"Top-down view of an embryonic filiform papilla at E17.5 in mice, using immunofluorescence immunohistochemistry for Frizzled-6 (green) and membranously-expressed E-cadherin (red). Frizzled-6 (FZD6), a membranous non-canonical Wnt receptor and core component of the planar cell polarity (PCP) pathway, is activated and sustained during the anteroposterior polarized growth phase of these papilla."

The University of North Carolina at Chapel Hill
Dear Colleagues,

It is my sincere pleasure to welcome you to the UNC School of Dentistry’s 2017 Dental Research in Review Day. Our faculty, students, research fellows, and visiting scholars continually generate new knowledge in the basic, applied and clinical sciences, as well as in the areas of health services, health policy, and health education. The overarching emphasis of our research is on oral health and function, and discoveries in these areas not only offer the potential to improve oral health but overall health and well-being.

UNC is one of the nation’s most research-intensive universities. Based on the most recent available data, Carolina ranks eighth among leading private and public research universities for the level of federal funding devoted to research and development in all fields (NSF, 2015). The School of Dentistry continues to be ranked 2nd among all dental schools in National Institute of Dental and Craniofacial Research (NIDCR) Grants to U.S. Dental Institutions and our investigators receive funding from numerous other federal agencies, foundations, and industry.

New knowledge in all aspects of oral health and dental medicine will be shared through poster and oral presentations highlighting the accomplishments of our faculty, students, research fellows, and visiting scholars. It is important to note that much of this ongoing research reflects interdepartmental, interprofessional, campus-wide, national and international collaborations which have stoked the pace of research and encouraged the development of innovative and groundbreaking strategies in investigating increasingly novel and complex areas.

Please join me in congratulating all the participants in the day’s activities and in thanking the Dental Foundation of North Carolina for their ongoing support of this celebration.

Best wishes for a remarkable day full of inspiration, wonder, discovery, and learning!

Scott S. De Rossi, DMD, MBA
Dean and Professor
February 22, 2017

Dear Colleague,

I would like to welcome everyone to the 33rd Dental Research in Review Day. Today’s poster and oral presentations showcase the research accomplishments of our students, faculty, staff, research fellows, and visiting scholars. Many of these presentations are the products of interdepartmental, campus wide, national and international collaborations.

The School of Dentistry’s Research Mission places an overarching emphasis on the promotion of oral health and function. Discoveries and new knowledge generated in the basic, applied and clinical sciences, as well as in the areas of health services, health policy and health education are represented in the abstracts presented for you today.

The day’s events include a keynote address by Dr. Marcelo W. B. Araujo, DDS, MS, PhD, vice president of the Science Institute for the American Dental Association (ADA). The title of Dr. Araujo’s talk is, “How Dental Practice Can Be Impacted by Scientific Information.” There are also several Lunch & Learn Sessions where you can discuss the latest updates in interprofessional education, anterior implant restorations, skeletal muscle regeneration, composite resins, Sjögren’s syndrome-induced xerostomia, and natural small molecules and their potential against infectious diseases.

Please join us and enjoy the day.

[Signature]

Eric Everett, Ph.D.
February 15, 2017

Dear Colleagues,

The North Carolina Section of the American Association for Dental Research (NC-AADR) and the Student Research Group (SRG) have the pleasure of welcoming you to our 2017 Dental Research in Review Day. Dental Research in Review Day is the University of North Carolina School of Dentistry’s annual showcase of the excellent research conducted at our school. Faculty and students in all our academic programs have worked hard to expand the realm of knowledge in dentistry from basic science to clinical applications. Most of the research presented today will be showcased at national and international conferences, including this year’s International Association of Dental Research (IADR) meeting in San Francisco, California.

Our program this year includes 6 lunch and learn sessions where invited speakers will be discussing the latest cutting-edge research in dentistry. Furthermore, 79 abstracts will be presented. They represent original basic, clinical and translational research performed at different academic levels not only at UNC School of Dentistry, but also as part of our scientific collaborations with several institutions in our state, in the US and abroad. Many of these presenters will be competing for awards in different categories, including pre-doctoral, DDS, masters and post-doctoral research.

We would like to thank the planning committee of students and faculty who have worked hard the past several months to plan this special day. We also want to thank our corporate sponsors for their generous support. Please take the time to visit their excellent exhibits.

We look forward to seeing you at the 2017 DRRD: this day was planned thinking of you.

Sincerely,

Faye Huang  
DDS Candidate,  
Class of 2018  
Co-President  
Student Research Group  
UNC School of Dentistry

David Guo  
DDS Candidate,  
Class of 2018  
Co-President  
Student Research Group  
UNC School of Dentistry

Andrea F. Zandon, DDS, MSD, PhD  
Associate Professor, Department of Operative Dentistry  
President  
North Carolina Section,  
American Association for Dental Research
2017 Dental Research in Review Day

Keynote Speaker

Marcelo W. B. Araujo, DDS, MS, Ph.D
Vice President, Science Institute

Dr. Araujo leads the scientific and dental research activities and manage the research agenda, including ADA policies and programs pertaining to the Council on Scientific Affairs; Center for Evidence-Based Dentistry; ADA Research and Laboratories; Professional Product Review; Seal of Acceptance; Scientific Information; and Standards. He provides administrative and scientific guidance within the Institute and agencies of the ADA to address current and emerging scientific issues that affect public health, patient care, dental practice, national and international health programs. Dr. Araujo collaborates serves as the liaison to ADAF VRC Office.

Prior to the ADA, Dr. Araujo held few Research & Development senior positions in the Pharmaceutical Industry in Dentistry and other therapeutic areas, including Cardiology, Nutrition, Women’s Health, Dermatology and Ophthalmology, always aiming innovation in the areas of public health and epidemiology research, development of new research methodology, scientific advocacy, scientific communication, professional education and external partnership with academic research.

His Clinical work has been published in peer review Journals, including JADA and benefited Dental practice all over the world, via global scientific program implementation. Prior to joining industry, Dr. Araujo held academic positions both in the US and in Brazil. He also practiced dentistry in his hometown of Rio de Janeiro, Brazil.

Dr. Araujo received his Doctor in Dental Surgery and earned a Certificate in Periodontology at Universidade Gama Filho in Rio de Janeiro, Brazil. He also received his PhD in Epidemiology and Community Health and Master of Sciences, Oral Sciences from State University of New York at Buffalo, where he also completed a 2.5 years Fellowship in Periodontology research and teaching.
# Dental Research in Review Day – February 22, 2017

## Program

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<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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| 7:00-7:15 a.m.      | **Poster Set-Up**  
*All Presenters*                          | Koury Oral Health Sciences Building  Atrium |
| 7:15-7:45 a.m.      | **Dean’s Welcome Breakfast,**                                          | Koury Oral Health Sciences Building  Atrium |
| 7:45 a.m.           | **Dean’s Welcome and Opening Remarks**                                  | Koury Oral Health Sciences Building  Atrium |
| 8:00-10 a.m.        | **Poster Session and Exhibition**  
*General Viewing and Vendor Exhibits*                         | Koury Oral Health Sciences Building  Atrium |
| 10:15-11:45 a.m.    | **Oral Sessions**  
*General Attendance*                         | Koury Oral Health Sciences Building  Assigned rooms |
| 11:55 a.m.          | **Raffle – Must be present to win**                                    | Koury Oral Health Sciences Building,  Kirkland Auditorium |
| 12-1:00 p.m.        | **Keynote Address: Dr. Marcelo Araujo**                                | Koury Oral Health Sciences Building,  Kirkland Auditorium |
| 1:10-2:10 p.m.      | **Lunch and Learn**  
*By registration only*                                 | Koury Oral Health Sciences Building Assigned Rooms |
| 2:30-4:30 p.m.      | **Oral Sessions**                                                       | Koury Oral Health Sciences Building Assigned Rooms |
| 5:00-6:00 p.m.      | **Awards Presentations**  
*Sponsored by the Dental Foundation of North Carolina*  
**Presenters:**  
*Dean Scott De Rossi*  
*Dr. Eric Everett*  
*Dr. Andrea Ferreira Zandona*  
*Dr. Flavia Teles*  
*Representatives from the Student Research Group*  
*Representatives from NCAADR*  
*Research advisors*                         | Koury Oral Health Sciences Building,  Atrium |
### 2017 Dental Research in Review Day

**LUNCH AND LEARN SESSION**

**NOTE:** The Lunch and Learn sessions scheduled from 1:10 - 2:10 (PM)

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<td>1. Green Tea Polyphenols</td>
<td>Dr. Scott De Rossi&lt;br&gt;Dean&lt;br&gt;UNC School of Dentistry</td>
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<td>A novel treatment for Sjögren’s Syndrome-induced xerostomia</td>
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<td>2. Anterior Implant Restorations</td>
<td>Dr. Ryan Cook&lt;br&gt;Director&lt;br&gt;Graduate Prosthodontics Program</td>
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<tr>
<td>Evidenced Based Approach to Anterior Implant Restorations</td>
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<td>3. Composite resins</td>
<td>Dr. Gustavo Oliveira&lt;br&gt;Operative Dentistry Department</td>
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<td>Composite resins: a potpourri of esthetic solutions</td>
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<td>4. Interprofessional Education</td>
<td>Jennifer Harmon, RDH, MS, Clinical Assistant Professor&lt;br&gt;Department of Dental Ecology</td>
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<td>Interprofessional Education</td>
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<td>5. Skeletal Muscle Engineering</td>
<td>Dr. Rishma Shah, Department of Orthodontics</td>
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<td>Skeletal Muscle Engineering as an Aid to the Management of Craniofacial Deformity</td>
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<td>6. Natural small molecules and their potential against infectious diseases</td>
<td>Dr. Ramiro Murata&lt;br&gt;Department of Foundational Sciences&lt;br&gt;ECU School of Dental Medicine</td>
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## 2017 Dental Research in Review Day

Poster Session: 8:00-10:00 am, Koury Oral Health Sciences Building Atrium, Ground Floor  
**Note:** Turner Award Finalists are indicated by (*).

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<td>Oral Hygiene and Occupational Therapy Education and Intervention for Direct Support Professions of Adults with Developmental Disabilities</td>
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<td>2</td>
<td>Abby Becherer</td>
<td>Pediatric Dentistry</td>
<td>The Public’s Perception of Genomics Testing for Precision Healthcare and Dentistry</td>
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<td>3</td>
<td>Mary Morgan Bitler</td>
<td>Periodontology</td>
<td>Accuracy of Digital vs. Conventional Impressions: A Pilot Study</td>
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<td>4*</td>
<td>Danielle Burgess</td>
<td>Periodontology</td>
<td>Aggregatibacter actinomycetemcomitans in African-Americans with Localized Aggressive Periodontitis</td>
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<td>5*</td>
<td>Kevin Byrd</td>
<td>Oral Biology</td>
<td>Identification of Label-Retaining Cells In Upper Aerodigestive Tract Epithelial Niches</td>
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<td>Miranda Carper</td>
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<td>Mustafa Girnary</td>
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<td>Omar Glover</td>
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<td>4-hydroxy-2nonenal (HNE) is a Viable Salivary Biomarker for Lipid Peroxidation in Stimulated and Unstimulated Saliva Procured from Healthy Volunteers</td>
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<td>13</td>
<td>Peter Green</td>
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<td>Cone-Beam Computed Tomography Volume Registration for the Analysis of Periodontal Bone Changes</td>
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<td>David Guo</td>
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<td>Catherine Haviland</td>
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<td>Shannyn Holder</td>
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<td>Sehrish Javaid</td>
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<td>25</td>
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<td>Ritu Metha</td>
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<td>Oral Health Assessment of the Rural Population in Juventino Rosas of Guanajuato, Mexico: A Prevalence Study</td>
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<td>Catharine Song</td>
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<td>Aatish Thennavan</td>
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<td>Leslie Trippe</td>
<td>Operative Dentistry</td>
<td>The Use of FACE Technology For Detecting Infected Dentin In Deep Dentinal Lesions, an In-Vitro Study</td>
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<td>Clinical Changes and Oral Microbiome Shifts in HIV+ Patients Following Periodontal and Restorative Therapy</td>
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**Oral Session I: 10:15-11:45 am, Koury G411**

*Note: Turner Award Finalists are indicated by (*).*

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**Oral Session II: 10:15-11:45 am, Koury G405**

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**Oral Session III: 10:15-11:45 am, Koury G502**

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2017 Dental Research in Review Day

1* Oral Hygiene and Occupational Therapy Education and Intervention for Direct Support Professions of Adults with Developmental Disabilities

Antor C1, Harmon J2, Molina J1, Hartsock S3, Heffner B4.
1Department of Dental Ecology, University of North Carolina at Chapel Hill School of Dentistry, 3Residential Service Inc., 4North Carolina Albert Schweitzer Fellowship Program.

Objectives: Prevalence of developmental disabilities in 1997-2008 was 13.78% in the United States, with an increase of autism of 289.5% in the last 12 years (J see ASF presentation for reference). In North Carolina there are 167,000 individuals living with a DD. Working in collaboration with a local community agency, each Fellow will design and implement a service project of at least 200 hours that addresses an unmet community health need. Each Fellow will work under the supervision of a Site Mentor at the participating agency and an Academic Mentor of the student’s choice. As Albert Schweitzer Fellows (ASF), the aim of our project is to improve the oral health and daily functioning of developmentally disabled (DD) adults in Orange County living in Residential Services, Inc. (RSI) housing (see ASF presentation for reference). Our objectives are to test the hypothesis that through individualized protocols, pre and post surveys, and presentations, DSPs will report improved comfort with assisting oral hygiene routines and residents will have improved oral health.

Methods: In our program, we visited each RSI group home three times, each visit averaging two hours in length. At each of these visits a dental student, dental hygiene student, and an occupational therapy student would observe each resident’s nightly oral hygiene routine. At the first visit, plaque scores were recorded using disclosing solution, which was preferably placed by the trained dental professional and immediately recorded. Oral hygiene forms were completed for each resident and an involved DSP was evaluated on their displayed comfort, on a scale from 1 - 5 (1 showing no signs of comfort, to 5 being highest level of comfort). During the first visit, an oral hygiene presentation was given to DSPs and interested residents. After, a pre comfort survey was administered to the DSPs. After this visit, dental students created individualized protocols for each resident and the occupational therapy student created recommendations for each resident. On the second visit, a nutrition focused presentation was given to DSPs and interested residents. After, a pre-nutrition survey was administered to the DSPs. At the last visit, plaque scores were recorded using disclosing solution, which was preferably placed by the trained dental professional and immediately recorded. Again, oral hygiene forms were completed for each resident and an involved DSP was evaluated on their displayed comfort, on a scale from 1 - 5 (1 showing no signs of comfort, to 5 being highest level of comfort). Post surveys were administered to DSP. Dental and occupational therapy students provided reflection on improvements and areas for growth were discussed. Any remaining questions, or adjustments to individualized protocols were addressed. Results: Of 27 residents served through this program, who live full-time in RSI group homes, 22 had an improvement in oral health measured by a decrease in at least one of the following: plaque score, gingival index, or caries risk; within one month from the initial visit. (5 residents were unable to be evaluated due to unavailability or personal reasons). Of 17 Direct Support Professionals (DSPs) 16 reported, via a pre and post survey, that they feel more comfortable in assisting the residents with their nightly routine. In addition to those 17 DSPs, 15 DSPs who participated in the program were inconclusive (due to the DSPs not being available to take one of the surveys or omitting taking the survey). Every RSI resident that we have worked with has an individualized implemented oral hygiene and occupational therapy protocol. Conclusions: Our assessment of this project has shown that through oral hygiene and occupational therapy education and intervention for DSPs and adults with DD, our program has improved the oral wellness of those we serve through interprofessional collaboration. This report also supports additional research to improve longevity of these gains.
2. The Public’s Perception of Genomics Testing for Precision Healthcare and Dentistry

Becherer A, Divaris K.
Department of Pediatric Dentistry, University of North Carolina at Chapel Hill School of Dentistry.

Objectives: Recent scientific advances offer promise for meaningful improvements in the population’s general and oral health via tailored care, precise diagnoses, risk assessment and anticipatory messaging. This trend has culminated in the concept of Precision Medicine. However, the public’s readiness for precision health care has not been systematically examined. To address this knowledge gap, we carried out this qualitative study to gain insights into the public’s perceptions of the acceptance, usefulness, applicability, and value of precision general and oral health information identified using genomics and other ‘omics tests or applications. Methods: To achieve this goal we are currently conducting semi-structured in-person interviews with 30 English-speaking parents of preschool-age children who are attending an UNC-Chapel Hill Pediatrics clinic (n=15) or are presenting for a post-operative appointment after general anesthesia for dental rehabilitation at the UNC-Chapel Hill Pediatric Dentistry clinic (n=15). Interviews are being recorded, transcribed verbatim and analyzed using a qualitative description research methodology. Inductive analyses are based on analytical summaries, double-coding, and summary matrices and are carried out using Dedoose. Results: Preparedness and prevention have emerged as perceived benefits of genetic testing from the first 4 interviews. Despite a general lack of knowledge on the topic, the interviewees were optimistic about the potential benefits of precision healthcare. Participants were not aware of the role of genetics in oral health, yet each could cite benefits to knowing one’s predisposition to oral conditions and felt it could influence health behavior change for themselves and their children. Conclusion: These preliminary results provide valuable insights into the public’s appreciation, perceptions and concerns regarding the utilization of genomics testing and information for routine health care among adults and children, including dental care. For precision medicine to realize its potential, substantial strides must be achieved in the population’s genomics’ health literacy. Supported by: the Thorp Community Engaged Scholars Fellowship and a grant from the National Institute of Dental and Craniofacial Research (NIDCR) U01DE025046.

3. Accuracy of Digital vs. Conventional Impressions: A Pilot Study

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Objectives: The aim of this in vitro study is to evaluate the dimensional accuracy of measurements obtained via direct digital scanning to those obtained indirectly via scanning of casts obtained using conventional impression techniques. Methods: Impressions of two physical models were obtained using alginate and polyvinyl siloxane impression materials and casts were poured using a type III gypsum material (Microstone). Digital impressions of the physical models were obtained through direct scanning (DS) of the object or through indirect scanning of the casts (AG, PVS) using the 3Shape Trios® 3 Handheld Scanner (3ST) or the 3Shape D810 Scanner (3SD). Dimensional accuracy of the scanned images was evaluated using three-dimensional open source modelling software (3D Slicer). Results: Data analysis is ongoing. We hypothesize that there will be no significant differences among the different scanning methods. Conclusions: Clinicians should be aware of potential differences in accuracy between direct and indirect digital scanning. However, it seems at this moment that all available choices lead to clinically acceptable outcomes.
4*. Aggregatibacter actinomycetemcomitans in African-Americans with Localized Aggressive Periodontitis

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Objectives: This study aims to investigate the prevalence of the highly leukotoxic JP2 sequence versus the minimally leukotoxic non-JP2 sequence of Aggregatibacter actinomycetemcomitans (Aa) within a cohort of 180 young African Americans with and without localized aggressive periodontitis (LAP) in North Florida, before and after treatment. 

