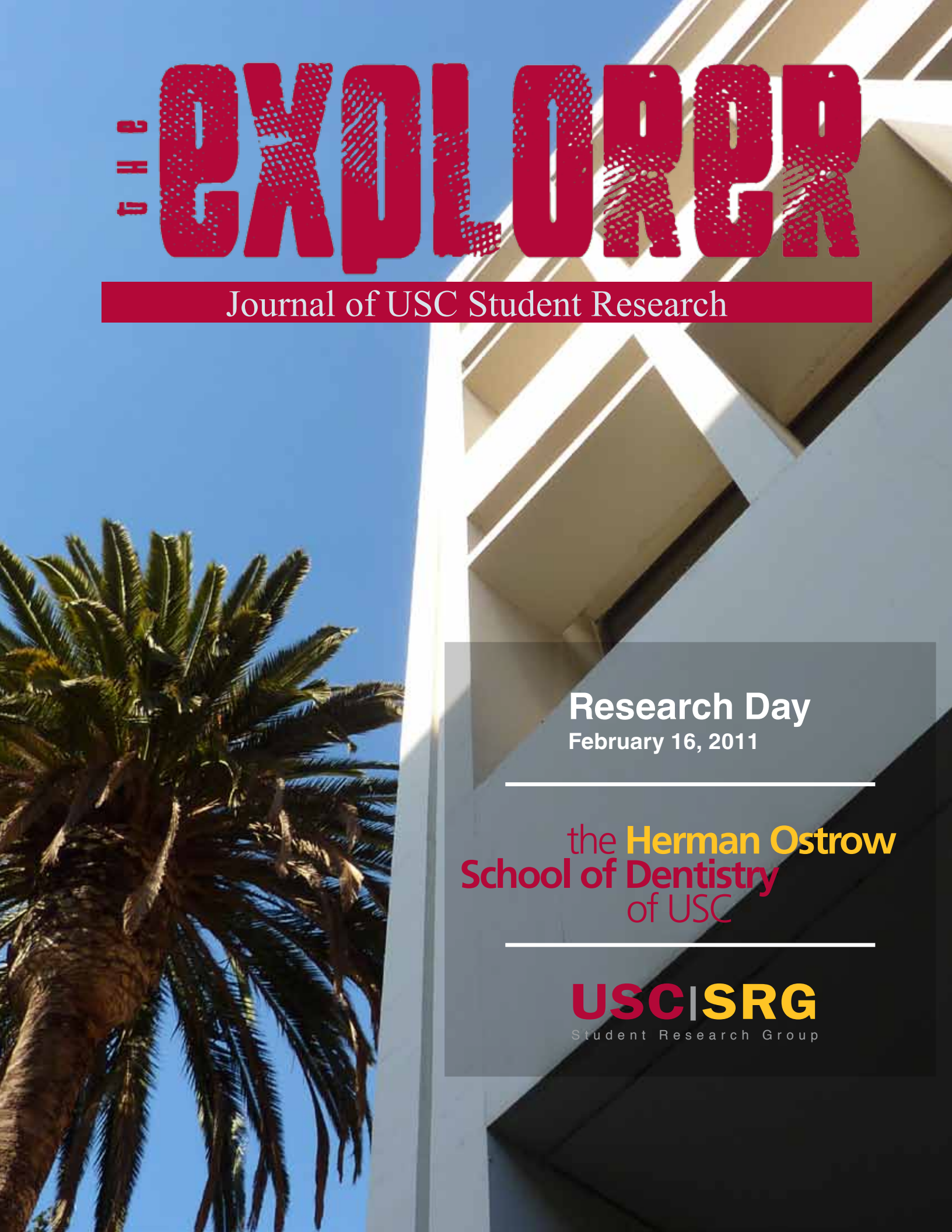

the EXPLORER

Journal of USC Student Research

Research Day

February 16, 2011

the Herman Ostrow School of Dentistry of USC

USC|SRG

Student Research Group

THE EXPLORER
Journal of USC Student Research

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The Explorer Journal is published annually by members of the student body of the Herman Ostrow School of Dentistry of USC.
Any questions may be sent to the Student Research Group at uscsrg@gmail.com

Welcome to the Explorer Journal
Dean Avishai Sadan

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

Research and Innovation
Articles and Features

Articles

Research Day

Poster Abstracts

Message from Dr. Chai
Associate Dean of Research

Dear Colleagues,

Photo by Philip Channing

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

Spotlight: Student and Faculty Perspectives on Research

By Weston Carpiaux · DDS 2012

Officers of the USC Student Research Group are often approached by students asking the same questions: What is the benefit of doing research while at USC and how do I get involved? To find answers I went directly to the source and sat down with two senior dental student researchers, Nini Hung and Lawrence Fung, along with Dr. Margarita Zeichner-David an award winning faculty advisor.

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."

Dr. Margarita Zeichner David

> "I personally feel that once a student is in the dental school they should get a full experience, and that includes research. "
>
> - Dr. Margarita Zeichner-David

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

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.

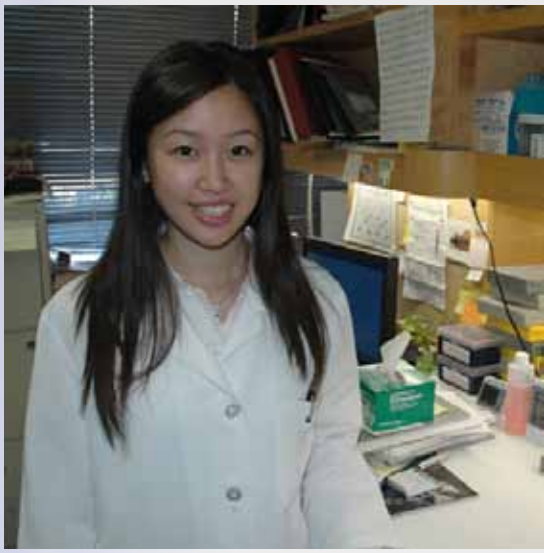
Nini Hung, now a senior dental student from the class of 2011, was selected her freshman year for this same program. Over her four years she has made the most of that original opportunity by continuing in her same line of research. Over the years she presented at multiple USC Research Days, California 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."

> "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 understand genetic development, more specifically different types of oral pathology and craniofacial developmental problems. I have a better understanding of how those problems come about, and a greater appreciation for craniofacial defects."



Nini Hung 2011

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."

Lawerence Fung 2011

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

Community Outreach Program: AYUDA Inc.

By Charles Odion · DDS 2012

The Herman Ostrow School of Dentistry at USC has committed itself for decades to addressing the needs of its surrounding community which often lacks access to dental care. The dental school has been innovative not only through empowering school directed dental outreach programs but also in facilitating privately funded groups in impacting dental health. One such group is AYUDA.

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. It conducts 11 local clinics and annually holds an international clinic, which is primarily held 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.

Dr. James Tom USC Anesthesiologist Interview

By Joshua Adcox · DDS 2012

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 as relevant and evidence-based. Ironically, the current literature and research doesn't really provide answers per se, but more questions! From there, the impetus to justify what I do or what I need to change in my everyday practice mainly comes from my examination of a large body of reports, studies, and articles that represent all aspects of anesthesiology pertaining to the issue.

What is the best way you have found to stay on top of the latest information/research, and suggestions to students on how to do this?

Not surprisingly, a lot of my investigation comes from the Internet. I subscribe to a number of forums from anesthesia professionals that discuss a variety of topics every day. It's really intriguing to see what other folks around the nation or globe are doing in certain situations. There are internet email forums that specifically deal with pharmacology, anesthesiology, pediatric anesthesiology, and surgery that come into my inbox every day. I skim and see what looks interesting. The Wilson Dental Library also has a service that sends you the table of contents of journals you may be interested in every month. After parsing the topics, you can go online and read the study or article. That by far is super convenient. I also have a few snail-mail subscriptions to pharmaceutical newsletters and journals that help me stay in touch with recent developments. Students should be able to access the same thing and if you're interested in a particular topic, you should find the relevant journals to see what the current issues in that discipline would be. One particular note is to always check out what the editors write about in their editorials. It gives one a good point of view on subjects that pertain to the discipline as a whole. Editors have a wealth of information, experience, and judgment to articulate issues that face the practitioner of whatever subject you're investigating at the time. I get a kick out of reading editorials from the 60's, late 70's, or early 80's. Way different times and attitudes back then!

Also, I'd be remiss if I didn't mention the widespread use of online encyclopedias such as Wikipedia. It's a great resource and I'll be the first to admit that when I have no clue on a subject, a quick and dirty search on the Wiki will point me in a direction. However, since the Wiki is suspect on its sources and information oftentimes, you have to develop a skill in recognizing good research and good articles from suspect information when you investigate things further. 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. The gold standard is still the randomized, double-blind, controlled prospective study, and its unlikely that Wikipedia will be sophisticated enough to discern the good studies from the weak ones.

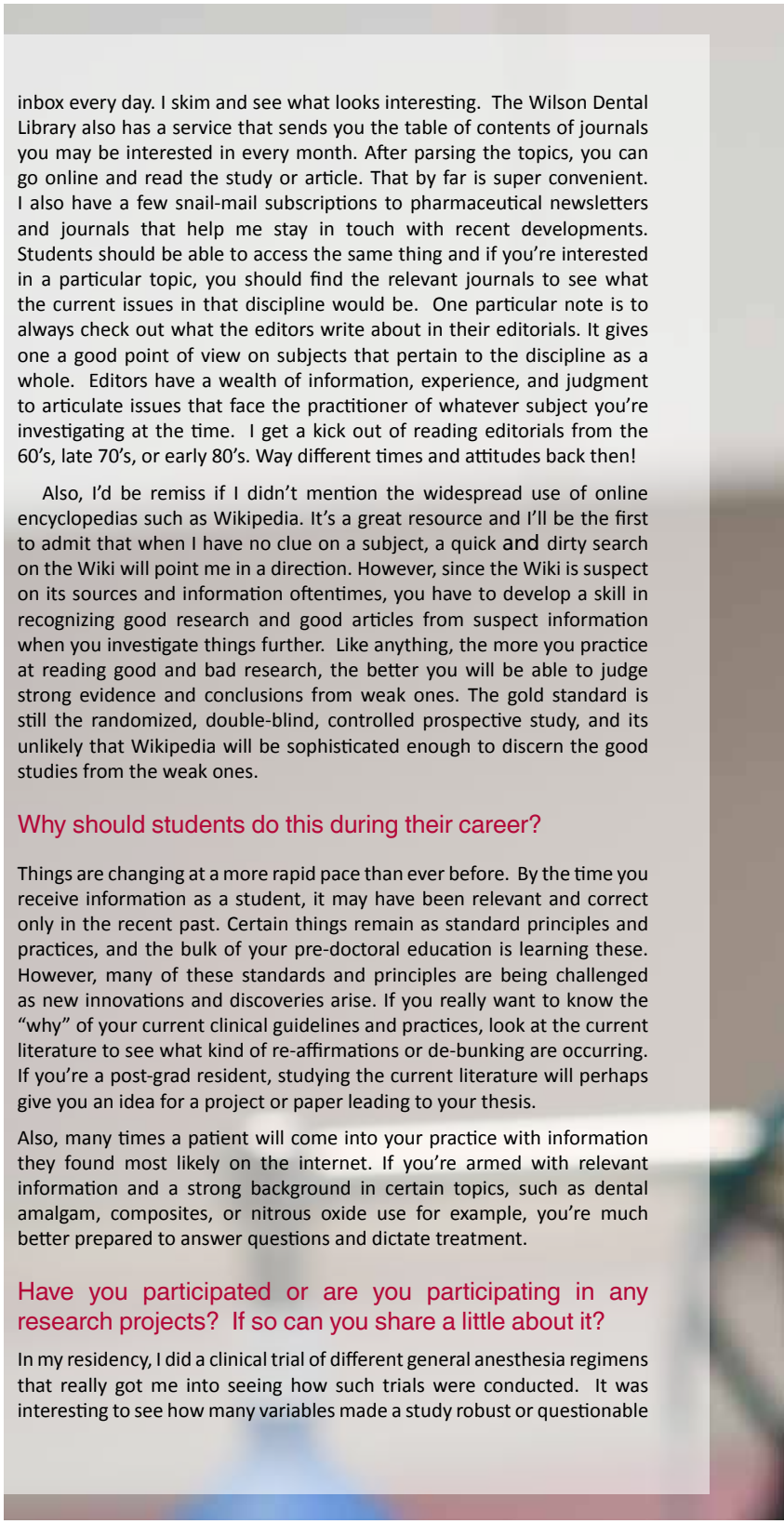
Why should students do this during their career?

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-grad 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



- 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.

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.

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.

Genetic mutation causing cleft palate defect in newborn mouse.

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.

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Dr. Duarte and Dr. Phark Interview

By Steve Johnson · DDS 2013

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 at the Sao Paulo State University at Araraquara 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, Endodontic, 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.

CAD/CAM AT USC:
COMPUTER AIDED DESIGN / COMPUTER AIDED MANUFACTURING

By Wilson Jing · DDS 2013

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.

