Research Day
February 16, 2011

the Herman Ostrow
School of Dentistry
of USC

USC SRG
Student Research Group
Dear Students and Colleagues,

Since last year’s Research Day, the Herman Ostrow School of Dentistry of USC has enjoyed another year of significant research milestones. During 2010 and early 2011, we’ve especially showcased our potential for innovation with our substantial American Recovery and Reinvestment Act grant successes as well as a prestigious National Institute of Dental and Craniofacial Research MERIT Award and an American Association for the Advancement of Science fellowship. However, as we celebrate all these accolades, we must also recognize our faculty members’ important work in providing mentorship and research opportunities for tomorrow’s top investigators – our talented students.

As Dean of the Ostrow School of Dentistry, I am very proud of the students that take the initiative and make the most of the unique scientific opportunities at the School, whether they get involved in clinical inquiry, developmental biology, materials science, or any of the myriad other research avenues available here. It’s easy to see just how motivated and brilliant our student body is – just look through the pages of this magazine and see the impressive projects helmed by Ostrow School of Dentistry students in all programs.

Congratulations to all of our Research Day participants – your creativity and curiosity is a big part of why the Ostrow School of Dentistry continues to enjoy such an eminent scientific reputation.

Fight On!

Avishai Sadan
Dean
G. Donald and Marian James Montgomery Professor of Dentistry
Herman Ostrow School of Dentistry of USC
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Dear Colleagues,

Welcome to our 2011 Research Day, a celebration of the innovative endeavors that are the hallmark of our faculty and students at the Herman Ostrow School of Dentistry of USC.

The University of Southern California is proud to be a member of a small group of elite research universities in the nation. Our faculty, students and staff work together to propel us to the forefront of excellence in health care. Our research opportunities help our students to combine their critical thinking skills and inquisitiveness with clinical training and transitional medicine in order to benefit their patients. The Herman Ostrow School of Dentistry has a long history of mentoring students. As our students represent the future of our profession, we must do everything possible to train our students to be life-long learners who can adapt to an ever changing world and become leaders of their profession.

History has shown that the public has derived immeasurable benefits from investment in biomedical research in a wide array of health issues. Looking to the future of oral, craniofacial, biokinesiology/physical therapy and occupational science/occupational therapy research, it is clear that we are entering a momentous time for our school. As we plan for the future, we will continue to emphasize the importance of oral health and how it affects the rest of the body. We will work closely with our colleagues to translate scientific discovery to practical health care. We will make every effort to ensure equity in the application of our research to benefit the entire population. We will continue to advance scientific knowledge and promote innovation in order to get the best return for our investment. Today more than ever, we need closer integration of research, practice and education. Working together, we will create a better future for our school.

I invite you to explore many of the exciting projects presented at our Annual Research Day 2011 where you will see how our faculty and students are working together to shape the future of health care.

Sincerely,

Yang Chai, DDS, PhD
George and MaryLou Boone Professor of Craniofacial Biology
Associate Dean of Research
Director Center for Craniofacial Molecular Biology
Herman Ostrow School of Dentistry of USC
As students at the Herman Ostrow School of Dentistry of USC we are immersed within a learner-centered education. This curriculum constantly challenges us to identify areas of uncertainty, develop ideas, and seek out answers in order to decipher solutions and advance our education. But what happens when students’ curiosities go beyond the answers found in textbooks and journals? Coincidently, the research faculty at USC are simultaneously conducting a similar process on a daily basis looking not only to solve their own inquiries, but to help gain insight for the entire dental profession. This unique circumstance creates the opportunity for these two bodies to work together, putting students at the forefront of scientific advancement and discoveries.

Over the years students have found research homes in many of the centers of research excellence hosted by the dental school. These include, to name a few, the Center for Craniofacial Molecular Biology, the Oral Biology Group, and the Center for Esthetic and Biomimetic Restorative Dentistry. Active student researchers have gone on to present their findings locally at USC’s Research Day, while additionally representing us at conferences both nationally and internationally. On an individual basis, these students have gained added skills and honed critical thinking abilities, all while performing as a contributing member of an efficiently functioning lab. USC continues to foster this environment and increase the opportunity for more students to get involved.

Dr. Margarita Zeichner-David, winner of the SCADA 2009 Faculty Advisor Award, has worked closely with students over her thirty plus years at USC. “I personally feel that once a student is in the dental school they should get a full experience, and that includes research. Once in school students are going to learn lots of subjects in the clinics, the cases, the lectures, etc. but one opportunity that not everybody takes advantage of is getting involved in research. How you go about doing research, how you can ask questions, plan experiments, and answer them and how it relates to dentistry.” She went on to say that, “These could be the subjects that maybe in the future, will be the new advancements in Dentistry or Medicine that practitioners will be doing in their offices.”

With six students currently working in her lab, Dr. Zeichner-David judges the success of each student on an individual basis. “A successful student is one that really gets involved in the lab, wants to learn, likes to do the work and is curious about what they’re doing. They are enthusiastic when they get data and they want to finish the project. The reward for their time in the lab is to have something to present at a meeting and, ideally, have a paper with their name on it! Not all students are equally enthusiastic, but fortunately I have had many that I can feel very proud of and they feel that the time spent was well worth it.”

Unfortunately not all students take advantage of this available resource during their dental
The students that volunteer their time are participating in the program. Nevertheless, funds and we had less students actually 2010 we were not that successful in obtaining and the AADR meeting in Washington D.C. In presented their work at our Research day Program. The majority of these students stipends for the students in the Summer in 2009 because we had NIH funding to pay this experience. “We were very successful a commitment and are gaining mightily from students are anticipating the benefits of such funding or no funding, incoming USC has led to obvious spikes in participation through grants and private donations Funding made available for select years can be described as an unpaid internship. “Doing Research here at USC laid a good foundation for methodology and how to use different techniques to obtain certain results” - Nini Hung

As a vital member of Dr. Yang Chai’s lab, Nini spent her time “exploring root development in mice and the molecular signaling involved as the root is formed after crown formation.” Her efforts culminated with a new discovery by the members of the lab. “We found a novel pathway in which (signaling) molecules diffuse from the epithelium to mesenchyme, back and forth to guide the shape of roots.” The research experiments she was conducting in the lab also complimented the education she was concurrently receiving in her classes and in clinic. “It has helped me better

education. Dr. Zeichner-David cites time as the major hindrance. “They don’t have time. In many other dental schools they have the summer free so they can take advantage of 8-10 weeks of undisturbed time in the lab during the summer”. The academic calendar at USC includes active semesters every summer during the four year curriculum. Thus it prevents students from working on a research project during the school year. According to Dr. Zeichner-David, this is “why the Summer Research Fellow Program for incoming freshman was started.”

The Summer Research Fellow Program is designed to give selected incoming freshman an opportunity to engage in a biomedical research project being conducted alongside USC Faculty. The goal of the program is to provide about 10 weeks of in-depth research training with the hopes of getting enough data for a meeting presentation and a manuscript. An additional goal is to give students new insight into the world of professional research, and provide them with a chance to explore advanced degree training options (i.e. Masters, Doctorate) in biomedical sciences through the USC Craniofacial Biology Graduate Program.

Each year the number of fellows fluctuates, and sometimes, the possibility of providing students with a fellowship or stipend will increase the number and commitment of the students. Participants must make the commitment to move to Los Angeles early and forgo a few months of work all while paying for room and board during what can be described as an unpaid internship. Funding made available for select years through grants and private donations has led to obvious spikes in participation including the seven fellows in 2009. Even so, funding or no funding, incoming USC students are anticipating the benefits of such a commitment and are gaining mightily from this experience. “We were very successful in 2009 because we had NIH funding to pay stipends for the students in the Summer Program. The majority of these students presented their work at our Research day and the AADR meeting in Washington D.C. In 2010 we were not that successful in obtaining funds and we had less students actually participating in the program. Nevertheless, the students that volunteer their time are equally successful in that many of them will be presenting at Research Day and then at the IADR meeting in San Diegio, CA in March of this year,” says Dr. Zeichner-David.

Nini Hung, now a senior dental student from the class of 2011, was selected her freshman year for this same program. Over her four years she has made the most of that original opportunity by continuing in her same line of research. Over the years she presented at multiple USC Research Days, California Dental Association Annual Meetings, American Association for Dental Research, and International Association for Dental Research General Sessions. This has taken her to cities like Dallas, Miami, Washington D.C., and even Toronto Canada. “Presenting at conferences gives you a good perspective on why your research is important and how you are contributing to the scientific community.”

Asked about her original motivation to enter the program, Nini responded “I did research in undergrad and worked for a year doing basic science research. So I just wanted to continue it while I was in dental school. It’s kind of always been a part of my life so I just wanted to keep at it. Initially when I started the summer research fellow program I was working on a bunch of different projects and learning techniques. Eventually I became interested in two projects and I worked on those two until they were finished.”

Looking forward, Nini’s involvement in research may have set the stage for an alternate and exciting career path. “Doing research here at USC laid a good foundation for methodology and how to use different techniques to obtain certain results. It gives me a lot of confidence to go towards a career route in academics. The most important thing that doing research helped me with after these four years is to reinforce a life in academics, and make me confident that if I ever decide to pursue something like that, it would be a good career. It is now definitely a serious option for me.”

Dr. Zeichner-David also touched on this very same topic. “There are very few dental students that are interested in going into academics and less even thinking about
pursuing a PhD degree. Our students enter the school with the intention of becoming dentists and working in their private offices once finished with their studies. The majority never considered the idea of going into academics as a viable choice because of their financial commitments to pay their students loans. Students are not aware of the many efforts that NIH/NIDCR and other organizations are doing to attract more dentists into academics with programs like the Loan Repayment Grants, etc. We, as Research faculty, need to make students more aware of these opportunities and maybe some of them will consider a career in Academics.”

“These conferences are huge and it’s amazing how much research is going on in dentistry, not just in materials but also all these other things that they have. It has opened my eyes tremendously.”
- Lawrence Fung

Lawrence Fung, another senior dental student from the class of 2011, was in this very same situation, oblivious to the rewards a career in academia had to offer. “I knew nothing about research, completely nothing.” When asked about his original motivations that got him started he responded, “Excitement, it was an exciting idea and I wanted to see the results of a hypothesis for once. You always read about it in biology class about people doing it and this was my chance to get an idea and actually test it and see if it really worked or not.”

Lawrence didn’t start his research endeavors in materials science until his junior year. “I had only heard from my classmates about how they had to titrate samples all day.” Instead he chose to investigate a topic of great interest to him from the clinic floor, looking to enhance post and core retention in endodontically treated teeth. “We developed and modified certain materials (at the head of metal posts) to see if we can have better retention of the core itself, whether it’s composite or some type of metal. I never heard of anybody doing anything kind of like this where they would go somewhere and have a bunch of samples smashed and then physically take it to get statistically analyzed.”

Not having the luxury of getting up to speed on a project preceding his freshman year in the Summer Research Fellow Program, Lawrence had to create his own opportunities. “I ended up going an alternate route by talking to faculty on the second floor who were not currently in research. One of them, a prosthodontist volunteer part time faculty Dr. Ochiai, said that he had a project, and if I was willing to, it was going to be a lot of hours, a lot of work, but if I wanted to we could get it out in a couple of months.”

Once paired up with an advisor, and a formulated project, Lawrence was hard at work putting in forty hours a week over a two month span. “I was here half of Thanksgiving break and the full month of December. My entire Christmas break and most into January was devoted to picking the incredible minds and preparing testing designs/specimens at USC and testing at UCLA courtesy of Dr. Angelo Caputo and Dr. Neal Garrett.”

Working without the assistance of fellow lab members, Lawrence drew from his experience in case-based learning over the previous three years. “The education that the school provided me helped me out in terms of finding resources and doing the literature review. It was a lot easier for me because (case based learning) had trained me to do that kind of thinking. To search through those databases, and find journal articles from all over the world, seeing what they used, what works and what doesn’t. None of this stuff was in textbooks.”

Having recently returned from Barcelona this past summer, Lawrence was one of the few student representatives presenting original research from USC at the International Association for Dental Research in Spain. “These conferences are huge and it’s amazing how much research is going on in dentistry, not just in materials but also all these other things that they have. It has opened my eyes tremendously.”

Moving forward, Lawrence made sure to reiterate how this research experience will benefit him the rest of his senior year, and continually after graduation. “Studying about dental materials has helped out tremendously in clinic. Now I understand the purpose of a lot of things that we do. In private practice, now that I’ve done my own research in dental materials, I know what to look for when I’m purchasing things for my own practice. When (companies) cite references I know how to evaluate them, whether it’s valid or not, and whether the test they used is really valid to support what they’re trying to say about the material. It’s made me a better clinician. I would probably do research again with materials later on as a private clinician.”

Even with his graduation date fast approaching, Lawrence has not shied away from additional projects and has already received a grant to start one of them. When asked about advice for his fellow USC students, and how they too can become successful student researchers he responded, “It’s doable. If you are a strong believer in it you just have to go for it. Even if things don’t look like it’s going to happen, they really can.”

For more information on how to get involved please contact us at USCSRG@gmail.com
What is the Mission of AYUDA?

AYUDA is actively engaged in improving and sustaining oral health of children in underserved areas of Southern California and beyond. It actively promotes health education and social betterment through its non-profit humanitarian dental, medical, research and educational efforts.

History

The formal founding of AYUDA in 1967 was preceded by several years of discussions between physicians and educators interested in improving the lives of the underserved in Latin America.

AYUDA's first project was established in the highlands of Guatemala where it created the country's first rural junior high school, built a hospital and dental clinic, revolutionized their agricultural system, and provided universal immunization to over 30,000 children living in Guatemala.

In 1991, Dr. Harris Done (class of 1963 USC School of Dentistry), commenced an even larger outreach program in Southern California in partnership with the Herman Ostrow School of Dentistry at USC. Throughout its history, AYUDA has provided dental care to over 210,000 children in Central American nations.

Every month the reaction from the community is the same as AYUDA helps children and families in need. The response of gratitude and admiration is extended toward the Herman Ostrow School of Dentistry at USC and its student volunteers at the finish of each local clinic.

Impact of AyUDA for its Volunteers

AYUDA offers one of most unique opportunities at the dental school for its student volunteers. Typically dental schools only offer hands on experiences within the confines of the school itself. It normally takes two years to get the dental experience necessary to graduate. However, AYUDA offers the Herman Ostrow Dental School students the ability to triple the hands on experience that they would normally receive. Each student volunteer will typically see 10 patients at every monthly clinic and over 60 with its extended and international clinics.

Take those numbers over two years and the outcome of this experience is simple: well rounded, clinically versed dental graduates that have a foundation of service and humanitarian drive that will further perpetuate the improvement of oral public health.

AYUDA's New Ambition: Research

In trying to develop new ways of advancing dental care, AYUDA is developing research projects that study public oral health within its monthly dental clinics. AYUDA's mission is to serve the underprivileged. With its mission statement in mind, AYUDA has posed the question: how can you improve your efforts without understanding your impact. Because of this, AYUDA has begun to keep a database of the oral health of its patients. It has created survey sheets on diet analysis. It is tracking the outcomes of fluoride treatments, and is also studying socio-economic factors in oral health. All of these efforts are being implemented to possibly finesse how it tackles the challenge of improving oral health.

Many of AYUDA’s clinics see the same patients year after year until they move from elementary school into middle school. This gives it a selective advantage in the undertaking of research, i.e. sample pool. This year marks the first year that AYUDA will present some of its findings at Research Day. AYUDA is grateful to be part of the Trojan family and is proud of its student volunteers as they try to make a difference in the field of research.
While here at the Herman Ostrow School of Dentistry, Dr. Tom has become a mentor to me. I have spent time with him in educational, clinical and administrative situations. Among his many qualities I have noticed that he is constantly aware and informed of the latest advancements in his field. I inquired how he did this, and found his answers so inspiring and helpful that I wanted to share them with you. His commitment and method of being a life-long learner something that I now strive to duplicate in my own life.

Why has it been important for you to stay on top of the current literature and research in your career?

In a teaching position, where students, residents, colleagues, and most importantly, patients, ask you clinical and scientific questions all the time, knowing current, state-of-the-art therapeutics and advances helps advance the profession and makes everyone a better clinician or researcher; and ultimately, better clinical care is delivered. Because the field of dental anesthesiology is rather small and relatively unknown, individuals who are trained in dental anesthesiology are often contacted when clinical questions arise or when special situations involving anesthesia occur. In dentistry as a whole, we need to address pain, fear, and anxiety better than we have in the past 10 or 20 years. Our patients simply demand more of us as clinicians and we need to address these concerns with modern pharmaceuticals, techniques, and innovations.

Moreover, the availability and access to research and literature is so much better than it has ever been before. Patients and advocacy groups are demanding better treatment from healthcare professionals, and as a result, we are continually examining our clinical practices in order to deliver the best, evidenced-based care possible.

How has this helped you?

I’d like to say I apply what I read to my everyday clinical practice, but in reality clinicians are a stubborn lot – myself included. It takes some very convincing evidence to drastically change one’s practice habits. Keeping current instead forces me to question my own clinical practice and ultimately, better clinical care is delivered. Because the field of dental anesthesiology is rather small and relatively unknown, individuals who are trained in dental anesthesiology are often contacted when clinical questions arise or when special situations involving anesthesia occur. In dentistry as a whole, we need to address pain, fear, and anxiety better than we have in the past 10 or 20 years. Our patients simply demand more of us as clinicians and we need to address these concerns with modern pharmaceuticals, techniques, and innovations.

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Why should students do this during their career?

Things are changing at a more rapid pace than ever before. By the time you receive information as a student, it may have been relevant and correct only in the recent past. Certain things remain as standard principles and practices, and the bulk of your pre-doctoral education is learning these. However, many of these standards and principles are being challenged as new innovations and discoveries arise. If you really want to know the “why” of your current clinical guidelines and practices, look at the current literature to see what kind of re-affirmations or de-bunking are occurring. If you’re a post-graduate resident, studying the current literature will perhaps give you an idea for a project or paper leading to your thesis.

Also, many times a patient will come into your practice with information they found most likely on the internet. If you’re armed with relevant information and a strong background in certain topics, such as dental amalgam, composites, or nitrous oxide use for example, you’re much better prepared to answer questions and dictate treatment.

Have you participated or are you participating in any research projects? If so can you share a little about it?

In my residency, I did a clinical trial of different general anesthesia regimens that really got me into seeing how such trials were conducted. It was interesting to see how many variables made a study robust or questionable...
as to its results. I also did some studies that involved distraction osteogenesis on rabbit femurs that involved some veterinary anesthesia — didn’t really float my boat, but I sure did learn a thing or two about bunnies and research protocols. At USC we participated in some of the investigations into the use of a local anesthesia reversal agent a few years back, and I got to witness first-hand the changing of study protocols and how a large pharmaceutical firm recruited and developed a strategic plan of obtaining FDA investigational drug numbers; from the inception of clinical studies to the eventual marketing of the drug. Currently, we are looking into initiating a clinical study for new local anesthesia delivery methods for our pediatric populations using an older ester-type local anesthetic – tetracaine. Today I am looking for a way to try out a fairly new intravenous sedative that targets alpha-2 adrenergic receptors and using it for minor oral surgery procedures. Stay tuned!

What is currently the latest topic of research that is impacting the world of Anesthesia the most?

One of the hot topics of concern right now is the issue of how anesthetics may cause quantifiable neurologic damage to developing neurons in numerous animal studies. Those of us who regularly perform general anesthesia on pediatrics of course wonder if this correlates to measurable and significant neurotoxicity to humans. The quandary is that we surely cannot design a human study with volunteers to see what, if any, kind of damage occurs to developing brains and bodies, so we’re trying to see if there’s any correlation and application from animal studies. It’s a pretty contentious subject right now that patients, their parents, and anesthesia providers wrestle with every day.

After this interview I have found a new determination to find good ways for me to make learning a part of my daily life. I challenge you, the reader, to find personal ways to develop habits to become a life-long learner.

- Like anything, the more you practice at reading good and bad research, the better you will be able to judge strong evidence and conclusions from weak ones.
Towards Detection and Prevention of Cleft Palate in Utero

By Andrew Kiss  DDS 2013

Each year in the United States approximately 250,000 children are born with some type of mental or physical defect and three fourths of these aberrations involve the face, head, and neck region. Due to the large number of craniofacial malformations found in congenital birth defects in humans, the study of craniofacial development has become a topic of great interest in the field of biomedical research. While the approach comes from different scientific fields, ranging from evolutionary biology to human genetics and tissue engineering, a common goal is shared to understand the molecular mechanisms of craniofacial formation. The most immediate application of this knowledge comes in the form of possible genetic screens in utero to detect craniofacial defects with the hope of someday preventing these malformations by altering genes and molecular pathways.

The development of the craniofacial region is a very complex process. One of the most important features of craniofacial development is the formation of cranial neural crest (CNC) cells. CNC cells have a unique function in the craniofacial region in that they form most of the hard tissues of the head such as bone, cartilage, and teeth. In contrast, mesoderm-derived cells form the majority of the hard tissues in the rest of the body. Genetic and/or environmental changes are able to negatively impact CNC cells, thereby causing craniofacial malformations.

One of the most commonly observed congenital birth defects in the human population is cleft palate. The main complications of this defect are the inability to eat properly, altered speech, and, of course, the psychological effects of living with facial deformity. The formation of the palate involves a sophisticated multi-step process of palatal shelf growth, elevation, midline fusion of the palatal shelves and the disappearance of the midline epithelial seam. The palatal structures are composed of the CNC-derived ecto-mesenchyme cells and pharyngeal ectoderm. Some genes have been identified that control the fate of the CNC cells during palate development.

In a study published in the journal Development, investigators at the Herman Ostrow School of Dentistry of USC explain one of several mechanisms controlling palate formation on a molecular level. Dr. Yang Chai, Director of the USC School of Dentistry’s Center for Craniofacial Molecular Biology, has gained deep insight into the potential genes responsible for the cleft palate defect. In his study he analyzes the unique functions of the Dlx5, Shh, and Msx1 genes and their effects on the developing palate.

The Shh gene produces the Shh protein, which alters the fate of the CNC cells, which ultimately affects palate formation. For proper palate structure and patterning, the Shh protein must be kept at a stable level in the developing fetus. Either an increase or decrease in the amount of expression of Shh will result in a misformed palate. Two genes have been discovered which independently influence and regulate the level of Shh produced. The gene Msx1 promotes Shh production and Dlx5 inhibits Shh production. In the study, fetal mice were genetically altered to have a defect in the Msx1 gene, causing a decreased expression of the Shh protein due to the unbalanced effects of Dlx5. Upon suppressing the expression of Dlx5, the effects of the Shh protein were rescued, which in turn controlled the fate of the CNC cells and caused the re-growth of the palate. The genetically altered mice that were rescued were born with healthy intact palates. Although it must be noted that some of the oral structures of the altered mice had minor differences as compared to completely healthy mice. The main discovery of the study is that modulation of Shh signaling may be utilized as a potential therapeutic approach for rescuing cleft palate.

Dr. Chai comments that close regulation of important signaling molecules during palatal formation may someday allow doctors to reverse a cleft palate before the baby is even born. With continued efforts in craniofacial developmental research, the breakthrough could make a big difference in how we approach cleft palate in humans. Aided by knowledge of genetics and molecular biology, as well as bioimaging, doctors in the future will be able to intercept craniofacial defects long before they begin to affect the life of the patient.

References:

Genetic mutation causing cleft palate defect in newborn mouse.
The Student Research Group (SRG) at the Herman Ostrow School of Dentistry at USC is excited to recognize two of our newest faculty members. I had the privilege of interviewing Dr. Duarte and Dr. Phark about some of their new ventures and responsibilities at the school. One of the greatest features of the Herman Ostrow School of Dentistry is its great diversity and strength of faculty. Dr. Sillas Duarte and Dr. Jin-Ho Phark are examples of this strength and I was fortunate to interview them to learn more about their research and what they bring to the field of biomaterials.

Some of Dr. Duarte’s and Dr. Phark’s new responsibilities include research in the biomaterial field of dentistry. While speaking with the new professors, I began to understand the beginnings of a new and exciting program at USC. This program, directed by Dr. Duarte, will be greatly aided by his as well as Dr. Phark’s expertise as they fulfill their responsibilities, which include:

- Developing, Implementing and Directing an Advanced Program in Operative Dentistry
- Conducting and publishing significant biomaterial research in peer-reviewed journals.
- Mentoring of faculty and students in the area of restorative related research projects.
- Exploring opportunities for collaborative efforts with other academic units within USC and beyond for furthering scholastic activities.
- Finding funding to support our research efforts.
- Teaching clinically or pre-clinically in the DDS restorative program.

One of the aspects of more biomaterial research at our school is the new the advanced specialty program, which will be a residency applied to by graduated dental students. The plan is to start this program in spring 2012. Although Dr. Duarte did not go into great depths about this program, he mentioned that a large feature of the program will be an option for students to either do research or clinical work in very advanced restorative procedures. Hearing his explanation of the new program, I pictured a very competent dentist performing cosmetic procedures and restorative procedures that push the edge of what bonding can do.

When I asked about the exciting and upcoming materials in dentistry I realized that I had asked the golden question for every researcher in biomaterials. Dr. Duarte explained how their research is focusing on what he termed “smart” materials, which are materials that mimic natural teeth. Dr. Phark mentioned that his lab even recreates natural conditions of teeth by changing the environmental factors in the lab. Some of these factors include testing materials’ resistant against time, pressure, water, acid and other factors. After hearing more about these processes and ways of testing, I asked Dr. Phark and Dr. Duarte how a student could get involved in this type of research. The response was that students are more than welcome and encouraged to join in the research. Students are even encouraged to come up with their own ideas and receive help in testing in the lab, which will soon be set up on the 4th floor.

In addition to being very knowledgeable and very experienced in the field of biomaterials, Dr. Duarte and Dr. Phark are very easy to talk to and are enthusiastic about their work. We are excited that they have joined the faculty at USC and look forward to learning from them and their research.