Methods: The study included patients aged 5 to 25 years old: 60 LAP patients, 60 healthy siblings (HS) and 60 unrelated healthy controls (HC). Subgingival plaque was collected from both diseased (PD = 5mm with bleeding on probing - BoP) and healthy (PD = 3mm with no BoP) sites from LAP, and from healthy sites from HS and HC. Plaque DNA was extracted and analyzed by PCR for the detection of the JP2 and the non-JP2 sequences of Aa. Sampling was repeated from the same sites at 3, 6 and 12 months after full mouth mechanical debridement and systemic antibiotics in LAP patients.

Results: Overall, 90 (50%) subjects tested positive for the JP2 sequence: 50 (83.33%) LAP subjects (75% of diseased sites and 67% of healthy sites), 16 (26.67%) HS and 24 (40%) HC (p<0.0001 among groups). The non-JP2 sequence was detected in 26 (14.44%) subjects: 17 (28.33%) LAP (18.33% of both diseased and healthy sites), 6 (10%) HS and 3 (5%) HC (p < 0.05 among groups). Following treatment, JP2 presence was significantly reduced at all timepoints (p<0.0001), down to 3% detection in diseased sites and no detection in healthy sites at 12 months. Additionally, presence of JP2 was significantly correlated with magnitude of PD and CAL.

Conclusions: JP2 Aa was strongly associated with LAP diseased sites in young African-Americans, significantly more so than the non-JP2, and its presence was greatly reduced after treatment. Supported by: NIH/NIDCR R01DE019456.
Identification of Label-Retaining Cells In Upper Aerodigestive Tract Epithelial Niches

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Objectives: The entry point for the gastrointestinal (GI) tract includes the oral cavity, oropharynx, and laryngopharynx (OOL), which are regularly challenged by pathogens, toxins, and injuries. Compared to other GI tract epithelia, the OOL epithelia have been understudied, resulting in minimal characterization of their development, maintenance, and renewal. Currently, no specific markers have been identified for slow-cycling/reserve stem cells of these tissues. The aim of this study was to investigate whether slow-cycling stem cells reside in OOL niches, identified through unbiased, genetic label-retention approaches.

Methods: We used two complementary pulse/chase genetic label retaining cell (LRC) strategies to identify quiescent/slow-cycling basal cell in OOL epithelial in situ. This approach utilizes a bipartite transgenic system where expression of GFP-tagged stable histone-H2B is expressed in a doxycycline-inducible and reversible manner (promoter: basal epithelial keratin 5- or keratin 14-tTA mice mated to TetO-H2B-GFP mice). These cells were harvested by tissue-specific microdissection and subsequently analyzed by immunofluorescence microscopy, fluorescence-activated cell sorting, and quantitative PCR. Results: We observed that few GFPhi cells are seen in the ventral tongue/floor of mouth after a short 7 chase, similar to epidermis. However, in mice chased for 7, 14 or 28, and 56 days, GFPhi epithelial niches can be seen in the palatal rugae, salivary glands, fungiform papilla, and oropharyngeal epithelia. LRC niches also display heterogeneous coexpression of Sox9 and known epithelial progenitor marker p63. Fluorescence-activated cell sorting and targeted qPCR analyses revealed differential expression of known stem cell and cell cycle regulators. Conclusions: We observed a) that the number of LRCs decreases with time, b) LRCs show tissue-specific variability, and c) there are observable differences between the complementary K5 and K14-tTA strategies, each of which will inform our future pooled and single cell transcriptomics studies on these niche-specific LRC populations.
Characterizing a Novel HPV-driven GEMM of Oral Squamous Cell Carcinoma

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1Department of Dental Ecology, University of North Carolina at Chapel Hill School of Dentistry, 2Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill School of Medicine 3Department of Cancer Biology Scripps Research Institute, Jupiter Fl, 4Department of Pathology and Laboratory Medicine, University of North Carolina at Chapel Hill School of Medicine.

Objective: HPV-induced OSCC is steadily increasing and currently implicated in 60% of all oropharyngeal carcinomas. Whole genome, transcriptome, and proteome analyses have aided in identifying altered signaling pathways in HPV-induced OSCCs; however, additional tools such as tractable genetically engineered mouse models (GEMMs) are needed. Current HPV-induced oral cancer models do not accurately recapitulate the levels, stoichiometric ratios, or anatomic location of oncoprotein expression. Our aim was to develop a conditional and inducible GEMM that specifically develops oral cancer to enable longitudinal investigation of HPV-driven OSCCs in vivo. Methods: We generated a GEMM that enables directed expression of the high-risk HPV16 E6 and E7 oncoproteins by introducing a transcriptional/translational STOP element flanked by LoxP sites upstream of an E7iresE6 cassette, and targeted to the ubiquitous Rosa26 locus (Rosa26-LSL-E7iresE6). Conditional and inducible activation of E6 and E7 in the basal epithelial layer of oral mucosa, a site of HPV infection in humans, was achieved by crossing these mice to tissue-specific, tamoxifen-inducible Cre recombinase (CreERT2) driven by the keratin 14 promoter (KRT14-CreERT2). In addition, we generated a GEMM for conditional and inducible expression of our LumiFluor (eGFP-NanoLuc) optical reporter (Rosa26-LSL-LumiFluor). Results: We compared two versus three intra-lingual tamoxifen injections into the ventral surface of KRT14-CreERT2; Rosa26-LSL-E7iresE6 cohort tongues to activate Cre-mediated recombination and STOP element removal leading to induced site-specific E6 and E7 expression. In agreement with previously reported HPV-induced abnormalities, E6 and E7 expression promotes tissue hyperplasia and dysplasia in our model compared to controls. Further characterization of targeted tamoxifen administration using our LumiFluor GEMM demonstrated higher induction with less tamoxifen in animals that received intra-lingual injections (1.5 mg) compared to conventional intra-peritoneal injections (5 mg). Conclusion: Ongoing studies are evaluating the cooperating mutations in driving OSCC development. Thus, we developed novel GEMMs for directed expression of E6, E7, and LumiFluor for establishing a tractable autochthonous model of HPV-driven OSCC.

Supported by: NIH T90-DE021986, R00-CA157954, and R21-DE025725.

Current L¹, Cotterill C¹, May L³, Eguren K¹.
¹Department of Pediatric Dentistry and Orthodontics, East Carolina University School of Dental Medicine,
²Foundational Sciences, East Carolina University School of Dental Medicine.

Objective: The purpose of this study was to evaluate the influence of physical activity during pregnancy on child oral health and development. We hypothesized that women who exercised while pregnant would have children with lower dental disease progression, decreased caries risk, and increased tooth maturation. Methods: Women with children 6 years old or younger seen as patients at the Pediatric Dental Clinic were asked to participate in the study. Based on responses to a pregnancy physical activity questionnaire, women were classified as exercisers, active control, or control, while pregnant with their child. We looked for differences in child oral health and tooth development between the 3 groups using multiple ANOVAs. Results: Data from 59 mother:child pairs was analyzed. No significant differences were found between groups for change in children’s dental disease progression or dental carries risk. We found a statistical trend (p = 0.03) of increased tooth maturity and development as a function of child’s age related to prenatal physical activity. Conclusions: The data suggests that variation in behaviors postpartum limit any association between prenatal exercise and decreased dental disease progression and caries risk of offspring. However, a physiological link may exist between child dental maturity and maternal activity during pregnancy. Pediatric and general dentists should focus on the postpartum behaviors to improve childhood oral health. Support provided by the East Carolina University School of Dental Medicine.

Supported by: East Carolina University School of Dental Medicine.
Screening for New Periodontal Pathogens Enrichment Using an Ex-Vivo Biofilm Model

Dua S1, Martin L1, Teles RP1, Henz S1, Schey K1, Jah T1, Phillips ST2, Butz N3, Azcarate-Peril MA3,4, Roach J3, Teles FRF1.

1Department of Periodontology, University of North Carolina at Chapel Hill School of Dentistry, 2Oral & Craniofacial Health Sciences, University of North Carolina at Chapel Hill School of Dentistry, 3Microbiome Core Facility, Center for Gastrointestinal Biology and Disease, University of North Carolina at Chapel Hill
4Department of Cell Biology and Physiology, University of North Carolina at Chapel Hill School of Medicine,
5Department of Research Computing, University of North Carolina at Chapel Hill, Chapel Hill, NC.

Approximately 35% of the oral microbiome remains uncultured due to limitations from conventional laboratory techniques. **Objective:** To identify optimal conditions for enriching the growth of uncultivated periodontal pathogens using a high-throughput, ex-vivo biofilm model. **Methods:** Subgingival biofilms from severe periodontitis patients (pocket depth ≥ 5 mm) were collected into PRAS and inoculated with 12 media types in Calgary Biofilm Devices (CBD, 4 per sample). CBDs were incubated in anaerobic and capnophilic atmospheres for 16 weeks. Biofilms from CBD pegs and spent media were collected at days 4, 10, 14, 25, 34, 55, 83, and 112. Biofilms and inoculum were treated with propidium monoazide before DNA extraction. The microbial content of samples was determined by 16S rRNA sequencing (V3-V4 region), and the taxonomy and relative abundance were sought with QIIME and HOMINGS, respectively. **Results:** The overall microbial load (mean DNA in ng ± SD) increased over time: 4d: 346.9±146.6; 10d: 669.0±326.3; 14d: 923.5 ±419.2; 25d: 842.2 ± 491.7; 34d: 1050.1±692.7; 55d: 1087.3±727.3, 83d: 1142.9±752.4; 112d: 1705.0±1098.0. Anaerobic environments harbored the highest relative abundance (RA) of uncultivated members including: *Peptostreptococcaceae* [XI][G-1] (highest RA, 12.8%; optimal media, SHI minus sucrose; day of highest growth, 25), *Lachnospiraceae* [G-8] (14.5%, PBB, 14), TM7 [G-1] (1.0%, T-soy broth+desferricoprogen, 25); capnophilic: *Bacteroidales* [G-2] (37.9%, SHI minus sucrose, 25), *Treponema* (16.0%, BHI+hemin+sheep blood, 25). Most taxa levels peaked at days 14 or 25 and significantly decreased at day 34 for both atmospheres. *Desulfovibulus* was present exclusively in Columbia broth for both anaerobic and capnophilic environments. *Fretibacterium* and *Treponema* were seen in all media types and atmospheres, but were most numerous in Brain Heart Infusion+Hemin+sheep blood, Artificial Saliva, SHI minus sucrose, and Columbia broth+horse blood+Hemin+vitamin K. **Conclusion:** Preservation of ecological communities through an ex-vivo biofilm, media supplementation, and long incubation in anaerobic and capnophilic atmospheres enrich for the growth of uncultured periodontal pathogens.

Supported by: NIH; NIDCR: R01-DE024767(FRFT), NIH: P30DK 34987 (UNC Microbiome Core)
Interprofessional Education (IPE) in the Student Dental Clinics

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OBJECTIVE: A team-based approach to care has been shown to reduce healthcare costs and optimize health outcomes. In dental education, interprofessional education (IPE) allows for reciprocal learning that can provide a lasting impact on patient care. The OWN (Oral Wellness and Nutrition) Program was created to support the collaboration of providers from the fields of dentistry, pharmacy, and public health in the clinical management of diabetic and medically complex patients. The purpose of this project was to evaluate the OWN program’s impact on dental student comfort levels and perceptions of IPE. METHODS: As part of the OWN program, pharmacists and registered dieticians worked alongside dental students to provide counseling services to patients with diabetes. All dental students in their third year attended an IPE orientation. Twenty-seven dental students directly engaged in IPE encounters when treating diabetic patients. Each encounter consisted of counseling with a registered dietician, pharmacist, or both, lasting 15-20 minutes each. Post-encounter surveys of comfortability and IPE perceptions were completed by all students regardless of OWN participation. RESULTS: Twenty-seven out of 58 dental students participated in one or more IPE encounters. Comfortability levels were significantly higher for students that engaged in IPE encounters either with pharmacists (76.5% vs. 39.1%; p=0.022) or with dietitians (73.7% vs. 48.4%; p=0.031). Of the dental students who worked with a pharmacist, 94.4% reported that pharmacy plays an important role in the dental setting, while 73.7% of those who worked with a registered dietician reported that nutrition plays an important role. CONCLUSIONS: Interprofessional encounters with pharmacy and nutrition resulted in higher comfort levels for dental students in discussing weight, diet, and diabetes management. A higher percentage of dental students exposed to IPE also reported that pharmacists and dieticians play an important role in the dental setting, indicating the need for further IPE experience development.

Supported by: Albert Schweitzer Fellowship.
10. **IFI16 is a Periodontitis Modulating Protein**

Girnary M¹, Morelli T¹, Jiao Y¹, Zhang S¹, Offenbacher S¹, Marchesan J¹, Kim S², Seaman W³, Webster-Cyriaque J³, Marlier A⁴, Cantley L⁵, Ting J⁶, Arnold R⁶.

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**Objectives:** Our group identified interferon, gamma-inducible protein 16 (IFI16) as a potential protein important for PD pathogenesis. IFI16/murine p204 is an innate immune sensor that mediates anti-inflammatory actions through suppression of activation of caspase-1 by AIM2-inflammasomes. The purpose of this study was to evaluate chemokine responses in IFI16 overexpressing cells and to quantify bone loss in p204/- mice after induction of periodontitis. **Methods:** Endothelial cells (HUVEC) were transiently transfected with IFI16. Chemokine responses (CCL2, CCL3, CCL4) were assessed in the context of IFI16 overexpression upon live periodontal pathogen infection (MOI 1:100). Wild-type and p204/- mice were induced for periodontal disease using the 10-day ligature model. Bone loss was evaluated by microCT analysis (alveolar bone crest-cementoenamel junction). Differences were evaluated by ANOVA and t-test (p=0.05). **Results:** Overexpression of IFI16 resulted in statistically significant decreases in chemokine responses with respect to control. CCL2 and CCL4 expression was significantly lower for Aa, Pg, and Fn (p=0.05). Decreased CCL3 expression was statistically significant for Aa and Fn (p=0.05). After 10-day ligature induced periodontitis, p204/- mice showed higher mean bone loss (ABC-CEJ distance) compared to WT mice [0.42mm (SD=0.092mm) vs 0.34mm (SD=0.083mm), representing 23.5% increased bone loss [p=0.0325 (1 tailed t-test)]. **Conclusion:** IFI16/p204 showed host-modulating properties. Overexpression of IFI16 resulted in a decreased chemokine response against periodontal pathogens. Ligature-induced bone loss was increased in the absence of IFI16 (p204/- mice). This data further supports a potential role IFI16/p204 in the pathogenesis of periodontal disease. Supported by RO-1 DE021418, RO-1 DE023836, UL1-RR02547.
11. 4-hydroxy-2nonenal (HNE) is a Viable Salivary Biomarker for Lipid Peroxidation in Stimulated and Unstimulated Saliva Procured from Healthy Volunteers

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Oxidative stress is well-known to be a pathological factor underlying several chronic inflammatory diseases. 4-hydroxy-2-nonenal (HNE) is a reactive aldehyde formed from oxidation of n-6 polyunsaturated fatty acids, the most common of which in humans are dietary derived linoleic acid (corn/soybean oil) and arachidonic acid. Once formed, these reactive aldehydes modify proteins, DNA and other lipids and trigger inflammatory signaling cascades that, if allowed to persist, can be deleterious. Traditionally, patients endure discomfort from invasive procedures that aim to measure oxidative biomarkers. Saliva offers an alternative, noninvasive method to test oxidative stress. 

Objective: We hypothesized that the oxidative biomarker HNE can be detected in stimulated and unstimulated saliva procured from health volunteers, and be used as a non-invasive surrogate of oxidative/carbonyl stress.

Methods: Whole stimulated and unstimulated saliva was procured through the process of drooling from confirmed healthy volunteers. Unstimulated saliva was obtained over a time period of 3 minutes, whereas stimulated saliva was induced by parafilm (gum-like substance) and attained over 2-minutes. Samples were prepared through centrifugation and placed on dry ice and/or stored in -80°C freezer. The sandwich or indirect Enzyme-linked Immunosorbent Assay (ELISA) method was used to evaluate the levels of HNE.

Results: GraphPad analysis was performed on data obtained. All samples procured from subjects contained levels of the oxidative biomarker HNE. There was higher HNE levels in unstimulated saliva in comparison to stimulated saliva in most subjects. Stimulated saliva had much less variability.

Conclusion: Saliva has the potential to be a convenient, noninvasive, and comprehensive tool in evaluating the overall health of the body. As a result, further studies are needed to identify and develop a wide array of methods to detect salivary biomarkers. These findings suggest that HNE is a viable salivary biomarker for lipid peroxidation in stimulated and unstimulated saliva of healthy volunteers.

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Objectives: This study investigated changes in the geographic distribution of dental health care providers within the state of North Carolina from 2010 to 2015. Changes in general practitioners (GPs), pedodontists, and orthodontists practicing in urban vs. rural counties were assessed, with the aim of discovering any potential associations of practice location with practitioner dental school of graduation or the acceptance of Medicaid. Methods: Cross-sectional retrospective data reflecting the demographic and practitioner location characteristics of GPs, orthodontists, and pedodontists actively practicing in North Carolina from 2010 – 2015, as well as county population data were acquired. Practitioner Density was calculated as one practitioner per 10,000 people for each county for GPs, pedodontists, and orthodontists. Changes in Practitioner Density were reported for each county and practitioner type from 2010 – 2015 and compared to historical data from 1990-2010 using Chi Square analysis. Level of statistical significance was set at P<0.05. Results: Initial results show that 56 counties saw an increase in total GPs from 2010 – 2015; 24 counties saw a decrease. Pedodontists increased in 19 counties; 7 decreased. Although North Carolina added 22 orthodontists from 2010 to 2015, 12 counties decreased in total counts, 19 counties increased. In 2015, East Carolina University (ECU) sent 16% of its graduates (8 GPs) to rural counties; the University of North Carolina (UNC) sent 8% (6 GPs). UNC sent 58% (46 GPs) of its graduates to urban counties; ECU sent 54% (27 GPs). Medicaid data and urban vs. rural county data will be reported. Conclusion: From 2010 – 2015, changes in the distribution of dental health care providers in North Carolina were observed. Data analysis to be presented may clarify if factors such as the graduation of dentists from ECU contributed to significant changes in the distribution of rural and Medicaid providers from 2010-2015 when compared to 1990 -2010. Supported by: Grover C. Hunter Research Fund Fellowship and DFNC – Orthodontics Chair’s Fund.
13. Cone-Beam Computed Tomography Volume Registration for the Analysis of Periodontal Bone Changes

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2D radiographs, used to monitor alveolar bone levels, are diagnostically limited due to superimposition of anatomy and inability to detect small changes in mineralization. Digital subtraction has been used to detect these changes with greater sensitivity but is time intensive, requires standardized projection geometry, and still produces two dimensional images. Little data exists on registering CBCTs to monitor bone changes. This may yield greater sensitivity in bone loss detection with the added benefit of three-dimensional views. **Objectives:**

1. Determine if observers are able to better detect and quantify changes in periodontal bone levels pre- and post-defect with registered CBCTs compared to intraoral radiographs.