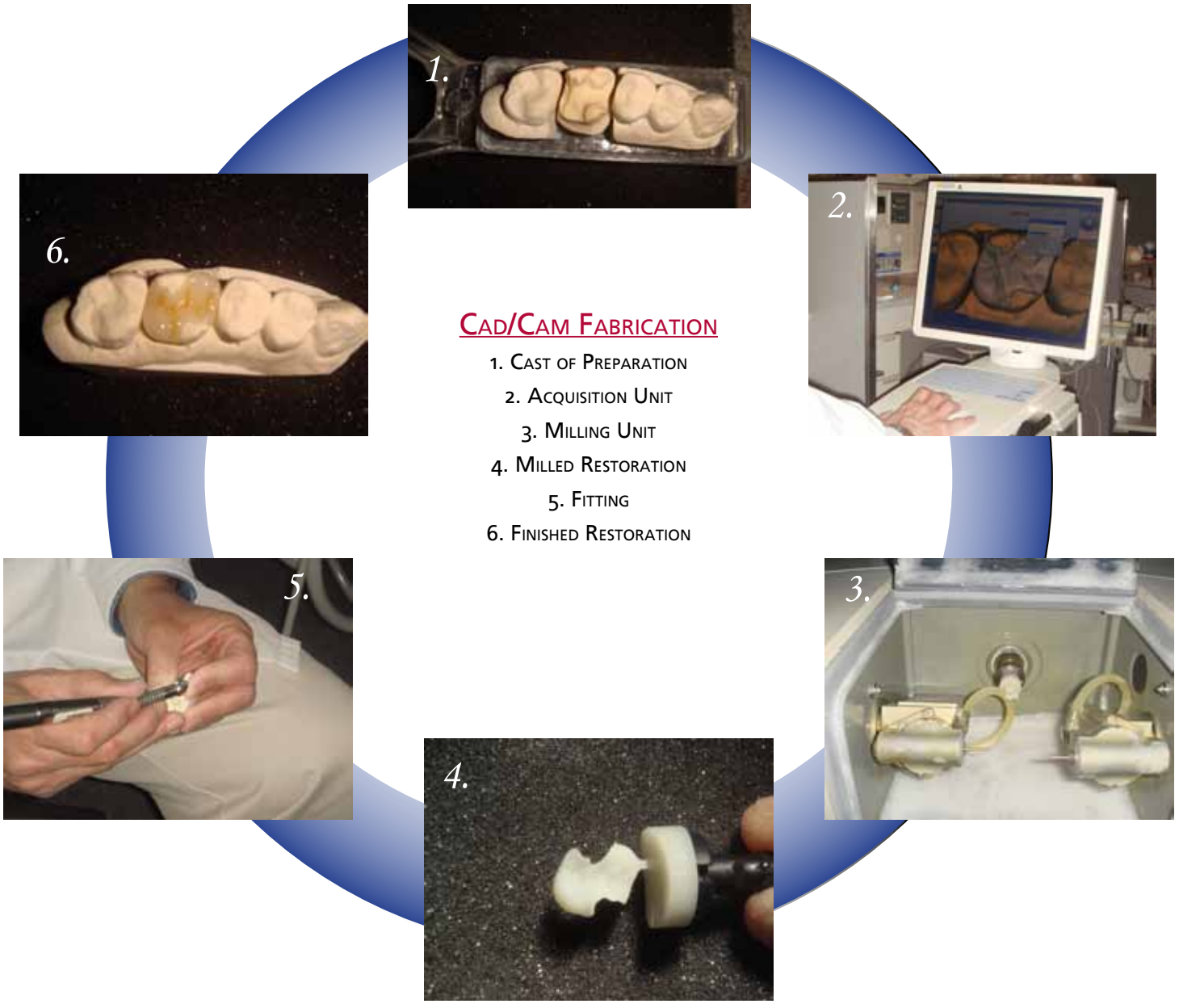
Despite the obstacles, Ostrow School of Dentistry of USC over the past six years has gradually incorporated the CAD/CAM technology into the clinic. With the CEREC system already in place, three quarters of the clinical faculty have already completed training. Clinically, over 75 restorations in selective 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

pre-clinical bonded restoration module is to gain familiarly 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

USC Students Present Research Around the World

By Weston Carpiaux · DDS 2012

Risa Regalado & 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

Miyoung Kim · DDS 2011
Hinman Student Dental Research Symposium
2009 Memphis, Tennessee
Changes in the phenotype of Dental Papillae Mesenchyme (DPM) cells maintained in vitro after treatment with NFIC-shRNA
Advisor: Dr. Margarita Zeichner-David

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

Khine Htet · DDS 2014
Hinman Student Research Symposium
2010 Memphis, Tennessee
CMV-Induced Embryonic Cochlear Pathogenesis
Advisor: Dr. Tina Jaskoll & Dr. Michael Melnick

Desiree 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

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

Union Rescue Mission USC+URM

By Heather Stephens · DDS 2012

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 woman 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

Table 2. Students' (n=260) evaluation of their rotation at the community outreach program serving homeless people, by percentage of total respondents to each question

Questions	Strongly Agree	Agree	Disagree	Strongly Disagree	Undecided	Missing
My experience at this rotation was very positive.	65%	33%	1.0%	1.0%	1.0%	0.4%
All my expectations of the program were met when I started.	41%	50%	4.0%	0.4%	4.3%	0.9%
The faculty made my experience enjoyable.	66%	31%	0	0	1.7%	1.3%
The staff made my experience enjoyable.	58%	39%	1.7%	0	0.4%	0.4%
The patients made my experience enjoyable.	37%	55%	0.9%	0	7.3%	0.4%
The rotation helped me to enhance my clinical skills.	55%	43%	1.7%	0	0.9%	0
The rotation helped me to better understand the needs of homeless people.	33%	46%	3.4%	0	6.0%	6.0%
After my rotation, I feel more comfortable treating homeless people than before.	39%	46%	3.4%	0	6.0%	6.0%
I would like to spend more time at this rotation.	56%	32%	1.7%	0	4.3%	5.6%
The rotation was organized.	54%	28%	4.7%	0	7.7%	5.6%

Note: Percentages do not total 100% because of rounding.

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:

Habibian, Mina, Laura Elizondo, and Roseann Mulligan. "Dental Students' Attitudes Toward Homeless People While Providing Oral Health Care." Journal of Dental Education74.11 (2010): 1190-196.

Seirawan, Hazem, Laura Kathleen Elizondo, Niel Nathason, and Roseann Mulligan. "The Oral Health Conditions of the Homeless in Downtown Los Angeles." California Dental Journal 138.9 (2010): 681-88.

TABLE 3

Numbers of Significant Procedures Provided and Percentages of URM Patients Received These Procedures (at Least Once) by Sociodemographic Characteristics

Characteristics	N	Oral Health Instructions	Sealants	Amalgam or Composite Restorations	Endo Treatment	Perio Treatment	Complete Dentures	Partial Dentures	Surgery
Total	409	948 (79.22)	364 (15.4)	1334 (56.48)	75 (13.2)	926 (53.79)	119 (15.89)	82 (14.43)	714 (45.23)
Age									
0-17	74	29 (37.84)	340 (71.62)	164 (59.46)	4 (4.05)	3 (2.7)	0 (0)	0 (0)	39 (27.03)
18-39	78	247 (98.72)	22 (11.54)	352 (73.08)	18 (16.67)	269 (76.92)	0 (0)	9 (7.69)	69 (43.59)
40-49	131	387 (93.13)	2 (0.76)	478 (54.2)	34 (17.56)	373 (64.89)	38 (16.03)	33 (19.08)	319 (51.15)
50-59	92	226 (79.35)	0 (0)	251 (51.09)	8 (8.7)	243 (66.3)	41 (25)	38 (28.26)	203 (57.61)
60-69	28	56 (75)	0 (0)	84 (39.29)	11 (25)	36 (39.29)	30 (57.14)	2 (7.14)	78 (28.57)
70-79	6	3 (50)	0 (0)	5 (16.67)	0 (0)	2 (16.67)	10 (83.33)	0 (0)	6 (50)
Gender									
Female	92	128 (63.04)	202 (30.43)	156 (50)	9 (7.61)	107 (32.61)	24 (14.13)	15 (11.96)	113 (41.3)
Male	317	820 (83.91)	162 (11.04)	1178 (58.36)	66 (14.83)	819 (59.94)	95 (16.4)	67 (15.14)	601 (46.37)
Race									
Black	202	540 (85.64)	43 (4.46)	682 (54.46)	38 (13.37)	552 (60.4)	78 (21.29)	56 (19.8)	431 (48.02)
Asian	7	12 (71.43)	26 (42.86)	20 (57.14)	2 (28.57)	14 (42.86)	0 (0)	0 (0)	2 (28.57)
White	62	163 (83.87)	1 (1.61)	216 (50)	18 (19.35)	134 (59.68)	21 (17.74)	13 (12.9)	118 (45.16)
Hispanic	126	203 (65.08)	292 (38.89)	364 (62.7)	15 (8.73)	198 (40.48)	18 (7.94)	12 (7.94)	140 (42.06)
Other	12	30 (100)	2 (8.33)	52 (58.33)	2 (16.67)	28 (58.33)	2 (8.33)	1 (8.33)	23 (41.67)

Bioengineering Bone by Therapeutic Antibodies

By Niki Katoozi · DDS 2013

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.

A novel strategy for tissue engineering has been developed utilizing monoclonal antibodies to bioengineer bone. In the contex 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 immuno modulate 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.

Experimental procedures were performed both in cells in vitro and in animals studies, including rats, rabbits, and dogs. The results demonstrated that there are antibodies able to bind endogenous BMP-2 molecules, and the formation of an immune complex is crucial to activate mineralization. These genetically engineered antibodies are the first therapeutic molecules in the bone biology field.

The research efforts of Dr. Zadeh and Dr. Freire will lead to great advancements in the field of periodontology and tissue engineering. Their innovative research is a breakthrough that will greatly impact bioengineering approaches and eventually translate to the development of smart biomaterials.

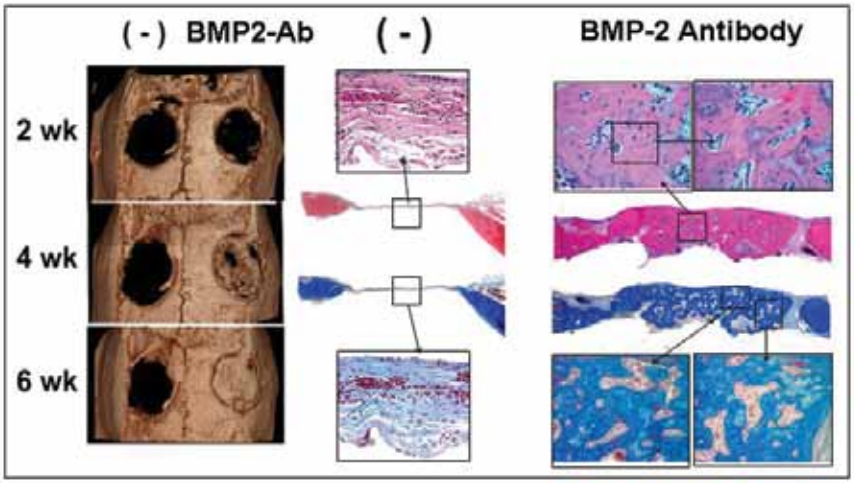


Figure: Antibody mediated osseous regeneration within rat calvarial defects, examined by micro-CT and histological studies. 5 mm surgical defects were created in rat calvaria, which were implanted with collagen scaffold alone (-) or with immobilized BMP-2 specific antibodies. Animals were scanned with 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

What you can gain from being involved in 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 regulators 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.

Division of Biokinesiology and Physical Therapy

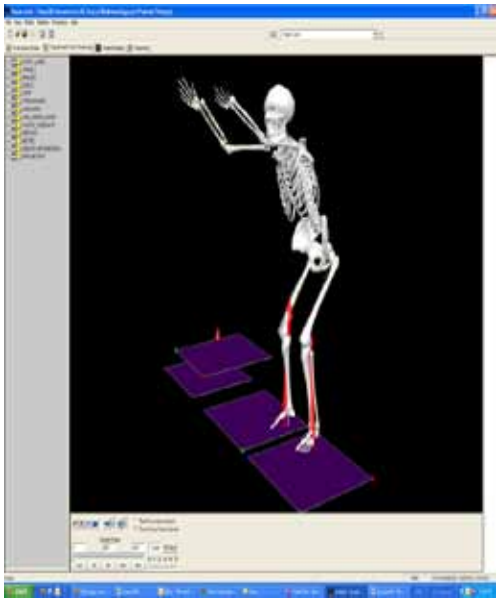
Message from Associate Dean and Division Chair James Gordon, EdD, PT, FAPTA

The core mission of the Herman Ostrow School of Dentistry's Division of Biokinesiology & Physical Therapy is to enhance the physical well-being and quality of life of humans, and one of the primary ways that we accomplish this is to conduct research that will expand our knowledge of the biological bases of human movement. This interdisciplinary focus on movement, which we call biokinesiology, includes four domains of research: (1) the neural basis of motor control and learning, (2) the biomechanics of the musculoskeletal system, (3) exercise and muscle physiology, and (4) the development of normal movement. In this issue of Explorer, we highlight two projects that are led by investigators from the biomechanics domain. Both these projects are noteworthy because they highlight the Division's strategic emphasis on translating basic research science into applications and interventions that will be useful to individuals in the communities that we serve.

YESS Seeks To Develop Effective Yoga Practices for Seniors

Principal Investigator: George Salem, PhD

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/

Division of Occupational Science and Occupational Therapy

Introduction from Associate Dean and Professor Florence Clark, Ph.D., OTR/L, FAOTA

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/

Ostrow School of Dentistry of USC
Research Day February 16, 2011

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 Magne** **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**

Key Note Speakers

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 multi-sensory 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.

Oral Presentation

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.

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Research Day
Poster Abstracts

Faculty

1 Abbey Marterella
Advisor: Jeanne Jackson

Weighing Down Adults With Mental Illness: A Qualitative Study

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 cause devastating 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 is 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 FGF2. **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-Jan

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
Advisor: Erna Blanche

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 treatment is delivered and received as intended and by helping to ensure that the independent variable is manipulated as planned (Bruckenthal & Broderick, 2007) A fidelity plan can also help prevent drifting of the intended intervention, which is common in interventions conducted in community settings (Mowbray, et al. 2003). Monitoring **Purpose:** The goal of this project is to develop a scale that will help monitor the treatment fidelity of a Lifestyle Redesign Pressure Ulcer Prevention intervention for the National Institute of Health research grant, 1R01HD056267-01A1, at the University of Southern California, through the development of a fidelity measure. **Methods:** The steps to be taken for fidelity instrument development will include: 1. 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 several 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 intervener. **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, to further strengthen the utility of the scale.

5 Mary C. Lawlor

Boundary Crossings: Re-Situating Cultural Competence

Background: The legacy of health disparities persists despite concerted efforts to eliminate inequities. Cultural competence initiatives have not fulfilled their promise. **Purpose:** This interdisciplinary, longitudinal ethnographic study of African American children with illnesses and disabilities, their families and practitioners draws on phenomenological, interpretive and narrative inquiry approaches to examine a number of interrelated concepts. Working hypotheses for this project have been extensive and relate to the following: meanings of illnesses and disabilities in everyday life, healthcare and health disparities, processes of "partnering up," and intersections of developmental and illness or disability trajectories. **Methods:** We examined how discrete moments of healthcare encounters produce effects across both contexts and time, influencing developmental trajectories, family life, and health and therapeutic outcomes. **Results:** The concentration on partnership and decision-making as located primarily within the clinical encounter disguises much of the learning on the family side, and their strengths and talents which contribute significantly to the efficacy of treatment interventions. Healthcare encounters are collaborative practices more centrally situated within family and child life and practitioners and families work to bridge clinic and home life. Families actively seek to acquire a range of subtle, highly situated expertise concerning biomedical culture. **Conclusion:** The proposed reframing of partnership redistributes the notion of expertise such that child and family expertise are recognized. Expertise is also re-situated as a moment to moment problem such that all parties learn how to learn about each other while directly engaged in healthcare encounters.

6 Olga Solomon

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, 2005; Prince-Hughes, 2001, 2004; Solomon, 2010) and technological

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 specially 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 and reciprocity are co-constructed by children with autism and their communicative partners; and on ways in wh ich inclusion of therapy dogs in social interaction mediates and affords the children's ability to display intersubjectivity and empathy. **Results:** Micro-level analysis of child-dog-trainer video-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 d 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.Solomon, 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-10-00365) we collected 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=.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 multinomial 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.

