SCIENCE DAY 2023

Sections of Prosthodontics, Special Patient Care (SPC), and Maxillofacial Prosthetics (MFP), and Weintraub Center for Reconstructive Biotechnology

9:00-9:20 **Annual overview of research in the sections**
Dr. Takahiro Ogawa
Professor, Section of Prosthodontics and Weintraub Center

9:20-10:05 ***Keynote lecture 1***
Microbe Meets Implant
Dr. Renate Lux
Professor, Section of Biosystems and Function

10:15-10:45 ***Faculty presentation***
Dental and orofacial mesenchymal stem cells-mediated craniofacial tissue engineering: The prosthodontist's view point
Dr. Alireza Moshaverinia
Associate Professor, Section of Prosthodontics and Weintraub Center

10:45-11:30 **Oral Presentation 1**
Andre Cataluna, Resident (Prosthodontics)
Kimberly Choi, Resident (Prosthodontics)
Stella Christina Stavrou, Resident (Maxillofacial Prosthetics)

11:30-1:00 Lunch and Poster View

1:00-1:50 ***Keynote lecture 2***
A Peptide-based biomimetic strategy for tooth repair
Dr. Janet Oldak
Professor, USC Center for Craniofacial Molecular Biology

2:00-3:15 **Oral Presentation 2**
Mary Lou Juanatas, Resident (Maxillofacial Prosthetics)
Po-Chun Chen, PhD student (Dr Jewett Lab)
Minjee Kang, Postdoctoral Researcher (Dr Lee Lab)
Weihao Yuan, Postdoctoral Researcher (Dr Moshaverinia Lab)
Keiji Komatsu, Postdoctoral Researcher (Dr Ogawa Lab)

3:30-5:00 **Poster Presentation and Competition**
19 presenters in 3 categories: Basic/translational, Material, and Clinical Sciences

5:00-5:15 **Award Ceremony**

5:15 **Reception**

Keynote lecture #1

Microbe Meets Implant

Dr. Renate Lux
Professor, Section of Biosystems and Function

Implants are an important part of prosthodontic restorations that in addition to providing single tooth replacements are used to support bridges or dentures. Peri-implant disease triggered by microbial colonization of the implant is the major cause for implant failure. An increasing body of research is focused on understanding the underlying processes and the development of implant materials and surface modification that can reduce or prevent microbial attachment, while at the same time allowing successful osseointegration.

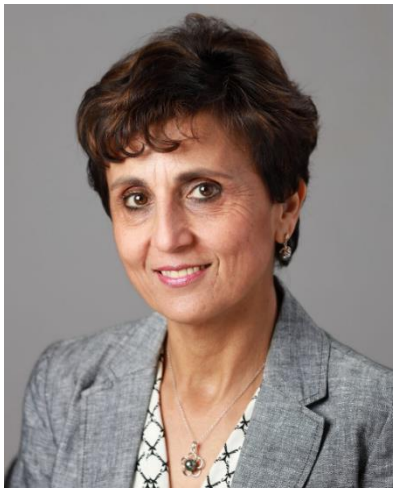
Dr. Renate Lux is a Professor at the UCLA School of Dentistry in the Section of Biosystems and Function. She received her PhD in microbial genetics from the University of Osnabrueck, Germany, in 1995. After completing her PhD, Dr. Lux joined the Albert Einstein College of Medicine in New York for a postdoctoral fellowship until joining the UCLA School of Dentistry at the end of 1999. Dr. Lux research interest is focused on the investigation of microbial biofilms on a molecular level and their role in oral health and disease. Her research includes the microbial colonization of artificial surfaces such as implants or denture materials that are introduced in the oral cavity as part of dental treatments.