2. Determine if bone thickness plays a significant role in detecting bone loss.

**Methods:** The IRB-approved ex vivo study included image acquisition of dried human mandibles with PSP intraoral radiographs and CBCTs, before and after induction of periodontal bone defects. CBCTs were registered using Anatomage Invivo5 software. Defect depths and cortical plate thickness were measured clinically as a gold standard. Observers were then asked to determine presence and extent of periodontal bone defects on the two imaging modalities using a five-point scale. Logistic regression was used to generate Odds Ratio Estimates and Type 3 Analysis of Effects. **Results:** Type 3 Analysis of Effects showed that a statistically significant difference in the detection of bone loss between the two imaging modalities when controlling for observer and bone thickness (p<0.001). The odds of detecting bone defects with CBCT was 2.3 times greater than for intraoral imaging. Bone thickness, imaging modality, as well as the observer all had a significant effect on the ability to detect bone loss (p<0.001). **Conclusion:** Detection of changes in alveolar bone levels is more effective with registered CBCTs compared to intraoral radiographs.
14*. Healthy Weight Counseling for Children in the Dental Setting

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Objective: A gap exists in the literature regarding optimal methods for the dental team to help address the childhood obesity epidemic. The authors aim to identify preferred communication approaches the dental team could employ to initiate dialogue with caregivers regarding the weight of the child patient. Study Design: A structured interview guide containing seven potential Healthy Weight Counseling (HWC) approaches and several follow-up questions was developed by the research team, pilot-tested and revised. Interviews were conducted at the Pediatric Dentistry Clinic of the UNC-CH School of Dentistry with 50 participants who are English-speaking caregivers of children ages 4-12. Results: A vast majority of participants are receptive to HWC in the dental setting if it benefited their children. Caregivers indicated varying levels of acceptance for the 7 HWC approaches presented based on specific verbiage contained in each approach (P<0.01). More than one-half of participants (53%) preferred HWC to be delivered away from the child, while 39% preferred child presence and 8% reported no preference. Current results are based on 46 completed interviews. Conclusions: Caregivers were open to weight-related conversations in the dental setting, but the dental team must choose their approach carefully and establish the proper doctor/patient relationship prior to HWC delivery.

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Development of a Novel Cell-Tracking Strategy in Bone Regenerative Devices

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Objectives: Cell-based graft devices (CBGD) are usually composed of two major components: supporting scaffolds and functionally active cells to regenerate biologically functional tissues. CBGD have been shown to advance bone tissue engineering and overcome limitations that only use synthetic substitutes in the treatment of oral and craniofacial defects. However, current techniques using fluorescent probes fail to sufficiently monitor the viability and function of transplanted cells in vivo, which limits CBGD's evolvement. To more accurately monitor transplanted cells in a spatiotemporal manner, we hypothesized that utilizing eGFP-NanoLuc (GpNLuc), a fusion reporter which generates the brightest bioluminescent signal known to date from the intra-molecular bioluminescence resonance energy transfer between NanoLuc and eGFP, will overcome the problems associated with traditional fluorescent probes and enable real-time tracking of cell viability, location, and function. Methods: Stable-transfection of GpNLuc in rat mesenchymal stem cells (rMSC) was developed and a series of in vitro assays including MTT assays and analysis of rMSC differentiation together with animal studies were performed to prove the concept that GpNLuc does not alter the physiological characteristics of rMSC but can efficiently monitor transplanted cells in live animals. Moreover, the GpNLuc stable cells were further tested in a 3D scaffold composite to assess cell growth. Results: GpNLuc did not significantly affect cell viability/proliferation ($p>0.05$) and the capability of adipogenic, chondrogenic and osteogenic differentiation in rMSCs. Furthermore, GpNLuc was successfully applied to quantify cell number and could generate an intense bioluminescent emission suitable for detecting and tracking rMSCs the host skin temporally and non-invasively. Local eGFP excitation enables improved sensitivity of GpNLuc by avoiding interference created by surrounding tissue or the 3D scaffold auto-fluorescence resulting from traditional ectopic excitation. Conclusions: We have developed an innovative cell tracking strategy to better understand the biology of transplanted cell migration and function during tissue regeneration at an injury site. Supported by: NIH/NIDCR R01DE022816-01.
16*. Efficacy of Buffered 1% Compared to Non-buffered 2% Lidocaine for Maxillary Field Block

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Objectives: Assess outcomes for pain on injection, and time to sensation return for buffered 1% lidocaine with 1/100k epinephrine (Epi) vs. non-buffered 2% lidocaine with 1/100k Epi. Methods: With an IRB approved, randomized, crossover trial, 40mg buffered 1% lidocaine was compared to 80mg non-buffered 2% lidocaine delivered in a maxillary field block. Outcome variables were subject reported responses at the maxillary 1st molar and canine upon cold and electrical pulp testing (EPT), pain on injection, and time until mid-face numbness. Teeth were tested prior to nerve block and at 30-minute intervals until a positive response was reported. Two weeks later subjects were tested with the alternate drug combination. The same outcome variables were assessed. Predictor variables were alternate drug formulations. For all outcome variables an assessment of treatment difference, calculated as 1% buffered minus 2% non-buffered, was performed using Wilcoxon rank sum tests with Proc NPAR1WAY (SAS v 9.3). Significance was set at p<0.05. Results: 58% of subjects were female, 58% were Caucasian, median age was 23.5 years. Times to response after injection were not significantly different, on average, between the two drug formulations for the cold test on a molar, p=0.08, or cold test on a canine, p=0.22. Times to response were significantly longer for the non-buffered drugs for EPT on the molar and canine, both p=0.01. Pain levels after injection were significantly lower on average, by 1 unit (IQR -2.5,+1) for the 1% buffered lidocaine, p=0.04. A trend of less time to mid-face numbness was reported for the buffered drug combination as compared to the non-buffered combination. The median difference in time between the two drug formulations was not significant, p=0.33, median 2.5min (IQR -5.5, +1.5min). Conclusions: Buffering 1% Lidocaine with 100k Epi can produce similar or more beneficial clinical outcomes with a maxillary field block as compared to non-buffered 2% lidocaine with 100k Epi.
Effects of DNA Methylation Inhibitors on Epithelial Barrier Function

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Objectives: Several studies have shown the involvement of epigenetics with periodontal disease. Since functional dissociation of paracellular permeability is expected during bacterial infection, we hypothesized that the methylation of host oral epithelial DNA represents an important element in the disruption of barrier function and pathogenesis of periodontal diseases. With this in vitro study we aimed to investigate the potential effects of DNA methyltransferase (DNMT) inhibitors on epithelial barrier function in response to infection with periodontal pathogen in human gingival epithelial cells. Methods: Primary human gingival epithelial cells (HGEPs) were stimulated with P. gingivalis, strain A7436 (MOI 50) either in the presence or absence of DNMT inhibitors (10 µM of RG108 or EGCG). CellTiter-Blue® Cell Viability Assay (Promega) was used to determine an optimum cell density and maximum inhibitor concentration at which cell viability is maintained. Transepithelial electrical resistance (TEER) at various time points were performed using an EVOM® electrical resistance system. DNA methylation was quantified by qPCR using EpiTect Methyl II PCR Primer Assays for PKP2. Immunofluorescence analysis was performed using PKP2 antibody (1:400 dilutions, Santa Cruz) and analysis performed using Zeiss710 confocal microscope. Results: Exposure of HGEPs to bacterial infection resulted in decreased TEER (P=<0.05) is associated with increased cell permeability. Methylation assays showed increased methylation levels of the PKP2 in comparison to non-infected controls (P=<0.05) and an associated PKP2 down-regulation (P=<0.05). For infected cells treated with DNMT inhibitors, PKP2 mRNA expression was increased (P=<0.05) and TEER values similar to non-infected cells. Comparatively, immunofluorescent staining of the PKP2 protein showed reduced protein expression in infected cells not treated with DNMT inhibitors. Conclusion: DNA methylation levels of PKP2 can affect epithelial barrier function potentially conferring increased susceptibility to infection. DNMT inhibitors can affect cell adhesion dissociation in response to infection minimizing the disturbance to the barrier function.

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Investigation of MORN2 Involvement in the Periodontal Host Response

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Objectives: Using gene-centric analysis in the ARIC GWAS cohort we identified MORN2 as a significant susceptibility locus for periodontal disease (PD). This MORN2 locus contains a coding, missense SNP (minor allele frequency=0.23, rs3099950, E->K). Our preliminary data shows MORN2-silencing impairs the phagocytosis of periodontal pathogen Porphyromonas gingivalis (Pg). Periodontal disease is a polymicrobial infection that results in an inflammatory response, therefore, we sought to evaluate the effect of MORN2 on phagocytosis of the periodontal pathogen, Fusobacterium nucleatum (Fn), as well as determine the cytokine response of MORN2-silenced cells upon bacterial challenge. Methods: Both scramble-control and MORN2-silenced THP-1 cells were challenged with either Pg or Fn (at MOI 1:100) in-vitro. Bacterial viability was quantified via CFU counting. The supernatant was collected and tested via Human screening assay R&D magnetic 4-plex. The experiments were done in triplicates at two different time points. The results are expressed as mean % uptake and observed concentration (pg/mL) [±/ SD (p =0.05)], respectively. Testing for statistical significance by t-test. Results: MORN2-silencing resulted in impaired Pg uptake and improved Fn uptake by THP-1 cells. As compared to controls, there was a significant decrease in Pg [655 CFU (SD=200) vs 191 CFU (SD=120)] and a significant increase in Fn [56 CFU (SD=21) vs 126 CFU (SD=6)] after four days of growth. There was a decreased cytokine (IL-6, IL-8, TNF-a, IL-1b) response in MORN2-silenced cells compared to controls. Conclusions: These data suggest a key role for MORN2 in the phagocytosis-killing of oral pathogens, Pg and Fn, as well as the inflammatory response to microbial challenge. The identification of a genetic variant of MORN2 provides a foundation for further exploration of this MORN2 genetic variant in the dysbiosis of chronic periodontitis and may provide an opportunity for gene-based precision periodontal medicine in the future.

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Validation of the CDK4/6-RB tumor suppressor pathway as a therapeutic target for a RAS-mutant cancers

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RAS proteins (KRAS, NRAS, and HRAS) are responsible for controlling signaling pathways that control the cell cycle, growth and survival. Oncogenic mutations in the RAS family of genes are drivers of many human cancers including pancreatic ductal adenocarcinoma, colorectal adenocarcinoma and head and neck squamous cell carcinoma (Frequency=97.7%, 52.2% and 5.5% respectively). Due to its involvement in tumor initiation and maintenance, RAS and its downstream effectors are attractive therapeutic targets. One key downstream component of RAS signaling are the cyclin dependent kinases 4 and 6 (CDK4/6). CDK4/6 phosphorylate and inactivate the RB tumor suppressor to promote progression through the G1/S phase of the cell cycle. Dual inhibition of CDK4 and 6 has been successful for treating breast cancer.

Objective: We tested whether the cancers with frequent RAS mutations are sensitive to palbociclib, a dual CDK/4/6 inhibitor. Results: Our results showed that palbociclib inhibited growth in different cancer cell lines. We then investigated whether the inhibition of CDK4 or 6 alone will be sufficient to decrease the phosphorylation of Rb. Using siRNA, we knocked down the proteins. Our results indicated that in most cell lines inhibition of CDK6 alone or with CDK4 will cause the loss of phosphorylation of Rb. Preliminary data from our lab also suggested that the combination of palbociclib and ERK inhibitor SCH772984, sensitized the cells to the growth inhibition. We generated CDK4 knockout cell lines using a CRISPR/Cas9 approach to test their sensitivity to the ERK inhibitor and the results will be reported. Conclusion: Our results indicate that the dual inhibition of CDK4 and 6 is an effective approach to treat RAS-mutant cancers and CDK4/6 inhibition may sensitize the cells to SCH772984.
20. In Vitro Caries Detection Reliability of ICDAS, QLF, and Spectra

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Objectives: Evaluate the intra- and inter-examiner reliability of the visual criteria International Caries Detection and Assessment System (ICDAS), and the fluorescent based caries detection devices Quantitative Light-induced Fluorescence (QLF) and Spectra for the detection of sound (ICDAS 0), initial (ICDAS 1&2) and moderate (ICDAS 3&4) occlusal and smooth surface caries. Methods: Unrestored teeth with fully formed roots, no developmental defects and ICDAS scores ranging from 0-4 on occlusal (n=60) and smooth (n=60) surfaces were selected. Teeth were imaged, mounted on dentoforms and placed in Phantom heads. Four calibrated examiners independently evaluated a pre-selected site twice, guided by masked images on a computer display, with a 7-day interval between exams, using each of the methods: ICDAS, QLF, Spectra. The Intraclass Correlation Coefficient (ICC) was calculated. Results: On occlusal surfaces, intra-examiner reliability ranged from 0.86-0.91 (ICDAS), 0.92-0.95 (QLF ΔF) and 0.88-0.96 (Spectra); inter-examiner reliability was 0.78 (ICDAS), 0.92 (QLF ΔF) and 0.92 (Spectra). For smooth surfaces, intra-examiner agreement reliability ranged from 0.84-0.97 (ICDAS), 0.80-0.95 (QLF ΔF) and 0.95- 0.96 (Spectra); inter-examiner reliability was 0.86 (ICDAS), 0.78 (QLF ΔF) and 0.96 (Spectra). Conclusions: Intra- and inter-examiner reliability for occlusal or smooth surfaces was excellent (>0.75) for all 3 caries detection methods tested. However, intra-examiner reliability range was higher for QLF on occlusal surfaces and Spectra on smooth surfaces. Furthermore, Spectra was the only method with an inter-examiner reliability >0.90 for both occlusal and smooth surfaces. Under the conditions of this study, Spectra was the least technique sensitive caries detection method. However, further investigation is required to determine the specificity and sensitivity of these techniques.
21*. Practicing Dental Hygienist’s Knowledge, Attitudes, and Comfort Level in Treating Patients with Dental Anxiety

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Dental anxiety has been ranked as the 5th most common fear in the general population and affects approximately 20% of adults in the United States. Dental anxiety has been defined simply as the fear of dental procedures. It is a common cause of delayed dental care, resulting in declining oral health and oral health related quality of life. Dental hygienists are in a paramount position to educate patients on the causes, risks, and treatment of a patient with dental anxiety. **Objective:** The purpose of this study was to investigate the knowledge, attitudes, and comfort level of practicing dental hygienists regarding dental anxiety in their patients. Results will be used to determine if additional education is needed to successfully treat patients with dental anxiety. **Methods:** Institutional Review Board (IRB) granted exemption status for this study. A survey was developed, pilot tested and administered to participants at the Annual Dental Hygiene Lecture continuing education (CE) course in April, 2016. Eligibility requirements included current employment as a dental hygienist and having an active license in the United States. The survey consists of five main domains: 1) demographics 2) practice setting 3) practice behaviors 4) dental anxiety awareness and 5) opinions and attitudes. The quantitative survey utilized a Likert scale system ranked from “extremely frequent to never” and “strongly agree to strongly disagree” and descriptive statistics were produced for each response item. **Results:** Of the 157 participants of the study, 153 participants met the inclusion criteria for a response rate of 97.5%. When the participants were asked how to identify a patient’s dental anxiety, only 19.7%, “Often” or “Always” use dental anxiety questionnaires. Participants’ confidence levels were high, 92.1% (N=140) in their ability to perceive if their patient feels stressed. One hundred and eighteen (p=77.6%) of the participants are interested in learning more about dental anxiety questionnaires and 125 (p=82.2%) would like to learn more about treatment options for patients with severe dental anxiety and where to refer them. Only 58.3% (N=88) of the participants believe that their dental hygiene education prepared them for treating patients with mild levels of anxiety; 37.5% (N=57) with moderate levels of anxiety; and, 21.7% (N=33) with severe dental anxiety. **Conclusions:** Although the majority of dental hygienists were confident in identifying anxiety in patients, few used validated questionnaires to determine the level of anxiety. Dental hygiene educational programs should include content on anxiety management for patients with all levels of dental anxiety. Dental hygienists are in the pivotal role for discussing the risks, characteristics, and treatment options for their patients with dental anxiety and for providing referrals. **Key Words:** Dental Anxiety, Dental Hygiene Education, Dental Fear
**Transcriptomic analysis of wound healing around tantalum and titanium in diabetes**

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**Objectives:** Type 2 diabetes in adults has been associated with impaired bone remodeling. This indicates osteoblast phenotype and function are altered. As the early events in bone formation associated with dental implant osseointegration can potentially be influenced by diabetic state, we proposed to examine the transcriptomic profile of diabetic subjects in comparison to healthy individuals focusing on osteogenic pathways during the initial phases of implant osseointegration. **Methods:** Eleven subjects were enrolled. Demographics included age, sex and BMI. Porous tantalum trabecular metal 3x5mm test cylinders were placed and submerged in the mandibles of 5 healthy and 6 Type 2 diabetic participants. The implant devices were trephined out at 2 and 4 weeks post-surgery. Bone tissues were harvested from the implants and RNA was extracted. RT2 Profiler PCR array system was selected to investigate gene expression pathways involved in osteogenesis. **Results:** In response to both materials transcriptome analysis performed at 2-week time point indicated downregulation (p>0.05) of multiple genes for diabetic subjects as compared to healthy subjects: At 4 weeks, there was upregulation of BMPs 2, 4, 6, 7 ranging from 1.3 to 1.8 fold; CSF2 (3.1 fold), CSF3 (9.3 fold) as well as EGF (6.7 fold), CALCR (2.3 fold) in diabetics with tantalum compared to health. This increased gene expression among diabetic subjects was not observed when compared to titanium implant test cylinders (data not shown), suggesting better osteogenesis associate with tantalum surfaces in this susceptible population at this time point. **Conclusions:** These results indicated that at four weeks after tantalum implant placement, genes playing a critical role in activating osteogenesis pathways were upregulated in diabetics, a response that was missing in titanium. More specifically, a key osteoinductive effect is expected by the upregulation of BMP-6 through activation of EGF pathway.

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23*.  Dental Implants: Assessment of Pain, Discomfort, and Altered Sensations

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Objectives: The purpose of this study was to determine the estimated point prevalence and putative risk factors for post-implant sensory disturbances (PISD) in the community of dental implant patients served by the UNC School of Dentistry. A small, but yet unknown, percentage of implant recipients experience PISD characterized by persistent discomfort, pain and inflammation, symptoms which are commonly associated with peri-implantitis. To date, no scientific assessment of the prevalence of PISD and its contributing putative demographic, clinical and biopsychosocial risk factors has been conducted.

