University of Pennsylvania
School of Dental Medicine
Student Research Day

May 9th, 2013
12:00pm – 5:00pm
# Student Research Day Program

May 9th, 2013  
Fonseca Gardens and Schattner Atrium  
School of Dental Medicine

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>11:30am – 12:00pm</td>
<td>Set-Up for Poster Presentations in Fonseca Gardens</td>
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<tr>
<td>12:15pm</td>
<td>Poster Session Opens</td>
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<tr>
<td>12:00pm – 3:00pm</td>
<td>Vernon Brightman Summer Program and Bridging the Gaps (BTG) Poster Judging</td>
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<tr>
<td>3:30pm – 5:00pm</td>
<td>Honors Students Presentation of Posters</td>
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<tr>
<td>3:40pm</td>
<td>Remarks from Dean Dennis Kinane</td>
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<td>3:50pm</td>
<td>Remarks from Dr. Kathleen Boesze-Battaglia</td>
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<tr>
<td>4:00pm</td>
<td>Announcement of Poster Award(s) - Vernon Brightman Summer Program and Bridging the Gaps (BTG) Poster</td>
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<tr>
<td>5:00pm</td>
<td>Poster Session Closes</td>
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*Light Food and Refreshments will be provided*
Healthy Habits for a Healthy Life

Student Interns:
Emily Wible, University of Pennsylvania, School of Dental Medicine
Nicole Enriquez, Bryn Mawr College, Graduate School of Social Work and Social Research
Laura Kranenburg, University of Pennsylvania, School of Nursing

Academic Preceptors:
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine
Maria Hervada-Page, MSS, Thomas Jefferson University, Jefferson Medical College
Ann L. O'Sullivan, PhD, FAAN, CPNP, University of Pennsylvania, School of Nursing

Community Preceptor:
Edna Reddick, Francis J. Myers Recreation Center

The Community Site:
Francis J. Myers Recreation Center, a program of the Philadelphia Parks and Recreation Department, is a youth achievement center offering affordable, fun and safe summer programming for children aged 2 to 14 in Southwest Philadelphia. On an ongoing basis, the recreation center engages in community outreach and support to help improve the lives of the neighborhood residents by providing meeting space for groups, lectures and a farmers market, among other things.

BTG Focus Areas Adopted From HP2010 and HP2020:
Injury and Violence Prevention; Mental Health; Nutrition and Weight Status; Oral Health; Physical Activity and Fitness

The Project:
Nicole, Laura and Emily worked together to create a health education program for the Francis J. Myers Recreation Center’s Youth Program that focused on the entire body from head to toe. Sessions addressed the Healthy People 2010 focus areas listed above and emphasized the importance of establishing healthy habits through real-life examples, including cooking classes, oral hygiene lessons, and outdoor physical fitness activities. Nicole, Laura and Emily also participated in weekly field trips and designed a weekly science program for the children that explored planting, the five senses and fossils. Nicole reflected, “My experience working with BTG was an invaluable one, particularly because it exposed me to working with groups of preschool children. … It challenged me to utilize my knowledge of child development and provided me with the skills to educate and engage little ones just entering the world. … The other interns and I incorporated art, music, science experiments, cooking classes and gardening classes into our work, which the children and interns equally enjoyed.” Laura noted, “Working with BTG this summer has been an extraordinary experience in several ways. As a nursing student, it has opened my eyes to many other aspects of care that are all integral to overall health by seeing daily the work of my fellow interns. … The BTG summer program has allowed me to see how the work I am doing now translates to my future career as a nurse by emphasizing the importance of interdisciplinary care.” Emily said, “BTG has been an amazing experience. It has given me the unique opportunity to work with other health professionals toward a common goal—a healthy lifestyle. I have also enjoyed the rewarding but challenging experience of working with very young children—more specifically, I have learned the importance of flexibility in appropriately adapting lesson plans to match a particular age group. I am excited to take all the information I have gathered through my community site and the BTG seminars and apply them as I develop my career as a dentist. This has been a once-in-a-lifetime opportunity to get to know the community I will be serving during my dental school education, and only the beginning of my work in community oral health.”
Small Feet, Big Strides - Children's Crisis Treatment Center

Student Interns:
Andrea Aduna, University of Pennsylvania, School of Dental Medicine
Eric Abhold, University of Pennsylvania, Perelman School of Medicine

Academic Preceptors:
Cindy W. Christian, MD, The Children's Hospital of Philadelphia
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine

Community Preceptor:
Nicholas Bisaccia, MSEd, Children’s Crisis Treatment Center Therapeutic Nursery

The Community Site:
The Children’s Crisis Treatment Center Therapeutic Nursery, located in Center City Philadelphia, is a structured full-day preschool program for children aged 2½ to 5. The Center provides educational, emotional and behavioral health services, including psychiatric services and play and movement therapies.

BTG Focus Areas Adopted From HP2010 and HP2020:
Maternal, Infant and Child Health; Mental Health; Nutrition; Oral Health; Physical Activity and Fitness

The Project:
The main focus for Eric and Andrea at the Children’s Crisis Treatment Center (CcTC) was to build relationships with both children and staff by assisting in the classroom and acting as positive role models. The core of CcTC’s philosophy is the Sanctuary Model, which promotes positive reinforcement and nonviolent solutions. The interns’ daily schedule included assisting in circle time, arts and crafts, water play, reading children’s books, dancing and mealtime. In addition to these roles Andrea and Eric also implemented weekly health-related activities to teach the children about proper hand washing, germs, oral hygiene, cardiovascular health, nutrition and exercise. Andrea explained that her experience at CcTC over the course of the summer has been “extremely rewarding and inspirational. The children and staff at the Therapeutic Nursery taught me the importance of implementing a constructive, safe and supportive program for children. I am amazed by the energy, curiosity, honesty and resilience from these children. … I am truly grateful for the opportunity and the insight CcTC has given me into the mental health issues associated with trauma in the pediatric population.” Eric summarized his time at CcTC as “the perfect summer experience for a starting medical student. It was an extremely fun and rewarding experience, but also a unique hands-on experience in dealing with behaviorally and emotionally troubled children. … Forming bonds with the children proved to be a fairly easy task; it was the maintenance and emotional toll that these bonds took on me that was difficult to deal with. … The children are amazing.”
Ready, Willing & Able

Student Interns:
Jacob Britt, University of Pennsylvania, School of Dental Medicine
Jessica Torres, Thomas Jefferson University, Jefferson Medical College

Academic Preceptors:
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine
Maria Hervada-Page, MSS, Thomas Jefferson University, Jefferson Medical College

Community Preceptor:
Mark Atwood, Ready, Willing & Able

The Community Site:
Ready, Willing & Able is a transitional housing provider using a comprehensive approach to tackling homelessness that includes providing paid work, vocational training, adult basic education, job placement, social support services and lifelong graduate services. The facility houses 70 residents. To graduate, trainees must meet three stringent criteria: full-time employment, independent housing and maintenance of a sober lifestyle.

BTG Focus Areas Adopted From HP2010 and HP2020:
Access to Health Care; Heart Disease and Stroke; Nutrition and Weight Status; Oral Health; Physical Activity and Fitness

The Project:
As health interns, Jake and Jess assessed the health issues faced by the Ready, Willing & Able (RWA) trainees and developed creative ways to address those issues. The interns used a multifaceted approach that focused on health education, advocacy, and promotion of healthy eating and exercise. Their weekly health education classes covered various topics including heart health, nutrition, men’s health, oral hygiene, exercise and preventive medicine. The interns promoted healthy lifestyle choices by working with the kitchen staff to make more healthful meals, holding exercise classes for the RWA trainees and putting the trainees in contact with health care providers. Jacob noted, “My experience at Ready, Willing & Able taught me a lot about myself, and in just seven weeks I was able to improve skills that will be vital as a future dental professional … such as public speaking, health communication and interdisciplinary teamwork, all while having a positive impact. Overall it was an awesome and unique experience that I will remember forever.” Jessica said, “This summer with BTG and Ready, Willing & Able has made a huge impact on my future career as a physician. There is no more valuable experience than working directly with an at-risk patient population over an extended period of time. I feel I will be better able to relate to my future patients, understand their current priorities and assess potential barriers to care. These skills will allow me to provide a more personalized, patient-centered medical plan of action, leading to improved compliance, a stronger doctor-patient relationship and, ultimately, healthier patients.”
Sudanese Women’s Group

Student Interns:
Eunice Chay, University of Pennsylvania, School of Dental Medicine
Ijeoma Chinwuba, University of Pennsylvania, Perelman School of Medicine

Academic Preceptors:
Joseph Metmowlee Garland, MD, University of Pennsylvania, Perelman School of Medicine
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine

Community Preceptor:
Sarah Peterson, MSW, HIAS and Council Migration Service of Philadelphia

The Community Site:
HIAS and Council Migration Service of Philadelphia works to resettle, reunite and represent immigrants and refugees of limited means residing in the Delaware Valley. The agency seeks the fair treatment and integration into American society of immigrants from all backgrounds. HIAS Pennsylvania is a partnership with Penn Center for Primary Care and Children’s Hospital of Philadelphia.

BTG Focus Areas Adopted From HP2010 and HP2020:
Access to Health Care; Health Communication; Maternal, Infant and Child Health; Nutrition and Weight Status; Oral Health

The Project:
Ijeoma and Eunice facilitated a biweekly women’s group for recently resettled Sudanese refugee women living in Northeast Philadelphia. Each meeting focused on a particular health topic or life skill, such as family planning, nutrition, oral health and financial literacy. Learning activities took place in clients’ homes as well as at various sites in the community, such as health clinics and grocery stores. Guest speakers were invited to present on pregnancy, personal safety and women’s health. Individually, Ijeoma worked to establish a link between the Drexel Women’s Health Center and the Penn Center for Primary Care in order to provide longitudinal care. Eunice assessed the need for improved access to pediatric dental care by identifying community resources and patterns of utilization. In addition, both Ijeoma and Eunice served as liaisons between patients and medical and dental clinics, as well as between the clinics and HIAS, by acting as patient escorts, scheduling appointments, securing interpretation services, and communicating messages and health information between patients and their caseworkers at HIAS. Eunice noted, “Working at HIAS and with refugee families this summer gave me a glimpse of the complex issues that refugees face in the United States. Their health is affected by their housing situation, finances, language barriers, culture, etc. It was truly an honor to get to know these families and their advocates at HIAS. I am humbled by the resilience of their collective human spirit. This experience has inspired and challenged me to want to do more for them as a dental professional and community advocate.” Ijeoma said, “Working with HIAS and our clients has been an endlessly gratifying experience. I believe the women’s group represents many of the concepts we learn about and hope to address in the future. Much like our future patients, our clients are already resilient and inspirational women—our task was to share the resources and knowledge needed to help them attain increased safety, health, education and financial independence. I am thankful that we were given the opportunity to begin doing this type of work so early in our careers, and I am even more grateful to have accompanied our clients through part of their journey.”
Consortium: Community Mental Health and Wellness

Student Interns:
Miriam Ciner, University of Pennsylvania, School of Dental Medicine
Alyssa Hansen, University of Pennsylvania, School of Social Policy and Practice

Academic Preceptors:
Zvi D. Gellis, PhD, University of Pennsylvania, School of Social Policy and Practice
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine

Community Preceptors:
Marvin Elias, PhD, Consortium, Inc., Chestnut Place Clubhouse
Raymond Harrod, Consortium, Inc., Seeds of Hope

The Community Site:
The Chestnut Place Clubhouse is a psychiatric rehabilitation center in West Philadelphia. In addition to offering a “work-ordered” day during which members divide themselves into units and work collaboratively to run the Clubhouse, it also offers temporary employment opportunities to acquaint members with jobs within the community and to prepare them for stable, longer-term employment. The Seeds of Hope program is a psychosocial rehabilitation program, also in West Philadelphia, that offers peer support in the form of recovery groups and outpatient services. Both are component programs of the Consortium, Inc. View Community Partner Web Site

BTG Focus Areas Adopted From HP2010 and HP2020:
Chronic Disease (Diabetes, Kidney Disease, Respiratory Diseases, etc.); Mental Health; Nutrition and Weight Status; Physical Activity and Fitness; Substance Abuse

The Project:
Throughout the summer, Miriam and Alyssa worked with the Consortium Clubhouse members specifically in the area of health and wellness. Workshops on nutrition, oral health and back-to-work wellness encouraged members to lead a healthy lifestyle. At Consortium’s Seeds of Hope, a recovery program for individuals with severe mental illnesses, Miriam and Alyssa focused on women’s health and relationship recovery. Alyssa commented, “My experience this summer has been amazing. After working with individuals with severe mental illnesses, it has become apparent that autonomy and accountability are important to the recovery process as well as the overall health of individuals in the programs. The individuals at both of the Consortium programs have been extremely accepting of us and open to sharing their experiences with us. I really appreciate and value the relationships I have formed through this opportunity!” Miriam noted, “This summer has been very instrumental in helping me to have a better understanding of different communities and the challenges they face. Speaking with members and learning about their pasts has introduced me to a whole new facet of society that I had never been exposed to before. It was especially helpful to work with two different branches of the Consortium and compare the programs that they each offer to their members. I enjoyed learning new methods of working with individuals who have mental illnesses both from the sites as well as from the perspective of my partner, who is of a different discipline.”
Working for Change

Student Interns:
**Wenting Guo, University of Pennsylvania, School of Dental Medicine**
Caroline Fortin, University of Pennsylvania, School of Social Policy and Practice

**Academic Preceptors:**
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine
Zvi D. Gellis, PhD, University of Pennsylvania, School of Social Policy and Practice

**Community Preceptors:**
Jacqui Bowman, PhD & Jon Goff, College of Physicians of Philadelphia

**The Community Site:**
The College of Physicians of Philadelphia is the oldest professional medical organization in the United States. Its mission is to advance the cause of health while upholding the ideals and heritage of medicine. Among its many outreach efforts are the Karabots Program and the Teva Program, both of which focus on the personal and professional development of Philadelphia high school students.

**BTG Focus Areas Adopted From HP2010 and HP2020:**
Health Communication; HIV; Immunization; Injury and Violence Prevention; Responsible Sexual Behavior

**The Project:**
Wenting and Caroline worked with the College of Physicians of Philadelphia staff and 13 high school students in the Teva Summer Internship program, which focused on STIs and violence education and prevention in Philadelphia communities. The program’s activities included workshops; writing and filming public service announcements about HPV; field trips to Children's Hospital of Philadelphia, local gardens and community building projects; and resource gathering. Wenting and Caroline assisted in the various program activities, compiled lessons on STIs, developed pre- and post-evaluations of the program, chaperoned trips, and hosted lunchtime discussions. Caroline reflected, “I had the privilege of working with an incredible group of high school students and a supportive staff in the Teva program this summer. We used storytelling to discuss violence and health concerns in the students’ communities all over Philadelphia, which proved to be extremely powerful for both the students and staff. The numerous accounts of trauma, violence and fear that our students shared have reinforced my commitment to social justice and reminded me of the importance of sharing, listening and being heard in the process of change… I am grateful to have been a part of this initiative for positive change in our city.” Wenting noted, “This is a precious opportunity for me to learn about the city through the eyes of 13 bright high school students at the College of Physicians. I have researched about violence in the city and its neighborhoods to prepare for the program, but it never touched me this much until I heard their personal stories. It amazed me how they embraced the hardships from their childhood experiences and channeled them into a desire for better. This program has allowed me to share my knowledge of health prevention with this talented group and to gain a better understanding for what issues really impact teenagers in Philadelphia nowadays. It has been a valuable and rewarding experience for me to help the teens to realize their potential and find support from each other. Being in this interdisciplinary team, I have gained confidence and skills working with the adolescent population, which will have a profound impact on the rest of my professional training and career.”
Healthy Mouth - Healthy Body for LIFE

Student Interns:
Allison Hensler, University of Pennsylvania, School of Dental Medicine
Claire Barbour, University of Pennsylvania, School of Social Policy and Practice

Academic Preceptors:
Zvi D. Gellis, PhD, University of Pennsylvania, School of Social Policy and Practice
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine

Community Preceptor:
Ingrid Sidorov, MSN, RN, LIFE - A Practice of Penn Nursing

The Community Site:
Living Independently for Elders (LIFE), a clinical practice of Penn Nursing (and a PACE Program in West Philadelphia), provides all-inclusive care for 450 frail, older adults in the community. This comprehensive, interdisciplinary program provides total medical and social care while allowing participants to remain living in their own homes. Services include meals, transportation, physical therapy, social services, family support, recreational therapy, medical treatment and personal care.

BTG Focus Areas Adopted From HP2010 and HP2020:
Chronic Disease; Elder Health and Senior Quality of Life; Health Communication; Nutrition and Weight Status; Oral Health

The Project:
Allison and Claire’s project at LIFE was to create a multi-pronged interdisciplinary program aimed at preventive oral care for members. Their project involved educating LIFE members about tooth brushing, denture care, expectations for visiting the dentist, and self-advocacy. Allison and Claire also conducted oral health education presentations for LIFE center staff, including nurses, social workers and caregivers, demonstrating that each health professional is an important part of the interdisciplinary team. In addition, they performed oral health promotion at nursing homes affiliated with LIFE and offered support and guidance to family members about taking care of their loved ones’ oral health. To improve access to care, Allison and Claire distributed toothbrushes, toothpaste and other oral health supplies to members at the LIFE center and at the nursing homes. They also created resources and materials that will be reused to allow the oral health education program to continue after the summer program. Claire reflected, “I came to LIFE this summer looking forward to working with the population of aging Philadelphians that LIFE supports. What I didn’t expect, though, was how much LIFE would support me. LIFE is a dynamic, challenging and nurturing place to learn and to grow, pushing me and my BTG partner, Alli, to think bigger, to go further, to bring oral health promotion not only to LIFE members but staff, families and affiliated long-term-care facilities. LIFE has exposed me to the challenges aging adults face in Philadelphia while teaching me that, given hard work and committed staff, these challenges can be surmounted.” Allison noted, “I am truly grateful for the opportunity to be a part of the interdisciplinary team at LIFE this summer. This experience has opened my eyes to the unique demands of geriatric health care, and the knowledge I have gained will influence my decisions in the future, both personally and professionally. The elderly members at LIFE have taught me about resilience through their stories and optimism. I have also developed an appreciation for the roles and responsibilities of a social worker through working with my BTG partner, Claire. Finally, the LIFE program has demonstrated the value of preserving independence for older adults, as I watched smiling members walking into the center each day.”
**Title: Dental ED Visits and Overall ED Visits in Camden NJ**

Access - Health Services Research Department of Epidemiology

**Student Name:**
**Kari Hexem**

**Faculty Preceptor:**
Joan Gluch
Andres Pinto, Ph.D
A. Truchil
K. Gross
J. Brenner

**Abstract:**
**Objectives:** To describe the prevalence and characteristics of dental emergency department (ED) visits in comparison to overall ED visits over time in Camden NJ.

**Methods:** Retrospective cohort study of all ED visits. The Camden Coalition of Healthcare Providers (CCHP) collected data from the billing records of Camden residents at the city’s three hospitals into the “Citywide All-Payer Hospital Claims Database,” which included patient demographics, date(s) of service, diagnoses, insurance, and cost information. From 2003-2011, the database included 634,069 ED visits. Dental-related ED visits were identified using ICD-9 diagnostic codes.

**Results:** The number of dental-related ED visits has increased over time in Camden, NJ, from 721 visits in 2003 to 1,978 visits in 2011. The total charges for dental-related ED visits have increased from $390,718 to $2,823,656 over the same eight-year period (inflation adjusted to 2011 dollars). The payer mix for these visits was 51% Medicaid, 34% Charity Care, 10% Commercial, and 5% Medicare. The majority (65%) of dental-related ED visits were from individuals ages 20-44 years.

In comparison, overall ED visits have also increased over time, from 58,611 in 2003 to 89,742 visits in 2011. However, dental ED visits nearly tripled over the study period (2.75x) while overall ED visits increased by only 1.5x (p<0.01). There were also significant differences between dental ED and overall ED visits by payer type and patient age, with more charity care individuals and more individuals ages 20-44 in the dental ED cohort (p<0.01 for both).

**Conclusions:** The numbers of individuals accessing dental-related ED services has increased over time, and these individuals differ from those accessing overall ED services in terms of age and payer status. These increases, and differences from overall ED visits, have important implications for programs designed to mitigate the use of the ED as a dental safety-net in poorer cities.
Laying Down Roots in West Philadelphia

Student Interns:
Laurel Lee, University of Pennsylvania, School of Dental Medicine
Nicole Oakman, University of Pennsylvania, Perelman School of Medicine

Academic Preceptors:
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine
Raina Merchant, MD, MSHP, University of Pennsylvania, Perelman School of Medicine

Community Preceptor:
Alia Walker, Earth’s Keepers, Inc.

The Community Site:
Earth’s Keepers, Inc. (EK), is an urban farm in Southwest Philadelphia that supports the community’s right to food sovereignty and justice. EK aims to establish a sustainable and healthy food source for those who otherwise cannot access or afford to purchase fresh, culturally appropriate organic foods.

BTG Focus Areas Adopted From HP2010 and HP2020:
Health Communication; Heart Disease and Stroke; Nutrition and Weight Status; Physical Activity and Fitness; Responsible Sexual Behavior

The Project:
Nikki and Laurel worked with high school students at Earth’s Keepers (EK) to grow, harvest and sell fresh organic produce. They also led discussions and hands-on exercises related to nutrition, food sovereignty, health, cooking and guidance counseling. The interns’ work culminated in the production of a colorful mural on the side of the garden’s greenhouse. Nikki commented, “Interning at Earth’s Keepers was an excellent way to spend my summer. I was able to learn about West Philadelphia by working with teenagers and adults in West Philadelphia. This experience has helped me realize the benefits of offering educational employment opportunities to adolescents. I also realize the challenges of obtaining nutritious food in areas of Philadelphia and how urban farms can help support communities that lack access to culturally relevant and affordable fresh fruits and vegetables.” Laurel noted, “I have really enjoyed my weeks at Earth’s Keepers. I have loved being outdoors, experiencing the satisfaction of growing many flourishing crops, and having the opportunity to hear about the teenage experiences of adolescents in Southwest Philly. Their personal goals and aspirations are unique, and I truly hope our summer together has helped them further define themselves. Seeing the interest people in the community have to come to the farm to volunteer, ask questions or purchase fresh produce reinforces my belief that food can bind a community, and reaffirms the importance of having local farms within otherwise food-poor neighborhoods.”
Fostering Strength in Family and Community

Student Interns:
Katherine Romelfanger, University of Pennsylvania, School of Dental Medicine
Sarah Trotta, University of Pennsylvania, School of Social Policy and Practice

Academic Preceptors:
Zvi D. Gellis, PhD, University of Pennsylvania, School of Social Policy and Practice
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine

Community Preceptor:
Myra Brown, MBA, Intercultural Family Services, Inc.

The Community Site:
Intercultural Family Services, Inc., located in West Philadelphia, provides more than 18 programs to Philadelphia individuals and families to stabilize strengthen and unite families and diverse communities. Programs provided by Intercultural include in-home case management involving case managers and home visits, parenting skill enhancement classes, a Work Ready program for high school students, housing counseling, interpretation and translation, and a Music and Mentorship program for children. Intercultural also operates two outpatient behavioral health clinics providing psychological testing, evaluations, and individual as well as family-based and functional family therapy.

BTG Focus Areas Adopted From HP2010 and HP2020:
Access to Health Care; Maternal, Infant and Child Health; Mental Health; Oral Health; Substance Abuse

The Project:
Katie and Sarah worked with Intercultural Family Stabilization Services. They jointly managed two cases and focused on enriching the families’ well-being by encouraging stable housing and employment; healthful nutrition; school attendance for children; counseling for mental health, substance abuse, and family dynamics; academic, financial, and sexual responsibility; and general and oral health for parents and children. To better serve families, Sarah and Katie needed to be keenly aware of Philadelphia’s community resources. This aspect of their work required them to review, update and reorganize the agency’s extensive directory of citywide community resources. Finally, Sarah and Katie created presentations for parenting classes about postpartum depression/birth-related PTSD and oral health for parents and children. Katie realized, “It’s not enough to give someone information about a service or tell them they need to do something. … I’ve seen aspects of life impacting and lessening one’s commitment to health, which I never seriously considered. My most important lesson has been that we, professional to professional and professional to client, learn mutually from each other, and collaboration is necessary to ensure a patient’s holistic well-being.” Sarah reflected, “There is extraordinary need in Philadelphia—need that extends beyond what we can even comprehend. It has truly been a privilege to work with individuals who are committed to bettering their lives, despite vast institutionalized oppression. I’ve had the opportunity to witness the resilient nature of the human spirit and the strength that creates vibrancy and life in underserved communities.”
South Philadelphia High School Health and Fitness Summer Camp

Student Interns:
Brian Rowan, University of Pennsylvania, School of Dental Medicine
Gustavo Gomez, Thomas Jefferson University, Jefferson Medical College

Academic Preceptors:
Rickie Brawer, PhD, MPH, Thomas Jefferson University, Jefferson Medical College
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine
James D. Plumb, MD, MPH, Thomas Jefferson University, Jefferson Medical College

Community Preceptors:
Eric Williamson, EducationWorks

The Community Site:
EducationWorks enriches the lives of children and families by providing educational programs and services in communities confronting high rates of poverty and other barriers to educational achievement. EducationWorks provides a summer program for adolescents at South Philadelphia High School.