11 Zoe Mailloux and Susanne Smith Roley

Advisor: Sharon Cermak

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 therapy center, 20 children with hearing loss were tested on the Sensory Integration and Praxis Tests and over 30 children were tested with developmental measures. Parent questionnaires related to sensory functions were also collected on all children. **Results:** The results of the assessments on the children with hearing loss included some findings not commonly included in the current literature that promise to influence the understanding of children with hearing loss in comprehensive ways that may lead to new and innovative interventions. **Conclusion:** The findings are likely to increase knowledge about the potential for and impact of temporary and chronic hearing loss for children with developmental delays. In addition, findings on the SIPT promise to influence the understanding of children with hearing loss in comprehensive ways that may lead to new and innovative roles for occupational therapists.

12 Mohamed H. Saber, Faisal Alonaizan

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 sequels of spread are life 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 **Conclusion:** 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 explore its potential application 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 onset and pain on injection. **Methods:** Our research 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 anesthesia. **Conclusion:** 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 use, with 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 population, Tregs, contributes to 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 center. Treg and TH17 cells 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 generated by using CBCT, which was used to determine the proper orientation of the head and maxillofacial structure. A different 3-plane coordinate system (transverse, mesio-distal, and bucco-lingual) 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 Sinclair

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 premolar 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, the Irregularity Index, 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 anterior 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 Abichaker

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)

Purpose: The aim of the present study was to determine if CMV infection induces tooth dysmorphogenesis and enamel defects in a developmental stage- and duration-dependent manner. **Methods:** We infected E15 Cap stage mandibular first molars with 25 PFU/ml mouse CMV (mCMV) at the Cap stage (day 0 of culture), Early Bell stage (day 5 of culture) or Bell stage (day 9 of culture) for 24 hrs, then cultured them in control medium for up to 19 days in vitro and employed morphological and molecular methodologies. **Results:** We demonstrated that mCMV infection induces tooth pathology and enamel defects in a stage- and duration-dependent manner: the earlier the initial stage and the longer the duration of infection, the more severely abnormal the phenotype. Cap stage and Early Bell stage-infected molars exhibit enamel agenesis and Bell stage-infected molars exhibit enamel hypoplasia. Multigene molecular signatures were generated and shown to differ when the virus was introduced at the Cap stage than when the virus was introduced at the Bell stage. These distinct molecular signatures are correlated with specific stage-dependent histopathology. **Conclusion:** Our data indicates that stage-dependent differences in the expression of genes important for tooth development and amelogenesis results in unique tooth histopathology.

18 Nicole Sakai

Advisor: Hongsheng Tong

Cbct Pan-Like Images: A Trend In Mesiodistal Root Angulation Discrepancies

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 be looking at 30 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. **Purpose:** The purpose of this study is to determine how much distortion there is in the constructed panoramic images, and if there is a trend based on the interincisal angle. The hypothesis is that 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 angulations that were found using the 3 plane coordinate system. **Results:** There are 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.

19 Samuel Lee

Advisor: Glenn Sameshima

Maxillary Central Incisors And Forehead Inclination In Adult White Females

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 want to evaluate the significance of 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 profile images 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 measure 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 a significant correlation in the control sample 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 female patients seeking improved facial harmony.

20 Soraya Chinea

Advisor: James Mah

Effect Of Cbct Imaging On Orthodontic Diagnosis And Treatment Planning

Background: The effect of cone-beam computed tomography (CBCT) imaging in orthodontic diagnosis and treatment planning has not been fully elucidated despite the increasing use of 3-dimensional imaging in dentistry. Concerns relating to cost and radiation exposure are two common reasons for the limited use of CBCT imaging in orthodontics. Utilization of CBCT for placement of mini-screws (Kim, 2009), localization of impacted canines (Walker et al, 2005), and evaluation of root resorption and alveolar bone levels (Estrela, 2009) have been described. A review of 500 orthodontic patients imaged with CBCT revealed incidental findings such as airway abnormalities, positive TMJ and other dental findings in 21.4% of the patients (Cha, 2007). No previous studies have evaluated the differences between the diagnosis and treatment plans of orthodontic patients when using conventional records and CBCT images. **Purpose:** 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 consecutive 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 also include CBCT data. The diagnosis and treatment plans with and without the 3-dimentional 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: Conclusion:**

21 Lindsey MacFarlane

Advisor: Glenn Sameshima

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 examined recently. 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 **Methods:** 46 patients from the private practice of an American Board of Orthodontics diplomate were evaluated. Full records of each patient were examined to compare premolar extraction rates in the permanent dentitions and resulting cephalometric measurements in single- and two-phase treatment groups. **Results:** There was no significant difference amongst single- and two-phase treatment groups with regards to extraction rates. Cephalometric outcomes between the two treatment groups were not significant. **Conclusion:** Early orthodontic intervention in Class II malocclusion does not provide any reduced rates in premolar extraction nor does it affect cephalometric outcomes.

22 Theresia Laksmana

Advisor: Casey Chen

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 with aggressive periodontitis and to confirm these results with quantitative real-time PCR. **Methods:** Subgingival plaque samples were obtained from 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 to verify trends seen by16s-rRNA analysis as exemplified by 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 considerable variety 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.

23 Yvonne Tam

Advisor: Hessam Nowzari

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 of teeth. **Purpose:** The objective of this study was to describe the peri-implant levels of pro-inflammatory cytokines and subgingival microbiology in clinically healthy sites. **Methods:** Subgingival plaque and gingival crevicular fluid (GCF) were obtained from 28 clinically healthy implants and 26 teeth selected from 24 individuals. Microbial composition was determined by selective anaerobic culture techniques. Pro-inflammatory cytokines were quantified by flow cytometry analysis of GCF. 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 innate immune response. A more frequent detection of periodontopathic bacteria was observed in teeth than implants. Cultivable levels of periodontopathic 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 account for more cytokine production than teeth.

24 Alireza Moshaverinia

Advisor: Winston Chee

Ultrasonically Set Novel Nvc-Containing Glass-Ionomer Cements For Applications In Fixed Prosthodontics

Background: Glass-ionomer dental cements have 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 applications in dentistry. **Purpose:** The objective of this study is to investigate the effects of application of ultrasound on the physical properties of a novel NVC (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 by the manufacturer. Specimens were mixed and fabricated at room temperature and were conditioned in distilled water at 37oC 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 set (CS) and ultrasonically set (US) were compared with the control group, using one-way ANOVA and the Tukey 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 set samples showed significantly lower water sorption values (p<0.05) due to improved acid-base reaction within the GIC matrix and accelerated maturation process. According to the statistical analysis of data, an increase was observed in the surface hardness properties of CS and US specimens in experimental and control samples. GIC Sample Physical Property Setting time (min) Vickers Hardness Number (VHN) Water sorption [(WSe)/µg.mm-3] NVC-GIC (CS) 3.0 ± 0.1 55.2 ± 4.2 40.2 ± 1.4 NVC-GIC (US) < 1.0* 61.0 ± 5.1 37.1 ± 0.8* Fuji IX (CS) 2.5 ± 0.1 50.1 ± 3.7 38.4 ± 2.1 Fuji IX (US) < 1.0** 53.9 ± 4.0 35.2 ± 1.2** *, ** Results are significantly different in each group. CS: conventional set US: ultrasonic set **Conclusion:** It was concluded that it is possible to command 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: E. Todd Schroeder

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 exercise (VIB = 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 VIB 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 program 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 Guilherme Cesar

Advisor: Susan Sigward

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 maturation. **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 two 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. **Results:** No interactions between group and condition were found. Slower approach velocity, greater knee flexion and larger vertical and posterior GRFs were noted during UN condition. Pre-pubertal athletes exhibited larger GRFs when compared to all other maturation groups. **Conclusion:** Online processing requirements during UN condition resulted in slower approach, greater knee flexion and greater GRFs. No interaction between group and condition suggests that athletes respond to online processing demands similarly across maturation. Larger GRFs across condition suggest that cutting presents a greater challenge to pre-pubertal athletes.

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. However, this association has not yet been examined under weight-bearing conditions. **Purpose:** 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 (LTI)) better correlates with patella alignment (lateral patella displacement and lateral patella tilt) during weightbearing as assessed using MRI. **Methods:** Axial images of the patellofemoral joint were acquired from 36 participants (18 PFP, 18 asymptomatic) 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 (SA and 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. **Conclusion:** The findings of this study suggest that the geometry of the lateral anterior femoral condyle is better associated with patellar alignment than the geometry of entire trochlear groove. As such, the LTI could be an underlying structural risk factor of patella malalignment and PFP.

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 Qualysis 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 pelvis 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, more relative posterior 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.

29 Jo Armour Smith

Advisor: Kornelia Kulig

Trunk Segment Coordination During A Jumping Task In Elite Dancers

Background: Successful performance of athletic skills requires appropriate task-specific inter-segmental coordination and coordination variability. During vertical jumping, trunk coordination in particular may be an important aspect of elite performance. **Purpose:** The aims of the study were to investigate the pattern and variability of inter-segmental trunk coordination relative to phase defining events during vertical jumping, and to examine the relationship between coordination variability and length of dance training. **Methods:** The trunk kinematics of healthy dancers (n=7; mean dance training history=12.6years) were recorded during 10 consecutive rate-controlled jumps. The pattern of coordination between the lumbar and thoracic segments 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 propulsion 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 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 finite element (FE) model can be generated by assigning 3-dimensional density measures to FE bony mesh. However, as cartilage exhibits little signal on CT, this approach becomes challenging when structuring cartilage contact problems. Therefore, we utilized fat-water chemical shift imaging (IDEAL MRI) to estimate bone density with the assistance of a calcium hydroxyapatite (CHA) calibration phantom. **Purpose:** The purpose of this study was to correlate the bone density measurements between QCT and IDEAL. **Methods:** A spoiled-gradient-echo IDEAL pulse sequence was performed on a female's knee joint with a CHA calibration phantom. The density of each voxel within patella was calculated from IDEAL in-phase (IP: water+fat)imaging. CT scan was obtained with another set of CHA calibration phantom and the x-ray attenuation coefficients were used to calculate bone density on QCT. To compare IDEAL- and QCT-based density measures, the position of patella on QCT imaging was registered to its corresponding position on IDEAL IP imaging. After positional registration, the average densities 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 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 approach for creating FE bone models.

31 Kathryn Havens

Advisor: Susan Sigward

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 COM position relative to the COP during sprinting and a cutting task at two speeds. **Methods:** 3 healthy females participated. 2-dimensional COM position was quantified during sprinting, and fast and slower paced sidestep cutting (SCUT) at a 45 degree angle. COP was calculated from force platform data. COM-COP distance was normalized to body height. Stance phase was considered for analysis. No statistical analysis was performed due to a small sample size. **Results:** When compared to sprinting, subjects performed SCUTs with a lower, more posterior, and more medial COM relative to COP at initial contact (IC) and less anterior and more medial COM at the end of stance. When compared to the slower SCUT, COM was less posterior at IC relative to 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 Stearns

Advisor: Christopher Powers

Knee Biomechanics And Return-To-Sport Test Performance: Retrospective Analysis Post-Acl Re-Injury

Background: Individuals who undergo anterior cruciate ligament reconstruction (ACLR) risk re-injury upon return to sport (RTS). Symmetry between legs (>80-90%) for strength and agility tests are commonly used to determine readiness for RTS. However, it is unknown if performance on these tests can identify persons at risk for re-injury. **Purpose:** To retrospectively analyze knee biomechanics during side-step cutting and performance on RTS tests in a female soccer player post-ACLR, who later re-injured her ACL. **Methods:** A 25 year old female, 18 months post-ACLR, was recruited to participate in a larger study. Three-dimensional kinematics and kinetics were collected while she performed a side-step cutting maneuver. Limb symmetry (involved/uninvolved*100) was calculated for the following RTS tests: 1) single leg 2) triple and 3) crossover hop for distance; 4) maximal isometric knee flexor/extensor strength. Three months post-testing, the subject sustained a second non-contact ACL injury. Data from seven healthy female soccer players (CON) was analyzed for comparison of knee adductor moments during cutting. **Results:** Performance on the ACLR leg was within 92-95% of the uninvolved (U) leg for all RTS tests. The peak knee adductor moment was higher on the ACLR leg as compared to the U leg (ACLR: 2.13 Nm/kg, U: 1.09 Nm/kg), and was more than 4 standard deviations greater than the mean of the CON group (0.75 ± 0.3 Nm/kg). **Conclusion:** While our subject met current criteria for RTS, she demonstrated knee biomechanics associated with ACL injury risk. Given 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 knee OA may be associated with increased tibiofemoral compressive loads. **Purpose:** The purpose of this study was to examine whether females with ACLR demonstrate greater tibiofemoral compressive load due to greater muscle co-contraction than healthy females with ACLR. **Methods:** Ten females with ACLR and 10 healthy females without ACLR (control group) participated. Each participant underwent 2 data collection sessions: 1) MRI assessment; and 2) biomechanical analysis (EMG, kinematics, and kinetics) during a single-leg drop-land task. Joint kinematics, EMG, and MRI-measured muscle volumes and patella tendon orientation were used as input variables into a MRI-based EMG-driven knee model to quantify the peak tibiofemoral compressive forces during landing. **Results:** The peak tibiofemoral compressive forces were significantly higher in the ACLR group when compared to the control group (97.3 ± 8.0 vs. 88.8 ± 9.8 N/kg). The ACLR group also demonstrated significantly greater muscle co-contraction as well as less peak knee flexion than the control group. **Conclusion:** Our findings support the premise that individuals with ACLR demonstrate increased tibiofemoral compression during drop-landing. Interventions aimed at correcting abnormal movement strategies (i.e., increased co-contraction) following ACLR may be beneficial in decreasing knee compressive loads in this population.

34 Lindsey Anderson

Advisor: E Todd Schroeder

Total Body Water And Lean Mass Assessment By Bioelectrical Impedance

Background: If accurate, multifrequency bioelectrical impedance (BIA) may provide a quick and cost-efficient method to assess total body water (TBW) and lean mass (LM) in different populations. **Purpose:** To compare TBW and regional LM measured by the BioSpace InBody multifrequency BIA devices to TBW determined by deuterium water (D2O) and LM measured by dual-energy x-ray absorptiometry (DEXA), respectively. **Methods:** 50 participants (25 men and 25 women) performed two measurements each on the InBody 520, 720, and S10 BIA devices, one DEXA scan, and a 4-hour TBW assessment. The two BIA measurements were averaged for analyses. TBW BIA measurements were compared to TBW measurements obtained from D2O analysis. Appendicular, trunk, and total lean body mass (LBM), total fat mass (FM), and percent body fat (PBF) BIA values were compared to the DEXA values. Independent t-tests were used to assess within-group differences ($p<0.05$), one-way ANOVA was used to assess between-group differences, and bivariate Pearson correlation was used to assess associations between variables. **Results:** Collectively and by gender, InBody TBW measurements were significantly higher than D2O TBW values. There were no significant differences comparing the BIA devices to DEXA for appendicular, trunk, and total LBM, total FM, and PBF as a group or by gender. Significant positive correlations between each DEXA or D2O measure and the corresponding BIA values ranged from r=0.91-0.98. **Conclusion:** While the BioSpace InBody devices appear to overestimate TBW by approximately 5 kg, they may be used in place of DEXA for adequate assessment of regional and total lean mass and total fat mass.