Dr. Sillas Duarte graduated with his DDS degree in 1990 and his PhD in 1997 from Sao Paulo State University of Araraquara, School of Dentistry. He has taught in the Department of Restorative Dentistry, Division of Operative Dentistry and Case Western Reserve University School of Dental Medicine in the Department of Comprehensive Care in Cleveland, Ohio. Additionally, in 1997 he received research training at the University of Alabama at Birmingham and in 2002 did a mini-residency in Operative Dentistry and dental materials at the University of Minnesota.

Dr. Phark received his degree in 2003 from the Humboldt University Dental School in Berlin Germany, where he also received his PhD and worked as a faculty member in the Department of Operative, Endodonic, and Preventive dentistry. In 2006, he was hired as a tenure track faculty member in the Department of Comprehensive Care at Case Western Reserve University School of Dental Medicine. At Case he was the co-director of the Dental Materials Characterization Laboratory, Institute for Advanced Materials. Some of his interests are in the field of biomaterials, especially on bonding to dental structures, composites, and ceramics.
The rapid development of technology has changed the dental profession. In the twentieth century, technology was integrated into the dental office to schedule appointments, collect money and bill insurance companies. In the twenty-first century, technology has advanced past the front desk and joined the dentist chair-side, providing convenient and excellent restorations that rival traditional methods of lab fabrication. With computer-aided design and computer-aided manufacturing (CAD/CAM), indirect or definitive permanent restorations can be provided to patients within a single office visit, changing the way we practice dentistry. The Herman Ostrow School of Dentistry of USC in effort to provide the best dental education understands the necessity and urgency to incorporate the dynamic technology into the curriculum.

Twenty-five years ago saw the birth of CEREC, (Chair-side Economical Restoration of Esthetic Ceramics) which utilizes three-dimensional digital imaging and CAD/CAM technology to design and fabricate restorations. As shown on the following page, the hardware is composed of an acquisition unit, equipped with an infrared scanner and proprietary software, and a milling unit. After the tooth preparation, the acquisition unit with infrared scanner captures the preparation and stores it as a 3-D digital model. Once the image is scanned, the software approximates the restoration via Biogenic design which then is refined by the user. Restoration is fabricated by the milling unit with operation time of approximately twenty minutes. Taking the completed restoration, the dentist fits, adjusts, and bonds the restoration to the patient. The beauty of the system is that the whole process, from the start of the preparation to the bonding of the restoration, can be done within an hour. The advantages of the current CAD/CAM technology include single visit appointments, reduced lab fees and high quality restorations.

The disadvantages of the CAD/CAM technology are capital and time investments, which coincidently are the obstacles an educational institution must overcome to train and educate their students. The hardware necessary requires tremendous capital; a single CEREC system cost over one hundred thousand dollars making it difficult to provide on a large scale. Even with the availability of hardware, the learning curve requires large amounts of time, design experience, and intensive labor. Since most clinical faculty has not utilized CAD/CAM in their private practice, training is necessary prior to teaching students. For clinical students, learning and utilizing new technology in addition to working on patients can be overwhelming. In an educational setting where student dentists require extended time for preparation to ensure quality, the additional time investment on CEREC to produce single-visit restoration may be intolerable for the patient. Therefore, although CAD/CAM technology in private practice has demonstrated high quality clinical results, many institutions have yet to integrate CAD/CAM into their dental curriculum.

Despite the obstacles, Ostrow School of Dentistry of USC over the past six years has gradually incorporated the CAD/CAM technology into the clinic. With the CEREC system already in place, three quarters of the clinical faculty have already completed training. Clinically, over 75 restorations in selective cases had been fabricated using CEREC. With the arrival of Dean Sadan and under the leadership of Dr. Kahn, the CAD/CAM technology at USC has gone through tremendous expansion in the past couple of years. Both men agree utilization of technology is where the dental profession is going, and digital technology and CAD/CAM is not the future but the present. There is a general consensus within the administration to increase the impact of CAD/CAM within the curriculum and to remain on the cutting edge of dental technology.

USC Dentistry, with cooperation from industry, recently added the E4D system by Henry Schein into the CAD/CAM arsenal. E4D is a newer CAD/CAM system that differs from CEREC in imaging and milling techniques. The updated CEREC system uses an LED camera whereas E4D uses a laser scanner. The use of lasers decreases shutter speeds to 1/30 of a second allowing for lower technique sensitivity. The milling unit of CEREC uses two burs each operating on an independent axis. The E4D also utilizes 2 burs, but of different sizes operating on the same axis, with the restoration in rotation. The larger bur carves the general shape and the smaller bur details the restoration. Under this mechanism, milling time is decreased significantly. Another convenient feature of the E4D which aids in the group practice environment is the queue ability of the milling unit, enabling 24 hour milling if necessary. The combination of an administration committed on cutting edge technology, patients and faculty dedication and gracious industry support, all contributed to the foundation of CAD/CAM in the school.

USC Dentistry steeped in clinical excellence, aims to integrate the CAD/CAM technology into the student curriculum starting with the class of 2014. Faculty training on the updated CEREC and E4D has already begun. The rationale for CAD/CAM exposure in the
The pre-clinical bonded restoration module is to gain familiarity with the hardware and develop restoration design skills for application in the clinic. Without clinical time constraints, under the guidance of trained faculty, the class of 2014 will learn and use CAD/CAM along with composite preparation and restoration. With more faculty and student awareness of the CAD/CAM impact at USC, the goal is to encourage and allow all current students to have exposure and understanding of this technology.

A decade into the twenty first century, digital imaging and CAD/CAM are welcomed by dentists because of cost reduction and user friendliness. Over the next five to ten years, traditional impressions might be a thing of the past. The Ostrow School of Dentistry of USC understands now is the transitional period when our profession catches up to the technology and we want our students to be prepared. Although the traditional techniques are still the core of our clinical foundation, we hope that the younger generation is not intimidated by these technologies, but rather eager to experiment and adapt them to their daily practice.

**CAD/CAM Fabrication**

1. Cast of Preparation
2. Acquisition Unit
3. Milling Unit
4. Milled Restoration
5. Fitting
6. Finished Restoration
Risa Regaldo & Kristen Wong - DH 2011
American Dental Hygienists’ Association Annual Session 2010 Las Vegas, Nevada
The Cherry On Top of Scaling and Root Planing: The Added Benefits of Bacteremia
Advisor: Dr. Karen Matsumura-Lem

Issa Kawas - DDS 2011
American Association for Dental Research 2008 Dallas, Texas
SLE-Associated Osteoporosis due to Increased Osteoclast Activity; Decreased Osteoblast
Advisor: Dr. Songtao Shi and Dr. Anh Le

Derek Havas - DDS 2011
California Dental Association 2009 Anaheim, California
Effects of NFIC Silencing on Root Formation Cells
Advisor: Dr. Margarita Zeichner-David

Brik Nielsen - DDS 2011
American Dental Association Annual Session 2009 Honolulu, Hawaii
The Interaction Between Impression Materials and Immediate Dentin Sealing
Advisor: Dr. Pascal Magne

Mickel Jourabchi - DDS 2011
California Dental Association 2010 Anaheim, California
The Influence of Hydrated Silica on Bracket Bond Failure Rates
Advisor: Dr. Vivian Maung

Desree Yazdanshenas - DDS 2012
IADR/AADR General Session 2009 Miami, Florida
A Western Blot Analysis and Immunohistochemical Study of 4-Day Old Mice Teeth Over-Expressing Amelotin during Amelogenesis
Advisor: Dr. Michael Paine

Myoung Kim - DDS 2011
Hinman Student Dental Research Symposium 2009 Memphis, Tennessee
Changes in the Phenotype of Dental Papilla Mesenchyme (DPM) Cells Maintained in Vitro after Treatment with NFIC-shRNA
Advisor: Dr. Margarita Zeichner-David

Andrew Kiss - DDS 2013
ADA Dental Students’ Conference on Research 2010 Gaithersburg, Maryland
Analysis of Early Events of Amelogenin Self-Assembly by Fluorescence Spectroscopy
Advisor: Dr. Janet Moradian-Oldak
A look at where some of our current students have presented their original research away from USC

**Nini Hung · DDS 2011**
International Association for Dental Research
2008 Toronto, Canada
Smad-dependent and independent pathways in mediating tooth and palate development
Advisor: Dr. Yang Chai

**Mary Satuito · ASPID 2011**
20th World Congress of the International Association of Disability and Oral Health
2010 Ghent, Belgium
Oral Bowenoid Papulosis associated with Invasive Squamous Cell Carcinoma: A case report

**Lawrence Fung · DDS 2011**
International Association for Dental Research
2010 Barcelona, Spain
Evaluation of Resin Core Foundation Retention for Endodontically Treated Teeth
Advisor: Dr. Kent Ochiai & Dr. Angelo Caputo

**Weston Carpiaux · DDS 2012**
International Scientific Exchange
2009 Yokohama, Japan
Apatite reduces amelogenin proteolysis by MMP-20 and KLK4 in vitro
Advisor: Dr. Janet Moradian-Oldak

**Daniel Khorshad · DDS 2013**
American Association for Dental Research
2010 Washington, D.C.
Fate of Hertwig’s Epithelial Root Sheath (HERS) In NFIC (-/-) Mouse Developing Roots
Advisor: Dr. Margarita Zeichner-David
As the recent real estate and economic crisis have shown, regardless of your past, the future is uncertain. Many average Americans have found themselves facing the loss of their jobs, homes, and financial security. Since 1999, the Union Rescue Mission (URM) has partnered with Ostrow School of Dentistry of USC to provide dental care to the homeless community in the skid row area of downtown Los Angeles. In the recently expanded eight-chair clinic, USC dental and hygiene upperclassmen work one day a week for seven weeks on rotation to provide comprehensive and emergency dental care to the clinic’s patients. The USC+URM clinic patients include men and women of various ages, many of who have children. Children under the age of 18 make up 18% of the clinic’s dental patients. Dental treatments provided include sealants, oral health instruction, amalgam or composite restorations, endodontic treatment, periodontal treatment, partial dentures, complete dentures, and tooth extractions.

Research is underway to analyze various aspects of the USC+URM clinic’s impact on both the patients receiving care and the dental students providing treatment. Members of USC Faculty have recently published two articles, the first in the Journal of Dental Education and the second in the California Dental Association Journal.

The first study by Dr. Mina Habibian, Dr. Laura Elizondo and Dr. Roseann Mulligan, analyzed responses to a questionnaire that was completed by over 200 students in a two year period regarding attitudes towards the homeless prior to and following their URM rotations. Their examination of dental literature revealed that quantitative data on the attitude of dental professionals towards the homeless was lacking. Other studies cited in the article illustrate that the homeless face many challenges including limited access to medical and dental care, and suggests that health care provider perception of the homeless is a contributing factor to their dental care deficiencies. The results of the study, as summarized in the article are that the score on the attitudes towards the homeless questionnaire (ATHQ) after rotation increased slightly. Students’ age, gender, and prior contact with the homeless population were not related to their attitudes toward homeless patients. Eighty-five percent of students agreed that the rotation made them feel more comfortable treating homeless patients, and 98 percent agreed that the patients made their experience enjoyable. The authors’ results suggest that overall dental students had positive attitudes toward the homeless and their scores on the ATHQ...
improved slightly after providing care during their USC+URM rotation.

The second publication by Dr. Hazem Seirawan, Dr. Laura Kathleen Elizondo, Dr. Niel Nathason and Dr. Roseann Mulligan was a retrospective review of over 1000 URM comprehensive care and emergency patient charts to document the extent of need and analyze the specific type of dental conditions most prevalent in the population studied. The authors found that among dentate patients the prevalence of untreated caries was 63.6% with a severity of 5.8 decayed teeth, male patients had 6.4 decayed teeth compared to female patients who had 3.39 decayed teeth (P<.001). The highest severity of untreated caries was among patients age 60-69 with 7.6 decayed teeth.

Sealants were provided to 72 percent of the children with a mean of 4.6 sealants per child, and were provided more to female than to male patients (31 percent versus 11 percent), and more to Hispanic than to black patients (39 percent versus 4 percent). 66.7% of adult patients were in need of scaling and root planning. Endodontic procedures were more frequent in the age group of 40-49, where they were provided to 18 percent of the patients. More than half (57 percent) of the patients in the age group of 60-69 had received either a complete maxillary or mandibular denture, or both. Those in the age range of 50-59 had greater need for partial dentures (28 percent) than any other age group. More men received quadrant scaling and root planing treatments than women (60 percent versus 33 percent). Simple extractions or root removal occurred most frequently in the age group of 40-49 (319 extractions) but was provided to a higher percentage of patients in the age group of 50-59 (58 percent), with an overall mean of 1.75 extractions per patient. The mean number of missing teeth (for any reason) was 16 among adults and was not different by gender.

Additional research is already underway to further assess the needs of the community, the effects of USC+URM dental care on patient’s quality of life, and the impact of homeless patient interaction on dental school students.

References:
A novel strategy for tissue engineering has been developed utilizing monoclonal antibodies to bioengineer bone. In the context of wound healing and bone regeneration, many factors, such as BMP-2, control the behavior of the cells and activate a number of events that controls microenvironment of the wound. Dr. Homayoun Zadeh and Dr. Marcelo Freire are both periodontists at the Herman Ostrow School of Dentistry and leading researchers in the field of dental implants and bone reconstruction. They have investigated the use of novel therapeutic antibodies to expedite the wound healing process in bone tissues. Their approach is to immunomodulate the surface of biomaterials by binding BMP-2 antibodies to them. This new surface will tether local endogenous BMP-2 molecules, this will increase the local concentration of this growth factor which enhances the healing process. This method is termed antibody-mediated osseous regeneration (AMOR). Dr. Zadeh & Freire have experimentally modified the surface of collagen membranes and implants by binding specific antibodies that are specific for BMP-2. These antibodies form a complex with BMP-2 that attracts mesenchymal cells and trigger osteoblastogenesis and regeneration.

Regeneration of bone in the craniofacial area is necessary for treatment of congenital anomalies, traumatic injuries, pathological osteolytic conditions, as well as for reconstruction of atrophic jaws. Approaches for bone regeneration often require harvesting of autologous bone from the iliac crest, tibia, ribs or craniofacial bones. Development of new strategies for tissue engineering are necessary for bone regeneration that mimic biological events in wound healing, to offer optimized surgical procedures and to increase clinical success to patients.

Figure: Antibody mediated osseous regeneration within rat calvarial defects, examined by micro-CT and histological studies. 5 mm surgical defects were created in rat calvaria, which were implanted with collagen scaffold alone (-) or with immobilized BMP-2 specific antibodies. Animals were scanned with micro-CT at 2, 4 and 6 weeks after surgery as represented in 3-dimension image reconstruction. Histological staining of bone specimens with H&E and trichrome were performed. These results suggest that monoclonal antibodies promote osteogenesis in calvaria rat model.
**The Goods of Research**

By Bridger Jensen · DDS 2012

It is six o’clock on Thursday night and I’ve just arrived at the emergency department of the LAC+USC Hospital. I quickly scan the ER computer to locate patients who have a chief complaint of “headache” and make my way to the first on the list. I push aside the curtain and enter the dimly lit room. Inside is a middle aged woman with both hands over her eyes, “Please, close the curtain” she whispers without moving her head to see who has entered the room. I begin inquiring about the frequency, duration and triggers of her headaches and her level of acculturation. I thank her for her participation, and quietly leave the room. For the past six months I have been working with “team headache,” a collection of medical students and myself, led by Dr. Soma Sahai from the USC Department of Neurology. The data we are gathering will be analyzed and compared to national trends. Before I joined “team headache”, I was constantly on the lookout for research projects and since joining, I am surprised by how much I’ve benefited by being associated with a research team. By considering all the “Goods” of research, it’s easy to see the many reasons to be involved.

Learn how to be a better clinician

Every experience with a patient, good or bad, has given me new insight into the type of clinician I want to be. By spending time with patients both at school and in the research setting, I have become more comfortable and felt more at ease at the patient’s side. I have also been able to witness others and learn from their example. By participating in research, you are also exposed to new studies and therapies that could be a benefit to your patients. I have no doubt that I will be a better clinician because of my time spent in research.

Help in overcoming fears

There are many times when I have been faced with challenging opportunities. Being put out of my comfort zone allows me to stretch myself beyond what I thought I was capable of handling. Choosing to be involved in a discipline I was unfamiliar with definitely gave me that opportunity to see what I could do. Walking into a busy emergency room filled with bustling nurses and busy physicians was very intimidating, and interviewing a patient in a non-native language stretched my abilities. However, to walk out with the task accomplished is a great reward.

Become trained and better understand research protocol

Before becoming involved with research, I had no idea the about all of the protocol that is involved and I learned that I needed to complete the training. Once I had completed all the requirements, I had a better understanding of all the regulations put in place to make sure that all research is done in an ethical and patient-friendly manner. I became educated about the Institutional Review Board (IRB) and about iStar (IRB Submission Tracking And Review system). I felt this better equipped me to be prepared for when I was working and dealing with the research team and patients.

Working with a team

At a bench-top, or a bedside the challenges of research can only be accomplished with teamwork. Working with a research group taught me how to be a team player. To keep our team strong, we meet regularly and correspond frequently to make sure each member is informed and up to date. There would be no way we would be able to accomplish all that needs to happen without working well with one another and being willing to help each other. I am part of something that is bigger than me; I am a member of a team.

Become better at time management

With the busy clinic and scholastic schedule that every student at the Ostrow School of Dentistry has, making time for research is challenging. However, as I’ve made research a priority in my schedule I have learned to make every hour of every day count. There have been times when I’ve felt like there wasn’t any way I could get everything done. I’ve learned to stay organized and to prioritize my schedule and I am amazed at all that can be accomplished. It may seem difficult, but I know the time and energy put forth will be worth it if you decide to make research a priority.

Desire to be a life-long learner

Continuing to learn after school is only natural. There is no such thing as knowing too much, particularly in the quest to become a better clinician. By being involved with research I can be aware of the latest studies and ideas. I am better able to apply the things I am researching and learning into my clinical approach and it will make me a better clinician. I have found that I now look for trends when I interview patients. Being involved in research has made me more attentive to the trends I see and excited about applying the scientific method to these observations.

Develop a great appreciation for those who devote their time and talents to research

At the Ostrow School of Dentistry not only are we taught by some of the greatest researchers in the country, but we also can look to these clinicians as mentors in our quest to become involved in research. It wasn’t long ago; when the techniques we are using in our every day practice were “new” and “groundbreaking” and only heard of in the research community. We only have to look to our own faculty to appreciate all of the hard work and sacrifice that has gone before us.
Many reputable sources claim that yoga is an ideal exercise for older adults—even for those who have osteoarthritis or other neuromusculoskeletal diseases. With its combination of physical postures, breathing exercises, and meditation, yoga is said to provide benefits that include cardiovascular fitness, resistance training for muscle strength and bone health, flexibility, and relaxation.

Yet little is known about the physical demands, effectiveness, and overall safety of yoga for older adults, whose joints have a reduced range of motion. Seniors also commonly experience reduced strength and balance, and are more likely to have musculoskeletal disorders. The Division’s recent clinical trial (R01 HD04834; Greendale, PI) has shown that yoga programs that are not based on medical evidence can put older individuals at risk for strains, sprains, and other injuries. To build on these findings, the Yoga Empowers Seniors Study (YESS) seeks to determine the safety and effectiveness of a 32-week yoga program designed for adults ages 65 and over. Led by Dr. George Salem in collaboration with Dr. Gail Greendale of the UCLA Division of Geriatrics this three-year intervention development study (IDS) will follow the progress of 24 senior participants who have passed a series of health and mobility screenings.

Each participant will attend two 16-week hatha yoga classes (beginning and intermediate), learning the yoga poses (asanas) from Leslie Kazadi, an instructor experienced in working with seniors. Measurements of the participants’ walking stride length, balance, muscle strength, and ability to perform everyday movements (physical function) will be taken at the beginning of the study and at the end of each phase. These assessments will be captured using high-speed cameras, computer models of the musculoskeletal system, force platforms, and electromyographic equipment. The participants will also be asked at each phase of the study about their ability to perform everyday physical tasks, bodily pains, health-related quality of life, and fears about falling (which have been shown to correlate with the risk of actually falling). The YESS team hypothesize that participants with relatively weak muscles will demonstrate poorer asana technique, but that as a group, the seniors are likely to improve their technique with practice. Walking speed and stride length, physical performance, balance, and quality of life are expected to increase. Participants who report joint pain and injury are likely to be limited to individuals with a history of joint problems. Data from YESS will be used to develop safe and effective yoga programs for seniors that are expected to result in fewer musculoskeletal side effects than those associated with non-evidence-based yoga practices. The new programs will be tested in a Phase II randomized controlled trial.

Funded by the National Center for Complementary and Alternative Medicine of the National Institutes of Health, YESS is directed by Dr. Emily Wang and co-directed by Dr. Sean Yu, members of the Division’s full-time research staff. Also involved in the project are research associates Michelle Haines and Lauren Mulwitz, and PhD students Rami Hashish and Dr. Sachithra Samarawickrame.
USC Community Health and Wellness Research Center at CATZ

Director: Susan Sigward PhD, PT, ATC

USC’s number-one ranked program in physical therapy has teamed-up with a nationally recognized leader in fitness and performance training (Competitive Athlete Training Zone) to establish a pioneering research, outreach, and education center.

This state-of-the-art center combines two institutions that have longstanding traditions of leadership and innovation in their fields. The development of the USC Community Health and Wellness Center at CATZ is a timely project that forges a path in the fields of Physical Therapy and Health and Wellness that is not commonly seen in today’s academic environment.

Together USC and CATZ share a mission to carry out research, education and outreach projects that incorporate physical activity and exercise for the purposes of improving health and physical function in people of all ages and abilities. Housed in the 14,000-square-foot CATZ facility in Pasadena, this setting provides unique opportunities beyond those of traditional research laboratories for fostering increased community participation in and support of research and education.

Research - Two research laboratories will be housed in the Center-motion analysis and exercise physiology-equipped to analyze exercise interventions from both biomechanical and physiological perspectives. Current projects at the Center include exercise interventions to prevent sports-related musculoskeletal injuries, promote exercise for inactive children, and to prevent the onset of metabolic disorders and disease recurrence in cancer populations.

Education - The shift toward wellness and prevention is critical in today’s health care environment. The Center provides a venue for the education of students, professionals, faculty members, and community leaders in the practical application of health and wellness programs across diverse populations.

Outreach - The Center works with community groups to provide accessible opportunities for individuals of all ages to participate in physical activity in an environment safe from physical harm and ridicule.

The Center is directed by Susan Sigward PhD, PT, ATC. Research collaborators include E. Todd Schroeder PhD and Beth Fisher PhD, members of the Division, Christina Dieli-Conwright PhD, Research Scientist at the City of Hope NCI-designated Comprehensive Cancer Center and graduate students supported by the division. Contributions from the community during our “Setting the Pace” Campaign Events have been invaluable and have ensured that we remain at the forefront of research, outreach, and education in this field.

To learn more about biokinesiology & physical therapy, please visit us at http://pt.usc.edu/
Health care in the future will be aimed at prevention and management of chronic diseases and comorbidities through customized lifestyle-based interventions. Activity, function, and participation in everyday life will be incorporated as critical indicators of health status. Treatments will put patients—considerate of their home and work environments, inclusive of their families and social systems, and respectful of their everyday selves—at the center of all care.

Established over twenty years at USC, Occupational Science is an interdisciplinary academic discipline that generates knowledge about the impact of everyday activities (“occupations”) on peoples’ health, function and well-being. Understanding “real people” in “real lives” requires interdisciplinary, translational and rigorously designed research which produces excellent scholarship that not only helps reveal the fascinatingly complex interplays between health, activity, society and culture, but also supports applied therapeutic practices across various intervention areas throughout the entire lifespan.

The Lifestyle Redesign® for PUPS project studies the effectiveness of a complex, community-based, lifestyle-focused intervention in the prevention of life-threatening pressure ulcers in people with spinal cord injury. By utilizing advanced imaging technologies, the Mirror Neuron study will provide a better understanding of how the brain perceives motor actions after neurotrauma and the potential implications for post-stroke rehabilitation, and the Prosody project will provide insights into the neurological basis of social and non-verbal communication deficits that are hallmarks of physical and psychosocial disorders. The Autism in Urban Context study will reveal strategies that might ultimately minimize health disparities in the care of autistic children in minority populations. Together, these four projects exemplify how realizing the future of health care will be accelerated through USC Occupational Science research.

Lifestyle Redesign for Pressure Ulcer Prevention in Spinal Cord Injury

Principal Investigator: Dr. Florence Clark

Advanced pressure ulcers, a common and medically serious complication of spinal cord injury (SCI), are associated with extremely high treatment costs and reduced quality of life. Lifestyle Redesign® for Pressure Ulcer Prevention in SCI, a randomized clinical trial led by Dr. Florence Clark, is investigating the efficacy of a promising lifestyle intervention aimed at preventing pressure ulcers in at-risk members of the SCI population, and diminishing the heavy healthcare burden with which they are associated. The five-year study, now in its third year of operation, is a collaboration between researchers from the University of Southern California and Rancho Los Amigos National Rehabilitation Center. In August 2010, an NIH Administrative Supplement Grant through the American Recovery and Reinvestment Act was awarded to accelerate the science associated with this project. As of December 2010, 117 participants have enrolled in the study, representing 73% of the targeted sample size of 160. Of these, 58 have been assigned to the intervention condition. Currently, 40 participants are being seen by one of six occupational therapists on the intervention team and 18 participants have completed the one-year Lifestyle Redesign® program.
The Mirror Neuron System: A neural substrate for methods in stroke rehabilitation

**Principal Investigator: Lisa Aziz-Zadeh**

A great deal of research has shown that we use our own motor systems to process other people’s actions, utilizing what is called the mirror system (MNS). However, how does this system work following stroke and subsequent motor disability? Can the mirror system be engaged to promote recovery from stroke in patients with limited voluntary motor ability? In a two year study, we aim to explore how the brain perceives actions after stroke, and thereby have a better understanding of how to apply methods that engage the MNS for stroke rehabilitation. By asking how the brain perceives actions that are not possible for participants with stroke to perform, we will also better understand the role of the MNS within the whole brain for action understanding, imitation, and social cognition.