BTG Focus Areas Adopted From HP2010 and HP2020:
Heart Disease and Stroke; Injury and Violence Prevention; Nutrition and Weight Status; Oral Health; Physical Activity and Fitness

The Project:
Brian and Gustavo collaborated with the EducationWorks staff at South Philadelphia High School to create and deliver a health and fitness curriculum for adolescents aged 15 to 18. Through lectures, debates, field trips, group activities and discussions, the youth gained a deeper understanding of health. The adolescents were exposed to a variety of health topics, including obesity, nutrition, chronic conditions like diabetes and hypertension, oral health, sex education, psychological well-being, substance use/abuse and others. Each day, the youth engaged in an hour-long INSANITY® workout, followed by journal time, a group lesson and about an hour of gym time. Along with a focus on health, the summer program emphasized 21st century job skills, including technological competence, public speaking and teamwork. Gustavo noted, “This BTG experience has by far been the best job I have ever had. I not only learned about the barriers and inequities people face, but I was given a chance to actually work with youth. … Over the course of the summer, I saw the students grow in many ways. The shy students spoke up more, all of them became more physically fit, and they all began to think seriously about their futures. Seeing these changes was personally very fulfilling. In terms of professional development, I gained valuable leadership and team-building skills, as well as teaching skills.” Brian commented, “On the surface, this program revolved around health and physical fitness, but its impact can be felt on a much broader horizon. The students learned about what they think success means in their future lives and, more importantly, the steps they need to map out in order to reach these goals and aspirations. However, I feel as though I have learned more this summer from the students than they have learned from me. … Often with the odds stacked up against them and barriers put in place by society, these students want to better themselves and their community. These students have shown great perseverance and have given me a positive outlook for their futures. Lastly, it has allowed me to collaborate with people very different from myself and foster a greater appreciation of diversity.”
The Community Site:
Southwest Community Development Corporation, locally referred to as Southwest CDC, tackles issues facing low-income Southwest Philadelphia residents through services such as utility and rental assistance, housing and employment counseling, family services, and economic development planning. Since 1999, Southwest CDC has planned and organized a free summer camp for children at the John M. Patterson Elementary School. The seven-week day camp provides free educational and recreational activities and nutritious breakfasts and lunches for the campers.

BTG Focus Areas Adopted From HP2010 and HP2020:
Injury and Violence Prevention; Mental Health; Nutrition and Weight Status; Oral Health; Physical Activity and Fitness

The Project:
Michelle and Maetal worked with the staff at the Patterson Elementary School Camp, a program of the Southwest Community Development Corporation. During the internship, Maetal and Michelle planned, created and taught health-based curricula for nearly 100 school-age campers that centered around five major themes: physical health, mental health, safety, oral health and hygiene. The interns used various teaching approaches tailored to each age group to engage the children, such as songs, games, role-playing, smoothie-making, demonstrations, movies, speakers, arts and crafts, and presentations. The daily camp schedule involved seven one-hour classes with groups of about 15 students each. In addition to lesson planning, Maetal and Michelle also organized and chaperoned an educational field trip for the fourth- and fifth-grade campers to the Mütter Museum in Center City. Maetal also facilitated several visits by the Penn dental van. During a planning period, Michelle and Maetal also independently solicited supplies from generous outside organizations to facilitate planned activities. Michelle reflected, “Gun violence, parental drug abuse, absentee fathers and low-income neighborhoods have done little to jade these amazing kids. Despite the realities of their socioeconomic disadvantages, the campers remain bright-eyed, bubbly and eager to learn—speaking volumes for the resiliency of children. They are unflatteringly optimistic, which is quite inspiring. As a future nurse working with children, I will definitely keep these experiences with me, as these kids have taught me that even when put through the ringer, with proper support children are extremely capable of bouncing back, something that is very important to remember when working with some of the doom and gloom often involved in health care.” Maetal noted, “My experiences in the Southwest Philadelphia community have been quite eye-opening. Working with the children has shown me that no matter where they are from, kids are still kids. The children at Patterson are so loving and caring, full of personality with dreams of becoming famous athletes, chefs, and policemen. … [This experience] will definitely impact my future as a practicing dentist as I try to help patients reconcile good health behaviors with unsupportive environments.”
Bridging the Gaps at Covenant House

Student Interns:
Travis Tucker, University of Pennsylvania, School of Dental Medicine
Gregory Epps, University of Pennsylvania, Perelman School of Medicine, Audun Lier, Drexel University College of Medicine Christine Prifti, Drexel University College of Medicine

Academic Preceptors:
Robert Chapman, PhD, Drexel University, College of Nursing and Health Professions, Behavioral Health Counseling Department
Kenneth Ginsburg, MD, MS.Ed, University of Pennsylvania, Perelman School of Medicine
Joan I. Gluch, PhD, RDH, University of Pennsylvania, School of Dental Medicine

Community Preceptor:
Denise Johnson, Covenant House Pennsylvania

The Community Site:
Covenant House Crisis Center: 50+ bed shelter located in the Germantown neighborhood of Philadelphia. Youth in crisis (homeless, runaway or trafficked young people) between the ages of 17 and 21 can work toward gaining meaningful full-time employment or completing high school. Once individuals become residents of the Cov they are required to attend job search training, and they are expected to actively look for employment during their stay. In addition, residents qualify for free meals, medical treatment and various other necessities such as professional clothing for job interviews. The Cov is meant to be a stepping-stone toward increased responsibility. For instance, qualified residents may apply for Rights of Passage (ROP), whereby they live in an apartment owned by Covenant House Pennsylvania and can work toward achieving independent living.

BTG Focus Areas Adopted From HP2010 and HP2020:
Heart Disease and Stroke; Nutrition and Weight Status; Oral Health; Physical Activity and Fitness; Tobacco Use

The Project:
Greg, Audun, Christine, and Travis worked together to design health promotion programs for the residents of Covenant House. These programs ranged from teaching the young adults about oral health, nutrition and tobacco use to presentations focused on basic life skills such as money management, to a basketball competition. The interns also encouraged and uplifted the residents as they searched for jobs and prepared for their interviews. To support the young adults’ job search efforts, the interns conducted a clothing drive and organized the Covenant “boutique”—a closet that included donated professional attire. In addition, they helped prepare for a graduation party by decorating and acquiring necessary items such as picture frames for the youths’ diplomas.
Yasaman Hakakian, Dr. Faizan Alawi D.D.S.

Departement of Pathology

GAR1 AND DNA DAMAGE RESPONSE REGULATION

Dyskerin is an essential and evolutionarily conserved protein that is required for H/ACA ribonucleoprotein biogenesis. Together with its obligate binding partners, NHP2, NOP10 and GAR1, dyskerin binds to and stabilizes non-coding H/ACA RNA molecules. It also plays important roles in precursor ribosomal RNA processing and in telomere homeostasis. It has been shown that loss of dyskerin significantly reduces the accumulation of several important phosphorylated DNA damage markers, including Histone H2A.X and p53, disrupts cell cycle checkpoints, and promotes survival following genotoxic exposure by reducing apoptosis. Since dyskerin is always bound by Gar1, NHP2 and NOP10, we want to know if depletion of these other three proteins, specifically GAR1, also have similar effects on the DNA Damage Response (DDR). One of the cell lines that were used in these studies is the osteosarcoma cell line, or U2OS cells, as these cells lack telomerase activity. Using siRNAs directed against DKC1, GAR1 and a negative control, U2OS cells was transfected, and the cells were treated for various times with DNA damaging agents, including doxorubicin and etoposide. Then protein was extracted and Western blots was performed, and we used different antibodies against various DDR biomarkers, including p-p53-Ser 15, phospho H2A.X, and DKC1. To test the effects of mutations on cell cycle checkpoints, the cells were harvested, washed, fixed, and analyzed by flow cytometry. According to the results, loss of GAR1 also reduces the accumulation of phosphorylated DDR biomarkers, including histone H2A.X and p53. Our Cell Cycle Analysis results indicate that loss of GAR1 has no effect on cell cycle relative to control cells either before or after DNA damage. As a result, loss of GAR1 has no effect on cell cycle relative to control cells; however, at the level of protein, there is a clear effect on the accumulation of DDR markers.
Title: Effect of Additive Ductility on Fracture Toughness of UDMA Resin Composites

Department of Preventive & Restorative Sciences – Division of Restorative Dentistry

Student Name:
Juliana Kim

Faculty Preceptor:
Dr. Francis K. Mante

Abstract:
Improving fracture toughness of composite resins is highly desired in order to increase median survival years of those restorations in posterior teeth. It was hypothesized that addition of liquid rubber (LR) of high ductility to UDMA based resin in presence of silaned coated inorganic fillers would result in improved fracture toughness that would be superior to LR of low ductility.

Control samples were made by adding camphorquinone and N,N-dihydroxy ethyl-P-toluidine (each 1% in weight of UDMA) to UDMA without liquid rubber. For non-control groups, two commercial liquid rubbers, Exothane8 and Exothane10 (Esstech, Phila, PA), were employed. Exothane 8 was added to UDMA in 5% increment up to 20% and Exothane 10 was added to UDMA in 5% increment up to 15%. Both camphorquinone and N,N-dihydroxy ethyl-P-toluidine added into every mixture each 1% in weight of UDMA. Stainless steel mold was used to fabricate samples with size dimensions of 25mm X 5mm X 2.5mm in shape of a notched bar. The mixture was paced into the mold in three increments (each 1 to 2 mm in thickness) and each increment was light cured with visible light Optilux 500 (Kerr, Orange, CA) for 80 to 120 seconds with a light intensity of 500 mW. Then samples were stored in a oven at 37°C with 100% relative humidity for at least one week prior to performing fracture toughness tests, following ASTM 399. Instron 4204 was at crosshead speed of 0.5mm/min. (full-scale load =125N).

Average value of fracture toughness UDMA control samples was 1.4985MNm^{-3/2} with a relatively large standard deviation, 0.4685MNm^{-3/2} (n=8). When Exothane 8 was added by 5%, average $K_{IC}$ value increased to 1.5581MNm^{-3/2} (n=8) but when greater amount of Exothane 8 was added, average $K_{IC}$ values were smaller than that of the control (Avg. $K_{IC}$=1.3601, 1.208, 1.3860MNm^{-3/2} respectively for 10, 15, and 20% addition of Exothane 8; n=12). Similarly, average $K_{IC}$ value for samples containing 5% Exothane 10 was greater than that of the control (Avg. $K_{IC}$=1.7383MNm^{-3/2}) while the other concentrations showed lowered average $K_{IC}$ values (Avg. $K_{IC}$=1.3033, and 1.2326 MNm^{-3/2} respectively for 10, and 15% addition of Exothane 10; n=12). However, these differences are not statistically significant.

Addition of liquid rubber did not significantly improve fracture toughness of UDMA based composites. However, obtained data size is insufficient to make a conclusion. Another limitation of the study was that incorporation of air bubbles was unavoidable during fabrication of samples and that these defects may have affected fracture toughness values. For the future, improvements can be made on mixing viscous materials uniformly by employing more powerful mixing system. This will allow one to add inorganic filler particles to more accurately simulate clinical dental composites. Determining crosslink densities and performing microscopy analysis will also help better understand effects of addition of Exothane 8 and 10 to UDMA based composites.
Title: Inheritance of Amelogenesis Imperfecta and Modifier Genes in Transgenic Murine Models

Department of Anatomy and Cell Biology, University of Pennsylvania School of Dental Medicine

Student Name: William S. Konicki

Faculty Preceptor: Carolyn W. Gibson
Yong Li

Abstract:
Amelogenesis imperfecta (AI) describes a family of inherited genetic conditions resulting in hypoplastic, hypocalcified, and/or hypomature enamel arising from mutations in one of six genes: AMELX, ENAM, MMP20, KLK4, FAM83H, and WDR72. Here, we restrict our investigation to the X-linked inheritance of induced knock-out mutations to Amelx, the gene coding for amelogenin, in C57BL/6, C3H/HeJ, and FVB/NJ commercial lab mouse strains and inter-strain crosses. As AI-positive individuals within families may display substantial phenotypic heterogeneity due to modifier genes and lyonization, mouse strains were selected to provide a controllable and predictable genetic background across individuals. Knock-out phenotypes were characterized by decreased enamel volume and density, a grainy appearance, and altered pigmentation as compared to the wild-type strains. All strains were evaluated for differential phenotypic expression and amelogenic deficits via gross photographic inspection, immunohistochemistry, image analysis, and microCT. Gross inspection revealed prevalent enamel defects in KO B6 and KO C3H/B6 strains (RR=5.4, 4.6). FVB mice were determined to have the shortest incisor lengths among WT strains, while both male and female KO C3H/B6 mice displayed the absolute shortest incisor lengths among all strains (p<0.05). KO C3H/B6 hybrids were determined to have the greatest degree of incisal hypopigmentation, an indicator of diminished enamel integrity (p<0.05). Via microCT, hypodense enamel in KO B6 and WT FVB strains was correlated with lower dentin densities compared to WT B6 mice, suggesting a hitherto unexplored link between amelogenesis and dentinogenesis (p<0.001). Our work, though largely preliminary, questions the uniformity of AI expression across commonly used mouse strains, and cautions against such assumptions. Furthermore, the wild-type FVB strain was observed to have a singular pattern of amelogenesis producing a short, richly pigmented, and inconsistently dense dentition—a potentially misleading body of idiosyncrasies for workers experimenting with transgenic FVB models. This work was supported by NIH grant DE011089.

Title: Sink or Source: Determination of Muscle and Liver Derived IGF-1 Distribution in Mice

Department of Anatomy and Cell Biology, University of Pennsylvania, School of Dental Medicine

Student Name: Allison Lawrence

Faculty Preceptor: Dr. Elisabeth Barton, Ph.D

Abstract:
Introduction: Insulin Like Growth Factor-1 (IGF-1) is critical for myoblast differentiation and proliferation as well as directing satellite cells in muscle repair. It is so important to muscle growth that animals lacking IGF-1 will not survive post-natally. IGF-1 is of increasing interest in the muscle community due to its function, especially in the context of diseases such as muscular dystrophy. While many tissues secrete IGF-1, the two most relevant sources are the liver and skeletal muscle. Unfortunately for researchers, the growth factor is indistinguishable based on source. Since endogenous sources produce identical IGF-1, it has thus far been impossible to determine which source, muscle or liver, is the most influential for growth. It is also noteworthy that the serum contains a large endocrine pool of IGF-1. Previous studies of muscle specific ablation of IGF-1 have produced significantly smaller mice. Thus suggesting liver IGF-1 has predominately endocrine function while muscle synthesized IGF-1 likely functions in a paracrine or autocrine mechanism. This project hypothesized that muscles can absorb and utilize circulating epitope tagged IGF-1 produced by the liver as well as secrete sufficient IGF-1 to supply other tissues.

Methods: Three groups of mice were utilized in this study. An Adeno-associated virus (AAV) that expressed an epitope tagged FLAG-IGF-1 with a tissue specific promoter was injected in one set of mice in order to track the locations of absorption. The virus was injected into lower limb muscles of mice and expressed a FLAG-IGF-1 with a muscle promoter. As a result IGF-1 synthesized by the muscles by the AAV are distinguishable from endogenous IGF-1. A second AAV was injected into the intraperitoneal cavity of an different set of mice with a liver specific promoter to limit FLAG-IGF-1 production by the liver. After injection the animals, the virus expressed for four weeks before tissues were collected. The control animals were sacrificed without receiving any injections. Tissues collected were: serum, diaphragm, liver, extensor digitorum longus, quadriceps, soleus, tibialis anterior and gastrocnemius. Samples from the left side of the body were preserved for histologic studies. Samples from the right side of the body were preserved for biochemical studies. Muscles to be used immediately for western blotting were crushed and the protein was extracted. Western blots were run to qualitatively assess total IGF-1 and FLAG-IGF-1. RNA was also extracted from muscle in order to run RNA PCR.

Results & Conclusion: Substantially more total IGF-1 was observed in animals that had received either liver or muscle injections of the AAV than the control animals. This verified viral expression. The bands from FLAG-IGF-1 were higher molecular weight than endogenous IGF-1. Flag-IGF-1 was detected in serum from animals injected with muscle targeted IGF-1, indicating that muscle is a source for IGF-1. For liver-targeted IGF-1, there was no evidence of FLAG-IGF-1 in tibialis anterior, suggesting that muscle is not an efficient sink for IGF-1 from the circulation. Further studies are needed to confirm this observation, including
immunohistochemistry, to rule out that the extent delivery of FLAG-IGF-1 to muscle is below the level of detection by immunoblotting. These results may impact how one designs strategies for increasing IGF-1 in muscle.
Title: Analysis of Cell Shape and Protein Content in Ameloblasts during Enamel Development in RhoA-DN Mice

Department of Anatomy and Cell Biology, University of Pennsylvania, School of Dental Medicine

Student Name: Rakhee Porecha

Faculty Preceptor: Dr. Carolyn Gibson
Yong Li
Hui Xue

Abstract:
In many cell types, the RhoA signaling pathway regulates actin filaments that determine cellular movement and alterations in shape. RhoA was hypothesized to be important in the normal shape changes that ameloblasts undergo during development of enamel as well as the regulation of ameloblast cell junctions. Using a transgenic mouse generated to express dominant negative RhoA (RhoA-DN) in ameloblasts, Li et. al (2011) found abnormal enamel development. The goal of this project is to determine the underlying mechanisms of disruptions in the normal RhoA pathway.

A plasmid used to generate transgenic mice was digested and inserted, leading to the strain TgAmelxEFGP-RhoA-DN13 (E-13) used for the experiments. 4-day mouse mandibles and maxillae were sectioned for histology and immunohistochemistry and analyzed for staining under a microscope using NIS Elements software. Amelogenin protein content was determined by western blotting and IHC with an Anti-Amelogenin antibody. Ameloblast heights were measured using H&E stained slides along with E-cadherin levels seen with IHC. E-13 showed lower levels of amelogenin protein in mandibular molars than wildtype (WT). Ameloblast height in E-13 molar cusps was significantly shorter than WT molar cusps, compared to incisors which revealed similar heights. E-cadherin levels in E-13 were also lower than WT. These results suggest that hypoplastic, defective enamel correlates with reduced expression of the amelogenin protein and E-cadherin. Together, these findings reveal that when RhoA activity is inhibited, there are deficits in molar ameloblast function.
Title: *P. gingivalis* Degrades Pannexin-1 Channels in Human Immortalized Gingival Keratinocyte (HIGK) Cells

Department of Anatomy and Cell Biology, University of Pennsylvania, School of Dental Medicine

Student Name:
Bernice Wong

Faculty Preceptor/Mentor: Dr. Claire Mitchell, Ph.D & Jason Lim

Abstract:
Introduction:
For ten weeks in the Mitchell Lab, I have been researched the effects of live and formalin-killed *P. gingivalis* on pannexin-1 channels in human immortalized gingival keratinocyte (HIGK) cells. *Porphyromonas gingivalis* is a gram-negative anaerobe that plays a major role in severe periodontal disease. *P. gingivalis* frequently colonizes gingival epithelial cells (GECs), which are part of the innate immune response of oral tissues. *P. gingivalis* uses different methods to modulate cell death pathways to ensure its intracellular survival. One prevalent area of study regarding this subject is how GECs infected by *P. gingivalis* become resistant to apoptosis and, more specifically, how the hemichannel PANX1 (pannexin-1) is related to the initiation of inflammasome assembly, the recruitment of macrophages, and the triggering of apoptosis through the purinergic receptor P2X7. Previous studies have shown that caspases-3 and -7 target the C-terminus of pannexin-1, leading to its activation and consequently, nucleotide release into the extracellular space. Thus, PANX1 channels play an important role in the release of the “find-me” signals, such as ATP and UTP from apoptotic cells.

Methodology:
Human immortalized gingival keratinocytes (HIGK), provided by Dr. Graves’ lab, were cultured 25cm² tissue culture flasks at 37°C and 5% CO₂. The culture medium consisted of KBM-2 (Keratinocyte Basal Medium) and bovine pituitary extract (BPE), human epidermal growth factor (hEGF), insulin, hydrocortisone, epinephrine, transferrin were added as supplements. Penicillin/Streptomycin/Fungizone was further added to inhibit contamination of the samples. The HIGKs were then grown to 70-80% confluence, while *P. gingivalis* was grown in Dr. Graves lab in an anaerobic chamber. Half of the *P. gingivalis* bacteria was killed in 1% formalin (denoted PgFK), and HIGK cells were incubated for 2+ hr in medium without antibiotics or antymycotics. The concentration of *P. gingivalis* was determined by measuring the optical density (OD) at 660nm. We then prepared our samples – the cells were incubated with or without *P. gingivalis*. At various time points, cells were lysed in RIPA buffer (w/ protease inhibitor) for protein (pannexin) extraction, and the samples were filtered to ensure removal of bacteria. We were able to detect the cleaved and uncleaved forms of these pannexin-1 channels by performing the western blot method on a series of samples, which were left to be infected by the *P. gingivalis* for various time frames (2 hours, 6 hours, 24 hours) at various MOI’s (1:10 or 1:50), and also with and without a caspase inhibitor (zVAD). We used actin and GAPDH to normalize our levels of protein and Coomassie blue stain to ensure that the proteins were transferred onto the Western blot membrane.
Results and Conclusion:
Originally, we hypothesized that infection of HIGK (human immortalized gingival keratinocytes) cells with live *P. gingivalis* would lead to uncleaved pannexin-1 channels, while we expected to find uncleaved pannexin-1 channels when treated with formalin-killed *P. gingivalis*. We analyzed the results using the Western Blot method and have found that there is much more research to be done before making any definitive conclusions. Contrary to our expectations, we found that at certain MOI’s and incubation times (such as 1:10 and 1:50 at 2, 6, and 24 hours), infection with both live and formalin-killed *P. gingivalis* resulted in entirely dead HIGK cells, and subsequently undetectable pannexin-1 proteins on our Western blot membranes. This preliminary data may suggest that *P. gingivalis* degrades pannexin. However, when HIGK cells were infected by live and formalin-killed *P. gingivalis* with a combination of zVAD-FMK, a caspase-inhibitor, the pannexin monomers seemed to be protected from cleavage. We were able to visualize evidence of pannexin oligomerization on our Western blots when cells were treated with zVAD-FMK and there was absence of the pannexin trimers when cells were not treated with zVAD-FMK (Pannexin-1, which usually forms a hexameric channel, is known to be made up of a variety of subunits; the monomer weighs 48 kDa, the dimer weighs 98 kDa, and the trimer weighs 147 kDa.). Furthermore, we normalized our levels of protein using actin and GAPDH, and observed that the actin and GAPDH expression from our cells were normal and equal. Additionally, we used a Coomassie Blue stain to detect all the proteins that were transferred onto our membrane, and all the lanes looked very similar, including the control lanes.

From our preliminary data that we have gathered over this past summer, we have observed in our samples that *P. gingivalis* degrades pannexin-1, and this degradation may be inhibited by zVAD. We were able to visualize from our Western Blots that the cells treated with zVAD-FMK (caspase inhibitor) resulted in normal pannexin oligomerization, suggesting that the zVAD may lend the pannexin channels protection from caspase-mediated cleavage and, perhaps, even gingipain-mediated cleavage. Previous studies have also shown that *P. gingivalis* may contribute to the stimulation of other caspase-like activities, by releasing gingipains. Gingipains, cysteine proteinases, are released by *P. gingivalis* as a major virulence factor that may degrade intracellular oral keratinocyte proteins. Gingipains may induce cell detachment, cell adhesion molecule cleavage, and apoptosis in endothelial cells. We are led to the question of whether there is possible involvement of gingipains in the disruption of pannexin-1 oligomerization. Both caspases and gingipains play large roles in apoptosis, and coincidentally, the catalytic domain of gingipain is topologically similar to that of caspase. It would be useful to further study the detailed effects of gingipains and caspases on pannexin-1 channels, by observing the results of our cells treated with both gingipain and caspase inhibitors; this would help in terms of understanding how their effects on pannexins contribute to apoptosis and the inflammatory response.
Title: The Role of Src-Family Kinases in Oral Squamous Cell Carcinoma

Department of Oral Medicine, SDM & Department of Dermatology, UPENN, Perelman School of Medicine

Student Name: Brianna Yang  Faculty Sponsor/Mentor: Thomas Sollecito, Ph.D

Abstract:

Introduction:
Src-family kinases (SFKs) are primary drivers of neoplasia in most epithelial tissues. Overexpression and/or elevated activity of SFKs have been demonstrated in a variety of epithelial cancers. However, the role of SFKs in oral epithelial neoplasia has not been defined clearly. Based on these observations, we hypothesized that SFKs are activated in oral squamous cell carcinomas (OSCC). In our study, we evaluated the activity of SFKs in human primary OSCC tumor specimens and in a novel murine model of oral carcinogenesis.

Materials & Methods:
Biopsy specimens from patients with OSCC were obtained from the archives of the Head, Neck and/or Oral disease Tissue Bank of the Abramson Cancer Center at the University of Pennsylvania with informed consent in accordance with the University of Pennsylvania Health System IRB protocol #417200. Immunohistochemical staining was performed to determine the level of activity of SFKs and their downstream effectors, STAT3, PDK1, and ERK1/2. Primary antibodies detecting the activated (phosphorylated) forms of the proteins were utilized. All slides were evaluated for the staining intensity and the extent of staining in OSCC and unremarkable mucosa (UNR). For each specimen, a staining index was determined by multiplying the intensity factor by the extent factor. To assess the p-values associated with differences in staining indices, two-tailed Student’s t-test was performed to analyze the means and standard deviations of the two groups (OSCC and UNR). A p-value of < 0.05 was considered statistically significant. To evaluate the in vivo effect of elevated activity of SFKs, transgenic mice expressing constitutively activated Fyn kinase, a member of SFKs, in specific regions of the oral mucosa were generated and characterized. K14-Fyn Y528F mice express a constitutively active form of Fyn under the control of the K14 promoter. K14-Fyn Y528F mice spontaneously develop oral lesions that were histologically characterized and were subjected to immunohistochemical staining.