35 Mark Blanchette

Advisor: Christopher Powers

Friction Demand During Running And Cutting

Background: Slips occur when the utilized friction (uCOF) of an individual exceeds the available friction provided by the shoe-floor interface. Previous studies have reported that the uCOF during normal speed walking ranges from 0.17 to 0.20, however, no study has examined the friction demands during sport activities. **Purpose:** To examine the uCOF during running and 2 types of cutting maneuvers (side-step cut and V-cut). **Methods:** Subjects performed 2 cutting tasks (side-step cut and a V-cut). A delayed illumination on a board visible to the subjects as they approached the force plate signaled the subjects to either continue running straight ahead or to perform one of the cutting tasks. One-way repeated measures ANOVAs were performed to test for differences in peak uCOF, vertical force and resultant shear force among the 3 conditions. **Results:** On average the uCOF during running had the lowest uCOF while the uCOF during the V-cut was the highest. With respect to ground reaction forces at the time of peak uCOF, there were no significant differences in the vertical force among tasks. However, there was a significant effect of task on the resultant shear force ($p <0.001$). **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 abductor 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 evaluated 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 main effect for time and interaction were present for pain and health status measures at 8 weeks ($p <0.05$). Pain and health status improved in the exercise group but did not change in the control group (VAS: -6.4±2.7 vs. 0.1±1.7 cm; WOMAC: -43.3±20.1 vs. 4.1±10.3). At 6 month follow-up, pain and health status of the exercise group was not different from that reported post-intervention ($p>0.05$). **Conclusion:**

Hip strengthening was effective in improving pain and health status in females with PFP. Importantly, the improvements were sustained at the 6 month follow-up. Hip strengthening should be considered a viable intervention for patients with PFP.

37 Matthew Gaston Villanueva
Advisor: E. Todd Schroeder

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 tested the hypothesis that hypertrophic and strength RT protocols equated for volume-load (sets x repetitions x load) and employing short rest intervals between sets will elicit acute increases in total testosterone. **Methods:** 6 men, 26±2.4 years of age, visited the University of Southern California Health Sciences Campus 6 times. Visit 1 involved signing of an informed consent and determination of maximum strength for the 4 exercises utilized in the experimental protocols. Visit 2 consisted of a control session, and Visits 3-6 consisted of 4 RT sessions in a randomized order. Visits 2-6 required 4 blood draws: pre-exercise, immediately post-exercise, 15 minutes post-exercise, and 30 minutes post-exercise. **Results:** The hypertrophic protocol with a 60 second rest interval (H60) elicited significantly ($p < 0.05$) different total testosterone concentrations from pre-exercise (7.32±1.85 ng/mL) to immediately post-(8.87±1.83 ng/mL), 15 minutes post- (8.58±2.15 ng/mL), and 30 minutes post-exercise (8.28±2.16 ng/mL). The strength protocol with a 60 second rest interval (S60) 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 (S90) 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 simultaneous enhancements in both muscle strength and size over a longer-term period of strength training.

38 Rami Hashish
Advisor: George Salem

The Influence Of Different Marker Sets On Lower Extremity Dynamics

Background: Heel plate (HP) and dorsal plate (DP) marker cluster sets have traditionally been used to track the foot during inverse dynamic calculations of the lower extremity. However, comparisons between these two methods have not been reported. **Purpose:** This study examines the differences in lower extremity dynamics during the stance phase of gait when tracking the foot with HP and DP triads. **Methods:** Eight subjects performed 3-5 trials of barefoot gait at their self-selected speed with DP and HP triads affixed to their dominant foot. Mean peak joint angles and moments were compared using Paired-t tests. Coefficient of multiple correlation was used to analyze joint dynamics throughout the stance phase. **Results:** Sagittal plane ankle kinematics (R=.846), and ankle (R=.868), knee (R=.811) and hip (R=.807) moments were strongly correlated between the two conditions throughout stance. There was a significant increase in peak plantar flexor ($p<.01$), knee flexor ($p<.01$) and hip flexor ($p<.05$) moments with the DP. Frontal plane ankle kinematics (R=.577), and ankle (R=.400), knee (R=.442) and hip (R=.582) moments were moderately correlated throughout stance. There was a significant increase in peak ankle evertor ($p<.01$), knee abductor ($p<.01$) and hip abductor ($p <.01$) moments with the DP. **Conclusion:** Use of a DP increases peak ankle plantar flexion and eversion angles, effectively altering kinetic calculations at the ankle, knee and hip in the sagittal and frontal planes. Caution should be exercised when analyzing intra- and inter-study results that use different triad locations.

39 Sachithra Samarawickrame
Advisor: George Salem

Biomechanics Of A Modified Yoga Pose In Healthy Older Adults

Background: Increasingly, yoga is being promoted as a safe and effective exercise program for older adults. The Downward Facing Dog pose is often modified (mDFD) for older participants in order to potentially reduce the risk of injury. Characterization of the biomechanical variables of the mDFD will help to determine the physical demands of this yoga pose and develop balanced, safe and effective yoga programs for older adults. **Purpose:** To determine the kinematic and kinetic characteristics of the mDFD pose in healthy older adults. **Methods:** 24 subjects (70.8 yrs ±4.2) performed the mDFD under a qualified yoga instructor□s guidance. Sagittal plane kinematic and kinetic data were obtained during the position of maximal forward bending. Flexion angles and flexor moments are reported as positive. **Results:** Mean dominant limb joint angles were: ankle= 12.6 ±6.4°, knee= 26.2 ±13.5°, hip= 83.1 ±17.6°, shoulder= 118.8 ±13.6°, elbow= 48.8 ±15.6°, and wrist= -15.5 ±12.3°. The angle of trunk relative to pelvis was -9.0 ±11.3°, and head relative to trunk was 17.4 ±12.6°. Mean internal moments of the dominant leg in the sagittal plane were: ankle= -0.32 ±0.13N.m/kg (plantar-flexor), knee= 0.02 ±0.19 N.m/kg, and hip= -0.48 ±0.20 N.m/kg. The moment at the trunk was -43.90 ±17.24 N.m/kg. **Conclusion:** The biomechanical demands of the mDFD were primarily on the trunk extensors, hip extensors, knee flexors and ankle plantar-flexors. These results may be used to inform selection and modification of the mDFD pose to suit older adults with different musculoskeletal constraints and pathologies.

40 Shawn C. Sorenson
Advisor: George Salem

Health Concerns Precede Intercollegiate Athletics Participation: Data For Five Conditions

Background: While previous studies have identified common injuries among intercollegiate athletes, additional data on the history of these conditions are needed to understand their influence on lifetime health & wellness. **Purpose:** This investigation provides descriptive epidemiology on the prevalence and time course of selected health concerns among intercollegiate athletes. **Methods:** 391 student-athletes completed an anonymous questionnaire documenting indicators of physical, mental, and emotional health, health-related quality-of-life, and related exercise behaviors and attitudes. Five health concerns (ankle, knee, shoulder, upper leg, and concussion) were examined in detail based upon their importance in established literature. Lifetime prevalence and age of first symptoms relative to intercollegiate sports participation were assessed for each condition. Comparisons between men and women were evaluated using relative risk estimates, X2 proportion tests, and independent sample t-tests ($P = 0.05$). **Results:** Overall lifetime prevalence was 47%, 49%, 40%, 17%, and 19% for ankle, knee, shoulder, upper leg, and concussion concerns, respectively. The age of first symptoms preceded intercollegiate sports participation on average by 3.3, 2.5, 1.5, 1.2, and 3.5 years. Women demonstrated higher risk of ankle (OR = 1.65) and knee (OR = 1.59) concerns. Ankle concerns began earlier among women (14.5 vs. 15.6 y), while concussion concerns began earlier among men (14.1 vs. 15.6 y). **Conclusion:** These data suggest that health concerns affecting college athletes occur prior to participation in intercollegiate sports. Gender influences both the prevalence and time course of these concerns. Improved preventative screening and treatment may reduce the impact and progression of these conditions. Future research should evaluate younger and older athletes to better understand unique benefits and risks of high-performance training across the lifespan.

41 Szu-Ping Lee
Advisor: Christopher Powers

A Double-Segment, Center Of Mass Based Pendulum Model To Predict Hip & Ankle Motion During Uni-Pedal Stance

Background: The coordinated actions of the hip and ankle are essential in maintaining postural stability. It is important to understand how hip & ankle movement patterns respond to different degrees of perturbation of the body center of mass (COM). **Purpose:** To validate a novel mathematical postural model that predicts the hip and ankle kinematics based on body COM. **Methods:** The pendulum model predicts the hip and ankle joint motions based on input of body COM locations estimated from a force platform. To validate the model, the model-computed joint kinematics were compared to video-based measurements of the hip and ankle joint angles obtained from 2 subjects performing 20 seconds of uni-pedal standing. In addition, simulated postural instability was conducted by increasing the excursion of body COM to evaluate the effect of instability on hip and ankle joint motions. **Results:** The model was capable of predicting hip and ankle joint motions (mean prediction error: hip = 0.24°, ankle = 0.59°). The simulation showed that a 100% increase in body COM excursion elicited a 13.9% (1.19°) and a 21.9% (2.05°) increase in hip and ankle motions, respectively. **Conclusion:** The coordinated hip and ankle actions in maintaining postural stability were predicted accurately by the proposed model. Moreover, our novel approach allows retrieving the hip and ankle angles without a videographic system. The simulation showed that adjustments at the hip and ankle are important in response to postural instability.

42 Yu-Jen Chang
Advisor: Kornelia Kulig

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 musculotendinous unit. 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 **Methods:** 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 (GRFv) data were used to calculate the leg stiffness (kleg) at maximal GRFv. 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 GRFv 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 and averaged for each subject. **Results:** The analyses of leg stiffness at the time of maximal GRFv showed no difference between Achilles tendinopathic subjects (AT) and healthy controls (HC). Ankle joint stiffness also showed no difference between groups. During the concentric phase, individuals with 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 regulating ankle stiffness, 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.

43 Shuya Chen

Advisor: Carolee Winstein

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 in a 2D workspace to targets of 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 presentations. Participants were then asked to reach quickly and accurately with whichever hand they preferred. Probability of hand selection (PHS) was defined as the ratio of hand selections to total trials. Correlations between RSE, target distance, target direction, hand dominance, and PHS were tested. **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=0.049; $p=0.893$). **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 Dayanidhi

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 there is a decline in manual abilities in adults related to sensory deterioration, muscular factors as well as changes in control of force direction (Cole, 2009). Previous studies in these populations have primarily focused on static tasks or on timed tasks as a means of quantifying manual abilities. **Purpose:** To quantify dexterous manipulation in adults and children across ages with the use of a dynamic device, which would provide useful information about development as well as ageing. **Methods:** Ninety children (4-16 yrs), 13 young adults (21-35 yrs) and 20 older adults (50-85 yrs) participated in this multi-site study. Two compression load cells were used across a slender spring, which required less than 3 N of force for complete compression. However with compression the instability of the spring increased. The subjects were asked to compress the spring to the point beyond which they felt the device would slip out of their hand and maintain it there for at least 2 seconds.Three to five trials were collected for each subject. **Results:** Significant differences were seen between the younger and older adults in mean hold force (2.15 ± .1, 1.75 ± .09 N). During development there is a steady increase in the mean force children are able to achieve with the dexterity device. Time series analyses reveal that in the state space the youngest children and oldest adults have similar dynamics of control. **Conclusion:** 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: Beth Fisher

Feasibility And Reliability Of Measuring Corticospinal Excitability Of Gluteus Maximus

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 gluteus maximus (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,k)), standard error of measure (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: 0.61 to 0.83). Within and between days analyses for SEM 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 Charalambous Charalambos

Advisor: Carolee Winstein

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 condition 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 in region with vision but without end-posture comfort exhibited the greatest max toe clearance. **Conclusion:** Depending on target location, anticipatory motor planning 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 Hsiang-han Huang

Advisor: Linda Fetters

The Impact Of Body-Scaled Information On Actions In Children With Cerebral Palsy

Background: Body-scaled information is related to affordances and critical for emergent actions. It remains a question whether similar body-scaled information is perceived for the emergent reaching actions for children with hemiplegic CP. **Purpose:** This study examined the body-scaled information that specifies the relation among hand size, object size, and reach patterns for children with hemiplegic cerebral palsy (CP) and typically developing children (TDC). **Methods:** Participants were nine children with CP and nine age-matched TDC. Both groups of children were asked to reach, grasp and nest cubes of ten sizes. Dimensionless ratios were calculated by dividing the cube size by the distance between the tip of the index finger and thumb. These ratios were then related to the emergent reaching patterns. Furthermore, the critical ratio was defined that determined the shift between one hand and two hand reaching patterns. **Results:** The results indicate that the critical ratio was not significantly different for either preferred or non-preferred arms both within and between groups. Children with CP tend to use one-handed reach more frequently for the (preferred) non-paretic arm when the dimensionless ratio is smaller than 1.2, when compared to the preferred hand for TDC. Moreover, we demonstrate that the frequency of one-handed and two-handed reaches for the paretic and non-preferred arms are similar for both children with hemiplegic CP and TDC. **Conclusion:** Personal constraints such as experience and severity level of impairments may account for these surprising findings. Future research is encouraged to examine the relationship of different constraints (e.g., experience, different severity level of impairments, changing object properties) to body-scaled information and resulting emergent actions.

48 Hyeshin Park

Advisor: Nicolas Schweighofer

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 subject's target reaching performance, we developed a mathematical model that evaluates the movement duration as follows: $MD = a * \log2((2*D/size) + 1) + b * \cos(3*\pi/4 - q) + c * (\pi/2 - q)^2 + d$, 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 radian, 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 show that distance (first term in the model), has 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.

49 Scott Young

Advisor: Terence Sanger

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 rating scales 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 correlated more strongly 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 dystonia. In order to fully represent the effect 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.

Dental Hygiene Student

50 Joan Beleno, McKalee Conrad, Samantha Naumann, Amanda Olvera

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 dental tissue and disease have yet to be investigated. **Purpose:** With the growing number of women undergoing infertility treatments and acknowledging that changes in hormones affect oral health, we aimed to explore changes in gingival tissue and response while women underwent ovulation therapy. **Methods:** Information from experimental research and professional journals were extensively reviewed. **Results:** Significantly higher levels of gingival index, bleeding upon probing, and cervicular 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 even more pertinent in assessing oral health needs and providing oral hygiene aids to help maintain gingival health.

