

Boston University Henry M. Goldman
School of Dental Medicine

SCIENCE DAY 2010 | MARCH 25

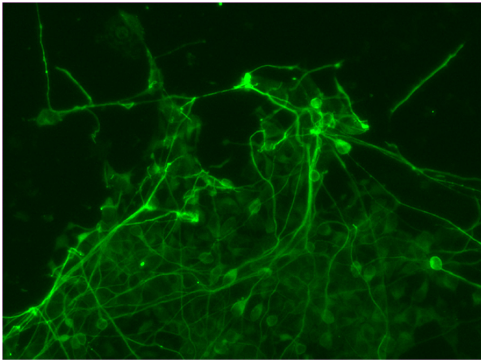


Image: Embryoid body (EB)-mediated neural differentiation of induced pluripotent stem (iPS) cells derived from dental pulp stem cells. EBs were treated with neurogenic medium after cell attachment. Differentiated iPS cells developed into a morphology resembling neural rosettes on day six after neurogenic stimulus and subsequently extended elongated cell cytoplasmic processes resembling neurons on day 12 after stimulation. These cells and their processes showed positive staining for the neuronal precursor marker Tuj1 (green fluorescence).

Featuring a keynote lecture titled, "It was the stem cell all along," by Dr. George Huang Chair and The Herbert Schilder Professor in Endodontics and Director, Advanced Specialty Education Program in Endodontics.

1 to 2 p.m.
670 Albany Street
Boston University Medical Campus

9 a.m. to
4 p.m.

vendor exhibition

100 East Newton Street, first floor hallway and cafeteria

3M ESPE	Johnson and Johnson
ADA Insurance	Massachusetts Dental Society
Army National Guard	Medical Protective
Biocon Implants	MIDMARK Corporation
Brasseler USA	Patterson Dental
Colgate Oral Pharmaceuticals	Rhode Island Dental Association
Dentsply Tulsa Dental Specialties	Sirona Dental Systems, LLC
Designs for Vision, Inc.	Surgitel
Door to Door Dental	Treloar & Heisel
Eastern Dentists Insurance Company	Zimmer Dental
Henry Schein Dental	
Hu-Friedy	

1 to
2 p.m.

keynote research presentation

670 Albany Street, auditorium

Dr. George Huang Chair and The Herbert Schilder Professor in Endodontics and Director, Advanced Specialty Education Program in Endodontics

“It was the stem cell all along”

Dr. Huang received his DDS from Taipei Medical College in 1983 and Certificate in Endodontics (1988), a Master of Science in Dentistry (1989), and a Doctor of Science in Oral Biology (1992), all from the Boston University Henry M. Goldman School of Dental Medicine (GSDM). He is a Diplomate of the American Board of Endodontics. Since beginning his academic career Dr. Huang has held faculty positions at Boston University, the University of California (San Diego and Los Angeles), the University of Maryland, Taipei Medical University, and Columbia University, where he was the Director of the Division of Endodontics. Currently Dr. Huang is the Herbert Schilder Professor in Endodontics and Director of the Advanced Specialty Education Program in Endodontics at GSDM.

Dr. Huang has held several research positions in the National Institutes of Health and is the author of more than 100 publications, including peer reviewed articles, abstracts, and book chapters.

Dr. Huang's current research focus is in two areas: One is to utilize adult stem cells isolated from teeth to regenerate lost dental tissues. The other is the most rigorously investigated reprogrammed cells in the past 3.5 years — induced pluripotent stem (iPS) cells.

Predoctoral Students

Matthew Annese, Basem Jamal, and Maria Kukuruzinska. Department of Molecular & Cell Biology: "Abnormal Expression and Localization of Cell-Cell Adhesion Components In Association With Sjögren's Syndrome."

Kimberley Chan, Xing Yan, James Liao, and George Huang. Department of Endodontics: "Embryonic stem cell gene expression detected in OFCD-ips cells."

Sarah Courtney, DJ Shin, Dan Faibish, Gabby Fredman, Robert Gyurko, and Thomas Van Dyke. Department of Periodontology & Oral Biology: "Resolution of Inflammation in Zymosan-treated ChemR23 Transgenic Mice."

Lindsey Jackson and Russell Giordano. Department of Restorative Sciences/Biomaterials: "A Comparison of Feldspar Ceramic Physical Properties Milled from Cerec 3 Compact and MC XL Milling Units."

Janaki Kanzaria, Michelle Henshaw, Sheree Norquist, Sharron Rich, Heavenly Mitchell, and Patricia Whitworth. Department of Health Policy & Health Services Research, Boston University Henry M. Goldman School of Dental Medicine and Boston Public Health Commission: "Impact of Type of Health Care Provider on Behavioral Intervention Outcomes."

Olga Krikunenko, Hatice Hasturk, Erin Breen, Alpdogan Kantarci, and Thomas Van Dyke. Department of Periodontology & Oral Biology: "Chewing Gum and Levels of Inflammatory Markers in Oral Health."

Jaeseop Lee, Maram Zamakhchari, Xiliu Sun, Frank Oppenheim, and Eva Helmerhorst. Department of Periodontology & Oral Biology: "Zymography of Dental Plaque Supernatant Reveals Multiple Gliadin-degrading Enzymes."

Kevin Ryan, Michelle Henshaw, Corinna Culler, and Susan Cote. Department of Health Policy & Health Services Research, Boston University Henry M. Goldman School of Dental Medicine and Maine Health: From The First Tooth: Integrating Oral Health into the Medical Home."

Leyla Sahabi, Corneliu Sima, Robert Gyurko, and Thomas Van Dyke. Department of Periodontology & Oral Biology: "Vessel Wall Structural Changes in Diabetic Microvasculature."

Moira Sinnott, Sharron Rich, Michelle Henshaw, Raul Garcia, Michael Monopoli, and Judith Jones. Department of General Dentistry: "Low Income Children Have Poor Oral Health-Related Quality of Life."

Postdoctoral Students

Aws ArRejaie, Richard Pober, and Russell Giordano. Department of Restorative Sciences/Biomaterials: "Mechanical Properties of Y-TZP/ Porcelain Interface with Multiple Surface Treatments."

Arwa A. Badahdah, Frank Oppenheim, Eva Helmerhorst, and Esther Bullitt. Department of Periodontology & Oral Biology and Department of Physiology & Biophysics at Boston University School of Medicine: "The Effect of a Naturally Occurring Antimicrobial Peptide (Histatin 5) on the Structure of Bacterial Adhesion Macromolecules (Pili)."

Maha Bahammam and Philip Trackman. Department of Periodontology & Oral Biology: "GSK3 β : A Novel Regulator of CCN2/CTGF Expression Human Gingival Fibroblasts."

AbdulElah Bin Mahfooz and Dan Nathanson. Department of Restorative Sciences/Biomaterials: "Properties of Autocured vs. Photocured Resin Cements."

Konstantina Thomadaki, Leandro G. Carneiro, Erdjan Salih, Jos A. Bosch, Eva Helmerhorst, and Frank Oppenheim. Department of Periodontology & Oral Biology: "Exploration of whole saliva proteolysis as a diagnostic marker for periodontal disease."

Postdoctoral Fellow

Brandon Meier, Prashath Ravi, Pushkar Mehra, Ishwar Bhatia, and Sadru Kabani. Department of Oral & Maxillofacial Surgery: "Ameloblastoma of the Jaws: Is recurrence likely?"

2 to
4:30 P.M.

oral presentations

670 Albany Street, rooms 107 and 108

Predoctoral Students

Sahar Abtahi, Yael Hour-Haddad, Taisuke Ohira, Alpdogan Kantarci, and Thomas Van Dyke. Department of Periodontology & Oral Biology: "Resolvin E1 Enhances P. gingivalis phagocytosis by PMN."

Evan Cohen and Paula Friedman. Department of General Dentistry: "Assessing changes in dental schools' geriatrics curriculum over 25 years."

Sheede Khalil, Ivan Rebustini, Janice Walker, and Maria Kukuruzinska. Department of Molecular & Cell Biology, Boston University Henry M. Goldman School of Dental Medicine; NIDCR-NIH; and Thomas Jefferson University: "N-Glycosylation Drives Duct Formation in the Developing Submandibular Gland."

Krina Shah and Dan Nathanson. Department of Restorative Sciences/Biomaterials: "Effect of Thickness and Photo-Polymerization Duration on Composite Curing."

Postdoctoral Students

Rima Abdallah, Hatice Hasturk, Aldogan Kantarci, Daniel Nguyen, Chris Andry, and Thomas Van Dyke. Department of Periodontology & Oral Biology: "Periodontitis and Atherosclerosis in High Cholesterol-fed Rabbits."

Leandro Carneiro, Caterina Venuleo, G. Goktub, Hatice Hasturk, Eva Helmerhorst, Frank Oppenheim, and Erdjan Salih. Department of Periodontology & Oral Biology: "Quantitative Proteomics of Gingival Crevicular Fluid in Periodontal Disease."

Mohammed Fahmi and Russell Giordano. Department of Restorative Sciences/Biomaterials: "Thermal Shock of Porcelain Veneered Zirconia with Various Surface Treatments."

Mohammed Nadershah, Larry M. Wolford, and Pushkar Mehra. Department of Oral & Maxillofacial Surgery: "Idiopathic Condylar Resorption: Analysis of treatment outcomes using custom-made TMJ Total Joint prostheses."