Results:
Our results showed elevated levels of activated SFKs and their downstream effectors in human primary OSCC lesion sites compared to UNR, and the differences in the staining indices were statistically significant. The in vivo effects of elevated SFKs activity were assessed using K14-FynY528F mice. Approximately 30% of K-14 FynY528F mice developed hyperkeratotic lesions on the dorsal tongue and the hard palate that resemble human OSCC in situ histologically. These lesions typically develop by 2 weeks of age and persist for at least 5 weeks. Immunohistochemical analysis of K14-FynY528F mice oral lesions demonstrated increased Fyn expression, keratinocyte hyperproliferation, increased SFKs activity, and activation of PDK-1. These data show that the FynY528F transgene induces OSCC in situ. Immunohistochemical staining patterns of K14-FynY528F mice oral lesions were consistent with those observed in human primary OSCC tumor specimen.

Conclusions:
SFKs and their downstream effectors are remarkably activated in OSCC specimens compared to adjacent unremarkable mucosa (UNR). We conclude that the activation of SFKs is a common feature seen in OSCC. These results provide a proper groundwork for further studies in the role of SFKs in driving oral epithelial neoplasia. The role of SFKs in oral epithelium neoplasia was further confirmed by histological and immunohistochemical analysis of K14-FynY528F mice oral epithelium. K14-FynY528F transgenic mice develop oral lesions that resemble human OSCC in situ histologically and molecularly. These results provide a direct evidence for the use of K14-FynY528F transgenic mice to study early stages of oral carcinogenesis.
Title: The Role of MMP13 in Skeletal Muscle Regeneration

Department of Anatomy and Cell Biology, University of Pennsylvania, School of Dental Medicine

Student Name:
Du Chung

Faculty Preceptor:
Elisabeth Barton, Ph.D
Lucas Smith

Abstract:
Muscle regeneration during development and tissue repair is a highly regulated process in which the extracellular matrix undergoes remodeling. Some of the key regulators are known as matrix metalloproteinases (MMP), a family of proteinases that target specific components of the ECM. Preliminary studies in the lab have found that MMP-13 may be a new family member of MMPs found in skeletal muscle. MMP-13 is a key enzyme in degrading ECM and an activator of other MMPs. Its target proteins in the ECM include aggrecan, perlecan, fibronectin, fibrillin, and potentially biglycan (Leeman, 2002). Collagen I and Collagen III are also significant targeted proteins as these are the main fibrillar collagens in muscles that are not well degraded by MMP-2 or MMP-9 when in their mature forms. MMP-13 is activated by MMP-2,-3, and -14, and in turn can activate MMP-2 and -9. Another important protein activated by MMP-13 is vascular endothelial growth factor (VEGF) (Lederel et al., 2010). The goal of my summer project was to analyze the skeletal muscle differences of wild type and MMP13^-/- mice prior to injury. Since the summer, the lab has continued the experiment and evaluated the effects of MMP13^-/- on skeletal muscle regeneration after inducing injury to the mice by injecting a cardiotoxin.

Methods and Results: (Muscle Mechanics) The body mass of MMP13^-/- was less than wt. There was no difference in active force production between the two groups. MMP13^-/- did demonstrate greater passive forces, but the difference was not statistically significant. (Biochemistry) A hydroxyproline assay did not show any increase in collagen in MMP13^-/- mice. When measuring the expression of mRNA, MMP13 expression was elevated one week post-injury. Expression of MMP2 was also elevated post injury with a significantly greater expression in MMP13^-/- mice. Expression of eMyHC was elevated as well post injury, but no difference was seen between the two genotypes. (Histology) Fiber size did decrease after injury, but showed no difference between both genotypes. Total fiber count also showed no difference with injury or with genotypes. Central nucleated fibers are an indication of regenerating muscle tissue. These fibers were non-existent prior to injury, but predominant 7 days post injury and did persist at day 10. However, there was no significant difference between the two genotypes. Evaluation of vascularization was done by staining for VEGF. There was no significant defect in MMP13^-/- mice. (Primary culture) Satellite cells were tracked over a span of 16 hours to measure the velocity of migration. The migration velocity of MMP13^-/- mice was impaired relative to wt mice.

Conclusion: MMP13^-/- muscle does not have functional defect without injury. The expression of MMP13 does increase after injury, but the lack of this gene shows no dramatic impairment in muscle regeneration. MMP13^-/- primary cultures, though, do exhibit slow migrating cells. Possible future studies should examine the importance of MMP13 and regeneration in fibrotic environment.
Title: The Effect of Musashi Expression on Self-Renewal and Differentiation of Mesenchymal Stem Cells

Student Name: Snow Feng

Faculty Preceptor: Christopher Lengner

Abstract:
The Musashi (Msi) family of RNA-binding proteins regulates stem cell proliferation and differentiation at the level of protein translation \(^1\). The role of Msi had been demonstrated in several stem cell compartments and aggressive tumors, but it has never been studied in mesenchymal stem cells (MSCs) \(^2\). The role of Msi proteins in regulating stem cell self-renewal and tri-lineage differentiation of MSCs into osteoblasts, chondrocytes and adipocytes were studied. Primary MSCs were collected from long bones of TRE-Msi1, TRE-Msi2, Msi1/2flox/flox and control mice. MSCs were cultured in osteogenic, adipogenic and chondrogenic differentiation growth media. For induction of Msi, TRE-Msi MSCs were given doxycycline, and for deletion of Msi, Msi1/2flox/flox MSCs were given 4-OH tamoxifen. Reduced colony formation was observed with cells that were Msi induced compared to that of control MSCs. There were no obvious differences of colony numbers observed with MSCs with deleted Msi compared to that of control. At histological level, both Msi inducible and deletion cells were able to differentiate into the tri-lineage when they were cultured in specific differentiation media and were not any different compared to the controls.

Title: miR-190 Targeting TP53INP1 and NR4A3 in Type I Latency Epstein Barr Virus Cells

Department of Microbiology, University of Pennsylvania, School of Dental Medicine

Student Name: 
Andrew M. Janiga

Faculty Preceptor: 
Yan Yuan, Ph.D 
Beth Cramer

Abstract: 
Introduction: Epstein Barr Virus (EBV) is a γ-herpesvirus that is associated with Burkitt’s lymphoma, Hodgkin’s disease, and nasopharyngeal cancers. The virus infects B lymphocytes, and can exist in a lytic state or one of three latent states. MicroRNA (miRNA) is a group of RNAs that have recently been discovered. They are an array of small, non-coding RNAs that have been found in various organisms, ranging from nematodes to humans. These sequences have been found to bind to the 3’ untranslated region (UTR) of messenger RNA (mRNA). It is believed that by binding to this region, miRNAs can act as post-transcriptional regulators of gene expression by down-regulating translation. miR-190 is a miRNA that has been seen in Epstein Barr infected type I latency cells. Microarrays performed on two different cell lines that over-expressed either an empty vector or miR-190 identified the genes TP53INP1 and NR4A3 as potential targets for miR-190. These two genes may be involved in maintaining type I latency by preventing cell death or limiting viral reactivation into the lytic state. Both of these genes are believed to have a seed sequence on their 3’ untranslated region that miR-190 can interact with, leading to an altered expression of these genes.

Methods: Luciferase plasmids were synthesized by obtaining primers for TP53INP1 and NR4A3 3’ untranslated regions, performing PCR using cDNA from 293T cells, and inserting these products into pMIR-REPORT luciferase plasmids. Mutagenic clones were synthesized by deleting the hypothesized seed sequence via site-directed mutagenesis. Plasmids were then placed into competent bacterial cells for amplification and antibiotic selection. Plasmids grown from competent cells were sequenced. After confirming the sequence, 293T cells were transfected with the luciferase plasmids, cultured, lysed, and analyzed using a Dual-Luciferase® Reporter Assay System.

Results and Conclusions: In the presence of miR-190, the 3’UTR of TP53INP1 is targeted through its predicted seed sequence. After adjusting PCR parameters and using different PCR equipment, we were able to successfully amplify the 3’UTR portions with potential seed sequences. Co-expression of miR-190 and the 3’UTR of NR4A3 resulted in reduced luciferase activity. Mutagenesis experiments of the 3’UTR of NR4A3 to identify its seed sequence are ongoing.
ROLE OF NHP2 IN DNA DAMAGE RESPONSE

Veena Kakarla
Principle investigator: Dr. Faizan Alawi
Department of Pathology

Introduction: Dyskerin is an essential and evolutionarily conserved protein that is required for H/ACA ribonucleoprotein biogenesis (Meier, 2006). Together with its obligate binding partners NHP2, NOP10 and GAR1, dyskerin binds to and stabilizes non-coding H/ACA RNA molecules within these complexes. All H/ACA RNAs are characterized by a double hairpin secondary structure. There are over 100 known human H/ACA RNAs including telomerase RNA (TERC) and subsets of small nucleolar and Cajal body RNAs (Meier, 2006). Through binding to these RNAs, dyskerin plays important roles in precursor ribosomal RNA processing and in telomere homeostasis (Mason, 2011).

Dyskeratosis congenita (DC) is a genetically heterogeneous, chromosomal instability disorder (Atkinson, 2008). Autosomal recessive DC is caused by mutations in NHP2 or NOP10 and is characterized by telomere dysfunction. Work from Dr. Alawi's lab as well as those of other investigators suggests that loss of dyskerin has no overt effect on rRNA processing (Alawi, 2011; Mitchell 1999). This led Dr. Alawi to investigate other possible functions for dyskerin in human cells. Since DC is a chromosomal instability disorder, this prompted Dr. Alawi to investigate the role of DC genes in the DNA Damage Response.

DNA double-strand breaks (DSBs) are the most lethal form of DNA damage (Seviour, 2010). Recent work in Dr. Alawi's lab suggests that loss of dyskerin function impairs the cellular response to DSBs. One of the cell lines that Dr. Alawi used in his studies is the osteosarcoma cell line U2OS. These cells do not express either TERC or TERT and lack telomerase activity. Thus, the role of dyskerin in the DDR is not dependent upon its association with either of these factors. However, dyskerin depletion does increase the turnover of its binding partners NHP2, NOP10 and GAR1 (Meier, 2006). As noted above, germline mutations in NHP2 and NOP10 are associated with autosomal recessive forms of DC (Mason, 2011). This leads us to hypothesize that loss of H/ACA ribonucleoprotein integrity disrupts the DDR. We further propose that depletion of any individual component of the complex will impair the cellular response to DNA DSBs.

Specific Aim: To determine if loss of NHP2 function disrupts the DDR. Like dyskerin, NHP2 is a core component of H/ACA ribonucleoproteins. Loss of dyskerin increases NHP2 turnover (Meier, 2006). Conversely, loss of NHP2 also increases dyskerin turnover. This leads us to hypothesize that like dyskerin, loss of NHP2 function will also disrupt the DDR. To test this hypothesis, we will investigate the effects of NHP2 depletion on various DDR biomarkers, DDR-induced cell cycle checkpoint activation and apoptosis.

Methods and Materials: siRNA transfection, Protein extraction, Western blots, Cell cycle analysis, Apoptosis assay, Cell proliferation assay, Microscopic analysis of the cells

Results and Conclusion: Preliminary cell cycle data indicated no statically significant difference between controls exerted on cell cycle phases by Nola2 and control U2OS strain cells. In addition, western blot data indicated no significant difference between levels of DNA damage response molecules in Nola2 and control U2OS strain cells. Future studies will aim to explore the potential role of NHP2 in DNA damage response further.
Title: Diabetes Reduces Mesenchymal Stem Cells Through Altering Apoptosis and Proliferation

Kang I. Ko, Leila S. Coimbra, Dana T. Graves

University of Pennsylvania, School of Dental Medicine, Department of Periodontics

Objectives: Diabetes mellitus decreases the amount of bone formation. The goal of this study was to test the hypothesis that diabetes reduces the number of mesenchymal stem cells (MSCs) and to test if this occurs through a mechanism involving diabetes-enhanced inflammation.

Introduction: Mesenchymal stem cells (MSCs) are bone marrow-derived multipotent stem cells that give rise to a number of cell types including adipocytes, osteoblasts, and chondrocytes. MSCs play an essential role in bone formation, thus they are indispensible for an appropriate fracture healing. However, whether or not diabetes affects MSCs in fracture healing has not been investigated.

Methods: An experimental mouse model of fracture-healing was used to test the impact of diabetes on MSCs in areas of bone formation. Type-1 diabetes was induced by treatment of mice with multiple low-dose streptozotocin. To determine whether the results were specifically due to diabetes, a diabetic group was treated with slow-release insulin. To test whether diabetes-enhanced inflammation affects MSCs, normoglycemic and diabetic mice were treated with tumor necrosis factor (TNF) inhibitor, pegsuntercept. Closed fracture of the femur was induced, and areas of bone formation were identified in H&E-stained paraffin sections. The relative number of MSCs was assessed by immunohistochemistry using antibody to CD271 and Sca-1. Double-immunofluorescence was used to identify double-positive TUNEL+/CD271+ apoptotic MSCs and Ki67+/CD271 double-positive proliferating MSCs. Oxidative stress was measured by using antibody to 8'-OHdG. Statistical analysis was prepared by one-way analysis of variance.

Results: Diabetic mice had a 40% reduction in CD271+ MSCs in areas of bone formation (p<0.05), which was reversed by insulin-treatment. MSCs had a 3.2-fold increase in apoptosis in diabetic mice compared to normoglycemic control mice (p<0.05), and insulin-treatment decreased MSC apoptosis in diabetic mice so that it was similar to control mice (p>0.05). When inflammation was inhibited by treatment of a TNF blocker, there was a 1.6-fold increase in the number of MSCs (p<0.05). Pegsuntercept treatment increased the number of MSCs by reducing apoptotic MSCs by 3.6-fold (p>0.05) and increasing proliferating MSCs by 2.2-fold (p>0.05). There was increased oxidative stress within MSCs in diabetic mice (p<0.05), and this was restored to normal level by pegsuntercept treatment (p>0.05).

Conclusion: Diabetes significantly reduced the number of MSCs in areas of bone formation, which is due in part to diabetes-enhanced TNF levels. This occurs through a mechanism that involves both enhanced apoptosis and reduced proliferation of MSCs.
Abstract:
Aggregatibacter actinomyetemcomitans is a bacterium that is known to be associated with localized aggressive periodontitis (LAP). One of the virulence factors that this organism produces is the cytolethal distending toxin (Cdt). This toxin is composed of three different subunits, A, B, and C, which have distinct functions. Subunits A and C mediate binding and internalization into host epithelial cell, respectively, and subunit B displays DNase activity that causes cell cycle arrest and, possibly, apoptosis. Upon exposure to this toxin the gingival epithelium shows changes in cell junction integrity and morphology. The gingival epithelium, includes both keratinized and non-keratinized layers which act as a physical barrier to invading microbial pathogens. The epithelial cells in these layers are characterized by their state of differentiation. As cells migrate towards the surface of the epithelium they differentiate by changing their expression of keratins, cytokeratins and structural proteins. Although the control of changes in protein expression and differentiation in epithelial cells is not well understood, it has been shown that exposure to increased Ca++ results in in vitro differentiation of epithelial cells. Our hypothesis is that epithelial cells that are in the least differentiated state, such as those in basal epithelial layer, are the most sensitive to the Cdt due their lack of structural keratin. Also, along with the ability to cause cell cycle arrest, Cdt will also induce changes in cytokeratin and structural protein expression, leading to changes in cell differentiation and disruption of epithelial cell integrity. The goal was to assess the effects of Ca++ on human gingival epithelial cells (HGEC) differentiation in the context of structural protein and keratin expression. Additionally, changes in keratin and structural protein expression were measured in primary HGEC cultures exposed to the Cdt. Expression of keratins 14 and 19 and β-catenin significantly increased in HGEC exposed to increasing concentrations of Ca++. The expression of these keratins was not altered by treatment of the cells with the Cdt. However, expression of β-catenin decreased in response of cells to the Cdt. These findings suggest that the Cdt contributed to the breakdown of epithelial cell-cell interactions in gingival tissue but may not alter the ability of the cells to differentiate.
Title: Diabetes Aggravates Periodontal Disease through a FOXO1 Mediated Process

Department of Periodontics, University of Pennsylvania, School of Dental Medicine

Student Name: Marisa Reason

Faculty Preceptor: Dana T. Graves
Sandra Pacios
Wenmei Xiao

Introduction: FOXO1 plays an important role in cytokine expression in dendritic cells in vitro. We will test whether FOXO1 expression in dendritic cells plays a role in periodontal inflammation in vivo. CD11c/Cre recombinase and FOXO1L/L mice have already been bred in our laboratory. A promoter element from CD11c restricts Cre recombinase expression to dendritic cells. Cre recombinase deletes floxed FOXO1 (FOXO1L/L) mice only in CD11c+ dendritic cells. Periodontal disease will be induced by the application of periodontal pathogens to the oral cavity as expressed below. We will compare the results in the experimental mice (CD11c.Cre+/-FOXO1L/L) versus the control mice (CD11c.Cre-/-FOXO1L/L mice). The hypothesis is that FOXO1 expression in dendritic cells is needed to fully activate an immune response in the periodontium in response to periodontal pathogens that leads to periodontal inflammation and bone resorption.

Methods/Specific Aims: Oral bacteria such as P.gingivalis and F.nucleatum were given by oral gavage (solution applied to the oral cavity). CD11c+/-FOXO1L/L (experimental) and CD11c-/-FOXO1L/L mice were exposed to six inoculation of P. gingivalis. A control group was inoculated with vehicle alone (2% methylcellulose in sterile PBS) instead of P. gingivalis and F.nucleatum. The vehicle and bacteria was inoculated into the oral cavity by application with a micropipette. This procedure is called "oral gavage" in the periodontal literature. The mice will be euthanized 6 weeks after the completion of oral inoculation. When harvesting the samples, we cut one upper jaw and one lower jaw of each mouse, fixed them with Formalin, then stored in 50% ethanol. The technical staff helped to reconstruct the data, and the original data was converted to Tiffs (by using ImageJ) since that is the pattern our analysis software (Osirix) can recognize. The samples were then analyzed and data collected pertaining to the percent of remaining bone. This was done by measuring the bone area interproximally and dividing that by the total area. Data was collected on the interproximal bone of the 1st and 2nd molar and 2nd and 3rd molar of both the mandible and maxilla. The goal is to determine if FOXO1 expression in dendritic cells has an essential role in modulating an inflammatory response to P.gingivalis and F.nucleatum that leads to periodontal bone resorption.

Results and Conclusion: After graphing the data it was found that there was no significant difference between the Cre+ and Cre- control mice in either the maxilla or mandible. However, in the experimental mice there was a significant difference between the Cre+ and Cre- mice. The Cre+ mice, which have the FOXO1 gene deleted, had significantly more bone loss than the Cre- mice.
The conclusions I made from my data build upon others previous work in the lab. Previously, it was concluded that dendritic cells lacking FOXO1 have less ability to activate lymphocytes, and less antibody found against \textit{P. gingivalis} when Cre+ dendritic cells present. Therefore, my data agrees and shows that CD11cre+ cells (lacking FOXO1) have more bone loss because they are ultimately losing a protection mechanism against the periodontal pathogens. Future work will be done to look for inflammation using immunohistochemistry determining the number of mononuclear cells and PMNs in the gingival epithelium to see the amount of inflammation present.
Abstract:

Based on our perspective and experiences there can be various treatment plan options for the patient. From the moment a patient walks into the clinic, based on patient intra- and extra-oral exam, problem list, and chief complaint, we begin to formulate a treatment plan for the patient. Our patient presented to SDM in August of 2010 as a 65 year old Caucasian male for comprehensive dental care with chief complaint “I have dental insurance and I need teeth taken out.”

Mr M had irregular visits to the emergency clinic, and the last visit was in November 2010 for an emergency visit. He was told that he needed an extraction, and wanted to get a second opinion. His past medical history includes biopolar disorder that was diagnosed 10 years ago and hospitalization for tonsillectomy as a child. He reports no allergies to medication. Current medications included Tegretol 200mg, Wellbutrin 100mg 1x/day. Mr. M denies any contributory family history and denies any use of alcohol, tobacco, or recreational drugs presently and in the past. Dental findings upon a thorough intraoral exam reveal gross caries on teeth #3 and retained root tips of teeth # 2, 7 and edentulous space on the lower arch bilaterally. # 6, 11, 14, 18, 21, 32 had moderate caries risk. Periodontally, pockets ranged 4-5mm with a localized choronic periodontitis with moderate bone loss. He had lingually tilted mandibular anterior teeth, mesially tilted molars, and a class III on the right and class I on the left side for the canine relationship. Extra oral examination included no clicks bilaterally on the TMJ and submandibular lymph nodes were non-tender, mobile, and palpable.

After discussing several treatment options with Mr. M, the treatment plan was finalized. For phase I treatment, selective SC/RP and prophylaxis were completed which was followed by extraction of root tips of #1,2,4 and 19 and non-restorable tooth #3. Teeth (#6, 11, 14, 21 and 32) that needed caries control were taken care of and #18 was endodontically treated before the phase II treatment. The most predictable treatment option which includes a 4 unit FPD of #11-14, 3 unit FPD of #18-20, bone graft and implant placement in the area of #3, 4, 29 and #30 was presented to the patient. However, Mr. M chose to go with an alternative option of having two maxillary and mandibualr removable partial dentures due to financial reasons. Therefore, upper and lower RPDs with a #18 survey crown were completed for the final phase II treatment.
In order to deliver successful dental care for each patient, a dentist should be aware of the patient’s medical, family and social history and collect as much data as possible to fully comprehend the case. More importantly, a dentist should communicate with the patient to understand the patient’s expectations and financial limitation so that he/she can provide the most realistic and predictable treatment for the patient. For Mr. M, the final treatment may not be the most ideal, but it was the most practical and predictable dental care we could provide based on the patient’s expectations and current financial situation.
Honors Research Project

Fracture Mechanics of Dental Adhesives Supplemented with PVM/MA Copolymer

Authors: Seung Hyun (Chris) Kim

Mentor: Fusun Ozer D.D.S Ph.D, Francis Mante D.M.D Ph.D

Department of Restorative Dentistry, School of Dental Medicine, University of Pennsylvania

Abstract:

Introduction: Shear and tension studies are not a good predictor of clinical success of dental adhesives because they can only determine their innate bulk properties under even stress distribution\(^1\). Because of this limitation, it is more appropriate to quantitatively assess a dental adhesive’s resistance and the interfacial stress distribution in an adhesive joint to fracture in tension using a fracture mechanics approach. Composite resin restoration has a limited lifespan of 5 years due to marginal fractures and secondary caries. According to Ozer F et al (2012), bond strengths of both etch-and-rinse and self-etch systems improved by incorporating Polymethyl-vinyl-ether-co-maleic anhydride (PMV/MA), a Gantrez-SN copolymer known to boost triclosan’s anti-bacterial activities in dentifrice products. By fabricating a heterogeneous structure of a composite-dentin joint, it is important to evaluate how PVM/MA improves its fracture toughness. Therefore, the objective of this study is to determine the effect of PVM/MA copolymer on interfacial fracture toughness (\(K_{IC}\)) of self-etch and etch-and-rinse adhesives.

Methods: Sixty-five chevron-notched dentin-composite resin specimens were prepared with sectioned human molar dentin. EsthetX HD, Clearfil SE and Prime & Bond NT were used as composite resin, self-etch adhesive and etch-and-rinse adhesive, respectively. The following testing groups were prepared, stored in distilled water for 24 hours at 37 °C, and then tested with universal testing machine at a cross head speed of 0.1 mm/min: Clearfil SE (Group 1); Clearfil SE mixed with 50 mg/ml PVM/MA in acidic primer (Group 2); Clearfil SE mixed with 50 mg/ml PVM/MA in bonding agent (Group 3); Primer & Bond NT (Group 4); Prime & Bond NT mixed with 50 mg/ml PVM/MA (Group 5). The mode of failure was examined with light microscopy and scanning electron microscopy. The \(K_{IC}\) values were statistically compared with ANOVA, and Weibull analysis.

Results: A slight improvement in \(K_{IC}\) was found in Group 2 and Group 3, but the differences were not statistically significant. Predominantly, cohesive failures were observed at the adhesive-composite resin interface in the two groups. Undissolved copolymer clumps were observed at the interface of Group 5 samples and significantly reduced \(K_{IC}\) of this group. The Weibull moduli represented a correlation between the solubility of PVM/MA copolymers in adhesives and defect distribution.

<table>
<thead>
<tr>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(K_{IC} ) [MPa m(^{1/2})]</td>
<td>0.60 ± 0.09</td>
<td>0.64 ± 0.09</td>
<td>0.68 ± 0.16</td>
<td>0.63 ± 0.09</td>
<td>0.41 ± 0.11</td>
</tr>
<tr>
<td>Weibull modulus</td>
<td>3.56</td>
<td>4.23</td>
<td>2.77</td>
<td>3.39</td>
<td>3.07</td>
</tr>
<tr>
<td>Mode of failure</td>
<td>cohesive</td>
<td>cohesive</td>
<td>cohesive</td>
<td>adhesive</td>
<td>adhesive</td>
</tr>
</tbody>
</table>
Seung Hyun (Chris) Kim cont…

**Conclusion:** PVM/MA copolymers did not improve $K_{IC}$ of the adhesives investigated. Their ability to improve fracture toughness of dental adhesives may be related to their solubility in adhesives systems.
Clinical Honors Project

Vani Takiar
Lauren Wegrynkiak

Abstract:
Treatment Considerations for Restoring a Cleft Lip and Palate Patient

Treating patients with dental anomalies is neither a simple, nor a straightforward process. Most often, the course of treating such patients involves multiple specialists, numerous treatment plans and a significant amount of planning. All of these are combined to ensure that the end result achieved is the best possible, is satisfying to the patient and is of a reasonable financial package. Considering that patients who require comprehensive dental care for dental anomalies consistently request esthetic results, it is often difficult for the dentist and specialists to provide the most ideal treatment to patients with subsequent dental limitations and inadequate finances, as was seen with patient R.M.

