 2011 class showed that pre-clinic practical grades are a positive indicator of clinic final grades (r = .511, p<.001). This suggests that preclinical coursework is fundamental in the development of the manual dexterity and dental competency that is necessary to succeed in clinic. The results of this study encourage that dental school curricula should place more emphasis on pre-clinical training. It would also be beneficial to identify students struggling in pre-clinical technique courses and implement extra-help or mentoring sessions to improve proficiency when they enter the clinic.

The Reporting and Recognition by Healthcare Providers of Child Abuse and Neglect in the Latino Population: Evidence Based Study

Aidee Nieto-Herman, Michelle Webb*; MHDA: Zuzana Mendez, Bernadete Campos-Therriault, Yimar Quijada-Angell, Elena Cucerov, Mishelle Gonzalez Espinosa; TAHSS: John Frazer, Elyane James, Abby Mendez

Domestic violence refers to any physical or coercive act against a spouse or a partner, including psychological, emotional, or sexual abuse and physical violence. It also includes threats against pets and personal property and other family members. By law, dentists are not required to report cases of domestic violence; however, cases of child, elderly, and disabled abuse are mandated for report. Evidence of abuse is more prevalent than statistics suggest due to many unrecognized and unreported cases. Although parents of the abused victim avoid seeking medical attention, dental appointments are often kept. Almost 2/3 of all patients are scheduled for dental visits at least once a year. Nearly 1 in 4 adult women experience assault by a partner during adulthood and with a high percentage of injuries occurring in the head and neck areas, oral health professionals have a major role in conducting routine assessments for abused victims. 65-75% of injuries occur in head and neck area—areas that are routinely observed during a dental exam. Dentists and dental personnel are in an ideal position to identify injuries associated with physical, emotional and sexual abuse.

Objective: The objective of this study is to determine whether or not dentists detect signs of abuse and dental neglect; specifically in the Latino Population. Also, if assistance and references were given to victims in comparison with physicians and other oral healthcare providers. This research addresses the potential benefit of developing a bilingual domestic violence prevention program and the relationship with dental neglect for the Latino population.

Materials and Methods --Types of Studies Reviewed: Information collected from previous publications about domestic violence and dental neglect in the Latino population from the past 10 years. We conducted a systematic search of 30 articles, identifying 22 that were eligible for use, which were systematically filtered to 6 final articles about dental neglect in the Latino population.

Results: The research concludes that there is insufficient evidence of domestic violence and dental neglect programs in the Latino population and that dentists are less likely than any other healthcare professional to report child abuse.

Clinical Implications/Recommendations: Hispanic/Latino single teen mothers have the highest dropout and pregnancy rates, therefore prevention programs should be created. We also suggest continuing education for oral healthcare providers, the introduction of domestic violence prevention education in the dental curriculum, and continuing research on this topic.

Conclusions: There is insufficient literature on domestic violence programs that are focused on dental neglect in the Latino population. Dentists are facing many barriers to deal with this problem.

Comparison between One versus Two Occlusal Appliances in TMD Population
Objective: The goal of this study was to compare the effectiveness of one active occlusal appliance (maxillary or mandibular) versus two active appliances (one maxillary appliance for nighttime and one mandibular appliance for daytime) in temporomandibular disorders (TMD) patients.

Methods: The authors analyzed 100 charts of patients being treated for TMD pain at Tufts Craniofacial Pain Center. Of them, 50 patients had one active occlusal appliance and 50 patients had both maxillary and mandibular appliances. On the day of insertion and the first follow-up exam after a minimum of three months, the pain levels were recorded using the Numerical Graphic Rating Scale. Patients rated their level of pain on a scale from 0 to 10 (0 for no pain and 10 for highest pain) for left and right TMD symptoms, including bite symptoms, TMJ pain, TMJ sounds, headache, facial pain, eye symptoms, ear pain, stuffy ear, neck pain, tingling, upper back pain, and lower back pain. The changes in pain levels were also assessed with consideration to age and sex. All statistical analysis was conducted using SPSS Version 19.

