

march
29, 2007

BOSTON UNIVERSITY SCHOOL OF DENTAL MEDICINE SCIENCE DAY

all day: exhibitions
lobby and cafeteria

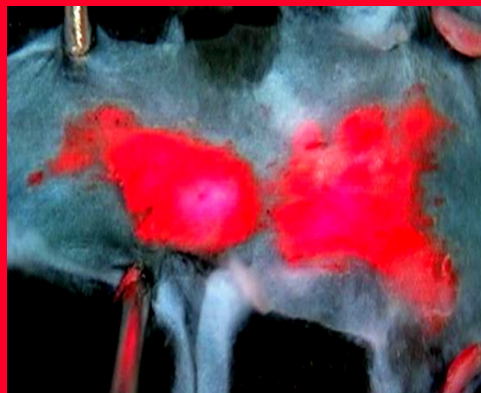
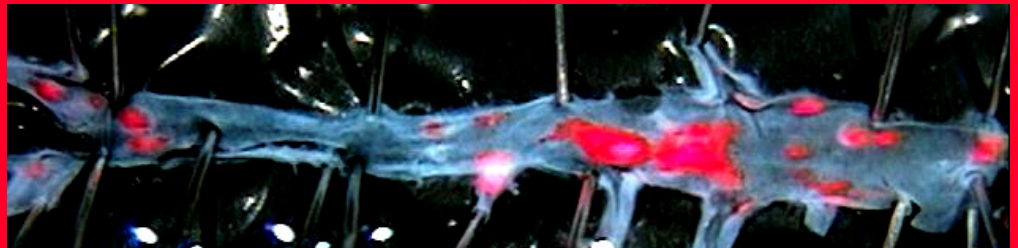
10 am to noon: poster
presentations and judging
third floor

noon to 1 pm: dr. barbara corkey,
"fat cells and β cells, co-
conspirators in obesity"
room 301

2 to 4:30 pm: oral presentations
room 309

5 pm: winners announced
room 309

fri, 6:30 pm: science night and
awards presentation
seaport hotel, boston



sponsored by busdm student
research group, busdm predoctoral
research program, and busdm
american student dental
association (asda)

photo: aortic tree of mice infected
with *Porphyromonas gingivalis*,
a major pathogen in periodontal
disease; red area denotes lipid-rich
atherosclerotic plaque
courtesy of dr. salomon amar

Student presentations Science Day 2007

Poster presentations (10AM-12N)

Predoctoral Students

Donna Afshar, Sheede Khalil and Maria Kukuruzinska. Department of Molecular and Cell Biology: "Role of E-cadherin junctions in Sjogren's disease."

Madhumitha Ambalavanan, Pushkar Mehra, Wael Youssef and David Cottrell. Department of Oral and Maxillofacial Surgery: "Evaluating the efficacy of penicillin in the treatment of head and neck fascial infections."

Prashanti Bollu, Shaza Mardini and Anita Gohel. Department of General Dentistry: "Horizontal versus vertical bitewings in opening interproximal contacts."

Renato DeLuna, Mihai Nita-Lazar, Sheede Khalil and Maria Kukuruzinska. Department of Molecular and Cell Biology: "Role of N-glycosylation in submandibular gland branching morphogenesis."

Kersden Loretoni, Jessica Yu, Alp Kantarci and Donald Ferguson. Department of Orthodontics: "Faxitron cephalometric analysis of tooth movement following selective alveolar decortication."

Michael Major and Carlos Flores-Mir. Department of Orthodontics at the University of Alberta: "Survey of systematic review authors in dentistry."

Doron Ringler and Judith Jones. Department of General Dentistry. "Veterans with mental illnesses report more dental problems than veterans without mental illnesses."

Devon Wan, Walter Siqueira, Eva Helmerhorst and Frank Oppenheim. Department of Periodontology and Oral Biology: "Proteomics of the human minor salivary gland secretions."

Postdoctoral Students

Srinivas Ayilavarapu, Alpdogan Kantarci and Thomas Van Dyke. Department of Periodontology and Oral Biology: "Phospholipase A2 (iPLA 2) activates superoxide generation in neutrophils from diabetic subjects."

Satheesh Elangovan and Frank Oppenheim. Department of Periodontology and Oral Biology: "Conformational analysis of acidic proline-rich salivary protein PRP-1 using FTIR."

Mohammed Fahmi, Richard Pober and Russell Giordano. Department of Restorative Sciences/Biomaterials: "Effect of surface treatment on porcelain bond strength to zirconia."

Paula Ohara and Donald Ferguson. Department of Orthodontics: "Orthodontic treatment and retention outcomes: PAOO and fixed retainers."

Sreedevi Srinivasan and Salomon Amar. Department of Periodontology and Oral Biology: "LPS dependent cytokine profile in LITAF deficient mice."

Xiuli Sun, Eva Helmerhorst and Frank Oppenheim. Department of Periodontology and Oral Biology: "Oral fungal disease prevention: impact of histatin proteolysis."

Yaritza Vazques and Salomon Amar. Department of Periodontology and Oral Biology: "A novel signaling pathway, p53/STAT6B/MAPK/LITAF, in inflammatory process."

Siddharth Vora and Phillip Trackman. Department of Periodontology and Oral Biology: "A role for the lysyl oxidase propeptide in the regulation of osteoblast proliferation and differentiation."

Mohammed AlZeitani and Donald Ferguson. Department of Orthodontics: "Influence of orthodontics plus selective alveolar decortication on root resorption."

Postdoctoral Fellows

Mihai Nita-Lazar and Maria Kukuruzinska. Department of Molecular and Cell Biology: "E-cadherin N-glycans inhibit intercellular adhesion by interfering with the recruitment of protein phosphatase 2A to adherens junctions."

Walter Siqueira and Frank Oppenheim. Department of Periodontology and Oral Biology: "Histatins in the in vivo formed acquired enamel pellicle."

Oral presentations (2PM-4PM)

Predoctoral Students

Matthew Lupu and Russell Giordano. Department of Restorative Sciences/Biomaterials: "Strength of Milled Ceramic Framework Material."

Vicki Rivera, Fawzi Al-Qatami, Alpdogan Kantarci and Donald Ferguson. Department of Orthodontics: "Morphological alveolar bone changes after corticotomy and orthodontic tooth movement."

John Turner, Fawzi Al-Qatami, Alpdogan Kantarci and Donald Ferguson. Department of Orthodontics: "Influence of selective alveolar decortication on PDL osteoclast count."

Postdoctoral Students

Melanie Campese, Eva Helmerhorst and Frank Oppenheim. Department of Periodontology and Oral Biology: "Salivary Histatins: a novel class of antimicrobials?"

Khiem Pham-Nguyen, Alpdogan Kantarci and Donald Ferguson. Department of Orthodontics: "Micro-CT analysis of osteopenia following alveolar decortication and tooth movement."

Faysal Succaria, Emad Al-Badawi and Dan Nathanson. Department of Restorative Sciences/Biomaterials: "In vitro shear bond and retention tests: self-adhesive resin cements."

Yair Whiteman and Dan Nathanson. Department of Restorative Sciences/Biomaterials: "Tear strength and dimensional accuracy of elastomeric impression materials."