Keynote lecture #2

A Peptide-based biomimetic strategy for tooth repair

Dr. Janet Oldak
Professor, USC Center for Craniofacial Molecular Biology

Through the biomineralization processes nature provides us with many examples of biominerals, including calcium phosphate crystals in bone and teeth, and calcium carbonate crystals in nacre and sea urchin. A very fundamental part of biomineralization is the complex extracellular macromolecular framework in which mineralization occurs, such as the collagen fibrils in bone and dentin, and extracellular matrix proteins in dental enamel. Unlike other mineralized tissues, such as bone and dentin, mature enamel is acellular and cannot regenerate itself after substantial mineral loss, which often occurs as dental caries or erosion. Biomimetic enamel reconstruction is a significant topic in material science and dentistry as a novel approach for the treatment of dental caries. In this presentation, I will present our recent studies for the development of a protocol for superficial enamel reconstruction and dentin remineralization, based on a novel amelogenin-peptide-chitosan (CS) hydrogel. Amelogenin is a critical protein for controlling the organized growth of apatite crystals in enamel. The rationally designed amelogenin-derived peptides P26 and P32 promoted apatite nucleation, mineralized collagen, and showed potential in enamel regrowth and dentin remineralization. The biomimetic in situ regrowth of organized apatite crystals on etched enamel surface generated a robust enamel–restoration interface, which is important for ensuring the efficacy and durability of restorations. The efficacy of the peptide-CS hydrogels in dentin repair was also evaluated by characterizing the microstructure, mineral density, mineral phase, and nanomechanical properties of the remineralized samples. Recent results indicated the potential triple functions of peptide-CS hydrogels for dentin repair: building a highly organized protective mineralized layer on dentin, occluding dentinal tubules by peptide-guided in situ mineralization, and promoting biomimetic dentinal collagen remineralization. Given our findings on peptide-CS hydrogels potential for remineralizing enamel, we see further promise for hydrogels to treat tooth defects involving multiple hard tissues, as in the case of non-carious cervical lesions (NCCLs).



Janet Moradian-Oldak is a tenured professor in the Department of Biomedical Sciences, Ostrow School of Dentistry, with a courtesy appointment in the Biomedical Engineering Department, Viterbi School of Engineering. She has completed her B.Sc degree in Chemistry in 1984 in the Ben Gurion University, a master degree in Structural Chemistry in 1986, and a Ph.D degree in 1992 from the Department of Structural Biology at the Weizmann Institute of Science, Israel. She published more than 125 articles in peer review Journals and book chapters. Her main research goal is to understand the principles that govern the formation and mineralization of dental enamel by learning how the intricate matrix of proteins, enzymes and minerals come together to form this remarkable bioceramic. The ultimate goal is to help scientists develop new dental materials that more closely mimic the structure and function of natural tooth enamel. Her areas of research that are currently funded by R01 grants from NIH-NIDCR integrate physical chemistry, biochemistry, molecular biology, biotechnology, and biomaterial sciences in the study of mineralization of tooth enamel. Prof. Oldak currently serves as the president of the International Conference of the Chemistry and Biology of Mineralized Tissues. Among various awards she was the recipient of the 2015 GSK IADR Innovation in Oral Care Award, 2019 IADR Distinguished Scientist award in Biological Mineralization and was recognized as the 2019 fellow of AAAS. **Complete List of Published Work in My Bibliography:** http://www.ncbi.nlm.nih.gov/sites/myncbi/janet.oldak.1/bibliography/40957020/public/?sort=date&direction=ascending

Faculty presentation

Dental stem cell-mediated craniofacial tissue engineering: the prosthodontist's point of view

Dr. Alireza Moshaverinia
Associate Professor, Section of Prosthodontics and Weintraub Center

The ultimate goal of bone tissue engineering is the regeneration of a construct that matches the physical and biological properties of the natural bone tissue. Repair and regeneration of craniofacial bone defects has widely been achieved with bone grafting procedures. However, there are several disadvantages associated with this treatment modality. An advantageous, alternative therapeutic option is bone regeneration using mesenchymal stem cells (MSCs). MSCs derived from orofacial tissues are attractive postnatal stem cells with self-renewal and multilineage differentiation capacity providing superior osteogenic properties. Furthermore, the neural crest origin of these MSCs makes them a better source for jawbone regeneration. In this session, alternative bone regenerative properties based on concepts of tissue engineering using stem cells and growth factors will be discussed. Educational Objectives are:

- Review the current treatment modality of craniofacial bone tissue regeneration.
- Discuss the potential disadvantages and limitation of bone grafting procedures.
- Discuss the latest developments in periodontal tissue regeneration and bone tissue engineering, using smart biomaterials and growth factors.
- Introduce novel treatment modalities for bone regenerative treatments based on stem cell therapy and tissue engineering concepts as futuristic therapies for patients.