Siddika Selva Sume, Alpdogan Kantarci, Alan Lee, Hatice Hasturk, and Philip Trackman. Department of Periodontology & Oral Biology: "Epithelial to Mesenchymal Transition in Gingival Overgrowth."

Nathan Turley, R. Figueroa, and Pushkar Mehra. Department of Oral & Maxillofacial Surgery: "Selective Alveolar Decortication: A Minimally-invasive Option for Office-based Surgical Management of Malocclusions."

Maram Zamakhchari, Jaeseop Lee, Frank Oppenheim, and Eva Helmerhorst. Department of Periodontology & Oral Biology: "The Oral Microflora Contains Gluten-Degrading Microorganisms."

Postdoctoral Fellow

Abhishek Mogre, Pushkar Mehra, and Richard D'Innocenzo. Department of Oral & Maxillofacial Surgery: "Anatomy of Dentate Segment of Mandible: Study of Cone Beam CT scans."

Science Day 2010 Abstracts

Abnormal Expression and Localization of Cell-Cell Adhesion Components In Association With Sjögren's Syndrome

Matthew Annese, Basem Jamal and Maria Kukuruzinska
Department of Molecular and Cell Biology

Objectives: Sjögren's Syndrome (SS) is a complex autoimmune disease of lacrimal and salivary glands that result in large lymphocytic infiltrate, acinar cell atrophy, mislocalization of proteins, and impaired acinar cell secretory capacity. In the study, using human minor salivary glands, we focused on the expression, and location of proteins and receptors associated with E-cadherin mediated adherin junctions (AJs) and tight junctions (TJs). Comparisons were made between sections of patients diagnosed with SS and those from a human cadaver to see if presence of lymphocytic infiltrate is the sequela of abnormal expression and localization of Cell-Cell adhesion molecules.

Methods: Tissue samples were analyzed by pathologist and were assigned focus scores based upon patient symptoms and microscopic findings that determined the compatibility of the section with Sjogren's. The formalin fixed and paraffin-embedded tissue samples were examined by indirect immunofluorescence and confocal microscopy for analysis of expression of AJ and TJ components. Control samples were used from non-compatible individuals. **Results:** Salivary tissues of individuals diagnosed with SS in comparison to those not compatible with SS exhibited dissimilar expression and localization of cell to cell adhesion components. **Conclusion:** The considerable difference observed between SS and non-compatible SS sample supports the hypothesis that altered expression and localization of Cell-Cell adhesion components may be attributed to one's genome and the lymphocytic infiltrate is the sequela of altered cell to cell adhesion. The evidence of disparity warrants further investigation using fresh tissue biopsies that will allow quantification and mouse models studies.

Supported by NIH/NIDCR grants RO1 DE 010183 and RO1 DE 015304.

Embryonic stem cell gene expression detected in OFCD-iPS cells

Kimberley Chan, Xing Yan, James Liao, George Huang
Boston University, Boston, MA, USA

Background: Oculofacialcardiodental (OFCD) syndrome is a genetic disorder caused by mutations in the BCOR gene. OFCD syndrome is characterized by enlarged dental roots (radiculomegaly) and eye, facial, and heart anomalies. Stem cells derived from the apical papilla (SCAP) were obtained from an OFCD patient and reprogrammed into induced pluripotent stem (iPS) cells to establish a disease study model. **Aim:** The purpose of this study is to determine whether OFCD-iPS cells derived by the four-factor (Lin28/Nanog/Oct4/Sox2) transduction express embryonic stem (ES) cell markers and whether their embryoid bodies have the potential to form cells of different germ layers. **Methods:** SCAPs were isolated from OFCD patients and reprogrammed to generate OFCD-iPS cells. Embryoid bodies were then grown to induce OFCD-iPS cell differentiation. Human embryonic stem (hES) cell markers expressed by OFCD-iPS cells were detected using immunocytofluorescence. Specific cell lineage markers representing three germ layers were used to examine the differentiation potential of the embryoid bodies from OFCD-iPS cells. **Results:** OFCD-iPS cells express the hES cell markers SSEA-4, TRA-1-60, TRA-1-80, Nanog, Oct4, and Sox2. OFCD-iPS embryoid body-derived cells expressed gene markers representing three germ layers: GFAP (ectoderm), Desmin (mesoderm) and AFP (endoderm). **Conclusion:** OFCD-iPS cells possess similar characteristics to hES cells in cultures and may be used to study the disease mechanisms of OFCD.

Resolution of Inflammation in Zymosan-treated ChemR23 Transgenic Mice

Sarah Courtney, Dong-Jin Shin, Dan Faibish, Gabrielle Fredman, Thomas Van Dyke
and Robert Gyurko

Department of Periodontology and Oral Biology
Goldman School of Dental Medicine, Boston University, Boston, MA

Resolution of inflammation and return to homeostasis is essential for maintaining normal tissue function. There are numerous molecular events that contribute to this process after an inflammatory insult. Specific omega-3 polyunsaturated fatty-acid-derived mediators have been recently described within resolving exudates, including resolvin E1 (RvE1). RvE1 binds its receptor chemR23 on monocytes and macrophages and accelerates phagocytosis of apoptotic neutrophils, thus enhancing inflammation resolution. In our laboratory a transgenic mouse strain was generated where the chemR23 receptor is over-expressed in leukocytes, thus amplifying RvE1 signaling. We hypothesize that over-expression of chemR23 and consequent augmentation of RvE1 signaling will accelerate resolution of peritoneal inflammation and clearance of zymosan particles via the lymphatic system and the spleen. We have identified chemR23tg mice by DNA extraction from ear samples, PCR and gel electrophoresis. Inflammation was induced by intraperitoneal injection of zymosan A (0.2 mg in 1mL phosphate buffered saline). 12 or 24 hours later mice were sacrificed; the spleen was removed, fixed in formalin, sectioned, and immunostained with anti-zymosan A antibody. Image analysis was performed to compare zymosan content in wild-type and chemR23tg spleens. Zymosan signal was detected in the spleens of wild-type and chemR23tg mice at 12 and 24 hours. No significant differences were detected in zymosan signal intensity between wild-type and chemR23tg mice. Additional time points need to be considered to validate the pro-resolving effect of chemR23 in the inflammatory process.
Supported by NIDCR grants DE16933 (RG) and DE15566 (TVD).

A Comparison of Feldspar Ceramic Physical Properties Milled from Cerec 3 Compact and MC XL Milling Units

Lindsey Jackson and Russell Giordano
Department of Restorative Sciences/Biomaterials

Objectives: The new Sirona milling unit, Cerec MC XL, is reported to produce a comparable result at a faster speed with a more user-friendly machine than the older version, Cerec 3. This study aimed to evaluate this statement in terms of the surface roughness and flexural strength of ten ceramic bars milled per units per speed setting, normal or fast, provided by Sirona Dental Systems. **Methods:** Testing was done using Mitutoyu profilometer and Instron three-point flexural strength machines. Once each of the bars was broken, they were examined using scanning electron microscopy to see if any surface defects were apparent. **Results:** Results showed that in the horizontal direction all bars were of comparable roughness, but that in the longitudinal direction the Cerec 3 fast mode was significantly rougher than all others ($P < 0.001$ vs. MC XL fast, < 0.01 vs. Cerec 3, < 0.05 vs. MC XL). Flexural strength testing revealed that units at normal speed gave comparable strength products, but the faster speed was significantly weaker as compared to Cerec 3 normal speed ($P < 0.01$ vs. Cerec 3 fast, $P < 0.05$ vs. MC XL fast). Scanning electron microscopy viewing showed that in all cases strength correlated with a smaller porosity size and in normal modes also correlated with larger cluster size. MC XL products differed only in that the shape of some porosities was convoluted, which was not present in any Cerec 3 samples viewed. **Conclusion:** The MC XL unit does produce a comparable product at a faster rate than the Cerec 3 unit.
All materials provided by Sirona Dental Company.