Neural Basis for the Production and Perception of Prosody

**Principal Investigator: Lisa Aziz-Zadeh**

Prosody, the melody and intonation of speech, is a significant and often under valued component of human communication and social interaction. The Neural Basis for the Production and Perception of Prosody research project is a two year study directed by Dr. Lisa Aziz-Zadeh that explores the application of recent approaches and concepts in human brain mapping to the study of perception and production of prosody. Elucidating the neural basis of prosody will make an important contribution to the neurobiology of non-verbal communication, and by extension, of social communication. Furthermore, this research will improve the understanding of the communication deficits which result from brain injury, as well as the understanding of core deficits of socially isolating neurological and psychiatric disorders (such as stroke), traumatic head injury, and autism. Data from this project so far indicate that the same brain regions that are involved in prosodic production are also involved in prosodic perception. Furthermore, activity in these regions correlates with individual differences in empathy. Results from this project have been published in PLoS ONE as well as described in an article in Scientific American Mind.

Autism in urban context: Linking heterogeneity with health and service disparities

**Principal Investigator: Olga Solomon**

Autism in Urban Context is a multi-method, ethnographic project funded by the National Institutes of Health / National Institute of Mental Health through the American Recovery and Reinvestment Act. The project is currently in its second year and it examines health and service disparities in Autism Spectrum Disorders (ASD) diagnosis of African American children living in Los Angeles. We are currently documenting the trajectories to an ASD diagnosis and services for a cohort of over 20 children. The interdisciplinary, translational study is conducted by a team of researchers and clinicians from the Division of Occupational Science and Occupational Therapy, Herman Ostrow School of Dentistry, USC University Center for Excellence in Developmental Disabilities at Children’s Hospital Los Angeles, and the Department of Preventive Medicine, Keck School of Medicine. Several talented post-doctoral researchers and graduate students are being mentored on the project to become future career research scientists. The project’s Principal Investigator, Dr. Olga Solomon, sees the major contribution of this research in identifying opportunities for and barriers to the development of collaboration among families and practitioners that would result in timely ASD diagnoses and services for African American children.

To learn more about occupational science and occupational therapy, please visit us at http://ot.usc.edu/
Schedule

08:00am - 09:00am  Poster Set Up
09:00am - 12:00pm  Poster Judging
12:00pm - 12:30pm  Lunch
12:30pm - 12:45pm  Opening remarks
  **Elizabeth Garrett**  
  Provost and Senior Vice President for Academic Affairs  
  University of Southern California
  **Avishai Sadan**  
  Dean  
  Herman Ostrow School of Dentistry of USC
  **Yang Chai**  
  Associate Dean of Research  
  Herman Ostrow School of Dentistry of USC
12:45pm - 1:30pm  Mary Marazita - Keynote Address  
  Professor and Associate Dean of Research  
  School of Dental Medicine, University of Pittsburgh  
  “Nonsyndromic Cleft Lip and Cleft Palate: Phenotype and Genetics”
01:30pm - 02:00pm  Pascal Magné  
  Associate Professor  
  Division of Restorative Sciences  
  Herman Ostrow School of Dentistry of USC  
  “Science, common sense and experience in biomimetic restorative dentistry”
02:00pm - 02:50pm  Michele Shapiro - Keynote Address  
  Director of the Center of Multisensory Environments at Beit Issie Shapiro in Raanana, Israel  
  “Physiological and Behavioral Effect of Sensory Adaptation on anxiety of Children with Developmental Disabilities: A New Approach”
2:50pm - 5:00pm  Poster Viewing
5:00pm  Awards Presentation
Mary L. Marazita, PhD – Dr. Marazita serves as Associate Dean for Research and as Director of the Center for Craniofacial and Dental Genetics at the School of Dental Medicine, University of Pittsburgh. She is also Professor and Chair of the Department of Biology, Professor of Human Genetics in the Graduate School of Public Health and Professor of Psychiatry in the School of Medicine. Dr. Marazita is a founding fellow of the American College of Medical Genetics. She is widely published in many prominent scientific journals, primarily in her specialty of craniofacial genetics. Her research program includes studies of orofacial cleft families from many countries including China, Turkey, India, Hungary, Guatemala, Spain, the Philippines and the United States. A particular interest is in expanding the phenotype of orofacial clefts to include subclinical manifestations. Another major research area is in the genetic factors contributing to oral health and to oral health disparities. Dr. Marazita participates in genetic studies of pre-term birth, developmental anomalies, behavioral traits and psychiatric disorders.

Michele Shapiro, PhD – Dr. Shapiro is the Director of the Center of Multisensory Environments at Beit Issie Shapiro in Raanana, Israel, which is a multi-purpose organization that develops and provides services for children and adults with developmental disabilities. She also conducts a private practice specializing in the assessment and treatment of children with sensory integration dysfunction and she is also a consultant on interior environmental planning and on accessible parks. Dr. Shapiro pioneered and developed the use of Snoezelen (controlled multisensory stimulation) in Israel and her lifelong interest in the impact of sensory stimulation on function and well-being has directed her research and involvements. Her study, published in an international journal of oral science, has found that the level of anxiety among children during dental treatment can be reduced through multisensory stimulation. The study was conducted as part of her occupational therapy doctoral work. Dr. Shapiro has been involved in the field for over 30 years and since 1993, has been specializing in dysfunctional sensory processing and the resulting behavioral effects.

Pascal Magne, PhD – Dr. Pascal Magne is the Don & Sybil Harrington Professor of Aesthetic Dentistry at the Herman Ostrow School of Dentistry of USC. Dr. Magne is a recipient of multiple awards from the Swiss Science Foundation and the Swiss Foundation for Medical-Biological Grants. He was the recipient of the 2002 Young Investigator Award from the International Association for Dental Research. He is also the author of numerous clinical and research articles on aesthetics and adhesive dentistry and is an internationally known lecturer on these topics. Dr. Magne authored the book Bonded Porcelain Restorations in the Anterior Dentition -- A Biomimetic Approach, which has been translated into eight languages and is considered one of the most outstanding books in the field of adhesive and aesthetic dentistry.
Building a bridge between USC and oral heath care professionals worldwide.

For more information please visit http://www.uscdentalcepanpacific.org
# 1 Abbey Marterell

**Background:** Unsuccessful weight management poses a grave threat to the health and well-being of adults with serious mental illness (SMI). Overweight and obesity rates for this group are estimated to be up to twice that of the general population. Further, these conditions are associated with cardiovascular disease and premature death. Weight management approaches for people with SMI are typically oriented toward personal changes to improve nutrition and decrease sedentary lifestyle. Yet these approaches are largely unsuccessful because the impact of sociopolitical and socioeconomic factors on everyday activity is rarely addressed. **Purpose:** The purpose of this study was to understand the complex lifestyle circumstances relative to weight management in adults with SMI as a first step in developing a successful weight management intervention. **Methods:** Fourteen participants engaged in four focus group interviews of 1½ to 2 hours each. Additionally, four of these participants completed an individual semi-structured interview lasting 2 to 3 hours and a participant observation session lasting 2 to 4 hours. Data analysis included coding transcripts to determine barriers to weight management as experienced by participants. **Results:** Macro-level sociopolitical and socioeconomic factors permeated the weight management experiences of these participants. Specifically, success was undermined by the effect of size discrimination on self-perception, an inability to meet basic nutritional needs, a lack of professional attention to physical health issues, and decreases in funded services that supported activity engagement. **Conclusion:** Weight management interventions for those with SMI may be more effective if they address sociopolitical action and system change strategies in addition to personal lifestyle changes.

# 2 Amy E. Merrill

**A Novel Human Craniosynostosis Disorder Results From Deficient Fgfr2 Signaling**

**Background:** The craniofacial skeleton is the framework for facial form and supports a unique set of tools to feed, sense, and communicate. Building the bones of the face begins in the embryo when mesenchymal precursors are shaped into integrated skeletal elements by spatiotemporal signals. Inherited human conditions compromising this process can devastate craniofacial malformations. **Purpose:** We identified a new autosomal dominant lethal skeletal dysplasia characterized by deficient skull ossification, craniosynostosis, and bent long bones and designated it Bent Bone Dysplasia (BBD). The aim of this study was to uncover the causative gene mutation for this novel craniofacial disorder. **Methods:** We isolated patient and parental DNA and sequencing candidate genes to identify coding mutations. Protein expression and signaling studies were performed on primary chondrocytes derived from an affected individual and stage-matched control using immunofluorescence and western blotting. **Results:** In all affected individuals, we found heterozygosity for a de novo missense mutation in the transmembrane domain of the cell surface receptor Fibroblast Growth Factor Receptor 2 (FGFR2). This polar amino acid substitution was predicted to inhibit membrane incorporation by a transmembrane prediction algorithm. Expression studies in patients’ cells confirmed little FGFR2 localized to the plasma membrane compared to control. Cell based assay to test the mutation’s effect on FGF signaling showed that mutant receptor was unable to activate a canonical downstream target in response to exogenous FGFR2. **Conclusion:** A heterogenous group of skeletal disorders with craniosynostosis results from activating mutations in FGFR2. This represents the first of which results from reduced FGFR2 function.

# 3 Ann Neville-Jam

**Child, Caregiver And Practitioner Experiences Of Incontinence In Spina Bifida**

**Background:** Spina bifida, the inability of the spinal cord to fuse by 28 days of gestation, causes many secondary problems depending on the area of the spinal cord lesion. Bowel and bladder incontinence occurs in approximately 90% of children with spina bifida. Incontinence produces significant stigma and limitations in everyday life. **Purpose:** The study reported here was part of a larger funded research project that was conducted to examine the effectiveness of bowel and bladder interventions in children 5-12 years of age. Using a smaller subset of participants from the larger study, our purpose was to understand the management of incontinence at home, in school, and in the community from the multiple perspectives of the child, caregiver, and practitioners. **Methods:** We used qualitative methods including interviews and focus groups. Our research participants were recruited from the larger sample at three sites in the western U.S. From transcripts of interviews and focus groups we identified themes across the data and examples that illustrated the different perspectives. **Results:** We identified that many tensions and struggles existed between a medical versus a social understanding of incontinence. We found that younger children expressed less concern with incontinence issues. However, older children, caregivers, and practitioners were concerned about full participation. For example our participants expressed concern about overnight visits with friends, community outings with family, and friends discovering their “secret.” **Conclusion:** While medical compliance with interventions is critical the social ramifications are also significant and need to be addressed in spina bifida clinics.

# 4 Jesus Diaz

**Creation Of A Fidelity Scale For A Lifestyle Redesign Intervention**

**Background:** The concern for treatment fidelity emerged from the 1960s community mental health movement that demanded an increase in accountability for psychotherapy (Moncher & Prinz, 1991). A fidelity plan adds rigor to the trials by ensuring that the independent variable is manipulated as planned (Bruckenthal & Broderick, 2007) A fidelity plan adds rigor to the trials by ensuring that the independent variable is manipulated as planned (Bruckenthal & Broderick, 2007). A fidelity plan can also help prevent drifting of the intervention for the National Institute of Health Human-Animal Interaction As A Site Of Intersubjectivity In Autism

**Background:** Children with autism appear to perceive as socially salient a group of ontological entities that includes animals (Grandin & Johnson, 2006; Prince-Hughes, 2001, 2004; Solomon, 2010) and technological reviewing the literature to determine the best practices for developing an instrument of this kind. 2. expert consultation to identify the elements of a lifestyle redesign intervention 3. formulation of steps to be taken 4. implementation of the fidelity scale. **Results:** The team identified seven components that required monitoring for our intervention, including: incident visits, qualifications of the therapist, schedule of client contacts, use of treatment manual, use of motivational interviewing, nurse consultation, provision of adaptive equipment, development of personal risk profiles, development of personalized prevention plan, ongoing risk monitoring, ongoing prevention plan monitoring, consideration of daily activity/routine, respect for client choice, and therapist client rapport. These components were then divided into two different sections: Structure and Process. A scale was developed for each component in the fidelity scale. The fidelity scale is currently administered once a month per interviewer. **Conclusion:** The scale has been deemed beneficial in monitoring the fidelity of the Pressure Ulcer Prevention Project during the last year. In the immediate future the PUPP team will be meeting to make any needed modifications to the fidelity scale, further strengthen the utility of the scale.
timely, accurate diagnosis and appropriate services. opportunities for African-American children receiving development was noticed, interpreted and identified; experience of how, when and by whom a child's atypical mothers' diagnosis stories provide a lens on their experience of interacting with professionals; to capture to examine how African-American mothers narrate their African-American mothers' experience of ASD diagnosis factors (Bimstein & Katz, 2009).

Background: Children In Underserved Populations

Relationship Between Obesity And Caries In Children In Underserved Populations

Background: Dental caries remains the most prevalent disease in children in the United States. Childhood obesity has increased to epidemic proportions in the last two decades. Both conditions have especially affected children of low-income families. Studies have shown obesity and dental caries share related etiologic artifacts such as robots (Feil-Seifer & Mataric, 2008) and virtual peers (Cassell & Tartaro, 2008). Purpose: This study examines embodied displays of social orientation and affective attunement of five children with autism as they interact with socially trained therapy dogs, parents and siblings. Methods: Analysis focused on both human and canine displays of intersubjectivity in animal-assisted therapy sessions, examining how social orientation is constructed by children with autism and their communicative partners; and on ways in which inclusion of therapy dogs in social interaction mediates and affords the children's ability to display intersubjectivity and empathy. Results: Micro-level analysis of interactions recorded spontaneous interactions shows that canine constraints on communication are highly complementary with the constraints that autism imposes on children: limited use of language, impairment in facial expression of affect, high interest in and orientation to objects and their instrumental use, an n need to maintain sameness in the environment. Conclusion: This study demonstrates how introducing therapy dogs as communicative partners of children with autism imposes significant and systematic constraints on social interaction and reorganizes it in ways that match the communicative abilities of children with autism.

# 7 Olga Solomon

Diagnosis Stories: Understanding African-American Mothers' Experiences Of Their Children'S Asd

Background: Research on the impact of a child's developmental disability on the family has focused on parental functioning and well-being relative to the kind of the disability, its severity, and perceived parental burden and stress. While the group design of these studies provides information about commonalities of parental experience, there is a need for a nuanced understanding of family members' experiences of raising a child with ASD. Purpose: To provide an account of African-American mothers' experience of ASD diagnosis to complement studies on parental stress and well-being: to examine how African-American mothers narrate their experience of interacting with professionals; to capture diversity in the family life and experience of ASD while identifying themes and issues that hold across families. Methods: Diagnosis narratives were selected from interviews with mothers collected for: 1) the study 'Autism in Urban Context: Linking Heterogeneity with Health and Service Disparities' (O'Sullivan, P.I.); and 2) the study 'Boundary Crossings: Resituating Cultural Competence' (M. Lawlor, P.I.). Narratives were analyzed along three dimensions: chronological, epistemic and thematic. Results: Chronologically, mothers narrated the experiences based upon a timeline of remembered noticings and the dates of clinical evaluations that led to an ASD diagnosis. Epistemically, the mothers evinced understanding of their child's particular kind of ASD. Thematically, sources and nature of evidence, clinicians' and mothers' partnering up, and views of the child's abilities relevant to the future were present across the data. Conclusion: African-American mothers' diagnosis stories provide a lens on their experience of how, when and by whom a child's atypical development was noticed, interpreted and identified; and offer a valuable perspective on the barriers to and opportunities for African-American children receiving timely, accurate diagnosis and appropriate services.

# 8 Reyes Enciso

Relationship Between Obesity And Caries In Children In Underserved Populations

Background: Dental caries remains the most prevalent disease in children in the United States. Childhood obesity has increased to epidemic proportions in the last two decades. Both conditions have especially affected children of low-income families. Studies have shown obesity and dental caries share related etiologic factors (Bimstein & Katz, 2009). Purpose: The purpose of this study was to understand the relationship between obesity and dental caries in a population of underserved children between the ages of 4 and 18 years. The subjects were all children who attended one of four USC Mobile Clinics in 2009 (Taft, East Los Angeles, Oxnard and Glendale). Methods: In this retrospective study (IRB#UP-03-0024), we collected data on age, gender, weight, height, and number of decayed/filled/missing surfaces from 441 charts of children 4-18 years old. Body Mass Index was calculated based on height and weight. Caries prevalence was analyzed based on the Decayed, Missing and Filled Surfaces (DMFS) index for permanent teeth and the decayed, filled surfaces (dfs) index for primary teeth. Statistical variables were tested for normality. Only age was considered normally distributed. Spearman correlation for non-parametric variables was used to test the association between BMI and DMFS score, with age as a confounder. Results: In this group of children 4-18 years old, the mean age was 10.2±3.2 years old and the mean BMI was 21.3 kg/m2 (range 12.5-40 kg/m2). 90% of children had at least one tooth decayed, and 54% had at least one tooth filled. Mean dfs for primary teeth was 10.9 for 2-11 years old, and the mean DMFS for children 12-18 was 11.1. BMI increased significantly with age (R=0.68; p<.0001). DMFS increased significantly with age (R=0.63; p<.0001) and BMI (R=0.59; p<.0001); however, BMI was not significantly correlated with DMFS after statistical adjustment for age (R=0.25; p=0.13). Conclusion: As children get older they put on weight (10 pounds per year in this group of children). Both Body Mass Index and dental caries measured by the DMFS index increase with age. Public health measures to improve dietary education and weight control could decrease the risk of both diseases.

# 9 Tae Kim

Structural Integrity Of Laser Surface Treated Zirconia

Background: Surface roughening enhances the micromechanical interlocking of luting agents to ceramic surfaces. Research has shown that laser treatment (Er:YAG) and other surface treatments of zirconia certainly improves bonding (Ural et al). These treatments penetrate a few micrometers into the outermost surface of zirconia creating microcracks and advancing the bond (Bahadir et al). However, there is limited scientific data available regarding the effects of laser irradiation on the surface of dental ceramics. A previous study reported that the recommended intensity of laser irradiation to zirconia is 200mJ and if superficial flaws are developed, they will propagate through the material reducing its strength (Cavalcanti et al). Our study will also investigate whether the proposed 200mJ is a proper intensity level for the treatment of zirconia surfaces. Purpose: This study aims to investigate the effect of laser treatment on the structural change of yttrium-stabilized tetragonal zirconia (Y-TZP) ceramics on its flexural strength. Methods: Forty Y-TZP soft blocks will be milled then sintered in equal dimensions. Twenty blocks are to be surface treated and twenty blocks will be left untreated. All of the blocks will undergo a three-point bend test using a universal testing machine until failure. All specimens and their modes of failure will be analyzed with SEM and statistical significance by one-way ANOVA. Results: We expect the results to show no difference between laser treated and non-treated surface on the flexural strength of zirconia. Conclusion:

# 10 Trudy Mallinson

Impact Of Urinary Incontinence On Rehabilitation Outcomes In Irfs

Background: In older adults urinary incontinence (UI) is associated with poor health outcomes including: lower ADL status, poor mobility, increased risk of falls and pressure ulcers, and increased health resource utilization. However, the prevalence of urinary incontinence in patients receiving inpatient medical rehabilitation remains largely unknown. Purpose: The goals of this study were to establish a baseline description of the prevalence of UI in inpatient medical rehabilitation settings and to evaluate the impact of UI on patient outcomes. We hypothesized that incontinence would be associated with less recovery of mobility function, and increased likelihood of discharge to nursing home. Methods: A retrospective cohort study of 403,697 Medicare beneficiaries admitted to Inpatient Rehabilitation Facilities (IRFs) in 2005. Results: Urinary incontinence is highly prevalent in patients admitted to IRFs. Prevalence varies by diagnosis. Most patients do not change their continence status. For patients incontinent on admission, 62% are still incontinent at discharge, 27% improve in continence status. In a multivariate regression, on average, urinary incontinence reduces discharge FIM mobility score by 2 points for stroke patients and 3 points for orthopedic patients. In a multimonial logistic regression, urinary incontinence significantly increases the likelihood of discharge to a nursing home. For older women treated for orthopedic conditions, urinary incontinence increases the likelihood of discharge to nursing home increases by over 70%. Conclusion: Urinary incontinence is highly prevalent in rehabilitation patients. It is a significant predictor of mobility at discharge and significantly increases the probability of discharge to a nursing home - especially for women with orthopedic conditions.
**Advanced Specialty Program Resident**

# 11 Zoe Mailloyd and Susanne Smith Roley
**Advisor:** Shawn Cepak

**Sensory Integration Patterns In Children With Hearing Loss**

**Background:** Although audition is clearly one of the critical senses in early development contributing to learning, social interaction and occupational performance, this sense is not as commonly included in occupational therapy assessment and intervention as other sensory functions. **Purpose:** While other professionals, such as audiologists and speech language pathologists, usually take the lead role in addressing hearing loss, occupational therapists do participate as members of educational or health care teams offering services to children who have conditions related to this concern. The literature on hearing loss and, more recently, the impact of cochlear implants, has reported mixed results related to accompanying developmental trajectories in this population. **Methods:** Through a collaborative project between the John Tracy Clinic, a non profit center for children with hearing loss, and Pediatric Therapy Network, a non profit children’s center for children with hearing loss, occupational therapists do participate as professionals, such as audiologists and speech language pathologists, in comprehensive ways that may lead to new and innovative roles for occupational therapists.

# 12 Mohamed H. Saber, Faizal Alonazain
**Advisor:** T. Levy, J. Simon, P. Sedghizadeh, J. Slots

**Characterization Of Pulpal And Periapical Microbiology Using Novel Sequencing Techniques**

**Background:** Pulpal and periapical infections are caused by microorganisms. Infection of the root canal will eventually lead to infection of the periapical area. Local spread of infection can result in abscess formation and cellulitis. Systemic spread can result in bacterial endocarditis: an acute infection of the heart. These sequelae are less threatening. The course of the infection is dependent on the type and amount of microorganisms involved. Thus, identification and quantification of periapical microorganisms is of pinnacle importance. **Purpose:** The aim of the study is to characterize and compare pulpal and periapical microbiology in teeth with necrotic pulps in healthy and HIV positive populations using PCR/electrospray-mass spectroscopy and pyrosequencing. The hypothesis (H0) states that there will be a difference in microbial profile of root canals and periapical lesions in healthy and HIV positive individuals. **Methods:** Twenty samples will be obtained from the root canals of healthy and HIV positive individuals (n=10/group). Another, twenty samples of periapical lesions will be harvested surgically from healthy and HIV positive individuals (n=10/group). Root canal sampling will be performed using a cut-off file and two paper points under strict asepsis. Sampling of periapical lesions will be performed surgically. Microbiological analysis will be done using integrated PCR/mass spectrometry. **Results:** To be available mid January.

# 13 Lac+usc Gpr
**Advisor:** Richard Green

**A Literature Review Of Buffered Local Anesthetics And Their Implications In Dentistry**

**Background:** Buffered local anesthetics have been used in several medical fields including dermatology, ophthalmology, and epidurals. Due to its widespread use, we wanted to evaluate its implication to dentistry. **Purpose:** The purpose of our literature review is to discuss the therapeutic benefits of buffered anesthetics for use in clinical dentistry including decreased time of operation and patient comfort. Our review encompasses a comprehensive overview of available literature on buffered anesthetics. **Results:** The vast majority of the studies found that buffered anesthetics are less painful than non-buffered. The benefits of buffering can be mitigated by decreasing injection speed. Also, buffering can be synergistically affected by including epinephrine and warming the solution prior to injection. There have been mixed findings with regards to how buffering affects the quality, duration, and time of onset of local anesthetics. Based on our review, there are some definite benefits that could be gained from the use of buffered local anesthetics in dentistry. Foreseeable limitations to its widespread use may include preparation time, storage, and cost to the practitioner.

# 14 Simon Choyee
**Advisor:** Anh Le

**Predictors Of Bronj In High-Risk Cancer Patients**

**Background:** Bisphosphonate related osteonecrosis of the jaws (BRONJ) is a morbid bone disorder associated with bisphosphonate exposure. An estimated 94% of cases reported in the oncologic patients receiving intravenous nitrogen-containing bisphosphonates (BP). Using our murine BRONJ-like model, we reported that an altered immune homeostasis regulated by the suppressor T-cell population influences the pathophysiology of BRONJ disease. Therefore, the altered T cell profile potentially serves as a new diagnostic tool for BRONJ. **Purpose:** To identify novel immune biomarkers/predictors of BRONJ in the high-risk cancer patients. **Methods:** We conducted a cross-sectional study using a well-defined group of cancer patients with history of chemotherapy and bisphosphonate treatment. The case controlled study evaluated patients who presented with osteonecrosis of the jaws (ONJ). Age and ethnically matched patients without ONJ were compared to the affected patients. Patients were screened from the Norris Cancer Center, the Ostrow School of Dentistry, and the LAC+USC medical centers. The Tregs were determined using flow cytometric analysis. Bone serum markers (C-telopeptide, osteocalcin, alkaline phosphatase) were measured using ELISA. **Results:** Data demonstrated a strong correlation between the suppressed ratio of Treg/Th17 cells and high-risk cancer patients with history of chemotherapy with and without zoledronate, and those with active BRONJ lesion. The high-risk cancer patients showed a significantly higher level Th17 cells than control. We also observed a nice correlation between a suppressed Treg/Th17 ratio and disease severity, early, advanced, late stage of BRONJ. The differential immune cells profile between control and high-risk BRONJ groups were more significant than the parallel serum C-telopeptide assay. **Conclusion:** The Treg/Th17 ratio appears to correlate with BRONJ disease severity and potentially serves as an immune biomarker for prediction of BRONJ in cancer patients on IV bisphosphonate and chemotherapy.