Methods: The study population consisted of male and female participants (N = 191) who had received one or more implant treatments from the UNC School of Dentistry. Demographic measures (sex, race, and age) and assessments of implant pain and sensory abnormalities were obtained along with measures of trapezius muscle pressure-pain thresholds. Questionnaires were used to assess potential psychosocial factors including perceived stress, anxiety, depression, and somatic symptoms. An intraoral examination of each implant site was conducted, along with a detailed consideration of the treatment history of each site. Results: Initial findings suggest that the estimated prevalence of self-reported PISD is 34.5% in this cohort. The demographics of those with PISD compared to those without did not differ. While trapezius muscle pressure-pain thresholds did not differ, several psychosocial factors such as somatic symptoms, perceived stress, anxiety and depression were elevated in participants with PISD. Initial assessments of clinical markers of inflammation around the implant site, such as frequency of gingival inflammation and the presence of bleeding on probing, were not increased in PISD cases. Conclusions: These results, although preliminary, provide evidence that PISD is highly prevalent and associated with multiple biopsychosocial factors. Whether these factors are antecedent and predictive of future destructive peri-implantitis, which also impacts a high percentage of implant patients, requires further investigation. Supported by: University of North Carolina School of Dentistry by means of resources of the Department of Prosthodontics and the Center for Pain Research and Innovation.
Decellularized Bone Matrix (DecBM) Grafts for Calvaria Regeneration

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Decellularization is a promising method to prepare natural matrices for tissue regeneration. Successful decellularization has been reported using various tissues including skin, liver, heart, blood vessel, tendon, and cartilage, though studies using hard tissue such as cortical bone are lacking. Objectives: To define the optimal experimental parameters to decellularize bone matrix (DecBM) and evaluate the DecBM as an alternative graft for bone regeneration. Methods: Rat calvaria were harvested and decellularized in a solution containing 0.5% sodium dodecyl sulfate (SDS) and 0.1% ammonium hydroxide by replacing every 36 hours for 3 weeks with constant shaking at RT. The completion of the decellularization was confirmed by Hematoxylin and Eosin (H&E) staining and DNA assays. After cytotoxic evaluation by live and dead assay, the effects of DecBM on mesenchymal stem cells’ (MSC) proliferation, osteogenic gene expression, and mineralization were investigated by MTS assay, real time PCR, and Alizarin Red S staining, respectively. After further evaluation of mechanical and biochemical characteristics of DecBM, new bone formation was analyzed with microCT, mineral apposition rate, and histomorphometry after 12 weeks of implantation of DecBM with MSCs in a critical sized defect in rat calvaria. Results: Complete decellularization was shown through H&E staining and DNA measurements (<2.05 ng/mg). DecBM biocompatibility was indicated by culturing DecBM particles with MSCs. DecBM also displayed a conserved structure, mechanical strength (p>0.05), and mineral content comparable to natural bone. After 12 weeks post-implantation, more new bone (43.24 ± 1.21 mm3) was formed around DecBM particles with MSCs than DecBM only (17.59 ± 2.58 mm3) and also merged with new bone between DecBM particles in the defect by MSCs. Conclusion: DecBM displayed stimulatory effects on MSCs’ proliferation and osteogenic differentiation in vitro and in vivo. Effective bone regeneration was achieved and that DecBM can serve as a promising alternative for current biological grafts. Supported by: NIH/NIDCR K08DE018695 and R01DE022816. The authors declare no conflict of interests.
25. The dentist's role in the multidisciplinary approach to head and neck cancer management: A literature review

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This literature review evaluates the current understanding of the dental role in multidisciplinary team management of head and neck cancer. Recent studies have described improved coordination and outcomes for cancer patients who are managed in this collaborative approach. Multidisciplinary teams often involve surgical, radiologic, and chemotherapeutic providers that work jointly in tumor board meetings and multidisciplinary clinics. The intent of this management strategy is to effectively improve diagnosis, planning, and treatment and thereby enhance overall care. Dentistry is a significant component of care in head and neck cancer treatment. The dentist plays a critical role throughout phases of treatment - pre-operative evaluation, in-treatment stabilization, and rehabilitation of head and neck cancer patients. Conclusions: Through this review, the state of integration of dentistry within multidisciplinary management can be better assessed and how it may impact the overall quality of care and outcomes in head and neck cancer patients.

26. Accuracy of VITA Easyshade and 3shape Trios in Dental Shade Matching

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Objectives: This study provides comparisons of these the VITA Easyshade and the 3shape Trios scanner to a benchtop spectrophotometer. Methods: Sixteen monochromatic porcelain disks of uniform shape and size were made from VITA feldspathic porcelain. The disks corresponded to the sixteen shades found in the VITA Classical shade guide (A1, A2, A3, etc.). CIELAB coordinates (L*a*b*) were obtained for each disc first using a benchtop spectrophotometer, and then with the VITA Easyshade. The Trios will only provide shade measurement in the more user-friendly VITA shades (i.e. A1, A2, A3, etc.). The Easyshade and Trios data were obtained in a controlled environment using a neutral color box with color corrected lighting at 5500K. For the VITA Easyshade, agreement with the benchtop spectrophotometer was evaluated using the equation: \( \Delta E = \sqrt{(L^*2 - L^*1)^2 + (a^*2 - a^*1)^2 + (b^*2 - b^*1)^2}/2 \) In the case of the Trios scanner, agreement analysis was limited to whether or not it was able to correctly identify the shade of the porcelain disc. Results: Analysis of data from the VITA Easyshade showed poor agreement with the benchtop spectrophotometer. The \( \Delta E \) values ranged from 18.40 to 24.49 (perfect match: \( \Delta E = 0 \)). The Trios scanner was likewise unable to provide accurate color measurement, only correctly matching the shade of porcelain for 2 of the 16 disks. The Easyshade was only able to select the correct shade for 1 of the 16 disks. Conclusions: The color matching technologies tested in this study were surprisingly inaccurate. Particularly concerning is that VITA's own device was unable to identify monochromatic VITA branded porcelain. While more research remains to be done on this topic (especially more nuanced analysis of the Trios), at the present the researchers would not recommend relying on either device as anything more than an adjunct to clinical shade matching.
27. Silver Diamine Fluoride in U.S. Dental Schools Curriculum

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Objectives: Silver diamine fluoride (SDF) is a low-cost topical agent used in many countries since the 1970s to treat dental caries and cleared by the FDA for the U.S. market in 2014. Evidence supports the use of 38% SDF to arrest caries in primary teeth, and to prevent and arrest root caries in elders. The purpose of this study was to survey U.S. dental schools regarding their didactic and clinical teaching of SDF to dental students. Materials & Methods: A 15-question survey was developed using a web-based survey tool. Email-invitations were sent to U.S. predoctoral dental education programs (n=66). Deans, chairs and selected faculty in restorative (or equivalent) and pediatric dentistry departments were asked to respond or forward the survey-link provided to the appropriate person in their school. Results: Descriptive statistics were conducted on all questions. When multiple answers were received from the same school, responses were collapsed for analysis. 62 schools responded to the survey among which 54.8% answered having SDF in their curriculum, 32.3% did not, and 12.9% had conflicting answers. 74% of the schools not teaching SDF planned on including it in their curriculum with 70.8% of them within the next 2 years or sooner. Indications taught for the use of SDF varied widely. However, all but one school consistently agreed on using SDF for arresting caries on primary teeth. Of those who teach re-application after initially arresting caries with SDF, most advocated 2x/year re-application. However, few were able to confirm an existing protocol at their school for the use of SDF. This question was left unanswered by 57% of the respondents. Conclusion: With the use of SDF increasing rapidly in the United-States and its adoption in the majority of dental schools in the near future, there is a need for standardized protocols to be developed.

28*. Defining the Cell-of-Origin in CRTC1/MAML2 Fusion Positive Mucoepidermoid Carcinoma

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Malignant mucoepidermoid salivary gland tumors frequently arise from a recurrent t(11,19)(q21;p13.1) translocation that generates a fusion protein consisting of the cAMP regulated transcriptional coactivator 1 (CRTC1) and mastermind-like 2 coactivator (MAML2) (C1/M2). Recently described gain-of-function interactions between C1/M2 and cAMP response element binding protein (CREB) as well as the myelocytomastosis (MYC) oncogene are necessary for the C1/M2 oncoprotein to drive transformation. However, a complete understanding of the molecular mechanisms underlying transformation is lacking since the cell-of-origin for C1/M2-positive mucoepidermoid carcinoma is still under investigation. Our lab has engineered immortalized human salivary acinar and ductal cells to inducibly express the C1/M2 oncogene. Here, we confirm the dox-inducible nature of C1/M2 expression in these cells by transcript-level analysis. We also show that expression of C1/M2 in acinar cells decreased cell viability, suggesting apoptosis may be induced. In contrast, C1/M2 oncogene expression in ductal cells did not alter cell viability but induced proliferation and promoted ductal cells to transverse the cell cycle into S-phase. Moreover, C1/M2 expression drives changes in ductal cell migration in wound healing assays. Collectively, C1/M2 expression in ductal cells induces a cancer-cell-like phenotype. Future work using mouse models will be necessary to confirm that C1/M2 expression in ductal cells promotes mucoepidermoid carcinoma development in vivo.

Supported by: NIH R00-CA157954
Objectives: This study was intended to identify factors affecting the prevalence of oral disease in a small community in Guanajuato, Mexico to gain better insight into the main social, cultural and behavioral factors affecting the oral health of the Chapel Hill immigrant patient population. Methods: A voluntary descriptive study in Juventino Rosas, a Guanajuato municipality, was undertaken in a self-selected population. Subjects verbally completed a questionnaire about dental history, dental care approach, and dietary habits. Dental students performed a limited exam and assessed decayed, missing, and filled teeth (DMFT) for subjects. Oral hygiene education and referrals to a local dentist were delivered as part of the 2016 Project Health Bridges of UNC Medical School. Water samples were collected in surrounding towns and fluoride concentrations were analyzed with Extech FL700 Fluoride Meter. Results: Limited examination of 144 adult participants revealed a mean DMFT of 11. Chi-square tests were used to determine association of carious teeth and missing teeth with dental visits. Results showed that ever going to the dentist does not affect dental caries prevalence (p=0.87), but ever going to the dentist is associated with more missing teeth (p=0.01). 51% reported dental pain (n=74). 81% of participants stated cost prevents them from seeing a dentist (n=117). Fluoride concentration among the surrounding rural communities ranged from 0.4–1.9ppm. 74% of adults cited bottle water as the major source of drinking water (n=108). Conclusions: Results indicate our study population see dentists for extractions rather than preventive procedures. A significant percentage of our participants suffered from dental pain and viewed cost as a significant barrier to dental care. Fluoride concentrations varied, occasionally exceeding safe levels (=1.2ppm). The majority of participants consume bottled water. The 2017 project will focus on education campaigns targeted at increasing preventive dentistry utilization and maintaining good oral health.
A Contemporary Examination of First Permanent Molar Emergence.

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Objectives: First permanent molar (FPM) emergence is a landmark growth and development event with important implications for clinical care and dental public health programs. The timing of FPM emergence varies by sex and race/ethnicity, and some evidence suggests that high Body Mass Index (BMI) i.e., overweight/obesity, is associated with earlier tooth emergence. However, this association has not been systematically examined. To address this knowledge gap, we sought to examine the association of BMI with FPM emergence timing among a representative sample of US children. Methods: We used demographic and dental examination data from the National Health and Nutrition Examination Survey (2009-12) for ages 4-7 years (n=1,642; representing ~16 million children). We calculated BMI percentiles for age and sex using CDC growth charts to define categories of underweight/healthy weight (<85th percentile), overweight (85th-94th percentile) and obesity (=95th percentile). We used linear regression to examine the influence of overweight/obesity on FPM emergence timing (outcome variable = count of FPMs), accounting for the complex survey design. Analyses were adjusted for age, sex, and race/ethnicity and used a conventional P<0.05 statistical significance threshold. Results: The mean age for 1 FPM erupted was 6.9 years (range: 4.7-7.9 years). Thirteen percent of children were overweight and 14% were obese. Overall, obesity, but not overweight, was associated with more erupted FPMs independent of age, sex, and race/ethnicity. In a sex-stratified analysis that accounted for age and race/ethnicity, both overweight and obesity among females, but only obesity among males, were associated with more erupted FPMs (linear regression model R²=0.7 for all models). Conclusions: Among 4-7-year-old US children, earlier emergence of FPMs is associated with overweight and obesity in females, but only obesity in males. These findings have implications for clinical care including the monitoring of growth and development, sealant placement, and planning and targeting in school-based dental sealant programs.
Verruciform xanthoma or the Oral Mucosa and potential association with lipid storage diseases.

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Verruciform xanthoma (VX) is an uncommon lesion that presents as a hyperkeratotic mucosal or skin plaque. Mutations on the NSDHL gene have been recently detected in VX of the skin. NSDHL participates in cholesterol synthesis, and is a possible marker for lipid storage diseases such as CHILD and CK syndromes. Objectives: 1) to catalog the cases of oral VX diagnosed at the UNC Oral Pathology Laboratory, and 2) to evaluate for NSDHL gene mutations in order to establish a possible link between oral VX and risk of CHILD and/or CK syndromes. Methods: Our study was approved by our Institutional Review Board (Protocol 16-1270). Cases of VX were retrieved and catalogued according to patient demographics and clinical features. Phase II of the project, corresponding to objective 2 is in progress, and consists of qrtPCR amplification to determine whether NSDHL mutations are identified. Results: 112 cases were retrieved, 53.3% in females; 25 cases had the patient race reported: 21 White, 2 Asians, 2 African-American. VX was most frequent in the 5th to 8th decades. The size ranged between 1-10 mm. The anatomic distribution included: attached gingiva (39), hard palate (31), tongue (10), buccal mucosa (7), lips (5), floor of mouth (2), frenula (2). Four patients had multiple lesions, 3 had recurrences. Two cases were associated with a removable denture, and 10 with tobacco use. Two of our cases also had candidiasis, two epithelial dysplasia, and one chronic sialadenitis. Conclusion: Ours constitutes the largest reported series to date of oral VX. The majority of our cases were on the attached gingiva and hard palate. UNC SOD now has a large, well-catalogued oral VX bank, with sufficient cases for Phase II of our study and evaluate for the presence of NSDHL mutations, indicative of risk for lipid storage diseases, CHILD or CK syndromes. Supported by: UNC SOD.
In Vitro Correlation of Caries Detection Using ICDAS, QLF and Spectra

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Objectives: Evaluate the correlation of the visual criteria International Caries Detection and Assessment System (ICDAS), and the fluorescent based caries detection technologies, Quantitative Light-induced Fluorescence (QLF) and Spectra, for the detection of sound (ICDAS 0), initial (ICDAS 1&2) and moderate (ICDAS 3&4) occlusal and smooth surface caries. Methods: Teeth with no restorations or developmental defects and ICDAS scores ranging from 0-4 on occlusal (n=60) and smooth (n=60) surfaces were selected. Teeth were mounted on manikins and examined on a Phantom head to mimic clinical conditions. Four calibrated examiners provided independent assessments of pre-selected sites twice, guided by masked images on a computer display, with a 7-day interval between exams, using each method: ICDAS, QLF, Spectra. For QLF, each examiner analyzed the images independently and obtained Q(%fluorescence loss vs. area). Association between the methods was evaluated using two-way contingency tables and Kendall’s tau-b correlation coefficients. Spectra and QLF-ΔQ data were changed to categorical variables. The manufacture guidelines were used to select the categorical variables for Spectra: (0-0.9)->0, (1-1.4)->1, (1.5-1.9)->2, (2-2.4)->3, (2.5-3.0)->4. For QLF ΔQ a decision tree model (CART method) was used. Occlusal surfaces ΔQ: 0 (ΔQ<0.45), 1 (0.45 ≤ ΔQ < 20.1), 2 (20.1 ≤ ΔQ < 47.35), 3 (ΔQ > 47.35). Smooth surfaces ΔQ: 0 (-0.205 ≤ ΔQ < 0.205), 1 (0.205 ≤ ΔQ < 14.35), 2 (14.35 ≤ ΔQ < 98.7), 3 (ΔQ > 98.7). Results: Biostatistics for occlusal surfaces, show correlation between ICDAS scores and QLF-ΔQ ranged from 0.49-0.73 (p<0.0001). Correlation with Spectra ranged from 0.41-0.6 (p<0.0001). For smooth surfaces correlation between ICDAS scores and QLF-ΔQ ranged from 0.46-0.74 (p<0.0001). Correlation with Spectra ranged from 0.45-0.58 (p<0.0001). Conclusions: A significant correlation was found between the ICDAS scores and QLF-ΔQ for both occlusal and smooth surfaces, and ICDAS scores and Spectra. Future histological validation will confirm findings.
Patient Satisfaction in the Dental School Setting

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Objective: The goal of the School of Dentistry is to provide patients with the highest quality of care. This study assessed patient satisfaction in the Dental Faculty Practice (DFP) and 3rd and 4th year DDS student clinics, revealing areas of strength and ones that need improvement. Methods: Reception desk personnel in the Dental Faculty Practice (DFP) and student clinics for the 3rd and 4th year dental students handed out a one page, 28-item survey to patients in the waiting area over a twelve-week period from October to December in 2016. Responses to each item were on a 5-point Likert scale ranging from “strongly agree” to “strongly disagree”. Age, sex and race were also collected. Descriptive statistics were used to compare the three clinics. This study was given exempt status by the IRB (IRB #16-1193). Results: 287 patients completed and returned the surveys: 122 from the 3rd year student clinics, 63 from the 4th year student clinics, and 92 from the DFP. Respondents in the study were predominantly female (57%) and Caucasian (77%). Patients in the DFP and student clinics responded to some questions similarly, for example, patients in all three clinics “strongly agreed” that they feel comfortable when receiving dental treatment (84% DFP, 82% in 3rd year student clinics, 83% in 4th year student clinics). Other questions had variable responses between the clinics; for example, regarding the fees being reasonable, more patients in the student clinics “strongly agreed” the fees are reasonable (62% in 4th year clinic, 67% in 3rd year clinic), whereas 49% of patients “strongly agreed” the fees are reasonable in the DFP. Conclusion: Patients are considered to be consumers of care, whose satisfaction impacts the success of a dental provider. There were some interesting trends that warrant further attention, such as the effect of demographic characteristics on the distribution between clinics. Supported by: Dora Lee and John C. Brauer Dental Research Fund.
Evaluation Of Patient Satisfaction Comparing Conventional, Overdenture And Palateless Overdenture Using Guided Maxillary Implant Placement

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Objectives: Placement of implants for improvement in quality of life is well documented in mandibular dentures as well as partial removable dental prostheses. However, reports for the treatment of the edentulous maxilla are limited. Increased patient satisfaction has been reported with fabrication of a new conventional denture attributable to esthetics, comfort, and chewing ability regardless of improved retention. Separately, palateless dentures suggest increased gustation and comfort. As patients continue to request treatment to increase retention and comfort of their prostheses, placement of 4 implants in the maxilla for an overdenture continues as a routinely desired treatment. Methods: In this single cohort prospective study, Oral Health Impact Profile (OHIP-49) questionnaires were distributed at different time points to evaluate changes in patient satisfaction for 15 maxillary edentulous patients that were restored with 4-implants and palateless maxillary overdentures. New conventional dentures were made and the placement of maxillary implants was completed using a mucosa borne fully guided approach. After 12-week healing, locator abutments were attached to the conventional denture and patients given 10-weeks to wear and evaluate the implant retained denture. Palateless implant retained overdentures were inserted and patients allowed the same time for evaluation. A linear mixed model will test the statistical significance of change in OHIP-49 severity score from the baseline scores at the three follow-up times: at 10-week of: post-insertion of conventional denture; post-pickup of locators in complete denture; and post-insertion of palateless overdenture. Results: Preliminary results are undergoing statistical comparison, however, initial findings suggest increase satisfaction with every consecutive procedure. Conclusions: Preliminary data supports the treatment of the edentulous maxilla with a 4-implant retained overdenture as a viable option to improve patient’s satisfaction. Differences between prostheses, once compared statistically, will aid in determining which stage of treatment correlates to the greatest effect on improvement in satisfaction.