Results: No significant difference was found between patients with one appliance versus two appliances when comparing the pain levels for all TMD symptoms. Patients who recorded their overall pain (n=42) also had no significant difference. No correlation was found between the changes in pain levels and age or sex.

Conclusions: TMD pain is a multifactorial condition that changes continuously. These findings suggest that using two occlusal appliances compared to one appliance for TMD patients does not correlate with a greater relief in pain for TMD symptoms or overall pain. Further studies are required to investigate concurrent treatments the patients were receiving during occlusal appliance therapy, as well as associated medical conditions. A prospective controlled study would be required to validate our results.

The Influences of Implant Geometry and Surface Composition on Bone Response
Mohammed Alasqah1,2, Abdullah AlFarraj Aldosari2,5, Sukumaran Anil3, K.A. Al Wazzan3,4, Samer A Al Jetaily2,5, John A. Jansen4,5 (1Department of Periodontology, Tufts University School of Dental Medicine, Boston, MA., 2Department of Prosthetic Dental Science, College of Dentistry, King Saud University, Riyadh, Saudi Arabia, 3Department of Periodontics and Community Dentistry, College of Dentistry, King Saud University, Riyadh, Saudi Arabia, 4Department of Biomaterials, Radboud University Nijmegen Medical Center, Nijmegen, The Netherlands, 5Dental Implant and Osseointegration Research Chair,(DIORC), College of Dentistry, King Saud University, Riyadh, Saudi Arabia)

Objectives: The surface properties and the shape of titanium dental implants are key parameters for rapid and intimate bone–implant contact. The osseointegration of four different dental implant was studied in the femoral condyle of rabbits.

Material and methods: Titanium implants were either tapered implants, cylindrical implants, hydroxyapatite (HA) coated tapered implants and HA coated cylindrical implants. After 8 weeks of implantation, the bone-implant contact and bone growth around the dental implant were compared histologically.

Results: Light microscopical examination revealed that no gross difference in bone response to the various implant types were present in 10 μm range. Concerning the osseointegration, the study demonstrate a higher bone-implant contact values for HA coated Tapered implants (65.62 ± 13.02) at 8 weeks healing.

Conclusion: From the observations of the present study it can be concluded that within the limitations of the currently used rabbit model no significant effect of implant design and surface composition on the bone-to-implant bone response was observed after six weeks of implantation.

Jehan AlHumaid*, David Tesini, Matthew Finkelman, Cheen Loo,
**Purpose:** There are a number of options when treating children with Autism Spectrum Disorder (ASD) in a dental office, however, the traditional Behavioral Guidance Techniques have been reported not to be effective. Thus the purpose of this retrospective study was to compare the effectiveness of a new approach for managing children with ASD, the D-Terminated Program, compared to the Standard Behavior Guidance Techniques (SBGT) in the clinical dental environment.

**Methods:** Charts from two different dental offices were retrospectively reviewed. Data collected included: age, gender, pre- and post Frankl scale, number of visits, OR referrals and oral hygiene indicators. Behavior was compared within and between groups pre- and post-treatment according to the Frankl Rating Scale.

**Results:** A total of 44 charts (22 in each group) were reviewed retrospectively. Results showed that children treated with the D-Terminated program showed a significantly greater change in Frankl scale (68.18% vs. 36.36%, P-value .034) and a significantly lesser OR referrals (8% vs 36%, P-value .03) compared to the control group.

**Conclusion:** This retrospective study showed a significant difference in behavior change between the two techniques. Future prospective studies are needed to confirm these findings.

Research supported by DHHS-HRSA#D84HP1995.

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**Prevalence of Depression Symptoms among Patients with Obstructive Sleep Apnea: A Retrospective Analysis**

Leopoldo Correa, Ghada Ali*, Ronald Kulich, Matthew Finkelman

**Aim of the Study:** To assess the prevalence of depression symptoms among patients diagnosed with obstructive sleep apnea referred to a university based dental sleep clinic.