# 15 Donald Kwon
**Advisor:** HongSheng Tong

**Proper Tip And Torque For The Whole Tooth In Three-Dimensional Space**

**Background:** Traditionally, it has been very difficult to determine the proper mesio-distal angulation and bucco-lingual inclination of the teeth utilizing clinical examinations and two-dimensional x-rays (lateral cephalograms and panoramic x-rays). **Purpose:** We hypothesize that the utilization of three-dimensional x-rays will enable us to determine the proper mesio-distal angulation and bucco-lingual inclination of the whole tooth resulting in a more stable finish and greater treatment success. **Methods:** After selection of the patients, a 3-plane coordinate system (transverse, sagittal, and coronal) was used to visualize the position of the teeth in a 3D space. Two points were digitized representing the center of the crown and the center of the root and a line drawn through these points were measured in relation to the different planes to determine the tip and torque values. **Results:** Utilizing the roots, in addition to the crowns, allows for a more accurate determination of the long axis of each tooth and a more ideal tip and torque value. **Conclusion:** The results have shown that there is consistent range that all the teeth fall within. This “ideal” tip and torque can be built into current bracketing systems. Furthermore, with three-dimensional imaging ideal placement of brackets via indirect bonding can be determined utilizing the full advantages of straight-wire appliances, minimizing the need for compensatory bends in the archwires.

# 16 Elaine N. Chow
**Advisor:** Peter Seanikai

**Long-Term Dental Stability Of Cases With Uncorrected Anterior Tooth-Size Discrepancies**

**Background:** Little et al performed a long-term stability study of cases with four or more extractions 10 and 20 years post-retention. It was found that less than 30% have a satisfactory anterior occlusion, regardless of how well the case finished. About 30% of the general population has an anterior tooth-size discrepancy, yet no stability studies have been conducted on these types of cases. **Purpose:** This study aimed to assess the long-term stability of cases with an untreated anterior tooth-size discrepancy. **Methods:** We evaluated the existing cases from the original long-term stability study and separated them into two groups: no anterior tooth-size discrepancy and anterior tooth-size discrepancy. The included cases were measured with digital calipers accurate to 0.01mm for intercanine width, intermolar width, arch length, overjet, overbite, overangled incisors, and seven ABO cast grading criteria at 3 time points: pre-treatment (T1), post-treatment (T2), and post-retention (T3). The measurements were averaged and compared within themselves and between groups. **Results:** Cases with untreated tooth-size discrepancy at T2 had worse occlusal relationship, higher irregularity index, and the alignment was not as good as those without a tooth-size discrepancy. Most of the differences between the two groups disappeared by T3. The exception was the occlusal relationship, which stayed significantly worse for the tooth-size discrepancy group. **Conclusion:** According to the occlusal relationship measurements, it appears more difficult to fit the teeth together ideally in those with an anterior tooth-size discrepancy, and this does not self-correct over time. In most other factors, an anterior tooth-size discrepancy does not greatly affect long-term stability.

# 17 George Abchaker
**Advisor:** Tina Jaskoll

**Cmv Induces Stage-Dependent Differences In Tooth Dysmorphogenesis And Enamel Defects**

**Background:** Of the approximately 8,400 children born each year in the U.S. with cytomegalovirus (CMV)-induced birth defects, more than 1/3 of these children exhibit hypoplasia and hypocalcification of tooth enamel. About 1 in 1,400 live births in the US will exhibit CMV-induced amelogenesis imperfecta (AI), nearly 6 times more common than all genetic AI combined (approx. 1/8,000)
### Background

Panoramic images have been used throughout dentistry; however, there have been many studies describing the distortions in the images. There is no study that has looked at a trend in the distortions and compared it to an ideal coordinate system. This study will investigate patients with interincisal angles divided into 3 ranges to compare if there is a trend in the mesiodistal angulations based on the changes in interincisal angulation. **Conclusion:** There is a trend in distortions based on the interincisal angle. **Methods:** Panoramic images were constructed using the 3D dicomm data on dolphin software. The long axis was drawn through each tooth and the angle was measured against the occlusal plane. These measurements were compared to the true mesiodistal angles that were found using the 3 plane coordinate system. The results revealed definite distortions in the mesiodistal angulations on the constructed panoramic images; however, the statistics were not completed. **Conclusion:** The final results have not yet been determined, measurements have been taken but no statistics have been run on the measurements.

### Methods

- **Background:** Facial esthetics is an important motivating factor for many patients seeking orthodontic treatment. Evaluating the face in profile is a significant part of a complete orthodontic diagnosis. Traditionally in orthodontics, facial profiles have been evaluated using cephalometrics and repose soft-tissue analysis. In this study we hypothesize that there is a significant difference in the profile soft-tissue analysis when the patient is smiling.
- **Purpose:** Our purpose is to evaluate and compare the anteroposterior relationship of the maxillary central incisors to the forehead in adult white females with harmonious profiles versus adult white female orthodontic patients.
- **Methods:** 94 photographic images of adult white females with good facial harmony (control sample) were compared with 150 photographs of adult white females seeking orthodontic treatment from 3 separate offices (study sample). All smiling profiles had the maxillary central incisors and the forehead in full view. The images were adjusted and rotated to the upright head position. Reference lines were drawn to evaluate the anteroposterior positions of the maxillary central incisors as well as forehead inclinations.
- **Results:** Our results indicate that there is a significant difference between the control sample (harmonious profiles) and each office. ANOVA and nonparametric analysis indicate that our results are significant. There was no major difference observed between anteroposterior incisor position and forehead inclination, however none in the study samples.
- **Conclusion:** The forehead is an important landmark for anteroposterior maxillary incisor positioning for adult white females seeking improved facial harmony.

### Effect Of Cbct Imaging On Orthodontic Diagnosis And Treatment Planning

**Background:** The effect of cone-beam computed tomography (CBCT) imaging in orthodontic and dental diagnosis and treatment planning has been evaluated. Our hypothesis is that CBCT imaging provides additional diagnostic information that will influence orthodontic diagnosis and treatment planning. **Methods:** Orthodontic examiners will diagnose and create treatment plans for 50 consecutively orthodontic patients using conventional orthodontic records and CBCT images. Examiners will complete questionnaires at three different points in time. The first two will use conventional records to determine intra-examiner reliability, whereas the third analysis will be used to determine if CBCT can alter treatment plans with and without the 3-dimensional imaging will be compared to determine if CBCT data alters the orthodontic diagnosis and treatment plans. In addition the type of cases in which CBCT has the most effect will be studied. **Results:** There is no correlation between CBCT data and the orthodontic treatment plans. **Conclusion:** There is no significant correlation in the control sample between anteroposterior incisor position and forehead inclination, however none in the study samples.

### Purpose:

The purpose of this study was to use a metagenomic approach in analyzing the species in subgingival plaque of 2 patients before and after non-surgical initial phase therapy. Metagenomic analyses of the plaque samples were performed by PCR amplification and sequencing of 16S-rRNA genes using the pyrosequencing platform 454. Species were identified by sequence analyses on the RDP database. Quantitative analysis by real-time PCR was then performed on the metagenomic DNA present in the subgingival samples. Our results indicate that there is a significant quantitative change in the proportion of the predominant species Porphyromonas gingivalis. **Results:** Although species-type distributions varied between both patients, pre- and post-therapy samples showed similar significant quantitative and distributive species changes. Quantitatively, many known pathogenic species went from easily detectable to zero counts while the opposite occurred for many known commensal bacteria. Real-time PCR results of the quantitative changes seen with P. gingivalis in both patients supported the results of the metagenomic analyses. **Conclusion:** The large inter-individual variability of species detected (n=150) supports further research in metagenomic functional gene analysis of entire microbial communities to better understand the etiology and pathogenesis of periodontitis.

### A Comparison Of Extraction Rates In One-Phase Versus Two-Phase Class II Malocclusion Patients

**Background:** The pros and cons of early two-phase treatment of Class II malocclusion have been recently examined. This study examines how growth modification will affect premolar extraction rates as well as final cephalometric outcomes. **Purpose:** We were attempting to test the following hypothesis: 1. There is a statistically significant difference in premolar extraction rates between single-phase and two-phase treatment 2. There is a statistically significant difference in cephalometric outcomes between single-phase and two-phase treatment groups. **Results:** There was no significant difference amongst single- and two-phase treatment groups with regards to extraction rates. **Conclusions:** Early orthodontic intervention in Class II malocclusion does not provide any reduced rates in premolar extraction nor does it affect cephalometric outcomes.

### Metagenomic Analysis Of Subgingival Plaque Of Periodontitis Before And After Periodontal Therapy

**Background:** New metagenomic approaches to analyze entire microbial communities have been created by researchers as an alternative to culture-based studies of single organisms in isolation. Recent studies on the oral microflora have revealed hundreds of as yet non-cultivable microbial species. **Purpose:** The objective of this pilot study was to use a metagenomic approach in analyzing the species in subgingival plaque of 2 patients before and after non-surgical initial phase therapy. Metagenomic analyses of the plaque samples were performed by PCR amplification and sequencing of 16S-rRNA genes using the pyrosequencing platform 454. Species were identified by sequence analyses on the RDP database. Quantitative analysis by real-time PCR was then performed on the metagenomic DNA present in the subgingival samples. Our results indicate that there is a significant quantitative change in the proportion of the predominant species Porphyromonas gingivalis. **Results:** Although species-type distributions varied between both patients, pre- and post-therapy samples showed similar significant quantitative and distributive species changes. Quantitatively, many known pathogenic species went from easily detectable to zero counts while the opposite occurred for many known commensal bacteria. Real-time PCR results of the quantitative changes seen with P. gingivalis in both patients supported the results of the metagenomic analyses. **Conclusion:** The large inter-individual variability of species detected (n=150) supports further research in metagenomic functional gene analysis of entire microbial communities to better understand the etiology and pathogenesis of periodontitis.

### The Profile Of Inflammatory Cytokines In Gingival Crevicular Fluid Around Healthy Osseointegrated Implants.

**Background:** Regardless of gingival health and subgingival microbiology, production of cytokines within peri-implant tissues may be different from that found in teeth. The concentration of cytokines between implants and teeth were compared with the independent t-test. **Results:** The concentration of cytokines was higher in GCF from healthy implants than in teeth. The profile of cytokines was characteristic of an inflammatory response. A more frequent detection of periodontopathogenic bacteria was observed in teeth than implants. Cultivable levels of periodontopathogenic bacteria were similar between implants and teeth. **Conclusion:** Despite gingival tissue health and scarce plaque accumulation, the profile of inflammatory cytokines in implant crevicular fluid was distinctive of an innate immune response and in higher concentration than in teeth. Other than bacterial stimulus, intrinsic factors related to implants may be involved in more cytokine production in teeth.

### Ultrasonorally Set Novel Nve-Containing Glass-Ionomer Cements For Applications In Fixed Fronts With Aggressive Bonding To Enamel.

**Background:** Glass-ionomer cement has unique properties (e.g., adhesion to tooth structure and fluoride release). However, they have some disadvantages, such as brittleness and moisture sensitivity, which limit their application in orthodontic bonding. **Purpose:** The objective of this study is to investigate the effects of application of ultrasound on the physical properties of a novel NVE (N-vinylcaprolactam)- containing conventional glass ionomer cement. **Methods:** The novel terpolymer of acrylic acid (AA)–Itaconic acid (IA)–N-vinylcaprolactam (NVC) with 8:1:1 was synthesized and used (50% solution)
in the formulations of the experimental (EXP) GIC samples. Experimental GIC (EXP) samples were made from the synthesized terpolymer with Fuji IX powder in a 3.6:1 P/L ratio as recommended for the manufacture of restorations. Specimens were mixed and fabricated at room temperature and were conditioned in distilled water at 37°C for 1 day up to one week. Ultrasound (US) was applied 20s after mixing by placing the dental scaler tip for 15 s on the top of the cement and applying light hand pressure to ensure the tip remained in contact with cement without causing any deformation. Vickers hardness was determined using a microhardness tester. The working and setting times were determined using a Gilmore needle. Water sorption was also investigated. Commercial Fuji IX was used as control for comparison (CON). The data obtained for the experimental GIC set through conventional test (CS) and ultrasonically set (US) were compared with the control (CON) using one-way ANOVA (Stat-Soft, Tulsa, Ok) multiple range test at α = 0.05. RESULTS: The application of ultrasonic (US) energy accelerated the curing process of both experimental cement and control group and also improved the surface hardness of all the specimens. US cement and US set GICs by the application of ultrasound, leading to GICs with enhanced physical and handling properties. US application might be a potential way to broaden the clinical applications of conventional GICs in restorative dentistry for procedures such as class V cavity restorations.

**BioKinesiology and Physical Therapy Student - Exercise Musculoskeletal Biomechanics**

### # 25 David Erceg
**Advisor: Ed. Schoodrod**

**Metabolic Effects Of Whole Body Vibration Training In Latino Boys**

**Background:** With an increasing obesity epidemic, efficient methods of exercise are sought to improve health. Vibration training has been in use for decades to improve strength and flexibility, however little is understood about the metabolic effects from whole body vibration (WBV) exercise. **Purpose:** To determine if WBV exercise can improve insulin/glucose dynamics, resting metabolic rate (RMR), glycosylated hemoglobin (HbA1C) and lipid profile in sedentary overweight Latino boys. **Methods:** 20 overweight prepubertal Latino boys 8-10yrs of age were randomly assigned to either a control (CON = 9) or 3 days per week WBV group and condition suggests that athletes respond to task demands. Demand may be greater in younger athletes as development of perceptual-motor skills continues into adolescences. We hypothesized that a random direction cue presented after initiation of an unanticipated (UN) and anticipated (AN) movements in sedentary overweight Latino boys. **Methods:** 20 overweight prepubertal Latino boys 8-10yrs of age were randomly assigned to either a control (CON = 9) or 3 days per week WBV exercise (WBV = 11) for 10 weeks. Changes in metabolic parameters were assessed at baseline and 48hours post last training session. Comparisons of changes within and between groups for variables of interest were conducted using t tests and general linear model (p<0.05). **Results:** The WBV program did not result in significant improvements in fasting insulin, glucose, HbA1C or lipid profile, however, RMR significantly increased (p=0.01). There was a significant decrease in fasting glucose (p=0.04), triglycerides (p=0.02), and VLDL cholesterol (p=0.02) for the CON group. Between groups analyses revealed a significant increase in RMR for the VB group (p=0.03), while the CON group significantly lowered VLDL cholesterol (p=0.02) and triglycerides (p=0.02). **Conclusion:** A controlled WBV exercise protocol is effective for increasing resting metabolic rate in Latino Boys which may increase daily energy expenditure. However data also suggests that a 10wk duration WBV program may not be effective for altering fasting insulin/glucose, HbA1C or lipids.

### # 26 Silvener Cesar
**Advisor: Susan Signard**

**Effects Of Online Processing On Cutting Maneuver Across Maturation**

**Background:** Random cues presented after task initiation require online processing resulting in increased task demands. Demand may be greater in younger athletes as development of perceptual-motor skills continues into adolescences. We hypothesized that a random direction cue presented after initiation of an athletic change of direction task (cutting) will result in adjustments in approach speed, lower limb posture and loading. These adjustments would be more pronounced in younger athletes when compared to their older counterparts. **Purpose:** To investigate the effect of online processing demands on cutting maneuvers across levels of motor development. **Methods:** 76 female soccer athletes were divided into 4 maturational groups: pre-pubertal, pubertal, post-pubertal, and young adult. A cutting task at 45° was performed under conditions: anticipated (AN) and unanticipated (UN). Cutting direction was indicated prior to (AN) and after (UN) task initiation. Velocity was analyzed during the approach; knee flexion and ground reaction forces (GRF) were analyzed at contact. Repeated measures two-way ANOVA was used to determine differences among groups and conditions.

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**# 27 Hsiang-Ling Teng**

**Advisor: Christopher Powers**

**The Association Between Patella Alignment And Femoral Trochlear Geometry**

**Background:** Altered patella alignment has been proposed as an etiologic factor associated with patellofemoral pain (PFP). Previous studies have suggested the geometry of femoral trochlea plays an important role in determining patella alignment. **Purpose:** To determine if the geometry of femur affect patellar alignment. **Methods:** Patellar alignment (lateral patella displacement and lateral tilt) and femoral trochlear geometry (the inclination of the lateral condyle (LTI)) were measured during walking, hopping, and under weight-bearing conditions. **Results:** The purpose of the study was to determine which anatomical characteristic of the distal femur (the sulcus angle of the trochlear groove (SA) or the inclination of the lateral anterior femoral condyle (LTC)) better correlates with patella alignment (lateral patella displacement and lateral patella tilt) during weight-bearing as assessed using MRI. **Conclusions:** Axial images of the patellofemoral joint were acquired in vivo and offline, using a 1.5T MR system under loaded conditions (25% of the body weight) at 4 knee flexion angles (0, 20, 40 and 60 degrees). Using the image containing the widest patella, patella alignment (lateral displacement and tilt) and femoral trochlear geometry (the inclination of the lateral condyle (LTI)) were measured. Pearson correlation coefficients were used to identify the correlation between patella alignment and femoral trochlear geometry at each knee flexion angle. **Results:** Significant negative correlations were found between the LTI and patella alignment across all knee flexion angles. No significant correlation was observed between the SA and patella alignment at any knee flexion angle. **Conclusions:** The findings of this study suggest that the geometry of the lateral anterior femoral condyle (LTC) is a more important factor in determining patellar alignment than the geometry of entire trochlear groove. As such, the LTI could be an underlying factor contributing to FAI.

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**# 28 Jennifer Peterson**

**Advisor: Christopher Powers**

**Individuals With Femoroacetabular Impingement Demonstrate Decreased Sagittal Motion During Squatting**

**Background:** Femoroacetabular impingement (FAI) is an anatomically defined condition resulting in abutment of femoral head-neck with the acetabulum. Little is known regarding kinematic factors contributing to FAI. **Purpose:** To compare hip, femur, and pelvis kinematics between individuals with Femoroacetabular Impingement (FAI) and control subjects during maximum depth squat. **Methods:** Maximum depth squatting was performed by 7 subjects with diagnosis of FAI (5 female, 2 male) and 6 control subjects (3 female, 3 male). Kinematic data were collected at 250 Hz using Qualisys Motion Capture System (Qualysis, Inc., Gothenberg, Sweden). Sagittal plane hip kinematics and femur and pelvis motion at maximum squat depth were compared between groups using independent t-tests (α =0.05). **Results:** At maximum squat depth, FAI group demonstrated decreased peak hip flexion (98.4 ± 5.7° vs. 106.5 ± 7.1°, p=0.023) and decreased femoral flexion (85.2 ± 7.2° vs. 99.2 ± 19.0°, p=0.048). There was a trend toward increased anterior privileged tilt in the FAI group however this was not significant (13.5 ± 8.7° vs. 8.6 ± 12.6°, p=0.42). **Conclusion:** Decreased hip flexion in the FAI group at maximum squat resulted primarily from decreased femoral flexion as FAI subjects demonstrated a tendency towards greater degrees of anterior pelvis tilt. We theorize that inability to rotate the pelvis posteriorly at maximum squat depth may contribute to bony impingement. Hypothetically, relative posterior-superior pelvis tilt during this phase may allow for greater femoral flexion, and therefore greater hip flexion. Our results suggest diminished pelvis motion during activities requiring high degrees of hip flexion may contribute to FAI.

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**# 29 Jo Armour Smith**

**Advisor: Kornelia Kulu**

**Trunk Segment Coordination During A Jumping Task In Elite Dancers**

**Background:** Successful performance of athletic skills requires appropriate task-specific inter-segmental trunk coordination. Variability in the sagittal plane (in-phase, anti-phase, lumbar phase, thoracic phase) and the coordination variability were determined across propulsion, flight and landing phases of the jump using the vector coding technique. **Results:** Coordination was primarily anti-phase during propulsion and landing and lumbar phase during flight. Mean coordination variability peaked just prior to landing, and at the transition from the landing phase of one jump to the propulsive phase of the next. Mean coordination variability was lowest during propulsion. There was a significant inverse linear relationship between dance training history and mean coordination variability (R² = 0.58; p=0.046). **Conclusion:** In elite dancers discrete phases of a jump were differently characterized by pattern and variability of inter-segmental trunk coordination. Peaks in variability can be explained by task-specific and phase-specific biomechanical demands. Analysis of inter-segmental coordination discriminated between subjects of different years of experience.
# 30 KAI-YU HO
ADVISOR: CHRISTOPHER POWERS
Measurement Of Bone Density: A Comparison Of CT And MRI
BACKGROUND: Quantitative computed tomography (QCT) has been commonly used to acquire subject-specific, volumetric bone densities. With QCT, a heterogeneous bone density can be generated by assigning 3-dimensional density measures to FE bony models.

**Purpose:** The purpose of this study was to correlate the bone density measurements between CT and QCT. QCT can be performed due to a small sample size.

**Results:** 
1. The bone density with the assistance of a calcium hydroxyapatite (CHA) calibration phantom.
2. The bone density was registered to its corresponding position on IDEAL IP imaging. After positional registration, the average of every 4 pixels within patella on IDEAL IP and QCT imaging were calculated and evaluated with Pearson correlation coefficient. **Results:** The densities calculated on IDEAL IP and QCT imaging were significantly correlated with those quantified from QCT on a human patella.

**Conclusion:** The current study demonstrates that IDEAL IP imaging can be used to quantify bone density. The subject-specific, volumetric bone density measurements acquired from IDEAL would provide an alternative to the bone density measurements with the assistance of a calcium hydroxyapatite (CHA) calibration phantom.

# 31 KATHRYN HAVENS
ADVISOR: SUBHENDU DEY
Separation Of Center Of Mass And Center Of Pressure During Running And Sidestep Cutting
BACKGROUND: Agility or maneuverability is essential for successful participation in multidirectional sports. Maneuverability involves self-generated perturbations to the body's center of mass (COM) from steady state locomotion. One indicator of the control of the center of mass during tasks that require a change in direction is the magnitude of the separation between the whole-body COM and the center of pressure (COP).

This separation is likely to differ from running and be affected by cutting velocity. **Purpose:** To characterize the COP during the faster SCUT. **Conclusion:** A control strategy that positions the COM lower, further posterior, and more medial to the COP may be necessary for effective whole-body directional change. Only changes in the anterior/posterior position were needed to respond to the demands of different cutting speeds.

# 32 KRISTEN STEARNIS
ADVISOR: CHRISTOPHER POWERS
Knee Biomechanics And Return-To-Sport Test Performance: Retrospective Analysis Post-Acl Re-Injury
BACKGROUND: Individuals who undergo anterior cruciate ligament (ACL) reconstruction have a high risk of developing knee osteoarthritis (OA). The elevated risk of OA may have been shown to have higher risk of developing knee osteoarthritis (OA). The elevated risk of OA may have been shown to have higher risk of developing knee osteoarthritis (OA). The elevated risk of OA may have been shown to have higher risk of developing knee osteoarthritis (OA).

**Conclusion:** While our subject met current criteria for RTS, she demonstrated knee biomechanics associated with ACL injury risk. The risk for re-injury upon RTS, it may be important to re-evaluate current guidelines for RTS.

# 33 LIANG-CHING TSAI
ADVISOR: CHRISTOPHER POWERS
Increased Tibiofemoral Compressive Loads Following Anterior Cruciate Ligament Reconstruction
BACKGROUND: Individuals with ACL reconstruction (ACLR) have been shown to have higher risk of developing knee osteoarthritis (OA). The elevated risk of OA may have been shown to have higher risk of developing knee osteoarthritis (OA). The elevated risk of OA may have been shown to have higher risk of developing knee osteoarthritis (OA). The elevated risk of OA may have been shown to have higher risk of developing knee osteoarthritis (OA).

**Conclusion:** The results of our study indicate that the friction demands during various sport-specific tasks are considerable. In particular, cutting tasks were found to require greater friction compared to running. The data obtained from this study can be used to establish available requirements for court surfaces in order to prevent the likelihood of a slip event during athletic competition.

# 36 MARK LYLE
ADVISOR: CHRISTOPHER POWERS
Effects Of Hip Muscle Strengthening In Females With Patellofemoral Pain
**Background:** Although hip weakness has been proposed as a contributing factor for developing patellofemoral pain (PFP), the effects of isolated hip strengthening on PFP symptoms has not been examined. **Purpose:** To examine the effectiveness of an 8 week hip strengthening program on pain and health status in females with PFP.

**Methods:** Twenty-eight females with bilateral PFP were sequentially assigned to an exercise (n=14) or control group (n=14). The exercise group completed bilateral hip adduction and external rotator strengthening 3x/ wk for 8 weeks. Pain (VAS: 0-10 cm) and health status (WOMAC) were assessed at baseline and at 8 weeks. Pain and health status also were measured at 6 months in the exercise group. Independent t-tests were used to examine between group differences at baseline. Separate 2 x 2 ANOVAs with repeated measures were used to determine the effects of the intervention.

**Results:** No differences were found between groups at baseline (p>0.05). A significant improvement in the intervention group was noted in both pain and health status at 8 weeks (p<0.05). Pain and health status improved in the exercise group but did not change in the control group (VAS: -4.4±2.7 vs. 0.1±1.7 cm; WOMAC: -4.3±2.0 vs. -4.1±1.3 cm). All post-rehab, pain and health status of the exercise group was not different from that reported post-intervention (p>0.05). **Conclusion:**
Testosterone Responses To Acute Resistance Training Protocols In Healthy Men

**Background:** Resistance training is a potent stimulator of skeletal muscle growth, and androgen signaling is important for mediating resistance training-induced muscle growth. **Purpose:** To examine the acute total testosterone response in healthy men to 4 different resistance training (RT) protocols. We hypothesized that the hypertrophic protocol and the strength protocol would result in an acute increase in total testosterone.

**Methods:** Twenty subjects participated in the double-blind, randomized, placebo-controlled, crossover study. Each subject participated in 4 resistance training protocols: hypertrophic, strength, moderate intensity, and low intensity. Each protocol consisted of 5 sets of 8-10 repetitions at 70% of 1RM. Blood was drawn pre-exercise, immediately post-exercise, 15 minutes post-exercise, and 30 minutes post-exercise.