Role of E-cadherin Junctions in Sjogren's Disease

Donna Afshar², S. Khalil², L. Ban³, D. Faustman⁴, and M. Kukuruzinska²,
¹Boston University, school of dental medicine, boston, MA, USA, ²Boston University, boston, MA, USA, ³Harvard University, charlestown, MA, USA,
⁴Harvard University, massachussets general hospital, charlestown, MA, USA

Objectives: Sjogren disease is an autoimmune systemic inflammatory disorder that affects a number of organs including salivary glands. Current understanding is that altered cell-cell adhesion of autoimmune target organs occurs prior to the establishment of lymphocytic infiltrates. The goal of this study was to gain insights into the cell biology of the developing submandibular glands (SMG) from a NOD mouse, a model for diabetes and Sjogren-like disease. Our hypothesis is that dysfunctional cell-cell adhesion in the developing SMG renders it a target for lymphocytic infiltration. Here, we investigated E-cadherin, the major salivary cell-cell adhesion receptor, in the embryonic staged SMGs from the NOD mouse to assess their functional status and effect on branching morphogenesis and cytodifferentiation. **Methods:** Submandibular gland rudiments were dissected from E13.5 and E18 NOD mice and cultured. Isolated glands were fixed, permeabilized and blocked overnight. The glands were then stained for E-cadherin and actin cytoskeleton using the indirect immunofluorescence staining method. Primary antibody to E-cadherin was obtained from BD Transduction and the secondary antibody, AfiiniPure Fab fragment goat anti-mouse IgG from Jackson ImmunoResearch Laboratories. Phalloidin, a stain for filamentous actin (F-actin), was purchased from Molecular Probes. The slides were analyzed using confocal microscopy. **Results:** E13.5 SMGs from NOD mice displayed altered morphology. Indirect immunofluorescence staining of E-cadherin showed mislocalized distribution of E-cadherin junctional complexes with a pronounced lack of targeting to the apical lateral cell-cell borders. Phalloidin staining for F-actin revealed disorganization of the actin cytoskeleton and this correlated with the loss of salivary cell polarity. Similarly, a population of SMGs at E18 displayed discohesive morphology, altered acinar structures and an apparent collapse of ductal structures. **Conclusion:** Our studies show that impaired cell-cell adhesion in the embryonically developing SMG may explain the susceptibility of this tissue to autoimmunity.

Supported by grants PHS RO1 DE10183 and RO1 DE14437.

Evaluating the Efficacy of Penicillin in the Treatment of Head and Neck Fascial Infections

Madhumitha Ambalavanan, David Cottrell, Pushkar Mehra, and Wael Youssef

Department of Oral and Maxillofacial Surgery, BUSDM

Objective: The purpose of this study is to assess some general characteristics of fascial head and neck infections, including anatomical space involvement, microbiology of the infections, and antibiotics used to treat them, and in turn, evaluate whether the administration of penicillin is adequate to treat space infections. **Patients and Methods:** This study is a retrospective record review that evaluates 78 patients admitted to the Boston University Medical Center in the past 3 years. Criteria for inclusion in the study are that patients must have undergone extra oral incision and drainage and have received general anesthesia for the procedure, received IV antibiotics, and microbiology culture testing. 77 out of the 78 patients reviewed had preoperative head and neck CT scans that showed evidence of a collection. The parameters of the study include gender and age of the patients, involved fascial spaces, duration of hospital stay, bacteria identified in the cultures, co-morbidities, and type of antibiotics administered. **Results:** At this point in the study, we have completely evaluated 10 patients. Among these patients, it was observed that the offending tooth most of the times was #18 and subsequently the most frequently involved space was the L submandibular. More aerobic growth was seen in cultures, especially streptococcus species. Clindamycin was used most frequently for antibiotic coverage in these patients. Penicillin was administered for 4 patients and 2 of those needed additional coverage with clindamycin after non resolution of infection. **Conclusions:** Penicillin was discovered in 1928 and has remained in the mainstay of treatment of odontogenic fascial infections, but over the years there has been an evolution of drug resistant strains. With the advent of synthetic antibiotics, these infections are now often effectively managed with additional antibiotics, most commonly clindamycin, in conjunction with surgery. From the results we can conclude that Penicillin, when used as stand alone therapy, has failed 50 percent of the times and patients needed additional coverage with clindamycin and this could be attributed to resistant strains, inadequate surgical drainage, and inefficient culture techniques for anaerobes, etc.

Horizontal versus Vertical Bitewings in Opening Interproximal Contacts

Prashanti Bollu, Shaza Mardini and Anita Gohel
Department of General Dentistry/Radiology, BUSDM

Introduction: Early diagnosis of occult lesions like incipient interproximal caries is critical to preserve healthy tooth structure. Bitewing radiographs are highly effective in opening interproximal tooth contacts and are used to provide visual detail of surfaces between adjacent teeth. Based on intraoral film position, bitewings may be classified as horizontal and vertical. **Rationale:** Vertical bitewings often do not capture the distal of canine and also fail to open all interproximal tooth contacts thus requiring re-taking the radiograph. The wider image field and more comfortable intraoral film position of horizontal bitewings may open more interproximal surfaces more consistently. A comparative analysis of horizontal versus vertical bitewings was performed to evaluate the effectiveness of each method in capturing the distal of canine and in opening interproximal tooth contacts. **Materials and Methods:** A sample of 30 horizontal and 30 vertical premolar bitewings was randomly chosen from a teaching file of dental patient radiographs. Exclusion criteria helped eliminate 4 horizontal and 2 vertical bitewings. Interproximal contacts between Canine-Premolar, Premolar-Premolar and Molar-Molar were observed for open and overlapped contacts. Six surfaces of each bitewing yielded a total of 324 interproximal surfaces. **Results:** Horizontal bitewings opened interproximal contacts in 67.9% of cases whereas only 38.0% of vertical bitewings did the same. Also, the percentage of vertical bitewings that did not capture the distal of canine was 64.3% when compared to 26.9% of horizontal bitewings. **Conclusions:** Horizontal bitewing radiographs may be a better choice for routine cases with no history or evidence of advanced caries or bone loss. Nevertheless, the longer image of vertical bitewings may still make them the ideal choice for patients with severe caries experience and or alveolar bone loss. Further research in this area could be useful in developing selection criteria when choosing the best bitewing radiograph for individual patient.

Role of N-glycosylation in Submandibular Gland Branching Morphogenesis

Ren de Luna, Sheede Khalil, Mihai Nita-Lazar, and Maria Kukuruzinska
Department of Molecular and Cell Biology, BUSDM

Objectives: The submandibular gland (SMG) develops through branching morphogenesis from an epithelial bud into an array of ducts terminating in secretory acini. In the present study, we investigated the role of N-glycans in E-cadherin adhesive function during SMG development. **Methods:** For these studies we used siRNA strategy to partially inhibit the ALG7 gene, the key regulator of protein N-glycosylation. In the developing SMG, buds comprise of three cell populations with adherens junctions (AJ) of varying stability. This stability is influenced by the N-glycosylation of E-cadherin which allows for dynamic intercellular interactions. Immunostaining of F-actin, E-cadherin, and β -catenin within control siRNA and GPT siRNA treated glands showed the following in earlier embryonic development: 1. siRNA inhibition of the glycosylation enzyme GPT led to amplified clefting within SMG bud and extensive inhibition of branching morphogenesis; 2. promoted more uniformly organized β -catenin earlier in embryonic development and; 3. increased F-actin staining extending distally into the buds compared to siRNA control. **Conclusions:** These data provide new insights into N-glycosylation in SMG development. Inhibition of N-glycosylation interferes with branching morphogenesis of the SMG by affecting, in part, the molecular organization of E-cadherin junctional complexes and their stability allowing for precocious development/differentiation early in branching morphogenesis. *Supported by grants PHS RO1 DE10183 and RO1 DE14437.*

Faxitron Cephalometric Analysis of Tooth Movement Following Selective Alveolar Decortication