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Anaerobic Bacterial Pathogen products mediate Epstein-Barr Virus Reactivation through Epigenetic modulation

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Objectives: Epstein-Barr virus (EBV) is associated with human oral and gastric cancers. Lytic reactivation contributes to EBV spread and increased EBV has been associated with periodontitis severity. Determining in vivo mechanisms of viral reactivation is essential to combat EBV-associated disease. This study sought to determine how metabolic end products (MEP) from anaerobic pathogens reactivate EBV. Methods: The microbiome of 10 HIV+ subjects was assessed. The latently-infected EBV+ gastric carcinoma cell line, AGS-EBV, was treated with bacterial spent media (BSM) from anaerobic bacterial pathogen cultures (F. nucleatum, P. gingivalis). BSM were enzymatically- and heat-treated to determine physical properties important to reactivation. Dose response/time course experiments were performed to characterize viral reactivation. Lytic viral proteins and epigenetic marks were assessed by immunoblots. RNA-seq and signal transduction pathway inhibitors and inhibitors targeting epigenetic marks (readers, methyltransferases) were used to determine pathways involved in reactivation. Intracellular viral DNA levels were determined by qPCR. Results: In vivo, periodontopathic bacteria in the microbiome were associated with high EBV levels. In vitro, pathogenic BSM sensitized cells to inhibitors targeting epigenetic marks (readers, methyltransferases), allowed open chromatin formation, and enhanced reactivation. Acetylated H3 at K9 and K27 and H3 methylation at the K4 transcription activator epigenetic mark were associated with EBV lytic gene activation. Increased intracellular viral DNA followed expression of Z, R, and EAD. Decreased viral gene expression with erk1/2 and selective NFkappaB inhibitors suggested these pathways were critical. Lentiviral shRNA knockdown of ASH2L, a component of H3K4 lysine methyltransferase (KMT), decreased H3K4me3, abrogating BSM-dependent EBV reactivation. BSM treatment induced cancer associate processes (hypoxia and anti-apoptosis). Conclusions: BSM-induced H3 acetylation/methylation suggested that MEP-induced epigenetic marks were involved in regulating EBV lytic gene reactivation through HDAC inhibition and KMT activation. Anaerobic pathogen induction of EBV reactivation, may contribute to viral transmission and increase the risk of EBV-associated neoplasms.
36. Association between longitudinal tooth fractures and visual detection methods in diagnosis

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Objectives: The present study aims to investigate the distribution of longitudinal tooth fractures (LTFs) by patient age and the association between visual detection methods and types of LTFs. Methods: Patients suspected of having LTFs were examined at the Department of Conservative Dentistry in Seoul National University Dental Hospital from September 1st 2009 to March 31th 2014. For identifying fractured lines, the naked eye, staining with a dye, an operating microscope, transillumination, and periapical radiographs were used. In some cases of vertical root fracture, diagnostic surgery was conducted to visualize a fracture line. The final diagnosis was made according to the American Association of Endodontists (AAE) classification: fractured cusp, cracked tooth, split tooth, and vertical root fracture. The probability density function for each type of LTFs was obtained to assess risks of developing LTFs by age. The association between detection methods and types of LTFs was analyzed with a Pearson’s chi-square test. Results: A total of 245 teeth were diagnosed as LTFs during the survey. LTFs often occurred in the patients aged 50-59 years (29.4%). 65.7% of LTFs were diagnosed as cracked tooth. Patient aged approximately 60 years were at a high risk of fractured cusp and split tooth. There was a significant association between detection methods and types of LTFs (P < 0.001). Conclusions: LTFs often occurred in patients aged older than 40 years and cracked tooth more frequently occurred than other types of LTFs. Detection methods for identifying fracture lines may affect the results of diagnosis for LTFs.

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37. Perioperative Factors For The Outcome Of Vital Pulp Therapy

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Objectives: Vital pulp therapy (VPT) remains a treatment option for cariously exposed teeth that reach the dental pulp. To our knowledge no study has examined whether perioperative pain predicts the outcome of VPT. The aim of this study is to examine the correlation between perioperative pain and the progression of pulpal disease into a more irreversible or necrotic state. Methods: Direct pulp caps or partial pulpotomies using MTA were performed on permanent teeth with carious pulpal exposures. Patients were contacted at 24 hours, 1 week, and 3 months following treatment and data was collected on pain experienced and analgesic intake using a standardized questionnaire. At 6 and 12 months after treatment an in-person clinical exam was performed on each subject, which included standard vitality tests along with exposure of a periapical radiograph. Success was defined as an asymptomatic, functional tooth that does not present with any clinical or radiographic pathology and has not had previous root canal treatment. Statistical analysis will be performed using logistic regression. Results: Preliminary results show the percentage of patients that experienced pain at 24 hours, 1 week, and 3 month time periods are 38%, 22%, 12%, respectively. Conclusion: Completion of the study will provide evidence whether post-operative pain after VPT is associated with pulpal progression from vitality to necrosis.

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Experience with Dental Emergency Department Visits


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Objective: The purpose of the study was to evaluate dental emergency department (ED) visit data from a local hospital and experience with dental ED visits of patients at a new dental school. This descriptive data will be used to later evaluate the impact of the newly opened dental school on dental ED visits at the local hospital. Methods: This two-part study consisted of 1.) A retrospective analysis of hospital ED records and 2.) A questionnaire dispensed at the dental school clinics. Results: Visits to the new dental school are continuing to increase since opening clinics in April 2013. There were 5,566 dental ED visits at the hospital, accounting for 1.92% of ED visits from April 2011 to March 2015. The percent of dental ED visits compared to all ED visits decreased from 1.94% in 2011/12 to 1.65% in 2014/15. Three diagnostic codes accounted for 90.9% of dental ED visits from January 2011 to December 2015. Unspecified codes accounted for 76.1% of dental ED visits, indicating no definitive diagnosis. According to the patient questionnaire, 13.5% of patients had a prior dental ED visit. Of these visits, 47.4% had no dentist. Most patients had a chief complaint of toothache and/or broken or chipped tooth and treatment with antibiotics and/or pain pills. Conclusion: Since opening clinics at the new dental school in 2013, visits have continued to increase. At the same time, dental-related ED visits at the local hospital visually appear to be decreasing. Patients that reported having a dental-related ED visit on the questionnaire showed that the primary reason for dental ED use was related to not having a dentist. The questionnaire also reported that the major reason for ED use was a toothache and/or broken or chipped tooth and the most common treatment was antibiotics and/or pain pills. Support Provided by East Carolina University School of Dental Medicine

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Communications and Interdisciplinary Health Curricula: Going Beyond the Signs and Symptoms. A Study in Patients with Eating Disorders.

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Objectives: To survey the effectiveness of an original oral health education program, “Smiles Matter”, developed at the UNC School of Dentistry, which aims to improve the patient’s oral hygiene and oral health knowledge. Evidence-based practices on appropriate communication techniques when managing the prevention, treatment, and post treatment of patients with eating disorders are needed for dental professionals caring for patients dealing with these disorders. There are few education programs specific for dental professionals wishing to provide oral health education to improve the distorted self-image that eating disorder patients have of themselves and to shift their focus to the importance of their smile and oral health. In order to engage eating disorder patients in a meaningful dialogue, specific information, interdisciplinary training, and communication skills are required to gain confidence in interacting with these patients. Ultimately, better communication and information may help oral health professionals change behaviors and improve the oral health of patients with eating disorders. The study will also provide a supportive environment for patient empowerment in order to take control of their own overall health. Methods: utilize 200 educational interventions using educational presentations created by an interdisciplinary team of psychiatrists, nutritionists, nurses, public health professionals and dentists that address esthetics, oral effects, pain and nutrition. Pre and post knowledge-based tests will be administered to analyze the effectiveness of the program. “Smiles Matter” is a collaborative effort with the UNC Center of Excellence for Eating Disorders, Carolina House, and Veritas Collaborative. Results: To date 21 interventions have been completed. The study had not yet collected enough data for statistical analysis.

Supported by: Institutional Review Board at the University of North Carolina at Chapel Hill.
Increased Expression of IFI16/p204 and AIM2 In Murine Periodontitis

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Objectives: The goal of this study is to characterize and quantify the expression of IFI16/p204 and AIM2 in murine and human gingival tissues. Methods: Periodontitis was induced in C57/BL6 mice (n=10) were using a ligature model. After 10 days, gingival tissues and maxilla were collected at sacrifice. Murine alveolar bone loss was evaluated by microCT analysis. Gingival tissues were evaluated for mRNA expression of p204 and AIM2 by qRT-PCR. Differences between groups were assessed by t-test. Gingival samples collected from healthy individuals and those with chronic periodontal disease (n=9) were characterized for expression of IFI16 and AIM2 by immunohistochemistry. Results: Mice with ligature-induced periodontitis demonstrated significant alveolar bone loss (0.33 ±0.029mm) compared to non-ligature controls (mean 0.23±0.01mm) (p=0.05). Gingival samples from mice with ligature showed significant increases in expression of p204 (2.4-fold) and AIM2 (2.8-fold) as compared to healthy controls (p=0.05). Immunohistochemical analysis showed the presence of IFI16 and AIM2 in several cells of human gingival samples, including epithelial cells, endothelial cells, fibroblasts and cells of the inflammatory infiltrate. Conclusion: The expression of p204 and AIM2 are increased in murine periodontitis compared to healthy controls. Expression of IFI16 and AIM2 are observed in multiple cells of human periodontal tissues. IFI16 and AIM2 may be involved in periodontal disease pathogenesis. Supported by: R01DE023836.
The Role of MORN2 in Response to Periodontal Pathogens

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Objectives: MORN2 is a phagosome protein of macrophages that promotes the recruitment of LC3 to M.tuberculosis-containing phagosomes and subsequent maturation to degradative phagolysosomes. Our previously-reported GWAS identified a missense SNP (rs3099950, minor allele frequency=0.23) in the MORN2 locus (gene-centric p=6.24 x 10^-7) to be associated with a complex periodontal trait derived from principal component analysis on 975 adult participants including microbial (eight periodontal pathogens) and inflammatory mediator (GCF IL-1ß) levels. This polymorphism is predicted to be a damaging (Glu-Lys) variant (Polyphen2 score=1.0). However, little is known about the role of MORN2 in periodontal disease. Our goal is to investigate the role of MORN2 expression in tissues and on monocytic phagocytosis and chemokine activation in response to P.gingivalis (P.g.) in vitro. Methods: We used previously-reported GWAS data to examine the association of the lead MORN2 locus polymorphism with P.g. levels, extent of probing depth = 4mm (EPD4) and interproximal attachment loss =5mm (IAL5). Immunohistochemistry was used to detect the distribution of MORN2 in healthy and periodontitis biopsy samples. Phagocytosis and killing of P. g. were evaluated in THP-1 cells. Proinflammatory cytokines and chemokines response to P.g. 33277 were characterized by RT-PCR. Results: In the human GWAS data, rs3099950 was significantly associated with the dominant emergence of P.g. as a dysbiotic trait, as well as P.g. counts (dichotomized at the 75th percentile), EPD4 (p<0.05) and IAL5 (all p<0.05). The overall immunostaining intensity and pattern of MORN2 expression were similar in chronic periodontitis and healthy gingival tissue. MORN2 was expressed in both periodontal epithelium and connective tissue cells. MORN2 knockdown in THP1 cells reduced the uptake of P.g. 33277 (p<0.05) and impaired phagocytosis-mediated killing efficiency. MORN2 knockdown downregulated proinflammatory cytokines (IL-1 β, IL-6 and TNF-a) expression as well as CXCL1, MIP-a, CXCL3, GCP-2, IL-8, CCL3 and RANTES expression in response to P.g. Paradoxically, MCP-1 expression was enhanced. Conclusions: Our studies suggest that MORN2 may play a role in the phagocytosis-mediated killing of P.g. and neutrophils signals for recruitment. It is possible that the functional significance of rs3099950 contributes to abnormal P.g clearance and impaired recruitment of defensive neutrophils leading to a P.g. dominated dysbiosis in periodontal disease. Supported by: RO-1 DE021418, RO-1 DE023836, UL1-RR02547.
42. Transcriptome Characterization of Special Histopathological Types of Breast Cancer

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Objectives: Histopathological examination classifies tumors into specific categories. For breast cancers, 17 histological phenotypes are known and commonly scored, including invasive ductal carcinoma, invasive lobular carcinoma, metaplastic carcinoma and mucinous carcinoma. Although some are rare, these histological variants have distinct clinical behavior, immunohistochemical (IHC) marker expression and fall into specific breast PAM50 molecular subtype. In this study, we define the genomic and transcriptomic profile of these distinct histological variants. We also integrate the Omics-based signatures to derive a comprehensive set of genes that could be used to derive clustering patterns to identify inter-relationships between the different histological findings. Methods: The TCGA dataset comprising of 1198 breast cancer and normal tissue samples was retrieved. They included RNAseq based gene-expression data, DNA exome sequencing based copy number and annotated mutations. Significant upregulated and downregulated genes were derived for each histological subtype using the significance of microarray (SAM) analysis. Gene ontology analysis (GOA) was developed using the DAVID bioinformatics resource for each histology subtype. DNA copy number alterations (CNA) were calculated using the R-coded statistical program called SWITCHdna and significant mutations were identified with the Broad Institute’s Mutation Significance tool (MUTSIG) within each histological subtype. A histological classification gene list was constructed utilizing significant SAM genes and a supervised clustering was performed and visualized using cluster 3.0 and Java Treeview. Consensus clustering was also performed using the R package – Consensus cluster plus. Results: Most histology subtypes (i.e. mucinous, metaplastic, lobular) showed distinct gene signatures, CNA, and somatic mutations and gene ontological pathways. Thus for most histological variants, characteristic expression, mutation, and DNA copy number changes could be identified, which can now be used to better understand the mechanistic features of these unique histological subtypes of breast cancer.

43. The Influence Of Intra-Operative Factors On Vital Pulp Therapy Outcome

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Objective: Vital Pulp Therapy (VPT) is a highly successful approach, under proper diagnosis and case selection. The success of VPT predicates on many intra-operative variables other than the materials used. The aim of this observational, prospective study is to identify intra-operative factors that affect the outcome of VPT. Methods: Treatments were performed using a standardized protocol on asymptomatic permanent teeth with carious pulpal exposures. Data was collected on multiple intra-operative factors (including type of exposure, size of exposure site, hemostasis control, and type of restoration) using standardized questionnaires. Study subjects were followed up with phone calls at 1 day, 1 week and 3 months after the treatment. A full clinical and radiographic examination was done at 6 months and 12 months. Success was defined as the retention of a functional, asymptomatic tooth without further need for endodontic treatment. Logistic regression using the glm function in R statistical software was used to analyze the data. Results: Approximately 25% of the treatments were performed using Isolite/Isovac and 75% of treatments using rubber dam isolation. Seventeen percent of treatment cases were partial pulpotomies and 83% of cases were direct pulp caps. Thirty one percent of restorations were amalgam and 69% were resin. Our interim analysis indicates that none of the variables examined affect the outcomes in the 3-month post-operative period. Conclusion: Improved understanding of the impactful variables on VPT will result in better treatment outcomes and improved patient care. Supported by: AAE Foundation grant.
Objective: To determine if the presence or absence of fluorescence as clinically detected by fluorescence-aided caries excavation (FACE) correlates with the traditional tactile method of dentin caries assessment. It was hypothesized that dentin with the clinical tactile sensation of sound dentin (hard to gentle probing) will have no fluorescence as assessed by FACE. Methods: 21 unidentified, extracted, human teeth with carious lesions were selected. Inclusion criteria included a red fluorescing caries lesion extending two-thirds into dentin, verified radiographically. Two calibrated examiners performed tactile assessment (TA) and fluorescence assessments (FACE) using a sterile explorer and “SIROInspect” (Sirona, Salzburg, Germany) respectively, before- during- and post caries excavation. Tactile assessment qualified the dentin as soft, leathery or hard. FACE qualified the dentin as red fluorescence, pink fluorescence or no fluorescence. Results: Inter-examiner agreement on TA as expressed by Kappa scores and weighted Kappa scores were 0.78 and 0.84, respectively. Before excavation both examiners assessed 11/21 teeth as soft by TA. During excavation both examiners assessed eleven teeth as leathery with pink fluorescence, eight as hard with pink fluorescence, and two were unable to be assessed. While occurrences of dentin assessed as soft (N=14 for examiner 1 and N=11 for examiner 2) by TA always had red fluorescence, there were teeth assessed as hard or leathery (7 teeth for examiner 1; 10 teeth for examiner 2) that also had red fluorescence. Approximately one-third of hard dentin was partially pink or red fluorescing (N=11 out of 32 for examiner 1 and 10 out of 31 for examiner 2). Conclusion: There was strong evidence to reject the hypothesis that hard dentin will have no fluorescence.
**Effect of Dietary Compounds of Bone Healing of Extraction Sockets**

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**Objectives:** Natural products could lead to altered soft and mineralized tissue parameters due to their effect on cells and extracellular matrix. We investigated the effects of two dietary supplements on growth, inflammatory, and coagulation factors and newly formed bone in extraction sockets. **Methods:** This study had institutional approval for human subjects research from all affiliated Universities. Subjects took ~300 mg t.i.d. of Grape Seed Extract (GSE) or Grapefruit Extract (GFE) two weeks prior to dental extraction and subsequently for sixty days (n=10/group). Non-restorable teeth were extracted and alveolar sockets covered with a commercially available collagen patch and sutured. After 24 hours, a socket sample was collected, RNA extracted and converted into cDNA. Quantitative real time PCR (qRT-PCR) was performed for TGFβ-1, VEGF, PDGF, BMP-4, BMP-7, RUNX-2, IL1-β, CXCL2, IL-6, VWF, and thrombin. Sixty days after extraction, a central core was obtained prior to implant placement, fixed in 10% formalin, and demineralized with 0.5M EDTA. Samples were embedded in paraffin, sectioned and stained by picrosirius red (PSR) to evaluate collagen organization/maturation, H&E for morphology, and tartrate-resistant acid phosphatase (TRAP) for osteoclast activity. **Results:** qRT-PCR revealed the GFE group had a statistically significant decrease in growth factors TGFβ-1 and PDGF and in inflammatory marker CXCL2. GSE showed an increase in IL1-β and IL-6 and coagulation factor VWF. Histological analyses showed a decrease in collagen density, bone maturation, increased osteoclast density, and abundant platelets and loose connective tissue in the GSE group. **Conclusions:** There was a significant impact of specific dietary supplements in healing of extraction sockets with delayed bone formation observed with GSE. This study highlights the importance of understanding the impact of natural products on human health.