Dr. Alireza Moshaverinia is a Diplomate of the American Board of Prosthodontics and a tenured associate professor at the UCLA School of Dentistry, Section of Prosthodontics. Alireza has received his DDS degree in 2004 from Iran. He has a Master of Science degree in Dental Biomaterials (2009) from the Ohio State University, College of Dentistry. He completed advanced clinical education in Prosthodontics and earned his PhD in Craniofacial Biology from Ostrow School of Dentistry of USC (2012). He has published more than 100 papers in peer-reviewed journals on dental materials, implant dentistry, and stem cell-mediated tissue engineering. He serves as an associate editor for Journal of Prosthodontics and serves on the editorial review board member for several scientific journals such as Journal of Prosthetic Dentistry. Dr. Moshaverinia is the recipient of several awards in recognition of his scientific achievements including: John Sharry Award and GSK Prosthodontist Innovator Award from the American College of Prosthodontists, NIH Career Development Award, International Association for Dental Research Innovation in Oral Care Award, IADR Academy of Osseointegration innovation in Implant Sciences Award, Academy of Osseointegration (AO) Research Grant Award, and Peter Geistlich Research Award (Osteo Science Foundation). Dr. Moshaverinia has received Discovery Inception Award from the California Institute for Regenerative Medicine (CIRM). More recently, he received the prestigious IADR Young Investigator Award from International Association for Dental Research and American College of Prosthodontists Distinguished Researcher Award. He is fellow of American Association for Dental, Oral, and Craniofacial research (AADOCR) and Academy of Osseointegration. Dr. Moshaverinia directs the Laboratory for Biomaterials Innovation & Tissue Engineering (BITE) at Weintraub Center for Reconstructive Biotechnology, UCLA School of Dentistry. His NIH funded research projects are focused on the development of novel biomaterials and to study the role of the biomaterials in the cross talk between stem cells and host immune system in stem cell-mediated tissue engineering. Dr. Moshaverinia lectures nationally and internationally on various topics such as dental ceramics, implant dentistry, and multidisciplinary treatment planning.

Competition (5 categories)

Oral presentation

Resident category 4 abstracts

Postdoc/PhD category 4 abstracts

Poster presentation

Basic/translational science category 6 abstracts

Material science category 4 abstracts

Clinical science category 9 abstracts

Oral presentations

Resident category (4 abstracts)

#OR1

Evaluation of Dopamer properties for use as a restorative dental material

Andre Cataluna, Alireza Moshaverinia

#OR2

Wear of 3D-printed, CAD/CAM, and conventional prefabricated denture teeth opposing monolithic zirconia

Kimberly Choi, Sachi Bhoir, Denny Chao, Daniela Orellana, MS, Kumar Shah

#OR3

Vacuum Ultraviolet (VUV) Light Treatment of Implant Abutments Reduces Oral Biofilm Formation

Stella Stavrou, Keiji Komatsu, Takanori Matsuura, Toshikatsu Suzumura, Bhumika Shokeen, Renate Lux, Takahiro Ogawa

#OR4

Color Calibrated Shade Guide for 3D-Printed Nasal Stents Using Polyjet Printer

Mary Lou Juanatas, Sam Haridy, Denny Chao, Jay Jayanetti

Oral presentations

Postdoc/PhD category (4 abstracts)

#OP1

Sequential therapy with supercharged NK cells with either chemotherapy drug Cisplatin or anti-PD-1 antibody decreases the tumor size and significantly enhances the NK function in Hu-BLT mice

Kawaljit Kaur, Po-chun Chen, Meng-Wei Ko, Ao Mei, Emanuela Senjor, Subramaniam Malarkannan, Janko Kos, Anahid Jewett

#OP2

Phosphatidylserine-incorporated Exosome Mimetics Encapsulating CXCR3 Antagonist Alleviate Osteoporosis

Minjee Kang, Zhi Li, Insoon Chang, Changlu Xu, Jiabing Fan, Michelle Chiang, Tara L. Aghaloo,* Min Lee*