**Results:** The hypertrophic protocol with a 50% 1RM (16.0% 1RM) elicited significantly (p < 0.05) different total testosterone concentrations from pre-exercise (7.32±1.85 ng/mL) to immediately post-exercise (8.78±1.83 ng/mL), 15 minutes post-exercise (8.58±2.15 ng/mL), and 30 minutes post-exercise (8.69±2.16 ng/mL). The strength protocol with a 60 second rest interval (50%) showed a noticeable non-significant (p < 0.056) difference in total testosterone concentration from pre-exercise (7.73±1.88 ng/mL) to 15 minutes post-exercise (8.35±1.64 ng/mL), and the strength protocol with a 90 second rest interval (60%) showed a noticeable non-significant (p < 0.07) difference in total testosterone concentration from pre-exercise (7.96±2.29 ng/mL) to immediately post-exercise (8.75±2.45 ng/mL).

**Conclusion:** Results suggest that utilizing short rest intervals between resistance training sets maximize the acute total testosterone response to hypertrophic RT schemes, and may potentially optimize the acute total testosterone response to strength RT schemes leading to significant increases in both muscle mass and strength over a longer-term period of strength training.

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**Ankle Actuator Deficits In The Presence Of Achilles Tendinopathy**

**Background:** Tendon is the primary elastic energy storage-release structure actuated during the stretch-shortening cycle of the lower extremity. An injured, more compliant tendon may lead to an alteration in this energy modulation capability. The regulation of joint stiffness is controlled by the tendon but also by the activation of skeletal muscle. During sub-maximal hopping, the ankle joint is the primary contributor to leg stiffness. We hypothesize that in the presence of Achilles tendinopathy, the body will maintain ankle joint stiffness to preserve total leg stiffness; and the tendinopathic Achilles tendon will not be able to exert the same amount of effort, determined by the net joint moment and net joint moment power, as the healthy tendon during the concentric phase of hopping.

**Purpose:** To determine ankle joint stiffness and performance in the presence of Achilles tendinopathy. Twelve male subjects participated in this study, five with Achilles tendinopathy. Lower extremity kinematics and kinetics were calculated during single-legged hopping at 2.2Hz. Each subject performed 20 hops, of which 8-20 were retained. Vertical ground reaction force (GRF) data were used to calculate the leg stiffness (kleg) at maximal GRF. Sagittal plane net Joint Moment (NJM) and Net Joint Moment Power (NJP) of the ankle joint were calculated using standard inverse dynamics. Angular stiffness of the ankle joint (kankle) at the interval of maximal GRF was defined. The concentric phase was defined as the time period when the ankle NJP is positive. Average ankle NJM and NJP during the concentric phase were calculated for each hop of each subject.

**Results:** The analyses of leg stiffness at the time of maximal GRF showed no difference between Achilles tendinopathic subjects (AT) and healthy controls (HC). Ankle joint stiffness also showed no difference between the two conditions. During the eccentric phase, with a further increase of Achilles tendinopathy showed lower average ankle NJM and, though to a lesser extent, lower average ankle NJP.** Conclusion:** Humans attempt to maintain optimal leg stiffness through regulatory mechanisms which can be achieved by modulating muscle activation. Human Achilles tendon is the primary structure designed to store and release elastic strain energy that ultimately reduces the metabolic costs during locomotion. Lower NJM and NJP may indicate that the energy release during the concentric phase is down-modulated which may be attributed to the more compliant tendinopathic tendon.
Self-Efficacy Predicts Hand Selection For Reaching Movements After Hemiparetic Stroke

**BACKGROUND:** Self-efficacy, the prospective confidence in motor capability to perform effectively in a given environment, may contribute to the expression of upper limb recovery after stroke. A new self-efficacy measure was developed to capture confidence in reaching movements performed to targets over varying distance and direction. **PURPOSE:** To validate the self-efficacy measure and to examine its relationship to hand selection after stroke. **METHODS:** Eleven individuals post-stroke and 10 healthy controls participated. Without moving the hands, participants were instructed to decide which target/hand set in a pair they had more confidence in reaching quickly and accurately. Reaching self-efficacy (RSE) for each set was defined as the ratio of its selections to its predictions. Results: RSE correlated significantly with target distance (r=0.657) and direction (r=0.590) and was significantly lower in the non-dominant hand in controls. Lower RSE for the paretic hand was seen in left-hand paresis (p=0.001), but not right-hand paresis (p=0.098). The correlation between RSE and PHS is high for individuals post-stroke (r=0.731; p=0.011), but absent for controls (r=0.048; p=0.893). **CONCLUSION:** Findings provide validity for the measure. The significant correlation between self-efficacy and paretic hand selection supports the contention that perceived confidence in task-specific motor capability plays a role in determining hand use after stroke.

# 44 Sudarshan Davaidni
Advisor: Francisco Valero-Cuevas
Dynamic Analysis To Quantify Dexterity During Development And Aging

**BACKGROUND:** Dexterity, control of fingertip force directions improves in children during development related to practice and neuromaturational factors (Forssberg et al., 1991). On the other side of the lifespan, dexterity declines of dexterity. Time series methods present an opportunity to examine the underlying dynamics of control of finger dexterity. This paper presents a method that quantifies development and decline of dexterity. Time series methods present an insight into the underlying dynamics of control of finger dexterity. This needs to be evaluated in children with cerebral palsy and other clinical populations as a means to quantify dexterity.

# 45 Ya-Yun Lee
Advisor: Linda Berberian
Feasibility And Reliability Of Measuring Corticospinal Excitability Of Glutamate Maxims

**BACKGROUND:** Sport-specific skill training has been shown to improve movement strategies for landing and cutting and reduce the incidence of non-contact knee injuries. Greater utilization of the glutamate maxims (GM) appears to be a critical component of the injury-prevention strategy. Transcranial Magnetic Stimulation (TMS) to assess changes in corticospinal excitability (CE) is a potential approach for determining training-induced central mechanisms associated with GM activation. **PURPOSE:** The purpose of this study was to investigate the feasibility and reliability of using TMS to assess CE of GM. **METHODS:** Within and between day reliability were measured on seven nondisabled adults. The CE of GM was measured by stimulating the GM ‘hotspot’ on primary motor cortex at 120% and 150% of motor threshold (MT) while subjects performed a double leg bridge. Motor evoked potentials (MEP) were calculated and normalized to background EMG. Intraclass correlation coefficients (ICC(3,1)), standard error of measurement (SEM) and minimal detectable change (MDC) were calculated to determine the within and between day reliability. **RESULTS:** For both the within and between day analysis, the ICC values of MEP at 120% and 150% MT showed moderate to good test-retest reliability (ICCs: 0.70-0.85). The test-retest reliability for GM and MDC ranged from 2.67 to 11.16, and 7.40 to 33.69, respectively. **CONCLUSION:** TMS combined with a double leg bridge is a feasible and reliable method to measure CE of GM. The SEM and MDC scores provide an estimation of potential measurement noise and conversely detection of a true change in CE of GM with training.

# 46 Charalampos Charalampos
Advisor: Carolles Whiten
What Factors Are Prioritized For Planning Actions That Require Goal-Directed Positioning?

**BACKGROUND:** Goal-directed stepping requires integration of the individual, task, and environmental constraints. We used a center-out target paradigm to study the effects of target location on stepping performance in forced direction in which the stepping limb was predetermined. **PURPOSE:** We hypothesize that stepping performance for targets in a region with vision and end-posture comfort will be optimized and for targets in a region without vision and end-posture comfort will be degraded. **METHODS:** Twenty-four targets were arranged on a platform in 3 concentric circles around a central ‘home’ position. The array had four quadrants which each had 6 targets. To test our predictions we measured error, movement time and maximum toe clearance within each quadrant. Twenty healthy adults stood in the home zone and stepped to a visually presented target with only the non-dominant leg. They were instructed to step as accurately as possible onto the specified target. Targets were cued in a pseudo-random fashion. **RESULTS:** Stepping onto targets in region with vision and end-posture comfort exhibited the lowest error and movement time, while stepping onto targets in region without vision and end-posture comfort exhibited the greatest error and movement time. Also, stepping onto targets with wide angle and without end-posture comfort exhibited the greatest toe clearance. **CONCLUSION:** Depending on target location, anticipatory motor control may optimize biomechanical cost or compensate for expected spatial error. Future work will extend these findings using direct analysis of end-point Variability, foot path trajectory, and include within-quadrant analyses of target direction and extent.

# 47 Hyeshin Park
Advisor: Nicole Schweghofer
Analysis Of Reaching Movements With The Art (Adaptive Reach Training) System

**BACKGROUND:** Current robotic systems for rehabilitation of upper extremity are impractical to use for rehabilitation trainings at home due to their size, weight, system complexity, and high cost. **PURPOSE:** Our goal is to develop and assess the ART system, which is a low cost, effective, and automatic device for the rehabilitation of upper extremity functions and spontaneous use. The ART system engages patients intensively, actively, and adaptively to improve reaching abilities for patients with stroke in real time. **METHODS:** Six right handed healthy participants (3 males, 3 females, 26.5 ± 2.6 yrs) were asked to use their dominant arm to reach the 100 targets on the ART system. To test the subjects' target reaching performance, we developed a mathematical model that evaluates the movement duration as follows: MD = a log2[(2*D/size)+1] + b*cos(3π/4 - α) + c*(n/2 - q)^2 + d, where MD, D, size, and q represent the movement duration, the target distance from the starting position, the target size (fixed to 3 cm), and the target angle from the starting position in radians, respectively. In addition, a, b, c, and d represent constant parameters. **RESULTS:** Our regression model of movement duration provided an excellent fit to the data for all subjects. Coefficients a, b, and c were highly significant (p < 0.001) for all subjects. Standardized ("beta") regression coefficient indicated that distance (first term in the model) shows the greatest effect compared with angle (second term) and deviation from midline (third term).

**CONCLUSION:** In conclusion, our regression model provides an excellent fit to the movement duration data in healthy subjects. It demonstrates that deviation from midline is an important component in reaching movement duration.
Electromyographic Measures Of Childhood Dystonia

**Background:** Childhood dystonia is a disorder that involves inappropriate muscle activation during attempts at voluntary movement. While there are a number of methods for judging the level of dystonia, little research has focused on providing quantitative physiological measures of childhood dystonia. **Purpose:** Here we present observations from two studies investigating methods for measuring dystonia by using electromyography in the arms and hands. **Methods:** Participants performed an isometric tracking task using electromyography of either (a) the biceps and triceps of their arm, or (b) intrinsic muscles of their hands. In both experiments, we measured the ability to selectively control and coordinate individual muscles by measuring tracking error. We also measured excess muscle activity by measuring (a) co-contraction between the biceps and triceps muscles in the arm, and (b) overflow to non-task muscles in the hands. **Results:** When compared to clinical rating scales, we found that all measures correlated with scores on the Barry-Albright dystonia scale (BAD), suggesting that these measures are related to the clinical manifestation of the disorder (all Pearson correlation coefficients greater than 0.5). The relative strength of the correlations differed between experiments, with tracking error correlating more strongly with BAD in the hands, while co-contraction was negatively correlated (p<0.01) with BAD in the arm. When compared to the same measures in children without dystonia, we found greater tracking error, co-contraction, and overflow in the dystonic group (results of all t-tests, p<0.02). At the same time, the range of values measured from the dystonic group overlapped extensively with the range of values measured from children without dystonia, suggesting that these measures are often comparable in both groups. **Conclusion:** While the results of these experiments suggest that instrumented measures based on electromyography can capture clinically relevant aspects of dystonia, they also indicate areas in which attention must be paid when investigating and developing quantitative measures of muscle activity in order to effect a measure of the disorder on muscle activity, any measure should consider both task-related muscle activity and muscle activity that is not directly related to the task at hand. In addition, it is important to consider the sensitivity and selectivity of a measure, as there may be extensive overlap between individuals with and without dystonia in the measurement of many physiological variables.

# 49 Scott Young
**Advisor:** Terence Sanger
**Electromyographic Measures Of Childhood Dystonia**

# 50 Joan Beleno, McKalee Conrad, Samantha Naiman, Amanda Olivera
**Advisor:** Karen Lem
**The Link Between Infertility Treatments And Periodontal Disease**

**Background:** According to the CDC, 6.1 million women in the US between the ages of 15-44 have difficulty getting pregnant or staying pregnant. Therefore, there has been a greater need for assisted reproduction technology such as ovulation therapy to increase chances of conception. Hormone medications such as oral contraceptives have consistently shown negative effects on the gingiva. However, other hormone therapies and their effects on gingival health have not been extensively reviewed. **Results:** Significantly higher levels of gingival index, bleeding upon probing, and cervical fluid were seen in all test groups undergoing ovulation therapy over the control group. It is important to note that plaque levels were consistent among both groups suggesting similar oral hygiene status however there were different tissue responses between the test and control groups. **Conclusion:** It is important to raise patient awareness on the risks involved with ovulation therapy and corresponding drugs that could negatively affect their oral health. Similar to the previous literature, therapeutic drugs used to induce ovulation showed elevated hormone levels suggesting that patients undergoing treatment should be cared for like patients undergoing pregnancy and other known systemic conditions. Therefore, the role of the dental hygienist has become more pertinent in assessing oral health needs and providing oral hygiene aids to help maintain gingival health.

# 51 Risa Regaldo, Kristen Wong
**Advisor:** Karen Lem
**The Benefits Of Bacteremia Post Scaling And Root Planing**

**Background:** Scaling and root planing is successful as a conventional therapy for periodontal disease treatment. A consequence of this procedure is the induced bacteremia which has the potential to lead to infection. Recent research has revealed a positive, stimulatory effect of bacteremia in regards to the immune system. The eventual entry of bacteria into the patient’s bloodstream post scaling and root planing has been shown to help activate the immune system to produce antibodies against periodontal disease pathogens. **Purpose:** Our research investigates the biological responses to bacteremia within the body. We aim to show that the induced bacteremia from dental prophylaxis can illicit a protective response within the immune system in non-immunocompromised patients. **Methods:** We reviewed both past and recent scientific literature pertaining to the relationship between periodontal pathogens and the human immunologic response. **Results:** Our review of the current literature revealed an association between high serum IgG levels and inactive periodontal disease. High IgG concentrations were linked to a reduction in bacterial viability, increased avidity, opsinization and phagocytosis to A.a and P. gingivalis. **Conclusion:** Bacteremia has protective characteristics in that studies have linked increased antibody levels to A.a and P. gingivalis with stabilization of periodontal disease in non-immunocompromised patients. Clinicians can use this understanding of the effects of bacteremia and the role it plays during each dental appointment by providing improved patient education regarding the oral-systemic link. Also, researchers can potentially develop a human periodontal therapeutic vaccine to prevent or stabilize periodontal disease by improving the immune response and periodontal pathogens.

# 52 Alena Knezevic
**Advisor:** Tae H. Kim
**Clinical Evaluation Of Immediately Restored And Loaded Dental Implants**

**Background:** The concept of immediate implant loading became popular recently because of reduced treatment time, decreased patient discomfort and anxiety, high patient acceptance, improved function and esthetics. Many recent studies show that immediately loaded implants have predictable clinical success. **Purpose:** The purpose of this study is to evaluate prosthodontic, aesthetic peri-implant mucosal outcomes and patient satisfaction of immediately restored, Superline dental implants (Dentium, USA) during 1-24 months observation interval. **Methods:** 13 patients meeting established criteria, received Superline dental implants with tapered design, Sandblasted with Large frit and Acid etch. Implants are stabilized at 35 Ncm of torque or more and restored immediately after surgery with provisional restoration. Provisional restorations were adjusted to light contact in maximal intercuspal position avoiding excursions where possible. Clinical measurements are done on each check up and include: resonance frequency analysis, radiographic evaluation of interproximal bone level, evaluation of the subject’s oral health (gingival, plaque and papilla index), subjective patient overall evaluation and evaluation of the placed restoration. **Results:** All 13 cases are successfully loaded and functioning without complication during the limited observation period. Current data shows 100% survival rate for immediately loaded dental implants of 10 months on average (interval range of 1-24 month). **Conclusion:** Results of this study are comparable to the already published results using immediate or conventional loading protocols and provide evidence-based guidelines for successful implementation of immediate loading of dental implants into the clinical practice.

# 53 Beth Phatak
**Advisor:** Florence Clark
**Confronting Methodological Challenges In A Community-Based Pressure Ulcer Prevention Rct**

**Background:** Pressure ulcers are a common and potentially serious complication of spinal cord injury (SCI) associated with high treatment costs and reduced quality of life. However, little attention has been paid to the role of lifestyle and activity as risk factors for developing pressure ulcers. Lifestyle redesign® for Pressure Ulcer Prevention in SCI (SR01HDS62673) is a community-based RCT testing a lifestyle intervention that aims to reduce the incidence of medically serious pressure ulcers, enhance quality of life, and diminish the heavy healthcare burden associated with pressure ulcers. **Purpose:** To describe methodological challenges associated with conducting a community-based RCT among a diverse high-risk population. **Methods:** 180 participants are randomly assigned to either a 12-month intervention or a standard care control condition. Participants complete healthcare utilization phone interviews quarterly and in-person assessments at baseline, 12 months, and 24 months. Primary outcome variables include the incidence of medically serious pressure ulcers, healthcare utilization, and health-related quality of life. **Results:** Several characteristics of the population present challenges for recruitment, retention, and intervention. Participants’ diverse backgrounds have led to the use of cultural brokers, bilingual project staff, and ethnic matching between therapists and participants. Participants are often highly transient, necessitating creative strategies for maintaining communication. The challenging life circumstances (e.g., homelessness, substance use) of some participants require a highly creative and flexible approach to intervention delivery. **Conclusion:** Conducting clinical research among a diverse at-risk population necessitates a high degree of creativity and adaptability to facilitate recruitment and retention of participants.
Roles Of Ctgf During Palatogenesis: Mediator And Modulator Of Tgf-Beta Signaling Pathway

Background: CTGf is a matricellular protein containing several domains that mediate interactions with growth factors, integrins and extracellular matrix (ECM) components. CTGf has been involved in proliferation, angiogenesis and wound healing in adult organisms, its functions during development are unclear. Purpose: To investigate CTGf roles during palatogenesis with TGF-beta pathway in this process. Methods: Analysis of different mutant models including Ctgf+/-, Tgfb2/fl/fl;Wnt1-Cre and Smad4/fl/fl;Osr2-Cre mice. In vivo and in vitro approaches were used. Results: Our qualitative and semiquantitative analysis of palate morphology in WT developing palates suggest that it exerts relevant functions during palatogenesis. To understand those functions we analyzed the cause of cleft palate in Ctgf KO mice. In these mutants, the expression of several ECM proteins is changed, revealing an alternation in the oro-nasal pattern of Ctgf KO palates that might lead to failure of palatal elevation. ECM production induced by CTGf in the developing palate appears to be Tgfb-beta dependent. Delamination processes, which are not in Ctgf mutants. In fact, through in vitro experiments we demonstrated that CTGf induces proliferation in WT palates apparently through activation of p38 MAPK and ERK cascades. Of fact, through in vitro experiments we demonstrated that CTGf acts as mediator and modulator of TGF-beta signaling pathway to regulate diverse developmental mechanisms during palatogenesis.

The Cooperation Of Enamelin And Amelogenin In Controlling Octacalcium Phosphate (Ocp) Crystal Morphology

Background: Recent studies have shown that enamelin, a phosphorylated glycoprotein and a minor component of the enamel extracellular matrix proteins, plays key roles in enamel mineralization, and is essential for the formation of the enamel. It has been reported that the 32kDa enamelin fragment promoted nucleation of apatite crystal in cooperation with amelogenin, induced elongation of apatite crystals in agarose gel, and interacted with amelogenin to partially disassociate nanospheres and stabilize oligomers. Purpose: To study the cooperation between the 32kDa enamelin and amelogenin, we examined their effect in controlling the morphology of octacalcium phosphate (OCP) crystals in vitro. The long term goal is to gain further insights into the cooperative roles of enamelin and amelogenin in enamel formation. Methods: The interactions between the 32kDa enamelin and recombinant amelogenin (R148) were investigated using immunophysical methods (dynamic light scattering (DLS) and fluorescence spectroscopy). OCP crystals were grown in 10% recombinant R148 with increasing concentration (0.04% - 0.4%) of the 32kDa enamelin, at pH 6.5 and 37°C using a semi-controlled system. The morphology of OCP crystals was observed by scanning electron microscopy (SEM) and the dimensional changes of OCP were measured by the mean values of length (L), width (W), and thickness (T), and analyzed by the ratios (L/W and W/T). Results: Analysis of amelogenin/ enamelin mixture showed that the hydrodynamic radius of rP148 particles increased from 9.3 to 12.3 nm following the addition of 32kDa enamelin at pH 6.5, indicating co-assembly of these two enamel proteins. The blue shift from 336 to 334 nm of fluorescence emission of R148 after addition of enamelin (molar ratios from 1:100 to 1:10) were indicative of conformational changes in amelogenin following their interaction with 32kDa enamelin. The dimensions revealed that their length to width ratios (L/W) increased with increasing concentration of the 32kDa enamelin added to 10% rP148 amelogenin while the width to thickness (W/T) decreased. Conclusion: Our results collectively demonstrate that the 32kDa enamelin has a direct interaction with amelogenin under the condition of crystallization. These two enamel proteins cooperate to control the morphology of OCP crystals in vitro resulting in the formation of crystals with higher L/W aspect ratio and lower W/T ratio. These morphological changes observed in vitro are consistent with the morphological changes observed in apatite crystals at different stages of enamel formation.

Smad-Dependent Pathway Is Crucial In Mediating Tgf-Beta Signaling During Tongue Myogenesis

Background: During tongue myogenesis, cranial neural crest (CNC) cells give rise to connective tissue and solitary somites-derived myogenic cells give rise to muscles. We have shown that TGF-beta plays a critical role in regulating the fate of CNC cells during tongue development; and conditional inactivation of Tgfb2r in mesoderm-derived cells (Myf5-Cre;Tgfbr2 flox/flox ) results in microglossia, shortened and disorganized muscle fibers in the tongue. The number of Pax7+ cells is reduced at E13.5 and E14.5; however, Pax3 expression level is significantly upregulated at E14.5 in CKO tongue, indicating that the transition from Pax3+ embryonic myoblast to Pax7+ fetal myoblasts is impaired when loss of Smad-dependent TGF-beta signaling in tongue myogenic cells. At E16.5, CKO mouse tongue sagittal sections show lower fetal myogenic cells and fewer laminin+ myofibers with a higher proportion of myHC+ myofibers compared with control. Therefore, the increased proportion of slow myofibers in CKO tongue implies that Smad4-dependent signaling in myogenic cells, suggesting that myogenic cells terminal differentiation is affected in CKO tongue. Conclusion: These results suggest that Smad-dependent TGF-beta signaling is able to regulate the commitment of Pax7+ myogenic progenitors, or Pax3+ embryonic myoblasts to Pax7+ fetal myoblasts transition during tongue myogenesis. Myogenic cells in tongue have autonomous requirement of Smad-dependent TGF-beta signaling for regulating fetal myoblast terminal differentiation and fetal myofibers formation.

Dominance Of Tgf Beta Pathway In Mesenchymal Stem Cells From Ossifying Fibroma

Background: Ossifying fibroma (OF) is a common benign fibro-osseous neoplasm of the orofacial bone with potential aggressive growth characterized as progressive enlargement of bone and high recurrence. Currently, complete surgical removal is the recommended treatment for OF. The indisputable acceptance of “safe margin” surgical resection of benign tumor as the standard of care reflects the current knowledge gap in the pathophysiology of benign oralofacial tumor, specifically OF, and should be reexamined based on current understanding of tumor stem cell biology. Purpose: Benign tumor stem cells are to be identified from OF and characterized for providing clues to novel therapeutic strategies. In addition, we intend to establish an OF in vivo model in immunocompromised mice as a platform to decipher the molecular pathogenesis and develop clinically applicable therapeutic approaches. Methods: Characterization of OF stem cells using flow cytometric analysis, cell doubling CFU forming, and cell proliferation assay. To use in vivo stem cell implantation approach to generate OF-like bone phenotype in the murine model. Transplantation of OF stem cells after treatment with TGF beta inhibitors. Results: We found that OF contains a population of benign tumor stem cells, namely mesenchymal stem cells from ossifying fibroma (MSC-OF). These MSC-OF displayed high proliferative rate and impaired osteogenic differentiation when compared to normal jaw bone (MSC-J). Interestingly, MSC-OF is capable of generating OF-like lesion containing dispersed calcified spherules and a hypercellular stroma when transplanted into immunocompromised mice. Conclusion: TGF beta pathway by small molecules can rescue OF phenotype of MSC-OF in vivo, suggesting that activation of TGF beta signaling pathway possibly underlies the pathogenesis of OF. Furthermore, TGF beta initiated self-activation loop provides multiple clues for therapeutic intervention. Conclusion: MSC-OF is a novel tumor stem cell and is responsible for the development of OF lesions. Modulation of the osteogenic pathway of MSC-OF may offer a novel therapeutic approach for OF.

Smad4-Mediated Wnt Signaling Controls The Fate Of Cranial Neural Crest Cells During Tooth Morphogenesis

Background: TGF-β/BMP signaling is crucial for regulating epithelial-mesenchymal interactions during organogenesis. The functional significance of Smad4, a common mediator of the canonical TGF-β/BMP signaling pathway, during dentinogenesis remains unclear. In this study, we investigated the biological mechanism of Smad4 in regulating dentinogenesis through tissue-specific inactivation of Smad4 in the dental mesenchyme. Purpose: To investigate the biological function of Smad4 in regulating dentinogenesis during tooth development. Methods: We specifically inactivated Smad4 in the dental mesenchyme by using the Cre/loxp system in vivo. We confirmed the loss of OF in Smad4 fl/fl;Osr2 Cre;Smad4 fl/flox/flox mice. Results: Ablation of Smad4 results in defects in odontoblast differentiation and dentin formation. Moreover, ectopic bone-like structures replaced normal dentin in teeth of Smad4 fl/fl;Osr2 Cre;Smad4 fl/flox/flox mice. Despite the lack of dentin, enamel formation appears to be normal in Osr2-iresCre;Smad4 fl/flox/flox mice. In conclusion, our study demonstrates that Smad4 plays a critical role in regulating odontoblast differentiation and dentin formation and that the interplay between TGF-β/BMP and Wnt signaling pathways may function to ensure proper cell fate determination during organogenesis.