R.M. presented to the University of Pennsylvania School of Dental Medicine (SDM) on October 18, 2012 as a 21 year old Hispanic male for comprehensive dental care with a chief complaint, “The main reason that I am going is to make my smile better, to keep updated on my teeth and understand that I was born with a birth defect and that I am not the same as anyone else. And that I may need special care for my teeth. Basically I want to make my teeth better and make sure that they are secured and that they do not fall out of my mouth.” R.M.’s history of present illness was within normal limits as he expressed an absence of pain, swelling and intake of medications for any oral conditions. Referred to SDM from an orthodontist, R.M. was regularly seeing her for his orthodontic care – he had been in braces for approximately seven years but had not visited a general dentist at all during this time period. His past medical history was also non-contributory. However he was born with a cleft lip and cleft palate for which he underwent approximately 14 surgeries (two distraction osteogenesis surgeries, two bone graft surgeries from his hips, two surgeries for tubes placed into his ears, one LeFort I osteotomy in addition to subsequent surgeries he could not recall).¹ R.M.’s family history was non-contributory but in regards to his social history, he admitted to smoking one cigarette every two weeks in addition to drinking alcohol socially with approximately 2-3 beers on weekends. R.M. denied taking any medications but stated that he is allergic to dogs and develops watery eyes. At his initial visit to SDM, R.M.’s review of systems was also non-contributory and he presented with a blood pressure of 125/80 RAS and pulse of 64 bpm RRR.

¹ Numerous attempts were made to receive the patient’s previous dental history information to determine exactly when and which surgeries were performed. Unfortunately, no information was obtainable.
A thorough extraoral examination of R.M. revealed his submandibular lymph nodes to be within normal limits - bilaterally palpable, non-tender, mobile and less than 1 cm in size. In addition, his temporomandibular joint presented with bilateral clicking upon opening and closing but an absence of popping and crepitus. Clinical and dental findings upon a complete intraoral examination revealed: Mallampati airway class I, braces from #3-14 with a left posterior crossbite, occlusal caries on #3, missing #7, lingual aperture on #9 with significant inflammation, missing #10, buccal fistula at apex of #14, partially erupting #17, significant inflammation around mandibular anteriors demonstrating poor oral hygiene and occlusal caries on #30. Upon raising the upper lip and examining the palate, the surgical repair of R.M’s cleft lip and palate are also visible – with the palatal area still somewhat open. A periodontal evaluation revealed most probings to be within normal limits with some sporadic probings greater than 3 mm – the most significant being a 10 mm pocket on the mid-facial of #14, and no significant mobility. A radiographic evaluation revealed: evidence of a LeFort I osteotomy, impacted #1, presence of a J-shaped lesion/significant external resorption occurring at #8, internal resorption at #9, possible supernumerary tooth (#10) apical to #9, and impacted #16 and #32.

R.M’s. phase I treatment plan consisted of caries control, oral hygiene instruction/care and a regimen for smoking cessation. Operative dentistry was performed to address the occlusal caries at #3 and #30 followed by periodontal prophylaxis to subsequently improve his generalized gingivitis, as his braces were removed. In addition, an endodontic and periodontal evaluation of #14 revealed an endodontic-periodontic lesion diagnosis at the mid-facial. Tooth #14 tested negative to cold, negative to palpation and positive to percussion. A radiograph of a gutta percha cone inserted via the fistula revealed a sinus tract at the direct buccal. A root canal was subsequently planned as treatment. During phase I treatment, our clinical findings and decision of clinical approach to address #8 and #9 were also discussed with R.M. Radiographically, neither #8 nor #9 appeared to be savable while clinically, neither tooth expressed significant mobility. But the pulp of #9 could clearly be seen via its lingual aperture. R.M. also expressed extreme discontent with the large spaces between all his maxillary incisors due to the absence of #7 and #10 in addition to the lack of symmetry of his central incisors - #8 being longer than #9. Hence we determined that it would be in R.M’s best interest to have #8 and #9 extracted and provide him with an immediate replacement so as to maintain his anterior esthetics.
Regarding phase II treatment, R.M. was made aware that #14 will definitely require a crown post root canal therapy. However we discussed and presented to R.M. three different phase II treatment plans that ranged from ideal to compromised, in order to restore #7-#10 and improve his anterior esthetics. Post extraction of #8 and #9, one treatment option discussed with R.M. was the placement of implants restored with implant crowns at #8 and #9. Since #8 is in the area of the cleft palate and there is already a significant amount of bone loss, we discussed the requirement of possibly more bone grafting and subsequent tissue grafting once the implants are placed. A second treatment option discussed with R.M. was a fixed prosthesis dictated by a bridge from #6-#11 which would include as many pontic teeth as possible within the dictated mesio-distal space between #6 and #11. A final treatment plan option discussed with R.M. was the subsequent extraction of #8 and #9 followed by delivery of a removable partial denture that would replace as many anterior teeth as possible. After a comprehensive treatment plan evaluation and discussion regarding treatment options, finances and success of treatment, R.M. decided to proceed with a fixed prosthesis. Considering the inadequate amount of space to replace #7-#10, the final prosthesis will subsequently result in #5 having a facial veneer to make it appear as a canine, #6 being altered into a lateral incisor, #8 and #9 will be present as pontics, #11 will also be altered into a lateral incisor and #12 will also have a facial veneer to give it canine anatomy. The phase II treatment plan chosen by the R.M. adequately satisfies his chief complaint of making his “smile better”.

In conclusion, the case of R.M. served as an exciting and interesting learning experience that involved multiple specialists and numerous treatment plans. It was a challenge to communicate with the orthodontist and the patient our clinical and radiographic findings. However, after a thorough evaluation and discussion with R.M. about his desires and what care we can provide as dentists, we truly feel that we succeeded in providing the best care possible to satisfy and maintain his anterior esthetics.
Abstract:
Mr. R is a 29-year-old Caucasian male who presented to SDM in 2010. The patient presented with a chief complaint of “I want to continue my treatment for dental implants.” His past medical history includes no significant medical conditions, current medications, or allergies. The patient drinks alcohol socially and denies any history of tobacco or recreational drug use. The patient has a significant past dental history including the loss of teeth #7 through #11, and alveolar bone, by a traumatic fall on an escalator when he was 11 years old. Otherwise, the patient has good oral hygiene, and nutritional habits. He is at low risk for caries, periodontal disease and oral cancer. The patient has a low smile line, and upon admission had an anterior implant supported bridge 7 to 10, single unit implant supported crown on 11.

The patient presented with osseointegrated implants in sites #7, 8, 9, and 10 (Branemark non-engaging, narrow-platform implants placed in 2002) and a failing implant in the site of #11 (Astra implant placed in 2005). A treatment plan including an implant bridge from #7 through #11 was agreed upon after agreeing that #11 was hopeless. In 2011, the #11 implant was extracted 2011 following by Guided Bone Regeneration with a non-resorbable membrane. The GBR was unsuccessful and the membrane was surgically removed. A maxillary sinus lift was tried as a second attempt for setting up an implant in #11 and a Guided Tissue Regeneration procedure was performed. Soon, it was discovered that implant #10 had a guarded prognosis, with about 50% of exposed threads, and tooth #12 was exhibiting severe attachment and bone loss on the mesial side, extending to the furcation, as a result of the resorption around the failed implant, bone loss upon removal of the implant, and failed GBR at the site of #11.

A new treatment plan would have to be devised after the re-evaluation showing that both implants #10 and 11 had failed, and #12 was a tooth with an unfavorable prognosis. In the meanwhile, the patient required an interim prosthesis to replace his maxillary anterior teeth. In January 2013, a long-term provisional was delivered, splinting implants: #7, 8, and 10, with tooth #12. The provisional was fabricated using CAD/CAM technology, and acted as an interim solution until the necessary implants are osseointegrated. The current treatment plan for the patient’s definitive prosthesis is to include a mini-implant in the site of #11, and an immediate implant placement at #12. A new 6-unit FPD will then be fabricated, spanning from #7 through 12. Mr. R, a clever patient, had questions about why the previous implants failed, and if two new implants can be expected to succeed in his mouth. Literature suggests that predicting an implant’s ability to osseointegrate can be difficult, but having adequate bony support and timely loading can reduce the likeliness.
There is contention in the literature concerning splinting implants to teeth. It is hypothesized that such splinting results in the destruction of the periodontal ligament of the splinted natural teeth and can result in intrusion of the native teeth. Also of interest is the restorative dentist’s challenge of restoring implants manufactured from different companies. Such sites like www.whatimplantisthat.com attempts to address these problems. Alternatively, companies like 3i are proactively addressing this problem by allowing all their restorative components to match any of their 3i surgical implant systems.

At this time Mr. R is very happy with his interim prosthesis that splints implants with tooth #12, but understands that this is not a long-term solution.
Research Honors Project

Student Name: Justin Kang

Faculty Sponsor/Mentor - Markus Blatz D.M.D., Ph.D/Fusun Ozer D.D.S Ph.D

Abstract:

**Assaying Endogenous MMP-8 in Acid-etched Dentinal Cavity Walls**

**Objectives:**

Inhibition of matrix metalloproteinase (MMP) activity is expected to increase the long-term stability and durability of resin-based restorations by preventing degradation of denuded collagen fibrils in hybrid layer (HL). In order to determine endogenous MMP activity in HL, identification and quantification of MMPs in dentinal cavity walls are imperative. The objective of this study was to assay MMP-8 in a *single-tooth* sample containing dentinal cavity walls.

**Materials and Methods:**

Occlusal surfaces of 8 extracted non-carious human molar teeth (<2 days from extraction and maintained at -80 ºC) were removed using a low-speed diamond saw. A cavity (2x4x2 mm in dimension) was prepared on the dentinal surface and removed from the tooth crown, leaving surrounding dentinal walls of 1 mm thickness. Cavity walls were then acid-etched with 38% phosphoric acid, and each sample was pulverized using an analytic mill with liquid nitrogen, and demineralized in 1% phosphoric acid for 10 min at 4 ºC. Demineralized dentin samples were rinsed 3x with water and suspended at 1:2 ratio in extraction buffer (100 mM Tris-HCl pH 7.6, 0.1 mM ZnCl₂, 100 mM CaCl₂, 200 mM NaCl, 1% Triton X-100) containing protease inhibitor cocktail, and centrifugally concentrated approximately 2x.

Total protein concentration was determined via Modified Lowry assay. MMP-8 concentration was determined using human ELISA kit and activity by release of fluorescent substrate following experimental activation of present MMPs with APMA.

**Results:**

<table>
<thead>
<tr>
<th>MMP-8</th>
<th>Molar1</th>
<th>Molar2</th>
<th>Molar3</th>
<th>Molar4</th>
<th>Avg</th>
<th>Minus Outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>pg/mg dentin</td>
<td>0.179</td>
<td>0.465</td>
<td>0.1036</td>
<td>0.2036</td>
<td>0.238±0.157</td>
<td>0.162±0.052</td>
</tr>
<tr>
<td>Activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.255</td>
<td></td>
</tr>
<tr>
<td>(µM fluorescence)</td>
<td>2.1988</td>
<td>2.7494</td>
<td>1.4895</td>
<td>2.5841</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions:
This study demonstrates a reliable and consistent method of extracting and assaying quantity and activity of MMP-8 from a *single-tooth* dentin sample consisting of dentinal cavity walls. This novel method will contribute toward determining *endogenous activity* of MMPs present in dentinal cavity walls, and establishment of a reliable extraction method for a study to investigate selective inhibition of host-derived MMPs using dentin adhesive systems in clinical situations.
Community Health Honors Program Proposal

United Community Clinic
First African Presbyterian Church

**Fred Chen, Denise Liu, and Sung Min Kim**
Faculty Advisor: Joan Gluch, RDH, PhD
Community Preceptor: Eric Goren, MD

Abstract:
United Community Clinics (UCC), located in the East Parkside neighborhood of Philadelphia, is a student-run free clinic that provides community members with a multitude of health care and social work services. Students from the University of Pennsylvania’s School of Medicine, Nursing, Social Policy and Practice, Dental Medicine, and Undergraduate Schools provide this multi-disciplinary care for patients coming to UCC. In addition, students from area Schools of Pharmacy and Optometry attend regularly to provide their services as well. The clinic is open every Monday night from 6:00pm until 9:00pm, with community members signing up for spots beginning at 8:00am that day. After receiving a full medical work-up by either a nursing or medical student, a patient is then asked to receive a dental/oral cancer screening. The patient can opt out if he/she wishes not to receive the screening. The medical or nursing student then presents major medical findings to the dental students, and the dental students reports their findings to nursing or medical students with the screening form. The dental team provides the patient a referral form with contact information of local services where patient can receive full dental care. On average, 12 patients are seen per day at UCC general clinic, 10 patients at hypertension clinic, and 6-10 patients are seen by dental students.

This year we have worked to increase the number of patients seen by dental students during each clinic night. In previous years, the dental screening was an optional service that the patient elected to receive, but it has been changed to an “opt-out” service instead. The number of patients seen by the dental team has increased by three to five patients each night. The clinical dental screening form has been updated with more details, to have more consistency between the screening done at UCC and at Penn Dental School. The referral form to local dental offices also has been updated to give more comprehensive information to the patients about their services. Also, we increased collaboration with other student groups at Penn Dental Medicine. For example, in the weeks surrounding the Oral Cancer Walk/Run, the OCW committee spoke with patients providing them more information about oral cancer and the. We are also working on the clinic flow so that the dental students can start seeing the patients at earlier time and to increase the number of volunteers from the dental school as well.
Abstract:
Restablishing Vertical Dimension of Occlusion with Removable Prosthesis

In an aging society, partial or full edentulism is a realization in an increasing number of individuals. Bruxism, increasing polypharmacy, periodontal disease, and caries over a lifetime can cause major problems for the dentition and the orofacial complex. Combined, these etiologies can produce tooth loss and associated loss of vertical dimension of occlusion (VDO). This loss of VDO can cause temperomandibular disorder (TMD), impaired function, unacceptable esthetics, and increased pathology such as angular cheilitis. Such is the case with Ms. D.

Ms. D. presented to SDM 12/01/2011 for comprehensive care and a chief complaint of “fixing my broken front teeth and crowns”. She states she has “weak teeth” and that her crowns from previous dentists keep “falling off”. The patient has a mandibular partial denture with a left distal extension that she feels is uncomfortable and does not wear. She wants to be able to chew her food properly and have a nice smile so she feels comfortable in public. Her medical history includes hypertension, hypothyroidism, anxiety, TMD, Irritable Bowel Syndrome, and pressure neuropathy. She was hospitalized twice (2006 and October 2011) for hypertension. She is currently on 112mcg Synthroid, 40mg Lisinopril, 5mg Amlodipine, 25 mg HCTZ, 20mg Paxil, 81mg ASA, flax seed oil, fish oil, Calcium, glucosamine chondroitin, and vitamins B12, C, and D. She is allergic to Erythromycin. Review of systems revealed that the patient has chest pain upon exertion and wears glasses. She does not drink alcohol or use recreational drugs, but she has smoked 10-15 cigarettes a day for the past 20 years. Her family history includes heart disease, emphysema, lung cancer, and Type II DM.

Radiographic and clinical exam reveal generalized moderate periodontitis with moderate bone loss in the maxilla and generalized mild periodontitis with localized moderate periodontitis with mild bone loss in the mandible. Poor oral hygiene and heavy bruxism in the past led to caries, which led to weakened tooth structure and tooth fracture and failure of multiple restorations. This tooth loss and tooth fracture, combined with periodontal disease and bruxism has led to secondary occlusal trauma in the maxilla and severe attrition in the mandibular anteriors. This wear on the mandibular teeth is a part of the cause of a loss of VDO. Dental findings in the maxilla reveal failing crowns #4 (improper margins), 5 (caries), 6 (lost crown), 7 (fractured at GM), 8 (fractured at GM),12 (open margin), 13 (caries), 14 (caries). All maxillary teeth have significant root resorption and moderate periodontitis, leading to an unfavorable crown-to-root
ratio. Dental finding in the mandible reveal severe dental attrition #24-27, and remaining crowns #22, 23, 28, 30, 31 restored to level of occlusal plane dictated by #24-27.

Patient was presented with multiple treatment plans, and due to financial limitations chose the following treatment plan: maxillary complete denture, crowns #22-28 and #30-31 set to re-established lost VDO, and mandibular RPD. Phase I treatment consisted of extractions in sequence of posterior teeth #4, 5, 6, 12, 13, 14, then an immediate denture was fabricated for the day of extraction of #9, 11. Scaling and root planing was performed on mandibular teeth. After healing of the maxilla, acrylic was added to the mandibular RPD to increase the height of her existing teeth, consequently reestablishing the VDO. Acrylic was added to the denture teeth and overlaid above the natural dentition, forming a stable occlusion on a continuous acrylic platform. VDO was initially increased 1.5 mm, and patient was monitored every 2 weeks for 2 months. Patient reported increase in ease of function and reduction of TMD symptoms. After establishing a tolerable and functional VDO for patient, phase II began. #22-28 and #30-31 were prepped and provisionalized for splinted crowns #22-28 and #30-31 to support reestablished VDO. Patient is currently in splinted provisionals and wearing her adjusted mandibular RPD. Case will be completed with splinted crowns #22-28 and #30-31, with survey crowns on 22, 27, 28, 31. A mandibular RPD will be fabricated and maxillary complete denture will be relined.

This case presented an opportunity to explore the relationship between rehabilitation of a compromised dentition and vertical dimension of occlusion with increased function and decreased TMD symptoms. While we cannot prove that Ms. D’s TMJ pain decreased because of the increase in VDO, we suspect that this contributed to her lessened symptoms by placing her joint complex in a more favorable position. The reestablishment of her VDO with a removable appliance could also have been accomplished during phase II treatment through heightening of her provisionals. Using provisionals possibly could have saved chair time, but using a removable appliance provided easier access to adjusting the VDO and was less invasive to the patient. A disadvantage to the removable method is compromised esthetics due to interface between acrylic and natural tooth, but in this case, the patient presented with no showing of mandibular anteriors in smile, so esthetics were not an issue. Regardless of the method, reestablishing the VDO was imperative to providing better function and esthetics for the patient.

In conclusion, although the final treatment plan decided upon by the patient was the most appropriate due to financial limitations, the addition of multiple maxillary implants and conversion to an implant-supported maxillary overdenture would be ideal. Placing implants would prevent future bone loss, increase retention, and improve overall function. Additionally, if minor bone loss does occur, the implants will provide a stable foundation so the complete
denture will still function properly despite slight changes in the residual ridge. If the patient declines future implant placement and conversion to an overdenture, bone loss will occur in the maxilla. This will eventually change the topography of the ridge, which will decrease the fit of the prosthesis, decreasing function. This will increase the need for multiple relines or a new prosthesis that accommodates the compromised ridge. Regardless of her choice, her chief complaint has been addressed, and she is happy with the overall esthetics and function that the treatment has provided her.
Research Honors Project

Student Name: Maral Mazrooei Faculty Sponsor/Mentor - Faizan Alawi, D.D.S

Abstract:
Dyskerin Depletion Decreases The Cellular Response To Stress And Promotes Survival Through Induction Of A Senescent-Like State

I. Introduction
Dyskeratosis Congenita (DC) is an X-linked genetic disorder caused by germline mutations in the DKC1 gene that encodes dyskerin. This disorder is associated with a wide variety of phenotypes including premature aging and cancer susceptibility\(^{(1,2)}\). Telomere dysfunction and premature senescence have been suggested to underlie the pathogenesis of human X-linked DC\(^{(3,4)}\). Senescence can be triggered by endogenous and exogenous stimuli including telomere dysfunction, oxidative stress, oncogenic stress, and persistent DNA damage signaling\(^{(5)}\). Expression of many soluble signaling proteins including growth factors, secretory proteases and other modulators and components of the extracellular matrix, such as collagens and Laminin, are dysregulated during senescence and called senescence-associated secretory phenotype (SASP)\(^{(5)}\). Our results suggest that acute depletion of dyskerin via siRNAs also induces senescence. Thus, gene expression profiling of dyskerin-depleted cells was studied to determine whether these cells express a molecular profile that mimics the SASP. Senescence is a tumor-suppressive state; hence if dyskerin-related senescence can be bypassed, our findings may also provide a foundation for understanding cancer susceptibility in DC patients.

II. Methods
U2OS cells were transfected with siRNA targeting the DKC1 gene (siDyskerin) and a non-specific siRNA (siCTRL). After 72 hours, total RNA was harvested, processed and mRNA expression was analyzed using qRT PCR. This was done to determine the upregulation and downregulation of various genes in siDyskerin U2OS cells compared to the siCTRL U2OS cells. mRNA amounts were measured and the relative levels of the respective mRNAs were normalized to either ACTB or VIM expression (levels of both mRNAs remained constant). Protein levels were also examined via western blots.

III. Results
As expected, DKC1 gene was downregulated. Several genes were upregulated and downregulated ≥ 3-fold in siDyskerin U2OS cells relative to the controls. Loss of dyskerin caused a decrease in expression of several pro-apoptotic genes including caspase 3 (CASP3). Another downregulated gene was serine protease PRSS2. Upregulated genes included proteases and factors involved in extracellular matrix regulation such as SERPINB5 and
SPINK1, as well as factors controlling cellular response to exogenous stress such as HMOX1. CDKN1a (p21\(^{Cip1/Waf1}\)), which is often upregulated during senescence\(^{(5)}\), showed increased expression of 1.3 fold in the siDyskerin cells relative to the control.

**IV. Conclusions**

If dyskerin depletion causes senescence, such cells should reflect the gene expression profile of SASP. Genes SERPINB5 and HMOX1 that were upregulated ≥3-fold in dyskerin-depleted U2OS cells encode proteins that are upregulated during senescence. Additionally upregulation of CDKN1a (p21\(^{Cip1/Waf1}\)) was validated, which is a common occurrence during senescence. Finally, downregulation of CASP3 implies an anti-apoptotic phenomenon. Together, these findings suggest that loss of dyskerin induces an anti-apoptotic, pro-survival molecular profile resembling that of SASP.

**V. References**

Community Health Honors Program Proposal

The Smile Initiative: Promoting Dental Health one Smile at a Time

University City Hospitality Coalition

Sara Ahmed and Parinaz Mazar-Atabaki

Dr. Glutch and Ms. Witsch

Abstract:
With our time spent at the University City Hospitality Coalition, our goal has been to gain a deeper understanding of the health care needs of the West Philadelphia community in order to develop methods to better promote and provide preventative dental care services. UCHC located at St. Agatha’s Church offers community members an array of services that address dental health, medical and legal needs.

A majority of our program participants lack access to dental resources and suffer widely from the perils of oral disease. We continue to educate and teach proper oral hygiene while simultaneously motivating the UCHC community to take an active role in their oral health. Our progressive study involved 252 participants from African-American, Caucasian, and Asian descent. In our quest to improve oral hygiene, we have established activities geared primarily towards mastering brushing techniques, flossing, as well as other preventative measures. Encountering the same participants on a weekly basis has allowed us to create personalized progress reports assessing oral hygiene improvement, plaque indices, caries and periodontal disease risk.

Additionally, we have had the opportunity to work closely with Ms. Ellen Witsch, our registered hygienist, who supervises our intra-oral examinations and oral cancer screening. Data is collected via questionnaire to survey chief complaint, access to medical and dental insurance, oral hygiene regimen, as well as education level. Intra-oral and extra-oral exams are provided and members are encouraged to participate in weekly progress exams. The purpose of progress reports is to better understand the population's oral health needs and barriers in receiving adequate care. As an incentive to help improve oral health, we provide our active participants with more attractive, larger dental products such as whitening toothpastes, mouth rinses, and even spin brushes. The general public receives goody bags consisting of toothbrush, toothpaste, and floss.

Of our 252 participants, the majority was male and 214 were African American, thus representing 85% of the population examined. Interestingly, nearly 80% of our participant pool attained only a high school diploma and only 11% were interested in receiving oral screenings. Primary chief complaint was pain from long standing infection and recurring abscess. However, a majority also suffered from gross decay and periodontal disease. Over 58% of the population reported a lack of dental insurance and an astonishing 35% had not visited a dentist in over 10 years. Those that had seen a dentist recently within a 6-month period sought emergency treatment. Poor oral health was correlated to an increased consumption of sugar, inadequate oral hygiene, lack of education and most importantly, access to care.
Our hopes for this project have been to positively impact the West Philadelphia community so that they become more knowledgeable and motivated to take an active role in their oral health. We also hope to continue providing proper resources that will assist them in accomplishing this goal. The data collected will allow us to better tailor preventative treatment plans for community members as well as promote and implement a system whereby oral hygiene education and preventative care are actively practiced. After all, a healthy mouth gives way to a happy, bright smile.
Clinical Honors Project

Scott Kim
Min Kim

Abstract:
Functional and Esthetic Rehabilitation by Increasing Vertical Dimension of Occlusion (VDO): A Case Report

BACKGROUND:
Mutilation of tooth structures, missing teeth and wear out of restoration can cause decreased vertical dimension of occlusion (VDO), which may severely deteriorate the orofacial system. Loss of vertical dimension of occlusion is a syndrome that affects the patient functionally, esthetically, and psychologically. Rehabilitation of dentition in this condition is challenging when a lack of restorative space exists. This often necessitates increase in occlusal vertical dimension to restore the dentition into more ideal functional and esthetic forms.