Impact of Type of Health Care Provider on Behavioral Intervention Outcomes

Janaki Kanzaria¹, Michelle Henshaw¹, Sheree Norquist, Sharron Rich¹, Heavenly Mitchell², and Patricia Whitworth²

¹Boston University Goldman School of Dental Medicine

²Boston Public Health Commission, Health Baby/Health Child

Objective: To determine the effectiveness of oral health counseling provided by non-dental professionals at reducing ECC (early childhood caries) risk factors as part of a pre- and postnatal home visiting program. **Methods:** The Healthy Baby/Healthy Child (HBHC) program provides at home pre- and postnatal care for the subpopulations of Boston that are disproportionately affected by health disparities. HBHC nurses were trained to provide patient centered counseling focused in ECC prevention and to conduct oral health assessments during the home visits. The nurses provided oral health visits at baseline, 3, 6, 9 and 12 months. Within 24 hours, a dental hygienist also conducted dental screenings and assessed what counseling messages the nurse provided and their behavioral risk factors for ECC. Nurse focus groups were conducted and client interviews are scheduled in order to understand barriers, facilitators and program effectiveness. **Results:** Baseline data was collected on 128 mothers/children so far. The percentage of mothers who clean or brush their child's gums or teeth 1-2 times daily increased from 54.6% to 91.3% from the first to the last visit. The percentage of mothers who put their child's pacifier and/or nipple in their own mouth before giving it to the child decreased from 28.3% to 5.6% from the first to the last visit. No significant differences were found in oral health behavior between those subjects that entered into the study prenatally and those that entered postnatally. **Discussion:** Preliminary data appears to support the hypothesis that oral health counseling by non dental health professionals is effective at reducing behavioral risk factors for ECC. Once data collection is complete, we will be able to determine if the nurses can accurately assess oral health status in this non-clinical setting and if the clients valued the nurses' counseling as much as counseling provided by dental health professionals. **Conclusion:** Nurses were able to integrate oral health counseling into the home visiting program. If the counseling is shown to be effective, we will use the results from this feasibility study to design and conduct a clinical trial to determine if home visiting nurses can effectively reduce ECC. *Supported by NICDR 1R21DE018654*

Chewing Gum and Levels of Inflammatory Markers in Oral Health

Olga Krikunenکو, Hatice Hasturk, Erin Breen, Alpdogan Kantarci, Thomas Van Dyke
Department of Periodontology and Oral Biology

Objective: To determine the impact of sorbitol chewing gum with additives including vitamin C (500 mg), green tea extract (1% of final weight), and gallic acid (5mg) on oral health by measuring the level of systemic inflammatory markers of periodontal disease and systemic diseases that are indicative of increased risk for cardiovascular and other systemic diseases. **Methods:** Ninety-two (92) adults with gingivitis (≥ 2 , modified gingival index) were enrolled. Subjects were assigned randomly to either chewing gum test group, or no chewing gum control group. During the study, subjects asked to chew 5 sticks of gum per day, each for at least 15 minutes, after breakfast, at mid morning, after lunch, mid afternoon and after dinner. The study duration was 8 weeks. Clinical periodontal measurements including gingival index (GI), plaque index (PI) and bleeding on probing (BOP) were taken at baseline and 8 weeks. Serum samples were obtained from peripheral blood samples collected at baseline and 8 weeks and were used to evaluate the levels of inflammatory markers, interleukin 1- β (IL-1 β), IL-6, IL-10, and C-reactive protein (CRP). **Results:** Ninety subjects have completed the entire trial; therefore data collected from these patients was used for the analysis. No statistical differences were found between baseline levels of inflammatory markers. Interestingly, baseline CRP levels were highly elevated in gingivitis patients and this was consistent with their level of gingivitis. More interestingly, 8 weeks of chewing gum use resulted in a significant decrease in CRP levels compared to non-chewing gum group ($p < 0.001$). Levels of IL-6 and IL-1 β did not show significant differences ($p > 0.05$), however IL-10 levels were increased in subjects with chewing gum indicating the anti-inflammatory actions of chewing gum with additives. **Conclusions:** The study results indicate that chewing gum with additives including green tea extract, Vitamin C and gallic acid may be useful in decreasing systemic inflammatory markers by reducing the clinical inflammation in patients with gingivitis. The significant decrease in CRP levels suggests the impact of oral health in reducing the risk for systemic disease including cardiovascular disease. *Supported by grants from Wm. Wrigley, Inc.*

Zymography of Dental Plaque Supernatant Reveals Multiple Gliadin-degrading Enzymes

Jaeseop Lee, Maram Zamakhchari, Xiuli Sun, Frank Oppenheim and Eva Helmerhorst
Boston University, Boston, MA

Objectives: Celiac disease is an auto-immune disease triggered by dietary gluten which affects about 1:150 individuals. We recently noted that dietary gluten show great structural similarities with salivary basic proline-rich proteins (bPRPs) with regard to their high content in glutamine and proline residues. These bPRPs are extensively cleaved by salivary proteases. It was hypothesized that oral microbial enzymes may also cleave dietary gluten, and therefore aid in the digestion of these proteins. **Methods:** Supragingival dental plaque was collected with an explorer, suspended in artificial saliva ion buffer and centrifuged. The supernatant was washed over 5kD filter for ion removal. To 2.5ml of supernatant, 2% ampholyte solution was added followed by iso-electric focusing (IEF) using the MicroRotofor cell apparatus (Bio-Rad). The sample was separated into fractions at 10°C and at 1 W for 210 min while the voltage was stabilized at 320 V. Enzymatic activities in the obtained fractions towards dietary gluten were investigated by zymography with gliadin as substrate. **Results:** The plaque supernatant was separated into 10 fractions by IEF yielding proteins with pI values ranging from pH 2.5 to pH 10. Subsequent gliadin zymography yielded the approximate molecular weights of the gliadin-degrading enzymes present in these fractions. Major bands appeared in fractions exhibiting pH values of 4.5, 5.5 and 6.5, and the components identified in these fractions showed MWs of approximately 50, 75, 100 and 150 kD. **Conclusion:** The results reveal that dental plaque contains multiple microbial enzymes with capacity to degrade gluten. Their concerted action towards gluten, likely involving different cleavage site specificities, attribute a role of saliva in digestion and extend the function of saliva beyond the oral cavity. These discoveries have important clinical implications for the treatment of gluten-sensitive enteropathies such as celiac disease and wheat allergies.

Supported by NIH/NIDCR grants DE05672, DE07652, and DE18132.

From The First Tooth: Integrating Oral Health into the Medical Home

Kevin Ryan¹, Michelle Henshaw¹, Corinna Culler¹, Susan Cote²
Boston University Henry M. Goldman School of Dental Medicine¹, Maine Health²

Objective: From the First Tooth (FTFT) seeks to eliminate early childhood caries (ECC) in Maine's youngest children (birth to age 3) which would dramatically improve their health and serve as a model to eliminate ECC in similar communities. This project is the first step in evaluating this program. **Methods:** Training and education on oral health assessment, fluoride varnish and parent counseling were provided to the medical team by a dental public health hygienist. Each site submitted quarterly reports which included de-identified data on number and age distribution of children receiving services, and frequency of fluoride application per child. Descriptive statistics were computed for each of the variables, stratified by site, including the percentage of age eligible children seen. In year 2 of the project, learning sessions were convened to solicit candid insights to the challenges and successes of program implementation. The session results were recorded and then independently coded for themes by three individuals. From these results, a coding rubric was established and used in a second coding of the data. This process was completed individually by each analyst in order to foster inter-rater reliability. Once completed, the analysts established a fixed set of codes which were used to finally classify the data. **Results:** The program provided 2,817 children with 4,405 fluoride applications. Age distribution was: 19% less than 12 months; 49% between 12 and 24 months 20% 25-36 months, and 12% greater than 36 months. Fifty eight percent of services were provided at independent pediatric practice (urban and rural), 18% at urban pediatric residency hospital practice, 13% at 13 different rural, family medicine practices and 7% at WIC sites. Qualitative analysis of the learning sessions showed that the most common barriers identified were related to training, workflow, documentation, and practice characteristics. The most common facilitators were having a leadership/champion, ongoing support, building on existing infrastructure, and well defined staff roles. **Discussion:** The sites had varying success with integrating oral health services into their medical practice. The evaluation of the facilitators and barriers provides further insight into how to improve services at existing sites and to facilitate replication. Some of the most prevalent problems include perceived lack of training, lack of strong leadership, problems with documentation, and lack of reimbursement, issues that can be addressed by FTFT efforts. **Conclusion:** A comprehensive evaluation of the program is necessary to facilitate program success, with tailored recommendations based on practice type. Currently, Maine's Medicaid program reimburses physicians for fluoride applications, but public policy will need to be expanded to have all insurers cover this service if the program hopes for widespread adoption. *Supported by The Sadie and Harry Davis Foundation*

Vessel Wall Structural Changes in Diabetic Microvasculature

Leyla Sahabi, Corneliu Sima, Robert Gyrko, Thomas Van Dyke
Department of Periodontology and Oral Biology
Boston University School of Dental Medicine

High blood glucose level in diabetes induces vascular changes via production of superoxide and subsequent oxidative stress. The Akita mouse is a model of type 1 diabetes with early onset hyperglycemia. It has a point mutation in the *Ins2* gene leading to impaired production of the normal insulin peptide that accumulates in the β cells inducing apoptosis. Akita males become hyperglycemic as early as 4 weeks of age. **Objective:** we assessed the post-capillary venule wall thickness in Akita compared to wild type mice in dorsal skin of induced air pouches following leukocyte recruitment inside the pouch. **Material and Methods:** Cryostat sectioning, Masson's-trichrome staining, Wright-Giemsa (Sigma), hemocytometer, trypan blue, isoflurane, tumor necrosis factor alpha: TNF α (MW 17.2 KDa, Roche), phosphate buffered saline 1X (PBS), zeiss axiovert 200 inverted epifluorescent microscope equipped with a Sony DFW-X700 digital video camera. Air pouch wall samples of wild type and Akita mice were collected four hours following the injection of TNF α inside the pouch and collection of recruited leukocytes by lavage. Total and differential leukocyte counts were done using hemocytometer then 50 μ l of each lavage was loaded on cytospin slides and stained with Wright-Giemsa. Vessel wall thickness was assessed on 10 μ m sections stained with Masson's trichrome and measured in 10 different locations along the circumference of trans-sectioned microvessels with diameters of 20-40 μ m. The average of 4 measurements in Akita was compared to WT. **Results:** Akita recruit fewer leukocytes inside the air pouches. Vessel wall in Akita microvessels showed increased thickness when compared to WT. This indicates that chronic hyperglycemia may induce structural vessel wall changes in microvasculature and thus contribute to impaired leukocyte recruitment in inflammation. **Conclusion:** Impaired innate immunity in patients with diabetes may be caused by inefficient leukocyte recruitment. The present study indicates that chronic hyperglycemia may be causing microvascular vessel wall changes thus contributing to impaired leukocyte recruitment.