Kersden Loretoni, J.W. Yu, Donald J. Ferguson, Alpdogan Kantarci, Robert S. Carvalho, and Thomas E. Van Dyke
Departments of Orthodontics and Periodontology and Oral Biology, BUSDM

Objective: Using faxitron imaging, to cephalometrically analyze the magnitude of tooth movement as a function of time post alveolar decortication in the rat model. **Methods:** In a split mouth control study, two thirds of 101 CRL-CD male rats underwent selective buccal and palatal alveolar decortication adjacent to the left maxillary first molar then assigned to 3 groups: decortication only, decortication + tooth movement, or tooth movement only. Mesial tooth movement using a 25 gram Sentalloy spring secured to a micro-screw lingual to the upper incisors was followed over a six week period. Animals were sacrificed at post-op days 3, 7, 14, 21, and 42. Total maxillas were stripped of most external soft tissues and prepared for ventral-to-dorsal faxitron imaging with settings of 35 KV and 45 seconds at 3X magnification and Kodak Biomax XAR film. Mesial and distal aspects of the 3 molars were identified by perpendicular lines to palatal midline. From posterior nasal spine, 13 linear distances were measured using the Olympus Micro Suite Program. For analysis, the animals were re-grouped at least 10 animals per group as week-1 (days 3 and week-1), week-3 (weeks 2 and 3) and week-6. **Results:** Oneway ANOVA with Scheffe post hoc testing showed a significantly greater mesial movement at week-6 in the decortication plus tooth movement group: mesial of first molar was 783.5 compared to the decortication only groups through week-3 (657.0 and 632.0, $p < .01$) and the day-3 & week-1 tooth movement group (610.5, $p < .01$); space distal to the first molar was 65.6 compared to all others (0.0 to 24.1, $p < .02$). **Conclusion:** Tooth movement combined with decortication resulted in greater tooth movement and produced 3X more space distal to the first molar. The influence of the decortication on magnitude of tooth movement was not evident statistically until week-6 in the rat model.

Survey of Systematic Review Authors in Dentistry: Challenges in Methodology and Reporting

Michael P. Major BSc^{1,2} Carlos Flores-Mir, DDS, Cert Ortho, PhD^{2,3}

¹ Goldman School of Dental Medicine, Boston University, Boston, USA, ²

Craniofacial & Oral health Evidence-based Practice Group (COEPG), ³

Orthodontic Graduate Program, Faculty of Medicine and Dentistry, University of
Alberta, Edmonton, Canada

Objective: 1) identify challenges systematic review (SR) authors face during literature search and selection, 2) determine whether reporting in the journal article of search and selection methods accurately reflects the actual procedures, and 3) determine if author experience has any bearing on reported methodology.

Methods: Corresponding authors of SRs published from Jan 1, 2000 to June 14, 2006 were surveyed electronically about the challenges they faced performing their SRs relative to the Cochrane protocols, 8 key literature search and selection methods, and author experience. **Results:** 53% of 147 subjects responded. Initial literature search and selection design and extended searches were the most challenging reported SR procedures. Limited time and feeling effort was not worth the return were the most frequent causes for extended literature search challenges. Agreement between characteristics of surveyed protocol and published protocol was generally low ($\kappa = 0.179 - 0.475$). There were no correlations between author experience and systematic review literature search and selection thoroughness ($r = -0.016 - 0.192$), and no differences in thoroughness between SRs written by clinicians and academics ($p = 0.783$). **Conclusions:** The main challenges identified – search design and extended searching – underscore the value of collaborating with a health sciences librarian when performing SRs. Dental SR authors still do not appear to fully appreciate the importance of extensive literature searches as central to the impact of their systematic reviews findings.

Veterans with Mental Illnesses Report More Dental Problems than Veterans without Mental Illnesses

Doron Ringler, Michelle B. Orner, Carolyn J. Wehler, Judith A. Jones
Department of General Dentistry, BUSDM and VA Center for Health Quality, Bedford

Objective: An estimated 26.2 percent of Americans ages 18 and older suffer from mental disorders in a given year. The aim of our project is to assess the oral health status and need for dental care in veterans with and without mental illnesses, from both the clinical and the patient perspective. **Method:** The study is a secondary analysis of existing study of oral health and quality of life in veterans. The sample consists of 513 users of the Veteran Affairs (VA) outpatient medical clinics (VHS). The primary outcomes of interest are summary and individual items in three Oral Quality of Life (OQOL) questionnaires (GOHAI, OH-1, A New Brief Measure of Oral Quality of Life). We describe clinical oral health, self-reported oral health and need for care parameters as a function of the mental illness status and as a function of each of the assessed mental illnesses: Schizophrenia, depressive disorder, Bipolar disorder, Generalized Anxiety Disorder, Post Traumatic Stress Disorder (PTSD), Drug addiction and Alcohol dependence. **Results:** Compared with veterans without mental illnesses, veterans with mental illnesses reported more: limitation in kinds/amount of food eaten because of teeth/denture problems, trouble biting certain foods, avoiding eating some foods, trouble swallowing comfortably, limited contact with others, taking medication to relieve mouth pain, worry, being self conscious and nervous because of problems with their teeth gums and dentures, being uncomfortable eating in front of others, avoiding going out, pain and distress, difficult to relax and , and worse health of teeth and gums. However, we found that they have better retention and stability of their dentures, and didn't find differences in their need for any dental care or caries indices. There were no differences in the reports of sensitivity to hot cold or sweet, uncomfortable dentures, or the way they pleased with the appearance of their teeth. Further analysis revealed different patterns of report for each mental illness group. In the depression group we found the greatest degree of oral health problem report followed by the generalized anxiety disorder group. **Conclusion:** Generally, veterans with mental illnesses report more problems and limitations attributed to their oral health, which were not compatible with the clinical exam (compared to the group of veterans without mental illnesses). Contingent on the veterans' mental illness diagnosis, we found a spectrum of responses. However, in the depression group we found the highest degree of dissatisfaction. We need to better understand the factors affecting these reports such as medications, co-morbidity, and whether the individuals answer the questions specifically as the writers intended. Further development of instruments to better anticipate the needs and allocate the appropriate resources among the mentally ill population is recommended.

Proteomics of the Human Minor Salivary Gland Secretions

Devon Wan, W. Siqueira, E. Salih, E. J. Helmerhorst, E.J., F.G. Oppenheim
Department of Periodontology and Oral Biology, BUSDM

Introduction: Current studies in oral biology have made inroads into the proteome of human whole saliva as well as the secretion proteomes of the major salivary glands. The proteome of minor gland secretions, however, has not been investigated to date. We have developed a method to isolate and collect such secretions without contamination from epithelial cells. **Objective:** The current study was aimed at the identification and characterization of proteins present in minor gland secretion using mass spectrometry. **Material and Methods:** Minor gland secretions were collected from 4 subjects in our Clinical Research Center. The mucosa of the lower lip was isolated with cotton rolls, washed 3 times with a water spray, air dried and kept a dry with a new set of cotton rolls. To stimulate salivary flow the lateral border of the tongue was swabbed with a 5% citric acid solution. Secretion droplets were aspirated with a pipet using a 10 ul plastic tip. The expelled secretions (10 -15 ul) were centrifuged and proteins were a) trypsinized directly, b) trypsinized and separated by Mono S cation exchange chromatography, or c) subjected to in-gel trypsinization. Proteomics analyses were carried with a LTQ linear ion trap (Thermo Electron) employing LC-ESI-MS/MS. **Results:** Among many proteins 44 positive identifications were made based on the presence of at least 2 tryptic peptides. Of the 44 proteins, 36 had previously been found in other salivary secretions or crevicular fluid. Interestingly 8 new proteins were discovered not previously reported in any other oral fluid. **Conclusion:** The results obtained represent the first proteome characterization of minor salivary gland secretion showing that this body fluid is significantly different from other oral exocrine secretions.