#OP3

A novel ZIF-8 for dental implants in periodontic diseases

Weihao Yuan, Alireza Moshaverinia, Bo Yu

#OP4

Vacuum ultraviolet (VUV) treatment of implant healing abutments promotes fibroblast function by reducing local stress

Keiji Komatsu, Takanori Matsuura, Toshikatsu Suzumura, Takahiro Ogawa

Poster presentations

Basic/translational science category (6 abstracts)

#PB1

Growth and functional improvement of damaged human gingival fibroblasts on vacuum ultraviolet (VUV) light-treated titanium

Takanori Matsuura, Keiji Komatsu, Toshikatsu Suzumura, Stella Stavrou, Mary Lou Juanatas, Takahiro Ogawa

#PB2

Gelatin Methacrylate Hydrogel with ZIF-8 framework and Bone Morphogenic Protein for Tissue Engineering and Regeneration

Ronit Khade, Weihao Yuan, Alireza Moshaverinia

#PB3

Supercharged NK cells lyse both CSCs/poorly differentiated and well differentiated tumors

Yash Jain

#PB4

Silicon Nitride, a new bioactive ceramic for dental implant

Wayne Gonzales, Ronit Khade, Takeru Kondo, Akishige Hokugo, Ismail Fahad, Takahiro Ogawa, Ichiro Nishimura

#PB5

Enhanced Cytotoxicity of Osteoclast-Expanded Supercharged NK Cells against Endometrial Cancer Cell Lines

Edward Sher

#PB6

A novel microrough titanium surface with rounded peaks for enhanced osteoconductivity

Gauri Vanjari, Toshikatsu Suzumura, Keiji Komatsu, Takanori Matsuura, Takahiro Ogawa

Poster presentations

Material science category (4 abstracts)

#PM1

Behavior and Function of Human Gingival Fibroblasts on Laser-Textured Healing Abutment with a Combined Topography of Meso-channels and Micro-ridges

James Cheng, Denny Chao, Keiji Komatsu, Takahiro Ogawa

#PM2

VUV (vacuum ultraviolet) light expedites carbon decomposition and removal on titanium

Toshikatsu Suzumura, Takanori Matsuura, Keiji Komatsu, Takahiro Ogawa

#PM3

VUV (vacuum ultraviolet) light remarkably increases bond strength between titanium and glass ionomer cement

Tomomi Baba, Toshikatsu Suzumura, Eri Komatsu, Yukako Matsuura, Julia Kim, Takanori Matsuura, Keiji Komatsu, Takahiro Ogawa

#PM4

Analysis of Retention Loss of Bar Attachments for Various Materials

Daniel Tahhan, Denny Chao, Daniela Orellana, Kumar Shah, Jay Jayanetti

Poster presentations

Clinical Science category (9 abstracts)

#PC1

Implementation & Impacts of Patient & Family Advisory Boards in Special Patient Care Dentistry

Meagan Smith-Bocanegra, Michael O'Hara, Eric Sung, Reeva Mincer, Kelly Vitzthum

#PC2

Prosthodontic Treatment Considerations for Patients with Obstructive Sleep Apnea

Tess Moran, Kumar Shah

#PC3

Preprosthetic Treatment Modalities of Severely Resorbed Mandibular Ridges

Jeong (Julia) Kim, Kumar Shah

#PC4

Prevalence of MRONJ in patients with a history of antiresorptive therapy receiving surgical dental intervention: A retrospective chart review

Daniel Bicknell, Reeva Mincer, Veronica Greene, Eric Sung

#PC5

Augmenting patient monitoring during intravenous moderate sedation with artificial intelligence

Melanie Mincer, Reeva Mincer, Veronica Greene, Eric Sung

#PC6

Factors influencing applicants when applying to PGY-1 dental residencies

Kenneth Gozali, Reeva Mincer, Veronica Greene, Eric Sung

#PC7

Assessing the degree of radiation-induced xerostomia in patients receiving radiation therapy for head and neck cancer

Maalik Konop DeFreitas, Reeva Mincer, Veronica Greene, Eric Sung

#PC8

Morbidity outcomes associated with comprehensive dental treatment under general anesthesia in obese individuals: A retrospective chart review.