Low Income Children Have Poor Oral Health-Related Quality of Life

Moira Sinnott, Sharron Rich, Michelle Henshaw, Raul Garcia, Michael Monopoli and
Judith Jones

Department of General Dentistry, Boston University Goldman School of Dental Medicine
and Dental Quest Foundation

Objectives: To empirically explore relationships between child, family and community-level characteristics (*Fisher-Owens, 2007*) and parent-reported oral-specific, health related well-being in kindergarten, third and sixth grade children in Massachusetts. **Methods:** This study is a hierarchical analysis of cross-sectional survey and clinical data from 2,209 children from the 2006-2007 Massachusetts Oral Health Project. The sample is a representative cross-section of kindergarten, third, and sixth graders in 155 Massachusetts public schools. Outcomes include a 6-item Pediatric Oral Health-related Quality of Life (POQL) Instrument and the single item self report of oral health (OH1). Surveys were filled out by parents regarding their own and their child's oral health as well as other questions such as those regarding work status, health habits, and education; children were briefly examined by a dentist or hygienist for the presence of caries. **Results:** Participants included 822 kindergartners, 855 3rd and 532 6th graders. Hierarchical multivariate regression models showed that child-level factors including urgent need for dental treatment and low income (as indicated by free or reduced-cost lunch status) were consistently associated with worse OH1 and POQL, including the presence of pain and missing school ($p < 0.02$). Child and parent-level factors associated with some but not all poor outcomes included children's brushing habits ($p < 0.01$), parents' education ($p = 0.045$) and immigration status ($p = 0.001$). **Conclusion:** Urgent need for treatment and low income are associated with measures of poor oral quality of life in children. Policies supporting preventive programs for low income children on free or reduced lunch have merit in terms of preventing pain, missing school and decrements in quality of life. *Supported by NIDCR U54 DE014264, U54DE019275, K24DE000419 and the Dental Quest Institute*

Mechanical Properties of Y-TZP/ Porcelain Interface with Multiple Surface Treatments

Aws Arrejaie and Russell Giordano
Department of Restorative Sciences/Biomaterials

Objectives: Evaluate the bond strength of different conventional veneering porcelains to Y-TZP materials with various surface treatments. Evaluate the effect of revising the firing chart of LavaCeram (3M/ESPE) on the bond strength to Y-TZP. **Materials and Methods:** 200 Y-TZP discs (Lava 3M/ESPE) were randomly divided into 20 groups. Four different surface treatments were conducted: 1. As sintered. 2. Grinding using a 120 grit resin bonded diamond disc (Struers) with a 0.0008 kg/mm² load. 3. Grinding followed by heat treatment of 1000°C for 15 minutes. 4. Sandblasting using 50 microns Alumina oxide. The pressure was adjusted to 80 pounds per square inch (6 bars), and the powder rate was adjusted to 4.2 gram per minute. The distance from the nozzle of the handpiece to the specimens was 20 mm at a speed of 30 mm/min. Discs were veneered with five conventional veneering porcelains: VM9, (Vita). Noritake CZR cerebian, (Noritake). NobelRondo Zirconia, (Nobel biocare). LavaCeram. Revised LavaCeram firing chart. The powder water slurry mix was condensed into a mold to form a button with a diameter of 4 mm and height of 3 mm. All specimens were subjected to a shear bond test using a 4 mm notched blade on universal testing machine (Instron) with a crosshead speed of 0.5 mm/min.

	VM9	Noritake	Nobel Rondo	LavaCeram (regular firing)	LavaCeram (custom firing)
As sintered	33.1±5.3	24.7±4.9	43.8±6.8	32.2±6.8	46.92±6.2
Grinding	59.22±6.87	47.8±6.8	64.64±6.66	54.9±6.62	72.045±5.7
Grinding + Heat treatment	83.13±13.1	65.1±5.03	88.7±11.3	65.53±9.2	94.6±7
Sandblasting	48.28±8.3	43.31±6.8	60.5±11.09	45.06±6.2	66.48±9.63

Conclusions: Surface treatments have a significant effect on the bond strength of multiple conventional veneering porcelains to Lava zirconia. Increasing the firing temperature of LavaCeram will significantly increase the bond strength to Lava zirconia.

The Effect of a Naturally Occurring Antimicrobial Peptide (Histatin 5) on the Structure of Bacterial Adhesion Macromolecules (Pili)

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Adhesion and colonization of host tissue cells are key steps for pathogenic bacteria to establish infection. For many bacterial species expression of surface adhesion pili, which are long thin filaments also known as fimbriae, is a major virulence determinant. Histatin 5 is a histidine-rich cationic salivary peptide known to exhibit cidal activities against a broad range of fungi. We are investigating whether histatin 5 could exert alternative antimicrobial activities, targeting pili and interfering with bacterial adhesion. We tested the effect of histatin 5 on the morphological features of CFA/I pili, purified from the enterotoxigenic *Escherichia coli* (ETEC) that cause traveler's diarrhea, using transmission electron microscopy. Different molar ratios of CFA/I pilus subunit to histatin 5 were examined starting from 1:1 to 1:4 molar ratio. Our data showed that histatin 5 has deleterious effects on pilus morphology. At low molar ratios, pili unwind to their fibrillar form. At higher molar ratios pili appear wider, stiffer, and more uniform in length. These observations suggest that histatin 5 may stabilize the natural transient unwinding form of the pilus helix or it may hyper-stabilize the helical form. Therefore, the pilus is either weak, or rigid with no flexibility, respectively. We speculate that in both circumstances pili may not be capable of presenting the adhesive tip to the host receptor and/or will be unable to sustain binding to host cell under shear forces from the host microenvironment. Future experiments will test the effect of this disruption on the ability of bacteria to adhere to host cells using tissue culture cells and haemagglutination assays. In conclusion, histatin 5 shows a disruptive effect on bacterial pili and this could be further explored to develop a new class of antimicrobials that target bacterial adhesion.

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GSK3 β : A Novel Regulator of CCN2/CTGF Expression Human Gingival Fibroblasts

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Introduction: Connective tissue growth factor belongs to the CCN family of growth factors, designated CCN2 or CTGF. Transforming growth factor β 1 (TGF β 1) stimulates CCN2/CTGF expression in human fibroblastic cells. CCN2/CTGF is responsible for mediating some of the effects of TGF β 1 and has been implicated in the onset and progression of fibrosis in most human tissues including the gingiva. **Objective:** Explore the involvement of intracellular signaling mediators in this response including PI3'K and its known downstream targets, namely PKC and GSK3 β . **Methods:** Primary human gingival fibroblasts and fetal human lung fibroblasts were cultured for comparative analysis on the regulation of CCN2/CTGF expression induced by TGF β 1. Total cell lysate protein was used for Western blot to detect changes in protein levels of CCN2/CTGF. **Results:** Our initial data suggested that PI3'K activity is important in regulating TGF β 1 induced CCN2/CTGF expression. We identified that GSK3 β plays a novel role in mediating TGF β 1-induced CCN2/CTGF and that this effect is independent of its involvement in the Wnt / β -catenin pathways. Investigation of PKC pathways indicates that they are not involved in this response human gingival fibroblasts. **Conclusion:** Our data further supports recent findings from our lab that supports the unique regulation of CCN2/CTGF expression in gingival fibroblasts that may provide therapeutic opportunities to treat oral fibrotic diseases, and is likely a mechanism of the tissue-specificity of drug-induced gingival overgrowth.

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Properties of Autocured vs. Photocured Resin Cements

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Objective: To evaluate the effect of dual curing vs. chemical curing on mechanical properties of contemporary self-etching (SE) resin. **Methods:** Seven SE resin cements were tested: a. Rely x unicem (3M ESPE); b. Embrace wetbond (Pulpdent); c. Multilink sprint (Ivoclar); d. Biscem (Bisco); e. G-cem (GC); f. Monocem (shofu); g. Multilink automix (Ivoclar). Flexural strength (FS) and Elasticity modulus (EM) were determined on bar-shaped specimens (2 x 2 x 25 mm). Compressive strength (CS) was measured on cylinder-shaped specimens (6 x 4mm). The freshly mixed cements were placed into Teflon molds. Ten specimens were dual cured using Triad curing machine for one minute. Other ten specimens were tested after chemical curing only. FS, EM and CS tested under the Instron Universal Testing machine (0.5 mm/min). Data was analyzed for significant differences using ANOVA and multiple comparison tests.