Supported by: IADR/Phillips Oral Healthcare Young Investigator Research Grant, The University of Pennsylvania and UNC-CH.
Objectives: Human papillomavirus (HPV) is a small DNA tumor virus increasingly associated with head and neck squamous cell carcinoma (HNSCC). HPV type 16 is responsible for 90% of all HPV-related HNSCC, which now outnumber cases associated with tobacco and alcohol use. Increased incidences of HPV-related HNSCC are correlated with poor oral hygiene and periodontal disease. Our group has previously shown that periodontopathic oral bacteria produce metabolic end-products (MEP) that induce the expression of HPV oncogenes. This study sought to determine whether periodontopathic MEP induce oxidative stress that drives the expression of HPV oncogenes in the HPV16+ human cervical carcinoma cell line, SiHa. Methods: Bacterial spent media (BSM) from pathogenic anaerobic oral bacterial cultures were used to treat SiHa cells. After treatment of cells with BSM for varying durations (0.5, 2, 24 hr), oxidative stress was measured by incubating cells with dihydroethidium (DHE), a compound that fluoresces under oxidizing conditions. Five random fields were assessed per condition for the presence of fluorescence post-treatment and mean fluorescence was calculated. Cells were also treated with N-Acetyl Cysteine (NAC), an inhibitor of oxidative stress. Results: At 0.5 hr, periodontopathic BSM treatment (Fusobacterium nucleatum/ Porphymonas gingivalis Fn/Pg) induced 167% more oxidative stress than commensal BSM (Streptococcus salivarius –Ss) treatment in SiHa cells as determined by the mean cell number per field. The Fn/Pg combination produced 2.5-fold higher fluorescence levels than Pg alone and 1.7 fold higher levels than both Fn and Ss alone. Conclusions: The results suggested that Fn/Pg, bacteria commonly associated with periodontitis, induced the highest levels of oxidative stress in HPV16+ human cells, compared to the commensal and to either PG and Fn alone. The combination of periodontopathic MEP induces oxidative stress, and may contribute to HPV-related oral tumorigenesis.
47*. Effect of Dopamine on Optineurin Expression in Osteogenesis and Osteoclastogenesis

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Objectives: Dopamine, a neurotransmitter in central nervous system, plays an important role in osteogenesis and osteoclastogenesis. However little is known about the relationship between dopamine and optineurin (encoded by OPTN gene), a recently identified osteoclastogenesis mediator. This study aimed to detect optineurin expression in response to dopamine treatment in osteogenesis/osteoclastogenesis. Methods: For the osteogenesis experiments, mouse MC3T3-E1 preosteoblasts subclone 14 were respectively cultured in growth media + 0µM dopamine, growth media + 50µM dopamine, growth media + 100µM dopamine, osteogenic differentiation media + 0µM dopamine. At each time point (4d, 7d, 14d, 21d, 28d, 35d), the cells were harvested for alizarin red staining, qPCR and western-blot detection. For the osteoclastogenesis experiments, mouse RAW 264.7 macrophages were cultured in growth media or osteoclasts differentiation media. 0µM, 1µM, 10µM, 50µM and 100µM dopamine solutions were used to treat the cells. When matured osteoclasts formed, the cells were harvested for TRAP staining, qPCR and western-blot detection. Results: Regarding osteogenesis, mineral nodule formation had no increase and ALP, BSP and OC mRNA expression had no change when dopamine was administrated. OPTN gene expressions in dopamine-treated groups were enhanced and the peak occurred on 4d. Regarding osteoclastogenesis, a dose-dependent inhibitory effect of dopamine on osteoclasts formation was shown by TRAP staining. qPCR showed that 100µM dopamine can significantly suppress NFATc1 and MMP9 mRNA expression during osteoclasts differentiation. But no difference in OPTN/optineurin expression was found between each dopamine-treated group. Conclusions: In osteogenesis, dopamine may enhance OPTN/optineurin expression in MC3T3-E1 preosteoblasts; in osteoclastogenesis, dopamine seems to have no impact on OPTN/optineurin expression. Supported by: NIH grant R01DE022816.
Buffered 1% Lidocaine With Epinephrine Effective for Mandibular Nerve Block

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Objectives: To assess outcomes for pain on injection and pulpal anesthesia for buffered 1% lidocaine vs. non-buffered 2% lidocaine both with 1/100K epinephrine. Methods: In an IRB-approved randomized cross-over trial, buffered 1% lidocaine was compared to non-buffered 2% lidocaine. After mandibular nerve block with 40mg of buffered lidocaine or 80mg of non-buffered lidocaine, data were collected regarding pain on injection based on a 10pt Likert-type scale and responses at the mandibular 1st molar and canine after cold and electrical pulp testing (EPT). Teeth were tested prior to injection and at 30-minute intervals until a positive response returned. Two weeks later, subjects were tested with the alternate drug combinations. Predictor variables were alternate drug formulations. Outcome variables were subjects’ responses to pain on injection and to cold and EPT stimulation. Statistical analyses Proc TTEST (SAS v 9.3, SAS Institute, Cary, NC), with the crossover option for a two period crossover design, analysed outcomes. Significance was set at p<0.05. Results: 57% subjects were female; 70% were Caucasian, 17% were African American and 13% belonged to other races. Median age was 25 years (IQR 21 -26y), median body weight 140lbs (IQR 120-155lbs). Median time to sensation return between the two drug formulations was 0 for all pulp tests. Time was not significantly different for: cold test on a molar (p=0.74, 95% CI:-0.49,0.57), cold test on a canine (p=0.50, 95% CI:-0.89,0.52), or EPT on a canine (p=0.52,95% CI:-0.58,0.30). Time was marginally significantly different between the two drug formulations for the EPT on a molar (P=0.05, 95% CI:-1.34,0.20). 70% of subjects reported lower pain scores with the buffered drug vs. the non-buffered, (p<0.01). Conclusions: Buffered lidocaine with epinephrine can produce similar clinical outcomes after mandibular nerve block with lower dosage as compared to unbuffered lidocaine.
Clinical Changes and Oral Microbiome Shifts in HIV+ Patients Following Periodontal and Restorative Therapy

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Objective: The microbiome may exert significant effects in the context of immunosuppression. The objective of this study was to compare clinical outcomes and microbiome changes following comprehensive dental care in HIV+ patients. Materials and methods: Ten HIV+ patients received periodontal treatment, oral hygiene instructions, caries control, and extraction of hopeless teeth. Systemic (viral load, CD4, ART regimen) and oral clinical parameters (caries, gingival and plaque indices were measured at baseline (BL) and 12 months (12M) after therapy. Periodontal disease severity was determined using the biofilm-gingival interface (BGI) index. Saliva samples were collected at the clinical visits. Their microbial content was analyzed by sequencing the 16S rDNA gene V1-V3 hypervariable region using MiSeq (Illumina, CA) and reads were evaluated using QIIME. Differences between clinical and microbial parameters between BL to 12M were determined.

Results: Patients were mostly male (80%), African Americans (80%) and were on ART (80%), at baseline. At 12M, 3 patients presented a decrease in viral load and 2 had an increase. BGI improved in 5 patients and remained unchanged in 2. We determined whether significant differences in OTU abundance in paired samples (pre and post treatment) were associated with changes in clinical correlates. The most significant OTU differences were detected in the Actinobacteria, Proteobacteria and Firmicutes taxa. Those demonstrating the greatest microbiome differences with the intervention had higher HIV viral loads at baseline. The relative abundance of taxa typically associated with periodontal disease were decreased after therapy, including Tannerella (mean % reduction/SD; 0.03%/0.1%), Prevotella (2.64%/3.3%), Filifactor (0.09%/0.2%), Parvimonas (0.49%/0.5%), Fusobacterium (0.19%/1%) and Treponema (0.04%/0.1%). Conversely, increased levels of host-compatible genera were observed, such as Actinomyces (0.44%/6.5%), Streptococcus (0.6% 12%), Neisseria (0.29%/8.6%) and Veillonella (1.58%/4.1%). Conclusions: Periodontal treatment in HIV+ patients promoted a reduction in levels of pathogenic microbiota and the establishment of a community conducive to clinical improvement.
50. An interdisciplinary Teaching Approach to Improving Retention of Pharmacology Knowledge

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Objectives: Teaching foundational science courses within a health professional curriculum presents multiple challenges, such as evaluating students’ maintenance of knowledge for subsequent clinical application and determining students’ confidence in understanding course material. Therefore, this study aimed to (1) evaluate the efficacy of pharmacy-generated, pharmacology-relevant clinical pearls (Medication Minutes) on short-term and long-term retention, and (2) assess students’ self-evaluation of understanding of Medication Minutes. Methods: Eighty second-year dental students in an introductory pharmacology course at UNC School of Dentistry were presented material in a basic science lecture format or Medication Minutes. Short-term retention was assessed using a series of five post-class session, non-graded quizzes, each containing four questions: 2 knowledge-based (1 from lecture material and 1 Medication Minute) and 2 application-based (1 from lecture material and 1 Medication Minute). Throughout the semester, 10 application-based (Medication Minutes) and 10 knowledge-based (basic science material) questions were included on exams in similar context to the quiz-question framing.

Results: On short-term retention measures, the mean proportion of students answering knowledge- and application-based questions correctly was higher on Medication Minute (M=0.76) than traditional lecture (M=0.58) material (p<0.001). On in-semester examinations, however, there was no difference in performance. On long-term retention measures, students performed better on Medication Minute material (M=0.66) compared to traditional lecture material (M=0.34) (p<0.001); this relationship persisted for students who completed less than two quizzes and more than two quizzes. Students were overconfident in their judgements of Medication Minute content asked as clinical questions and underconfident when Medication Minute content was asked as knowledge questions. Conclusions: Teaching and using formative assessments in a clinical context yields better short-term and long-term retention than teaching in a non-clinical focus. Additionally, students’ confidence in understanding material is impacted by the manner in which the material is presented versus how it is assessed. Supported by: UNC School of Dentistry Multidisciplinary Curriculum Innovation Award.
Objectives: Health literacy is a significant predictor of patient health status. Patient education material (PEM) written at patients’ reading level has been reported to improve health outcomes. Readability is the objective measurement of reading skills needed to understand written material. Key healthcare groups including the Institute of Medicine recommend that PEMs written at a fifth to sixth grade reading level are ideal. PEMs from multiple sources are available in dental schools but their readability level is unknown. This study aims to assess the readability of a sample of dental PEMs to determine if they are in compliance.

Methods: Sixty PEMs from UNC SOD clinics that were tested comprised three categories based on their source: Industry (IN), Dental Specialty Organizations (DS) and UNC SOD original material (UNC), 20 for each group. Each PEM was analyzed electronically (On-Line Utility.com) using Gunning Fog, Coleman Liau, Flesch-Kincaid Grade Level, Automated Readability, SMOG and Flesch Reading Ease indices. Results: PEMs overall averaged 11.91 grade reading level. Flesch-Kincaid Grade Level means were: IN = 10.6, SD= 2.1) DS =10.59, (SD=2.8) UNC =12.88, SD=3.7). Only 5 (8.0%) PEMs scored at or below 7th grade reading level. There were no statistically significant differences between IN and DS PEMs (p=0.89); however, there was a statistically significant difference between UNC PEMs and IN (p=0.012) and DS PEMs (p=0.017). There were similar statistically significant differences across all other Readability Indices. Conclusion: All categories of PEMs failed to comply with recommended readability levels, with UNC SOD being the least compliant. A review of UNC SOD readability of in-house PEMs can help improve intended patient outcomes. In order for PEMs to be of optimal benefit to the patient, dental educators should apply readability assessments to all in-house PEMs prior to their distribution and judiciously distribute IN and DS PEMs that are out of compliance.
The Effect of Oral Health on Quality of Life in Recently Diagnosed and in Those with Longterm Human Immunodeficiency Virus (HIV) Diagnosis

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Objective: Dental care is among the top unmet needs for people living with HIV (PLWH). The effect of oral health on overall health has been understudied in PLWH. This longitudinal study sought to determine the impact of comprehensive dental intervention on quality of life using a validated short form -8 (SF-8) in newly vs previously diagnosed PLWH. Methods: 84 subjects were divided into 3 groups: newly diagnosed (=1 year since HIV diagnosis/no regular dental care), previously diagnosed (>1 year since HIV diagnosis/ no regular dental care) and historical (>1 year since HIV diagnosis/ receiving regular dental care). Dental prophylaxis/ debridement, oral hygiene instruction, and interviews were conducted that included the SF-8, factors affecting oral health, HIV status and demographics at 6 mo intervals for 24 mo. Comprehensive dental care was provided. Results: The majority of subjects were male (76.19%) and African-American (64.28%), and the mean age was 45. Their mean income was less than $851/mo and most had at least a high school education. At baseline, their mean CD4 and HIV viral load were 512.15 cells/ul and 560.68 copies/ ml, respectively. The mean raw SF-8 scores at baseline for the newly, previously and historically diagnosed subjects were 187, 329, and 340 respectively. SF8 scores after 12 months for the three groups were 138, 281, and 298 respectively with the mean raw SF- lower score correlated to better self-perceived health. Continued decrease in composite raw scores were detected in the previously diagnosed and historical groups at 24 mo, scores were 236, and 278 respectively. Conclusion: Among the three groups, those in the previously diagnosed group showed the greatest improvement in overall self-perceived health. This suggests that the oral intervention was most effective in the previously diagnosed. Overall self-perceived wellness in those with long term HIV diagnosis improved with comprehensive dental care.
Optineurin Deficiency Causes Paget’s Disease of the Bone by Increasing Osteoclastogenesis

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The autophagy receptor, Optineurin (OPTN), is genetically linked to Paget’s disease of the bone (PDB), with the OPTN variant resulting in decreased gene expression and increased bone turnover in focal areas. We hypothesize that OPTN affects bone homeostasis and that deficiency of Optn contributes to the pathogenesis of PDB. Methods: Optn global knockout (Optn–/–) mice were generated, and bone phenotypes of 3- and 22-month-old mice were examined by micro-CT scanning. To confirm the diagnosis of PDB, histological analyses (H&E and TRAP staining, TNF-α and RANKL immunohistochemistry staining) were conducted, and ALP activity, TNF-α, IL-6, and IFN-β levels in the serum were measured. Finally, in vitro osteoclastogenesis was performed from bone marrow cells; the expression of osteoclast differentiation, autophagy, and NF-KB activation proteins were assessed by Western Blot. Results: While no lesions developed among 3-month-old Optn–/– mice, they all exhibited osteopenia. All 22-month-old aged Optn–/– mice developed polystotic osteolytic lesions in axial bones resembling the early stage of human PDB, while no lesion was found in Optn+/+ control mice (p<0.001). Histological analysis showed significantly increased osteoclast number (p<0.01), and number of nuclei in osteoclasts (p<0.001) within osteolytic lesions. Affected Optn–/– mice also had significantly increased ALP activity (p<0.05), which resembles the laboratory findings of PDB patients; besides, they had significantly increased TNF-α, but not RANKL in the sera or lesions. In vitro studies demonstrated that Optn–/– osteoclast precursor cells significantly increased osteoclastogenesis (p<0.001) with an elevated expression of NFATc1 and c-Fos. Optineurin deficiency did not affect autophagic flux induction in osteoclasts, but increased the phosphorylation of p65 leading to canonical NF-KB hyper-activation. Conclusions: Aged Optn–/– mice developed Pagetoid lesions that recapitulate the clinical manifestation of human PDB. Mechanistically, Optn modulates canonical NF-KB activation in osteoclast precursor cells to negative regulate osteoclastogenesis.

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Self-Directed Digital Learning: When Do Students Study?

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Objectives: Self-directed, web-based learning methods have been shown to be effective in pre-doctoral dental education, but uncertainty remains as to how contemporary students use such resources. The purpose of this investigation was to evaluate, using direct observation, the utilization patterns of web-based learning modules in relation to (1) planned self-study time allocated across a pre-doctoral dental curriculum and (2) proximity to course examinations. Methods: The Growth and Development (G&D) curriculum at the University of North Carolina School of Dentistry uses self-directed web-based learning modules in the place of lectures and includes scheduled self-study times during normal 8AM-5PM school hours to provide time to use the modules. Module access (using a unique log-in/password) for the DDS Class of 2014 was recorded for date and time across 4 G&D courses between the Summer of 2011 and the Fall of 2012. Conditional logistic regression was used to assess whether the likelihood of a student accessing modules during scheduled time differed among the four courses. Poisson regression was used to assess changes in the number of times a student accessed the modules across the four courses during 3 time frames: >7 days before an exam, 3 to 7 days, and 0 to 2 days. Results: There was a statistically significant difference in the likelihood of a student accessing modules during scheduled time across the curriculum (p < 0.0001). The odds of scheduled-time module access during the first G&D course (G&DI) was higher than in the other courses. 64% of students accessed modules during scheduled time in G&DI, but only 10%, 19%, and 18% in G&DII, G&DIII, and G&DIV respectively. For all courses, the proportion of students who accessed modules was highest 0 to 2 days before an exam (60%) and lowest greater than 7 days before an exam (10%). Module access differed significantly within each time frame across all 4 courses (p < 0.001). Conclusions: As dental students progressed through the curriculum, self-directed learning module access both during scheduled times and in proximity to examinations varied significantly. This evidence may help optimize dental curricula using such resources.

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Periodontitis is Associated with Non-alcoholic Fatty Liver Disease

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Objective: To investigate the relationship between periodontitis and the occurrence of Non-alcoholic Fatty Liver Disease (NAFLD). Methods: This was a prospective cohort of the Study of Health in Pomerania from 1997 to 2012. Adults aged 20-79 years were selected using a stratified two-stage probability sampling design. Of 6,265 eligible persons invited, 4,308 participated at baseline. 3,300 participated at first follow-up and 2,333 participated at second follow-up. Periodontitis was determined at baseline as: 1) the proportion of periodontal sites with clinical attachment level (CAL) of ≥3mm; 2) the proportion of sites with probing pocket depth (PD) of ≥4mm. Participants with no teeth (edentulous) were included as a separate exposure group. Incident NAFLD was defined as a significant increase in liver echogenicity on ultrasound relative to the kidneys, with the diaphragm indistinct OR the echogenic walls of the portal veins invisible. Elevated alanine transaminase levels indicative of NAFLD were >34.2 U/L for men and 24 U/L for women. Results: After a median follow-up of 7.7 years, 605 incident cases of NAFLD accrued at a rate of 32.5 cases per 1,000 person-years. Compared to participants with a healthy periodontium, participants with ≥30% of sites with CAL of ≥3mm had multivariable-adjusted Incidence rate ratio (IRR) of 1.60; 95% CI, 1.05-2.43. The corresponding IRR for participants with <30% of sites with PD ≥4mm was 1.53; 95% CI, 1.00-2.35. Conclusions: This is the first population based longitudinal study to report an association of periodontitis with NAFLD occurrence. Periodontitis should be considered a possible risk factor for NAFLD with potential implications for its prevention and management. Supported by NIH/NIDCR R03DE025652-01A1

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The Role of IL-37b from Plasma Cells in Periodontitis Pathogenesis

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Objectives: B lymphocyte make up ~60% of the leukocytes in periodontal lesions and participate in periodontitis. In addition to antibody-producing cells, recent studies identified that B cells can also secrete cytokines and subsequently regulate immune responses. Remarkably, we discovered that IL-37, a newly identified anti-inflammatory cytokine, is highly expressed by plasma cells in gingival tissue from periodontitis patients. Therefore, besides antibody production, plasma cells may also play an immunoregulatory role in periodontal disease. However, the relationship among IL-37, plasma cells and periodontitis remains unknown. This study investigate the role of IL-37 from Plasma cells in periodontitis.