Justina Esuola, Reeva Mincer, Veronica Greene, Eric Sung

#PC9

Prevalence of odontogenic infection leading to systemic sequelae: A retrospective chart review.

Kenneth Glenn, Reeva Mincer, Kelly Vitzthum, Eric Sung

Abstract

Oral presentations

Resident category (4 abstracts)

#OR1

Evaluation of Dopamer properties for use as a restorative dental material

Andre Cataluna, Alireza Moshaverinia

Objective: to evaluate the physical properties of a novel dental biomaterial (Dopamer). **Methods:** Dopamer restorative dental material was fabricated by surface coating aluminate silicate glass particles using biomimetic polydopamine to promote mineralization and mixing with polyacrylic-acid-containing polymers. Compressive strength, diametral tensile strength, flexural strength, and hardness of Dopamer and Fuji IX GP (control) specimens were tested after 24 hours and 7 days of immersion in distilled water. Bond strength to dentin against shear force was tested using extracted third molars, with the assemblies being stored in 100% relative humidity at 37 °C for one hour and then in distilled water for periods of 24 hours and 7 days. In vitro remineralization properties of Dopamer were analyzed via scanning electron microscopy (SEM) after specimens were immersed in artificial saliva for 1, 7, and 14 days. Additionally, Dopamer specimens were co-cultured with human dental pulp stem cells (DPSCs). After 7, 14, and 21 days, the cells were retrieved and quantitative polymerase chain reaction (qPCR) was utilized to evaluate dentinogenesis-related genes, including dentin sialophosphoprotein (DSPP), matrix extracellular phosphoglycoprotein (MEPE), and dentin matrix protein 1 (DMP-1). **Results:** Dopamer was found to have similar working time to Fuji IX, but faster setting time. Dopamer had improved diametral tensile strength, flexural strength, and shear bond strength compared to Fuji IX, while compressive strength and hardness were similar. SEM analysis revealed Dopamer promoted hydroxyapatite formation on its surface and at the dentinoenamel junction, while Fuji IX did not. Dopamer presented no cytotoxicity when DPSCs were cultured in its presence. qPCR of cells cultured with Dopamer showed upregulation of DSPP, MEPE, and DMP-1. **Conclusions:** The Dopamer restorative material was found to have acceptable handling and mechanical properties as compared to Fuji IX, as well as the ability to re-mineralize tooth structure and upregulate genes related to dentinogenesis.

#OR2

Wear of 3D-printed, CAD/CAM, and conventional prefabricated denture teeth opposing monolithic zirconia

Kimberly Choi, Sachi Bhoir, Denny Chao, Daniela Orellana, MS, Kumar Shah

Objective: Compare the vertical height loss of 3D printed resin, CAD/CAM PMMA, and prefabricated denture teeth opposing zirconia. **Methods:** Total of 24 zirconia (Alien HT Zirconia) specimens 6x6x12mm were sintered and polished according to manufacturer's recommendations. Three antagonist materials were evaluated (n=8): 3D-printed resin (Nextdent C&B MFH), CAD/CAM (Pearson Vivid PMMA), and prefabricated denture teeth (Ivoclar Vivodent SDCL). The maxillary right canine was used as the master antagonist tooth and subsequently scanned for additive and subtractive manufacturing of the remaining specimens. Specimens were loaded at 49N for 240,000 cycles (SD Mechatronik Chewing Simulator) in distilled water. Vertical height loss was measured every 4,600 cycles. All antagonists and zirconia samples were scanned before and after testing. The vertical height loss recorded by the simulator was compared to measurements made by an engineering software (Geomagic Qualify). Statistical analysis was performed using a one-way ANOVA and

Tukey's post hoc test (□ = 0.05). **Results:** There was no wear on zirconia samples after testing. The average vertical height loss measured by the simulator was 0.23 ± 0.13mm ¬ for CAD/CAM, 0.16 ± 0.05mm for prefabricated denture teeth and 0.10 ± 0.05mm for 3D-printed. A significant difference ($p<0.05$) was found between 3D-printed and CAD/CAM, but no statistical difference was between 3D-printed and prefabricated denture teeth. No significant difference was found between prefabricated denture teeth and CAD/CAM. The geomagic software measured an average vertical height loss of 0.25 ± 0.09mm for CAD/CAM, 0.14 ± 0.03mm for prefabricated denture teeth, and 0.08 ± 0.02mm for 3D-printed. There was a statistical difference among all three groups ($p<0.0005$). Differences in measurements between simulator and geomagic could be attributed to factors such as scanner accuracy and spray thickness. **Conclusions:** 3D-printed resin was found to have the lowest vertical height loss compared to prefabricated denture teeth and CAD/CAM PMMA when opposing zirconia.