Results: The mean of (CS), (FS), (EM) and SD are shown in the following table:

Test	Curing method	Embrace Wetbond	Monocem	Biscem	G-cem	Multilink Sprint	Multilink Automix	Rely X Unicem
CS	Dual	236.3(44)	267(21.6)	204(15)	211(16.5)	198.5(10.7)	300(21.6)	204(14)
CS	Chemical	214(21)	225(34.7)	205.5(23.5)	200(14.5)	188.8(7.8)	309(17)	184.6(11)
FS	Dual	88.4(13.4)	75(13.7)	91(16)	77(12.3)	99(17.8)	116.9(6)	80.6 (11.6)
FS	Chemical	42(10)	53(16.5)	71(13)	59(9.3)	75(19)	100.8(7.6)	62.6(8.2)
EM	Dual	2746(508)	2036 (420)	6813(632)	7675(1161)	6272(394)	6313(336)	6911 (832)
EM	Chemical	897(298)	1089 (444)	5367(875)	5481(496)	3599(1332)	5425(320)	832(407)

Conclusion: The dual cure cements reported significantly higher CS, FS and EM ($P < 0.05$) than all the other material tested after chemical curing only.

Exploration of Whole Saliva Proteolysis as a Diagnostic Marker for Periodontal Disease

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Introduction: Periodontal disease is a chronic disease of the oral cavity comprising a group of inflammatory conditions affecting the supporting structures of the dentition. All the oral surface molecular/enzymatic activities associated with periodontitis occur in tissues bathed in whole saliva making it a valuable diagnostic source. **Aim:** To compare the overall proteolytic activities in whole saliva supernatant (WSS) from periodontal patients and periodontally healthy individuals, with regard to their capacity to degrade synthetic histatin 5 and histatin 3. **Materials and Methods:** Whole saliva was collected from 48 individuals, of which 23 were periodontally healthy and 25 were afflicted by moderate to severe periodontitis. WSS were obtained after centrifugation and frozen at -80°C . Histatin 5 was added to a 450 μl aliquot of WSS to a final concentration of 0.2 mg/ml and incubated for after 0h, 0.5h, 1.5h and 3h. The degradation of histatin 5 was visualized by cationic PAGE and quantitated by densitometric analysis. In addition the synthetic substrate, Z-RGYR-MCA, was added to a 90 μl WSS aliquot to a final concentration of 10 mM. Enzymatic cleavage of this substrate was measured in triplicate fluorimetrically at a $\lambda_{\text{ex}} = 340\text{nm}$ and a $\lambda_{\text{em}} = 465\text{ nm}$. **Results:** The half life for the degradation of histatin 5 was 91.95 ± 45.7 and 105 ± 38.4 minutes in WSS from healthy and periodontal patients, respectively. Z-RGYR-MCA substrate conversion was 22.51 ± 10.6 and 25.30 ± 9.61 AU/min for healthy and periodontal patients, respectively. **Conclusion:** In all subjects, protease activities could be established successfully using either the natural histatin 5 substrate or the synthetic analog. While there were no significant statistical differences between the experimental groups, the prospect of using whole saliva as a diagnostic fluid for detecting active periodontal disease remains an attractive avenue of exploration.

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Ameloblastoma of the Jaws: Is Recurrence Likely?

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Statement of Problem: Ameloblastoma is a benign and locally aggressive odontogenic tumor with the literature universally reporting a high recurrence rate. The purpose of this study was to evaluate the results of primary ‘*aggressive*’ surgical management of ameloblastoma of the jaws. **Methods and Materials:** Surgical treatment was prospectively provided with a uniform protocol (resection with 1.5 cm margins) based on principles of known tumor biology, results of histopathological examination, and clinical and radiographic presentations. The study included data from patient’s charts with respect to patients’ age, sex, tumor size, type, location, radiographic correlation, and type of surgical treatment. The records were also assessed for success of reconstruction, implant osseointegration, results of nerve repair, and rate and timing of recurrences. **Results:** A total of 33 patients were included in the study. The age of the patient sample ranged from 14-86 years (mean 36.42 years) and the follow-up ranged from 5- 16 years (mean 10.4 years). No recurrences were seen in any patient at longest follow-up. Twenty-two (67%) patients were female and eleven (33%) were male. Twenty-seven (82 %) were multicystic (24 mandible and 3 maxilla) and six were unicystic (4 mandible and 2 maxilla). Twenty-seven patients had an impacted tooth associated with the lesion. All five maxillary patients underwent resection and reconstruction with an obturator. Twenty-seven mandibular defects were reconstructed with non-vascularized cancellous marrow grafts harvested from the iliac crest and one patient underwent microvascular free flap reconstruction. A total of 64 endosseous implants were placed in 14 of the patients reconstructed with iliac crest bone with a success rate of 94%. All bone grafts were successful and surgical complications were minor, not requiring re-operation. Patients undergoing inferior alveolar nerve preservation and/or repair had excellent recovery of sensation at longest follow-up. **Conclusion:** The results of this study show that: 1) Aggressive surgical management consistent with principles following current known concepts of tumor biology, could be considered as “curative”, and, 2) patients can undergo predictable functional and esthetic reconstruction with a very low rate of complications. Based on this experience, we propose the concept of using the term “*persistence*” rather than “*recurrence*” to describe the high recurrence rate previously reported in the literature, as in our opinion, the high rate of recurrence is perhaps related to inadequate surgical management rather than the tumor recurring by itself due to its intrinsic potential.

Resolvin E1 Enhances *P. gingivalis* phagocytosis by PMN

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Background: Resolvin E1 (RvE1), a lipid mediator derived from eicosapentanoic acid, has been shown to resolve inflammation by controlling the neutrophil (PMN) and macrophage-mediated acute inflammatory response. *Porphyromonas gingivalis* (*P. gingivalis*) is a major pathogen associated with severe periodontal disease. Periodontitis is characterized in part by a persistence of the pathogen in a robust inflammatory lesion.

Objectives: The aim of the study was to evaluate the impact of RvE1 on the phagocytosis of *P. gingivalis* by human PMN. **Materials and Methods:** Human PMN were isolated from the peripheral blood of healthy human donors (n=6). *P. gingivalis* was labeled with FITC and incubated with the PMN at various multiplicities of infection (MOI). The impact of RvE1 was tested at different doses (10^{-9} - 10^{-7} M). Phagocytosis was quantified using FACS analysis. The number of PMN actively phagocytosing bacteria and the number of bacteria per PMN was quantified based on FLH-1 (FITC) content after 2 hours at 37°C. **Results:** There was an increase in the number of actively phagocytosing PMN and an increase in bacterial uptake per PMN with RvE1 treatment. The MOI at which PMN lost viability was increased by RvE1. RvE1 increased the number of surviving PMN and the capacity to phagocytose *P. gingivalis*. **Conclusions:** RvE1 treatment induces an increase in PMN phagocytosis of *P. gingivalis* increasing the number of phagocytosing cells and the bacteria per cell. During conditions of high bacterial load, PMN treated with RvE1 are more resistant to *P.g.* toxicity indicating that PMN-mediated defense against this bacterium as well as PMN survival during bacterial challenge is enhanced by RvE1.

Assessing Changes in Dental Schools' Geriatrics Curriculum Over 25 Years

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Objectives: To evaluate how dental school curricula has adapted to growing geriatric populations in the United States and Canada since the seminal Moshman study, conducted in 1984. **Methods:** This study employed a 12 item self-administered questionnaire sent to the deans of 55 dental schools in the United States and 10 dental schools in Canada. The survey inquired about the quality and proportion of pre-doctoral education dedicated to geriatric dentistry from a multi-factorial point of view. Factors such as, how many faculty members trained in geriatrics are on staff, how many total hours are allocated to geriatric education, if schools intend on expanding their geriatric curriculum, etc. The study also investigates *Annual ADEA Surveys of Dental School Seniors* in order to determine how graduating dental students rate their own experience in geriatrics. **Results:** Results were received from 49 US and 7 Canadian dental schools for an 85% response rate. Results from the questionnaire clearly indicate that emphasis on geriatric dentistry has not significantly increased over the past two decades. For example, results show that 82% of dental schools do not actually have a department of geriatric dentistry, only 16.3% of schools currently provide adequate training in geriatrics to their faculty, and graduating dental school seniors consistently report their training in geriatric dentistry as receiving an inadequate amount time. **Conclusion:** Considering the expanding elderly populations in the United States and Canada, appropriate changes regarding the emphasis and time devoted to training in geriatric dentistry have not been implemented. Pre-doctoral experience in treating elderly patients is inadequate, and changes to dental school curricula need to be made in order to keep up with current trends in population change.

N-glycosylation Regulates Duct Formation in the Developing Submandibular Gland

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Objectives: During the mouse submandibular gland (SMG) morphogenesis, presumptive ducts are extended from the initial stalk into the proximal regions of the developing buds, where the interior cells reorganize and undergo differentiation into duct cells. During differentiation, ductal progenitors downregulate cellular N-glycosylation, acquire mature E-cadherin junctions and cease to proliferate. We have shown that mature E-cadherin junctions are required for ductal cell survival. Moreover, the formation of mature E-cadherin junctions requires downregulation in its N-glycosylation status. These data suggest that N-glycosylation played an important role in the development of ductal structures. Here, we investigated the effects of downregulating N-glycosylation on duct extension during SMG branching morphogenesis by targeting the DPAGT1 gene, shown by us to be the upstream regulator of E-cadherin N-glycosylation status.