Methods: The dominant IL-37 isoform in human gingival tissues was tested by qPCR using isoform specific primers. The co-localization of IL-37 and plasma cells (CD138 and CD38) was determined by immunohistochemistry and immunofluorescence. As mice do not express IL-37 or homologues, but do express the receptor for IL-37b (IL-18R), the mouse plasma cell line (MPC-11) was used to create stable IL-37b transfectants by lentivirus system and sorted by flow cytometry. The anti-inflammatory function of IL-37b secreted by MPC-11 was investigated by Transwell by co-culturing with RAW cells. The cytokine in the culture supernatant was measured by ELISA. Differences between groups were tested using ANOVA selecting p<0.05 as significance. Results: Among the 5 isoforms of IL-37, IL-37b was the dominant expression in human gingival biopsy samples. IL-37b co-localized with Plasma cells in the human gingival tissue. MPC-11 expressing IL-37b showed significant immunosuppressive function to RAW cells in the trans-well system compared with control MPC-11 cells. Conclusions: Our studies indicate that IL-37b from plasma cells plays an essential role in regulating the pathogenesis of periodontitis. Importantly, because plasma cells are not normally present in the gingival tissue and are recruited in response to periodontal pathogens, our findings highlight plasma cells as a potential player in periodontal pathogenesis.

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57. Flossing is Associated With Disease Prevalence and 10-year Tooth Loss

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Objectives: Recent removal of flossing recommendation from the Dietary Guidelines for Americans issued by the federal government reports have questioned the importance of flossing. The purpose of this study was to estimate the prevalence of disease and 10-year tooth loss among flossers and non-flossers.

Methods: Three population studies using random sampling methods were analyzed: NHANES-2009-14 (n=10,513), Dental Atherosclerosis Risk In Communities (DARIC) (n=6,653), and Piedmont 65+dental study (PDS) (n=419). All studies used standardized examiners. Outcome measurements used were extent of interproximal clinical attachment levels (iCAL)=3 mm and interproximal probing depth (iPD)=4 mm. Tooth loss was available by a 10-year follow-up questionnaire in DARIC and 5-year tooth loss was calculated based on exam for PDS. Demographics, flossing (numbers of times/week) and brushing (number of times/day) data were collected via questionnaire. General linear models (SAS-proc GLM) and hazard ratios (PROC-GENMOD) were used. All analysis presented include adjustment for age, race, gender, diabetes, smoking and education.

Results: DARIC flossers had lower mean extent of sites with iCAL=3 mm compared to non-flossers [22.0% (SE=0.33) vs 26.7% (0.45) sites, p=0.0001]. NHANES findings showed similar pattern with flossers having iCAL=3mm [20.0% (0.28)] compared to non-flossers [29.5% (0.42) sites, p=0.0001]. Stratifying by number of times brushed/day, we found that DARIC participants who flossed =1X/week and brushed 0-2X/day showed lower levels of clinical measurements compared to non-flossers (iCAL=3 mm and iPD=4 mm). The relative risk for 10-year tooth loss in DARIC showed that non-flossers had a 1.25 (1.03-1.52) excess risk for losing =3 teeth. Similar data in the PDS for 5-year risk of tooth loss showed that non-flossers had a 3.23 (1.82-5.74) excess risk of losing =3 teeth. Conclusions: Flossing was associated with lower extent of iCAL and iPD even in the presence of brushing 1-2 times/day. Flossing was associated with lower risk of tooth loss over 5 years and 10-years.

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Exploring the Relationships among the Placental and Umbilical Microbiomes, the Oral Microbiota and Adverse Pregnancy Outcomes

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Adverse pregnancy outcomes (APOs) represent a major social and financial burden in the US and worldwide. It has been postulated that bacteria-initiated oral inflammatory conditions contribute APOs development. **Objectives:** To compare the microbiomes of placenta and umbilicus samples from full term (FTB) and preterm births (PTB; <35 weeks) as well as the levels of maternal subgingival periodontal species in each group pre and post-partum. **Methods:** Placenta and umbilicus samples from FTB (n=22) and PTB (n=22) were homogenized in liquid nitrogen and processed for DNA extraction (MasterPure Kit). Their microbial content was assessed by 16S rRNA sequencing (v3-v4 region, MiSeq, Illumina). Taxonomy was determined by QIIME and HOMINGS. Two pre- and post-partum subgingival samples/mother (total: 196 samples) were examined for the levels of 41 bacterial species using checkerboard DNA-DNA hybridization. Community structure was examined using Principal Coordinate Analysis. Significant differences between groups were sought with general linear models. **Results:** Placenta samples harbored more *Fusobacterium, Streptococcus and Prevotella* sp while umbilicus presented more *Lactobacillus* and *Pyramidobacter* sp. When compared to the FTB group, PTB placenta samples harbored greater levels of members genera *Fusobacterium* (mean relative abundance ±SD; PTB x FTB; 14.9%±9.8% vs. 9.4%±9.0%, p=0.06) and *Veillonella* (18.7%±11.4% vs. 16.1±10.3%). PTB umbilicus samples were also more heavily colonized by members of the genera *Veillonella* (18.9%±18.2% vs. 9.7%±8.5%, p=0.04), *Granulicatella* (1.2%±1.5% vs. 0.4%±0.8%, p=0.04) and *Campylobacter* (2.1%±2.6% vs. 1.5%±2.4%). Antepartum subgingival biofilms in the PTB group had higher abundance of *T. socranskii* (3.7%±1.8% vs. 2.3%±1.5%, p=0.01), *P. micra* (3.1%±1.7% vs. 2.0%±0.8%, p=0.01), *Fusobacterium nucleatum ss vincentii* (3.4%±1.8% vs. 2.3%±0.8%, p=0.02), A. actinomycetemcomitans (1.6%±0.9% vs. 1.0%±0.7%, p=0.04), E. saburreum (1.7%±0.9% vs. 1.2%±0.6%, p=0.04) and *F. fastidiosum* (1.9%±1.2% vs. 1.5%±0.9%). **Conclusion:** The placental microbiome is distinct from that of the umbilicus. PTB subgingival biofilms harbor higher levels of periodontal pathogens.

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59*. Prospective, Comparative Assessment of Alveolar Ridge Preservation Using Different Bone Grafting Materials Following Tooth Extraction

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Objectives: The aim of this randomized clinical trial is to characterize the dimensional osseous changes of the alveolus and overlying soft tissues 3 months following ridge preservation with different bone grafting materials. Secondly, the influence of buccal plate thickness on ridge remodeling and the clinical changes in soft tissue architecture following tooth extraction will be determined. Methods: 80 patients requiring tooth extraction and subsequent implant treatment are being recruited. Post-extraction, cone beam computed tomography (CBCT) imaging is performed and patients are randomly treated with ridge preservation using either Allograft (AG), Alloplast (AP), or Xenograft (X) bone graft covered by a collagen membrane, or with a negative no-grafting control (C) using a collagen membrane alone. At 3 months, a second CBCT is obtained and changes in the volumetric and linear osseous dimensions are evaluated using open source imaging software (ITK-SNAP, 3D Slicer). Soft tissue impressions are obtained at baseline and 3 months for digital analysis. Digital implant planning using commercially available software (coDiagnostiXTM) is used to evaluate the need for additional bone grafting to facilitate ideal implant positioning. Results: Interim data analysis suggests no difference in the volumetric or linear dimensional changes of the alveolus and overlying soft tissues between AG, AP, and X treatment groups. All three treatment groups result in reduced dimensional changes compared to C. Ideal implant positioning in the AG, AP, and X treatment groups is achieved at 3 months with minimal need for further bone augmentation, with the C group most often requiring further bone grafting. It is hypothesized that no significant differences will be present between the AG, AP, and X treatment groups. Conclusions: Early results suggest that ridge preservation procedures reduce the amount of dimensional bone loss following tooth extraction and reduce the need for additional bone grafting prior to implant surgery. Supported by: an unrestricted grant from Dentsply IH AB.

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Objectives: Community water fluoridation ranks among the 10 great public health achievements of the 20th century. In order to effectively protect against dental caries, people need to consume the water. We sought to determine sociodemographic variation in consumption of community systems water in the U.S. population.

Methods: Cross-sectional data were analyzed for a nationally representative sample of 42,140 participants aged ≥2 years in the 2005–2014 National Health and Nutrition Examination Survey. Interviewers administered a 24-hour dietary recall interview that asked about the participant’s source of the tap water and a response of “community supply” was used to create the binary classification of drinking community systems water. Binary logistic regression for survey samples was used to estimate odds ratios as measures of association between drinking community systems water and sociodemographic characteristics.

Results: Overall, 68.1% of the US population aged ≥2 years reported drinking community systems water. Sociodemographic variation was greatest for race/ethnicity (ranging from 57.9% for Mexican-Hispanics to 69.7% for non-Hispanic Whites, P<0.001) and for head-of-household education (ranging from 54.3% for less than 9th grade to 77.9% for college degree or higher, P<0.001). In a multivariable model that adjusted for age, gender, race/ethnicity, nativity status, education and income, there was a monotonic reduction in odds of drinking community systems water across successively lower levels of education (for those with less than 9th grade, odds ratio=0.4, 95% confidence limits=0.3,0.5, relative to college degree or higher) while variation among race/ethnic groups was not statistically significant.

Conclusions: There was a strong, positive gradient between educational attainment and drinking community systems water. Adjustment for the confounding effect of education nullified disparities among racial/ethnic groups that were seen in univariate analysis. These findings suggest that increased education could ameliorate racial/ethnic disparities in consumption of tap water from community water systems in the United States.

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Exploring the Genomic Basis of Early Childhood Caries

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Objectives: We conducted a pilot genome-wide association study (GWAS) to investigate the heritability of early childhood caries (ECC) and identify genetic loci associated with this severe childhood disease.

Methods: The discovery sample included children participating in the ZOE study (n=212; mean age=39 months; range=30-52 months; ECC prevalence=38%). Clinical examinations and saliva sample collection for DNA extraction were done by a single examiner in community locations. Genotyping of ~2.5 million markers (SNPs) was done on the Illumina Human Omni2.5-8 platform. Replication of SNP associations with P<5x10⁻⁵ in ZOE was examined in 3 independent cohorts of preschool-age children with similar ECC prevalence from the COHRA (n=326), IFS (n=348) and IHS (n=247) studies.

Results: The heritability (h²) explained by all genotyped SNPs with minor allele frequency =5% was 52% (P=0.03). This estimate diminished after adjustment for ancestry (10 principal components): h²=13% (P=0.4). We found no genome-wide significant association but 13 loci had P<5x10⁻⁵. An intergenic locus on 4q32 (rs4690994) showed the strongest association with the ECC case definition [P=2.3x10⁻⁶; odds ratio (OR)=3.5; 95% confidence interval (CI)=2.1-5.9], followed by the CLDN14 locus (P=5.3x10⁻⁶; rs439888; OR=3.6; 95% CI=2.1-6.2). None of these loci met nominal statistical significance criteria in the replication samples and directional concordance was noted for only 15 of 39 replication tests.

Conclusion: These results affirm a heritable component of ECC, demonstrate the feasibility of conducting GWAS among community-based samples of preschool children and underscore the importance of conducting large-scale genetic epidemiologic studies to dissect the biological underpinning of childhood oral health and disease.

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Dental Treatment and Expenditures under General Anesthesia for Medicaid-Enrolled Children

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Objectives: Medicaid is the largest insurance program that covers children’s dental services. Many cited studies examining dental treatment under general anesthesia (GA) are dated. Considering recent policy changes and advances in disease management, updated data would be central to advocacy efforts. This study aimed to provide contemporaneous data about children receiving dental GA by 1) determining utilization and associated expenditures, and 2) examining time-based trends and the effects of provider distribution. Methods: This time series cross-sectional study of all Medicaid-eligible children ages 0-8 in North Carolina used aggregate Medicaid claims data from State Fiscal Years (SFY) 2011-2015 to collect demographic and dental treatment information. Descriptive statistics were stratified by age and year to examine trends over time. Panel data analysis techniques were used to explore the regional effects of provider distribution on dental GA utilization. Results: For SFY2011-2015, 51.65% of children/year (Total enrolled N=632,941 children/year) received dental services, and 1.58%/year received dental GA. Total dental expenditures averaged $113M/year, of which $16.7M/year were for dental GA. The proportion of dental GA accounted for 3.05% of overall utilization and 14.80% of total expenditures. The proportion of dental GA expenditures increased over time (P<0.001) and varied by age (P<0.001). Provider distribution did not affect dental GA utilization rate (P=0.114), but did increase the number of children receiving dental GA (P<0.001). Conclusions: Utilization and expenditures associated with dental treatment under GA continue to increase. While this reflects increased access to care, interventions should be examined to provide preventive care earlier in a child’s life.

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Dental Caries Experience Among Children with Special Health Care Needs

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Objectives: Multiple caries risk assessment tools are currently available to aid dentists in using available patient information to determine the likelihood of patients experiencing dental caries in their future. Current caries risk assessment tools (CRAT) collect information pertaining the patient’s biological and social status, availability and use of protective factors, and clinical findings to predict caries risk. CRATs from the AAPD, ADA, and CAMBRA place all children with special health care needs (CSHCN) uniformly into the same risk category, despite the fact that this group represents a highly diverse set of patients. By evaluating caries patterns and caries risk factors in four separate groups of CSHCN: those with autism, congenital heart disease, cerebral palsy, and Down syndrome, our study hopes to shed light onto where CSHCN fit into current caries risk assessment tools or whether there is enough variability in caries experience by medical diagnosis to warrant having a separate CRAT for CSHCN. Methods: A retrospective chart review from a single private practice setting will be conducted to evaluate the caries pattern over time of patients with autism, congenital heart disease, cerebral palsy, and Down syndrome, as well as a healthy control group of patients. The data will be collected from visits throughout the time span that each patient was seen in the practice. In addition to collecting information pertaining to presence and location of caries, data will also be collected pertaining to presence or absence of risk factors laid out by the AAPD as well as additional factors, which we think, may be of significance in this population.
64*. Fluid Contact Angle Assessment to Evaluate Wetting of Dental Materials

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Objectives: Dental crown materials have been shown to cause wear on the natural opposing tooth, but there is uncertainty in the exact mechanism of wear. The purpose of this study is to evaluate the presence of salivary lubrication on dental crown materials. We speculate that wear of natural opposing tooth is a result of lack of salivary adherence on the crown material. A goniometer will be used to measure the contact angle of water and artificial saliva on different crown material specimen. An image processing software is also developed in MATLAB to complement the goniometer measurements. Methods: The following crown materials were evaluated: zirconia, feldspathic porcelain, resin nano ceramics, lithium disilicate and leucite-reinforced glass ceramics. Each crown material specimen is prepared according to its manufacturer specification. One drop of liquid is dispensed from the goniometer’s microsyringe onto a material specimen and an image is taken. There are a total of four trials per liquid-material pair. For a given trial, the contact angle is measured every 10 seconds for a total of five angle measurements. Goniometer images are imported into the MATLAB software. Edge detection is applied to outline the liquid drop and trigonometry is used on key points identified with search algorithms to determine contact angle. Wear data on each type of crown material is documented through a literature search. Results: The resin nano ceramic material has the largest contact angle of 60.5°, indicating hydrophobicity and lack of salivary adherence. The zirconia material has the lowest contact angle of 20.4°, indicating hydrophilicity and greater salivary adherence. MATLAB contact angles correlated with goniometer measurements. Conclusion: Measured contact angles correlate with wear data from literature and show that wear on antagonist tooth decreases from most to least as follows: resin nano ceramics> leucite-reinforced glass-ceramics> feldspathic porcelain lithium disilicate> zirconia.

65*. A Prospective Analysis of Prognostic Indicators of Direct Pulp Caps on Mature Permanent Teeth

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Direct pulp capping on mature, permanent teeth with carious exposures is an efficient and minimally invasive procedure that is not commonly utilized. Identification of factors associated with improved outcome of direct pulp capping will provide valuable insight on this treatment option allowing clinicians to better predict the outcome. Objective: This prospective observational study aims to examine the relationship between perioperative factors such as location size of exposures, post-operative pain, and the outcome of direct pulp caps. Methods: Subjects with asymptomatic, vital pulp exposures on mature permanent teeth received a direct pulp cap with MTA and were contacted by phone at 24 hours, 1 week, and 3 months to follow up. In-person recalls were conducted at 6 months and 1 year for a complete clinical and radiographic exam. Successful treatment was defined as a functional asymptomatic tooth that responds to all pulp sensibility tests. Results: Data gathered intra-operatively indicated that most exposures occurred interproximally with sizes mostly = 2mm. Post-operative pain had the highest incidence at 24 hours after the procedure and dropped off dramatically afterwards. Linear regression analysis did not reveal significant correlation between prognostic indicators and treatment outcome. Conclusion: These results indicated that the perioperative factors including site and size of the exposure, tooth type, and post-operative pain did not affect the outcome of direct pulp caps.

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Faculty Calibration with Instructional Videos for Head and Neck Examinations
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Objectives: The primary objective of this pilot study was to evaluate the effect of an online head and neck exam instructional video for dental hygiene (DH) faculty knowledge. Additional objectives were to assess if the number of years of experience teaching and/or clinical experience would affect the intra and inter-rater agreement of faculty, and if faculty groupings: full-time, part-time, and graduate teaching assistant (GTA) would affect test performance. Methods: Institutional Review Board (IRB) granted exemption status for this study. A repeated measures design was used. DH clinical faculty (N=24) were invited to participate by completing an online pre-test, instructional technique video, and immediate post-test. Statistical tests included Pearson Correlation Coefficient and t-tests. Results: Pre-test response rate was 79% (N=19) with 95% (N=18) completing the immediate post-test. Results showed mean pre-test scores of 68% and post-test scores of 76%. There was no significance between years of clinical experience with either test score or faculty grouping. There was significance (P=.016) between years of teaching experience and lower pre-test scores. This indicates the increase in score was only due to use of the instructional video. Conclusion: The use of an instructional video increased the knowledge level of DH clinical faculty for head and neck examinations. In dental hygiene education, increasing faculty knowledge can enhance calibration which is essential to provide effective and consistent education for students. Research studies should continue to explore viable options for faculty calibration to increase faculty knowledge and consistency in clinical education.