51 Risa Regalado, 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 with 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 based on the interaction between the immune response and periodontal pathogens.

Graduate Post-Doctoral Trainee

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 and SLA surface (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 Pyatak

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 (5R01HD56267-3) 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:** 160 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.

54 Carolina Parada

Advisor: Yang Chai

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. Although 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 and its interaction with TGF-beta pathway in this process. **Methods:** Analysis of different mutant models including Ctgf-/-, Tgfbr2fl/fl;Wnt1-Cre and Smad4fl/fl;Osr2-Cre mice. In vivo and in vitro approaches were used. **Results:** Our qualitative and semiquantitative analyses of Ctgf expression 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 alteration 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 TGF-beta dependent. Defects in midline epithelial degeneration in Ctgf mutants were ruled out. Similarly, apoptosis and proliferation levels in Ctgf KO palates are comparable to those of controls. The absence of proliferative defects in vivo might be due to compensation by other CCN proteins, as they are upregulated 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 interest, an exogenous source of CTGF is able to rescue the proliferative defect of Tgfbr2fl/fl;Wnt1-Cre palatal mesenchyme. Accordingly, we showed that Ctgf is a downstream target of the canonical TGF-beta pathway in the palatal mesenchyme and also that CTGF regulates its own expression through TGF-beta. **Conclusion:** CTGF acts as mediator and modulator of TGF-beta signaling pathway to regulate diverse developmental mechanisms during palatogenesis.

55 Daming Fan

Advisor: Janet Moradian-Oldak

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 normal enamel tissue. 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 (rP148) were investigated using biophysical methods (dynamic light scattering (DLS) and fluorescence spectroscopy). OCP crystals were grown in 10% recombinant rP148 with increasing concentration (0.04%-0.4%) of the 32kDa enamelin, at pH 6.5 and 37°C using a cation selective membrane 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:** DLS 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 absorption of rP148 after addition of enamelin (molar ratios from 1:100 to 1:10) were indicative of conformational changes in amelogenin following their interaction with enamelin. Analysis of OCP crystals 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 conditions 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.

56 Dong Han

Advisor: Yang Chai

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 occipital somites-derived myogenic cells give rise to muscles. We have shown that TGF-beta signaling plays a critical role in regulating the fate of CNC cells during tongue development; and conditional inactivation of Tgfbr2 in mesoderm-derived cells (Myf5-Cre;Tgfbr2 flox/flox) results in myogenic differentiation defect in tongue, implying that TGF-beta signaling is also specifically required in myogenic progenitors during tongue development. **Purpose:** In this study, we investigate the functional significance of Smad-dependent TGF-beta signaling in regulating tongue muscles development. **Methods:** We used the mesoderm specific Cre, Myf5-Cre, to investigate the function of Smad-dependent TGF-beta signaling in regulating myogenic cells differentiation in tongue. **Results:** Conditional inactivation of Smad4 in myogenic cells (Myf5-Cre;Smad4 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 a basic muscle pattern, but the tongue is smaller and contains fewer myofibers. Also, muscles contain fewer laminin+ myofibers with a higher proportion of MHC-S+ myofibers compared with control. Therefore, the increased proportion of slow myofibers in CKO mice likely results from a decreased formation of fetal myofibers, suggesting that myogenic cells terminal differention is affected in CKO tongue. **Conclusion:** These results suggest that Smad-dependent TGF-beta 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.

57 Haiyan Qin

Advisor: Songtao Shi

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 the affected jaw 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 orofacial 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 approaches. 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, population 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 MSC derived from 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. Inhibition of 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 benign 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.

58 Jingyuan Li

Advisor: Yang Chai

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, and cultured the lower first molar in kidney capsule to explore dental mesenchymal cell fate. **Results:** Ablation of Smad4 results in defects in odontoblast differentiation and dentin formation. Moreover, ectopic bone-like structures replaced normal dentin in teeth of Osr2-IresCre;Smad4fl/fl mice. Despite the lack of dentin, enamel formation appears to be normal in Osr2-IresCre;Smad4fl/fl mice, challenging the paradigm that initiation and formation of enamel depends on normal dentin formation. At the molecular level, loss of Smad4 results in upregulation of canonical Wnt signaling. **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.

59 Jun Wang

Advisor: Anh Le

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 and maintenance of optimal MSC functions. **Purpose:** 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, 100 mM non-essential amino acid, and 550 µM 2-mercaptoethanol). GMSCs at passages 4-6 were transferred to ultra-low attachment dishes with complete medium to allow 3D-spheroid 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-1/2a were determined by RT-PCR, immunocytochemical and Western blot analysis, respectively. The cytokine secretion profile by spheroid GMSCs was determined using a commercial cytokine antibody array. **Results:** Compared to their adherent counterparts, spheroid GMSCs showed a decreased expression of CD29, CD73, CD90, CD105 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-1/2a) and superoxide dismutase-2 (SOD2), a manganese-superoxide dismutase (MnSOD) that plays an important antioxidant role by counteracting reactive oxygen species (ROS). In addition, spheroid GMSCs showed an elevated expression of CXCR4, a chemokine receptor important in the migration and homing of stem cells. Cytokine arrays showed that spheroid GMSCs secreted higher levels of IL-6, MCP-2, MCP-3, M-CSF, RANTES, SCF, SDF-1, angiogenin, oncostatin M, and VEGF, with relevant roles in chemotaxis, immunomodulation and angiogenesis. **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 spheroid 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 craniofacial development. **Purpose:** In this project, we investigate 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 Tgfr2. **Results:** We found that loss of Tgfbr2 in neural crest cells in mice results in elevated Tgf-beta expression. The elevated Tgf-beta activates a novel Tgf-beta signaling pathway involving Tak1/p38 MAPK/14-3-3 signaling. Strikingly, blocking p38 MAPK activation rescues cleft palate in Tgfbr2 mutant mice, suggesting that the activation of Tgf-beta signaling pathway is responsible for causing cleft palate in Tgfbr2 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: Janet Moradian-Oldak

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 concentration, pH and temperature. **Methods:** Recombinant porcine amelogenin (rP172) 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 5.8. Further analysis of this pH range revealed 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 increase corresponded to the assembly of the oligomers themselves. Heating and cooling experiments established that the oligomers were metastable as their formation was reversible on cooling. **Conclusion:** We created conditions under which metastable amelogenin oligomers could be formed. Unlike other intrinsically disordered proteins that undergo a folding change upon dimerization / oligomerization, amelogenin oligomerization was not concomitant with a large change in folding. DLS revealed that a critical concentration 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 (BMMSCs) 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, periodontitis, inflammatory bowel disease, and sepsis. However the detailed mechanism by which BMMSCs inhibit T cells is not fully understood. **Purpose:** Clarification of the mechanism of immunomodulatory property in BMMSC. **Methods:** To evaluate immunomodulatory functions, BMMSC were co-cultured with splenocytes in vitro and infused into lupus erytheatosus (SLE)-like MRL/lpr mice in vivo. **Results:** A new subset of telomerasehigh/CD34+ BMMSCs (tBMMSCs) that fail to adhere to plastic culture and remain in culture suspension was identified. tBMMSCs are capable of adhering to extracellular cell 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 cluster on ECM, and fail to differentiate into hematopoietic cell lineage. tBMMSCs exhibit significantly increased immunomodulatory capacities in vivo and improved treatment for SLE-like mice, which are associated with high levels of nitric oxide (NO) production regulated by telomerase activity coupling with the Wnt/beta-catenin signaling. Furthermore, we found that telomerase activator-treated BMMSCs are analogous to tBMMSCs in terms of exhibiting significantly improved immunomodulatory function. **Conclusion:** This study identifies a novel subpopulation of BMMSCs and a practical approach to recover this subset BMMSCs for clinical therapeutic use. The mechanism that telomerase/beta-catenin promoted NO production in BMMSCs suggests a potential of improving BMMSC-based clinical therapy for immune disorders.

63 Kimberly Wilkinson

Advisor: Mary Lawlor

Mothers' Perspectives On Everyday Life With Children With Autism: Mealtimes 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) often 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 and mealtime observations. Data analysis consisted of 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 Lei 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 autoimmuno diseases. **Purpose:** To determine whether MSCs infusion could rebuild bone/marrow homeostasis in ovariectomy (OVX)-induced ostoeporotic 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. Host bone marrow MSCs (BMMSCs) were cultured for stem cell characterization. Receptor Activator of NFkB ligand (RANKL) and osteoprotegerin (OPG) levels were measured by enzyme-linked immunoassay in serum. **Results:** MSCs infusion significantly increased BMD, and improved bone structures as manifested by bone volume/total volume and trabeculae thickness in OVX mice. Histological analysis revealed that MSCs infusion inhibited osteoclast activity, 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, BMMSCs in OVX-induced osteoporosis showed scarified osteogenic differentiation and increased adipogenesis differentiation; and MSCs infusion was capable of enhancing host BMMSCs' osteogenesis while reducing their adipogenesis. **Conclusion:** Our findings have revealed that MSCs infusion could restore bone/marrow homeostasis by revitalization of host BMMSCs and inhibition of osteoclast activity in OVX mice, leading to ameliorating bone density. Systemic infusion of stem cells may be a promising alternative in osteoporosis treatment.

65 Peyman Kelk

Advisor: Songtao Shi

Cellular And Molecular Response Of Human Macrophages Exposed To Aggregatibacter Actinomycetemcomitans Leukotoxin

Background: Aggregatibacter actinomycetemcomitans is associated with severe forms of periodontitis. The leukotoxin is believed to play an important role in the bacterium's pathogenicity. This toxin selectively kills human leukocytes. **Purpose:** Previous studies examining the role of the leukotoxin in host-parasite interactions have mainly focused on polymorphonuclear leukocytes. Macrophages play a significant role in the regulation of the inflammatory reactions and the tissue breakdown and remodeling. Thus, the aim of this study was to investigate death mechanisms of human macrophages exposed to leukotoxin. **Methods:** Human leukocytes isolated from venous blood were exposed to purified leukotoxin or live A. actinomycetemcomitans strains. Different leukocytes were characterized by their expression of cell surface molecules, cell membrane integrity and morphological alterations. The expression and activation of cytokines of the leukotoxin-challenged leukocytes were examined and the biological activity of the secreted cytokines was investigated in a bone resorption assay. Additionally, different intracellular signaling pathways were examined. The significance of differences was assessed with t-test, multiple comparisons with one-way ANOVA, and two-tailed t-test. The statistical analyses were performed in SPSS software. **Results:** Monocytes/macrophages were the most sensitive leukocytes for A. actinomycetemcomitans leukotoxin-induced lysis. This process involved caspase-1 activation, and in addition, leukotoxin triggered rapid and abundant activation and secretion of IL-1β from these cells. When live bacteria were used, the A. actinomycetemcomitans-induced IL-1β secretion from human macrophages was mainly caused by the leukotoxin. The secreted IL-1β was bioactive and stimulated bone resorption. In addition, this pro-inflammatory cell death was inhibited by oxidized ATP, which indicates involvement 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.

66 Ping Hu

Advisor: Michael paine

Preparation Of In Situ Probe To Investigate The Expression Profiles Of Carbonic Anhydrases 2, 3, And 6 During Amelogenesis

Background: Carbonic Anhydrase (CAs) can affect the local pH by catalyzing the reversible conversion of carbon dioxide to bicarbonate. Sixteen CA-isoforms generated from unique genes are known in mammals, and high homology exists at the protein level. By RT-PCR mRNA of all 16 CA, isoforms could be detected in mouse enamel epithelial cells; however, qPCR indicated that only carbonic anhydrases 2, 3, and 6 (Car2, Car3, Car12) were expressed at significant levels in rat-derived enamel epithelia, and that expression was low in secretory stage ameloblasts and highly up-regulated during the maturation stage of amelogenesis (unpublished data). **Purpose:** The purpose of this investigation is to confirm the expression patterns of Car2, Car3 and Car6 in enamel epithelial cells, and establish which cell population(s) of the enamel organ are responsible for their production. While there is a clear suggestion in the literature that ameloblasts are solely responsible for Car2 and Car6 expression in amelogenesis, the expression patterns of Car3 has yet to be investigated. **Methods:** By in silico analysis, nonhomologous mRNA regions of the carbonic anhydrases were identified primarily at the 5' untranslated region. Three-hundred base pair regions of carbonic anhydrase cDNAs (5' untranslated regions of Car2, Car3 and Car6) were prepared from ameloblast-like LS8 cells by RT-PCR, subcloned into an appropriated vector, sequenced, and deemed suitable for in situ studies. Labeled RNA probes corresponding to the 5-untranslated regions of Car2, Car3 and Car6 have been prepared for in situ hybridization. In situ hybridization will be performed on sagittal sections of 7-day old mouse 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. Lacruz

Advisor: Michael Paine

Enamel 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 Cftr 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 the freeze-dried enamel organ cells from each of the three zones using Qiagen RNeasy Minikit. Reverse-transcribed PCR was performed using iScript cDNA Synthesis kit (Biorad). Real time-PCR (qPCR) reactions were performed using iQTM SYBR® Green Supermix (BioRad) 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 ?PrimerBank? 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. Backscattered Electron Imaging of porcine incisors: The crowns of four lower left deciduous 3rd incisors (Di3) of newborn wild type pigs, four delta-F508 and four CFTR-null animals [Rogers et al., 2008; Stoltz et. al., 2010], were embedded in polymethylmethacrylate (PMMA) resin and cut with a diamond band saw at a point below the cusp tip to be representative cross section of the fully mature enamel. Each PMMA block was subsequently polished to a 1µm surface finish and acid etched (37% phosphoric acid) for 3 seconds. Specimens were washed, air dried, and imaged at variable pressure (50 Pa) by a Zeiss EVO-50 in BSE-SEM imaging mode at 20kV, 400 pA, and 10mm working distance without a conductive coating. The electron beam was confirmed stable after 30 minutes of operation and, when possible, BSE detection, contrast, and brightness were arbitrarily set to conditions that contained both specimens within a broad 0-255 grey dynamic range for semi-quantitative comparison. When mineralization density differences were too large to be sensibly contained within the full dynamic range, representative images were acquired for illustrative purposes. Grey-level mages were subject to an 8-bin color look-up-table for visual comparison of differences in mineralization density between samples. Two sets of comparisons were performed using color-coded images; wild type pig deciduous incisors delta-F508 animals were independently compared to CFTR-null and to CFTR- **Results:** When comparing mid-late maturation stage amelogenesis to secretory-stage amelogenesis there was significant up-regulation of AE2 mRNA (2.9 fold) and Cftr mRNA (5.6 fold). Our results confirm previous findings that AE2 and Cftr are expressed in enamel organ cells during amelogenesis and delta-F508 and are up-regulated as enamel matures. Overall, both CFTR- CFTR-null animals show hypomineralized enamel when compared to wild type animals **Conclusion:** Stringent acid/base regulation during enamel biomineralization is essential for the development of healthy enamel. To achieve this, enamel epithelial cells express many pH-regulatory genes that modulate this process, and AE2 and CFTR are two examples. Being able to identify which of these proteins responds to a changing environment during amelogenesis will help in better defining the complex acid/base transport processes involved in enamel biomineralization.