Methods: We used small interfering RNA to partially inhibit DPAGT1. Because DPAGT1 is present in both SMG epithelium and mesenchyme, we separated the epithelium from the underlying mesenchyme using dispase prior to siRNA transfection. Isolated epithelial rudiments were then cultured in the presence of either siRNA to DPAGT1 or scrambled controls at a concentration of 200 nM for 22h. **Results:** Phase microscopy images showed that downregulation of DPAGT1 resulted in a greater number of elongated ductal structures compared to controls. Immunofluorescence staining of F-actin revealed intense cortical actin staining in regions of the extending ducts in treated glands in contrast to controls. In addition, SMGs treated with siRNA to DPAGT1 exhibited increased organization of E-cadherin junctions in the extending ductal structures.

Conclusion: Our results indicate that diminished N-glycosylation drives duct development. Moreover, they suggest that DPAGT1 functions as a morphogenetic switch in the formation of ductal structures.

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Effect of Thickness and Photo-Polymerization Duration on Composite Curing

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Objective: To assess the effect of light curing duration and composite thickness on the level of deep layer curing of two restorative resins.

Methods: Two composite-resins: A. Kalore (GC); and B. Venus Diamond (Heraeus) were included in the study. The composites were placed in plastic molds with cylindrical openings 2mm in diameter and 2mm or 3mm in depth and light cured with the Bluphase 16i (Ivoclar) unit set on 'high power' for either 20 or 40 seconds. The level of curing was assessed by microhardness testing (Micromet 2003, Buehler) of the top and bottom surfaces of each cylindrical composite specimen. Nine readings for each test parameter were conducted. The results were tabulated and subjected to ANOVA statistics.

Results: The table below shows the relative level of composite bottom surface microhardness (expressed as mean % and SD) per composite group vs. the corresponding top surface microhardness (considered as 100%):

Composite Thickness	2mm	2mm	3mm	3mm
Photocuring duration	20sec	40sec	20sec	40sec
Composite A	81.39% (6.62)	80.80% (5.32)	50.03% (7.26)	61.70% (2.56)
Composite B	67.72% (4.21)	75.52% (9.73)	38.73% (8.47)	53.60% (6.88)

Conclusions: Both composites exhibited a significant difference between bottom and top surface microhardness ($p=.000$), suggesting that even at 2 mm thickness the deep regions of the composites were not fully cured. Increasing curing time from 20 to 40 sec had a significant curing improvement effect ($p=.000$) on the bottom layers of both materials, especially at 3 mm thickness. There was a significant difference in 'depth of cure' between the 2 materials.

Periodontitis and Atherosclerosis in High Cholesterol-fed Rabbits

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Objective: Epidemiological and recent clinical studies have implicated periodontitis as a risk factor for cardiovascular disease. The purpose of this study was to determine whether treatment of periodontitis with topical Resolvin E1 (RvE1) reduces the risk for cardiovascular disease in a high cholesterol-fed rabbit model of periodontitis and atherosclerosis. **Methods:** Periodontitis was induced using ligature and *P. gingivalis* for 6-weeks in 20 animals on a 13 week regimen of 0.5% cholesterol diet. Animals were divided into 4 treatment groups: non-treatment; vehicle; RvE1 (1 mg/ml); RvE1 (0.1 mg/ml). Topical application of treatments was performed every-other-day for 13 weeks. In addition, 4 animals received ligature and cholesterol diet alone without *P. gingivalis* as control. Morphometric, radiographic and histologic evaluations were performed. Histologic sections were stained with hematoxylin-eosin and Masson's Trichrome for descriptive histology and collagen activity, respectively. Lipid deposition was evaluated by computer-assisted morphometry in the aortas en face after staining with Sudan IV. **Results:** Total serum cholesterol increased in the RvE1 and control groups to 1711.5 ± 416.6 and 1829.4 ± 417.9 mg/dl, respectively ($p > 0.05$). Clinical and radiographic measurements showed a significant periodontal disease progression in groups with periodontitis and vehicle treatment at 13 weeks while RvE1 treatment prevented periodontal inflammation and bone loss in a dose dependent manner. Similarly, histological analysis demonstrated severe bone loss in specimens from non-RVE1 treated animals, whereas complete protection from inflammation and further bone loss induced by *P. gingivalis* was observed in RVE1 treated animals. The percent of aortic surface covered by lipid was significantly increased in the no treatment and vehicle groups compared to RvE1-treated groups and ligature alone group ($p < 0.01$). **Conclusions:** In an experimental periodontitis model in rabbits, RvE1, used as a topical agent, resulted in prevention of atherosclerotic changes induced by periodontal inflammation. *Supported by USPHS Grant DE16191.*

Quantitative Proteomics of Gingival Crevicular Fluid in Periodontal Disease

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Gingival crevicular fluid (GCF) has been of major interest for many years because of its unique capacity to reflect in its protein composition the changes that occur during the transition from gingival health to periodontal disease. As periodontal disease develops the proteins of GCF are known to show changes, both quantitatively and qualitatively. Of particular interest are local inflammatory response proteins and local alveolar bone matrix components as they may reflect disease remission or exacerbation. **Objectives:** To compare the GCF proteome of individuals suffering from periodontal disease versus healthy controls. **Methods:** GCF samples were collected with paper strips (Periopapers, ORAFLOW NY) from 10 patients with good general health and absence of gingival inflammation (healthy group) and 10 patients exhibiting more than 5mm pocket depth (periodontitis group). Samples were collected from 4 different sites from each subject and pooled. An aliquot of 100µg total protein from each pool were separately derivatized with amine-reactive isotopic variants of mTRAQ reagents. Both samples were combined and analyzed by nano-flow LC-ESI-MS/MS for protein identification and relative quantification. **Results:** A total of 140 GCF proteins were identified and quantified. Among these, 37 components significantly increased in GCF of the periodontitis group. These proteins include a wide range of biological functions and origins such as extracellular matrix, immunity, inflammation, enzymes and enzyme inhibitors. **Conclusions:** This study is the first of its kind to utilize a large-scale relative quantitative proteome analysis of GCF. The comparison of LC-ESI-MS/MS data obtained from healthy and periodontal diseased subjects provide the foundation for identifying proteins useful as diagnostic biomarkers.

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Thermal Shock of Porcelain Veneered Zirconia with Various Surface Treatments

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Objective: Clinical reports indicate potential problems with veneer porcelain fracture on zirconia frameworks. The purpose of this study was to use thermal shock testing to evaluate the crack resistance of the different surface treatment of the zirconia veneered with different kind of porcelains. **Methods:** Yttria stabilized zirconia blocks (Vita) were sectioned into discs approximately 2 mm thick and sintered according to the manufacturer's instructions in the recommended furnace. A total of 144 specimens were randomly divided into three groups. For each group, a different surface treatment was applied: (1) No treatment (2) Grinding using a 120 grit diamond disc with a 0.0034 kg/mm² load (3) Grinding then heat treatment at 1000°C, 15 minutes. Four types of veneering porcelains were used: VM9, Lava Ceram, NobelRondo and Noritake CZR. Each type was fired according to the manufacturer's recommendations. Specimens were thermal shocked by heating to 90°C and then quenched in ice water. Specimens were dried at room-temperature and replaced in the furnace at 90°C until they reached equilibrium. Porcelain crazing was examined by: (1) Visual examination. (2) Microscope (10X) (3) UV- light inspection of fluorescent dye penetration. If failure was not observed the specimens were reheated to a temperature 10°C higher, quenched, and re-examined. This was repeated at 10°C higher each time until failure was observed in each specimen.

Results: Table 1: Weighted Mean Temperature of Failure.

Porcelain Type	No Treatment	Grinding	Grinding and Heating	Total Mean
VM9	198°C	163°C	215°C	192°C
Lava Ceram	174°C	148°C	187°C	170°C
NobelRondo	156°C	140°C	145°C	147°C
Noritake CZR	160°C	144°C	172°C	158°C
Total Mean	172°C	148°C	180°C	

ANOVA and Tukey showed there were significant differences among porcelain type and surface treatment ($p < 0.05$). **Conclusion:** Grinding lowers crazing resistance. Grinding followed by a heat treatment improves crazing resistance.

Idiopathic Condylar Resorption: Analysis of treatment outcomes using custom-made TMJ Total Joint prostheses

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Statement of Problem: Idiopathic condylar resorption (ICR) continues to present a major diagnostic and therapeutic challenge to practitioners for many reasons including rarity of the condition, progressive nature of the deformity, and its simultaneous involvement of skeletal, occlusal and articular disorders. Recommended treatment alternatives range from no surgery, only orthognathic surgery (maxillary impaction and chin camouflage surgery), staged TMJ and orthognathic surgery, to concomitant TMJ and orthognathic surgery. Traditionally, costochondral grafts have been used for TMJ replacement in this sub-group of patients, but advances in technology and availability of modern, patient-fitted TMJ alloplastic replacement systems offers many benefits over such autogenous replacement options. **Materials and Methods:** A retrospective analysis of all patients who underwent surgical treatment of ICR by a single surgeon at Boston University Medical Center hospital between 2000 and 2008 was performed. Criteria for inclusion in the study included: 1) Progressive mandibular retrusion secondary to TMJ resorption, 2) negative screening for known forms of systemic arthrides causing TMJ resorption, c) Absence of any history of trauma, 4) Presence of anterior open bite with Class II skeletal and dental malocclusion, and, 5) Surgical treatment involving bilateral TMJ total joint replacement and concomitant mandibular advancement with or without maxillary surgery. Clinical and radiographic examination was performed presurgically (T1), immediately postsurgery (T2), and at longest follow-up (T3). Visual analog scales were used for subjective examination of jaw function, dietary restrictions, functional disability, patient satisfaction, and pain at each of the above intervals. Objective examinations included: a) clinical evaluations of TMJ sounds, anterior open bite, occlusal relationship, mandibular range of motion (excursions, protrusion, and maximum opening), cranial nerve VII injury, and objectionable scarring, and, b) radiographic analysis by superimposition of cephalometric tracings for measurement of surgical change (T2-T1) and relapse (T3-T2). **Results:** A total of 14 patients were included in the study. The average patient age was 25.6 years (range 22 – 32) and average follow up was 3.4 years (R 2-8). All patients were females. 10/14 (70%) patients correlated the period of active orthodontic treatment to the initiation of resorption. All patients gave a history of clicking/popping of their TMJ's at some stage during their lifetime. Average surgical time was 8.5 hrs (R 5.5-12) and the average duration of hospitalization was 3.6 postsurgical days (R 3-7). Average mandibular advancement at Point B was 18.7 mm (R 14-27) and average occlusal plane change was -5.8 degrees (R 3-8). 9/14 (64%) underwent maxillary orthognathic surgery for posterior downgrafting with rigid fixation and grafting. The table below summarizes some of the other results:

	Pain (0-10)	TMJ Sounds (# pts)	Anterior open bite (# pts)	Maximal interincisal opening without pain (mm)	Maximal interincisal opening irrespective of pain (mm)	Lateral excursion	Diet	Permanent cranial nerve injury	Objectionable scarring
Preop (T1)	5.6 (0-10)	14	14	18.6 (5-39)	44 (37-52)	8.9 (3-9)	6.8 (0-10)	0	0
Postop		2	0	38.8	39.5	1.6	2.3	0 *	0

(T3)				(30-45)	(35-45)	(0-3)	(0-4)		
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* one patient had prolonged weakness of the frontal/temporal branch, which resolved completely in 7 months **Conclusions:** ICR patients can be treated very effectively using custom-made TMJ total joint prostheses for correction of TMJ resorption and mandibular advancement in combination with maxillary orthognathic surgery, when indicated for correction of the associated dentofacial deformity. Use of these prostheses eliminates donor site morbidity and allows for extremely large mandibular advancements to be performed in a predictable manner with a drastic reduction in TMJ dysfunction symptoms and excellent stability of orthognathic movements.

Epithelial to Mesenchymal Transition in Gingival Overgrowth

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Epithelial to mesenchymal transition (EMT) occurs normally in development. In pathology, EMT drives cancer and fibrosis. Medication with phenytoin, nifedipine, and cyclosporine-A often causes gingival overgrowth. Based partly on the histopathology of gingival overgrowth, the present study investigates the hypothesis that EMT could contribute to its development. Phenytoin-induced human gingival overgrowth tissues, the most fibrotic drug-induced variety, contain diminished epithelial E-cadherin expression, whereas FSP-1 levels are up-regulated. In connective tissue stroma, fibronectin and fibronectin ED-A levels are increased in overgrowth lesions. TGF- β 1 treatment of primary human gingival epithelial cells cultured in transwell plates resulted in inhibited barrier function as determined by reduced electrical resistance, paracellular permeability assays and cell surface E-cadherin expression. TGF- β 1 altered the expression of other markers of EMT determined at the mRNA and protein levels: Ecadherin decreased, whereas SLUG, fibronectin, MMP2, MMP9 and MMP13 increased. In summary, in vivo studies show that important EMT markers occur in phenytoin induced gingival overgrowth tissues. Data in vitro support that human gingival epithelial cells undergo functional and gene expression changes consistent with EMT in response to TGF- β 1. These findings support the hypothesis that EMT likely occurs in drug induced gingival fibrosis. *Supported by NIH/NIDCR grant DE11004 and RR00533.*

Selective Alveolar Decortication: A Minimally-invasive Option for Office-based Surgical Management of Malocclusions

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Statement of the Problem: Hospital-based major orthognathic surgical procedures have been traditionally used for predictable surgical management of skeletal malocclusions. Recently, selective alveolar decortication (SAD) has been proposed as an alternative option. However, no previous reports exist in the oral and maxillofacial surgery literature regarding long-term stability and/or limitations of this technique for correction of dentofacial deformities. We aim to define specific indications, and present data showing failure and stability of treatment results with the use of SAD. **Materials and Methods:** The study involved a total of 48 patients with malocclusions who were surgically treated by combined SAD and orthodontic treatments. All surgical procedures were performed as outpatient surgery in an office setting under intravenous sedation. Buccal and lingual/palatal decortication was performed using rotary high-speed instrumentation under irrigation. Alveolar augmentation was performed with particulate allograft (Osteograft N-300/700 mixture), when indicated. Rapid orthodontic treatment was initiated within a few days (range 3-14 days) of surgery and continued until correction of malocclusion. All patients then underwent standard orthodontic retention. **Methods of Data Analysis:** For study purposes, patients were divided into sub-groups based on the presenting malocclusion: Maxillary transverse deficiency (n= 8), Dental crowding (n= 8), Anterior open bite (n= 8), Deep bite (n= 8), Skeletal class II (n= 8), and skeletal class III (n=8). Data were assessed for: 1) Type of skeletal malocclusion corrected, 2) Soft and Hard tissue response, 3) Surgical, orthodontic, and total treatment times, 4) Cost of surgical treatment, and 5) Long-term stability. **Results of Investigation:** Regional Acceleratory Phenomena (RAP) occurs following purposeful SAD, thereby resulting in increase bone turnover and decrease bone density; these biological effects lead to accelerated tooth movement and reduced treatment duration, without adverse effects on the periodontium. The technique was extremely successful for correction of certain specific malocclusions including dental crowding, transverse maxillary constriction, and some open bite malocclusions. Scope of non-surgical orthodontic treatment increased 2-3 x when compared to conventional treatment. Long-term results were extremely stable secondary to high tissue turnover and thicker cortical bone resulting from the augmentation grafting. The technique was not successful in treating skeletal anteroposterior (class II/III) discrepancies greater than 3 mm. **Conclusion:** SAD significantly increases the scope of non-extraction orthodontic treatment and has the potential to be an alternative to traditional orthognathic surgery when used for management of certain specific types of dentoskeletal deformities. Even for patients requiring routine orthognathic surgery, SAD may be indicated as it decreases the preoperative orthodontic treatment time by more than 50 % (e.g., leveling and aligning of dental arches, relief of dental crowding, canine retraction, etc). Advantages of SAD include minimally invasive surgery, decreased treatment time, decreased health-care costs, and the ability to perform surgery in an office. It is not indicated, by itself, for management of severe skeletal class II and/or III cases.

The Oral Microflora Contains Gluten-Degrading Microorganisms

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Introduction: a previous study carried out in our laboratory has shown that oral microbial proteases exhibit cleavage activity towards the frequently occurring XPQ tripeptide sequence in salivary basic proline-rich proteins. The XPQ tripeptide is also abundant in dietary gluten including glutenins and gliadins. We hypothesize that the oral microbial proteases involved in cleaving salivary basic proline-rich proteins may also degrade gluten. **Materials and methods:** Supragingival plaque was collected from interproximal surfaces using a dental scaler and suspended to an OD₆₂₀ of 1.0 in artificial saliva mimicking the inorganic composition of oral fluid. Plaque suspension or supernatant fractions separated by centrifugation were incubated at 37°C for various time intervals with gliadin at a final concentration of 250 µg/ml. Gliadin degradation as a function of time was monitored by SDS PAGE and the gliadin peptides generated in the supernatant were sequenced by LC-ESI-MS/MS. The specific cleavage specificities were confirmed using in vitro synthesized gliadin peptide analogs covalently linked to paranitroanilide. These synthetic substrates were used at a final concentration of 400 µM and substrate hydrolysis was measured spectrophotometrically at 405 nm. **Results:** SDS-PAGE monitoring of gliadin indicated complete degradation within 6 h. Mass spectrometric analysis of the peptides generated yielded prominent cleavage site specificities not only C-terminal to XPQ but also to XQP, XPF, and XFP. C-terminally protected paranitroanilide-derivatized peptides containing the sequences YPQ, QQP, PPF and PFP were all hydrolyzed. Among these synthetic substrates, YPQ was cleaved most efficiently. **Conclusion:** This is the first reported evidence for gluten-degrading microorganisms to be part of the natural oral microflora. It is very well possible that oral microorganisms play an unappreciated role in the digestion of gluten and are implicated in gluten-related enteropathies such as celiac disease.