**Introduction:** Obstructive Sleep Apnea (OSA) is a common sleep disorder consisted of alternative episodes of complete or partial obstruction of the airways, leading to breathing disruption, decrease oxygen levels (Hypoxia) and sleep fragmentation throughout the night. It has been suggested that sleep fragmentation and hypoxia in patients with OSA may provoke depressive symptoms; also depressive symptoms could be a result of any chronic medical condition, including obstructive sleep apnea. Based on literature review we hypothesized that patients diagnosed with obstructive sleep apnea are more vulnerable to depression symptoms due to the cross linkage between obstructive sleep apnea pathophysiology in sleep deprivation and neural mechanisms that regulate the mood.

**Study design:** Retrospective cross-sectional study.

**Methods:** Chart review of three hundred patients, data collected included self-reported history of depression, psychological assessment utilizing the SCL 90 depression subscale questionnaire (13 items) identifying depressive symptoms answered by the patient at the initial evaluation.

**Statistics Analysis:** Statistical analysis was performed using SPSS software. Chi-Square was performed to test for an association between self reported depression and gender. Level of significance was set at $p < 0.05$.

Percentage of self reported history of depression was calculated, and the percentage of each depressive symptom was calculated for each answer scale ranging from 0 (Not at all) to 4 (Extremely).

**Results:** Among the 300 hundred charts, 177 fulfill the criteria, 28 of them did not answer the questionnaire at the initial evaluation and 149 charts were completed (92 males and 57 females) for patients who had been evaluated for OSA. Mean age was 50.92 ± SD 11.44. Among 92 males 16(17.4%) reported history of depression while 23 of 57 (40.4%) females reported history of depression ($p = 0.004$). While 25.5% reported loss of sexual interest, 60.1% reported feeling low energy, 15.4% reported thoughts of death or dying, 16.8% reported easy crying, 28.2% reported blaming themselves and feeling lonely, 32.9% reported feeling blue, 49.7 % reported worrying too much about things, 22.8% reported no interest in things, 17.4% reported feeling hopeless about the future, 34.9% reported feeling everything is an effort, 14.8% reported feeling of worthlessness and 11.4% reported feeling of being caught or trapped. Those are all effective depression symptoms based on the SCL 90 subscale.

**Conclusions:** We found that 57.8% of our patients self reported history of depression at the time of initial evaluation; while others reported symptoms of depression which need multidisciplinary approach of treatment to reach the maximum benefit from the OSA treatment modalities based on improving the patient’s psychological
status. Dentists involved in the field of dental sleep medicine should include psychosocial assessment as part of initial evaluation.

Incidence of Endocarditis in Down Syndrome Patients
Farrah Beg* and Diran Balekian*

Patients with Down’s syndrome are more likely to have delayed eruption of teeth, which may lead to increased harboring of oral bacteria. Although these patients are historically shown to have a lower incidence of caries, they are found to have a high rate of periodontal disease. The amount of plaque and calculus seen on the teeth is not proportionate to the severity of the disease. In addition to, 40-50% of patients with Down’s syndrome are born with some type of cardiac abnormality. Most receive surgical correction at a young age, but many develop mitral valve prolapse. The combination of the two characteristics, in theory, makes these patients more susceptible to sub acute bacterial endocarditis. The reason for this case study is to further analyze the incidence of endocarditis with Down’s syndrome. We will discuss, in depth, the cardiac and dental abnormalities found in patients with Down’s syndrome and research cases in which patients with Down’s syndrome developed bacterial endocarditis. We will also evaluate how many these cases cultured oral bacterial. We hope to increase our understanding of endocarditis potentially stemming from oral bacterial and its frequency in patients with Down’s syndrome. We will also discuss the possible ways we can help prevent the occurrence of endocarditis in patients with Down’s syndrome.