Phospholipase A2 (iPLA 2) Activates Superoxide Generation in Neutrophils from Diabetic Subjects

Srinivas Ayilavarapu, A. Kantarci, K. Omori, H. Hasturk, and T.E. Van Dyke
Department of Periodontology and Oral Biology, BUSDM

Objective: To investigate the role of Phospholipase A2 (iPLA2) in superoxide generation by neutrophils isolated from diabetic and healthy subjects. **Methods:** Sixteen human subjects diagnosed with diabetes mellitus were recruited in this study along with matched controls. The severity of diabetes was graded according to the Hb1Ac%. IRB approved the protocols for this study. Peripheral venous blood was collected into heparinized tubes and neutrophils were isolated by Ficoll-Hypaque density gradient centrifugation. Superoxide generation was evaluated by a superoxide dismutase inhibitable cytochrome-C reduction assay and data expressed as Vmax and nano moles / 10⁶ cells. Data represents average of at least three experiments with standard error of mean. ANOVA with posthoc Bonferroni's correction for multiple comparisons between groups was used for statistical analyses. **Results:** Neutrophils isolated from diabetic subjects generated significantly more superoxide than neutrophils from healthy subjects when stimulated with fMLP (1 μ M) and this was inversely correlated with their glycemic control ($p < 0.05$). Bromo-eno-lactone (BEL), a specific iPLA2 inhibitor, inhibited superoxide generation from neutrophils in a dose-dependent and biphasic action. This inhibition was rescued by arachidonic acid (50 μ M). Neutrophils isolated from diabetic subjects demonstrated resistance to this inhibition in the initial burst phase of the superoxide generation. **Conclusion:** The data suggest that superoxide generation in human neutrophils is mediated through iPLA and the lack of the glycemic control in diabetic subjects leads to increased activation of iPLA 2.

Supported by USPHS grants DE15566 and RR00533.

Conformational Analysis of Acidic Proline-rich Salivary Protein PRP1 Using FTIR

Satheesh Elangovan¹, Henry C Margolis², Frank G Oppenheim¹, Elia Beniash²

¹ Department of Periodontology and Oral Biology, Boston University Medical Center, MA, USA.

² Department of Biomineralization, The Forsyth Institute, MA, USA.

Salivary acidic proline-rich phosphoproteins (PRPs) have a high affinity for hydroxyapatite surfaces and are believed to play an important role in the formation of acquired enamel pellicle, in the regulation of tooth demineralization in vivo, and providing receptors for the colonization of oral microorganisms when bound to tooth surfaces. Changes in protein conformation upon adsorption have been suggested to play an important role in driving protein-mineral interactions.

Objective: To characterize the conformation of PRP1 in solution and when bound to two synthetic enamel prototypes, hydroxyapatite (HA) and carbonated hydroxyapatite (CHA). **Methods:** Protein binding experiments were carried out at 37°C using purified PRP1 (0.5mg/ml) and 8mg of well-characterized HA and CHA (6wt % carbonate) in buffer solution (0.04M TRIS/0.05M NaCl, pH 6.8). The conformation of PRP1 in buffer and when bound to HA and CHA in suspension was characterized using Fourier transform infrared spectroscopy (FTIR) in the attenuated total reflection mode (ATR). **Results:** FTIR analyses suggest that portions of PRP1 in solution adopt a polyproline type II (PPII) structure, based on the presence of a strong absorbance band at $\sim 1620\text{ cm}^{-1}$, characteristic of a hydrated PPII structure. Upon binding to HA or CHA, this band diminished in intensity and an absorbance band at 1641 cm^{-1} became apparent. It has been reported that dehydrated PPII and PPII complexed with Ca^{2+} have a maximum absorption band at 1641 cm^{-1} . Absorption bands corresponding to beta-sheet and beta-turns were also observed for PRP1 in solution and in the bound state. No significant conformational differences were observed between PRP1 bound to either HA or CHA. **Conclusion:** We show for the first time that acidic PRP1 exhibits PPII-like structure in solution and when bound to apatite surfaces, possibly suggesting that the PPII structure is involved in protein-mineral interactions.

Supported by NIH/NIDCR grant DE-07652, DE-05672 and DE-14950.

Effect of Surface Treatment on Porcelain Bond Strength to Zirconia

Mohammed Fahmi, R. Pober, and R. Giordano
Department of Restorative Sciences/Biomaterials, BUSDM

Objective: This study was conducted to assess the influence of grinding and heat treatment on the shear bond strength of a veneering porcelain to yttria partially stabilized zirconia. **Methods:** Yttria stabilized zirconia blocks (Vita Zahnfabrik, Bad Sackingen, Germany) were sectioned into discs approximately 2 mm thick using a Buehler Ecomet diamond saw and sintered according to the manufacturer's instructions in the recommended furnace. Thirty six specimens were randomly divided equally into three groups. For each group, a different surface treatment was applied: (1) No surface treatment (2) Grinding using a 120 grit resin bonded diamond disc (Struers) with a 0.0034 kg/mm² load (3) Grinding followed by a recommended heat treatment of 1000°C for 15 minutes. The recommended porcelain, Vita VM9, was fired according to the manufacturer's recommendations in two steps. First a dentin VM9 wash layer was fired onto the YZ followed by the VM9 dentin porcelain to produce a "button". An acrylic mold for holding the zirconia specimen while adding the porcelain was made. A silicone mold was placed on top of the zirconia and a powder/water slurry was condensed into the mold to produce "buttons", 3 mm high x 4 mm diameter. The shear bond strength of the porcelain to YZ was tested using a half- circle shaped cavity tool applied at the porcelain/zirconia interface with an Instron at a crosshead speed of 0.5 mm/min. SEM examination of the fractured surfaces was performed.

Results:	No surface treatment	54.59 ± 22.50 MPa
	Grinding	76.38 ± 26.35 MPa
	Grinding and Heat treatment	97.69 ± 27.57 MPa

ANOVA and Tukey statistical analysis showed a significant difference between groups.

Conclusion: Surface finish and heat treatment has a significant effect on bond strength of veneering porcelain to Vita YZ yttria partially stabilized zirconia

Orthodontic Treatment and Retention Outcomes: PAOO and Fixed Retainers

Paula Ohara, D. Ferguson, W. Wilcko, and M. Wilcko
Department of Orthodontics, BUSDM

Orthodontic post treatment stability depends upon the severity of the initial malocclusion and the type of retention used. Selective alveolar decortication plus grafting (PAOOtm) has been shown to yield 3 to 4 times more rapid active treatment and more stable retention outcomes. **Objectives:** To compare non-extraction orthodontic treatment and retention outcomes, with and without PAOOtm and fixed retainers for moderately severe malocclusions. **Methods:** Pre-treatment patient records (n=128) were screened for Discrepancy Index (DI) scores between 10 and 42 and grouped according to type of treatment and retention: PAOOtm (PAOOtm & removable retainers; n=23), Hawley (non-PAOOtm & Hawley retainers; n=40), and Fixed (non-PAOOtm & fixed retainers; n=36). Study casts and panoramic x-rays were scored at post treatment and retention using the 8 Objective Grading System (OGS) criteria plus total score and a subset of 15 OGS criteria (24 total). **Results:** Kruskal-Wallis testing showed some DI mean scores were different at pre-treatment but not crowding. At post treatment, no differences were observed for alignment. Compared to Hawley and Fixed, PAOOtm was lower for OGS occlusal contact and higher for maxillary B-L inclination. Compared to Hawley, PAOOtm was lower for interproximal contact and higher for occlusal relations. At retention, PAOOtm was significantly lower in all 5 OGS alignment criteria. 2 of 3 OGS criteria measuring marginal ridge discrepancies, and 1 of 3 criteria measuring occlusal contact; occlusal relation was higher for PAOOtm. During retention alignment relapsed in Hawley (2.6 vs 4.3, p=.000) and Fixed (2.7 vs 4.2, p=.000) while alignment improved in PAOOtm (2.7 vs 1.2, p=.007). **Conclusions:** Treatment of moderately severe malocclusions with PAOOtm resulted in improved alignment during retention while alignment relapsed without PAOOtm regardless of using Fixed or Hawley retention. Better alignment with PAOOtm during retention is likely due to increased tissue turnover and thicker alveolar cortices from augmentation grafting.