CASE DESCRIPTION:
76 yo female presents to UPSDM with chief complaint of poor mastication due to multiple missing posterior teeth. Clinical examination reveals multiple missing dentitions (#1, 2, 3, 4, 10, 11, 13, 14, 15, 16, 17, 21, 29, 30, 31, 32), a lost crown on tooth #28 with exposed cast post & core, and excessive anterior overbite and anterior guidance due to loss of vertical dimension of occlusion. Maxillary Interim Partial Denture with an anterior bite block (Hawley Appliance) is used to increase vertical dimension of occlusion, after anatomical landmark measurements and facial analysis. Once the compatibility of the new vertical dimension is confirmed after 6 months of provisional period, permanent reconstruction is initiated. Teeth #5, 19, 20, and 28 were provisionalized to confirm compatibility of the newly established vertical dimension of occlusion with fixed prosthesis, and then, restored with porcelain-fused-metal survey crowns. Maxillary and Mandibular Removable Partial Dentures were fabricated to replace all missing dentitions, providing improved functional and esthetic rehabilitation with new vertical dimension of occlusion.

CLINICAL IMPLICATION:
The partial-edentulous patient with compromised esthetics and functions due to loss of vertical dimension of occlusion can be successfully treated with fixed and removable prostheses, through adequate treatment planning and precise laboratory procedures. However, conventional removable and fixed restorations have limited life spans, and therefore, long-term management and maintenance of the newly established VDO may be challenging.
Abstract:
Investigation of the Association of Iron Deficiency with Olfactory and Motor Dysfunction

Chronic occupational exposures to metals can have adversely affect the ability to smell, as has been shown in studies of metal workers. Iron in particular, which normally tightly regulated, is an essential element in the metabolism of all cells. Imbalance of Iron levels is associated with a number of neurodegenerative disorders. For example, it is well known that neurons within the substantia nigra of patients with Parkinson’s disease accumulate iron. However, little is known about the significance of low amount Iron and whether there is a link between iron deficiency and olfactory behavior in mice. In humans, smell loss is among the very first signs of Parkinson’s disease, frequently appearing long before the onset of the classical motor phenotype.

The goal of this study was to determine whether iron deficiency influences olfactory and motor function of mice. Anemia was induced using an iron deficient diet and verified by blood iron levels measured using a complete blood count (CBC) machine. Olfactory perception was tested using an operant conditioning system and an air-dilution olfactometer. Specifically, we established the differential ability of the iron deficient and control mice to discriminate between mixtures of various proportions of the enantiomers R-Carvone and L-Carvone. Rotarod® tests were used to examine motor function over the period of 4-6 weeks. In this test, the mice are placed on horizontally rotating cylinders and the time they can stay on the accelerating rotating cylinder is measured.

This ongoing study will provide key information as to how iron deficiency influences olfactory and motor function. Future studies will determine whether iron deficiency exacerbates the PD-related pathology of transgenic mouse models of PD.
Abstract:

The Dental Explorers – A Children’s Book Dedicated to Oral Health

After participating in elementary school visits during our first year of dental school, we noticed the lack of children’s books that were directed towards preventive dental care. Most of the current literature focus exclusively on visiting the dentist, and ignores the value of educating children on preventative oral health. The goal of our story is to connect the dots between oral hygiene, nutrition, and oral health. Our book follows a group of children who decide to play detective when they discover that one of the kid’s older brothers is having tooth pain and needs to see the dentist. The team follows a series of clues that takes them on a journey through a typical kids lunch, close up into the relationship between bacteria and sugar, and to a wise neighbors house who teaches them about brushing. Throughout the book the reader is tested on such topics as proper nutrition and oral hygiene. This book is intended for kindergarten and early elementary school aged children. This is the ideal target audience for such a book because children at this age are eager to learn about their health and they are very impressionable at this age. This is also the age where they may have questions regarding oral health since this is when they are getting their permanent dentition. In addition to educating the children, we hope that their parents can learn a few lessons from the story as well. Just as children are unfamiliar with the proper brushing technique, parents too have several questions about brushing, flossing, and visiting the dentist. Eventually we would like to publish the book and distribute it amongst local pediatric offices, youth centers, and schools. It is our hope that children and parents better understand the connection between our diet, our daily dental care, and our dentition once they read this book.
Mr. D is a 60 year-old Caucasian florist/event planner who has been coming to SDM since 2002 by referral from an SDM faculty who was one of his clients. Mr. D is healthy with no significant medical history, and no history of surgeries and hospitalizations. He is allergic to codeine. Mr. D had a history of tobacco use – stopped smoking 15+ years ago (1 pack would last 3-4 days) – and does not drink alcohol or used recreational drugs. Mr. D has a history of dental trauma that initially occurred about 25 years ago when he was hit by a mirror of a truck while waiting for the bus. He fell face forward, resulting in a complicated crown fracture of #8, and a horizontal root fracture (middle to coronal 1/3 of root) of #9. An outside dentist treated #8 by RCT + PFM, but provided no treatment for #9 because no mobility was observed. Radiographs were taken and Mr. D was asked to follow-up every 6 months. Pre-existing restorations included: #8 RCT/PFM, #19 PFM, #21 (O, B amalgam), #28 (O amalgam), and #30 RCT/PFM. Mr. D’s restorative work at SDM started in 2002 and included:

2002: 4-unit bridge #2-5; #29 MOL porcelain/ceramic onlay
2004: #13-15 porcelain/ceramic inlay (DO) – pontic – onlay (MOB)
   #20 ODL composite
   #31 MOL porcelain/ceramic onlay
2005: #31 MO composite (to improve contact of existing onlay)
   #20 MODB onlay-composite resin (lab)
   #13-15 (3-unit PFM bridge)
2006: #8 PFM was redone
2007: #10 F composite (Class V)
   #11 F composite (Class V)
   #12 RCT (due to pulp exposure during Class V restoration)
   #31 RCT & Provisionalization → Crown to root fracture → Extraction
2008: #12 PFM; #31 implant + implant crown (Straumann 4.8mm x 12mm)

A thorough review of his past dental history revealed that Mr. D not only had a history of dental trauma, but also numerous restoration fractures and significant gingival recession. According to Mr. D, none of his

<table>
<thead>
<tr>
<th>Tooth #</th>
<th>Initial Restoration</th>
<th>Initial Completion</th>
<th>Re-Diagnosis</th>
<th>Re-Treatment</th>
</tr>
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The following table summarizes Mr. D's fractured restorations:

On October 21, 2011, Mr. D presented to SDM as an emergency patient with a chief complaint of “I need an exam because I felt my front teeth move when I bit into a soft pretzel.” Emergency exam findings revealed #9 with a pre-existing horizontal root fracture, Grade 2 mobility, no pain on percussion or palpation, and probing depth WNL. Patient was treatment planned for extraction of #9 and an immediate implant placement, along with interim partial denture or Essix appliance depending on if implant can be immediately loaded. Patient was referred for a Perio consult where they recommended #9 extraction with socket preservation, guided bone regeneration, and implant placement.

After the extraction was completed, OraGraft was packed into the area as a bone graft material, BioGuide was used for guided bone regeneration, and it was allowed to heal for three months. The bone graft was performed because at the time of extraction the labial bone was observed to be very thin. Therefore, to ensure greater success of implant placement and integration, guided bone regeneration was completed. An Essix was provided as the provisional and the patient wore the Essix for 6-7 weeks. But, during a follow-up visit, Mr. D complained that the Essix tray was uncomfortable and irritating his gums. Therefore, the Periodontist used the de-coronated #9 to create a resin-bonded bridge. Although this provisional was more comfortable, it did not meet the esthetic needs of the patient.

After complete healing of the graft tissue, implants were placed at a bone level on #9 position in July 2012. There was no buccal perforation and implants achieved good primary stability. Biomet 3i NanoTite Certain Prevail 5/4 x 13mm bone level implant was placed. Immediate loading was not performed because the Periodontist was not sure if a gingival graft would be necessary, especially given Mr. D’s high smile line. Instead, a healing abutment (4w x 3h mm) was immediately placed and the area was sutured to preserve gingival tissue. At the 3-month follow-up, a Seibert Class I ridge defect was observed at #9 position. A tissue augmentation procedure was recommended in order to correct the defect. In preparation for the tissue augmentation procedure, the healing abutment was replaced with a cover screw to allow tissue to grow over the implant. Stage II surgery and Roll Pedicle Graft Tissue Augementation Technique was performed in November 2012. Healing abutment (4w x 3h mm) was again placed and provisionalized with resin-bonded bridge. In January 2013, a more esthetic provisional was created using a screw-in cylinder and crown-form shell. Because the implant was placed too labially, the access hole was located on the incisal edge and extended onto the
facial surface of #9. The access hole was filled with Regisil material just to cover the screws and composite on top for esthetics. Regisil was used instead of cotton pellet to avoid bacterial trap.

The treatment plan was also augmented at this time so that #8 PFM would be re-done to esthetically match the #9 all-ceramic implant-crown. Because of the patient’s high smile line and concern about esthetics, zirconia framework was recommended instead of metal for more natural-looking shades and to avoid gray shadows at the gingival margin. In addition, due to the labial placement of the implant, we recommended that the lab prepare a custom abutment for cement retained implanted supported restoration. Finally, an occlusal guard was included into the treatment plan after all Phase II treatment is completed to prevent future restoration fractures.

Open-tray final impression for #9 single implant crown and #8 all-ceramic crown was made together in February 2013 using lightbody PVS around the implant and #8, and medium body PVS in the custom tray. Diagnostic casts of the upper and lower arches were sent to the lab to give them an idea of teeth shape, incisal length, overjet and overbite. The fit of gold custom abutments and zirconium framework was confirmed with periapical radiographs. Shade selection was confirmed with the patient and clinical pictures were sent to the lab, requesting the lab to mimic shades on facial surfaces of adjacent teeth. Final crowns and abutment was inserted in April 2012. Custom abutments were torqued down to 35Ncm. #9 implant crown was cemented with Temp Bond while #8 all-ceramic crown was cemented with Fuji glass-ionomer cement.
ORAL CANCER AWARENESS

James G. Choi & Kristopher Paik & Yaniv Harel & Sajini Sasthri-R & Payal Verma & Kruti Patel

Abstract:
Oral cancer is one of the most commonly missed cancers in the United States and has a good prognosis only if diagnosed and managed early. National Cancer Institute (NIC) estimates 41,380 new diagnosis and 7,890 deaths in the year 2013. According to the National Institute of Dental and Craniofacial Research (NIDCR), African-American males have the highest risk of developing oral cancer. Incidentally, 3 in every 4 people occupying West Philadelphia are African-American and roughly over half are male. Moreover, Philadelphia has a higher incidence of oral cancer than most other cities in the United States.

The Oral Cancer Awareness Group at the School of Dental Medicine was formulated to reach out to communities in West Philadelphia to raise awareness and promote early screenings for oral cancer. We believe that this can help in lowering the disease incidence. Our group collaborated with private and public outreach programs for educating patients through brief informational presentations and distribution of educational materials. We also performed oral cancer screenings and involved ourselves in inter-disciplinary dissemination of information to students and young professionals of local universities.

Our first projects was with ‘City Lights’, a group represented by various organizations from the Southwest Philadelphia area that facilitates regional collaboration and resources between faith-based and community organizations, both private and public. An educational presentation was given focusing on oral cancers as well as on the importance of self-diagnosis and early detection by dentists/physicians. Further, we involved ourselves with community health clinics ex. The United Community Clinic (UCC), University City Hospitality Coalition (UCHC), and Sayre Health Clinic. Through these clinics we were able to screen and educate the patients on oral cancers. We held one-on-one sessions with the patients and taught them how to perform self-screening, while educating them on the importance of early diagnosis and treatment. NIH Informational pamphlets and detailed information on follow-up care was also provided.

The most important contribution of our group towards this cause was the successful organization of ‘The Annual Oral Cancer Walk and 5K’ event held at the School of Dental Medicine in April 2013 to spread oral cancer awareness. The family oriented event included free oral cancer screenings and health promotion, a motivational session by an oral cancer survivor (Mr. Christian Patchell) as well as fundraising through 5K run and walk. We had 203 participants as walkers or runners, 120 volunteers from Penn Dental, Temple Dental, Drexel Post-Baccalaureate Program, Swarthmore College, Community College of Philadelphia, and several volunteer faculty screeners from Penn Dental and Temple Dental. The event was a huge success with $15,662.34 funds raised for Oral Cancer Foundation.

In an effort to promote inter-professional education, we also organized an educational seminar event inviting undergraduate and graduate students from Penn, Drexel, Jefferson and Temple. Dr. Alawi (Oral Pathologist) held the presentation and a formal discussion on the etiology, clinical presentation, prevention and management of oral cancers.
Personal Learning:
Oral Cancer is a commonly misdiagnosed and misunderstood cancer; therefore as dental professionals it is our obligation and moral duty to educate people about the importance of early diagnosis and management of this preventable cancer.

We were able to achieve this by collaborating with various community programs and organizing several educational events over the year. The entire experience was an eye opener for all of us. We realized how lack of education can impact someone’s life and at the same time how a simple educational talk can make a difference. We now feel even more motivated to work towards this great cause. In our brief time at different community centers, we have developed a greater appreciation for preventive care and for its role in improving quality of life of a potential cancer patient.

Follow-ups still remain a major challenge, therefore it is important to incorporate a method to follow up with patients in future.

We hope that in future, students will be able to collaborate with many more organizations to spread the much-needed awareness about the risks and disastrous outcomes associated with oral cancers. This will not only help our community but will be an excellent learning opportunity for the students.
Abstract:
Mr. Le presented to SDM on 06/06/2012 as a 25 year old Asian male for comprehensive dental care and with the chief complaint of “I want to fix my teeth. I have occasional pain on my upper teeth. “Mr. Le has a fairly flexible time schedule and is very motivated, punctual, and responsible. He is concerned about esthetics and function. Mr. Le has no active medical problems. His family history is non-contributory. He has no known drug allergies and is not currently taking any medications. He denies any past surgeries, operations, or hospitalizations. As for his social history, Mr. Le uses alcohol socially and smokes half a pack of cigarettes of day although he is currently trying to quit smoking. He also has a past history of social marijuana use.
Mr. Le has restorative work at a young age. He has a history of trauma on teeth #8, 9, and 10 in 2007 and had root canals completed on #8, 9 and 10 subsequently. However, he claims to have occasional intermittent swelling, infection, and pain in that area ever since. His last dental visit was in July 2011. He has fair oral hygiene. He presents with the following amalgam restorations: 2O/OL, 3O/OL, 18O/B, 19O/B, 20O, 30O/B, and 31 O/B. He has questionable RCT on #8, 9, 10, and 14 and swelling in the area where #10 is. He has pink, firm stippled gingiva. #20 and #10 has periapical pathology.

Mr. Le’s diagnosis include: generalized mild gingivitis with localized periodontitis, endodontic failure on #10, questionable RCT on #8, #9, and #14, PAP on #20, failing restorations and recurrent decay, new caries, and dental angle class I malocclusion. The etiological causes include: trauma, poor/failed restorative and endodontic dental work, endodontic lesions, tobacco use, and poor oral hygiene. The aims for therapy include: controlling disease progress, infection control (reducing the cariogenic flora), creating a maintainable periodontal environment, improving oral hygiene, and creating an esthetic smile.

The treatment plan presented includes the following for Phase I: SC/RP for selective teeth, caries control, ext of 1, 16, 17 and 32, OHI, endo retreat of 8, 9, 10, and 14, tobacco cessation, and bleaching prior to definitive restoration of anterior teeth. Phase II consists of PFM with metal occlusal on 3 due to mal-occlusion, splinted zirconia crowns on 8 and 9, veneer on 10, PFM on 14, PFM on 20, occlusal guard, and re-eval and maintenance.

Zirconia splinted crowns are selected for 8 and 9 due to large access and regard for anterior aesthetics. Access for 10 is proportionately small; therefore the tooth may do well with veneer.
Tooth #7 is in healthy condition and displays ideal aesthetics, thus it will serve as the guide for construction of 8-10 fixed prosthetics.

Phase I treatment successfully controlled gingival inflammation and active dental disease. A complication arose when the endodontic re-treat of 14 resulted in broken and non-retrievable instrument. The prognosis for the tooth is poor, and the tooth is currently held by build-up material and being monitored. Upon completion of active caries, the patient underwent the course of bleaching until he reached his desired shade of A1, prior C2. Crown restorations on 3, 8, 9, 10 (veneer), and 20 have been shade matched 2 weeks post bleaching. A wax-up of his anterior teeth was done to achieve a visual demonstration of the modifications to be made to 8, 9, and 10. Phase II completion fulfilled the patient's request for an aesthetically pleasing smile and correcting his pre-existing dental conditions.
Clinical Honors Project

Jessica Fayans

Abstract:
There are several dental treatment options available for partially edentulous patients who wish to restore function and esthetics. As practitioners, we must remember that the patient’s treatment is never completed. We must bring our patient’s back for re-call visits, evaluate our treatment as years pass, and provide the proper oral cancer exams. At the beginning of treatment, patients need to be carefully assessed with CAMBRA: caries management by risk assessment. We can provide our patients with the best treatment option; however, it is up to the patient to maintain the prosthesis we create. With constant education, compassion and enthusiasm, we can try to provide our patients with the best outcome possible.

Miss E.B., a 50 year old white female, presented to SDM on 11/12/2013 for comprehensive dental care, with a chief complaint: “I want to fix my teeth.” Miss. E.B. has not seen the dentist since 2011, brushes occasionally, and does not floss. Her past medical history includes Hashimoto’s Thyroiditis. She is allergic to latex, penicillin and sulfa drugs. Her medications include Synthroid (112 mcg 1X daily), as well as over the counter multivitamins. Miss E.B’s family history is non-contributory, but she admits to smoking a pack of cigarettes each day, drinks socially on the weekend, and smokes marijuana daily. She has a past history of recreational drug use including cocaine and methamphetamines. This patient is classified as an ASA Class II and is medically cleared for treatment. Her extra-oral exam findings include a BP: 127/74 with a PR of 74 BPM. Her submandibular lymph nodes are <1cm, non-tender, mobile and palpable. Her TMJ is WNL, with a maximum jaw opening of 42 mm and no deviation to right or left upon closing, no pain, no clicking, no crepitus. Her OVD is 2 mm, her lip support and esthetic plane are adequate and her smile line is low. Her phonetics are WNL, her smile width is 10 teeth, her maxillary midline is centered and her mandibular midline is shifted to the left by 1 mm. Her smile is assymetrical, as her incisive curve line follows the lower lip with a slight deviation. The gingival crests of the anterior teeth are unaligned due to recession/poorly done composites, and each anterior tooth is a different shade. Intra-ortally, the oral cancer screening exam is negative. Dental findings upon a thorough intraoral exam reveal bone loss, recession, generalized teeth mobility, deep probing depths, anterior flaring, caries, missing teeth, mesial drift, super-eruption, iatrogenic dentistry, crowding of anterior teeth and tissue overgrowth of the right tuberosity. She is diagnosed with generalized chronic severe periodontitis, caries, secondary occlusal trauma, and pneumatization of the sinus. The etiology includes: smoking, substance abuse, bacteria-plaque/calculus, inadequate restorations, poor oral hygiene, tooth loss and infrequent dental visits. Due to Miss E.B.’s past use of methamphetamines, as well as her extensive restorative and periodontal needs, one can say she suffers from “Meth Mouth”.

Poster # 61
Methamphetamine users may lose their teeth abnormally quickly, a condition informally known as “meth mouth.” According to the ADA, “meth mouth” is probably caused by a combination of drug-induced psychological and physiological changes resulting in xerostomia, extended periods of poor oral hygiene, frequent consumption of high-calorie, carbonated beverages and bruxism. Methamphetamine also has the potential to cause excessive cigarette smoking for users already smoking, as was the case for Miss E.B.

Mrs. E.B.’s phase I treatment consisted of oral hygiene instructions and nutritional counseling, periodontal SCRP all four quads, open flap debridement and osseous surgery, re-evaluation and extraction of root tips 29, 31. Even after periodontal treatment, Miss E.B. still presented with extreme bone loss, generalized mobility, and recession. Miss E.B. was presented with several treatment plan phase II options that would help restore both function and esthetics. Treatment plan option 1 was a 6-8 unit implant supported FPD for both the maxillary and mandibular arches. Treatment plan option 2 was a 6 unit implant supported hybrid for both arches, treatment plan option 3 was an implant supported overdenture for both arches and treatment plan 4 was a complete denture for the maxillary arch and several options for saving many of the mandibular teeth. We presented with an option of extracting 17, 23-26; implant FPD from 23-26 (implants in 23 and 26), crown teeth 18 and 19, implant FPD 29-31. For the maxillary arch, Miss E.B. chose to receive an immediate denture and then a 4 unit implant supported overdenture. For the mandibular arch she chose to re-crown teeth #18 and #19, and get an implant bridge from 29-31. Miss E.B says that later on, if finances permit, she will opt for the implants of 23-26. The patient is aware that the prognosis of the mandibular incisors is guarded and that tooth #18 and #19 might need crown lengthening, RCT and cast-post core. The phase II treatment plan chosen by Miss E.B. will restore proper function and give her a more esthetic smile, all within her financial budget.

For phase II treatment, we will first give Miss E.B. an interim partial denture to give her more surfaces to bite on. This will help her function better and get used to having an appliance in her mouth. We will also work at evening out the occlusal plane on the mandibular arch. We will re-crown teeth #18 and #19 to the proper occlusal height and complete an enameloplasty on teeth #22-27. Then, we will place implants on teeth #29 and #31 and place an implant FPD. Next, we will complete the immediate denture. With this treatment, Miss E.B. will never go without “teeth”. We will then duplicate the immediate denture and make a surgical stent using orthodontic acrylic and barium sulfate. After healing, we will complete a bone graft and sinus lifts, place 4 implants and then complete the implant supported overdenture.
Extensive dental work takes time, money, patience and commitment. Fortunately, Miss E.B. has each characteristic. Although she did not choose the most ideal treatment plan, she has chosen to take a step in a positive direction. She is restoring her occlusion, removing decayed root tips and restoring her smile. In the future, if she continues to improve, she can opt for the implant supported FPD. This prosthesis helps to generate masticatory forces approaching that of natural teeth, whereas complete denture wearers have only been shown to exert 25% of this amount. This option is the most esthetic and a palate-less option proves to be stable. Although she did not choose the ideal treatment for her mandibular arch, she is putting in an effort to restore function and replace the posterior missing teeth. However, if she still continues to smoke heavily and brush infrequently, she is at risk for future dental infections. Miss E.B’s case is guarded, as she is a heavy smoker, marijuana abuser and does not maintain proper hygiene. With continuous education, I hope to get Miss E.B. on the right track.
Abstract:
Current consensus on minor surgical procedures (extractions and implants) for patients on oral bisphosphonates

The following case presentation and treatment plan is discussed primarily in order to focus on the current thinking with regard to conducting minor surgical procedures for patients taking oral bisphosphonates. A brief synopsis of our literature review is presented here in attempt to substantiate our treatment plan by considering relevant potential risk factors.

Mrs. W is a 58-year-old female who presented to SDM for comprehensive dental care in the beginning of May 2012. Her chief complaint was that she “want[ed] something more permanent than a flipper in the front, and need[ed] a few implants”. She further stated that she “[doesn’t] want bridges, but rather separate crowns and implants” and that she “want[s] to floss between each tooth”. She was esthetically conscious and wanted crowns on #6 thru #11 in order for all her maxillary anterior teeth to be the same shade. She wanted to replace her interim removable partial denture for #8 with an implant and crown.

She was initially diagnosed as osteopenic in 2004 and was treated with 35mg Risedronic acid (Actonel), an oral bisphosphonate, QWK for 1 year. After developing dysphagia, Actonel was discontinued. It was later determined that Actonel was not the source of her dysphagia, but rather GERD. A bone scan in 2005 and further studies in 2010 led to a diagnosis of osteoporosis. The patient then resumed taking Actonel in 2010. Mrs. W also has a history of osteoarthritis, and she took Ibuprofen as needed for pain. She has no known drug allergies.

Her dental findings upon clinical and radiographic examination revealed missing teeth numbers #5, 8, 12, 15, 17, 20, 29, 30, and 31. #16 was a microdont. #4 had a prefab post with a Fluorocore buildup that had not been restored with a crown. Existing fixed prostheses included PFM crowns on #1, 2, 13, 19, 28, and 32. Existing restorations included amalgam restorations on # 3, 14, 18, and 21; and composite restorations on #7, 9, 10, 11, and 14.

In addition to distal decay on #21, the following restorations had recurrent decay: #3D, #7M, #9M/D, #10M/D, #11M/D, #18 B/L, #26D, and #32 L. Additionally, the following restorations
were defective: #1 buccal overhang, #4 insufficient post length, #14 M marginal ridge defect, #28 L open margin and #32 L overhang. With regard to her periodontal status, pocket depths were on average 2-3mm without bleeding on probing, she displayed moderate (#23-26) and severe (#14) clinical attachment loss, and class II furcation involvement on teeth #2, 3 and 14.