A Prospective, Randomized, Controlled Clinical Trial of Two Different Sedation Sequences for Removal of Third Molars in Adults
Ruba Khader¹, Daniel Oreadi², Matthew Finkelman³, Marcin Jarmoc², Sanjeet Chaudhury*², Roman Schumann⁴, Morton Rosenberg² (¹Division of Oral and Maxillofacial Surgery, College of Dentistry, University of Kentucky, Chandler Medical Center, Lexington, KY, ²Department of Oral and Maxillofacial Surgery, Tufts University School of Dental Medicine, Tufts Medical Center, Boston, MA, ³Department of Public Health and Community Service, Tufts University School of Dental Medicine, Boston, MA, ⁴Department of Anesthesiology, Tufts Medical Center, Boston, MA)

Background and Objectives: In Oral and Maxillofacial Surgery outpatient practices, alteration of consciousness plays an important role in the management of patients for a wide variety of surgical procedures. The overall objective of this study was to explore if there is any difference in pain perception among subjects undergoing third molar extraction by switching the order in which Midazolam or Fentanyl are administered.

Methods: This prospective, randomized, parallel groups, clinical trial was conducted at Department of Oral and Maxillofacial Surgery, Tufts University School of Dental Medicine. Subjects were randomly assigned to two groups (Group 0 received Fentanyl first in sedation sequence, Group 1 received Midazolam first) Recollection of intraoperative pain score was measured 24 hours after surgery using Wong-Baker faces pain scale.

Results: A total of 66 subjects were enrolled in the study. Only one subject discontinued from the study. There was no statistically significant difference in the recollection of the perception of pain during the surgical procedure between the two groups. There was no significant difference in the change in vital signs from baseline to two surgical end points among the two groups.

Conclusions: There is no evidence of a benefit is switching the order of administration of medications. The choice of the anesthetic technique should be tailored to the patient’s needs, type of surgical procedure to be performed, and surgeon preference.

Comparison of the Prevalence of Missing Teeth among Different US Dental Schools
Irina Dragan*, Eduardo Marcuschamer, Penelope Pani, Paul Levi, Paul Stark
**Background:** The loss of Single or multiple teeth is a concern addressed by different dental specialties. Classical studies of tooth prognosis revealed that maxillary molars have the worst prognosis and mandibular canines have the best. The prevalence of tooth extractions has increased in conjunction with the increased popularity of dental implants.

The Consortium for Oral Health Research and Informatics (COHRI) is a collaborative that created an inter-university dental data repository (DDR) that integrates data from different dental data sources: University of Texas Health Science Center at Houston (UTH), Harvard School of Dental Medicine (HSDM), Tufts University of Dental Medicine (TUSDM), University of California San Francisco (UCSF) that allows users to explore and extract information to support their specific research.

**Aims:** To identify the prevalence of missing teeth between TUSDM and the three other schools: HSDM, UCSF, and UTH.

**Methods:** The database consists of data on 1,178,718 subjects, with a total of 198,414 for TUSDM and 980,304 for the other three schools. In this cross-sectional study, the COHRI DDR was analyzed, procedure codes were used to evaluate the prevalence of the missing teeth. Data from the odontograms was evaluated to determine the incidence of missing teeth, divided by specific tooth number. Descriptive statistics and percentages were calculated and reported.

**Results:** At initial presentation, the most common missing tooth at TUSDM was tooth #4 (right maxillary second premolar), with a total of 10,647, expressed as 5.36% of all the missing teeth. That was in agreement with the data from the other three dental schools, where the most commonly missing tooth was tooth #4, with a total of 21,038, expressed as 2.15% of all missing teeth. The least common missing tooth at TUSDM was tooth #31 (right mandibular second molar), with a total of 75, expressed as 0.04% of all missing teeth. This result was again in agreement with the data from the other three dental schools, identified as tooth #31, with a total of 120, expressed as 0.01% of all the missing teeth.

**Conclusion:** The use of the COHRI data repository allows non-technical users the ability to answer important research questions. This is the first study that reveals data from a dental school setting that identifies the right maxillary second premolar as the most commonly missing tooth and the right mandibular second molar as the least commonly missing tooth is a population of 1,178,718 subjects.