Enhanced Stem Cell Properties And Hypoxia-Related Genes By Spheroid Human Gmscs

Background: Human gingiva-derived mesenchymal stem cells (GMSCs) are capable of both immunomodulatory and anti-inflammatory functions. Cell-based therapies have demonstrated promising therapeutic outcomes in both preclinical and clinical studies; however, the major roadblock remains the inability for large-scale expansion as a major limiting factor to translation. In this study we explore the use of 3D-suspension culture system to expand GMSCs and characterize their stem-like properties and immunomodulatory functions in comparison with cells cultured under traditional adherent conditions. Methods: GMSCs were isolated...
and expanded as adherent monolayers in complete culture medium (alpha-MEM supplemented with 10% FBS, 100 U/ml penicillin/100mg/ml streptomycin, 2 mM L-glutamine, non-essential amino acids, and 550 μM 2-mercaptoethanol). GMSCs at passages 4-6 were transferred to ultra-low attachment dishes with complete medium to allow 3D-spherical formation. Evaluation of cell cycle distribution and expression of cell surface markers were determined using flow cytometry, while the expression of stem cell–related transcriptional factors including Oct-4, Nanog and hTERT, and other genes such as SOD2 and HIF-1α were determined by RT-PCR, immunocytochemical and Western blot analysis, respectively. The cytokine secretion profile by spherical GMSCs was determined using a commercial cytokine antibody array. Results: Compared to their adherent counterparts, spherical GMSCs showed a decreased expression of CXCR3, CD90, CD34 and Stro-1, but exhibited an increased expression of early lineage stem cell–related transcriptional factors, including OCT4 and Nanog, along with a significant increase in the expression of hypoxia-inducible factors (HIF-1α/2α) and superoxide dismutase-2 (SOD2), a manganese-superoxide dismutase (MnSOD) that plays an important antioxidant role by counterreacting reactive oxygen species (ROS). In addition, spherical GMSCs showed an elevated expression of CXCR4, a chemokine receptor important for cell migration and homing of stem cells. Cytokine arrays showed that spherical GMSCs secreted higher levels of IL-6, M-CRP, MCP-3, M-CSF, RANTES, SCF, SDF-1, angiogenin, oncostatin M, and VEGF, with relevant roles in chemotaxis, angiogenesis, and homing. Conclusion: Findings showed that GMSCs in 3D-suspended culture system displayed characteristic phenotype of early stemness and hypoxia-related genes, suggesting the presence of a hypoxic-like stem cell niche (microenvironment) in the spherical form.

**# 60 JUNICHI IWATA
ADVISOR: YANG CHAI**

**Modulation Of A Novel Tgf-Beta Signaling Mechanism To Rescue Cleft Palate**

**BACKGROUND:** Mutations in transforming growth factor beta (TGF-beta) receptors type I or II (TGFBR1 or TGFBR2) are associated with cleft palate and other congenital malformations in humans. Similarly, loss of Tgfbr2 or Tgfbr1/Alk5 in neural crest cells leads to cleft palate and other congenital malformations in mice. However, it is still unknown how TGF-beta signaling exactly functions in cleft palate. **PURPOSE:** To determine the role of TGF-beta signaling during palatogenesis to rescue the cleft palate in mice. **METHODS:** We performed microarray and proteomics analyses to identify downstream targets of TGF-beta signaling during palatogenesis. Based on the global analyses, we generated compound mutant mice to rescue the cleft palate resulting from the absence of Tgfbr2. **RESULTS:** We found that loss of Tgfbr2 in neural crest cells results in cleft palate. The elevated Tgf-beta activates a novel Tgf-beta signaling pathway involving Taki1/p38 MAPK/14-3-3 signaling. Strikingly, blocking p38 MAPK activation rescues cleft palate in Tgfb2 mutant mice, suggesting that the activation of Tgf-beta signaling pathway is responsible for causing cleft palate in Tgfb2 mutant mice and that subtle changes in Tgf-beta levels can affect downstream signaling cascades important for craniofacial development. **CONCLUSION:** Modulation of TGF-beta signaling may thus be therapeutically beneficial for the prevention and treatment of congenital birth defects.

**# 61 KEITH BROMLEY
ADVISOR: JAMIE OLASKY**

**Dissecting Amelogenin Nanospheres: Analysis Of Metastable Oligomeric Forms**

**BACKGROUND:** The tooth enamel protein amelogenin forms large assemblies encompassing different numbers of monomers ranging from tens (nanospheres) to hundreds (nano-chains). The question of whether smaller oligomeric structures can be formed and studied is important as it may provide insight into the mechanism of nanosphere formation. **PURPOSE:** First, to establish whether stable amelogenin oligomers can form and second, to analyze amelogenin secondary structure following its oligomerization by controlling temperature. **METHODS:** Recombinant porcine amelogenin (pP172) was analyzed in the range of: temperature 5 to 37 ºC, pH between 3.5 to 9 and protein concentration of 0.2 to 10 mg/mL. We used circular dichroism spectropolarimetry (CD), intrinsic tryptophan fluorescence (ITF), fluorescence anisotropy (FA), and dynamic light scattering (DLS). **RESULTS:** ITF over the pH range from 3.5 to 9 revealed a large blue shift associated with visible aggregation at pH 5.8. Below this pH, there was a gentle blue shift between 3.5 and 5.4. For the analyses performed at pH 5.4, we observed a gradual increase in FA, implying an increase in hydrodynamic radius. CD analysis over this range revealed that there was very little change in secondary structure further indicating that the blue shift in fluorescence emission was due to self-association and not folding. DLS analysis and fluorescence anisotropy at pH 5.5 revealed an increase in average hydrodynamic radius (RH) at concentrations from 0.2 up to 5 mg/mL, after which a plateau was observed (at RH = 5.5 nm). This showed that oligomerization was occurring up to a particular oligomer size, after which further oligomerization was terminated. Average oligomer size could be increased to higher RH at high concentration (10 mg/mL) and temperature >25 ºC. This is consistent with the domain sizes of oligomers themselves. Heating and cooling experiments established that the oligomers were metastable as their formation was reversible on cooling. **CONCLUSION:** We conclude that amelogenin in solution can form metastable amelogenin oligomers. Unlike other intrinsically disordered proteins that undergo a folding change upon dimerization / oligomerization, amelogenin oligomerization was not concomitant with a large change in fluorescence emission. A critical contrast is required before large oligomers (RH = 5.5 nm) can be formed. The pH range that the oligomers can be formed was found to be around 5 – 5.8. In this range, the strongest hydrophobic interactions cause the monomers to bind. We hope that NMR will elucidate the binding mechanism. **# 62 KENTARO AKIYAMA
ADVISOR: SONGTAO SHI**

**Telomerase Activates Immunomodulatory Function Of Bone Marrow Mesenchymal Stem Cells**

**BACKGROUND:** Systemic infusion of bone marrow mesenchymal stem cells (BMSCs) has been successfully used for treating a variety of diseases, including acute graft-versus-host disease, ameliorating hematopoietic stem cell engraftment, systemic lupus erythematosus, diabetes, rheumatoid arthritis, autoimmune encephalomyelitis, and improved osteoclast activity and bone healing. However, the detailed mechanism by which BMSCs inhibit T cells is not fully understood. **PURPOSE:** To elucidate the mechanism of immunomodulatory property in BMSCs. **METHODS:** To evaluate immunomodulatory functions, BMSCs were cultured with splenocytes in vitro and infused into lupus erythematosus (SLE)-like MRL/lpr mouse in vivo. **RESULTS:** A new subset of telomerase/CD34+ BMSCs that fail to adhesion to plastic culture and remain in culture suspension was identified. BMSCs are capable of adhering to extracellular matrix (ECM)-coated dishes and showing mesenchymal stem cell characteristics with distinction to hematopoietic cells as evidenced by co-expression of CD73 or CD105 with CD34, forming single colony on ECM, and fail to differentiate into hematopoietic cell lineage. BMSCs exhibit significantly increased immunomodulatory capacities in vivo and improved treatment for SLE-like mice, which recapitulates the levels of nitric oxide (NO) production regulated by telomerase activity coupling with the Wnt/beta-catenin signaling. Furthermore, we found that telomerase activator-treated BMSCs are analogous to BMSCs in terms of exhibiting significantly improved immunomodulatory function. **CONCLUSION:** This study identifies a new population of BMSCs and a practical approach to rescue this subset BMSCs for clinical therapeutic use. The mechanism that telomerase/beta-catenin promoted NO production in BMSCs suggests a potential of improving BMSC-based clinical therapy for immune disorders.

**# 63 KIMBERLY WILKINSON
ADVISOR: MARIE LAWLOR**

**Mothers’ Perspectives On Everyday Life With Children With Autism: Mealtime Explored**

**BACKGROUND:** Participation in family mealtimes is consistently linked with indicators of health and well-being for children (Fiese & Schwartz, 2008). Children with autism spectrum disorders (ASD) exhibit differences in eating and mealtime behaviors (Ahearn, 2001; Bandini et al., 2010). Mother’s stories about their day-to-day experiences with their children contain information that can be used for understanding strengths and challenges of families, and identifying priorities for intervention (Lawlor & Mattingly, 2009). **PURPOSE:** The purpose of this study was to explore the impact of ASD on family and child occupations related to eating and mealtime and to discuss how better understanding the perceptions of mothers of children with ASD and feeding and eating challenges can improve provision of services. **METHODS:** Data collection took place over a six-month period during which each mother participated in narratively focused interviews three times. Data analysis was conducted using thematic analysis and narrative methodology from an occupational science perspective. **RESULTS:** Analysis of the interviews and observations revealed that the difficulties with eating that these children exhibited had a profound impact on the day-to-day lives of these families. The mothers in this study identified priorities related to minimizing this impact on family mealtime. **CONCLUSION:** Understanding how these mothers perceived the impact of feeding challenges on the life of their families and the way they shaped the daily activities of their family to reflect and balance these priorities allows for more effective planning and implementation of services for families with children with ASD and feeding or eating challenges.

**# 64 LIU WANG
ADVISOR: SONGTAO SHI**

**Mesenchymal Stem Cells Infusion Rebuilds Homeostasis In Osteoporosis-Like Mice**

**BACKGROUND:** Osteoporosis is the most prevalent skeletal disorder, characterized by overreactive T cells and imbalanced bone remodeling, leading to bone fragility fractures and difficulty in dental restorations. Concerns have been addressed for severe side effects of current drug therapy. Mesenchymal stem cells (MSCs) infusion has been proved to be able to induce immunotolerance in several autoimmune diseases. **PURPOSE:** To determine whether MSCs infusion could lead to bone/marrow homeostasis in ovariectomy (OVX)-induced osteoporotic mouse models. **METHODS:** Systemic infusion of mouse MSCs was performed 3 days after OVX, and a sham operated group was taken as control. Femurs were harvested for BMD, micro-CT and histologic analysis. **RESULTS:** MSCs infusion significantly increased BMD, and improved bone structures as manifested by bone volume/totall volume and trabecular thickness in OVX mice. Histological analysis revealed that MSCs infusion increased bone turnover and RANKL/OPG levels in serum confirmed that the OVX-host underwent rebalance of bone formation and resorption after MSCs infusion. At the cellular level, BMSCs in OVX-induced osteoporosis showed scarified osteogenic differentiation and increased adipogenesis. Difficulties in osteogenesis was capable of enhancing host BMSCs’ osteogenesis while reducing their adipogenesis. **CONCLUSION:** Our findings have revealed that MSCs infusion could restore bone/ marrow homeostasis by boosting BMSCs and inhibition of osteoclast activity in OVX mice, leading to ameliorating bone density. Systemic infusion of stem cells may be a promising alternative in osteoporotic treatment.
lower incisors so that each individual section contains all stages of amelogenesis from pre-secretory to late maturation. **Results:** This work is ongoing, and will be reported on at future meetings. **Conclusion:** This work is ongoing, and will be reported on at future meetings.

**67 Rodrigo S. Lacroz**
**Advisor:** Michael Pane

**Enzyme Pathology Resulting From Loss Of Function In The Cystic Fibrosis Transmembrane Conductance Regulator In A Porcine Animal Model**

**Background:** Cystic fibrosis (CF) is caused by mutations in the gene encoding the cystic fibrosis transmembrane conductance regulator (CFTR), a phosphorylation and ATP regulated anion channel. CFTR expression and activity is frequently associated with an anion exchanger (AE) such as AE2 (coded by the Slc4a2 gene). Mice null for Cfr and mice null for Slc4a2 have enamel defects, and there are some case reports of enamel anomalies in patients with CF. **Purpose:** In this study we have analyzed the dentition of a porcine model for cystic fibrosis and have assessed the relative expression levels of this gene by qPCR at different stages of amelogenesis as well as the expression levels of genes commonly co-expressed with CF (AE2). **Methods:** Total RNA isolation and real time PCR. Total RNA was extracted by homogenizing tissue samples, reverse-transcribed, and examined using primer pairs shown in Table 1. Primer pairs were designed to span intronic regions, and are the rat-equivalent to either human or mouse primer pairs identified in iPRimeBank as tested and ideal for qPCR (http://pga.mgh.harvard.edu/primerbank/index.html). Relative expression of mRNA was calculated using the CT method (Livak and Schmittgen, 2001). All values for the mRNA species were normalized to beta-actin, which indicated that the predominant expression of the purinergic receptor P2X7 in this process. **Conclusion:** This novel virulence mechanism of the leukotoxin may play an important role in the pathogenic potential of this bacterium and can be a target for future therapeutic agents.

**68 Rosamaria Baghain-Nair, Yu-Lee Kim**
**Advisor:** Hamdy Zaid

**Clinical Outcome Of Implants Placed In Extraction Sockets’ Grafted Sites.**

**Background:** Several studies have demonstrated the effectiveness of socket preservation procedures on the prevention of horizontal and vertical bone loss in extraction sites. However, clinical data on the stability of peri-implant alveolar bone in these areas is scarce. **Purpose:** The purpose of this study was to evaluate crestal bone outcomes of implants inserted in sites treated by socket preservation in comparison with those placed in healed alveolar ridges. **Methods:** Socket preservation (SP); Non-extracted, debridement, placement of large particle size cancellous bovine anorganic bone and coverage with polytetrafluoroethylene membrane. After three months of healing, implants were inserted in SP sites, as well as healed ridge sites (HR; N=40). Parallel digital periapical radiographs were taken immediately post-operatively. Follow up radiographs were taken 6-24 months after functionally-loaded implants. Crestal bone height was measured relative to a fixed point on implants. All radiographs were calibrated and measured. **Results:** In the SP group, mean crestal bone change was 0.32mm and 0.35 mm in mesial and distal aspects, respectively. In the HR group, mean crestal bone change was 0.18mm and 0.24 mm in mesial and distal aspects, respectively. **Conclusion:** The crestal bone response to implants placed in socket preservation sites compares favorably to that of implants placed in healed ridges.

**69 Sunil Chokh**
**Advisor:** Pragya Patel

**Genetic Dissection Of Inherited Dental Anomalies**

**Background:** Establishing the genetic control of morphogenesis and cell differentiation during tooth development is crucial to our understanding of the pathogenesis of genetic and acquired diseases that involve dentition. Two major approaches may be employed to elucidate these processes: studying animal models created by knocking out one or more genes expressed during tooth development or humans affected with various dental/craniofacial anomalies. **Purpose:** Our goal is to identify candidate factors important for tooth development in humans and to understand how mutations within genes encoding these factors contribute to conditions such as hypodontia and amelogenesis imperfecta. **Methods:** We have previously characterized families segregating various forms of hypodontia or amelogenesis imperfecta. We have used linkage analysis with polymorphic markers to map the underlying locus and narrowed the candidate region. **Results:** We mapped a gene for amelogenesis imperfecta (AMI) to chromosome 8 in a large Brazilian family. Subsequently, another group identified a gene, FM3B3H that bore mutations in patients with AMI. We examined the family we had studied for mutations in FM3B3H and have not found any mutations. We are presently screening this family for deletions/duplications and for intronic mutations by next-generation sequencing. A second large Brazilian family segregating hypodontia has been subjected to linkage analysis and the locus mapped to chromosome 17. We are using next generation sequencing to identify the mutation in this family. **Conclusion:** We have successfully mapped novel loci underlying rare dental anomalies using large families and for intronic mutations by next-generation sequencing. A second large Brazilian family segregating hypodontia has been subjected to linkage analysis and the locus mapped to chromosome 17. We are using next generation sequencing and quantiative real-time PCR approaches to identify the underlying mutation.
to Caucasian children, they have a higher probability of being misdiagnosed, diagnosed later, or require more visits to a doctor in order to receive a diagnosis. **Purpose:** This study explores one preliminary finding from the Autism in Urban Context Study. The objectives of this study were to examine barriers to and opportunities for African American children receiving a diagnosis and appropriate services for autism spectrum disorders, patterns of communication among African American caregivers and practitioners, and African American caregivers’ knowledge about ASDs. **Methods:** Participants included 23 African American children diagnosed with an autism spectrum disorder in the Los Angeles area, and their families. Interviews were collected through interviewing families and service providers, and through observing children and families at home, in the clinic, and at school. Thematic and selective coding, and narrative analysis were used to analyze the data related to patterns and relationships from the data. **Results:** Most of the families in the study engaged their children in occupations (meaningful activities) as part of creating a typical childhood experience. Some families indicated that they engaged their children in occupations to advance development, promote social skills and increase their children’s ability to self-regulate. **Conclusion:** In addition to engaging their children in occupations as part of creating a typical childhood experience, some parents engaged them in childhood occupations with therapeutic goals in mind.

### 71 Toshiki Yokota
**Advisor:** Yaoh Chai

The Mechanism Of Soft Palate Development

**Background:** Clefing of the soft palate is one of the most common cleft palate phenotypes in humans. However, few studies have been conducted on soft palate development. **Purpose:** We tried to figure out the mechanism of soft palate formation. **Methods:** We generated 3D reconstruction images from microCT and histological sections in a mouse model of soft palate clefing (K14-Cre;Tgfbr2fl/fl mice). We found that direction and orientation of muscle fibers were compromised and muscle volume was decreased in the posterior region of the palate in K14-Cre;Tgfbr2fl/fl mice, following defects in cell proliferation and differentiation in myoblasts. **Conclusion:** Our findings indicate that loss of Tgf-β signaling in epithelial cells compromises cell proliferation and differentiation of myoblasts during soft palate formation.

### 72 Xin Wen
**Advisor:** Malcolm Snead

Lrp Influences Mesenchymal Stem Cell Fate By Inducing Wnt10B

**Background:** Amelogenin is the most abundant protein of the enamel organic matrix and is a structural protein indispensable for enamel formation. One of the amelogenin isoforms, Leucine-rich Amelogenin Protein (LARP) induces osteogenesis in various cell types. Previously, we demonstrated that LRAP activates the canonical Wnt signaling pathway to induce osteogenic differentiation of mouse ES cells through the concerted regulation of Wnt agonists and antagonists. **Purpose:** There is a reciprocal relationship between osteogenic and adipogenic differentiation in bone marrow mesenchymal stem cells (BMSCs). Wnt10B-mediated activation of canonical Wnt signaling has been shown to regulate mesenchymal stem cell fate. Our objective is to study the function and mechanism of LRAP in influencing mesenchymal stem cell differentiation. **Methods:** Bone marrow mesenchymal stem cells (BMSCs) and biopatterned Wnt agonists and antagonists. **Purpose:** Deregulation was induced in the presence and absence of LRAP. **Results:** LRAP stimulates osteogenesis and inhibits adipogenesis of BMSCs. LRAP activates the canonical Wnt/b-catenin signaling pathway. A specific Wnt inhibitor SR142801 was used to investigate the effect of LRAP on osteogenesis and the inhibition of adipogenesis of ST2 cells. LRAP treatment elevates the Wnt10b expression level whereas Wnt10b knockdown by siRNA abrogates the effect of LRAP. **Conclusion:** LRAP promotes osteogenesis of BMSCs at the expense of adipogenesis through upregulating Wnt10b expression to activate Wnt signaling.

### 73 Xudong Yang
**Advisor:** Janet Morahan-O’Dowd

Dynamics Of Amelogenin Self-Assembly During Its In Vitro Proteolysis By Mmp-20

**Background:** Mutations in MMP-20 lead to abnormal enamel formation and amelogenesis imperfecta supporting the critical function of enamel proteinases in amelogenin self-assembly. MMP-20 activity on amelogenin self-assembly. **Methods:** Recombinant rPMP-20 was used to digest the full-length recombinant pig amelogenin (pP172) at pH 8.3 under four different conditions. **Results:** During the first ten minutes of proteolysis, amelogenin self-assemblies were detected in the solution, followed by the appearance of 19.7 nm particles and large monodisperse assemblies of 104 nm, after the first hour of rPMMp20 action. Following 2 hours of proteolysis when the mass quantities of pP172 and the 2-148 product were similar, the sizes of the large assemblies increased to about 123 nm and continue to grow to 3328.3 nm after 10 hours, when the majority of the mass was the 2-148 product. **Conclusion:** The first ten minutes of proteolysis were significantly more important than the later stages of the proteolysis process. The critical size of calvaria bone defect could be dramatically repaired via local IFN-γ and TNF-α inhibition and systemic up-regulation of regulatory T cells. **Conclusion:** The host immunological and systemic pathological role in BMSC-based tissue regeneration. The results provide a new approach to improve tissue regeneration.

### 74 Yanyun Huang
**Advisor:** Casey Chen

Genome Comparisons Of Aggregatibacter Actinomycetemcomitans Pair Strains

**Background:** Microarrays have recently become a novel procedure to evaluate the genetic content of bacterial species. However, most microarrays are built based on complete genomes. **Purpose:** To examine the genome sequences of A. actinomycetemcomitans (AA) over time within subjects with a pan-genome microarray. **Methods:** A pan-genomic array was designed based on the genome sequences of 18 AA strains, representing all different serotypes of AA. **Results:** The specificity and sensitivity of gene detection is above 95%. Two pairs of strains isolated three years apart showed no difference in genomic content. Strain 523A has eight genes that were not present in strain 123C, which was confirmed by PCR and sequencing. Strain SCC393 lost two genes when cultured in vivo. **Conclusion:** This pan-genomic microarray provides an excellent tool to characterize the genomic content of unknown AA strains.

### 75 Yi Liu
**Advisor:** Songtao Shi

Improve Tissue Engineering By Systemic Immunological-Regulation

**Background:** Cell based tissue engineering offers great potential for tissue regeneration. Tissue engineering depends on an appropriate cell source, cell-supporting scaffold, and recipient microenvironment that is the functional role of the recipient microenvironment, especially recipient immune activity, in tissue regeneration is not fully understood. **Purpose:** To investigate whether the host immune system contributes to the functional role of the recipient microenvironment. **Methods:** Different types of T cells were used to test if the host immunological system could interfere with tissue regeneration in a mouse model. Bone marrow mesenchymal stem cells (BMMSCs) and regular T cells were injected into K14-Cre;Tgfbr2fl/fl mice to alter BMSC-mediated tissue regeneration. The interplay between the host and donor cells was also observed. **Results:** When BMMSCs were transplanted individually, their angiogenesis was stabilized only using hydroxyapatite tricalcium phosphate (HA/TCP) as a carrier. The ectopic bone formation was observed at eight weeks post transplantation. However, BMMSCs failed to regenerate bone tissue in regular mice. Systemic infusion of activated T cells was able to diminish BMSC-mediated bone tissue in immunocompromised mice via elevated levels of IFN-γ and TNF-α. Interestingly, regulatory T cells can enhance BMSC-mediated tissue regeneration in regular mice. In order to translate above findings to potential clinical applications, we showed that a close relationship between the critical size of calvarial bone defect could be dramatically repaired via local IFN-γ and TNF-α inhibition and systemic up-regulation of regulatory T cells. **Conclusion:** The host immunological and systemic pathological role in BMSC-based tissue regeneration. The results provide a new approach to improve tissue regeneration.

### 76 Zhan Huang
**Advisor:** Malcolm Snead

Enamel Regeneration And Biomimilation Instructed By Bioactive Peptide Amphiiple Nanofibers

**Background:** During tooth development, enamel mineralization occurs with ectoderm-derived ameloblast cells creating a complex protein mixture that serves to control cell to matrix interactions and the habits of the hydroxyapatite crystals. Enamel is the hardest and most highly mineralized tissue in human body, yet also susceptible to demineralization and diseases such as caries. Our previous study shows that bioactive self-assembling amphipiles not only stimulate ameloblast proliferation and differentiation, but also promote enamel matrix accumulation and biomimilation (J Bone Miner Res, 2005; 20:1995-2006). We have explored further the effect of artificial bioactive nanostructures on regulating enamel formation and biomimilation, with the long-term goal of developing cell-based strategies for enamel substitutes and then tooth regeneration. **Methods:** Branched RGD-containing peptide amphiphile injected tooth organs at embryonic day 18 were implanted host mice under the kidney capsule and cultured for up to eight weeks. Micro-computerized tomography was applied for confirmation and localization of new-formed enamel pearls. The surface area and the Ca and P content of natural enamel and enamel pearls was investigated by TEM and EDX element analysis, H&E staining and immunostaining were used to detect the expression of enamel matrix and enamel organs recovered showed that the matrix was converted into 2,466 predicted genes in the 18 genes were grouped into 3,426 homologous gene clusters. The longest gene in each cluster was selected as a representative gene and the Agilent’s gene expression analysis was used to design the genomic DNA was extracted from four pairs of AA strains isolated from four respective individuals. The genomic DNA was labeled and hybridized according to Agilent’s protocol. **Results:** The specificity and sensitivity of gene detection is above 95%. Two pairs of strains isolated three years apart showed no difference in genomic content. Strain 523A has eight genes that were not present in strain 123C, which was confirmed by PCR and sequencing. Strain SCC393 lost two genes when cultured in vivo. **Conclusion:** This pan-genomic microarray provides an excellent tool to characterize the genomic content of unknown AA strains.
Influenza Niche Governs Msc’S Differentiation In Maxillofacial Giant Cell Lesion

Background: Maxillofacial giant cell lesion (MGL), one kind of benign tumor, contains a lot of osteoclast-like giant cells which cause bone defect. The Stromal cells in this disease should be of stem cell origin and the inflammatory factors in the disease affect stem cell development. Purpose: Here we use this disease model to demonstrate how the inflammatory niche affect stem cells development and contribute to tumorigenesis.