#OR3

Vacuum Ultraviolet (VUV) Light Treatment of Implant Abutments Reduces Oral Biofilm Formation

Stella Stavrou, Keiji Komatsu, Takanori Matsuura, Toshikatsu Suzumura, Bhumika Shokeen, Renate Lux, Takahiro Ogawa

Objective: The formation of bacterial biofilm is one of the leading causes of peri-implant inflammation with subsequent destructive bone loss in the pathogenesis of peri-implantitis. The objective of this study was to investigate the impact of vacuum ultraviolet (VUV) light treatment of healing abutments on biofilm formation of human oral bacteria. **Methods:** Two groups of titanium healing abutments were subjected to seeding of human oral bacteria: 1. untreated and 2. under VUV light treatment for 1 minute. The surface morphology and elements of the healing abutments was examined using scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS) prior to experiments. Human oral bacteria were seeded in both groups and bacterial attachment was evaluated at 6, 12, and 24 hours after seeding. The accumulation of oral microbial biofilm biomass on the abutments was quantified using the crystal violet assay. Additionally, the colony morphology and biofilm formation were assessed using SEM. **Results:** SEM observations revealed that VUV treatment did not alter the morphology of the abutment surface. Surface elemental analysis confirmed that VUV treatment induced decarbonization of the abutment surface. After 12 hours of bacterial incubation, the biomass accumulation was approximately 25% lower in the VUV-treated abutments than in the untreated abutments. This trend was maintained even after 24 hours of cultivation. SEM revealed that the bacterial colonization on VUV-treated abutments was more sparse with smaller, more scattered bacterial cell clusters in comparison to the more widespread and larger microcolonies on the untreated abutments. **Conclusion:** VUV light treatment has shown a reduction of bacterial attachment and biofilm formation on titanium abutments in comparison to their untreated counterparts. These results should be considered in clinical practice to prevent biofilm-associated peri-implant complications and better promote peri-implant health.

#OR4

Color Calibrated Shade Guide for 3D-Printed Nasal Stents Using Polyjet Printer

Mary Lou Juanatas, Sam Haridy, Denny Chao, Jay Jayanetti

Nasal stents following rhinectomies offer improved midfacial cosmesis and psychosocial comfort for the patient. Nasal stents were first described as a clear vacuum-formed laminate over a cast. The lack of color offered limited cosmesis during the postoperative period. The technique for stent fabrication has evolved to incorporate CADCAM. By incorporating color, nasal stents can be used as an interim prosthesis during adjuvant therapies and healing phase prior to a definitive prosthesis. Although 3D-printed nasal stents can faithfully recreate the nasal anatomy, fidelity in reproducing the patient's base shade is challenging. A limitation is that printed prostheses are still monochromatic and the esthetic outcome is not yet able to replace maxillofacial prosthodontists or anaplastologists. Today, there is no material for 3D printing available

that is an ideal material for facial prosthetics in terms of elasticity, color, biocompatibility, and or/all of them combined. However, we can produce fast and direct colored-3D printed stents as temporary prostheses. The authors have formulated a handheld color-calibrated shade guide to help the clinician select a base skin tone. Photographs of multiple subjects holding a color checker with a gray color tab were taken. The photos were inspected, color calibrated, and imported into a software for further correction of the white balance and color adjustment with defined hex codes. The hex codes were then transferred to the Stratasys J750 printer. A gradient of base shades and corresponding hex codes were printed. Because the colored resin is not approved for extended body contact, both nasal stents and shade tabs printed are sandwiched between an FDA-approved biocompatible material for body contact longer than 30-days. The clear layer has the added benefit of a realistic perception of shade and depth of color. Future directives: developing techniques to blend colors to avoid a monochromatic appearance and applications to flexible materials.