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**The Effect of Different Dental Ceramic Systems on the Wear of Human Enamel: In Vitro Study**

Rabie El Huni*

**Aim:** The purpose of this in vitro study is to evaluate the effect of different dental ceramic systems on the wear rates of opposing tooth enamel.

**Introduction:** The search for dental restorations of high strength, enhanced marginal integrity, and improved color quality has recently resulted in the introduction of advanced systems in the form of pressable glass ceramics and Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) ceramics. Although dental ceramic materials are generally wear-resistant, they tend to cause damage to the opposing enamel and this damage varies according to the ceramic material used. Aiming at getting an evidence-based validation of dental ceramics, which have been considered lately among the most promising restorative options, large numbers of studies and scientific data have been conducted recently to investigate factors limiting the acceptable restoration longevity, mainly the mechanical properties. The online search on the contact relationship between dental hard tissues in general has revealed bunch of previous studies in which restorative materials and the antagonist wear of the human enamel were examined. Clinical trials are complicated, expensive, and time-consuming. In addition, such studies may result with relatively high standard deviations due to the biological spread between the studied individuals in terms of masticatory function, tooth form and type, time of teeth eruption, teeth position in relation to the arch, enamel thickness and hardness, and finally; the type and PH of the eaten food. On the other hand, the data obtained by bench studies were inconsistent mainly due to the fact that the test parameters differed widely. However, laboratory studies may be helpful for accurately predicting the clinical performance of evaluated
materials intra-orally. They may also assist researchers for standardizing the wear test parameters so a perfect correlation with clinical circumstances can be achieved.

**Methods:** Four groups of all ceramic systems (N=12) and one control group, containing natural enamel specimens, were evaluated in this study. Group I IPS e.max CAD (Ivoclar Vivadent Inc., Schaan, Liechtenstein), Group II IPS e.max Press (Ivoclar Vivadent Inc., Schaan, Liechtenstein), Group III LAVA Plus Zirconia (3M ESPE Dental Products, St. Paul, MN, USA), Group IV Super Porcelain EX-3 (Noritake Kizai Co., Ltd., Nagoia, Japan), and Group V Control enamel. Wear test procedure was run in the form of two-body wear contact of bi-directional back-and-forth sliding movements in which a stylus (Enamel Cusp) runs against a flat surface (Ceramic and control enamel disks), with no lifting of stylus. Specimens of each ceramic system were fabricated into the form of 11 mm diameter and 3 mm thickness disks according to the respective manufacturer’s instructions. Enamel disks with almost equal dimensions to those of ceramic systems were cut off the lingual surfaces of lower molar teeth using a slow speed handpiece and (Ø 6.0 mm) Trephine burs No. 04-9485-01(ACE Surgical Supply, Inc. Brockton, MA). For the enamel cusp styluses, upper wisdom teeth with completely formed roots were cut mesio-distally then buccopalataly to take off their buccal and disto-palatal cusps respectively. The mesio-plalatal cusps, along with their roots, were then embedded individually in 25x25x25 mm cubic holders using the auto polymerizing resin (Caulk Orthodontic Resin, Dentsply, Milford, Del.). For wear simulation, a specifically designed, electro-mechanical, cyclic loading machine (TA-317C, Texture Technologies corp. Hamilton, MA, USA) was used to allow for force application and control. A clear plastic container was fixed to the feed table of the machine. This container was filled with Artificial Saliva that covered the loaded cusps and disk specimens. Five samples were run every time. For wear quantification, all enamel cusps were scanned three dimensionally using the SmartOptics Activity 800 Digital Scanner (smart optics Sensortechnik GmbH. Bochum, Germany). Data of base line and follow/up scans were compared using the scanner’s matching 3D digital inspection software Qualify (Geomagic Inc., Research Triangle Park, NC, USA). This software generated color-mapped models of each enamel cusp and then aligned the models (Best Fit Alignment) to detect the resultant geometrical changes that illustrate the wear results (Volume loss) opposing each specimen. After verifying that all the assumptions of the One Way Analysis of Variance (Anova) were true, descriptive statistics were calculated and data were analyzed using the software SPSS version 17.0 (SPSS).