Methods: We identify the stem cells from MGLC, immunostaining, muti-differentiation and PCR analysis of cells were used in vitro and transplant the cells to nude mice in vivo. Results: From immunostaining and ELISA result, MGLC express high TNF- α and IL-1β. The Stromal cells from MGLC were characterized to be mesenchymal stem cells and showed weak osteogenic properties both in vitro and in vivo. TNF- α and IL-1β both increased Rank ligand expression after TNF- α and IL-1β treat of MGLC.

Conclusion: This study identifies stem cells from MGLC and shows immunochemical niche decreases the bone forming ability of normal MSCs. The inflammatory niche also stimulates Rank ligand expression which will cause osteoclasts. A small pilot clinical study inferred improvement of immune homeostasis and mesenchymal stem cells niche deficiency of skin and bone marrow. It is necessary for regulation of target genes by VicR.

Background: OFCD (Ocular-Facial-Cardiac-Dental) is a rare genetic disease characterized by ocular anomalies, craniofacial abnormality, cardiac septal defect, as well as excessive tooth root growth. Insights into the mechanistic deciphering of the disease are provided by previous researchers indicating that epigenetic modification due to functional absence of Bcor protein produce the disease symptoms.

Purpose: From orofacial diseased stem cells to iPSC to understand and find diseased mechanisms. Although basic mechanistic investigation gives clues to understanding the disease’s development, comprehensive perspective, as well as therapeutic approach; design is still elusive. Based on induced pluripotent stem cells, an in vitro differentiation model can be established to delineate the function of the mutated gene at different stage and cell types and the process of disease progression.

Methods: Tooth root mesenchymal stem cells from OFCD patients and normal counterparts are isolated and reprogrammed to pluripotent stem cells (iPSCs) by retrovirus-mediated ectopic expression of Oct4, Sox2, Klf4 and c-Myc. OFCD iPSCs are extensively characterized and compared with normal iPSCs and human embryonic stem cells. By in vitro differentiation, the output of Bcor absence is functional scrutinized in different cell type and differentiation stage, especially those who related to the disease phenotype. Results: OFCD iPSCs, akin to normal iPSCs and human ES cells, have typical compact colonial morphology and show hypomethylated Oct4 and Nanog promoter and similar global gene expression pattern. However, Ap-2a, downstream target of Bcor, shows dramatic decrease between iPSCs and human ES cells. During differentiation, OFCD iPSCs demonstrate obvious neural tropism and distinctive gene expression pattern in cell type that related to the disease symptoms. Conclusion: From orofacial diseased stem cells to iPSCs, this system provides a better platform to understand and find diseased mechanisms. Reprogramming of some rare genetic mutated cells, by serendipity, demonstrates the fundamental difference between iPSCs and ES cells.
dependent signaling pathway. **Methods:** First, it must be established that loss of integrin α8 definitely causes MEE persistence. To test whether or not it is integral for MEE disappearance, palatal shelves from E13.5 wild-type mice were treated with siRNA for integrin α8 (Itga8) to down-regulate the gene expression of Itga8, and then check for MEE persistence. **Results:** Preliminary results indicate MEE persistence in the Itga8 siRNA treated palates and a disappearance of MEE in those that were not. Also, there was expression of activated caspase 3, a marker of apoptosis, in the palate without Itga8 siRNA treatment. There was no expression of activated caspase 3 in the Itga8 siRNA treated palate. **Conclusion:** We believe that integrin α8 plays a role in MEE disappearance during palatogenesis. Next, I want to test how reliant MEE disappearance is on the integrin α8 signaling pathway. To test this, I would like to knockdown the expression of integrin α8, and see if it can rescue MEE persistence in the palate from K14-Cre;Tgbr2fl/fl mice. Finally, I want to verify that latent TGFB is able to activate a TGF-β receptor-independent signaling pathway through integrin α8 in MEE cells. **PurPose:** Identify Functionally Important Strain-Specific Genes Of Aggregatibacter Actinomycetemcomitans **Background:** Strain-specific genes are often acquired by bacteria via horizontal gene transfer from plasmids or phages and influence the virulence of the bacteria. A. actinomycetemcomitans is a Gram-negative periodontal pathogen. The basis for strain-to-strain variations in virulence of A. actinomycetemcomitans remains to be determined. Our laboratory has completed a project to compare the genome content of 14 A. actinomycetemcomitans strains recovered from periodontal health and disease. Numerous strain-specific genes of unknown functions have been identified; our goal is to detect and functionally important strain-specific genes of A. actinomycetemcomitans for further studies. **Methods:** The pathogenic A. actinomycetemcomitans and the nonpathogenic A. aphrophilus are closely related species. A virulence determinant kat (catalase gene) was found in A. actinomycetemcomitans but not in A. aphrophilus strains. The kat gene is important in bacterial resistance to oxidative stress. The acquisition of kat may have been a key step in the evolution of the pathogenic A. actinomycetemcomitans. **Results:** The A. actinomycetemcomitans-specific kat could be transferred into A. aphrophilus and confer an advantage in the resistance to oxidative stress. **Conclusion:** Methods: A. aphrophilus strains were screened to identify a naturally competent strain, which was used as a recipient of the kat gene from A. actinomycetemcomitans strain D7S-1. A kat-deletion mutant and the corresponding kat-complemented deletion mutant were constructed in A. actinomycetemcomitans D7S-1. These strains were tested for their sensitivity to a 10-min treatment of 3% hydrogen peroxide. **Results:** A highly competent A. aphrophilus strain strain N7800 (transformation frequency 1.2x10^6) was identified and used to construct a kat-expressing A. aphrophilus mutant. The survival rates to the hydrogen peroxide treatment for A. actinomycetemcomitans D7S-1, kat-deletion mutant and the corresponding kat-complemented deletion mutant were 25%, <0.1% and 20%, respectively. The survival rates for A. aphrophilus N7800 and kat-expressing mutant of N7800 were <0.1% and 15%, respectively. ConclusioN: A functional kat derived from A. actinomycetemcomitans enhances the resistance of A. aphrophilus to oxidative stress. Future work will involve the construction of N7800 expressing all three virulence determinants specific to A. actinomycetemcomitans (catalse, leukotoxin and streptokinase A), and test its virulence in animal model.
Linking Motivation And Occupational Engagement To Recovery From Eating Disorders

Background: There is a correlation between disordered eating and a disordered lifestyle. Finding the motivation to participate in daily and meaningful occupations is often related to the motivation for recovery from an eating disorder. A cornerstone of the Occupational Therapist’s treatment content is to reflect how patterns of change in a person’s life are similar, whether recovery-focused or more occupationally-driven. Purpose: The intervention focused on the disordered lifestyle, determining what is or was meaningful to the individual. Understanding what prevented engagement in these activities highlights possible barriers to making changes related to recovery. Deconstructing the challenges associated with making change allows the individual to better understand their level of motivation in initiating such a process. Methods: Using a task analysis framework, the process of change is broken down into separate components: Thinking about change; Devising change strategies about change; Doing something to create change. By inviting an individual to personally identify what motivates or challenges them to take action in their life, a motivational process becomes identified. Results: Feedback consistently highlighted the importance of identifying what factors make change such a difficult process. It also reflected contributing factors to successful experiences of making change. This approach normalized the confusion and frustration associated with the motivation to change and provided a natural extension to more focused goal setting. Conclusion: Enabling an individual to understand that the approach to recovery is similar to that of daily occupational engagement creates a different understanding of the motivation and process to creating change in their life.

A Mixed Methods Study Of Older Adults In A Lifestyle Redesign® Program

Background: Two randomized controlled trials (RCTs), the USC Well Elderly 1 Study (WE1) and USC Well Elderly 2 Study (WE2), established the efficacy, effectiveness, and cost-effectiveness of an occupational therapy intervention called Lifestyle Redesign® (LDR) in addressing this need. Purpose: The purpose of the dissertation described in this poster was to examine how a subset of 22 participants from the WE2 sample viewed the impact of the LRD intervention and the relationships between several study constructs. Methods: Quantitative methods were used to generate a sample comprised of 22 WE2 participants. Qualitative data including interviews and fieldnotes were collected and later analyzed using modified analytic induction. Findings were compared to WE2 findings. Results: Participants perceived that the intervention impacted healthy activity, social support/social networks, perceived control, stress, perceived physical health, psychosocial well-being, and cognitive functioning. In addition, some participants indicated that positive changes in several of these constructs led to improvements in perceived physical health, psychosocial well-being, and cognitive functioning. Conclusion: The findings add depth to current understandings of the centrality of healthy activity in elders’ lives, the complexity of the relationships between hunger indicators and psychosocial constructs, and the pathways through which older adults perceive their health and well-being are impacted. These findings can inform the development of future interventions for elders. Future research is needed to more deeply explore some of the emergent themes, especially death/dying, transportation, slipping, risk, and fear of relocation to a nursing home.

College Students’ Praxis Abilities As Measured By The Sipt® Subtests.

Background: Although numerous assessments and screening measures of praxis or motor coordination exist for pediatric populations, few can be used in adult populations since they are standardized for younger individuals. One such measure of praxis, the Sipt®, has been standardized through age 11. Purpose: (1) To determine if Postural Praxis and Oral Praxis subtests of the Sipt® can be used in young adults without achieving a ceiling effect. (2) To determine if young adults who rated themselves as poorly coordinated, now or as children, perform more poorly on Sipt® subtests of praxis (imitation) compared to young adults who rate themselves as well-coordinated. Methods: A convenience sample of participants aged 17-27 (n=72 at time of abstract submission; intended n=100) was screened using the Sipt® Postural Praxis and Oral Praxis measures. Participants also completed a brief assessment of their self-perceived motor coordination. Results: Results indicate a negatively skewed distribution on the Oral Praxis subtests. Conclusion: The lack of relationship between Sipt® measures and self-perception measures may indicate that praxis/imitation represents a different construct than motor coordination.

Praxis test with 58% of participants scoring within one point of ceiling and 35% reaching ceiling. Scores on the Postural Praxis test show a moderate negative skew, with 36% within one point of ceiling and 8% reaching ceiling. No relationship was found between the self-perception measures and children with ASD diagnostic criteria. Results: These results indicate that the Postural Praxis and Oral Praxis measures could be useful in indentifying praxis/imitation impairments in young adults, however, the addition of more difficult items might enhance discrimination. The lack of relationship between Sipt® measures and self-perception measures may indicate that praxis/imitation represents a different construct than motor coordination.

Conclusion: Future research will need to be conducted using procedures specifically designed to test mirror neuron system involvement during imitation in individuals with DCD. We hypothesize that differential activation will occur in frontal and parietal mirror regions during imitation in individuals with DCD compared to a control population.

Sensory Sensitivity And Oral Care: Children With And Without Asd

Background: Children with autism spectrum disorders (ASD) often have challenges with oral care which can negatively impact their oral health. Difficulties processing sensory stimuli in children with ASD are commonly mentioned as contributing to oral care challenges, but have rarely been empirically studied. Purpose: To investigate the differences of prevalence and magnitude of sensory over-responsivity between children with and without ASD and examine possible relationships between sensory over-responsivity and difficulty with dental cleanings and uncooperative behaviors during dental care.

Methods: Data was collected using responses from a dental questionnaire (n=196 ASD, n=202 typical). Two-tailed Chi-square analyses were utilized to test for associations between groups and the dichotomous oral care and sensory variables. Results: Children with ASD reported moderate-to-extreme sensitivity on three or more of the eight sensory variables were categorized as “sensory over-responders”, while those reporting two or fewer variables were placed in the “typical responder” group. Significantly more children in the ASD group were over-responders. With both groups combined (ASD and typical), significantly more parents of over-responders reported moderate-to-extreme difficulty with routine dental cleanings, and exhibit an increase in uncooperative behaviors in the dental office significantly more than parents of typically-developing children. Parents who reported “moderate-to-extreme” sensitivity on three or more of the eight sensory variables were categorized as “sensory over-responders”, while those reporting two or fewer variables were placed in the “typical responder” group. Significantly more children in the ASD group were over-responders. With both groups combined (ASD and typical), significantly more parents of over-responders reported moderate-to-extreme difficulty with routine dental cleanings, and exhibit an increase in uncooperative behaviors in the dental office significantly more than parents of typically-developing children. Parents who reported “moderate-to-extreme” sensitivity on three or more of the eight sensory variables were categorized as “sensory over-responders”, while those reporting two or fewer variables were placed in the “typical responder” group. Children with ASD, compared to typically-developing children, exhibit a greater prevalence and greater magnitude of sensory over-responsivity, and that over-responsivity is significantly associated with both difficulty with dental cleanings and increased uncooperative behaviors during dental care.

The Role Of Experience In Understanding Physically Different Others

Background: How does experience change the neural circuitry supporting our understanding of others, particularly when their bodies drastically differ from our own? Previous research indicates that understanding others’ actions engages sensorimotor regions, with unfamiliar actions generating more activity than familiar ones. Purpose: In the current study, we examined how visual experience with body parts that are different from one’s own (e.g., an amputated limb) attenuates the sensorimotor response compared to familiar body parts (e.g., a hand). Methods: Using fMRI, we scanned 14 typically developed participants as they observed actions performed by an individual without arms and typically developed individuals both in short videos (PRE) and longer videos of more elaborate actions (EXPERIENCE), and finally short videos again (POST). Results: PRE session: Observation of stump actions compared to hand actions generated more activity in left sensorimotor regions, including the premotor and inferior parietal cortices, with additional activity in the left insula, a region associated with emotional processing. EXPERIENCE session: Observation of stump versus hand actions activated parietal regions strongly, premotor
regions less strongly, and noinsula. POST session: Observation of stump versus hand actions generated activity only in the left parietal region. Conclusion: When initially viewing a new effector, there is stronger activity in sensorimotor regions, possibly to understand the unfamiliar body part. However, with experience, this response decreases so that similar activation occurs in response to observation of both the amputated limb and hand. These results provide novel evidence of how visual with physical differences may alter sensorimotor representations and suggest that increased experience allows us to represent new and familiar body parts on similar regions of our own bodies.

# 95 STEPHANIE BODISON
ADVISOR: ENINA BLANCHE
Exploring The Impact Of Proprioception On The Lives Of Children

# 96 ALEXANDER NGUYEN
ADVISOR: MATT LEE
P53Shc Nuclear Localization Is Not Growth Factor Receptor Dependent

Background: Upon stimulation by epidermal growth factor (EGF) and transforming growth factor (TGF) β receptors, Shc signaling proteins are phosphorylated, then associate with Grb2 and Sos, and activate the Ras oncogene. While this occurs in the cytoplasm, Shc proteins also localize to the nucleus during both development and bronchopulmonary dysplasia. Although growth factor receptors are known to translocate into the nucleus and regulate gene activity, the mechanism and function of the translocation of Shc are unknown. Purpose: We hypothesize that Shc nuclear localization requires growth factor receptor endocytosis. Methods: Myeloma cells were treated with the endocytosis inhibitor phenylarsine oxide (PAO) prior to stimulation with either EGF or TGF-β. Nuclear and cytoplasmic fractions of the cells were isolated by differential centrifugation and the Shc localization assessed by Western blot. Cells were also transfected with an expression vector encoding a chimera of p52Shc and green fluorescent protein (GFP). p52Shc in individual cells was then visualized by confocal microscopy. Results: Both methods demonstrated that even with PAO treatment, Shc proteins localized to the nucleus. Conclusion: Shc nuclear localization is independent of growth factor receptor endocytosis, and it is not a passive result of receptor movement. A separate transport mechanism is likely necessary for Shc nuclear transport, so we hypothesize that Shc is involved in nuclear transport, so we hypothesize that Shc is involved in an unidentified nuclear signaling function that is distinct from its well-characterized role in the cytoplasm.

# 97 ANDREW NGUYEN
ADVISOR: ANN LEE
Mitigation Of Chemotherapy-Induced Oral Mucositis By Sphingoid Gases

Background: Oral mucositis is a debilitating adverse effect of cancer therapy, in a high percentage of patients receiving chemotherapy, myeloablative conditioning regimen for bone marrow transplant, or high-dose radiation to the head and neck. It is the paramount cause of a patient’s failure to complete cancer therapeutic course and negatively impacts patients’ survival, quality of life, and the overall health care cost. Relative little is known of the pathophysiology of mucositis and current therapeutic interventions are incomplete. Purpose: In this body, we will explore a novel strategy using stem cell-based therapy to mitigate oral mucositis induced by chemotherapy in mice. Methods: GMSCs were cultured in suspended condition using the ultra-low attachment dishes. Low-GMP3-D3-spheroid formation. Oral mucositis was induced in Balb/c mice with 5-fluorouracil injection (50mg/kg intraperitoneally) for 3 consecutive days. On day 4, the treatment groups (n=4) were intravenously infused with either sphingoid GMSCs (1x 106/mice) or their adherent counterpart (2 x 106/mice). Placebo group were treated with PBS. On day 7, tongue samples were collected for further analysis. Treatment effects were evaluated using optical coherence tomography (OCT) in parallel with histological studies. In cell tracking experiment, GMSc pre-labeled with CM-DII were injected into mice and imaged using multi-photon microscopy (MMP) technology. Results: Spheroid GMSCs showed increased expression of CXCRA4 and exhibited homogenous and smaller size morphology as compared to their adherent monolayer counterparts. Systemic infusion of spheroïd GMSCs showed significantly increased homing capability to the injured epithelial sites of mucositis lesions as determined by ex vivo MMP imaging and fluorescence microscopy. The apparently higher recruitment of spheroïd GMSCs relative to adherent GMSCs also correlates with a significantly increased epithelium regenerative potential and consequently decreased mucositis induced by chemotherapy demonstrated by OCT and histological studies. Conclusion: Findings suggest that spheroïd GMSCs are more potent than their adherent counterparts and capable to reverse epithelial injuries associated with chemotherapy-induced oral mucositis.

# 98 CHANDLER HO
ADVISOR: MARGARITA ZEICHNER-DAVID
Changes In Gene Expression In Hers Cells Maintained In Vitro Lacking Dlx3.

Background: A defect in one of the genes of the distal-less family, Dlx3, has been found to be responsible for the anodontia in a number of known syndromes such as Tricho-Dento-Osseous syndrome (TDO). Individuals affected present with hair, bone and teeth malformations including defects in enamel and root formation. In previous studies we localize expression of Dlx3 in HERS using immunohistochemistry. Since Hertwig’s epithelial root sheath (HERS) initiates and directs root formation, we want to understand the role of Dlx3 in HERS functions. Purpose: In this study, we used a HERS cells line where Dlx3 was down-regulated using shRNA to compare gene expression associated with the lack of Dlx3 in these cells. Methods: Immortalized HERS cells were stably transfected with Dlx3-shRNA. Cells were grown in culture for several days under different differentiation conditions. RNA was collected from these cells after 7 days and after 28 days in culture. RNA was converted to cDNA and used for DNA microarray comparison between the treated and control cells. RT Profiler™ PCR Arrays (SuperArrays, Bioscience Corp) were used. Results: After 7 days in culture, cells lacking Dlx3 showed a general decrease in gene expression except for 2 genes which were increased; Jag1 and Mmp3. After 28 days in culture, cells lacking Dlx3 continue to express higher levels of Jag1 and several other genes while the expression of Mmp3 decreased and there were lower levels of expression of Stat3. Conclusion: These results, although preliminary, show that the phenotype of HERS cells is altered when Dlx3 is absent and suggests that this transcription factor might have an important role on HERS function which could explain the taurodontism present in patients with TDO.

# 99 KHINE HTET
ADVISOR: TINA JASHOLL
Cox-2 And Salivary Gland Tumor Formation

Background: Mucoepidermoid carcinoma (MEC) is the most common primary salivary gland neoplasm (SG), representing 5% of all salivary gland tumors and 35% of the malignant forms. However, little is known about the mechanisms underlying SG tumor formation. Purpose: The aim of our study was to develop a 3-D in vitro SG tumor model and investigate whether COX-2 signaling plays an important role in tumorigenesis. Methods: We employed an in vitro strategy using CMV infection of newborn SGs and characterized the viral-induced pathology using histology, immunohistochemistry, and quantitative RT-PCR. To determine if COX-2 signaling mediates SG tumor formation, we used the COX inhibitor diclofenac to interrupt COX-2 signaling in vitro and assayed the cultured glands. Results: We demonstrated that CMV-infected SGs exhibit a cellular pathology which resembles secretory glandular neoplasia. CMV-infected SGs are characterized by atypical ductal epithelial hyperplasia, severely dilated ductal lumina, apparent mesenchymal-to-epithelium transformation, oncocyte-like stromal cell metaplasia, and expression of the MEC tumor marker CRTC1. We found a significant increase in COX-2 transcript and protein expression in CMV-infected SGs as compared to controls. Interruption of COX-2 signaling by diclofenac inhibited viral-induced pathology and ameliorated the tumor phenotype. Conclusion: Our results demonstrated that CMV infection of newborn SGs in vitro induces early stages of SG tumor formation. Our results also suggested that COX-2 signaling plays an important role during MEC carcinogenesis. Further studies are needed to delineate its precise role during SG tumorigenesis.

# 100 LEIA YEN
ADVISOR: WEI YEN
Conbeem Ct Comparison Between Autogenous Bone And Bmp2/Dhm Grafts For Cleft Lip And Palate

Background: Cleft lip and palate is the most common facial birth defect. An alveolar bone graft is usually performed to bridge the maxillary segments of bone. While the gold standard is bone from the iliac crest, bone morphogenetic protein-2(BMP2) placed in a demineralized bone matrix(DBM) carrier shows promise for eliminating a surgery for harvesting bone. Purpose: We hypothesize that BMP-2/DBM can have outcomes similar to autogenous bone. We performed to bridge the maxillary segments of bone. While the gold standard is bone from the iliac crest, bone morphogenetic protein-2(BMP2) placed in a demineralized bone matrix(DBM) carrier shows promise for eliminating a surgery for harvesting bone. Purpose: We hypothesize that BMP-2/DBM can have outcomes similar to autogenous bone. We performed to bridge the maxillary segments of bone. While the gold standard is bone from the iliac crest, bone morphogenetic protein-2(BMP2) placed in a demineralized bone matrix(DBM) carrier shows promise for eliminating a surgery for harvesting bone. Purpose: We hypothesize that BMP-2/DBM can have outcomes similar to autogenous bone. We performed to bridge the maxillary segments of bone. While the gold standard is bone from the iliac crest, bone morphogenetic protein-2(BMP2) placed in a demineralized bone matrix(DBM) carrier shows promise for eliminating a surgery for harvesting bone. Purpose: We hypothesize that BMP-2/DBM can have outcomes similar to autogenous bone. We performed to bridge the maxillary segments of bone. While the gold standard is bone from the iliac crest, bone morphogenetic protein-2(BMP2) placed in a demineralized bone matrix(DBM) carrier shows promise for eliminating a surgery for harvesting bone. Purpose: We hypothesize that BMP-2/DBM can have outcomes similar to autogenous bone. We performed to bridge the maxillary segments of bone. While the gold standard is bone from the iliac crest, bone morphogenetic protein-2(BMP2) placed in a demineralized bone matrix(DBM) carrier shows promise for eliminating a surgery for harvesting bone.
received either BMP2/DBM or an autogenous bone graft from the iliac crest. After three months, high resolution conebeam CTs (Kodak) of the graft site were taken. My part of the project was to convert the DICOM files into a file that is compatible with SCANO bone histomorphometry software for microCTs. The graft volume and 3-dimensional renderings were calculated for each graft. Student t-tests were used to compare the graft volumes. The results illustrate that 2-dimensional ratings of bone grafts overestimate the bone graft volume; moreover, the BMP2/DBM resulted in almost twice the volume of bone. However, neither grafts provided enough bone for placement of dental implants. **Conclusion:** BMP2/DBM is an alternative bone graft material that can provide comparable bone fill without the morbidity of a surgery to harvest the bone.

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# 104 ANTHONY NGUYEN
ADVISOR: PARIKH SIDDHADEV
Ex Vivo Micro-Ct Evaluation Of Single Rooted Teeth Prior To Endodontic Biofilm Disinfection With Nanosecond Pulsed Atmospheric-Pressure Cold Plasma

**Background:** Using the digital imaging and communications in medicine (DICOM) program known as OnDemand3D, three-dimensional (3D) reconstruction and virtual endoscopy of teeth is made possible. **Purpose:** The objective of the study was to analyze single rooted teeth with micro-computed tomography (micro-CT) prior to biofilm disinfection with nanosecond pulsed atmospheric-pressure cold plasma. **Methods:** Eleven extracted teeth were sent through a micro-computed tomography (micro-CT) scan. The image data was uploaded onto OnDemand3D where it can be visualized. The application first introduces a 3D view volume of the sample along with the sagittal, axial, and coronal orientations. Features such as the threshold control and the curved planar reformat (CPR) allow examination of the airway path through the canal. **Results:** Utilizing the many features of the application, we were able to view the morphology and intracanal topography, and measure the entire length of the canal within each tooth (n=11, mean ±1.20.1mm±3.2). In addition, by using the virtual camera feature, we were able to make virtual endoscopy video clips traveling through the canals. From the endoscopy, the topography of the canals, accessory canals, and other anatomic features can be more accurately observed. **Conclusion:** Micro-CT analysis is needed for viewing the morphology and intracanal topography of teeth. By investigating the micro-anatomy of the teeth, as well as secondary canals, we can establish the surface topography, length, and volume of the canals prior to biofilm inoculation and treatment, allowing for quantitative analysis post-treatment.