Saudi Arabian Dental Hygienists’ Attitudes and Opinions Regarding Establishing a Professional Association
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Professional associations provide resources for members to support and enhance their careers. While dental hygiene has been a licensed profession in Saudi Arabia since 1980, there is no professional association. Objectives: The purpose of the study was to assess the attitudes and opinions of dental hygienists in Saudi Arabia regarding the establishment of a professional association including the role it should have to meet their professional needs. Methods: A cross sectional electronic survey using Qualtrics was utilized. IRB exemption was obtained prior to distribution. Although there are 318 licensed dental hygienists in Saudi Arabia, email addresses were only available for 101 respondents: those obtained previously by direct contact for the purpose of initiation of a professional association and those referred by the direct contacts. Dental hygienists were emailed a link to the survey. Results: Seventy-seven dental hygienists responded to the survey but 6 only provided demographic information for a response rate to outcomes of interest of 70.3%. 81.7 percent of the respondents (N=58 of 71) favored the establishment of a Saudi dental hygiene professional association. 84.5% (n = 60) responded that such an association would promote development of the profession in the country at least somewhat and 78.9% (n=56) agreed that their professional needs could be met by its establishment. Interestingly, approximately two-thirds of those who did not support the creation of the professional association believed it would promote development of the profession and meet professional needs. Conclusion: Dental hygienists in Saudi Arabia support the establishment of a professional association and feel that it would advocate and promote the dental hygiene profession in the country and meet their professional needs.
68*. CBCT Image Quality Assessment Testing Clinically Relevant Volume Orientation and Position
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Objective: Some physical measures of CBCT image quality have been shown to correlate well with diagnostic image quality. Traditionally, these objective measures have been assessed in the center of the volume in a standard orientation. The purpose of this study was to test whether measures of image quality vary as a function of test tool location, test tool orientation, and dose. Methods: CBCT image quality was assessed with one standard and three modified phantoms (Quart GmbH, Zorneding, Germany). The test tool was located at the center of the phantom (standard), angled with respect to the image acquisition plane (Mod1), at the periphery (Mod2), or angled with respect to the image acquisition plane and at the periphery (Mod3). Each phantom was imaged with a Carestream CS 9300 CBCT scanner (Carestream, Rochester, NY), using regular dose (180µ voxel/90kVp/64mAs) and low dose (400µ voxel/85kVp/14.5mAs) with an 8x8cm field-of-view. Contrast-to-Noise-Ratio (CNR) and 10% modulation-transfer-function (MTF) were assessed in three repeated volumes. Data were analyzed using ANOVA and Tukey’s HSD. Results: CNR differed by phantom (p<0.0001) and dose (p<0.0001). Mod3 displayed significantly greater CNR than other phantoms. Low dose provided higher CNR. MTF differed only by dose (p<0.0001). Conclusions: CNR improved for a peripherally positioned tilted test tool (Mod3). Reduced kVp and larger voxels appear to counteract the effect of reduced mAs producing improved CNR at low dose. Thus, image quality parameters are different at the center of a CBCT volume when compared to the periphery, depend on the orientation of the object and vary as a function of kVp and voxel size.

69*. Comparing Panoramic Radiographs and CBCTs: Impact on Radiographic Signs and Differential Diagnoses
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Objectives: 1. To determine if there is a difference in the radiographic features of pathology on panoramic radiographs and CBCT. 2. To determine if CBCT increases the accuracy of differential diagnoses or affects the confidence levels of oral and maxillofacial radiologists. Methods: A search of patient records at UNC SOD was done to obtain cases with biopsy-proven intraosseous pathology, and panoramic radiographs and CBCTs taken within 3 months of each other. 33 subjects were included. 3 board-certified oral and maxillofacial radiologists were asked to review the panoramic radiographs and CBCTs to describe lesion features and to provide their differential diagnoses and confidence levels. Kappa test was performed to assess agreement between panoramic radiographs and CBCTs with respect to lesion features and differential diagnoses. Discordance was assessed using conditional logistic regression and McNemar’s test. Cochran-Mantel-Haenszel statistics used to compare the mean rank of correct differential diagnoses and confidence levels when using panoramic radiographs and CBCTs, while controlling for observer and subject ID. Level of significance was set at 0.05. (UNC IRB #15-1328). Results: Observers detected differences in radiographic features of lesions on panoramic radiographs and CBCTs with respect to border definition, continuity of corticated borders, expansion of surrounding anatomic boundaries, cortical thinning and cortical destruction (P<0.05). There was no significant difference in when the correct differential diagnoses was derived nor radiologists’ confidence levels when using panoramic radiographs or CBCTs. Conclusions: The radiographic signs of lesions are not identical on panoramic radiographs and CBCTs. However, the imaging modality does not appear to affect the accuracy rates of differential diagnoses made by oral radiologists, nor their confidence levels.

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70*. BKPyV etiology in HIVSGD hyposalivation

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Objective: HIV-associated salivary gland disease (HIV-SGD) is an AIDS defining illness frequently reported in adult and pediatric HIV/AIDS persisting in the era of HAART. Five to eight percent of HIV-infected adults in the US, 48% of adults in the developing world, and up to 40% of HIV infected children develop HIV-SGD. HIV-SGD causes salivary gland hypofunction resulting in xerostomia/dry mouth which predisposes to rampant tooth decay, and progressive periodontal disease. Currently there is only palliative treatment because of the lack of an identified etiologic agent. The aim of this study is to determine the etiologic relationship between BKPyV and HIV-associated salivary gland disease (HIVSGD). Methods: Oral fluids (saliva and throatwash) and urine were examined from HIV positive patients with/without HIVSGD and HIV negative/kidney transplant control subjects. qRT-PCR was used for BKPyV DNA detection. Salivary gland function was analyzed by collecting saliva from patients during a five-minute period in a 50ml conical tube. Patient demographics, medication use and subjective description of saliva production were assessed. Results: Overall 47% of the patients were female, 58% Black/African American, 25% White, 17% other, with a median age of 45. BKPyV DNA was detected in the urine of 4 out of 5 (80%) kidney transplant patients and not in HIV+/non SGD or HIVSGD patients. BKPyV DNA was detected in the saliva of 6/16 HIVSGD (38%), 4/15 (27%) HIV+/non SGD and 1/5 (20%) in kidney transplant patients. Salivary gland hypofunction was detected at higher levels in HIVSGD compared to HIV+/nonSGD. Conclusion: BKPyV DNA was detected more frequently in oral secretions of HIVSGD compared to HIV+/non SGD or HIV negative/kidney transplant patients. BKPyV was only detected in the urine of HIV negative/kidney transplant patients. Salivary gland hypofunction occurred more frequently in HIVSGD patients. Therefore, BKPyV infection of the oral cavity may be tied to clinical HIV disease severity and salivary gland hypofunction.

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NLRX1 promotes HIV-1 and DNA viruses replication by blocking STING-TBK1 innate immune signaling


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Microbial infections are the most common cause of death in humans. Type I interferon (IFN-I) is a key element bridging the host innate and adaptive immune response against infections. Delineating the molecular regulation network of IFN-I signaling is critical for developing novel antiviral strategy and benefiting rational therapy. Using an unbiased siRNA screen, we find NLRX1, one nucleotide-binding leucine-rich-repeat-containing protein, is a host factor that promotes an early step of HIV-1 infection. NLRX1 suppresses type-I interferon (IFN-I) and cytokines in response to HIV-1 reverse-transcribed DNA and enhances the nuclear import of HIV-1 DNA. In addition to HIV, NLRX1 also reduces STING-dependent host response to cytosolic DNA, c-di-GMP, cGAMP, and DNA virus. Mechanistically, NLRX1 associates with STING in mitochondria-associated ER membranes, and prevents STING recruiting TBK1 and activating downstream interferon signaling. By using purified recombinant proteins, we find NLRX1 interacts directly with STING. Furthermore, DNA virus infected Nlrx1-/- mice exhibits enhanced innate immunity and reduced morbidity and viral load. In summary, these findings reveal that NLRX1 is a checkpoint protein for DNA sensing adaptor STING and may represent a novel precision target for anti-viral therapy.

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Expression of Human Cytomegalovirus in Salivary Gland Mucoepidermoid Carcinoma

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Objectives: Mucoepidermoid carcinoma is the most common malignant salivary gland tumor. Histological grading of the tumor predicts patient outcomes and dictates treatment protocols. The goals of this project are: 1) To evaluate two histologic grading systems of mucoepidermoid carcinoma of salivary glands (sMEC) and correlate the grading with survival outcome. 2) To validate the recent finding of transcriptionally active human cytomegalovirus (hCMV) in sMEC and absence in normal salivary gland tissue (NSGT). 3) To correlate the level of viral protein expression to tumor grade.

Methods: 23 specimens of sMEC were independently graded by two Board-certified oral and maxillofacial pathologists (OMP) and one OMP resident using both the Armed Forces Institute of Pathology (AFIP) and Brandwein point-based systems. Consensus was achieved through roundtable discussion in cases of grade disagreement. Kaplan-Meier curves and log rank tests compared each system to patient outcome. Cohen’s kappa measured interobserver agreement. sMEC versus NSGT specimens were immunohistochemically (IHC) evaluated using antibodies to IE1-72 and pp65. The level of cellular protein expression was analyzed.

Results: Kaplan-Meier curves demonstrated correlation between grade and outcome in both the AFIP and Brandwein grading systems; however, this was not statistically significant by log rank analysis in either grading system (\(p > 0.05\)). Cohen’s kappa was greater for the AFIP grading system than the Brandwein (\(k = 0.743\) vs \(k = 0.650\)). IHC staining was negative for hCMV using antibodies to IE1-72 and equivocal with antibodies to pp65.

Conclusions: There was increased grader agreement when using the AFIP grading system when compared to the Brandwein system. hCMV protein IE1-72 was not identified in any tumor samples by IHC, thus this method cannot be used as a prognostic indicator in sMEC grading.

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73. Craniofacial Characterization of Marfan Syndrome

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Marfan Syndrome (MFS) is a life-threatening connective tissue disorder and diagnosis is often elusive. The diagnosis of this syndrome is based on clinical findings using the Ghent criteria which define hallmark features of the syndrome in the cardiovascular, ocular, and skeletal systems. The morbidity and mortality associated with MFS warrant timely diagnosis and intervention to allow for improved long-term prognosis. Previous research has highlighted the diagnostic value of craniofacial features in the diagnosis of this syndrome. **Objective:** This project aimed to investigate craniofacial and dentoalveolar features in child/young adult patients with MFS. **Methods:** Subjects were recruited based on a positive diagnosis for MFS (\(N=20\)). Select craniofacial anthropometric measurements were made on each subject and compared to established norms of age- and sex-matched controls. Comparison of the test measurements to the control measurements was done by converting each test measurement into a Z-score. Lateral and frontal photographs were taken to qualitatively describe facial features in subjects, and a clinical exam was completed to document occlusal relationships. Biometric and demographic information were obtained on each subject using a questionnaire. **Results:** Participants were between the ages of 5-25 years (mean age 10.7yrs±6.0yrs) and primarily female (60%). Comparison of anthropometric measurements revealed for 3 of the 11 craniofacial measurements, >50% of the study population had a Z-score =2. For 7 of the 11 measurements, =15% of the study population had a Z-score =2. For occlusal relationships, 55% of subjects had a Class I molar relationship, 40% a Class II relationship, and 5% a Class III relationship. **Conclusions:** Our data suggests there are quantitative differences in the facial anatomy of patients with MFS when compared to a control population. Continuing analyses are needed to correlate severity of disease, defined as multi-system involvement, and physical presentation. Supported by: Southern Association of Orthodontists.
74. Investigating the Etiology of the Short Root Anomaly

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The etiology of the short root anomaly (SRA) remains unknown and the literature suggests a susceptibility to external apical root resorption in affected teeth. **Objectives:** We aimed to test the hypothesis that one or more genes contribute to the short root anomaly phenotype and to assess the incidence and severity of orthodontically induced external apical root resorption (OIEARR) in individuals with SRA. **Methods:** PCR based mutational analysis was completed for 11 SRA samples for BMP4, BMP2, NFI-C and PTH1R. Sequencing and determination of single nucleotide polymorphisms (SNPs) or functional mutations was completed. Pre- and post-treatment panoramic radiographs for 7 patients were evaluated for OIEARR of SRA affected maxillary central incisors. Severity of the observed OIEARR was categorized on a scale from 0-3 using Malmgren’s index for quantitative assessment of root resorption. Risk factors for root resorption were evaluated including extractions, treatment time, time in rectangular archwires and interarch elastics. **Results:** Mutational analyses of PTH1R and BMP2 revealed the following alterations: PTH1R c.1389T>C (N=1) and BMP2 c.570A>T (N= 3). OIEARR was observed in 64% of affected maxillary central incisors. Mild resorption was observed in 50%, moderate resorption was observed in 7% and severe resorption was observed in 7% of incisors. **Conclusions:** Mutations in PTH1R and BMP2 may contribute to the presence of SRA. Most incisors with the SRA phenotype do not experience severe external apical root resorption after orthodontic treatment. Supported by Masters Research Support Grant and SAO Research Grant. Supported by: Masters Research Support Grant, SAO Research Grant.

75*. Accuracy and Performance of Novel 3D Metal Printed Orthodontic Brackets

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**Objective:** 3D metal printing is an emerging technology with potential to streamline bracket production for personalized and precision orthodontics. Conventional brackets are made in multiple parts by metal injection molding, then tack-welding a mesh pad to the base for retention of composite. 3D metal printed brackets can be manufactured in one piece, with the retentive features printed into the base. We hypothesized that the dimensional accuracy and shear bond strength (SBS) of the 3D metal printed brackets are comparable to that of conventionally manufactured brackets. **Method:** A novel .022 inch bracket was 3D printed in 316-SS and compared to two commercially available bracket systems, Damon and Ti-Orthos (Ormco) (N=35 per system). The slots of each bracket were visualized by stereomicroscope (Nikon) and measured with software (NIS Elements Basic Research) by two examiners. **SBS** was recorded by an Instron universal testing machine at a crosshead speed of .05 mm/min. **Results:** The 3D printed slot (.0233± .001in.) Was found to be more accurate than control bracket slots (Damon=.0247± .001in.; Ti-Orthos=.0244± .005in.) (p<.001). There was no difference in SBS of the three systems (p=.9). **Conclusion:** It can be concluded that 3D metal printing produces a more accurate slot with acceptable SBS. To our knowledge, this is the first study to provide data to support the use of 3D metal printing for the orthodontic bracket manufacture.
76*. Evaluating Flexure of the Mandible on Opening as Captured by Intraoral Scanners

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The mandible flexes on opening, constricting the width in the transverse dimension. Digital intraoral scanners require the patients’ mandible to approach maximum opening during capture. Objective: This study compares the dimensional changes of the teeth as captured by intraoral scans, alginate impressions, and Cone Beam Computed Tomography (CBCT). **Methods:** Thirty subjects with existing CBCT scans had alginate impressions and intraoral scans. Stone models were poured and scanned using a desktop scanner. Surface models (STL) were generated for each method, superimposed and total mean surface errors of the teeth were calculated. **Results:** The mean error of alginate to intraoral scan was 0.09mm±0.10, alginate to CBCT was 0.26mm±0.14, and intraoral scan to CBCT was 0.31mm±0.28. **Conclusion:** The labial surface of the mandibular 2nd molar showed the greatest error (0.48mm±0.49) between alginate and intraoral scan. Intraoral scans produce similar results to alginate and CBCT except for the labial surface of the 2nd molars. Acknowledgements: UNC Department of Orthodontics, Southern Association of Orthodontics Scientific Affairs Committee. Supported by: UNC Department of Orthodontics and SAO research grant.

77*. Accuracy of condylar position in orthognathic surgery cases treated with virtual surgical planning: an exploratory study

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**Objectives:** To assess the pre-operative and short-term post-operative positions of the mandibular condyle in bimaxillary orthognathic surgery cases prepared using Virtual Surgical Planning (VSP). Additional aims are to evaluate the relationship between surgical characteristics and condylar positional changes, as well as to quantify the difference between actual surgical outcome and planned virtual outcome. **Methods:** 23 consecutively operated Class III patients that underwent double-jaw orthognathic surgery with VSP were selected from a private practice database retrospectively. 3D models generated from CBCT scans obtained pre-surgically (T1), post-surgically (T2), and from the VSP predictions were then oriented to Frankfurt horizontal, superimposed, and registered on the anterior cranial base through a voxel-based method. Anatomic landmarks on the condyles, maxilla, and mandible were manually selected on T1, T2, and VSP models using SlicerCMF (open-source software). Displacement of corresponding landmarks on T1, T2, and VSP models was measured in both 3D distance and in its component vectors in the transverse, vertical, and anteroposterior axes. **Results:** The Root Mean Square (RMS) of condylar translation from T1 to T2 with VSP is 1.15±1.14 mm in the transverse, 1.44±1.21 mm in the anteroposterior, and 1.18±1.18 mm in the vertical. The RMS for condylar yaw is 7.41±6.24 degrees and roll is 7.78±7.16 degrees. A correlation was observed between the magnitude of mandibular movement in the sagittal plane and severity of condylar torque. Comparison of VSP and actual outcomes showed A-point at on average 4.39 mm from the planned position and B-point at 4.44 mm from the planned position. **Conclusion:** Virtual surgical planning does not prevent changes to condylar position as a result of surgery and does not appear to improve operating accuracy. Supported by: grants from the Southern Association of Orthodontists and the Dental Foundation of North Carolina.
78. 0.014 versus 0.016 in alignment and leveling: does it make a difference?

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Objectives: From an intuitive clinical standpoint, a more rigid archwire such as .016 should demonstrate greater efficacy for stage one tooth movement than a more flexible archwire such as .014. However, there is little to no clinical data to support this theory. We hypothesize that archwire dimension affects efficacy of tooth movement in the alignment and leveling stage of orthodontic treatment. Methods: To test this hypothesis, a prospective, randomized clinical trial was performed featuring 9 patients (18 arches) using 0.014 and 0.016 archwires. Double-blinded distribution of archwires was performed with intraoral scans obtained using the 3M True Definition scanner at 3 times points (baseline, 6 weeks, and 12 weeks). Digital measurements were performed by a single examiner using Ortho Insight 3D. These measurements were based on Little’s Irregularity Index, but accounted for all planes of space, representing a linear displacement of the contact (LDC). 2-way repeated ANOVA was performed, with the main effects being archwire dimension and time. Results: When comparing baseline to 6 weeks with 6 to 12 weeks, the former demonstrated greater reduction in LDC, and was statistically significant (p=0.045). This could relate to either biological or mechanical factors, or more likely a combination of both. Although no statistically significant difference was noted between the two wire dimensions, there was a tendency for .014 to show greater reduction in LDC than .016. Conclusions: These findings are consistent with the idea of truncated forces in orthodontic treatment, which is one factor that has led to exploration of accelerated treatment modalities, many of which are based on avoiding this stagnation in tooth movement. With further study and a greater sample size, the difference in wire dimension could prove to be significant, and would be valuable clinical information for the practicing orthodontist.
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