**Results:** After 125,000 bi-directional loading cycles in a specifically designed wear simulator, this study showed no significant difference in the amount of opposing enamel wear between the evaluated all ceramic materials (P-value = 0.225). It showed also that no significant difference is seen between the evaluated ceramic systems and the control enamel group.

**Conclusion:** Within the limitations of this study, it can be concluded that there was no significant difference in the volume reduction of natural enamel cusps abraded against natural enamel surfaces and those abraded against evaluated ceramic materials. The findings of the current study point to the recommendation that advanced ceramic systems could be appropriate choices for the fabrication of full contour restorations in the oral cavity since they are esthetic and produce opposing enamel wear similar to that caused by natural teeth surfaces.

**Force Decay of Orthodontic Elastomeric Chains- A Product Comparison Study**

Harneet Grewal*, Kasun Rajapaksha, Masly Harsono, Angel Park, Matthew Finkelman, Stanley A. Alexander

**Purpose:** There were two purposes of this in vitro study. To evaluate the % force decay of four commercially available orthodontic elastomeric products and to compare the initial and final force levels of short and long elastomeric chains.

**Methods:** Thirty-two short and thirty-two long elastomeric chains were procured from four commonly used companies vis-à-vis American Orthodontics (AO), Rocky Mountain Orthodontics (RMO), Ormco, and GAC. They were divided into eight groups (8 samples per group) and stretched 25mm, using polyester closing jigs with expansion screws. The samples were stored in an aqueous media at 37ºC. An Instron machine was used to record force measurements in gram force (gf) over 28 days (at 0 hour, 1 hour, 2 hours, 24 hours, 48 hours, 7, 14, 21 and 28 days). The stretched length of the chains was decreased 0.25 mm per week to simulate tooth movement. All
the data was summarized in percentage force decay. Statistical analysis was done by one-way ANOVA with post-hoc analysis conducted via Tukey Kramer test.

**Results:** For short changes, average baseline force values varied between 159-303 gram force among the four groups with GAC showing the highest initial force. The % force decay at 2hours was maximum for RMO followed by GAC and lowest in Ormco products. On the 28th day the final mean % force decay order was GAC (52.89%) > RMO (35.01%) > AO = ORMCO (27%). GAC showed statistically significant difference from each of the other 3 companies with p < .0001. Long chains: average baseline force value between 153-253gf with GAC showing the highest initial force. All 4 companies showed highest mean %force loss in the first 24 hrs with GAC being the maximum at 69.8%. A steady force decline was seen thereafter till the last day. GAC. On the 21st day the final mean % force decay order was GAC (73.8%) > AO (49.5%) > ORMCO (47.61%) > RMO (45.46%). GAC showed statistically significant difference from each of the other 3 companies with P < .0001. Mean initial force, for short chains was 38.91 gf higher than long chains.. However due to lesser % decay (37.85%) in short chains the final difference between the short and long chains was 60gf. (The 28th day data for long chains is still pending till next week.)

**Conclusions:** GAC elastomeric chains have the highest %force decay for both short and long chains. Long chains for all 4 companies show a more consistent pattern of force decay than short chains. The highest drop in force levels occurs in the first 24 hrs followed by a gradual force decay. The baseline and final force for short chains is higher than long chains. Short chains also have lower % force decay.

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**Dental Abscesses in the Non-Communicative Patient**

Jamie Holden* and Marion Hernon*

The non-communicative patient can represent many types of people including children, elderly, hospitalized individuals, special needs population, and others. There are many challenges in diagnosing dental abscesses in such patients; however, the negative consequences of untreated dental abscesses have demonstrated the importance of developing protocols, policies and techniques that promote early detection of disease and intervention as soon as possible.