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# 105 ARASHI BASHAJ
ADVISOR: HAMIDOUN ZADEH
Histological Evaluation Of Extraction Sockets Grafted With Bovine Anorganic Bone

**Background:** Proper management of extraction sockets is critical insure appropriate future implant sites. A number of studies have demonstrated that socket preservation grafting can reduce the dimensional changes of alveolar ridge following tooth extraction and yield a greater degree of vital bone. **Purpose:** The purpose of present study was to examine histological response of tissues in extraction sockets grafted in anticipation of implant placement. **Methods:** The subjects (N=30) were planned for tooth extraction and dental implant installation. Teeth extracted in a manner to reduce trauma. Extraction sockets were thoroughly debrided and large particle size cancellous bovine anorganic bone was loosely placed in sockets without deliberate condensation. A polytetrafluoroethylene (PTFE) membrane was used to isolate bone substitute material from the oral cavity. After 4 weeks. After three months, osteotomy was performed with the trephine of smaller diameter than the final drill needed to place the implants. The bone core was evaluated by micro-CT (data reported separately). Histologic sections were stained with H&E and trichrome. **Results:** Histologic slides were analyzed by histomorphometry using NIH/Scion image software. Standard ASBMR methods and nomenclature were utilized in determination of osteoid and bone fill within bone specimens. **Conclusion:** Histologic evaluation revealed presence of new bone in direct

cytokine of the Th17 population mediates immunity to extracellular pathogens and promotes autoimmune immunopathology. The signaling mechanisms triggered by the IL-17 receptor (IL-17R) and related receptors are strikingly different from other cytokine subclasses. Namely, IL-17Rs contain a conserved SEF/IL-17R (SEFR) and TILL(TIR-like loop) subdomains that engage Act1, leading to activation of the NF-kB, C, EBP, and MAPK pathways. **Conclusion:** For this project were to delineate the SEFR containing IL-17RA signaling domain and test its characteristic function. **Methods:** In order to delineate the C-terminal boundary of the SEFR-containing domain, a series of IL-17RA cytoplasmic deletions were created and expressed stably in IL-17RA-/mice tail fibroblast cells. Short after assessment of their receptor expressions through flow cytometry, cells were treated with cytokines(IL-17A and TNF-alpha or IL-17A and TNF-beta) and this requires the signaling domain. **Conclusion:** Indicating no obvious impairments in protein folding or transport caused by deletions. **Conclusion:** The truncation at aa645 of IL-17RA may lie close to the C-terminus functional subdomain and therefore renders the receptor less stable. **Conclusion:** The C-terminal border of the signaling domain of IL-17RA lies between aa 645 and aa625, which is at least 92 amino acids beyond SEFR/ TILL domain. **Conclusion:** Recruitment of Act1 alone cannot lead to ubiquitination of TRAF6 which is a necessary step for NF-kB activation 5. Lymphotixin(LT) is known to play a role in anti-viral immunity. Mounting evidence suggests that IL-17 contributes to anti-viral responses, and thus it is conceivable that this might be mediated in cooperation with LT.
apposition to residual graft particles, demonstration active osteogenesis. Histomorphometric analysis is currently under way. Data on percentage of bone fill, resorption, and condensation of connective tissue was presented on research day. Conclusion: Histologic response of extraction sockets grafted with bovine anorganic bone appears to demonstrate efficacy in bone regeneration.

# 106 CHARLES ODON
ADVISOR: GARDNER BIELE
Three-Tier Oral Health Study: Urban, Rural, And Third-World
Background: The three-tier study collected data from AYUDA dental clinics. Clinic locations were Los Angeles, Terra Bella, California, and from the Gobne tribe in the jungles near Changuinola, Panama. The study sought to identify the oral health status of individuals with access to dental care and the oral health of those without access. Purpose: Evaluate oral health statuses of three geographically distinct areas. The oral health (amount of decay on first molars) will be proportional to the access to dental care. Methods: At each clinic AYUDA volunteers completed oral health surveys. They indicated the presence of decay and restorations on the first molars of each patient. Patients also indicated if they had visited a dentist within the last year. The data was tabulated in Excel and the results compared. Results: Patients who visited a dentist within the last year: 51.8% urban, 48.1% rural, and 2.9% third-world. Patients with no decay on first molars: 63.4% urban, 45.8% rural, and 27.2% third-world. Conclusion: Urban and rural access to care was similar however urban patients had 2x less decay. Alarmingly, one does not have to travel far from urban areas to see conditions similar to third-world oral health. A promising point: of the individuals who saw a dentist within the last year, nearly 40% had no decay or restorations.

# 107 DAVID L. MCAINNICH, IV
ADVISOR: PRAGNA PATEL
Dentists Knowledge Of Genetic Diseases With Dental And Craniofacial Manifestations
Background: This study was inspired by a family with multiple cases of supernumerary teeth. These patients were dentally cross-bred and all diagnosed under the underlying condition. Genetic linkage analysis established that the mutation in this family was associated with the RUNX2 locus and that the members were affected with cleidocranial dysplasia. Experts of the dental and craniofacial region, dentists must be able to recognize syndromes affecting these regions of the human anatomy for proper treatment. Purpose: The purpose of this study is to gauge the current knowledge and understanding of dentists and genetic diseases with dental and craniofacial manifestations. Our hypothesis is that dentists’ current level of knowledge of genetic diseases is inadequate due to either poor education and/or lack of clinical experience. Methods: A survey will be issued to dentists of all specialties and varying years in practice. The survey attempted to assess the respondents’ education in genetic diseases, knowledge of genetic diseases, clinical exposure to genetic diseases, and their interest in learning more about genetic diseases. Results: In Progress. Conclusion: TBD

# 108 JOHN MIKAZKAN
ADVISOR: HOMAYOUN ZADEH
Micro-Ct Assessment Of Extraction Sockets Grafted With Bovine Anorganic Bone.
Background: Successful osteointegration of dental implants largely depends on the ability of alveolar bone to provide sufficient stabilization. Socket preservation has been proposed as a method to maintain the geometry of alveolar ridge while the socket defect is healing. Purpose: The objective of this study was to evaluate the response of alveolar bone following socket preservation grafting using micro-CT and quantitative analysis. Methods: The subjects (N=30) were planned for extraction and dental implant installation. Teeth were extracted and sockets were thoroughly debrided. Large particle size cancellous bone graft (CG/CM 1:1) were used, with condensation. Polytetrafluoroethylene (PTF) membrane was used to cover extraction sockets and was removed after 4 weeks. Following 3-month healing, osteotomy was performed with a smaller diameter trephine than the final implant size, the mounted on bone. The bone core specimens were imaged by micro-CT scanner. After scanning, 3D reconstruction of DICOM data was performed using AmiraTM software. Segmentation of data was performed to generate volumes corresponding to connective tissue, bone, and residual graft material. The density of each of these 3 segmented volumes was measured and compared. Results: MicroCT analysis allowed identification of bone, connective tissue and residual graft material. The density of each of these 3 segmented volumes was measured and compared. Conclusion: Healing response of extraction sockets grafted with bovine anorganic bone appears to demonstrate efficacy of this technique in bone regeneration.

# 109 LAWRENCE FUNG
ADVISOR: SHERIF HADDAD
Intra-Oral Tracer And Its Use In Dentulous Patients: A Case Report
Background: Obtaining repeatable centric relation in patients is necessary in articulator cast mounting, denture construction, and occlusal equilibration. If a mandibular record is not reproducible, a dentist cannot evaluate treatment outcomes. Purpose: To present a modified method of reproducing centric relation in patients wearing an immediate mandibular denture opposing natural maxillary dentition via the use of a Gothic arch intra-oral tracer. Methods: A 68-year-old Class III male patient presented with a recent delivered mandibular immediate denture opposing a natural dentate maxillary arch with the chief complaint of sore spots and incorrect bite. After adjusting the borders and internal surfaces of the denture, a clinical remount was performed to adjust the occlusion. A gothic arch intra-oral tracer (Candulor USA, LA, CA ) was used with the tracing plate clutch attached to the palate using a customized soft baseplate wax pre-adapted to the patient. The tracers were recorded and imaged with OCT. Teeth were prepared “ideally” with the use of a preheated light curing composite resin (Filtek Z100). Fifteen extracted human upper pre-molars were used. Composite resin onlays and zirconia (60) and ceramic composite resin Paradigm MZ100 (60) abutments. Using a CEREC machine, standardized onlays (60) and crowns (60) were designed and milled in ceramic (Paradigm C) or composite resin (Paradigm MZ100) to simulate a maxillary premolar. All restorations were luted with a preheated light curing composite resin (Filetek Z100). Fifteen extracted human upper pre-molars were used. Composite resin onlays and zirconia (60) and ceramic composite resin Paradigm MZ100 (60) abutments. Presented the most biomimetic dynamic response to load when compared to teeth in a simulated PDL/bone support structure.

# 110 MICHAEL SILVA
ADVISOR: PASCAL MAGNE
Can Implant Restorations Be More Biomimetic?
Background: Dental implants and the growing market they represent are among the leading forms of restorative dentistry available today. Their remarkable ability to be integrated into the existing dentition combined with the possibility of restoring proper function and relationships is of great significance to both the practitioner and the patient respectively. At the same time, there is an equally strong trend to maintain a restorative quality as close to the natural dentition as possible. This study sought to examine the leading abutment materials for implants and evaluate their biomimetic quality. Purpose: A new test methodology was developed to evaluate tooth and implant restorations. The Perimeter is a percussion probe that measures the energy loss coefficient (LC) and consists of hardware and software that are interfaced to a unique handheld instrument. The purpose of this study was to evaluate the LC of extracted human teeth and assess which type of implant-supported abutment (zirconia/Paradigm C or composite resin) abutments combined with composite resin and ceramic onlays and crowns) would respond more biomimetically to physiologically-relevant dynamic loading. Methods: One hundred-and-twenty molar taper implants (Titamax CM 1:1) were mounted on bovine anorganic bone core specimens and restored with CAD/CAM zirconia (60) and composite resin Paradigm MZ100 (60) abutments. Using a CEREC machine, standardized onlays (60) and crowns (60) were designed and milled in ceramic (Paradigm C) or composite resin (Paradigm MZ100) to simulate a maxillary premolar. All restorations were luted with a preheated light curing composite resin (Filetek Z100). Fifteen extracted human upper pre-molars were used. Composite resin onlays and zirconia (60) and ceramic composite resin Paradigm MZ100 (60) abutments. Presented the most biomimetic dynamic response to load when compared to teeth in a simulated PDL/bone support structure.

# 111 SANDEEP POTDAR
ADVISOR: JENNIFER HOLZMAN
Comparison Of Oct With Current Clinical Standards To Detect Caries
Background: Current clinical standard treatment (clinical examination and radiographic exam) does not have the capacity to reliably detect early stage caries. With an imaging depth of 1-3mm, Optical Coherence Tomography is ideal for identifying and mapping early changes in tooth structure and dental sealant. OCT is a non-invasive high resolution optical imaging modality that uses back-reflected near-infrared light to provide cross-sectional, high-resolution, sub-surface images of teeth, and has been used on other organs in vivo. This project compared Optical Coherence Tomography (OCT) with current clinical standard treatment to detect early natural caries, including caries under dental sealant. Methods: 200 teeth with various stages of caries were photographed, radiographed, and imaged with OCT. Teeth were prepared “ideally” with caries left in palpal and axial walls, restored with composite material, imaged again and radiographed, and then sectioned. Blinded examiners reviewed radiographs and OCT images. The presence of decay was confirmed with histological examination after sectioning and microscopic evaluation. Results: OCT was able to detect early caries more reliably that visual, radiographic, and microscopic methods. Areas that were truly carious were identified as such (sensitivity >90%); teeth that identified as sound were truly sound (specificity >85%). Radiographs outperformed OCT only when decay was >2mm below the tooth surface. Conclusion: The project supported the potential use of Optical Coherence Tomography for early caries detection including lesions under dental restorations, such as recurrent caries.

# 112 BHURJAZ HAFID, DAVID MCAINNICH, JUSTIN ALZER
ADVISOR: FAREBBDI FARDIN
Incidence Of Post-Operative Bleeding In Hypertensive Patients
Background: Hypertension is the leading cause of death...
in industrialized nations. According to a study by Hajjar et al, 28.6% of the US population was diagnosed with hypertension from 1999-2002. Because hypertension is so prevalent in today’s society, it is frequently encountered in the dental clinic. As a result, treatment modifications must be considered during invasive dental treatment, specifically dental extractions. From our research, there is a lack of information about the incidence of post-operative bleeding in patients who have been diagnosed with hypertension. **Purpose:** The purpose of our research is to study the correlation between hypertension and post-operative bleeding. Our hypothesis is that hypertension is a risk factor for post-operative bleeding. We expect that patients with hypertension will have an increased likelihood of post-operative bleeding, which would necessitate the use of treatment modifications with the dosage or timing of their medication to prevent post-operative bleeding. Necessary treatment modifications will be followed up in a future study. **Methods:** Patients were categorized into 4 groups based on the JNC 7 classification of blood pressure. Group 1, the control group, was composed of normotensive (<120/<80) patients. Group 2 was composed of prehypertensive (120-139/<80-89), Group 3 was Hypertension, stage I patients (140-159/90-99), and Group 4 was composed of Hypertension, stage II (≥160/≥100) patients. Patient’s blood pressures were recorded before and after injection of prilocaine material, with the exception of one study that utilized electrothermal atomic absorption spectrophotometry. The results of the study suggest that fixed orthodontic appliances can cause significant increase in the amount of nickel and cobalt in saliva of orthodontic patients after one to two years. In spite of the fact that these amounts of Ni and Co can cause some problems in patients having allergic background; orthodontic treatment in these patients must be done with more awareness. **Use of appropriate collecting method, patients with long orthodontic treatment, balanced design and consideration of the same criteria for both groups are positive points of this study. We think that consideration of paired design could improve the analysis avoided in this study due to the time shortage and unsuitable situation of patient follow-up.**

**Background:** The noticeable demand of orthodontic treatment has made researchers think about potential undesired effects. Can orthodontic treatment cause health problems? Several studies have been done to uncover whether orthodontic appliances release metal ions through emission of electro-galvanic currents, with saliva as the medium or through continuous erosion over time. The detrimental effects of nickel have been systematically studied at the cell, tissue, organ, and organism levels. Nickel complexes in the form of arsenides and sulfides have long been recognized to be allergenic, carcinogenic, and mutating substances. Even at nontoxic level, nickel can lead to DNA alterations mainly through base damage and DNA-strand scission. **Purpose:** To investigate concentrations of nickel, cobalt and chromium ions in salivary samples from patients treated with fixed orthodontic appliances. **Methods:** Six patients with completely edentulous maxillae and inadequate height to support implants underwent NFA over a period of 3 y. The nasal floor was exposed via intraoral approach and grafted with bone graft substitutes. Twenty-four dental implants were placed, restored with a bar-retained implant-supported overdenture after a traditional healing period and were followed-up after prosthetic loading. Patient’s satisfaction with form and function was evaluated using a questionnaire and responses were expressed on a visual analog scale. Bone levels were quantified radiographically based on a numerical score ranging from 1-3, where 3 represented the highest bone support. Soft tissue health around implants was evaluated for absence or presence of inflammation as evidenced by visible plaque, changes in soft tissue color and presence of exudate. Dental implant thread exposure was recorded. The status of soft tissue health was documented by obtaining intraoral standardized photographs. Implants were considered successful if the following clinical and radiographic criteria were met: absence of mobility, they were asymptomatic, had bone scores of 3, and had healthy peri-implant soft tissue without thread exposure. Success rates were calculated accordingly. The age of patients ranged from 48-84 y. With a mean of 71.2 y. Three patients underwent NFA and simultaneous implant placement while the remaining had a mean healing period of 6.5 m. before implant placement. Post loading follow-up ranged from 1.7-24.5 m. with a mean of 12.1 m **Results:** Survival rate was 100% with no failures and no complications. Success rate was 75%. Patients were satisfied with form and function and had healthy peri-implant soft tissue with the exception of one patient who demonstrated gingival recession and thread exposure. Bone scores ranged from 2-3 with 79.2% having a score of 3 and 20.8% having a score of 2. **Conclusion:** The use of bone substitutes for NFA, as shown in this case series, is a reliable method for reconstruction of the anterior atrophic maxilla for implant-supported overdentures.

**Purpose:** The aim of this study is to evaluate the survival and success of implants placed in nasally grafted bone utilizing bone graft substitutes. **Methods:** Six patients with completely edentulous maxillae and inadequate height to support implants underwent NFA over a period of 3 y. The nasal floor was exposed via intraoral approach and grafted with bone graft substitutes. Twenty-four dental implants were placed, restored with a bar-retained implant-supported overdenture after a traditional healing period and were followed-up after prosthetic loading. Patient’s satisfaction with form and function was evaluated using a questionnaire and responses were expressed on a visual analog scale. Bone levels were quantified radiographically based on a numerical score ranging from 1-3, where 3 represented the highest bone support. Soft tissue health around implants was evaluated for absence or presence of inflammation as evidenced by visible plaque, changes in soft tissue color and presence of exudate. Dental implant thread exposure was recorded. The status of soft tissue health was documented by obtaining intraoral standardized photographs. Implants were considered successful if the following clinical and radiographic criteria were met: absence of mobility, they were asymptomatic, had bone scores of 3, and had healthy peri-implant soft tissue without thread exposure. Success rates were calculated accordingly. The age of patients ranged from 48-84 y. With a mean of 71.2 y. Three patients underwent NFA and simultaneous implant placement while the remaining had a mean healing period of 6.5 m. before implant placement. Post loading follow-up ranged from 1.7-24.5 m. with a mean of 12.1 m **Results:** Survival rate was 100% with no failures and no complications. Success rate was 75%. Patients were satisfied with form and function and had healthy peri-implant soft tissue with the exception of one patient who demonstrated gingival recession and thread exposure. Bone scores ranged from 2-3 with 79.2% having a score of 3 and 20.8% having a score of 2. **Conclusion:** The use of bone substitutes for NFA, as shown in this case series, is a reliable method for reconstruction of the anterior atrophic maxilla for implant-supported overdentures.

**Background:** Nasal floor augmentation (NFA) is a method for reconstruction of the anterior atrophic maxilla: A Case Series

**Purpose:** The aim of this study is to evaluate the survival and success of implants placed in nasally grafted bone utilizing bone graft substitutes. **Methods:** Six patients with completely edentulous maxillae and inadequate height to support implants underwent NFA over a period of 3 y. The nasal floor was exposed via intraoral approach and grafted with bone graft substitutes. Twenty-four dental implants were placed, restored with a bar-retained implant-supported overdenture after a traditional healing period and were followed-up after prosthetic loading. Patient’s satisfaction with form and function was evaluated using a questionnaire and responses were expressed on a visual analog scale. Bone levels were quantified radiographically based on a numerical score ranging from 1-3, where 3 represented the highest bone support. Soft tissue health around implants was evaluated for absence or presence of inflammation as evidenced by visible plaque, changes in soft tissue color and presence of exudate. Dental implant thread exposure was recorded. The status of soft tissue health was documented by obtaining intraoral standardized photographs. Implants were considered successful if the following clinical and radiographic criteria were met: absence of mobility, they were asymptomatic, had bone scores of 3, and had healthy peri-implant soft tissue without thread exposure. Success rates were calculated accordingly. The age of patients ranged from 48-84 y. With a mean of 71.2 y. Three patients underwent NFA and simultaneous implant placement while the remaining had a mean healing period of 6.5 m. before implant placement. Post loading follow-up ranged from 1.7-24.5 m. with a mean of 12.1 m **Results:** Survival rate was 100% with no failures and no complications. Success rate was 75%. Patients were satisfied with form and function and had healthy peri-implant soft tissue with the exception of one patient who demonstrated gingival recession and thread exposure. Bone scores ranged from 2-3 with 79.2% having a score of 3 and 20.8% having a score of 2. **Conclusion:** The use of bone substitutes for NFA, as shown in this case series, is a reliable method for reconstruction of the anterior atrophic maxilla for implant-supported overdentures.

**Background:** Nasal floor augmentation (NFA) is a method of augmenting bone height in the anterior maxilla. Autogenous bone has been commonly used as graft material, with the exception of one study that utilized a bone graft substitute. Due to considerable variations in results and the focus on survival rather than success. **Purpose:** The aim of this study is to evaluate the survival and success of implants placed in nasally grafted bone utilizing bone graft substitutes. **Methods:** Six patients with completely edentulous maxillae and inadequate height to support implants underwent NFA over a period of 3 y. The nasal floor was exposed via intraoral approach and grafted with bone graft substitutes. Twenty-four dental implants were placed, restored with a bar-retained implant-supported overdenture after a traditional healing period and were followed-up after prosthetic loading. Patient’s satisfaction with form and function was evaluated using a questionnaire and responses were expressed on a visual analog scale. Bone levels were quantified radiographically based on a numerical score ranging from 1-3, where 3 represented the highest bone support. Soft tissue health around implants was evaluated for absence or presence of inflammation as evidenced by visible plaque, changes in soft tissue color and presence of exudate. Dental implant thread exposure was recorded. The status of soft tissue health was documented by obtaining intraoral standardized photographs. Implants were considered successful if the following clinical and radiographic criteria were met: absence of mobility, they were asymptomatic, had bone scores of 3, and had healthy peri-implant soft tissue without thread exposure. Success rates were calculated accordingly. The age of patients ranged from 48-84 y. With a mean of 71.2 y. Three patients underwent NFA and simultaneous implant placement while the remaining had a mean healing period of 6.5 m. before implant placement. Post loading follow-up ranged from 1.7-24.5 m. with a mean of 12.1 m **Results:** Survival rate was 100% with no failures and no complications. Success rate was 75%. Patients were satisfied with form and function and had healthy peri-implant soft tissue with the exception of one patient who demonstrated gingival recession and thread exposure. Bone scores ranged from 2-3 with 79.2% having a score of 3 and 20.8% having a score of 2. **Conclusion:** The use of bone substitutes for NFA, as shown in this case series, is a reliable method for reconstruction of the anterior atrophic maxilla for implant-supported overdentures.
Research Day Awards

**Poster Category Awards**
Awarded to outstanding posters within each category

- Ostrow School of Dentistry Faculty
- Advanced Specialty Program Resident
- Biokinesiology and Physical Therapy Student - Exercise Musculoskeletal Biomechanics
- Biokinesiology and Physical Therapy Student - Neural Control and Motor Behavior
- Dental Hygiene Student
- Graduate Post-doctoral Trainee
- Graduate Pre-doctoral Candidate
- Occupational Science and Occupational Therapy Student
- DDS Student - Basic Science
- DDS Student - Clinical Science

**Dean's Research Award**
Awarded to the most outstanding project poster overall

**USC Stevens Institute for Innovation Award**
Awarded to the poster with the highest likelihood of translating into practical use

The USC Stevens Institute for Innovation is a university-wide resource in the Office of the Provost at the University of Southern California designed to harness and advance the creative thinking and breakthrough research from USC for maximum societal impact. As the first institute of its kind, the USC Stevens Institute empowers USC innovators university-wide to make broader impact with their ideas.

The USC Stevens team prepares USC faculty and students for a lifetime of innovation, supporting innovators from USC's College and all 17 professional schools by integrating intellectual property management and licensing functions with educational programs, community-building, and events designed to stimulate innovation across the university.

The USC Stevens Institute for Innovation was established through a generous $22M naming gift from USC alumnus and trustee Mark A. Stevens, a partner at the legendary Sequoia Capital venture capital firm, and his wife, Mary.
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<tr>
<td>USC Ruth Ragland 25th Dental Hygiene Symposium</td>
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<td>Applied Hypnosis: Treat Pain, TMD &amp; Other Dental Conditions</td>
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<td>Implant Therapy In The Esthetic Zone</td>
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<td>Interdisciplinary Dentistry to Promote Success in Clinical Practice</td>
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<td>Esthetic Full-Mouth Implant Reconstruction: From Treatment Planning to Fixed Restoration</td>
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<td>Mastering Bone Grafting for Esthetic Implant Site Development - Lecture &amp; Hands-on Workshop</td>
<td>Module I: Fri, Mar 25</td>
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<td>Obstructive Sleep Apnea, Snoring and Dental Advancement</td>
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<td>Advanced Implant Protocols</td>
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<td>Esthetic Periodontal Surgery for the General Practitioner: A Hands-On Course</td>
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<td>Digital Clinical Photography: All You Need to Know!</td>
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<td>Atraumatic Extraction and Minimally Invasive implant Site Development</td>
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<td>Endodontics From A to Z: Hands-On Workshop for the General Practitioner</td>
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<td>Part II: Fri - Sun, Jun 17 - 19</td>
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<td>Implant Therapy In Compromised Sites</td>
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<td>37th Annual Review of Continuing Education in Dentistry (Maui, Hawaii)</td>
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<td>The Artistic Dentist: Excellence in Direct Anterior and Posterior Composites</td>
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<td>Mastering Bone Grafting for Esthetic Implant Site Development - Lecture &amp; Hands-on Workshop</td>
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<td>Fundamentals of Implant Surgery and Restoration</td>
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<td>Part II: Sat - Sun, Oct 1 - 2</td>
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<td>Part III: Sat - Sun, Nov 5 - 6</td>
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<td>Team Driven Diagnosis, Treatment Planning and Acceptance, for a Successful Esthetic Practice</td>
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Division of Periodontology, Diagnostic Sciences & Dental Hygiene Dentistry

Division of Endodontist, Oral and Maxillofacial Surgery & Orthodontics

Division of Restorative Sciences

Division of Biomedical Science

Division of Biokinesiology and Physical Therapy

Division of Occupational Science and Occupational Therapy

USC SRG

Student Research Group

RESEARCH ON!