Her Phase 1 treatment plan included a prophylaxis, fluoride application, oral hygiene instruction, nutritional counseling, caries control, and extractions of #16 and #18.

In devising a Phase 2 treatment plan for Mrs. W, special consideration was given to the potential risks of conducting extractions and placing implants since she had been taking oral bisphosphonates. While it has been clearly established that osteonecrosis of the jaw (BRONJ) is a real risk for patients on IV bisphosphonates, oral bisphosphonates pose a much smaller risk of developing BRONJ than their intravenous counterpart.

In conducting a literature review, it is evident that there are conflicting studies regarding implant success rates for patients taking oral bisphosphonates and for non-medicated patients. Some studies have shown a negligible difference in success rates (Jeffcoat 2006, Grant 2008, Fugazzotto 2007, Bell & Bell 2008) while others demonstrate a slight discrepancy between such success rates (Kasai et al. 2009). The American association of oral and maxillofacial surgeons and others do not contraindicate minor surgical procedures for patients taking oral bisphosphonates. It is important, however, to keep in mind that some studies have identified certain risk factors associated with oral bisphosphonate use, factors of which the dental provider should be aware. Being a middle-aged female, having implants placed in the maxilla, and taking oral bisphosphonates for a period longer than three years have been shown to increase the risk of developing post-surgical complications.

In addition to addressing the patient’s chief complaint and high esthetic demand, the treatment plans presented to the patient attempted to decrease the number of minor surgical procedures, especially in the maxilla, thereby minimizing the patient’s risk for developing complications in healing after extraction and implant placement.

Her Phase 2 treatment plan, which depended on bone quality assessment by the periodontal department, included possible bone grafting and implants on #8, 29 and 30, all ceramic crowns on #7, 9, and 10 after external bleaching on #6 and 11, and PFM crowns on #3, 4, 14, 28, and #32. #15 was not planned for replacement with an implant, leaving Ms. W. in first molar occlusion on the left side of her mouth. Additionally, #18 would not require replacement. This
would minimize her risk for implant failure due to the aforementioned higher risk for implant failure in the maxilla, as well as minimizing the number of overall surgical procedures.

An alternate treatment plan that was ultimately rejected by the patient due to esthetic concern was to utilize maxillary and mandibular removable partial dentures in conjunction with fixed prostheses. For the maxilla this would involve extraction of #3, 14 and 16, placement of a three-unit bridge from #7-9, and an RPD to replace #3, 14 and 15. For the mandible this would involve extraction of #18, survey crowns for #28 and #32 and an RPD to replace #18, 29 and 30. Although the extraction of hopeless teeth would not be avoided, this eliminates the need for implant placement altogether.

Although the second phase of treatment was not completed, this case illustrated some considerations when planning treatment involving minor surgical procedures for patients on oral bisphosphonates and the potential need for alternative treatment options.
Community Health Honors Program Proposal

Developing Tobacco Cessation Activities for Pre-Doctoral Students and their Patients

Christine Martin

Site: SDM Pre-Doctoral Clinics

Faculty Advisor: Jill Klischies, RDH

The detrimental systemic health effects of tobacco use in its varied forms have been well-documented over the years. As dental students, we are well aware of the sound body of scientific research establishing additional causative and correlative relationships between tobacco use and a myriad of poor dental health outcomes, including periodontal disease, caries, oral cancer, implant failures, poor wound healing, altered microbial flora, and poor dental esthetics. During their third and fourth years at SDM, students are expected to carry out a minimum of two tobacco cessation counseling activities. Yet, there seems to be a general reluctance among students to fully engage their patients in tobacco counseling activities, primarily due to lack of confidence regarding how to have these necessary, albeit potentially uncomfortable, conversations with our patients.

To that end, I have been working on a project under the guidance of Ms. Jill Klischies and the division of Community Oral Health at SDM, which would aim to guide developing young dental clinicians in carrying out tobacco cessation counseling activities. Our goals for this project are to develop readily accessible, comprehensive, and concise reference materials for pre-doctoral students. According to Ms. Klischies, state laws vary in their allowance of dentists to prescribe tobacco cessation medications to patients outside the context of a structured tobacco cessation counseling program. In addition, we feel that many of our clinical faculty do not regularly prescribe these medications and would not feel comfortable prescribing them with their students. As such, the emphasis of our project is to increase students’ confidence in their abilities to carry out tobacco cessation conversations with their patients, recommend over the counter products, refer patients to tobacco cessation programs, and initiate a lifelong practice of counseling patients against tobacco use.

In order to do so, we are compiling comprehensive and concise reference materials for pre-doctoral students with the aim of empowering developing dental clinicians to engage their patients through motivational interviewing and cessation counseling activities. To that end, I conducted literature reviews to draw upon an existing wealth of evidence-based recommendations and tailored them to the needs of dental students and their patients. Topics covered in the student reference materials include guidelines for determining individual patient motivations, willingness, and readiness for change. The materials also provide categorized talking points for tobacco cessation counseling based upon where an individual patient falls in terms of readiness to quit, and how to encourage a patient to consider cessation through motivational interviewing. By working with the IT department, Ms. Klischies and I would like these materials to be readily accessible to our students, both on the COH department website and eventually through user-friendly roll-over links on the Health Promotion Treatment Plan form on Inside SDM, as was done in an honors project last year relating to oral hygiene product recommendations. The reference materials to be linked to the electronic clinical forms will
provide chair-side information about various over the counter cessation products, as well as information about online resources and referrals to tobacco cessation programs.

Finally, we have made recommendations to Dr. Kuperstein in Oral Medicine to discuss a possible modification to the current History and Physical electronic clinical form. In reference to smoking behavior, the current form provides only a binary yes/no checkbox. In their publication, “Treating Tobacco Use and Dependence,” the US Department of Health and Human Services recommends that all health history forms inquire into smoking status by asking patients to indicate whether they are a current, former, or never smoker. As such, the next revision of the SDM form will provide space to record whether a patient is a current, former, or never smoker, as well as space to indicate how much tobacco the patient consumes, how many packyears, and/or how recently the patient quit smoking. Dr. Kuperstein has indicated that this revision will also provide a good method for us to track the prevalence of smoking behaviors among SDM patients, in addition to providing an opportunity to have more meaningful cessation conversations with the patients. It is our hope that by increasing students’ access to information as well facilitating opportunities for the conversations to occur; we may empower our students to empower their patients to make what is arguably one of the most beneficial changes for both their general and oral health.
Abstract:
Ms. M, a 25 year old Caucasian female presented to SDM on 11/3/2011 with the chief complaint of “My teeth are rotting and decayed.” Prior to 2008, Ms. M reports that she saw her family dentist regularly for comprehensive dental care and was in “good dental health.” However, from 2004-2010, Ms. M had a drug addiction, namely to heroin, crack cocaine, and methadone. Throughout the six years of drug abuse, the patient neglected her oral health, which resulted in rampant decay. Ms. M’s active medical conditions include Hepatitis C (diagnosed in 2006), Bipolar and panic disorders (diagnosed in 2009), and seasonal allergies. The patient admits to having smoked a half a pack of cigarettes per day from 2008-2010. At the time Ms. M presented to SDM, she had been prescribed with several medications: Clonazapam (anxiety), Benadryl (seasonal allergies), Clindamycin (dental infection), Hydroxyzine (allergies), Flonase (allergies), Lamictal (bipolar disorder), Orthotrycycline (contraceptive). She reports that she has seasonal allergies and adverse drug reactions to Compazine and Codeine. An intraoral examination of Ms. M revealed caries on #3 MO, #5MDB, #7-#10 gross decay, #11 MD, #12 gross decay, #19 MOD, #20 MDB, #21 MD, #22 MBD, #23 DB, #24 MDB, #25 MD, #26 MDB, #27 MBD, #28 MD, #29 MDB, #30 MDB; PAP lesions: #4, #12, #13, #14, #18, #31; Missing teeth: #1, #16, #17, #32; Generalized mild marginal gingivitis; Bilateral TMJ disturbances: Bilateral symptomatic clicking, and Angle Class I malocclusion.

The etiology of the dental disease can be mainly attributed to a history of drug use: heroin (2004-2006), crack cocaine (2004-2006), and methadone (2006-2010); and was exacerbated by a poor diet, poor oral hygiene, plaque, calculus, failing restorative dentistry, and a possible genetic predisposition to dental caries. Heroin is an opioid analgesic that produces a state of euphoria. Heroin users have a higher prevalence of caries and caries-associated behaviors.\(^1\) High caries rate is due to general personal neglect combined with a shortage of money that may lead to greater consumption of foods high in simple sugars, in addition to the fact that heroin users crave sweet substances.\(^2\) Cocaine is an alkaloid, a naturally occurring chemical compound, that is a triple reuptake inhibitor of serotonin, norepinephrine, and dopamine. Caries incidence may be higher in cocaine users, due to the sugar added to pure cocaine.\(^3\) Methadone is an opiate analgesic used to treat withdrawal symptoms. Users typically have high sugar consumption and the high acidic content of methadone causes enamel erosion. The pattern of caries is generally cervical caries.\(^5\) Initially, Phase I and ideal Phase II treatment plans were presented to Ms. M. Since Ms. M’s maxillary teeth were virtually all non-restorable, it was recommended that all of her maxillary teeth be extracted, along with extraction of #18 and 31 retained root tips, caries control on remaining mandibular teeth, prophylaxis, oral hygiene instruction, and nutritional counseling. The ideal Phase II treatment plan presented to Ms. M consisted of a fixed maxillary implant-supported prosthesis and PFM crowns on teeth #20, 21, and 30. Due to financial constraints, Ms. M could not afford the ideal treatment plan. A modified Phase II treatment plan option included an implant-supported maxillary complete denture; however, she still could not afford this treatment option. Ms. M opted to complete all Phase I therapy, and accepted a Phase II treatment plan consisting of a maxillary immediate complete denture, a new maxillary complete denture after 6 months, and PFM crowns on teeth #20, 21, and 30.
The completed Phase I therapy included #19 MOD resin, B resin; #20 crown buildup; #21 crown buildup; #22 ML resin, DL resin, F resin; #23 DL resin, F resin; #24 DL resin, ML resin; #25 MLF resin, DL resin; #26 ML resin, DL resin, F resin; #27 RCT, crown buildup, #28 MOD amalgam; #29 MOD amalgam, B resin; and #30 crown build up restorations. Ms. M received an immediate maxillary denture on 3/29/2012. A soft reline of her maxillary immediate denture was completed on 7/20/2012 and a hard reline was completed on 11/15/2012. Ms. M is very satisfied with the esthetics of her maxillary immediate denture; however, due to ridge resorption after extraction, the denture does not fit as well as it had fit initially. A new maxillary complete denture is currently in progress, with PFM crowns on teeth #20, 21, 27, and 30 to follow. Ms. M is highly satisfied with the progress of her treatment at SDM and exclaims that her life has been positively impacted by her new smile.
Mr. A, a 40 year old Caucasian male, presented to SDM in December 2010 for comprehensive dental care with the chief complaint, “All of my teeth are loose. They hurt and I don’t like to show my teeth because they are ugly.” Mr. A states that he had regular dental visits as a child. However, he gave up on his teeth as a teenager, as he remembers being diagnosed with “about ten cavities at each dental checkup”. Since his teenage years, he has only seen a dentist for emergency care. His past medical history includes hypertension, for which he takes Atenolol/Chlorthalidone (50-25 mg), and an allergy to penicillin. Mr. A reports smoking one pack of cigarettes per day for the past 20 years, drinking alcohol socially, and occasionally smoking marijuana. He has a family history of prostate cancer on his father’s side, and his mother has Type II diabetes and hypertension.

Clinical and radiographic dental findings included gross caries (#2, 6, 14, 15, 18, 24, 27, 28, 31), missing teeth (#10-13), mobility, supra-eruption (#14 and 20), a high buccal frenum attachment (maxillary left), retained root tips (# 3, 4, 5, 19, 20, 29), gingival recession, bilateral mandibular tori, slight nicotine stomatitis, abundant plaque/calculus, generalized severe horizontal bone loss with loss of crestal cortication, and periapical radiolucencies (#5, 19, 20, 29, 30).

As Mr. A has very limited finances, his treatment was heavily dictated by cost. The major goals of his treatment were to create a functional and esthetic dentition. While the ideal treatment may have consisted of maxillary and mandibular fixed hybrid dentures or implant supported overdentures, Mr. A had a very limited budget. Consequently, Mr. A’s accepted treatment plan consisted of a maxillary immediate denture, as he did not want to be without teeth, and maintaining teeth #21-28 until he saves up enough money for a mandibular implant-supported overdenture.

Phase I treatment consisted of oral hygiene instructions, nutritional counseling and tobacco counseling. Teeth #2-5, 14, 15, 18-20 and 29-31 were extracted and a left buccal frenectomy was performed. Scaling and root planning of the mandibular LR and LL quadrants and a perio re-evaluation were completed. The remaining mandibular teeth were then splinted using an extracoronal splint to reduce mobility. Teeth #6-9 were then extracted and an immediate maxillary denture was delivered. Future treatment includes soft relines of his maxillary immediate denture followed by a hard reline 3-6 months after delivery. Furthermore, implants will be placed in his mandibular arch, his mandibular tori will be removed, and a mandibular implant-supported overdenture will be fabricated.
While Mr. A’s treatment deviated from the ideal treatment, it still provided him with a much more esthetic smile, which he was very satisfied with, as well as a more functional dentition. In cases such as Mr. A’s, where an edentulous maxilla opposes mandibular anterior teeth, one must be aware that “Combination Syndrome” may occur. However, this risk would be temporary, as Mr. A’s final treatment plan consists of a mandibular implant supported denture opposing his maxillary denture.
Abstract:
A 51 years old Caucasian female presented to UPSDM for comprehensive care with chief complain “I don't like my crowns and I have bleeding gums”. Medical history she has Hypertension, Medications Metoprolol . Allergies : NKDA. SH: negative for Alcohol drugs and tobacco use. FH: Hypertension.

Clinical Findings: failing restorations with overhangs and recurrent caries, gingivitis with localized areas of 4-6 attachment loss next to overhang restorations, and next to the crowns on #9 and 15. Existing clinically overhang PFM crowns on 7-10 that has poor esthetic and showing the metal margins at the gum line and has porcelain wearing on the palatal surface on #9. The crowns were splinted into two pairs 7 splinted to 8 and 9 splinted to 10, creating midline diastema that the patient didn’t have before placing the crowns. Radiographic bone loss evident on #9 with clinical 6mm pockets on the palatal surface. The patient reported that these crowns was made because she had a discolored tooth because of old trauma and to get better esthetic it was suggested for her to have all four anterior teeth to be crowned, and shortly after cementing these crowns on 2006, her gum was bleeding.

Treatment plan phase I included OHI, scaling and root planning, caries removal and restoring all failing restorations and overhangs. Also it included the removal of the existing crowns on #7,8,9,10 and placing temporary crowns without functional interference and with better contouring , then re-evaluating the gum response to the temporary crowns. 

For Phase II of treatment several treatment options were discussed with the patient, as this case could be approached in different ways. After having consultation with the periodontics, it was not recommended to the patient to have pocket reduction surgery on #9 because it will leave a gap in the palatal tissue which may be harder to clean. The gum responded favorably to the new temporary crowns.

The different treatments suggested were, Single all ceramic crowns with Zirconia undercasting , with informing the patient of the possibility of having more bone loss around #9 in the future which may indicate tooth extraction and implant placement, but this treatment option provide an environment that can be easily maintained .
Splinting #7,8,9 and 10 in four units Ceramic bridge with Zirconia undercasting. This treatment option can help to keep the bridge in case of more bone loss around #9 that may necessitate extraction in the future. This treatment option provide an environment that is more difficult to be maintained.

The third treatment option suggested having forced eruption on #9 to raise the bone level, with RCT, then osseous surgery before final crowns can be fabricated, the disadvantage of this treatment option is that it requires longer time to achieve the goals of the treatment. Since the area of concern is in the esthetic zone, the esthetic results may be compromised depending on the bone and gum response to the surgery.

Based on the patient preference, it was decided to fabricate four single all ceramic crowns with Zirconia undercasting, with emphasizing on the importance of home care and regular periodontal exams and cleaning.

Having the opportunity to restore this case provided me with great experience in how to address the patient’s concerns and how to work directly with the lab technician and the patient, to perform treatment in the best interest of the patient.
Clinical Honors Program Case Presentation

Dylan Keener
Keith Jackson

Abstract:
Successful treatment planning and execution of treatment by the general dentist is often dependent upon one’s ability to form and utilize a comprehensive dental team. Knowledge in all facets of dentistry will allow a practitioner to give patients many treatment options that will not only result in successful treatment, but also please the interests of our patients. Such was the case of Ms. D. Ms. D. presented to University of Pennsylvania School of Dental Medicine (SDM) in October 2011 after years of treatment in a private office. She was unhappy with her perceived mismanagement of treatment and wished for comprehensive treatment at SDM. As a 51 year old Caucasian female stay-at-home mother, Ms. D’s chief complaint was the she “needs a lot of dental work done in order to have a healthy mouth and nice smile again.” When pressed a little further, Ms. D stated that some of her goals were to have brighter teeth, an esthetically pleasing smile, replace missing teeth, and to keep as many of her natural teeth as possible.

Upon clinical and radiographic examination, Ms. D. presented with multiple failing dental restorations, mandibular partial edentulism, and a fractured maxillary lateral incisor that resulted in the coordination of dental and medical specialists including Endodontics, Periodontics, Orthodontics, and Family Medicine.

When considering treatment plan options, certain aspects were kept in mind. Naturally, satisfying Ms. D’s chief complaint of being able to smile confidently and keep her remaining natural teeth was paramount. Other considerations included long term prognosis of the treatment plan, patient’s financial capabilities, and medical precautions. Ms. D’s medical history includes hypertension, psoriasis, osteoarthritis, and a previous infection of Hepatitis C. While her current viral load for Hepatitis C is undetectable, she does take medication to manage her hypertension and psoriasis. Namely, the immunosuppressant Enbrel (Etanercept) used to treat her psoriasis was a significant consideration when developing her periodontal treatment plan.

When the eventual treatment plan, which included crown lengthening surgery, was accepted, it was recommended that Ms. D cease her Enbrel usage one week prior to surgery and wait one week after surgery before continuing the regimen.

Considering all facets of Ms. D’s case, the accepted treatment plan called for Phase I therapy to include replacement of several bulky, poor, or failing restorations along with selective root planing, generalized scaling, and oral hygiene instruction. Also included in Phase I therapy was a root canal retreatment of tooth #7 – replacing the current prefabricated post with a fiber post. Tooth #10 also received root canal therapy along with a fiber post. Composite buildups were placed on both of these maxillary lateral incisors, and the fiber posts helped with esthetics and resistance to root fracture. Phase II therapy began with replacing missing mandibular teeth with a removable partial denture. Meanwhile, tooth #10 underwent forced eruption in order to obtain enough ferrule for a crown restoration. Upon completion of the forced eruption, periodontal crown lengthening surgery was performed to gain even more clinical crown and shape the gingival architecture to maximum esthetic appearance. The latter stage of Phase II therapy will be definitive esthetic restorations of all four maxillary incisors. Teeth #7 and #10 definitely require crowns due to the root canal treatment. Teeth #8 and #9 may be either crowned or veneered depending on patient and operator preference. Finally,
Phase III treatment will consist of maintenance visits and reinforcing proper oral hygiene in order to give this treatment the best long-term prognosis.

In conclusion, there were many treatment options that could have potentially satisfied the patient’s goal of obtaining an esthetic smile and restoring her missing teeth. In particular, the decision to retain the patient’s maxillary lateral incisor by forced orthodontic eruption and crown lengthening was a decision that took a lot of coordination between many dental and medical specialists. However, due to the patient’s desire to preserve her natural dentition and her willingness to accept the treatment required, we were able to achieve a successful outcome.
Abstract:
Today there are many dental treatment options available to edentulous patients who wish to replace their missing teeth and restore their smiles. Despite the fact that conventional removable dentures can still be effective for many patients, the use of implants to treat edentulous jaws has become a standard of care for lower edentulous arch. Implant supported overdentures significantly enhances the overall quality of life with improved function, esthetic, phonetic and eliminates use of messy denture adhesives. Although science and technology have drastically improved the options available to edentulous patients, realistically patient’s treatment plans are often limited by their finances and compliance as was the case of Mr. P. Mr. P. presented to SDM on 1/23/2012 as a 67 years old African American patient for comprehensive dental care and with the chief complaint of “I want implant mounted denture”. Mrs. P regularly saw his dentist as a child, but has since only been to the dentist for emergency visits. His past medical history, Mr. P denies history of any systemic diseases, allergies and medications. Mrs. P’s family history is non-contributory, but he admits to pipe smoking approximately for the last twenty five years and now quit smoking, drinking alcohol socially and denies history of recreational drug. Extraoral exam reveal that general: WD/WN, Neuro: AAOX3, Psych: appears cooperative. CN: II-XII grossly intact, facial-cervical lymph nodes: bilateral palpable soft mobile non tender <1.0cm. Facial asymmetry/swelling is negative, and TMJ:FROM, no trismus. Vital signs: BP:124/83 RAS, P:73 RRR, Wt: 210 lb, and H:5’11”.
Intraoral exam reveal normal oral mucosa and Mallampati air way classification is class -I-. Dental findings upon a thorough intraoral exam reveal a completely edentulous maxillary dental arch and bilateral partially edentulous (Class -I- Kennedy classification) mandibular dental arch. The existing lower teeth are 20, 21, 22, 23, 24, 25, 26, 27 and 28. Teeth # 24 and 26 has existing incisal-lingual composite resin restorations as well as tooth # 28 has occlusal composite resin restoration. Mr. P currently wearing maxillary immediate denture and mandibular removable partial denture with lingual plate type major connector, MO rest seat and D guide plan on abutment tooth # 20 (combination clasp type), MO rest seat on abutment tooth # 21, inverted -V- cingulum rest on abutment teeth # 22 and 27, D guid plan on abutment tooth # 27 (combination clasp type) and D guide plan on abutment tooth # 28.

Mr. P is unsatisfied with the several rounds of relining procedures that had been done in an attempt to get a more stable and properly functioning upper immediate denture, now Mr. P’s concern is to substitute the current removable prosthesis with an implant supported overdenture. Our goal is to provide the best oral rehabilitation for Mr. P through an implant supported overdenture to restore the oral health status in terms of stability, function and esthetic as well as the patient's psychosocial point of view.

Mr. P's preventive treatment plan and risk factor assessment for dental caries and periodontal diseases indicates a low risk factor for dental caries whereas the risk factor for periodontal diseases is moderate. Consequently, the phase I treatment plan consisted of oral hygiene instruction, motivation, education, health promotion plan and nutritional counseling to promote
the oral health status of the patient. Then, a periodontal therapy is followed up including scaling and root planing of remaining lower teeth followed by four weeks reevaluation and periodontal prophylaxis procedure and oral hygiene instructions.

After reevaluation of phase I treatment was completed, Mr. P is presented with phase II treatment plan to restore his multiple missing teeth. The option of implant supported removable prosthodontics for maxillary arch and redo the mandibular metal framework removable partial is discussed. After thorough patient education and financial consideration Mr. P agreed to the proposed treatment plan that entailed a 3 main phases: the surgical phase consisted of first stage of surgical placement of 4 endosteal implants on teeth # 4, 7, 10, and 13, followed by second stage for healing abutments. The prosthodontic phase involved the prefabricated abutments, precision attachments and fabrication of implant supported maxillary complete overdenture as well as re fabrication of mandibular metal base removable partial denture utilizing the same design of previous RPD. Then, the final phase is the maintenance phase. Phase II treatment plan chosen by Mr. P worked for him because it was financially within his budget, satisfied his original chief complaint by giving him a stable and functional dental prosthesis.

Many of the problems reported by conventional complete denture wearers can be eliminated when implants are used to support fixed prostheses or removable overdentures (Narhi et al 2001). A number of reported longitudinal studies confirm the effectiveness of this treatment in the mandible even in patients with severe alveolar bone loss (chan et al 1996) but results in the maxilla have been mixed (Adell et al 1990). Furthermore, it has been shown that implants reduce the rate of resorption of the residual ridge (Feine et al 2002). An implant overdenture provides stability of the prosthesis, and patients are able to reproduce a determined centric occlusion (Tallgren 1966). The analysis illustrate that patient general satisfaction and oral health-related quality of life are greater with implant-retained overdentures than conventional dentures (Thomason 2012). The study of Pan et al, 2007 demonstrate the use of implants to retain and support the denture improved comfort, giving the patients more self-confidence and improved social interaction, in addition to oral rehabilitation. This study demonstrates that oral rehabilitation with an implant-retained overdenture is a predictable treatment modality. On the other hand, a study of Visser et al, 2006 demonstrate that patient treated with an implant-retained overdenture need more treatment interventions and treatment time than patients treated with conventional dentures. There are many differences between implant supported removable dentures and conventional (tissue supported) dentures. Generally, implant supported overdentures are more stable than conventional dentures. Once implants have been placed, they can be restored with a fixed detachable (hybrid) denture or with removable overdentures. One major advantage of hybrid denture versus an overdenture is that the hybrid denture is not removable and can only be removed by the dentist. But its disadvantage is more expensive. Heydecke et al, 2003 reported that both removable and fixed prosthesis can be attached to edentulous maxilla. Removable implant supported overdentures received significantly higher ratings of general satisfaction than fixed prostheses. Patients also rated their ability to speak and ease of cleaning significantly better with the removable overdentures. The results suggest that maxillary removable overdentures on multiple implants may provide patients with better function than fixed prosthesis.
The advantages of removable implant supported overdenture are: Facial esthetic enhanced with labial flanges, prosthesis removed at night/nocturnal parafunction, fewer implants, shorter treatment time, less expensive and daily home care is easier than fixed implant supported prosthesis. The fixed design for implant prosthesis is only appropriate for patients with minimal resorption of the alveolar bone and an optimal maxillomandibular relationship. The removable overdenture may be indicated from the outset and is no longer restricted to patients with a compromised situation in which fixed implant prostheses are not feasible. (Zitzmann et al 1999). As was the case with Mr. P.