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Anatomy of Dentate Segment of Mandible: Study of Cone Beam CT scans

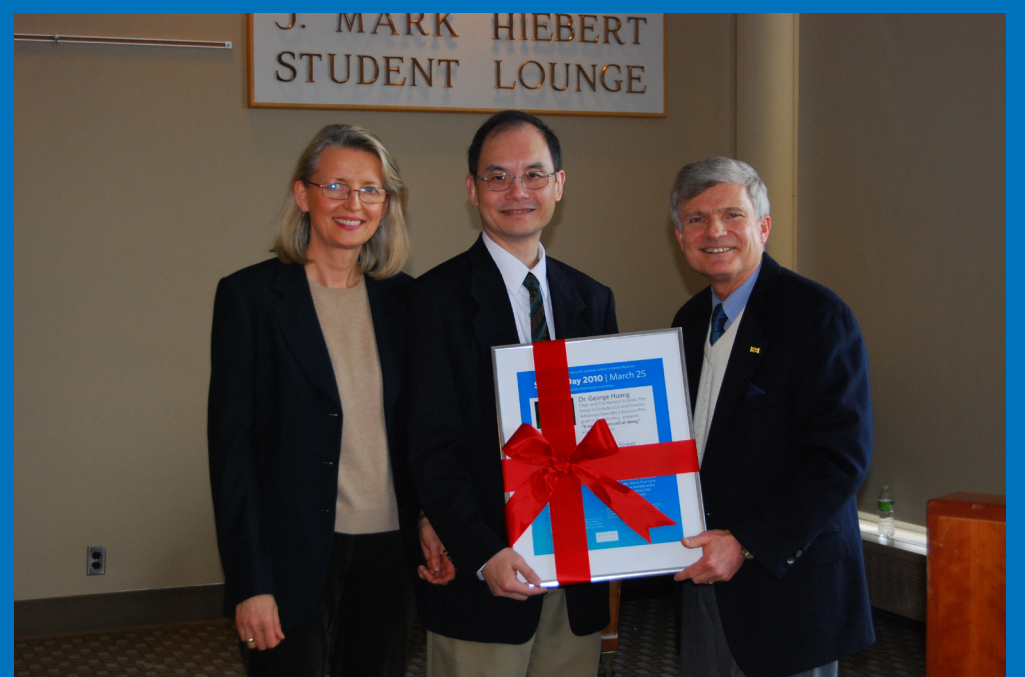
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Objectives: To evaluate detailed anatomy of the dentition-bearing portion of mandible using CT scans. **Materials & Method:** The study involved an analysis of cone-beam CT scans of the dentate mandibular segment by the Department of Oral & Maxillofacial surgery in the Boston University Goldman School of Dental Medicine. Criteria for exclusion included 1. Presence of pathology of the mandible, 2. Presence of internal hardware (e.g.: plates, screws, implants, etc), which could cause artifacts, and, 3. Prior mandibular surgery. Each scan was evaluated for the following data: 1. Width of alveolar ridge, 2. Width of buccal cortex, and, 3. Width of lingual cortex, 4. Horizontal dimension of inferior alveolar nerve (IAN), 5. Vertical Dimension of IAN, 6. Distance between IAN and teeth apices, 7. Distance between IAN and buccal cortex, 8. Distance between IAN and lingual cortex, 9. Distance between IAN and inferior border of mandible (IB), 10. Width and location of mental foramen, 11. Distance between mental foramen and IB, 12. Distance between the mental foramen and the teeth apices. Mitutoyo electronic calipers with a resolution of 0.01mm were used to make measurements including 100 random, 2-point measurements ranging from 0.1 - 10mm. Standardized two-point markings were made and three individual examiners interpreted these. The kappa value of the measurements was calculated to verify accuracy and minimize technical errors. **Results:** A total of 46 mandibular Ct scans were reviewed. The results were as follows: 1- Average width of alveolar ridge was 8.97mm (r: 6.22 to 14.25). 2- Average width of buccal cortex was 2.46mm (r: 1.12 to 4.2). 3- Average width of lingual cortex was 2.32mm (r: 1.18 to 2.42). 4- Average horizontal dimension of IAN was 3.41mm (r: 2.88 to 3.45). 5- Average vertical dimension of IAN was 4.66mm (r: 3.18 to 4.73). 6- Average distance between IAN and teeth apices was 3.9 (r: 0.9 to 5.88). 7- Average distance between IAN and buccal cortex was 4.76mm (r: 2.13 to 8.3). 8- Average distance between IAN and lingual cortex was 3.06mm (r: 0.3 to 4.78). 9- Average distance between IAN and IB was 8.24mm (r: 4.38 to 10.48). 10- Average width of the Mental foramen was 4.15mm (r: 3.5 to 4.2). 11- Mental foramen was located apical to second premolars in over 90% of scans. 12- Average distance between the mental foramen and IB was 14.2 (r: 9.88 to 14.57). 13- Average distance between the mental foramen and teeth apices was 5.07mm (r: 4.18 to 5.31). **Conclusion:** The findings of this study point some important landmarks and measurements that surgeons should keep in mind while performing mandibular surgery to minimize the possibility of iatrogenic damage to vital anatomic structures. 3rd molar surgery: The IAN was found to be lingual in relation to the 3rd molars in 100 % cases, thus, removal of buccal bone for exposure and removal of third molars remains a safer choice as opposed to the older lingual-split technique. Internal fixation in trauma, reconstructive and orthognathic surgery: We recommend the use of ≤ 4 mm length within the neutral zone if bone screws are to be used to avoid iatrogenic damage to the IAN. Based on the range of alveolar width measurements, it appears that 8-10 mm length screws can be usually safely placed without injuring the lingual nerve during rigid fixation of osteotomies and mandibular fractures in the 3rd molar and adjacent ascending ramus area. Rotary instrumentation: The surgical burs commonly used in mandibular orthognathic surgery have a 6mm cutting surface; in order to avoid IAN damage, we recommend initially using only half the length of the bur while making the vertical buccal cuts of a sagittal split osteotomy procedure, and then assessing the need for increasing the depth by checking presence or absence of bleeding (cancellous) bone.

Science Day 2010

Boston University Henry M. Goldman School of Dental Medicine hosted Science Day 2010, featuring keynote speaker Dr. George Huang, March 25 and the Science Day Awards Luncheon April 6.

Dean Jeffrey W. Hutter presented Dr. Huang with a framed Science Day 2010 poster for his keynote lecture.



Moira Sinnott DMD 12 (right, left) was honored for receiving the IADR Behavioral, Epidemiological, & Health Services Research Outstanding Predoctoral Student Abstract Award in 2009 for her research on oral health disparities.

Leyla Sahabi DMD 12 (right, second from left) won best predoctoral poster presentation.

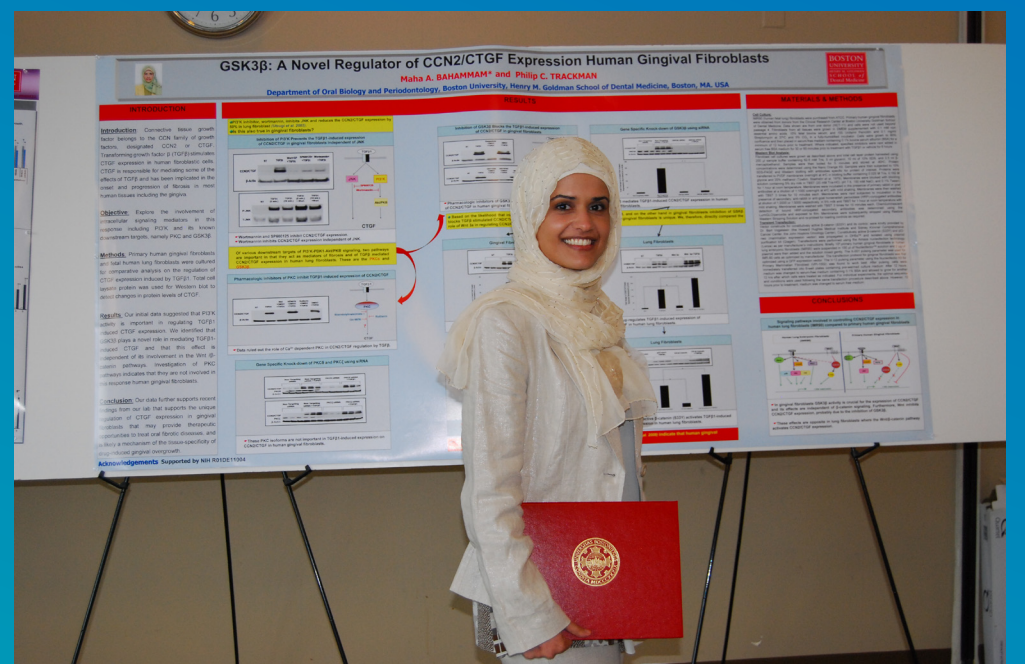


Sahar Abtahi DMD 12 (right, center) won best predoctoral oral presentation.

Kimberly Chan DMD 12 (right, second from right) won this year's ADA/Dentsply Award.

Lindsey Jackson DMD 12 (far right) presented research at the AADR annual meeting in March.

Maha Bahammam PERIO 11 won best postdoctoral poster presentation.





Siddika Selva Sume ORAL BIO 10 won best postdoctoral oral presentation. She also won the Provost's Award at Boston University Science & Engineering Day 2010. Mai Zamakhari won the Goldman School of Dental Medicine Dean's Award at the same event.



Jeffrey Clark DMD 11 (far left) was honored for winning an award from the National Students Research Group of the AADR at the Hinman Symposium in 2009. Oral & Maxillofacial Surgery Postdoctoral Fellow Prashath Ravi (left, right) won best postdoctoral fellow poster presentation.

Sheede Khalil DMD 12 was honored for winning an AADR/Johnson & Johnson Healthcare Products Hatton Award in the Junior category. To the right, she explains her research at the Awards Luncheon.



Award winners with Provost Karen Antman, Dr. Maria Kukuruzinska, Associate Provost for Research Ronald Corley, and Dean Jeffrey W. Hutter.