LPS Dependent Cytokine Profile in LITAF Deficient Mice

Sreedevi Srinivasan, and Salomon Amar
Department of Periodontology and Oral Biology, BUSDM

Objective: TNF- α has been implicated as a major proinflammatory cytokine in endotoxic shock. LPS-induced TNF- α Factor (LITAF) has been identified as a transcription factor that mediates inflammatory cytokine expression. **Methods:** In this study, macrophage-specific LITAF-deficient (macLITAF $-/-$) and corresponding wild type (WT) mice were subjected to a lethal dose of intra-peritoneal injection of LPS with D-Galactosamine. Serum samples collected at different time points after LPS and D-Galactosamine injection were analyzed for the expression levels of 23 cytokines using multiplex cytokine Immunoassay. **Results:** We demonstrate in this study that after LPS lethal dose injection the survival rate of macLITAF $-/-$ is higher than for WT mice. Serum TNF- α levels were found substantially reduced in macLITAF $-/-$ mice compared to WT confirming the important role of LITAF in TNF- α gene expression. Other proinflammatory cytokines such as IL-1, IL-6, IL-3, IL-13 and KC and anti-inflammatory cytokines IL-10 and IL-17 were found similarly reduced in macLITAF $-/-$ mice compared to WT. **Conclusion:** Our data demonstrate that LITAF deficient mice are immune to LPS challenge and that may be explained by the reduced expression of inflammatory cytokines.

Oral Fungal Disease Prevention: Impact of Histatin Proteolysis

Xiuli Sun, E. Salih, F.G. Oppenheim, and E.J. Helmerhorst
Department of Periodontology and Oral Biology, BUSDM

Introduction: Histatins are human salivary proteins which have important biological properties related to oral health, such as antifungal activity and participating in enamel homeostasis. Among the major histatins, only histatin 1 (His1) is phosphorylated. All histatins are prone to proteolytic degradation in saliva. To what extent proteolysis impacts their functions is of importance in understanding their role in preventing oral diseases such as candidiasis and caries. **Objectives:** To investigate the rate and mode of His1, 3, and 5 degradation in a whole salivary environment, to establish the role of the phosphate group in their proteolytic susceptibility, and to determine if and how whole saliva proteases affect the biological functions of histatins. **Methods:** His1, His3, His5, and the dephosphorylated variant of His1 (dHis1) were chemically synthesized. Protein samples (200 µg) were incubated with 1.0 ml of pooled human whole saliva supernatant for various time intervals, and the resultant digests were analyzed by RP-HPLC, LC-ESI-MS/MS, and in antifungal assays. **Results:** Both His1 and His3 show rapid proteolytic degradation by whole saliva supernatant proteases with 50% degradation after 1.3 and 0.5 hr, respectively. dHis1 was more susceptible to proteolysis than His1, suggesting that phosphorylation of His1 plays a protective role against proteolysis in human saliva. Analysis of the primary degradation products of His1, 3, and 5 revealed that they mostly arise through tryptic-like fragmentation. Despite extensive proteolysis, the primary His5 degradation mixture appeared as effective in antifungal assays as the intact protein. **Conclusions:** Even minor sequence differences as present in His1 and His3, as well as the degree of phosphorylation show a major effect on both proteolysis kinetics and degradation patterns. Despite the loss of histatins' primary structure, degradation peptides retain activity consistent with a protective and preventive role in oral cavity. *Supported by NIH/NIDCR grants DE05672, DE07652 and DE14950.*

A Novel Signaling Pathway, p53/STAT6B/MAPK/LITAF, in Inflammatory Process

Yaritza Vázquez, Xiaoren Tang, and Salomon Amar
Department of Periodontology and Oral Biology, BUSDM

Previous studies identified a novel transcriptional factor named LPS-induced TNF alpha factor (LITAF) involved in the regulation of pro-inflammatory cytokines such as Tumor Necrosis Factor-alpha (TNF- α) in response to LPS stimulation. These cytokines play a crucial role in the initiation and maintenance of the inflammatory process and the overproduction of these cytokines is extremely deleterious to the host as evidenced by their role in a variety of human diseases: Periodontitis, Rheumatoid Arthritis or Crohn's disease. **Methods:** To determine the signal transduction pathway(s) involved LPS-induced macrophages we investigated the mapping of LITAF signaling pathway in mouse assuming that mouse LITAF would behave just like in human as judged by their substantial homology. All signal transduction candidates were cloned and transfected in peritoneal mouse macrophages and MusLITAF promoter activity along with Western blotting were used as readout assays. In addition, to test if LITAF-dependent cytokines production, including TNF- α , is also mediated by the same candidates, Multiplex cytokine assay was performed. MusLITAF promoter assays along with Multiplex cytokine assay disclosed that mouse MAPK or mouse STAT6B can significantly activate mouse LITAF gene expression and regulate LITAF-dependent cytokine production including TNF- α . **Results:** Changes in promoter activity were found similar at protein levels. Interestingly, we noticed that MAPK-activated LITAF pathway can be specifically blocked by p53 accumulation. However, we found that LITAF production mediated after overexpression of STAT6B does not seem to be affected by p53. The mapping of LITAF signaling pathway in mouse disclosed the involvement of p53, MAPK and STAT6B. **Conclusion:** Further studies will elucidate the mechanism between p53/STAT6B/MAPK and LITAF in inflammatory processes to potentially develop pharmacotherapeutic intervention.

A Role for the Lysyl Oxidase Propeptide in Regulating Osteoblast Proliferation and Differentiation

Siddharth Vora and Philip Trackman
Department of Oral Biology and Periodontology, BUSDM

Bone formation occurs in 3 stages : proliferation, matrix maturation, and mineralization. Tightly controlled expression and action of growth factors, maintain the correct phenotype of osteoblasts in their respective stages. A key enzyme, critical for normal collagen maturation is lysyl oxidase. It is secreted as a 50 kDa pro-enzyme and later cleaved into a 30 kDa mature enzyme (LOX) and a 18 kDa pro-peptide (LOPP). Though the importance of the mature enzyme in cross-linking of collagen and elastin molecules, has been well established, the possible functions of the released propeptide are beginning to be investigated . Its presence in the extracellular matrix along with LOX, led us to investigate the effects of LOPP in osteoblast function. Previously, LOPP was shown to inhibit proliferation of osteoblastic cells. We wished to address mechanisms for this effect. **Results:** We found that LOPP robustly reduced the levels of cyclin D1, a key activator of cell proliferation. LOPP inhibited the IGF-1 (Insulin like Growth Factor-1) mediated, activation of Erk Map Kinase (p44/42) and Akt (PKB). It also inhibited the levels of active β -catenin following induction of the canonical Wnt pathway. Both these effects can result in reduced cyclin D1 levels. At the same time LOPP induced phosphorylation of p38 Map Kinase, another molecule implicated in negatively regulating cyclin D1. We believe that these actions of LOPP are responsible, in part, for its anti-proliferative effects. Moreover, our preliminary findings hint that LOPP can increase protein levels of CTGF (connective tissue growth factor) and of pro-lysyl oxidase. **Conclusions:** These effects indicate a positive role of LOPP in the matrix maturation phase, a stage where levels of LOPP itself, were found to be maximal. Because LOPP inhibited proliferation and may also stimulate matrix production, we hypothesize that it is a key regulator of the matrix maturation phase of osteoblast differentiation.