In conclusion, after conducting more research and learning more about the implant prosthesis, in this case, the concept of implant supported removable overdenture constitutes a long term, successful functional therapy. Removable implant-retained prostheses have given the restorative dentist options to significantly improve speech, esthetics, and function to enhance the quality of life. The outcome of treatment in this case is expecting to get a better quality of life through an improvement in patient's chewing ability, denture stability and retention. The necessary technical skills are needed to fabricate a functional prosthesis. The cost, discomfort and time involvement associated with implants and implant prostheses are appropriate only when acceptable esthetic and functional results are expected.

References


Milia Alamir & Oqba Almemar cont...


Abstract:
A 57-year-old Asian female patient presented to the University of Pennsylvania School of Dental Medicine for comprehensive treatment. The patient reported that she had not seen a dentist in over 10 years. Her chief complaint was, “I need my teeth cleaned and my lower front teeth seem to be loose”. The patient’s past medical history was significant for hypertension. A completed medical consultation was received from the patient’s physician and the patient was subsequently prescribed hydrochlorothiazide. The immediate treatment goal for the indicated patient was to arrest any further dental caries and prevent any further progression of suspected periodontal disease.

Comprehensive dental charting, periodontal exam, and comprehensive oral evaluation were completed. Based on the potential complexity of the patient’s case, the initial stone models were mounted on a semi-adjustable articulator. Treatment plan options were compiled and a treatment planning consultation was completed with the patient. Based on the potential need to restore more than 6 units in the mandibular arch alone, the patient accepted treatment planned case was submitted to TPEC. After consultation with TPEC, the proposed treatment plan was accepted. The patient reported that she had necessary financial resources for the accepted treatment and elected to enroll in a payment plan.

The phase I treatment plan addressed: hopeless prognosis of mandibular anterior teeth, toothbrush abrasion, and dental caries. More specifically, this included dental prophylaxis, extraction of teeth #23-#28, Class V composite restorations on #21 and #22, and an OL composite on #15. Phase I treatment re-evaluation was completed.

Two options were presented to the patient for phase II treatment. The first option was a mandibular removable partial denture replacing teeth #23-#28 and tooth #30. The advantages of this option include: decreased cost, decreased treatment time, less invasive, and easier home care maintenance for the patient. The disadvantages for this RPD option include inability to maintain bone in edentulous areas, not as pleasing esthetically as a fixed option, the need to reduce sound enamel for rest and guide plane preps, reduced comfort compared to a fixed option, acrylic teeth wear is more rapid in comparison to porcelain teeth, and most importantly, it does not satisfy the patient’s request for no removable prostheses.

The second phase II treatment plan option included implant placement in sites #23, #26, and #28 and then a subsequently placed PFM implant FPD replacing teeth #23-#28, excluding tooth #24. The exclusion of tooth #24, and therefore a 3 mandibular incisor FPD was determined during the diagnostic wax-up of the case. A mandibular interim partial denture was fabricated to function as a temporary for the anterior teeth following extraction. Additionally, a PFM FPD from #29-#31 was also included in this treatment plan. Originally, a single implant in site #30 was planned; however, after further evaluation with CBCT, there was inadequate buccal-lingual bone in site #30 for implant placement. Thus, a PFM FPD from #29-#31 was treatment planned, and accepted by the patient. Lastly, an existing #18 PFM crown showed radiographic and clinical evidence of an open distal margin. Therefore, this tooth was treatment planned for a new PFM crown. The advantages of this second phase II option are that it includes fixed dental
restorations and thus satisfies the patient’s request for fixed dental work, it is more esthetically pleasing than a removable appliance, a FPD is potentially a longer lasting restoration with porcelain as the main material rather than acrylic, and the implants maintain bone in the edentulous areas. The disadvantages for this option include a stronger commitment to excellent oral hygiene by the patient to ensure treatment success, higher cost, longer treatment time due to surgical procedures and osseous healing time, and the need to prepare sound tooth structure on #29 and #31 for the planned FPD.

The accepted treatment plan was completed as planned. No deviations from the treatment plan occurred. Overall, the treatment was successful and the patient was more than satisfied with the outcome. Home care oral hygiene instruction for the prosthesis was given and the patient demonstrated her ability to maintain the prosthesis while in the dental clinic. Lastly, due to a previous history of periodontal disease and the newly existing fixed dental prosthesis, the patient will be maintained at a 3-month recall interval.
Clinical Honors Project

Wesam Alani

Abstract:
Patient S.H. is a 24 year old Asian male that presented to the emergency clinic for trauma to teeth #8 and 9 during a ski trip. The patient has no medical conditions and does not take any medications. The fracture line on tooth #8 was located subgingivally and on #9 was in the coronal middle third. He was referred to the endodontic clinic for treatment of both the teeth.

Endodontic treatment for both teeth was completed and post space created for the cementation of pre-fabricated posts. Both posts were cemented and access covered with zinc oxide eugenol. Patient was then referred to main clinic for a restorative evaluation and comprehensive treatment planning. It was decided that both #8 and 9 would need clinical crown lengthening in order to be restored. It was determined that this could be done using orthodontic forced eruption. S.H. was referred to the orthodontic department for evaluation and treatment.

An orthodontic evaluation was completed and it was decided that brackets could be placed on both teeth in order to extrude them. Tubes were bonded on both maxillary first molars (#3 and 14) and brackets from upper canine to upper canine (#6 to 11) using MBT prescription. An open coil was placed from #7 to 10 in order to aid in attachment of wire to brackets. The brackets on #8 and 9 were placed on the gingival third of the crowns in order to achieve extrusion. Size 16” stainless steel wire was used. Prophylaxis was completed and oral hygiene instruction reiterated.

S.H. returned two weeks later for lingual adjustment in order to create space for the extrusion. Patient returned for follow-up every two weeks for necessary adjustments. Osseous surgery may be necessary at the end of treatment in order to remodel the level of the bone as needed.
Community Service Honors

Penn Smiles Bus-Homeless Health Initiative

Natalie Laucius
Bhaven Sayania

Faculty Advisor: Dr. Joan Gluch

Abstract:
The Homeless Health Initiative (HHI), based out of the Children’s Hospital of Philadelphia, is a program started in 1988 to "provide medical and dental services to children in area shelters and assist families in accessing important health care services including health insurance, primary care and specialty care."¹ This program was implemented to navigate around the barriers to oral health care for this underserved population. On Tuesday nights, the dental students and residents from the University of Pennsylvania School of Dental Medicine (UPSDM) participate in conjunction with HHI to screen children for dental disease at the three homeless shelters for single women and children in West Philadelphia. The average population within these shelters includes young African American mothers and their children ranging from newborns to 18. The shelter system helps the mothers to develop life skills to live independently and provide for their family. For this reason, most families only stay from six to nine months.

The original objectives of HHI began as an outreach program in order to identify dental needs of the homeless children in west Philadelphia. The students were able to see direct results of their work through screenings and referrals completed on HHI nights. Oral health education was also an objective adequately achieved at screening nights. The effectiveness of this education proves to be difficult to assess because of the constant flux of families into and out of the shelters. Maintaining these objectives, the implementation of the PennSmiles Bus allowed us to expand our objectives to include preventive and restorative care. After contacting each shelter and the PennSmiles Coordinator, Ms. Debra Linkstrom, we were able to organize a screening day and two bus visits to each shelter in West Philadelphia during the summer of 2012. We used this program to take initiative and go beyond simple oral health awareness and education. We expanded our goals and provided needed treatment to the children in addition to health care education for the whole family.

The screenings which took place before the bus visits were used to obtain a medical history and informed consent for each child. During the screenings, each child was evaluated and placed into one of three categories: urgent, restorative, or preventive. Of the 29 children screened in the summer of 2012, 7% needed urgent care, 24% needed restorative care, and 69% needed preventive care. Appointments were then made for each child according to their needs on the PennSmiles Bus. During the bus visits, we implemented a survey to reassess the need of this community population. Due to families moving in and out of the shelters, 31 children were seen on the bus. Their average age was 9.25 years old. After seeing the children, 48% instead of the original 24% needed restorative work. Furthermore, the average time the children had not been to the dentist was 2.3 years with a range of 3 months to 13 years/never. Additionally, 51% only brushed their teeth once a day and one child never brushed her teeth at all. In addition to the surveys, time was taken from the screening to

Natalie Laucius & Bhaven Sayania cont...

educate the children and mothers individually about the importance of preventive healthcare and how their existing dental problems can be prevented with various daily habits. In the fall of 2012, 12 children were prescreened at a local shelter in West Philadelphia, and 9 children were seen on the PennSmiles bus, 11% needed urgent care, 56% needed restorative care, and 33% needed preventive care. The average age for this bus visit was 5.25 years old. In the spring, of 2012, 9 children were prescreened at one of the shelters. Of the 9 children screened, 0% needed urgent care, 56% needed restorative care, and 45% needed preventive care. The average age for this bus visit was 6.66 years old.

Our continued involvement in this venture has increased our awareness of the ongoing needs in our community. From this project, we see a broader scope of treating individuals especially outside the clinic. We are able to look outside the clinic walls to the individuals who have limitations and cannot find a way to the clinic on their own. We have learned that as health professionals we must be loyal not only to our patients, but also to the members of the community. We believe that continued screenings and PennSmiles visits are essential in servicing this community. In addition, we learned how imperative oral health care education is to both children and parents of this population. It is important to impress upon these patients the importance of dental care and its intricate involvement with the rest of one’s health and well-being.
Clinical Honors Project

Victor Ivancev
Maral Seroon

Abstract:
Mr. G. presents to SDM emergency admission in order to be admitted as patient in dental school dental. The patient’s chief complaint was “I am here for continuation of treatment, after having some extractions in the summer” Patient denies any pains or discomfort. Patient was at the emergency department of the dental school for emergency extractions.
Patient has concerns about the cost of dental treatment. The only medical problem that patient has is the he was diagnosed with seasonal allergies and he takes Claritin prn for the allergy. Son currently diagnosed with pancreatic cancer. Patient denies using tobacco products, alcohol or recreational drugs. Patient has a very active lifestyle and works out everyday, plays baseball at least twice a week. In the same time is helping his son during his treatment.

Dental History:
Patient has not received consistent dental care. His last visit to the dentist was more than 10 years ago and was emergency care only. His home care consists of brushing once a day and no flossing. Nutritional analysis was done in order to discover the impact of his diet on dental status. Analysis showed that patient eats fish, brown rice, vegetables, lean meats, wheat pasta, no sugars, and patient does not snack. From the fruits category he eats apples, oranges, grapes. Patient drinks water, green tea with no sugar and patient doesn’t drink soda. Patient grew up in Philadelphia and had access to fluoridated water. The extensive damage to his teeth he blames on sports injuries, such as boxing, and baseball. Another reason for the loss of tooth structure is bruxism. His bruxing was so loud that he would wake up from sleep because of the grinding noise. In addition to that infrequent visits to the dentist and not restoring the teeth when was necessary.

Extraoral Exam:
The facial profile oval to round, the submandibular lymph nodes non palpable. TMJ clicking on the left side non tender on palpation, FROM, and no deviation upon closure.
No other significant findings were found on the extraoral exam.

Intraoral Exam:
Malampati Airway Classification is class IV. Multiple severe carious lesions, broken teeth, severe attrition, periodontitis, missing teeth, edge to edge occlusion, calculus and plaque buildup, plaque coated tongue. Poor oral hygiene and there are no signs erythroplakia or leukoplakia.

Summary of Findings

<table>
<thead>
<tr>
<th>Tooth #</th>
<th>Findings</th>
<th>Tooth #</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Absent</td>
<td>17</td>
<td>O- amalgam restoration</td>
</tr>
<tr>
<td>2</td>
<td>Absent</td>
<td>18</td>
<td>Deep carious lesion. PAP</td>
</tr>
<tr>
<td>3</td>
<td>Absent</td>
<td>19</td>
<td>Retained root tip</td>
</tr>
<tr>
<td>4</td>
<td>Present and sound</td>
<td>20</td>
<td>Present occlusal attrition.</td>
</tr>
<tr>
<td>5</td>
<td>Cervical abfraction</td>
<td>21</td>
<td>Present occlusal attrition.</td>
</tr>
<tr>
<td>6</td>
<td>Present, incisal attrition</td>
<td>22</td>
<td>Present incisal attrition.</td>
</tr>
</tbody>
</table>
Occlusal Analysis:
Edge to edge occlusion with group guidance. The VDO is adequate but the lower four incisors over erupted compensating for the loss of tooth structure of the maxillary anterior teeth. Patient presents with centric stops on right and left premolars and left molar area. There is supra eruption of #14 due to the loss of tooth structure of the opposing mandibular teeth. There is no evidence of TMD.

Periodontal Exam:
Periodontal exam found periodontal pockets between and BOP. There was calculus buildup especially in the anterior mandibular teeth, plaque and staining on all teeth. The cause of staining could be from poor oral hygiene and diet.

*The Dental Diagnoses:* Carious lesions, loss of tooth structure, bruxism, supraeruption of teeth, tipping of teeth, periapical pathologies, loss of arch integrity, uneven plane of occlusion, edge to edge occlusion of the anterior teeth.

*The Periodontal Diagnosis:* Generalized gingivitis, generalized moderate with localized severe periodontitis.

*Etiology:* The patient’s dental problems are inadequate home care, dental plaque, calculus, pathogenic microflora, occasional dental care, parafuncion.

*Caries Risk Assessment:* is moderate, the reason for the moderate and not high risk assessment is the motivation of the patient to follow up with the treatment and get his dental conditions under control. In addition to that most of the teeth that are affected by the caries will be extracted due to the extensive carious lesions.

*The Periodontal Risk Assessment:* is also moderate. Most of the attachment loss is on the teeth that are hopeless and the BOP could be resolved with four quads of SRP and patient motivation to improve and save as many teeth as possible.

After the diagnoses and risk assessment patient needs several referrals to specialties in order to have an adequate treatment plan. The referrals were to the Ortho department, OMFS, Endo and Perio departments. Based on the results that we obtained from those departments and in consultation with the patient needs and preferences treatment plan goals were identified. The
Victor Ivancev & Maral Seroon cont…

treatment goals were improving on the home care and restore an optimal periodontal health. Extract all hopeless teeth and restore the missing teeth with interim restorations in order to prevent migrations of the adjacent and opposing teeth. Restore if possible patients canine guidance and obtain and Cl I occlusion. Prevent further loss of tooth structure or damage to the restorations to the bruxism. Enhance esthetics. After finalizing the treatment patient will be placed on a 3 to 4 months recall schedule.

_Treatment Plan Phase One:_ Patient agreed to extraction of the teeth #14, 18, 19, 29 and 30. Periodontal treatment with SRP four quads and reinforcing home care. Treating the carious lesion on #16 that will be used for anchorage during Ortho treatment. Ortho treatment for the mandibular arch with intrusion and lingualising of the four anterior incisors in order to create space for maxillary incisors. Realigning of the mandibular teeth so patient could receive implant treatment after the orthodontic treatment is finished. Orthodontic treatment for the maxillary arch with forced eruption of the four maxillary incisors with exposure of more tooth structure, in the same time restoring the patient to a Cl I occlusion. Retainers for maxillary and mandibular arch after the completion of the orthodontic treatment in order to prevent tooth movement.

_Treatment Plan Phase Two:_ Referral to Perio department for implant placement (if possible) in area of #2, 3, 14, 19, 29 and 30. For the anterior area on the maxillary arch crowns will be placed on the teeth #6, 7, 8, 9, 10, and 11. After the restoration of implants teeth #16, 17 and 32 will be extracted. On the right side patient will have occlusion up to the second molar and on the left side patient will be in first molar occlusion. Reason for that is the patients concern for the cost of the treatment. Also the space between #14 that is a hopeless tooth and #16 is too small for placement of two implants.

As an alternate plan for the treatment after finalizing of the ortho treatment is extractions of the teeth #32 and fabrication of maxillary and mandibular RPD.

There are concerns and complications that we have to be aware during the treatment. During the orthodontic treatment is the blunting of the roots for the mandibular teeth during the intrusion and extrusion of the posterior teeth used for anchorage. This could be avoided by keeping the intrusion forces low so the occlusion will negate the extrusion forces that are exercised by the wire. For the maxillary teeth it would be challenging to bond the brackets to the tooth structure because of lack of tooth structure. Another complication could be inadequate bone and inability for bone grafting of the implant recipient areas and falling of the implants to osseointegrate. The interocclusal space is not of a concern in this case. Complications that arise after implant restorations is porcelain chipping according to the research. Having a shorter arch on the left side (first molar occlusion) could be another question to be answered, and by looking at the data this is not a problem especially that in this case the patient will have second molar occlusion on the right side. And last and not least what kind of the restorations should be chosen for the anterior area. The evidence shows that E-Max crowns (lithium disilicate) single crowns will fulfill the hygiene and esthetic requirements.

This is a very complicated and in the same time interesting case. At the present time the patient is after the extractions stage of the hopeless teeth.


5. IPS e.max® Lithium Disilicate. http://www.ivoclarvivadent.us
Abstract:
The appearance of the gingival tissues surrounding the teeth plays an important role in the esthetics, especially in the anterior maxillary region of the mouth. Abnormalities in symmetry and contour can significantly affect the harmonious appearance of the natural and prosthetic dentition. Nowadays, patients have higher esthetic demands, which may influence the treatment of choice. Crown-lengthening surgery helps to relocate the alveolar crest apically to allow room for acceptable crown preparation and reattachment of the epithelium and connective tissue. Good communication between the restorative dentist and the periodontist is the key to achieve optimal results with crown-lengthening surgery, particularly in esthetically demanding cases. In addition to establishing the smile line, the restoring dentist evaluates the anterior and posterior occlusal planes for harmony and balance along with the anterior and posterior gingival contours. This information allows the restoring dentist to determine the ideal dimensions of the anterior maxillary teeth. On the basis of these projections, the periodontist recontours and relocates the gingival margin and the alveolar crest to achieve both an esthetically pleasing appearance and periodontal health. A proposed major determinant of the esthetics of a smile is the amount of gingival display, which can be excessive in cases of altered passive eruption.

Mr. D is a 50 yrs old caucasian male who presented to UPSDM in April 2012 with the chief complaint of ‘My dentist that I’ve seen for years told me that I might need gum surgery and caps replaced, and I wanted to come to the dental school to be diagnosed and treated’. Patient has been regularly seeing his dentist. About three years back, patient’s dentist treatment planned periodontal surgery and new PFM crowns. Patient is currently not in any pain. He is a well known business person and thus interacts with a lot of people. He is extremely dissatisfied with the current appearance of his smile and is very keen on improving his smile.

Pertinent medical history includes essential hypertension, which is well controlled with Olmesartan, an angiotensin receptor blocker. He denies any hospitalizations/surgeries. He is allergic to penicillin and developed hives in the past. Extra oral examination revealed no significant findings. His face was symmetric with a straight profile. His smile line extended to the second premolars and displayed approximately 4 mm of gingival tissues.

Dental findings include generalized plaque and calculus accumulation with severe tetracycline stains on mandibular anterior teeth. Dental caries was noted on #3, #12 and #30. Maxillary anterior teeth (#6 - #11) had PFM crowns with gingiva which encroached upon the crowns and mandibular anterior teeth were severely attrited.

Review of the full mouth series revealed no significant findings. The crestal bone level was within normal limits, and the crown to root ratio was favorable. Occlusal analysis revealed an Angle’s class I molar relationship with anterior deep bite. No signs of fremitus were observed. The patient had adequate anterior guidance upon protrusion and adequate group function upon lateral excursions.

Phase one treatment plan was completed with selective scaling and root planning, oral prophylaxis and oral hygiene instructions. Carious lesions were restored with resin.
Phase 2 treatment plan was finalized with

1. All-ceramic crowns with zirconia copings #6-#11.

2. Bonded veneers #22-#27 to cover the tetracycline stains. Options of full coverage crowns / veneers were discussed.

3. Occlusal night Guard.

Pt was referred to the department of Orthodontics for correction of the anterior deep bite. Pt refused to get the orthodontic treatment due to the time taken to achieve the desired result. After treatment planning with the patient, group leader and periodontist; alginate impressions were taken. Patient was treatment planned for crown lengthening surgery on anterior maxilla and mandible and was referred to the department of Periodontics. A wax up of the anterior maxillary and mandibular teeth was done to determine the incisogingival length, the mesiodistal width and the contour of the teeth that would provide a pleasing appearance. A surgical stent was prepared from the wax-up to guide the amount of gingival recontouring and ostectomy required. Laser gingivectomy and osseous surgery was performed under Dr. Lee Ernesto's guidance.

After 8 weeks, #6 – #11 were prepared and provisionalized. Care was taken to ensure that the margins of the temporary crown were smooth and closely adapted to ensure gingival health. Bonded resin restorations were completed on mandibular anterior teeth. Provisional crowns were left in place for 4-6 weeks. The periodontium was found to be healing well. Patient was satisfied with the appearance of the provisional crowns. Impressions of provisionals intraorally were taken and casts were poured.

Final impressions were taken. Zirconia copings were tried in and were found to be satisfactory. Shade was selected and was sent to the lab along with patient’s photographs and casts of maxillary provisionals. All-ceramic crowns were cemented with Panavia. Patient is extremely satisfied with the appearance of his smile and occlusal function. Impressions were taken for occlusal night guard.

Patient’s high esthetic needs were fulfilled by appropriate treatment planning and by providing excellent dental treatment with high quality dental materials.
Abstract:
Ms. M. is a middle-aged woman who works in administration at Princeton. She has two sons, one in college and one in high school. She came to the school seeking an affordable means of restoring her missing front tooth (#8). She was tired of her interim partial denture (flipper) and wanted fixed restoration. She was seeing and continues to see a dentist regularly for hygiene and direct restorative work, but was referred to the school to have implants placed and restored where it was more within her means financially.

Medically and dentally, she was relatively healthy. The ideal treatment for her would have involved orthodontics to correct posterior and anterior cross bites. She was treated orthodontically in her youth, however, and attributed some of her current problems to this treatment. Thus, she refused to have further treatment. The next step was to see if she would tolerate an alteration of her occlusal scheme and if it could be improved, which it seemed was possible. Looking specifically at the teeth in question, due to a dehiscence on the buccal surface of 6, the tooth was determined to be not restorable. Tooth 7, even with treatment, would have had a guarded prognosis at best. Therefore, The treatment option decided upon required two implants (at sites 6 and 8) supporting a 3-unit bridge (FPD). This could be used in correcting not only the missing tooth, but also the lost facial support on the right side and negative overjet (under bite).

The patient was very pleased with the outcome of treatment. It allowed her to regain a more natural and full smile and she was thrilled not to have to wear removable dentures anymore. In addition to the obvious dental improvement, a fullness of the maxillary lip was restored and the profile is less concave. This has even affected the appearance of the nose and other soft tissue. The patient will continue to see her dentist for periodontal recall visits every three months. Restorative work can be continued and evaluated at this time as well.

One inherent risk with the procedure is peri-implantitis. Despite already frequent recall hygiene visits, she shows some evidence of periodontitis, which is concerning. Her home hygiene techniques have improved greatly, though, which should mitigate this. The other concerns are a result of the altered occlusion. Some occlusal guidance has been added in an area where previously there was none. While contacts were light and shared amongst several teeth even during excursive movements, this will require additional care on the part of the patient, and the occlusal guard will help as well.
Abstract:
In vitro adherence of *Candida albicans* to novel denture base material

Introduction:
The injection technique for denture base materials can compensate for polymerization shrinkage and result in increased accuracy as compared to the conventional pack-pressed method (1, 2). Examples of such accuracy and various other mechanical properties have been described in the literature (2, 3, 4). The adherence of *Candida albicans*, however, must also be considered when evaluating such materials, as *C. albicans*-containing plaque on the base of dentures has been implicated in denture stomatitis, leading to pain, discomfort, and lack of compliance in many patients. Mechanically sound materials with less yeast adhesion might ultimately improve the well-being of patients. The purpose of this study is to compare the adherence of *C. albicans* to saliva-coated surfaces of both injection (Ivobase®, Ivocap®, Success®) and non-injection (ProBase®, Compression®) resin denture materials.

Methods:
Ivobase®, Ivocap®, ProBase® (Ivoclar Vivadent), Success®, and Compression® (Dentsply) discs were polished with a series of increasingly finer SiC abrasive papers (400-1200 grits), and sterilized. Saliva from one donor was centrifuged, and the supernatant was collected and filtered. Each specimen was immersed in supernatant saliva for one hour, and then placed in a phosphate-buffered-saline (PBS) solution containing a pre-adjusted concentration of *C. albicans*. Immersed specimens were then incubated at 30 °C for two hours. The yeast was detached from each disc with a sonicator, and serial dilutions were made. Dilutions were inoculated on agar plates, and after anaerobic incubation (24 h at 30 °C) colony formation units (CFUs) were counted. Additional discs of each material were then identically prepared and inoculated with *C. albicans*, dried, sputter-coated, and viewed under Scanning Electron Microscope (SEM).