**Case of Spontaneous Gingival Bleeding**

Robert Reti*, Shane Citron and Maria Papaageorge

A 24-year-old male presents to the emergency room with complaint of continuous gingival bleeding for 24 hours from the oral cavity. Patient denied trauma, use of any medications, recreational drugs, odontalgia or recent dental procedures. An orthopantogram revealed an enostosis apical to the right second mandibular molar and impacted third molar #’s 17 and 32. The patient was discharged by the emergency room physician with a diagnosis of dental abscess. The patient returned the next morning with continued bleeding and presyncopal symptomatology. An Oral and Maxillofacial surgical consult was requested for evaluation. We present a case of spontaneous gingival bleeding due to a blood dyscrasia that was overlooked due to a poor understanding of dental pathology by a medical colleague. The case emphasizes the need for dental specialty coverage in emergency rooms.
Pediatricians’ Knowledge of Oral Health in New England: A Survey
Eileen Saunders*, Cheen Loo, Matthew Finkelman

**Purpose:** The purpose of this study is to clarify what practicing pediatricians throughout New England know about oral health.

**Methods:** This study is a randomized anonymous survey of pediatricians in New England. Using the AAP directory 600 pediatricians were randomly selected and contacted through email to take the online survey with Qualtrics. Once the surveys were sent, the respondents had three weeks to complete it. After that time, two reminder emails were sent in one week intervals.

**Results:** Approximately 126 people have completed the survey. From the preliminary analysis of the data it appears that as the age of the pediatrician increases, their knowledge of the appropriate age to refer children to the dentist is increasingly incorrect. However, when the chi-squared test was run it showed that these results are not significant (P=.151). The number of people who answered this question correctly did not correlate with the number of dental training hours received during residency (P=.550). The people that had the most training actually had the lowest rate of correct responses.

**Conclusions:** From the preliminary data that has been collected it seems as though practitioners who are older and have been practicing for longer do not know the current recommendations for the age of referral. The younger generation does seem to be more informed regarding this although all ages seem to have received similar amounts of dental training. In order to be able to further analyze the data and evaluate further questions, a second random sampling will be performed.

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Dental Outreach in South End Churches
Hitesh Tolani*, Gina Terenzi, Wanda Wright, Mark Nehring

Oral health disparities, specifically dental caries/early childhood caries have remained higher in the Black and Hispanic communities than in other populations. The CDC and The Boston Public Health commission have identified that the burden of unmet need for these populations remains an acute problem throughout life and Mayor Menino’s call to action known as “Step-Up” has asked Boston dental schools to help with meeting this need.

Recently, increasing numbers of health agencies and researchers have successfully partnered with churches, specifically Black churches to respond to the troubling statistics regarding health disparities. Because the Black church has a long history of being in the forefront of addressing critical social, economic, political, and health issues of African Americans, it is clear they are the principal gatekeepers in reversing these negative trends. Working with churches to reduce health disparities is not a new concept. The Boston Public Health Commission’s “Faith Based Public Health Partnership” aims to do just this, but lacks a dental component.

This intervention project proposes a partnership between Tufts Dental School, the Boston Public Health Commission and African American and Hispanic churches in the South End and Roxbury to provide an oral health screening with fluoride varnish for children in these communities. The identified churches will promote the screening from the pulpit and provide a location for the screening. Tufts School of Dental Medicine will provide the screenings, oral health education, and an option for an appointment at Tufts School of Dental Medicine Department of Pediatric Dentistry. The Boston Public Health Commission will help patients secure coverage for dental treatment if necessary.

Assessment of occlusal stability with the assistance of wireless electromyographic tools.
Aundrea Vereen*, Hiroshi Hirayama, Sujey Rodriguez-Lozano
A case report of a patient with tenderness of the left masseter was monitored with surface electromyography during prosthodontic treatment. The patient presented with pain upon palpation of her left masseter muscle with the recommendation of posterior reconstruction due to caries and functional malposition of current restorations. A removable occlusal therapy appliance was used to determine the anticipated treatment position. Surface electromyography (EMG) was used to detect the electromyographic characteristics of muscle tonus. Bilateral baseline EMG recordings on masseter and temporalis muscles followed by subsequent recordings, were taken throughout treatment until resolution of tenderness and normalized EMG readings were observed.