Influence of Orthodontics Plus Selective Alveolar Decortication on Root Resorption

Mohammed Al-Zeitani, D. Ferguson, W. Wilcko, and M. Wilcko
Department of Orthodontics, BUSDM

Literature evidence suggests that root resorption, an adverse side effect of orthodontic therapy, may be decreased under conditions of alveolar osteopenia, a condition characterized by diminished bone density and created secondary to selective alveolar decortication surgery. **Objectives:** To evaluate root resorption of the maxillary central incisors following non-extraction orthodontic treatment combined with selective alveolar decortication surgery. **Methods:** The sample consisted of 15 patients treated with non-extraction orthodontics following maxillary alveolar decortication surgery and augmentation grafting. Periapical radiographs of maxillary central incisors were taken by the same operator using the same radiographic equipment using the paralleling technique. The pre-treatment, post treatment and retention radiographs were scanned and images measured in millimeters using DSR version 2.10 Electro Medical Systems software. CEJ to incisal edge length was measured on each radiograph and normalized to the pre-treatment image. Total length of right and left central incisors as well as CEJ to alveolar crest bone heights were measured and recorded. **Results:** Paired t-testing revealed no significant differences ($p > .05$) in any combination of treatment stages for either tooth length or crestal bone height. **Conclusions:** Orthodontic treatment combined with selective alveolar decortication and augmentation grafting resulted in no change for tooth length or alveolar crest bone height at pre, post and retention stages.

E-cadherin N-glycans Inhibit Intercellular Adhesion by Interfering with the Recruitment of Protein Phosphatase 2A to Adherens Junctions

Mihai Nita-Lazar¹, Vikki Noonan¹, Ivan Rebutini², Janice Walker³ and Maria A. Kukuruzinska¹ ¹ Department of Molecular and Cell Biology, Boston University; ² NIDCR, NIHHealth, Bethesda, MD; ³ Department of Pathology, Anatomy and Cell Biology, Thomas Jefferson University, Philadelphia, PA

Cancer cells are frequently characterized by unwarranted increases in protein N-glycosylation and by disruption of E-cadherin-mediated cell-cell contacts or adherens junctions. The destabilization of intercellular adhesion by E-cadherin N-glycans suggested that they interfered with E-cadherin's tumor suppressive function. Here, we show that freshly resected and archival specimen of oral squamous cell carcinoma (OSCC) were characterized by aberrantly high cellular N-glycosylation, immature AJs and absent TJs junctions (AJs). Both adhesion complexes have been shown to be regulated by their association with protein phosphatase 2A (PP2A), albeit in distinct ways: while PP2A promotes the maintenance of AJs, it inhibits the assembly of TJs. N-glycans on E-cadherin extracellular domains destabilized AJs by interfering with the recruitment of γ -catenin and vinculin to E-cadherin scaffolds. **Results:** Our studies demonstrate that E-cadherin N-glycans inhibited the association of PP2A with AJs and that this interfered with the assembly of TJs. In MDCK cells, partial inhibition of cellular N-glycosylation using siRNA to its key regulator, the first dolichol pathway gene DPAGT1, caused reduction in E-cadherin N-glycosylation concomitant with its increased association with PP2A. Increased recruitment of PP2A to E-cadherin scaffolds in DPAGT1 siRNA-treated MDCK cells correlated with a diminished association between PP2A and ZO-1. Instead, ZO-1 exhibited augmented association with claudin-1, indicating TJ assembly. Reduced N-glycosylation of E-cadherin correlated with a greater accumulation of cells in the G1 phase of the cell cycle. **Conclusions:** Our studies reveal a novel mechanism for coordinating the stability of AJs with the assembly of TJs through the effects of E-cadherin N-glycans on the recruitment of PP2A to these junctional complexes.

Supported by grants PHS RO1 DE10183 and RO1 DE14437.

Histatins in the *in Vivo* Formed Acquired Enamel Pellicle

Walter L. Siqueira, Eva J. Helmerhorst, W. Zhang, Frank G. Oppenheim
Department of Periodontology and Oral Biology

The acquired enamel pellicle (AEP) is an important structure present in the oral cavity formed by the selective adsorption of proteins onto enamel surfaces. Our previous investigation on the composition of *in vivo* AEP has revealed that it contains at least 89 different proteins. Based on *in vitro* hydroxyapatite adsorption studies, statherin, histatins and proline-rich proteins (PRPs) have been considered to be precursor proteins for the formation of AEP. However, due to the high proteolytic activity of oral fluid, AEP may mostly contain fragments of these proteins rather than the intact precursor molecules. **Objective:** To investigate whether native histatin, statherin, and PRPs or their proteolytic fragments can be detected in *in vivo* AEP. **Methods:** *In vivo* formed AEP proteins were harvested from the tooth surface using dry electrode wick papers. Proteins were electro-eluted by placing these strips directly onto a stacking gel followed by cationic PAGE or anionic PAGE to elute histatins or PRPs/statherins, respectively. Protein bands eluting from the strips with electrophoretic mobilities similar to those of histatin, PRPs and statherin standards were excised, extracted from the gel and analyzed by MALDI-TOF and LC-ESI-MS/MS. **Results:** Components with m/z values of 4062.21 Da and 3036.45 Da were identified indicating the presence of intact histatin 3 and histatin 5 in *in vivo* AEP. No evidence was obtained for the presence of intact histatin 1, statherin, or acidic PRPs, but multiple fragments of these proteins were detected. **Conclusion:** These data suggest that despite the high proteolytic susceptibility of histatin 3 and 5 in an oral environment, the intact forms of these proteins are an integral part of the AEP structure. This study provides the first full characterization of *in vivo* formed AEP.

Flexural Strength of CAD/CAM Ceramic Framework Materials

Mathew Lupu and R. Giordano
Department of Restorative Sciences/Biomaterials, BUSDM

Objectives: A number of new block materials have been developed for milled frameworks. Objectives of this study are to measure the flexural strength of a glass ceramic (Ivoclar e.max Cad) and zirconia block materials (Vita YZ, 3M LAVA, Ivoclar e.max ZirCad). Methods: Bars, 2x4x25 mm, for strength testing were cut directly out of the CAD/CAM blocks using a Buehler Isomet diamond saw. The bars were sintered according to the manufacturer's recommendations. A three point bend test, span 20 mm, was performed using an Instron with a crosshead speed of 0.5 mm/min. Subgroups of the e.max Cad glass ceramic were tested before crystallization firing, after crystallization firing, and after being subjected to simulated porcelain veneer firing cycles for 1, 3, 5 and 7 times. White (more translucent) and blue e.max Cad glass ceramic blocks were tested. **Results:**

Flexural Strength of Zirconia Block Materials

Zirconia Type	Flexural Strength (MPa)
Vita YZ	950.89 ± 98.54
3M/ESPE LAVA	960.65 ± 100.83
Ivoclar e.max ZirCad	860.10 ± 90.51

Flexural Strength of Glass Ceramic Block Materials

e.max CAD Glass Ceramic Group	White Block	Blue Block
	Strength (MPa)	Strength (MPa)
As Received	133.97 ± 26.80	164.27 ± 32.06
Crystallization	261.52 ± 87.80	257.45 ± 81.12
Veneer 1	337.58 ± 111.58	302.41 ± 12.10
Veneer 3	296.55 ± 20.85	329.61 ± 16.78
Veneer 5	324.37 ± 75.33	308.32 ± 45.15
Veneer 7	246.08 ± 65.06	314.06 ± 31.73

Conclusion: ANOVA and Tukey test showed significant increase in strength after crystallization firing for e.MaxCad.