68 Roshanak Baghai-naini, Yu-Lee Kim

Advisor: Homayoun Zadeh

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 scant. **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; N=40) procedure entailed extraction, 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. **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 Sunju Choi

Advisor: Pragna Patel

Genetic Dissection Of Inherited Dental Anomalies

Background: Elucidating 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 used 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 elucidate 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 sampled DNA from phenotypically 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 amleogenesis imperfecta (AMI) to chromosome 8 in a large Brazilian family. Subsequently, another group identified a gene, FAM83H that bore mutations in patients with AMI. We examined the family we had studied for mutations in FAM83H 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 highly polymorphic DNA markers. We are optimizing next-generation sequencing and quantitative real-time PCR approaches to identify the underlying mutation.

70 Tessa Milman

Advisor: Olga Solomon

Uses Of Occupations In Families With Children Diagnosed With Autism

Background: Disparities exist in autism diagnosis and services for African American children. When compared

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 paper discusses 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. Data 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 understand patterns and relationships in 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 articulated 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 Toshiaki Yokota

Advisor: Yang Chai

The Mechanism Of Soft Palate Development

Background: Clefting 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 clefting (K14-Cre;Tgfbr2fl/fl mice). **Results:** 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

Lrap 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 splicing isoforms, Leucine-rich Amelogenin Peptide (LRAP) 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 (BMMSCs). 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 (BMMSCs) and biopotential stromal cell line ST2 were cultured and differentiation was induced in the presence and absence of LRAP. **Results:** LRAP stimulates osteogenesis and inhibits adipogenesis of BMMSCs. LRAP activates the canonical Wnt/b-catenin signaling pathway. A specific Wnt inhibitor sFRP-1 abolishes the effect of LRAP on the stimulation of 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 BMMSCs at the expense of adipogenesis through upregulating Wnt10b expression to activate Wnt signaling.

73 Xiudong Yang

Advisor: Janet Moradian-Oldak

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 amelogenesis. **Purpose:** To investigate the effect of MMP-20 activity on amelogenin self-assembly. **Methods:** Recombinant rPMMP-20 was used to digest the full-length recombinant pig amelogenin (rP172) at pH 8, 37 °C and substrate: enzyme ratio of 200:1. Proteolysis progress was monitored by SDS-PAGE . The changes in amelogenin particle size distribution and assembly behavior during proteolysis were studied by dynamic light scattering and transmission electron microscopy. **Results:** During the first ten minutes of proteolysis particles of 3.8 RH were detected in the solution, followed by the appearance of 19.7nm RH particles and large mono-dispersed assemblies of 104nm RH, after the first hour of rpMMP20 action. Following 2 hours of proteolysis when the mass quantities of rP172 and the 2-148 product were similar, the sizes of the large assemblies increased to about 123nm and continue to grow to 3328.3nm after 10 hrs, when the majority of the mass was the 2-148 product. TEM examination revealed that rP172 formed monodispersed spherical particles (~16nm diameter) on the grid at pH8.0. Aggregation of the spherical particles was initiated around 1 hour of proteolysis and formation of chains was evident during the 2nd to 4th hours, and chain-like structures curled after 20 hours. For the isolated spheres, a general decrease in diameter size was observed after proteolysis. DLS analysis of a 1:1 mixture of recombinant rP172 and rP148 revealed a significant shift in size distribution of the particles in the mixture suggesting co-assembly between the two components. **Conclusion:** We demonstrate that stepwise cleavage of amelogenin by MMP-20 alters the dynamics of amelogenin self-assembly inducing the formation of chain-like structures that result from the co-assembly between the full-length amelogenin and the main proteolytic product (2-148).

74 Yanyan 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 single or few strains from the same species. We developed a pan-genomic array based on 18 Aa strains, representing all six different serotypes of Aa. **Purpose:** To examine the genome changes 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, consisting of three published complete genomic sequences and the unfinished genomes of fifteen strains in large contigs. The 42,668 predicted genes in the 18 genomes were grouped into 3,426 homologous gene clusters. The longest gene in each cluster was selected as a representative gene and the Agilent eArray tool was used to design multiple 60-bp probes specific to each gene cluster. 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 S23A has eight genes that were not present in strain I23C, which was confirmed by PCR and sequencing. Strain SCC393 lost two genes over a period of 10 yrs 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. 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 mesenchymal stem cell based tissue regeneration. **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 also be used to regulate the immunological system to alter BMMSC-mediated tissue regeneration. The interplay between the host and donor cells was also observed. **Results:** When BMMSCs were transplanted into immunocompromised mice subcutaneously 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 BMMSC-regenerated bone tissue in immunocompromised mice via elevated levels of IFN-γ and TNF-α. Interestingly, regulatory T cells can enhance BMMSC-mediated tissue regeneration in regular mice. In order to translate above finding to potential clinical application, we showed that critical size of calvarias 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 system plays a pivotal role in BMMSC based tissue regeneration. The results provide a new approach to improve tissue regeneration.

76 Zhan Huang

Advisor: Malcolm Snead

Enamel Regeneration And Biomineralization Instructed By Bioactive Peptide Amphiphile 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 crystallites. 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 peptide amphiphiles not only stimulate ameloblast proliferation and differentiation, but also promote enamel matrix accumulation and biomineralization (J Bone Miner Res. 2008; 23:1995-2006). **Purpose:** In this study, we explored further the effect of artificial bioactive nanostructures on regulating enamel formation and biomineralization, 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 explanted to 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 (enamel pearls). The ultrastructure and the Ca and P content of natural enamel and enamel pearls were investigated by TEM and EDX element analysis. H&E staining and immunostaining were used to detect the expression of enamel matrix proteins. **Results:** Enamel pearls formed at the injection site of bRGD PA after 8-week's culture, while none formed at the scramble RGD PA or sham control group. Cells surrounding enamel pearl were elongated, polarized and organize the matrix into a pattern similar to that observed for canonical enamel, including enamel rods. PA injected-, developing tooth organs recovered showed that the matrix was converted to hydroxyapatite with similar chemical composition to authentic enamel. **Conclusion:** These experiments indicate epithelial cells from the tooth organ retain developmental plasticity and can be stimulated by a bioactive peptide amphiphile to regenerate tissue that is patterned and organized identical to the authentic enamel. Bioactive PA may be used to instruct naïve cells of the developing tooth organ to create a biomineralized enamel tissue.

77 Bei Li

Advisor: Songtao Shi

Inflammatory Niche Governs Msc'S Differentiation In Maxillofacial Giant Cell Lesion

Background: Maxillofacial giant cell lesion (MGCL), 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 tumorgenesis. **Methods:** To identify the stem cells from MGCL, 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, MGCL express high TNF- α and IL-1β. The stromal cells from MGCL 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 of stem cells of MGCL and normal jaw bone MSCs but TNF- α and IL-1β combination can decrease osteogenesis of jaw bone MSCs. The weak osteogenesis of stem cells of MGCL could be reversed by erk pathway inhibitor and erk pathway inhibitor could decrease Rank ligand expression after TNF- α and IL-1β treat of MGCL. **Conclusion:** This study identifies stem cells from MGCL and shows inflammatory niche decreases the bone forming ability of normal MSCs. The inflammatory niche also stimulates Rank ligand expression which will cause osteoclast forming. The mechanism that inhibits erk pathway can reverse this phenotype and suggests a new approach to treat maxillofacial giant cell lesions.

78 Chider Chen

Advisor: Songtao Shi

Mesenchymal Stem Cell Transplantation Restores Immune Homeostasis In Systemic Sclerosis Mice And Humans

Background: Systemic Sclerosis/Scleroderma (SS) is an autoimmune connective tissue disease characterized by fibrosis of the skin and internal organs, and the production of anti-nuclear antibodies (ANA). Despite improved immunosuppressive medication, part of SS patients continues to suffer significant morbidity due to lack of effective treatment approach. Previous clinical study showed that bone marrow mesenchymal stem cell transplantation (MSCT) can improve central nervous system (CNS) phenotype. However, whether MSCT has effect on immune system of SS patients is unclear. **Purpose:** In this study, we examine the efficacy of allogenic MSCT in immune homeostasis of SS patients and explore the mechanism by which MSCT can cure SS symptom in a mouse model. **Methods:** In vitro and in vivo stem cell analysis assays, including flow cytometry, inductive differentiation, Western blot, and implantation were used, and systemic MSCT was utilized to treat SS-like Tsk/+ mice and treatment-refractory patients. **Results:** The impairments of skin stem cells (SSCs) and BMMSCs, associated with epithelial and osteoblastic niche deficiencies, contribute to SS phenotypes in Tsk/+ mice. At the cellular level, systemic MSCT is capable to induce the skin and bone marrow niche reconstruction and effectively reverses multi-organ dysfunction via recovery of the immune homeostasis. Based on the promising outcomes in BMMSC-treated SS-like mice, four treatment-refractory SS patients were treated with allogenic MSCT as a small clinical pilot study. The 3-12 months primary data showed an amelioration of disease activity. **Conclusion:** SS is associated mesenchymal stem cell niche deficiencies of skin and bone marrow. MSCT is an effective therapeutic approach for SS via improvement of immune homeostasis and mesenchymal stem cell niches. A small pilot clinical study inferred efficacy and safety for allogenic MSCT in SS patients during short-term follow up. A long-term follow up is in progress, and may provide a new feasible treatment approach in clinical application.

79 Cunye Qu

Advisor: Songtao Shi

Disease Modeling Of Ofcd Syndrome By Ipscs

Background: OFCD (Ocular-Facial-Cardiac-Dental) syndrome, caused by mutation of BCL-6 co-repressor (BCOR), is a rare genetic disease characterized by congenital cataract, microphthalmia, craniofacial anormaly, 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 underlies 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.

80 Eduardo A. Ayala

Advisor: Steven Goodman

Target Binding Sites Of The Vicrk S. Mutans Two Component System

Background: Streptococcus mutans, the principle causative agent of dental caries, is a major acidogenic component of plaque biofilm. It is known that bacteria can alter gene expression in response to a changing environment through two-component signal transduction systems (TCS). Canonical TCS consist of a sensor protein that detects an extracellular signal and transduces the signal through the transfer of a phosphate group to a response regulator, thus activating the response regulator to bind DNA and modulate gene expression. The vicRK system is one of few essential TCS in gram positive bacteria and is involved in sucrose-dependent adhesion, biofilm formation, and competence development. **Purpose:** In this study we are identifying the target gene binding sites of the response regulator VicR in S. mutans. **Methods:** Affinity protein purification, electrophoretic mobility shift assay, and DNaseI footprinting. **Results:** The protected regions of the genes studied shared elements of the B. subtilis consensus sequence TGTWAHNNNNNTGTWAH identified by Howell et. al. **Conclusion:** Only one of the direct repeats may be necessary for regulation of target genes by VicR.

81 Farhan Durrani

Advisor: B.P. Singh

Platelet Rich Fibrin On Healing Of Implants

Background: Use of platelet rich fibrin as guided tissue regeneration on implants: A histological study. **Purpose:** Time frame of health as compared to commercial membranes. **Methods:** Split mouth design in several patients comparing one side with PRF and the other side with commercial membranes available for GTR. **Results:** More vital bone formation and excellent soft tissue healing as comparted to control with reduced time frame. **Conclusion:** Platelet rich fibrin can be used at GTR is in fact better than commercially available membranes.

82 Ikiru Atsuta

Advisor: Songtao Shi

Inhibitory Effects Of Mesenchymal Stem Cells For Myeloma Cells

Background: Cellular therapies represent a new frontier in the treatment of many diseases. Especially, mesenchymal stem cells (MSCs), which can be harvested from bone marrow, adipose tissue, and umbilical cord blood, along with various other sources. MSCs possess several qualities that may be used to treat many kinds of cancer; however, the mechanism of MSC treatment for cancer remains to be elucidated. **Purpose:** The effects of MSCs on the multiple myeloma (MM) cell lines apoptosis were studied in vivo and in vitro. **Methods:** We investigated as the following to show the treatment effect of isolated MSCs from mouse bone marrow for MM cells. In vivo, using the MM mouse model, we evaluated the change of mouse survival and MM indenization with MSCs administration. In vitro, we checked the proliferation and apoptosis rate of MM cells in co-culture with MSCs. **Results:** In vivo, the treatment of MM with MSCs showed the remarkable inhibitory effect on MM indenization by histological data and the extension of mouse survival by statistical. On the other side, in vitro, the decrease of proliferation and the increase of apoptosis in the MM cells were showed clearly in the co-culture with MSCs. Furthermore, the preliminary evaluation of the mechanism for these effects revealed that the binding between Fas and Fas Ligand significantly induced apoptosis of MM cells, as evidenced by increases in the expression of apoptosis marker and Fas in MM cells. **Conclusion:** The results of these studies strongly suggest that MSC could induce the myeloma cells apoptosis directly via Fas pathway and might be considered in the treatment of multiple myeloma in the future.

83 Jamie Hsiung

Advisor: Yang Chai

The Role Of Integrin Alpha 8 In Medial Edge Epithelial Cells During Palate Formation

Background: Cleft palate, a malformation of palate development, is one of the most common human congenital birth defects, affecting approximately 1/500 to 1/1000 live births worldwide. During the final stage of palatogenesis, in which the opposing palatal shelves become fully fused, the medial edge epithelial cells (MEE) cells must first fully disintegrate. Several proposals have been made as to how these MEE cells disappear, including programmed cell death (PCD), epithelium to mesenchyme transformation (EMT), and migration to the oral and nasal epithelia. Our lab focuses on how TGF-β signaling causes the MEE cells to disappear. Specifically, the K14-Cre;Tgfbr2F/F mouse model, in which the TGF-β receptor II is conditionally inactivated in the epithelia, allowing us to further study the signaling pathways that are activated or inactivated, which then leads to the persistence of MEE cells in this conditional knockout. Microarray analysis of the K14-Cre;Tgfbr2F/F MEE at E14.5 revealed, among other genes, a statistically significant downregulation of Integrin alpha 8 relative to the littermate wild-type control. Integrin alpha 8 is a member of the Integrin family which has important roles in regulating cell proliferation, cell migration, and differentiation. Although integrin alpha 8 has been not been shown to activate TGF-β signaling, it is known to bind to the RGD site of (latent) LAP-TGF-β and activate focal adhesion kinase and ERK in pituitary adenoma cell lines. **Purpose:** We therefore hypothesize that integrin alpha 8 has an important role in regulating MEE cell disappearance by binding to latent TGF-β and activating the non-receptor

dependent signaling pathway. **Methods:** First, it must be established that loss of integrin alpha 8 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 alpha 8 (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 conclude that integin alpha 8 plays a role in MEE disappearance during palatogenesis. Next, I want to test how reliant MEE disappearance is on the integrin alpha 8 signaling pathway. To test this, I would like to see whether over-expression of integrin alpha 8 can rescue MEE persistence in the palate from K14-Cre;Tgfbr2fl/fl mice. Finally, I want to verify that latent TGF-β is able to activate a TGF-β receptor-independent signaling pathway through integrin alpha 8 in MEE cells, since it has already been shown to activate FAK and ERK signaling in pituitary adenoma cell lines.