Results:
According to the analysis of CFUs thus far, ProBase® witnessed the lowest level of adhesion to *C. albicans*, with IvoBase® coming in second. Ivocap® and Compression® had the highest levels of adhesion. SEM studies are ongoing.

Conclusion:
The results up to now suggest that adherence of *C. albicans* to denture surfaces is material-dependent. Chemical and mechanical properties governing the adhesion of salivary proteins and *C. albicans* to denture base materials require further investigation.
References


Clinical Honors Project

Pierre J Botes
Margarita Rivera

Abstract:
This clinical report describes the treatment of a 29 year-old Caucasian female who presented to the University Of Pennsylvania School Of Dental Medicine (SDM) in May 2012. The patient’s chief complaint was "I want to be able to smile. I have missing front teeth and have not been able to smile since I can remember". Her medical history was unremarkable. Her dental history revealed that she has missing upper laterals and lower #24,25,26. She has been under orthodontic treatment at the University of Pennsylvania School of Dental Medicine for the past 8 years. Clinical and radiographic findings revealed oligodontia of tooth #,2,7,10,15,24,25,26,31. Periodontal diagnosis is ADA type I. Thick biotype. Esthetic analysis revealed facially proportionate high smile line and maxillary central incisors W/H ratio of 88%. The aim of treatment was to create an esthetically acceptable smile by placing laterals in the missing anterior spaces and fabricate anterior mandibular restoration to restore anterior and canine guidance. Our goal was to restore patient with implants on tooth # 7,10 and veneers on tooth # 6,8,9,11 and implant #24,26 with FPD. After a thorough discussion of the advantages and disadvantages and financial considerations the patient decided to accept a maxillary anterior ceramic bridge with tooth 6,8,9,10 abutments and 7,10 pontics and mandibular implants with FPD restoration. The phase one treatment consisted of prophy and fluoride treatment with oral hygiene instructions. Phase two treatment consisted of Hanau articulation and wax up of the anterior maxilla and provisional fabrication. Preparation of tooth #6,8,9,11 and provisionalizing 6-11. Connective tissue graft in tooth #7,10 area to create ovate pontic site with a natural appearance of interdental papillae between the pontic and the adjacent tooth. After 8 weeks of healing we started to alter the ovate pontic site to create interproximal papillae. We repeated the alterations bi-weekly until we were satisfied with the result. The restorative phase of the treatment of the maxilla will consist in all ceramic crowns #6,8,9,11 pontics # 7,10 and implant supported FPD in tooth # 24,25,26.

This clinical report will also discuss the predictably achievable interproximal soft tissue dimensions for tooth to pontic restorative environment and the approach to create an interproximal papilla with an ovate pontic. Dennis P Tarnow found that papillae were present in 100 % of cases if the distance between the inter proximal contact point and the bone crest is 5mm or less; 56% if the distance is 6mm and 27% if the distance is 7mm or more. It was later summarized by Salama et al in 1998.
Garber found that ovate pontic forms give rise to lateral support as well as support of the facial free gingival margin and are recommended for use when replacing a missing tooth with a fixed bridge. The shape of ovate pontic forms are easily cleaned by the patient on a daily basis and are more conducive to ideal tissue health. The subgingival contours of an ovate pontic must not be over-contoured or they will give rise to a displacement of the surrounding tissues apically

An ovate pontic supports the facial gingival margin and allows the prosthetic replacement to appear, as would a natural tooth, to emerge from the gingiva.

This is an ongoing case. To date the soft tissue alterations with the ovate pontics are about to be completed and the final impression is about to be taken. The mandibular implants are in the planning phase in periodontal clinic. The space between tooth # 23 and 27 is retained with orthodontic brackets and wire. The limiting factor in this case is time. Time for healing and soft tissue architecture for appropriate esthetics in the pontic areas is imperative. Hopefully this case will be further along at the poster presentation, but currently, we have already done this patient a great service just in the provisional phase of treatment. Her anterior esthetics has dramatically improved and the patient is extremely happy with her treatment at SDM thus far.

<table>
<thead>
<tr>
<th>Class</th>
<th>Restorative environment</th>
<th>Proximity limitations</th>
<th>Vertical soft tissue limitations</th>
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<tbody>
<tr>
<td>1</td>
<td>Tooth-Tooth</td>
<td>1mm</td>
<td>5mm</td>
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<tr>
<td>2</td>
<td>Tooth-Pontic</td>
<td>N/A</td>
<td>6.5mm</td>
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<tr>
<td>3</td>
<td>Pontic -Pontic</td>
<td>N/A</td>
<td>6mm</td>
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<tr>
<td>4</td>
<td>Tooth-Implant</td>
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<td>Implant- Pontic</td>
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<td>6</td>
<td>Implant-Implant</td>
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Community Health Honors Program Proposal

Oral Health Literacy and Quality of Life: VA Dental Practice

Ross Uhrich
Aidan McKinlay

Site: Dental Clinic VA Philadelphia Medical Center
Advisor: Joan Gluch
Community Preceptor: Roy Feldman

Abstract:
The objective of the study that Ross Uhrich, Aidan McKinlay, Dr. Joan Gluch, and Dr. Roy Feldman (Chief of Dental Service at VA Medical Center Philadelphia) designed is to provide descriptive data for the levels of oral health literacy and quality of life among patients presenting for outpatient dental care at the VA Philadelphia Medical Center Dental Clinic. More specifically, to determine if there is a correlation between time since service discharge, oral health literacy, perception of oral health, and current oral health status. We currently have 110 veterans who have completed the study. The pool of veterans examined ranged from Vietnam War veterans to Operation Enduring Freedom soldiers. The majority of veterans who completed the study are of the Vietnam War era.

These veterans answered questions and completed two instruments, the Rapid Estimate of Adult Literacy in Dentistry 30 Word Version (REALD-30) and the Oral Health Impact Profile-14 (OHIP -14)\(^1,2\). Additional data was collected by asking the following questions: How long has it been since your service discharge? How long has it been since your last dental visit? Is your mouth currently dry? Do you currently smoke cigarettes? How many diseases are you currently being treated for? How many prescription medications do you currently take each day? Demographic information was also collected such as age, gender, race, and ethnicity. Clinical measures of oral health status including Decayed, Missing, Filled Tooth Analysis (DMFT) numbers and Perio Screening and Recording (PSR) sextant scores were collected to compare with patient reported oral health status.

The study results were recorded digitally on the Philadelphia VA Medical Center computers in each operatory room. This made it possible to interview patients and access their dental records without collecting any personal identifiers. The data was subsequently analyzed and categorized to determine if any correlations could be made between our age brackets and the results collected.

The first three of the eight months of this study have been statistically analyzed, and 85% of contacted veterans completed questionnaires. 90% were male, with average length of time since military discharge of 31 years and average age of 48 years. The mean REALD-30 score was 16 (SD=9) and mean OHIP-14 score was 20 (SD=10). Healthy literacy scores did not vary significantly by age. One-half the sample reported good-to-excellent dental health and history of

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dental visit in the last year while OHIP-14 failed to correlate positively with clinical dental measures. Based on these three months of data analysis it can be concluded that the extent to which oral healthy literacy correlated with quality of life is independent of service-connected eligibility for dental care. Further analysis of the remaining months of the study as well as a continuation of the study would be needed to solidify these conclusions.

Implications of Outreach Programs on Campus Climate and Sense of Community Among Students of Color in Dental Education

Student Name: Deena AbdulRahman  Elliot Hersh, Ph.D Beverley Crawford, D.M.D

Introduction:
The purpose of this study is to understand how students of color attending dental programs describe the campus climate they are surrounded by in the college. Specifically, we want to understand how participating in one of the several outreach programs offered by the Office of Diversity and Community Outreach enhances their educational experience. We aim to understand if these students feel as though they are part of the community in regards to the four elements necessary to achieve a sense of community (membership, influence, integration and fulfillment of needs, and shared emotional connection). Searching through the literature, a qualitative study on this issue using sense of community as a framework has never been done. This study will aid in understanding what dental institutions can improve or change in order to allow underrepresented minority students feel as though they are part of the educational community.

Methods:
Research participants included underrepresented minority students (URMs) attending dental school (first, second, third, or fourth year dental students) at the University of Pennsylvania. We were able to recruit a total of 11 participants. All dental students were enrolled in the DMD program at the University of Pennsylvania and are members of the Student National Dental Association. Since the Office of Diversity and Community Outreach holds members’ email addresses, an email was sent to the office and subsequently forwarded to potential participants. A follow-up email was sent two weeks later to encourage students to participate. A qualitative approach was used to conduct this study. In-depth one-on-one interviews gave the participants the opportunity to share in detail specific situations and recounts from which the investigators were able to draw conclusions based on the framework of sense of community. Saturation of responses was reached by the seventh interview. Responses were grouped based on common themes and ideas and related back to the four elements of sense of community.

Conclusions:
Based on the four elements of sense of community, the following conclusions were made:
Membership – It was found that the majority of participants sought relationships with other URM students, although all students had relationships with White students but not to the same degree. The majority of participants did not feel a sense of membership to the larger dental school community.
Influence – The majority of participants are members of a student organization on campus. Therefore, most of them had a sense of influence within their own community and not within the larger dental school community.
Integration and fulfillment of needs – The majority of participants feel integrated within their own community, and feel as though their values are shared mostly by other URM students.
Shared emotional connection – A majority of participants had similar backgrounds in a sense that they were all first-generation college students and came from lower socio-economic backgrounds. Therefore, they felt as though there was more of a shared emotional connection within the URM community.
Community Health Honors Program Proposal

Puentes de Salud

Rosemary Lelich
Mehreen Merchant
Kristin Santroch

Faculty Advisors: Mary Francis Cummings, Dr. Joan Gluch, Dr. Andres Pinto

Site Description:
Puentes de Salud is a non-profit organization that provides free medical care to the Latino population of South Philadelphia. Puentes takes a multi-disciplinary approach to health care and works in partnership with community members, local public schools and universities, governmental institutions and other non-profit organizations in order to augment access to healthcare for this population.

Program Description:
As Penn Dental students, our role at Puentes is multi-faceted. The services we provide include a sealant and screening program, restorative care on the PennSmiles Bus, and oral health education nights. The population we serve includes children ages 18 and under who would not otherwise have access to such care. Additionally, we routinely visit St. Aquinas Church in South Philadelphia to spread awareness of our work at Puentes and to provide oral health education. Our overall objective at the site is to serve as many patients as possible in order to improve the oral health of the Latino children of Philadelphia.

We visit Puentes every other week for our Screening and Sealant Program, where we offer free dental exams, prophylaxes and sealants to children. For each new patient, we obtain informed consent from the parent or guardian and we record all examination findings in patient charts. If the patient can benefit from sealants, we place them at that visit. If the patient has restorative needs, we inform them of our next monthly visit to Puentes with the PennSmiles Bus. On the bus, we take radiographs and offer simple restorative care. During these visits and on separate Oral Health Education nights, we speak to patients in the Puentes waiting room about oral health care and nutrition. We review topics such as proper flossing and brushing technique, the importance of regular dental check ups, the negative consequences of smoking, and nutritional counseling. With the combination of these programs, we have been able to serve a wide number of patients and spread both awareness and access to oral health care.

In order to evaluate our effectiveness at Puentes de Salud, we asked parents to complete a questionnaire for each of their children. The questionnaire asked about the child’s history of dental care, frequency of brushing/flossing, snacking habits, and their source of drinking water. Results of the questionnaire revealed that many of our patients had not seen a dentist before coming to Puentes. Also, many children reported brushing only once a day and the majority did not floss regularly. Another interesting finding was that the overwhelming majority of patients drank bottled water rather than tap water which contains fluoride. Answers to our questionnaires provided a baseline assessment by which we could make appropriate oral health care suggestions to our patients and their parents. As a result of our instructions and preventive care recommendations, we were able to see marked improvement in the oral health and hygiene of many of our patients on their six month recall visits. Another way we measured our effectiveness was to record the volume of patients seen and procedures accomplished at each visit, as well as our ability to follow up with the patient as necessary. Throughout the year, we saw dozens of children, many of whom became regular patients at Puentes.

Our work at Puentes has equipped us with a heightened sense of cultural sensitivity and enhanced our skills in effective communication across cultural barriers. By speaking with patients and learning how their culture has shaped their oral health habits, we were able to
customized our recommendations and provide appropriate preventive oral health care
recommendations. In a population that has such limited access to oral healthcare due to social
and economic barriers, we have been able to improve access little by little, spreading the word
both about our work at Puentes and putting patients in contact with Spanish speaking dentists in
the area.

**Puentes Hacia el Futuro**

*Marla Martinez*

Puentes Hacia el Futuro was developed to address the need for education support among the
large and growing Mexican immigrant population in South Philadelphia. Children in this
community face daunting challenges related to academic, cultural, and social assimilation as
they begin their education in the public school system. Puentes de Salud, the parent
organization, has partnered with Philadelphia’s Mexican immigrant community over the past
seven years to provide low cost, culturally and linguistically accessible, sustainable health care.
The program recognizes that education and health needs are connected and strives to provide
an interdisciplinary approach to improving community wellness.

Puentes Hacia el Futuro pairs elementary school children with tutors/mentors who are
undergraduate students, graduate students, and community professionals. The volunteers
provide elementary school children with homework and literacy support, as well as guide them
in exploring the Mexican culture and Spanish language, identity, and self-esteem. In particular,
my job is to provide relevant health and dental education for the children and families. The oral
health promotion is focused on many educational themes such as basic dental anatomy,
functions of teeth, good vs. bad foods, the role of bacteria, dental plaque, and most importantly,
proper dental hygiene. Tooth brushing and flossing skills are taught to the entire class of
children, employing a large tooth brush and dental puppet models. The children get rewarded
with goodie bags of dental supplies to take home and show off their new skills. Tutoring
sessions are held 3:00-5:00 p.m. on Mondays, Tuesdays, and Thursdays at Southwark
Elementary School at 1835 S. 9th St in Philadelphia.
Clinical Honors Project

Deena Alani
Laura Gart

Abstract:
Resident Research Productivity During Advanced Specialty Training in Endodontics

Background:
As part of the Commissions on Dental Accreditation standards for Endodontic programs, it is stated that students/residents must engage in scholarly activity. It is further described that the intent of this standards is to ensure that each student/resident is capable of developing a research protocol and has an active role in conduction a research project. The research experience and results must be compiled into a document in publishable format. However, to date there have not been studies that focused on how many research projects presented by endodontic residents in fact become published articles. Therefore, the purpose of this study is to describe the rate of resident peer-reviewed publications. Variables of interest include if the work was published in the Journal of Endodontics and external funding.

Design:
This study is a retrospective cohort study of endodontic residents that authored poster or oral presentations in the years 2009 and 2010 (N= 269).

Results:
The percentage of endodontic residents that had their research projects published in a peer review journal was 40% (36% in 2009 cohort, 27% in 2010 cohort). Of those published, 67% were published in the Journal of Endodontics. Funding by the American Academy of Endodontics was identified in 15% of publications.

Conclusions:
Less than half of presentations by endodontic residents actually reach publication in peer-reviewed journals. This may be due to a number of factors. This may be attributed to the lack of sufficient mentoring support, time dedicated by residents to scholarly work, or interest in publishing. Limitations of this study, however, need to be taken into account. Such limitations could include studies that had different titles from their original format or those that took longer than two years to publish.
Community Honors Program

Donguk Lee & Christopher Maliken & Vani Takiar

Penn Dental Medicine at Sayre Health Center

SITE: Sayre Health Center

PRECEPTORS: Dr. Gregg Rothstein, DDS and Deanne Wallaert, RDH

FACULTY ADVISOR: Dr. Joan Gluch, PhD

Abstract:
West Philadelphia is known to be a medically underserved and primary care health professions shortage area. With this in mind, Sayre Health Center (attached to Sayre High School), is a new Federally Qualified Health Center located in the Cobb’s Creek section of West Philadelphia. Established by the University Of Pennsylvania School Of Medicine’s Department of Family Medicine and Community Health along with the Netter Center for Community Partnerships, Penn Dental Medicine recently joined with a dental operatory approximately two years ago. Fully equipped to provide comprehensive dental care to the community, Penn Dental Medicine at Sayre Health Center is staffed by a full-time hygienist, part-time general dentists and current third and fourth year dental students participating in various outreach activities so as to tackle the community’s dental needs.

Through our services at Sayre Health Center, we planned to accomplish five major objectives: (1) to provide comprehensive dental care in a community based setting under the guidance of a practicing dentist (Dr. Gregg Rothstein), (2) to further strengthen our skills as clinicians, (3) to develop an understanding of practice management in a public health setting, (4) to work collaboratively with physicians and nurses as part of a healthcare team, and (5) to provide oral hygiene education and preventative dental care under the supervision of a practicing hygienist (Ms. Deanne Wallaert) while emphasizing the importance of oral health and its connection to systemic well-being.

For the 2012-2013 academic year, we have worked every full Friday with Dr. Rothstein to provide comprehensive dental care and every Wednesday evening with Ms. Wallaert to provide oral hygiene instruction and preventative dental care to the residents of West Philadelphia. In addition, we have participated in numerous oral cancer screenings and various health promotion outreach activities, including the Sayre Health Fair, so as to increase the awareness of oral maintenance within the larger community. Furthermore, our patient interactions have allowed us to develop a greater understanding of public health dentistry. Through these rare experiences at Sayre Health Center, not only have we improved upon our clinical skills, but we have developed good practice management, communication, interpersonal and leadership skills – all which are necessary to become a well-rounded dentist.
As Penn Dental Medicine students continue to participate in community outreach, we will definitely improve the oral health needs of the West Philadelphia community while gaining a valuable educational experience. While volunteering at Sayre, we have developed a greater appreciation for public health dentistry and for its role in providing comprehensive dental care to medically underserved and primary care health professions shortage area communities. We have gained the confidence along with many invaluable clinical and communication skills and have subsequently developed into understanding, poised and competent clinicians.
Community Health Honors Program Proposal

Dental Health Education: Promoters in South Philadelphia

Community Health Honors - Erica Damante
Faculty Advisor: Dr. Gluch
Community Preceptor: Dr. Victor Alos
Community Site: Houston Community Center

Abstract:
Dr. Alos is an acclaimed public health dentist who wholeheartedly volunteers his time to educate “promoters” through an umbrella organization of Puentes de Salud. Promoters are advocates and mentors who are trained to be community health providers. Most are from rural Mexico, and serve as a great asset in providing a link between Spanish speaking, uninsured individuals and health care facilities, such as Puentes de salud and their partners. They are mostly women who share a wealth of medical knowledge with the underserved Latino population in South Philadelphia.

Dr. Alos prepares lectures for promoters on high risk health concerns of the Mexican population. He is responsible for two grant supported projects that address cardiovascular disease and diabetes. The curriculum is developed by the CDC and NIH. Ultimately, through training the promoters and implementing an educational program at the local community health center, the promoters are then able to relay integral health information to the community. The promoters are later evaluated on their own health lessons and feedback is collected from participants. The promoters are eager to learn and educate their community. It became apparent that there was a high caries risk among the Latinos as well. The promoters became interested and enthusiastic about learning dental health, and made a special request for such lectures. Thus, this Community Health Honors project developed from the very concerns of the promoters.

Dental Health Education has been added to the promoters’ program in hopes that the community of South Philadelphia will become acclimated to dental health and confident in practicing proper oral hygiene instructions. These lectures are written for the promoters in Spanish, although most promoters also understand English as well. Lecture information is recommended by Dr. Alos and reflects subject matter that specifically addresses dental health issues in the Latino community. The goals of the lectures are to educate the promoters about the causes of dental caries, provide information about prevention, and give explanations for oral findings. They are designed to encourage and educate. Without direct access to health care or outside interventions, the Latino population in South Philadelphia will continue to suffer from dental caries. These lectures are a great start for paving the path toward dental awareness firstly among the promoters, and subsequently the Latino community.

Lectures focus on why and how caries form, how caries can be prevented, nutritional counseling, and how to brush one’s teeth. A special focus is given to caries in adolescence, a main concern of the promoters. Additionally, other lectures explain common lesions found in the mouth, as well as pathologic lesions associated with systemic diseases. Although this project is in the initial stages, future directions include the promoters incorporating this dental health information into their own health education sessions within the community.
The Latino community in South Philadelphia presents with many health concerns, but a difficulty in seeking and receiving needed health care. The promoters are dedicated to sharing their knowledge to help the community navigate the health care system, and it is the work of Dr. Alos and *Puentes de Salud* that brings these efforts to fruition. It is an honor to have the opportunity to impact the Latino community in South Philadelphia under the preceptorship of Dr. Alos, and to experience the wonderful work of public health dentistry.
Clinical Honors Project

Deena Alani

Abstract:
Patient A.S. is a 73 year old African American male presented for admission to the dental school. His chief complaint was that he had upper and lower complete dentures made at a health center in south Philadelphia that needed adjustment. He explained that he uses a significant amount of adhesive in order to keep the dentures from dislodgment. He had no sores or ulcers at the time of admission.

A.S. presented with a hemangioma on the left side of his face. He explained that he was born with the hemangioma and that he was treated for it in 1959, but is not sure what type of treatment he received at the time. A panoramic x-ray revealed several areas of calcifications on the left side of the head. The patient also has history of prostate cancer in 1993, and kidney cancer in 1997. He received laser treatment for cancer of the kidney and had his prostate removed. He visits his urologist twice per year for follow-up and has blood work done at each visit. He also suffers from glaucoma. He used to smoke but quit 20 years ago. Patient drinks about 16 oz of beer per day. A.S. used to take Naproxen for pain but does not use it anymore.

When asked about his family history, he does not recall any significant diseases that his parents suffered from, but explains that his brother has several medical issues. An intraoral examination revealed that the hemangioma involved the left side of his tongue, palate, cheek, lip, and buccal mucosa. He has a significant amount of fibrous tissue on the left side. It was difficult to see his airway because of the enlarged hemangioma in the tongue. His vital signs were normal.

Preliminary casts were taken and mounted on a Hanau articulator. His current dentures were tried on the casts and found not to fit properly. A.S. was treatment planned for fabrication of new upper and lower complete dentures. Border molding of the custom trays was challenging due to the fibrous tissue. The patient has poor control of his tongue, and therefore proper manipulation to record borders was difficult. Setting of the teeth was also challenging as the patient has poor soft tissue support due to the extension of the hemangioma in his lip and cheek.

When teeth were chosen for A.S.‘s dentures, it was decided that he would benefit most from a lingualized occlusion due to compromised retention of the dentures. Throughout the treatment, the patient lost a significant amount of weight due to the fact that he continued on a soft diet. He was very satisfied at the wax try-in and with the final prosthesis. A 24-hour follow-up appointment was completed and there were areas of soreness on the left side of the mandibular arch that were relieved. Retention was adequate and the patient reports that he uses a minimal amount of adhesive.
Abstract
THE ROLE OF ANKRD2 PROTEIN DURING MUSCLE REPAIR

Introduction:
When a muscle cell is stretched or overworked, it usually undergoes hypertrophy, which eventually leads to muscle growth. There are many pathways that control this hypertrophic growth of muscles, and the different proteins involved have been discovered in recent years. However, the exact signaling mechanism that links the mechanical perturbation of the muscle and the nuclear signaling for hypertrophy are not very well understood. Ankrd2 is part of a family of proteins called muscle ankyrin repeat proteins (MARPs), which plays a crucial role in coordinating mechanical signal transduction and growth of myocytes. Ankrd2 is localized mainly in the I-band of striated muscle, but recent studies have suggested the possibility of Ankrd2 playing a role of gene expression during muscle repair. It has been proposed that Ankrd2 is a sensor protein in the cytoskeleton that can translocate to the nucleus to affect transcription of various muscle repair genes by interacting with nuclear proteins such as premyelocytic leukemia protein (PML), p53, and YB-1. However, recent immunoblotting studies that measured the quantitative levels of Ankrd2 in the cytoplasm versus the nucleus in stretched muscles did not show a distinct translocation of Ankrd2 from the cytoplasm to the nucleus.

Methods:
In this study, we performed an immunohistochemical investigation of extensor digitorum longus (EDL) muscles that had been damaged with cardiotoxin to either confirm or refute the results of the immunoblotting study. Primary Ankrd2 Ab was used, and a rabbit polyclonal anti-Ankrd2 Ab (568 nm) was used as the secondary Ab. In order to get the best image captures as possible, we used the “deconvolution algorithm” supported by the “OpenLab” software. Images seen through a microscope often contain many different focal planes, and this method will help get rid of the out-of-focus focal planes and help us capture only the specific focal plane of interest.

Results:
In this study, we used murine EDL muscles that were injected with CTX and then used immunohistochemistry to analyze the different patterns of distribution of Ankrd2 within the cytoplasm and nucleus. Different timing of the CTX exposure were studied, such as no damage (control), 3 days post CTX, 5 days post CTX, and 11 days post CTX. After treatment with CTX, some of the samples showed a decrease in the concentration of Ankrd2 in the cytoplasm (Fig. 2), but others showed no change in the concentration (Fig. 3). None of the samples showed a
definite accumulation of Ankrd2d within the nucleus, which indicates that the translocation of Ankrd2 from the cytoplasm to the nucleus couldn’t be duplicated as in previous studies.

**Conclusion:** At the conclusion of the study, we were not able to show a translocation of Ankrd2 to the nucleus within damaged EDL muscle cells. This raises the possibility of different roles of Ankrd2 within different physiologic types of muscles. Therefore, performing similar studies on masseter muscles, which has been shown to have different physiological properties than limb muscles, could provide more insight on the exact mechanism of action of Ankrd2 as a definitive nuclear signaling protein.