Morphological Alveolar Bone Changes After Corticotomy and Orthodontic Tooth Movement

Vickie Rivera, Alpdogan Kantarci, and Donald Ferguson
Department of Orthodontics, BUSDM

When alveolar bone is treated with corticotomy followed by orthodontic tooth movement, there is a higher rate of bone turnover (modeling and remodeling) than with traditional orthodontics without surgery; the net result is a dramatic reduction in orthodontic treatment time. **Objectives:** To understand the morphological changes of alveolar bone treated by corticotomy and orthodontics as observed after various time points in treatment at a histopathological level. **Methods:** 79 CRL-CD male rats were separated into three groups – corticotomy, tooth movement or combination of tooth movement and corticotomy. The left side of the rat palate served as the experimental variable and the right side as the control. The animals were sacrificed at 3 days, 1, 2, 3, and 6 weeks. The maxillas were decalcified, fixed and embedded in paraffin for sectioning. The 5 μ m-thick sections were stained with hematoxylin and eosin. **Results:** The data showed that the bone apposition and resorption i.e.trabecular bone turnover, increased by 3-fold in corticotomized animals; the peak catabolic effect was evident at the week-3 stage. **Conclusions:** The corticotomy-assisted tooth movement group resulted in the least amount of calcified spongiosa at every experimental stage and peaked at week-3. .

Influence of Selective Alveolar Decortication on PDL Osteoclast Count

John Turner, D.J. Ferguson, A. Kantarci, R.S. Carvalho, and T.E. Van Dyke
Departments of Orthodontics and Periodontology & Oral Biology, BUSDM

Clinical orthodontics is 3 to 4 times more rapid following selective labial-lingual alveolar decortication but the biological rationale for rapid tooth movement remains obscure. **Objective:** To compare and contrast osteoclast and osteoclast precursor counts (catabolic alveolar bone modeling) in relation to decortication and tooth movement. **Methods:** Seventeen CRL-CD male rats were grouped as decortication (D), tooth movement (TM), and decortication + tooth movement (DTM). Selective buccal-lingual alveolar decortication adjacent to the left maxillary first molar was performed on 12 animals in a split mouth design. Mesial tooth movement using a 25 gram Sentalloy spring secured to a micro-screw placed lingual to the upper incisors was accomplished in 10 animals. The animals were sacrificed at day 3 and weeks 1, 2, 3, and 6. Maxillas were removed, stripped, and prepared for decalcified histology using TRAP stains. Within a standardized grid (0.07 mm²), each PDL area (M-D-B-L) of each maxillary first molar root were examined and osteoclast and/or precursor counts (OC) were made using three 0.02 mm² grids positioned near cementum, in the central PDL or near bone. **Results:** Kruskal-Wallis testing showed that OC in the PDL of the decortication group at week 1 was significantly higher (31 to 40) than all other groups (3 to 25) at week 6. Within group testing revealed that OC was greater for DTM experimental side day 3 and week 1 (21 to 25) than all other groups (4 to 15). Within group D, OC was higher for the experimental side week 1 (26 to 33) than all other groups (2 to 11). Within TM, experimental week 1 was higher (9 to 12) than most other groups (4 to 7). **Conclusion:** PDL osteoclast recruitment is highest within one week following alveolar decortication and is 3 to 4 times greater than tooth movement alone.

Histatins: A Novel Class of Antimicrobials?

Melanie Campese, Frank G. Oppenheim, Eva J. Helmerhorst
Department of Periodontology and Oral Biology, BUSDM

Histatins are a family of small salivary proteins that are secreted by the major human parotid and submandibular salivary glands. They range in size from just a few amino acids to 38 residues in length, and are unique in their high histidine content. Major interest in these proteins stems from the fact that they exhibit potent antifungal and antibacterial activities, and inhibit proteases and toxins that are involved in periodontal disease. As such, histatins may play a vital role in maintaining oral microbial homeostasis and prevent host tissue destruction during periodontal inflammation. Previous studies have shown that pure histatins are rapidly degraded in a whole saliva environment. **Aim:** to gain insight into the endogenous histatin concentrations and stability in pure glandular secretions and whole saliva (WS). **Methods:** Parotid secretion (PS) and WS were collected from six subjects. WS was centrifuged to obtain WS supernatant (WSS). Samples were incubated in a 37°C waterbath. After various time intervals aliquots were boiled to abolish proteolytic activity, proteins separated by cationic polyacrylamide gel electrophoresis followed by densitometric analysis of the gels for protein quantitation. **Results:** Histatin concentrations were found to be significantly lower in WSS than in PS. Histatin 1, 3, and 5 levels in PS were 36 ul/ml, 33 ul/ml, and 42 ul/ml, respectively, compared to their levels in WS which were 15.5 ul/ml, 4.6 ul/ml, 6.8 ul/ml. Upon incubation of PS at 37°C, histatin 1 was more stable than histatin 3 in PS. While histatins were much faster degraded in whole saliva, a similar difference in histatin stability was observed. **Conclusions:** WS proteolysis is an important parameter to be taken into account in salivary protein structure-function analyses. The relatively high stability of histatin 1 suggests it is a suitable candidate for further clinical exploitation.

Supported by NIH/NIDCR grants DE05672, DE07652, and DE14950.

Micro-CT Analysis of Osteopenia Following Alveolar Decortication and Tooth Movement

Khiem Pham-Nguyen, D. Ferguson, R. Carvalho, A. Kantarci, and T. Van Dyke
Departments of Orthodontics and Periodontology and Oral Biology, BUSDM

Objective: Using Micro-CT technology, to evaluate alveolar bone volume and density after selective decortication and tooth movement over 6 weeks in the rat model.

Methods: In a split mouth control study, 52 CRL-CD male rats underwent selective alveolar decortication and grouped as decortication (D), decortication+tooth movement (DTM), and tooth movement (TM). Mesial tooth movement using a 25 gram Sentalloy spring secured to a micro-screw lingual to the upper incisors was accomplished and followed over 6 weeks. At least five animals were sacrificed at post-op days 3-7, 14, 21, and 42. Maxillas were prepared for Micro-CT volumetric imaging (SCANCO Medical uCT-40, a desktop cone beam scanner) and scanned at 70 kVp, 114 microA, with 200 msec. integration time/angle, at medium resolution (1024x1024 pixel slice), and 36 micron voxel size (slice thickness). All samples were binarized using the same parameters. The 3-D volume surrounding the left maxillary first molar was defined by outer limits of first molar root structure on the mesial, coronal and apical sides and the mesial-most of the second molar; buccal and palatal alveolar cortical plates defined the lateral limits of the cube. Bone volume to total volume fraction (BV/TV) was calculated as was average mineral density of hydroxyapatite taken over all voxels in the volume.