84 Jamie Waite

Advisor: Yang Chai

Tgf-B Regulates Basal Transcriptional Machinery To Control Cell Proliferation And Differentiation In Osteoprogenitor Cells

Background: Transforming growth factor beta (Tgf-β) signaling is crucial for regulating craniofacial development. Loss of Tgf-β signaling in cranial neural crest cells (CNCC) results in craniofacial deformities including a defect in bone. **Purpose:** In this study, we investigate the mechanism by which Tgf-β signaling regulates bone formation in CNCC-derived osteogenic cells. **Methods:** We performed histological and biological analyses to identify the downstream targets of TGF-β signaling during intramembranous ossification. **Results:** Basal transcription factor Taf4b is specifically down-regulated in the CNCC-derived intramembranous bone in Tgfbr2fl/fl;Wnt1-Cre mice. Tgf-β specifically induces Taf4b expression in the ex vivo maxilla organ culture and the in vitro cell culture of primary mouse embryonic maxillary mesenchymal (MEMM) cells. Promoter analysis of Taf4b indicates that Taf4b expression is regulated by Tgf-β signaling. siRNA knockdown of Taf4b results in decreased cell proliferation and altered osteogenic differentiation in primary MEMM cells, as seen in Tgfbr2 mutant cells. In addition, we show that Taf1 is decreased at the osteogenic initiation stage in the maxilla of Tgfbr2 mutant mice. Furthermore, siRNA knockdown of Taf4b and Taf1 together in primary MEMM cells results in upregulated osteogenic initiator Runx2 expression, with decreased cell proliferation and altered osteogenic differentiation. **Conclusion:** Our results indicate a critical function of Tgf-β mediated basal transcriptional factors in regulating osteogenic cell proliferation and differentiation in CNCC-derived osteoprogenitor cells during intramembranous bone formation.

85 Marcelo Freire

Advisor: Homayoun Zadeh

Biofilm Mediated Osteolytic Infection

Background: Biofilm-induced inflammatory osteolytic oral infections such as periodontitis and peri-implantitis have complex etiology and pathogenesis. The lack of appropriate animal models, where the inflammatory response to pathogenic biofilms can be investigated has been an obstacle to research. **Purpose:** The aim of this study was to develop a novel animal model to study the host response of rats to A. actinomycetemcomitans biofilm colonizing titanium implants. **Methods:** Implant surfaces microtextured by grit-blasting and acid-etching were inoculated in vitro with A. actinomycetemcomitans D7S-1, a well-characterized clinical strain, establishing a biofilm for 1-3 days. Implants with and without established biofilm were transmucosally inserted into rat hard palate or alveolar ridge up to 6 weeks. Implant surfaces as well as biofilm formation patterns in vitro were analyzed by SEM. Confocal laser scanning microscopy (CLSM) was used to investigate cell viability. Peri-implant tissues of animals were evaluated clinically and bone levels were evaluated by Micro-CT scan 3 and 6 weeks stage after implant placement. **Results:** A. actinomycetemcomitans biofilm was successfully established on titanium implants in vitro with viable bacterial cells, detected by (CLSM). An inflammatory response characterized by clinical inflammation, bleeding, ulceration, hyperplasia, and necrosis was observed around biofilm-inoculated implants. A. actinomycetemcomitans was detected by PCR and culture analysis on 100% of biofilm-inoculated implants for up to 3 weeks and 25% for up to 6 weeks. Micro-CT analysis demonstrated significantly lower bone volume ($P<0.05$) around biofilm-inoculated (29.6% ± 7.6%) compared with non-inoculated implants (50.5% ± 9.6%) after 6 weeks. **Conclusion:** These results describe a novel animal model where A. actinomycetemcomitans biofilm was established in vitro on titanium implants prior to installation in rat oral cavity, leading to an inflammatory response, osteolysis, and tissue destruction. This model may have potential utility for investigation of the host responses to biofilm pathogens and anti-biofilm treatment modalities. .

86 Sang Hyun Jee

Advisor: Casey Chen

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 may enhance the fitness of the bacteria. A. actinomycetemcomitans is a Gram-negative periodontal pathogen. The basis for strain-to-strain variations of virulence in 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. A systematic approach is required to detect functionally important strain-specific genes of A. actinomycetemcomitans for further studies. **Purpose:** It is postulated that some strain-specific genes may enhance the growth of A. actinomycetemcomitans. **Methods:** Gene deletion mutants of strain-specific genes and other genes were constructed for A. actinomycetemcomitans strain D7S-1 and tested for their growth rates in liquid media. **Results:** Mutants with a deletion of a ~5 Kb genomic island (designated as "285-island") exhibited higher growth rates than the wild-type D7S-1 or mutants with deletion of other gene(s). 285-island deletion mutants restored with a copy of the 285-island exhibited growth rates similar to that of strain D7S-1. This is the first study that demonstrates a function of any strain-specific genomic island of A. actinomycetemcomitans. **Conclusion:** The growth rate of A. actinomycetemcomitans D7S-1 was modulated by a functional strain-specific 285-island. The results demonstrate the feasibility of our approach to screen for functioning strain-specific genes of A. actinomycetemcomitans. Future studies will screen a larger set of strain-specific genes of A. actinomycetemcomitans in a variety of growth conditions. Subsequently, selected wildtype and strain-specific gene deletion mutants will be tested for their virulence in an animal model of periodontitis in rats.

87 Wenru Su

Advisor: Anh Le

Human Gingiva-Derived Mscs Attenuate Mast Cell-Mediated Allergies Via Pge2-Dependent Mechanisms

Background: Human gingival-derived mesenchymal stem cells (GMSCs) exhibit potent immunomodulatory/anti-inflammatory functions. To date, little is known about interactions between MSCs and mast cells (MCs), and whether MSCs are efficacious in treating MC-driven allergic diseases. **Purpose:** This study aims to investigate effects of GMSC treatment on MC functions and MC-mediated allergic disorders in mice and the underlying mechanisms. **Methods:** MCs were cultured alone (2×105/well) or co-cultured with increasing density of GMSCs in both direct cell-cell contact and transwell systems for 72 h, followed by stimulation with PMA. The secretory and intracellular cytokines were determined using ELISA and flow cytometry. For in vivo study, the murine model of contact hypersensitivity (CHS) was induced by topical application of 1% oxazolone to the right ear. Seven days after sensitization, the ear was challenged with 1% oxazolone. Mice were intravenously injected with GMSCs (2.0 x 106/mice) pre-labeled with CM-DiI one day before or on the same day of challenge. Clinical index was evaluated by ear thickness and histology. **Results:** GMSCs inhibited MC activation by suppressing inflammatory cytokine expression. The inhibition of MC activation by GMSCs was robustly attenuated when GMSCs were pretreated with indomethacin, a specific inhibitor of COX2. Meanwhile, treatment of GMSCs with exogenous TNF-α increased COX2/PGE2 expression, while addition of TNF-α neutralizing antibody significantly attenuated the upregulation of COX-2/PGE2 in co-cultured GMSCs and MCs stimulated by PMA. In vivo study further confirmed that GMSC treatment dramatically ameliorated CHS, accompanied by a decrease in the number and degranulation of MCs and decreased production of inflammatory cytokines. These therapeutic effects of GMSCs on CHS were abrogated by indomethacin treatment. **Conclusion:** Findings suggest that GMSCs are capable of attenuating mast cell-mediated contact hypersensitivity via PGE2 dependent mechanisms.

88 Yu-Ting Alice Yang

Advisor: Casey Chen

Expressing A Virulence Determinant Of A. Actinomycetemcomitans In Nonpathogenic A. Aphrophilus

Background: 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. Catalase plays an important role in bacterial resistance to oxidative stress. The acquisition of kat may have been a key step in the evolution of the pathogenic A. actinomycetemcomitans. **Purpose:** The A. actinomycetemcomitans-specific kat could be transferred to A. aphrophilus and confer an advantage in the resistance to oxidative stress. **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 NJ8700 (transformation frequency 2.73x10-6) 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 D7S-1 kat-complemented deletion mutant were 25%, <0.01% and 20%, respectively. The survival rates for A. aphrophilus NJ8700 and kat-expressing mutant of NJ8700 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 NJ8700 expressing all three virulence determinants specific to A. actinomycetemcomitans (catalase, leukotoxin and cytolethal distending toxins), and test its virulence in animal model.

89 Michelle L Elliot

Advisor: Mary Lawlor

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 practice within the treatment context 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; Talking 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.

90 Jeanine Blanchard

Advisor: Florence Clark

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® (LRD) 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 health 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.

91 Julie Werner

Advisor: Sharon Cermak

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 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 measure and either SIPT® measure. **Conclusion:** 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. Future work should include actual assessment of motor skills using measures such as the BOT-2® and other self-report measures to ascertain whether the SIPT praxis measures correlate with self-perceived motor coordination or DCD diagnostic criteria.

92 Julie Werner

Advisor: Lisa Aziz-Zadeh

Neural Correlates Of Imitation In Dcd: The Mirror Neuron Hypothesis

Background: Recent findings related to the human mirror neuron system, a fronto-parietal network that is active both during action observation and action execution, have led researchers to posit that this network may be involved in imitation. Clinical tests and research investigations suggest that impaired imitation of actions, postures, and gestures is a key characteristic of DCD. **Purpose:** We intend to determine if mirror neuron system dysfunction is a justifiable hypothesis underlying differential imitation ability in DCD. **Methods:** We conducted a comprehensive literature review of evidence pertaining to mirror neuron system functioning during action imitation and imitation learning from visual observation. Fifty-six studies investigating mirror neuron region activation and imitation using neuroimaging and neuropsychological methods were critically appraised for their usefulness in understanding imitation in the context of DCD. In addition, we reviewed research findings of the only 3 fMRI studies known to us providing evidence of the neural correlates of DCD to determine if these brain regions overlap with areas of the mirror neuron system. **Results:** Our findings reveal that mirror neuron regions are intricately involved in imitation and that task differences and inter-individual differences correlate with activation levels in this network. Far fewer neuroimaging studies have been conducted in populations with DCD and none of these specifically examined mirror neuron regions of interest or utilized imitation tasks. However, the whole brain analyses in these studies report different activation patterns in key mirror neuron regions (the inferior frontal gyrus and inferior parietal lobule) when compared to control participants. **Conclusion:** Further 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.

93 Leah Stein

Advisor: Sharon Cermak

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 oral care. **Methods:** Data were based on 398 parental 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:** Parents of children with ASD reported their child to be oversensitive to sensory stimuli across all sensory modalities, experience 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 cleanings and an increase in uncooperative behaviors in the dental office, as compared to parents of typical-responders. **Conclusion:** Children with ASD, compared to typically-developing children, exhibit a greater prevalence and 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.

94 Sook-Lei Liew

Advisor: Lisa Aziz-Zadeh

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), then 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 classic 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 no insula. 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 experience 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 Stefanie Bodison

Advisor: Erna Blanche

Exploring The Impact Of Proprioception On The Lives Of Children

Background: Children with developmental disabilities often exhibit problems processing proprioceptive information. These difficulties may affect the child's level of arousal, attention, and motor performance. Within the pediatric clinical community, there are very few clinical tools to assess the proprioceptive system and its impact on function. This makes it difficult for clinicians to quickly and accurately assess the child's proprioceptive functioning in the moment and determine the most appropriate level of intervention needed. A newly developed tool, the Clinical Observations of Proprioception (COP), offers clinicians a quick and easy way to clinically assess the proprioceptive functioning of children during functional activities. **Purpose:** The purpose of this research was to explore the ease of use of the Clinical Observations of Proprioception (COP) and compare the findings gathered through this tool to previously established standardized measures of proprioception. **Methods:** A chart review of client data on 24 cases was reviewed and analyzed. Data compiled included performance on standardized measures of proprioception and clinical observations analyzed via video analysis. **Results:** Based on statistical analysis of the data from the 24 cases reviewed, several items on the Clinical Observations of Proprioception significantly correlated with the currently available standardized tools. **Conclusion:** The results of this study suggest that the Clinical Observations of Proprioception provides clinicians with a quick and accurate way to clinically assess the proprioceptive functioning of children and its potential impact on functional performance.

DDS Student Basic Science

96 Alexander Nguyen

Advisor: Matt Lee

P52Shc 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:** Mv1Lu 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 an unidentified nuclear signaling function that is distinct from its well-characterized role in the cytoplasm.

97 Andrew Nguyen

Advisor: Anh Le

Mitigation Of Chemotherapy-Induced Oral Mucositis By Spheroid Gmscs

Background: Oral mucositis is a debilitating adverse effect of cancer therapies 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 patient survival, quality of life, and the overall health care cost. Relatively little is known of the pathophysiology of mucositis and current therapeutic interventions are ineffective. **Purpose:** In this study, 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 to allow 3D-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 spheroid 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 (MPM) technology. **Results:** Spheroid GMSCs showed increased expression of CXCR4 and exhibited homogeneous and smaller size morphology as compared to their adherent monolayer counterparts. Systemic infusion of spheroid GMSCs showed significantly increased homing capability to the injured epithelial sites of mucositic lesions as determined by ex-vivo MPM imaging and fluorescence microscopy. The apparently higher recruitment of spheroid GMSCs relative to adherent GMSCs also correlates with a significantly increased epithelial regenerative potential and consequently a full recovery of mucosal disruption induced by chemotherapy demonstrated by OCT and histological studies. **Conclusion:** Findings suggest that spheroid 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 anomalies presented in the inherited disease known 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 differentiation conditions. RNA was collected from these cells after 7 days and after 28 in culture. RNA was converted to cDNA and used for DNA microarray comparison between the treated and control cells. RT² Profiler™ PCR Arrays (SuperArrays, Bioscience Corp) were used. **Results:** After 7 days in culture, cells lacking Dlx3 showed a general decreased 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 Jaskoll

Cox-2 And Salivary Gland Tumor Formation

Background: Mucoepidermoid carcinoma (MEC) is the most common primary malignancy of the salivary gland (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 for tumorogenesis. **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 diclofenec 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, oncocytic-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 tumorogenesis.