Results: Oneway ANOVA with Scheffe post hoc testing showed a significantly lower BV/TV for all DTM groups (37.2% to 48.0%) compared to all other groups except TM experimental at day-42 (53.6%) and DTM control at days 3-7 (53.8%). Mineral density was lowest in DTM at day 14 (468.41 mg HA/ccm) and significantly different than all TM and D controls (634.7 to 692.5) except for days 3-7.

Conclusion: Decortication combined with tooth movement significantly reduces periodontal bone volume fraction in rats and provides a rationale for rapid tooth movement after selective alveolar decortication.

In-Vitro Shear Bond and Retention tests: Self Adhesive Resin Cements

Faysal Succaria, E. Al-Badawi, and D. Nathanson
Department of Restorative Sciences/Biomaterials, BUSDM

Objectives: The objective of this study was to evaluate new self adhesive resin cements for 1) shear bond strength to dentin and 2) retention of metallic crowns.

Methods: The occlusal surfaces of 25 human molars embedded in acrylic bases were sectioned and the exposed dentin surfaces were polished with diamond grit (70, 45, 15 microns successively). Pressed ceramic rods (Empress Esthetic – Ivoclar-Vivadent) 2.5 mm in diameter were etched at the base and attached with self-adhesive cements to the dentin surfaces as follows: Group 1: RelyX Unicem (3M ESPE); Group 2: BisCem (Bisco); Group 3: Experimental resin cement (GC); Group 4: MonoCem (Shofu); Group 5: Multilink (Ivoclar-Vivadent); and Group 6: Embrace (Pulpdent). All cements were applied according to the manufacturers' recommendations. Shear bond strength was tested after 24 hours storage in water using a flat blade at 0.5 mm/min (Instron). Retention was tested by cementing stainless steel cylinders (6.2 mm diameter) using the 6 cements into corresponding milled metal retainers designed with 50 Micron cement space. (n= 6 /group). Cemented cylinders were pushed out in compression (Instron) and stress at cement failure was calculated. ANOVA and Tukey multiple comparison tests were used for analysis (P<.05). **Results:** Mean shear bond strengths (MPa) and SDs as well as retention stresses and SDs are shown:

	Relyx Unicem (3M ESPE)	BisCem (Bisco)	Experimental resin cement (GC)	MonoCem (Shofu)	Multilink (Ivoclar-Vivadent)	Embrace (Pulpdent)
Shear Bond Strength	2.84 0.82	3.72 1.72	2.32 0.57	2.6 1.02	23.41 7.07	4.86 1.43
Retention	40.08 11.1	78.0 16.8	52.4 5.4	53.7 6.0	40.3 9.9	54.46 7.6

The results showed that Multilink (Ivoclar-Vivadent) produced significantly higher shear bond strength values than other tested self adhesive resin cements. There was no significant difference among all other materials. Biscem (Bisco) produced significantly higher retention values than other tested self adhesive resin cements. There was no significant difference among all other materials.

Conclusion: Tested self-adhesive resin cements exhibited relatively low bonds to dentin except for Multilink (with priming). Retention values ranging from 40.8 to 54.46 MPa were not significantly different except for BisCem at 78 MPa.

Tear Strength and Dimensional Accuracy of Elastomeric Impression Materials

Yair Whiteman, and Dan Nathanson
Department of Restorative Sciences/Biomaterials

Objectives: This study evaluates new impression materials for tear strength and effect of time and storage temperature on dimensional accuracy. **Methods:** Low-viscosity impression materials: A. Aquasil (Dentsply); B. Imprint (3M-ESPE); C. Imprint Quickset (3M-ESPE); D. Impregum (3M-ESPE) E. Flexitime ([Heraeus Kulzer](#)); were tested for tear strength. Specimens (ADA Specification # 19) were prepared in special molds and tested in tension (Instron) immediately and 26 hours after setting. The Materials were also tested for effect of time/ temperature on dimensional accuracy. Impressions (n=45, 5/material) made of a standard stainless steel die (Spec # 19) were measured under a measuring microscope with +/- 1 Micron resolution 24 hours after setting. Each group was further divided into 3 groups according to storage temperature: 1. 21⁰C; 2. 12⁰C; and 3. 37⁰C; and kept at these temperatures for 2 weeks, then retested for dimensions. **Results:** Data (shown) were analyzed using ANOVA and Tukey-Kramer Multiple Comparisons test:

Material	Aquasil	Impregum	Imprint	Imprint Quickset	Flexitime
Tear Strength (N/mm ²²) Immediate	0.3966	0.2567	0.2916	0.2969	0.2577
Tear Strength(N/mm ²²) 26 hours	0.3736	0.328	0.324	0.2616	0.2144
Change (mm) 21 ⁰ C	-0.0323	-0.0368	0.0103	0.0038	0.0001
Change (mm) -12 ⁰ C	-0.0391	-0.0297	0.0298	-0.00867	-0.0168
Change (mm) 37 ⁰ C	-0.0133	-0.0527	0.0068	0.0153	-0.0014

For Materials tested immediately after setting a significant difference was found. Aquasil shows significantly greater tear resistance from the other materials. No significant difference was shown among the other materials. Tested 26 hours after setting; Aquasil shows significant difference compared with Imprint Quickset and Flexitime. Impregum had a significant difference compared to Imprint Quickset as well as Flexitime. Imprint showed significant difference compared to Flexitime. Storage (2 wks) generated significant dimensional change from baseline at 21 °c, as follows; Aquasil and Impregum were not different from each other but both were less dimensionally stable than Imprint, Imprint Quickset and Flexitime. Change in -12°C, shows no significant difference between tested materials. At 37°C, significant differences were found between materials, Impregum showed a difference compared to Imprint, Imprint Quickset and Flexitime. **Conclusions:** Tear strength varied significantly among the materials

tested. Storage (2 wks) at 21°C, -12°C and 37°C generated some dimensional changes. All changes were small and within ADA specifications and accepted clinical parameters.

Science Day 2007 Winners

Doron Ringler AS 07 and Dr. Judith Jones, chair of the Department of General Dentistry, won the Predoctoral Research Award for the poster "Veterans with mental illnesses report more dental problems than veterans without mental illnesses."

Drs. Srinivas Ayilavarapu PERIO 08; Alpdogan Kantarci, assistant professor in the Department of Periodontology and Oral Biology; and Thomas Van Dyke, director of the Clinical Research Center earned the Postdoctoral Research Award for the poster "Phospholipase A2 (iPLA 2) activates superoxide generation in neutrophils from diabetic subjects."

Drs. Mihai Nita-Lazar and Maria Kukuruzinska, director of predoctoral research, received the Postdoctoral Fellows Award for the poster "E-cadherin N-glycans inhibit intercellular adhesion by interfering with the recruitment of protein phosphatase 2A to adherens junctions."

The ADA/Dentsply Student Clinician Program Award went to John Turner DMD 08; Fawzi Al-Qatami DMD 07; Dr. Alpdogan Kantarci; and Dr. Donald Ferguson, chair of the Department of Orthodontics for the oral presentation "Influence of selective alveolar decortication on PDL osteoclast count." Turner will travel to the ADA Scientific Sessions in San Francisco September 27 to 30 to compete against students from other U.S. dental schools.

Science & Engineering Research Symposium Winner

Dr. Siddharth Vora ORAL BIO 08 and Philip Trackman, professor in the Department of Periodontology and Oral Biology received the SDM Dean's Award for **Siddharth Vora** and Phillip Trackman. Department of Periodontology and Oral Biology: "A role for the lysyl oxidase propeptide in the regulation of osteoblast proliferation and differentiation."