100 Leia Yen

Advisor: Stephen Yen

Conebeam Ct Comparison Between Autogenous Bone And Bmp2/Dbm 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. To test this hypothesis, the Kodak conebeam CT was used to image the graft site. My part of the project was to convert the DICOM files for use with SCANCO bone histomorphometry software normally used to analyze microCT images. **Methods:** Thirty patients with cleft lip and palate

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 SCANCO 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. **Results:** 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.

101 Megan Laughlin

Advisor: Margarita Zeichner-David

Effect Of The Transcription Factor Nfic On Growth Factor Gene Expression In Odontoblast-Like Cells Maintained In Vitro

Background: The transcription factor NFI-C has been shown to be essential for root development. Knockout mice for Nfic do not form roots and end up losing their teeth. Previous histological studies have shown morphological abnormalities in the dental papilla mesenchyme-derived odontoblast cells in these mice, as well as the formation of a sparse and irregular dentin layer. We produced a DPM cell-line lacking Nfic (silenced using small hairpin RNA). This cell line can now be used to determine down-stream genes affected by Nfic during dentinogenesis. **Purpose:** In this study, this cell line was used to determine possible growth factors affected by Nfic using DNA microarray technology by comparing DPM cells maintained in vitro where Nfi-C has been silenced with shRNA and DPM cells where Nfic is expressed normally. **Methods:** Immortalized DPM cells were stably transfected with Nfic-shRNA. The presence of Nfic in these cells was reduced by 94%. Cells were grown in culture; RNA was extracted, converted to cDNA and used for DNA microarray comparison between the treated and control cells. RT² Profiler™ PCR Arrays for growth factors were used. **Results:** Our data shows that there were statistically significant changes in more than 35 different growth factors when DPM cells depleted of Nfic were compared to the control DPM cells grown under the same conditions. The most significant changes were an increase in several members of the Fibroblast Growth Factors, particularly fgf5, in DPM cells lacking Nfic. There was also considerable reduction in the amount of Colony stimulation factor 1 in the cells. **Conclusion:** These results show that the phenotype of DPM cells is altered when Nfic is absent and suggest that expression of some of these growth factors will have a significant effect on the function of these cells.

102 Sean Gardner

Advisor: Margarita Ziechner-David

Hertwig'S Epithelial Root Sheath Proteins And Pdl Cell Differentiation

Background: A major problem in periodontal disease is the regeneration of periodontal tissues such as cementum, periodontal ligament and alveolar bone. To achieve complete regeneration it is necessary to recapitulate the process of embryogenesis involved in the formation of the attachment apparatus. Since the Hertwig's epithelial root sheath (HERS) is responsible to initiate the process of periodontium formation, we propose that HERS proteins secreted by these cells can induce periodontal ligament cells to differentiate into different cell types and regenerate the periodontium. **Purpose:** In this study we tested if and which type of proteins secreted by these cells have the ability to induce changes in periodontal ligament cells (PDL) maintained in vitro. **Methods:** Immortomouse-derived HERS cells were grown on differentiation conditions, the media was collected (HERS-CM), passed through a Heparin column and proteins eluted (NB) or retained in the column (B) were collected. PDL cells were grown up to 28 days under differentiating conditions in the presence of HERS-CM (NB or B) or without any addition (control). The effect of the HERS-CM on the phenotype of these cells was determined using RT-PCR DNA Microarrays. **Results:** Our results indicate that there were major changes in the phenotype of cells grown alone (control) or in the presence of HERS-CM NB or B. Amongst the most significant changes were the reduced expression of collagen type I and III and the increased expression of BMP2 and its receptor in these cells. **Conclusion:** Our studies suggest that HERS cells (or their products) have an effect on the differentiation of periodontium-associated cells during root development and perhaps a possible therapeutical value to regenerate a diseased or damaged periodontium. This study was supported by NIH/NIDCR grant DE12346

103 Jenna Park

Advisor: Sarah L. Gaffen

Molecular Mapping Of Interleukin-17 Receptor Cytoplasmic Tail

Background: Chronic diseases, such as periodontal disease (PD) and rheumatoid arthritis (RA), are characterized by a robust immune response resulting in unresolved inflammation. IL-17, the hallmark cytokine of the Th17 population mediates immunity to extracellular pathogens and promotes autoimmune immunopathology. The signaling mechanisms triggered by the IL-17 receptor (IL-17RA) and related receptors are strikingly different from other cytokine subclasses. Namely, IL-17Rs contain a conserved SEF/IL-17R (SEFIR) and TILL(TIR-like loop) subdomains that engage Act1, leading to activation of the NF-kB, C/EBP, and MAPK pathways. **Purpose:** Aims of this project were to delineate the SEFIR containing IL-17RA signaling domain and test its characteristic function. **Methods:** In order to delineate the C-terminal boundary of the SEFIR-containing domain, a series of IL-17RA cytoplasmic deletions were created and expressed stably in IL-17RA-/- mouse tail fibroblast cells. Short after assessment of their receptor expressions through flow cytometry, cells were treated with cytokines(IL-17RA and TNF alpha or LTalpha3). IL-6 secretion was evaluation by ELISA, Act1 and TRAF6 by co-immunoprecipitation using transiently transfected HEK293T cells, other transcription factors by Real-Time RT-PCR. **Results:** 1. Each IL-17RA cytoplasmic deletion expressed their extracellular portion stably on cell surfaces, 2. IL-17RA deletion at amino acid 645 signaled weakly compared with longer deletions. 3. The signaling motif is functionally distinct from other IL-17R family members. 4. Activation of TRAF6 but not Act1 requires the domain 5. Like IL-17A synergizes with TNF-alpha, it synergizes with Lymphotoxin alpha3(LT, or TNF-beta) and this requires the signaling domain. **Conclusion:** 1. Indicating no obvious impairments in protein folding or transport caused by deletions 2. The truncation at aa645 of IL-17RA may lie close to the C-terminus functional subdomain and therefore renders the receptor less stable. 3. 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 SEFIR/TILL domain. 4. Recruitment of Act1 alone cannot lead to ubiquitination of TRAF6 which is a necessary step for NF-kB activation 5. Lymphotoxin(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.

DDS Student Clinical Science

104 Anthony Nguyen

Advisor: Parish Sedghizadeh

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 by 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 (CT) scan. The image data was uploaded onto OnDemand3D where it can be visualized. The application first introduces a 3D volume view 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 view the morphology and intracanal topography, and measure the entire length of the canal within each tooth (n=11, mean=20.10mm±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 a highly extensive virtual method 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 plasma treatment, allowing for quantitative analysis post-treatment.

105 Arash Bakhaj

Advisor: Homayoun Zadeh

Hitological Evaluation Of Extraction Sockets Grafted With Bovine Anoraganic 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 manner to reduce trauma to alveolar bone.Extraction sockets were thoroughly debrided and large particle size cancellous bovine anorganic bone was loosely placed in sockets without deliberate condensation.A polytetraflouroethylene (PTFE) membrane was used to cover extraction socket.Membrane was removed 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). Specimen were processed for histology and stained with H&E and trichrome.Photomicrographs of histological slides were analyzed by histomorphometry using NIH/Scion imageJ software.Standard ASBMR methods and nomenclature were utilized in determination of osteoid bone fill within bone specimens. **Results:** Histologic evaluation revealed presence of new bone in direct

apposition to residual graft particles, demonstration active osteogenesis.Histomrphometric analysis is currently under way. Data on percentage of bone fill, residual graft and connective tissue will be presented on research day. **Conclusion:** Histologic response of extraction sockets grafted with bovine anorganic bone appears to demonstrate efficacy in bone regeneration.

106 Charles Odion

Advisor: Gardner Beale

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 Gnobe tribe in the jungles near Changuinola, Panama. The study compares 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. Of the patients with no decay or restorations and had seen a dentist: 25% urban, 15.3% rural, and 0% third-world. Of those seeing a dentist in the last year that had no decay or restorations: 48.3% urban, 31.7% rural, and 0% 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. McAninch, 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 seen by dentists and all went undiagnosed with 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. As 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 Mizukawa

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 bovine anorganic bone was placed in sockets without condensation. Polytetrafluoroethylene (PTFE) 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 drill needed to place the implants. 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 xenograft within bone core samples obtained from healing grafted extraction sockets. Data on percentage of connective tissue, bone and residual graft is currently being measured and will be presented on research day. **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: Tae Kim

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 to our clinic with a recently 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 diagnostic cast opposing a needle point tracing clutch fixed to the lower mandibular immediate denture. Centric relation was recorded by having the patient move in a protrusive and laterotrusive movement and a clinical remount was performed and occlusion adjusted. **Results:** Centric relation was recorded using Take-1 Bite Registration material (Kerr, USA). Reproducibility of centric relation was compared and checked by chin-point guidance technique. Occlusion was then adjusted after a clinical remount was performed at the centric relation provided by the modified Intra-Oral tracer. Pt left in no discomfort. **Conclusion:** Intra-oral tracers can be used in situations where one of the arches remain dentulous and the use of chin-point guidance has been unable to reproduce centric relation reliably.

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 response to dynamic loading. The Periometer 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 restoration (CAD/CAM composite resin and zirconia abutments combined with composite resin and ceramic onlays and crowns) would respond more biomimetically to physiologically-relevant dynamic loading. **Methods:** One hundred-and-twenty morse taper implants (Titamax CM 11 mm) were mounted on bone-simulating acrylic resin base and restored with CAD/CAM zirconia (60) and composite resin Paradigm MZ100 (60) abutments. Using a CEREC3 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 (Filtek Z100). Fifteen extracted human upper pre-molars were mounted with a simulated PDL (RubberSep) and used as control group. After restoration assembly, the probe tip was positioned perpendicularly to the buccal surface of each restoration. Three measurements were collected for each specimen. The averaged LC of each group (n=15) was compared using 2 way-ANOVA. **Results:** Differences in LC between the abutment material (zirconia/Paradigm MZ100) and the restoration material (Paradigm C/ Paradigm MZ100) were recorded but not between the restoration design (onlay/crown). The average LC of zirconia and composite resin abutments ranged from 0.040 to 0.053 and 0.059 to 0.068 respectively. Zirconia abutments restored with composite resin onlays (0.051) had the closest loss coefficient value when compared with the tooth samples (0.049). **Conclusion:** Composite resin onlays bonded to zirconia implant 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 Holtzman

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 real time cross-sectional, high-resolution sub-surface tissue images, 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 restorations. **Purpose:** To compare Optical Coherence Tomography with current clinical standards (clinical exam and radiography) to detect early caries including lesions 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 pulpal and axial walls, restored with composite material, imaged again and radiographed, and then sectioned. Blinded examiners reviewed radiographic 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, or combined 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 findings support the potential of Optical Coherence Tomography for early caries detection including lesions under dental restorations, such as recurrent caries.

112 Shiraz Haider, David McAninch, Justin Olsen

Advisor: Fariborz Farnad

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 patients (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 3% as well as 5 minutes after extraction. Subjects were limited to those who presented for 1 or 2 teeth to be extracted. Patients were contacted after 4 hours and asked about bleeding status. A finding was considered positive if a patient reported continued bleeding 4 hours after surgery. Patients with known coagulopathies or congenital bleeding disorders were excluded from the study. **Results:** In Progress **Conclusion:** TBD

113 Maral Khazali

Advisor: Fariborz Amini

Metal Release In Fixed Orthodontic Appliances

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 allergic, 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:** 60 saliva samples were collected from two groups of patients aged 12 to 25 years. The first group consisted of 30 patients with fixed orthodontic appliances in both arches for duration of one to two years. The second, control group, consisted of 30 patients without orthodontic appliances, no amalgam filling, and no metal restorations in their mouth. The chemical analyses were done with an electrothermal atomic absorption spectrophotometry (Varian AA220, GTA-95). The Mann-Whitney U-test statistics is used to analyze the differences between these two groups. **Results:** Nickel and Cobalt concentrations were respectively 4.8ppb and 0.2ppb higher in the patient group than in the control group. **Conclusion:** 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.

114 Mohammad Khosousi

Advisor: El-Ghareeb

Nasal Floor Augmentation For The Reconstruction Of The Atrophic Maxilla: A Case Series

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 3.7-24.5 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.

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Awarded to outstanding posters within each category

- Ostrow School of Dentistry Faculty
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- Biokinesiology and Physical Therapy Student - Exercise Musculoskeletal Biomechanics
- Biokinesiology and Physical Therapy Student- Neural Control and Motor Behavior
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- Graduate Pre-doctoral Candidate
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Fri - Sun, Mar 11 - 13

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Interdisciplinary Dentistry to Promote Success in Clinical Practice
Fri, Mar 18

Esthetic Full-Mouth Implant Reconstruction: From Treatment Planning to Fixed Restoration
Module I: Fri, Mar 18
Module II: Sat, Mar 19
Module III: Sun, Mar 20

Mastering Bone Grafting for Esthetic Implant Site Development - Lecture & Hands-on Workshop
Module I: Fri, Mar 25
Module II: Sat, Mar 26

Obstructive Sleep Apnea, Snoring and Dental Advancement
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Fri - Sun, Apr 1 - 3

Esthetic Periodontal Surgery for the General Practitioner: A Hands-On Course
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New Approaches For Antimicrobial Treatment of Periodontal Disease (Las Vegas)
Sat, Apr 9

Fundamentals of Restorative Implant Dentistry for the General Dentist
Part I: Fri, Apr 15
Part II: Sat, Apr 16

Digital Clinical Photography: All You Need to Know!
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Part II: Sat, Apr 16

Common Oral Lesions: Soft & Hard Tissue Diseases
Fri, May 6

Physical Evaluation
Mon, May 16

Emergency Medicine
Tue, May 17

Monitoring & Clinical Emergency Medicine
Wed, May 18

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Module IB: Sat, May 21

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Implant Therapy In Compromised Sites
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Clinical Intravenous Sedation
Part I: Thu - Sun, Jul 7 - 10
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Avoiding And Managing Complications Associated with Implant Therapy: Lecture & Impact Panel
Sat, Jul 16

Esthetic Full-Mouth Implant Reconstruction: Advanced Prosthodontic Techniques for Challenging Patients
Module I: Fri, Jul 22
Module II: Sat, Jul 23
Module III: Sun, Jul 24

Contemporary Applications of Porcelain Veneers: A New Paradigm for the 21st Century
Part I: Fri, Jul 29
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37th Annual Review of Continuing Education in Dentistry (Maui, Hawaii)
Mon - Thu, Aug 1 - 4

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Fri, Aug 26

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Module II: Sun Aug 28

Fundamentals of Implant Surgery and Restoration
Part I: Fri - Sun, Sep 9 - 11
Part II: Sat - Sun, Oct 1 - 2
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