Oral presentations

Postdoc/PhD category (4 abstracts)

#OP1

Sequential therapy with supercharged NK cells with either chemotherapy drug Cisplatin or anti-PD-1 antibody decreases the tumor size and significantly enhances the NK function in Hu-BLT mice

Kawaljit Kaur, Po-chun Chen, Meng-Wei Ko, Ao Mei, Emanuela Senjor, Subramaniam Malarkannan, Janko Kos, Anahid Jewett

The study highlights the unique attributes of supercharged NK (sNK) cells, which differ from primary NK cells. It shows that chemotherapeutic drugs are more effective against differentiated oral and pancreatic tumors than their stem-like counterparts. In hu-BLT mice, sNK cell immunotherapy alone or combined with CDDP effectively inhibited tumor growth and increased IFN-γ secretion and NK cell-mediated cytotoxicity by immune cells of bone marrow, PBMCs, and solenocytes. Differentiated tumors expressed higher levels of PD-L1 and were more susceptible to NK cell-mediated ADCC in the presence of anti-PD-L1 than their stem-like counterparts. The study also reveals that anti-PD1 antibody induced higher IFN-γ secretion from NK cells in the presence of stem-like tumors as compared to differentiated tumors. sNK cell immunotherapy alone or combined with anti-PD1 antibody significantly inhibited tumor growth in hu-BLT mice and improved immune function from BLT mice. Sequential treatment with sNK cells and anti-PD1 augmented IFN-γ secretion and NK cell-mediated cytotoxicity by immune cells of spleen, peripheral blood, and bone marrow of tumor bearing hu-BLT mice. These findings suggest that targeting different stages of tumor differentiation with sNK cells, chemotherapeutic drugs, or checkpoint inhibitors may lead to successful cancer eradication and cure.

#OP2

Phosphatidylserine-incorporated Exosome Mimetics Encapsulating CXCR3 Antagonist Alleviate Osteoporosis

Minjee Kang, Zhi Li, Insoon Chang, Changlu Xu, Jiabing Fan, Michelle Chiang, Tara L. Aghaloo,* Min Lee*

Objectives: Exosomes derived from mesenchymal stem cells (MSCs) are an active area of research due to their therapeutic potential in treating osteoporosis. To further harness their therapeutic performance in osteoporotic conditions, we have equipped exosomes with targeting moieties on their surface as well as drug molecules. Phosphatidylserine (PS) lipids, serving as global immunosuppressive and “eat-me” signals, were incorporated in the membrane of exosome mimetics (EMs) to achieve a marked affinity for osteoclast precursors and potential anti-resorptive effects. We also aimed to tackle a CXCL9-CXCR3 ligand-receptor axis, identified as an essential axis to control osteoclast precursor recruitment and differentiation at bone resorption sites. We encapsulated a CXCR3 antagonist, AMG487, in the PS-incorporated EMs (PS-EMs) for the purpose of blocking osteoclast recruitment and mitigating osteoporosis. **Methods:** PS-EMs were generated by extrusion method. Cellular internalization of PS-EMs was investigated using confocal microscopy. The effect of PS-EMs on osteoclastogenesis was studied using Tartrate-resistant acid phosphatase (TRAP) staining. In-vitro transwell migration assay was performed to evaluate the effect of AMG-487 in macrophage migration under exposure to CXCL9. Ovariectomized mice model was used as an in-vivo model to investigate the effects of PS-EMs in preventing osteoporosis. **Results:** Confocal imaging demonstrated that PS-EMs were preferentially internalized by macrophage cells over MSCs compared to control EMs, indicating a role of PS in targeting macrophages. PS-EMs exhibited enhanced inhibitory effects on the formation of TRAP-positive multinuclear cells. In chemotaxis assays, PS-EMs loaded with AMG-487 were highly effective in blocking migration of osteoclast precursors in the presence of CXCL9. Intraperitoneal administration of PS-EMs

attenuated bone loss in osteoporosis mice, analyzed by the quantification of bone parameters in femurs. **Conclusion:** We successfully inhibited osteoporosis in an ovariectomized mice model by adapting osteoclast-targeting exosome mimetics. Our findings demonstrate the great promise of PS-EMs as cell-free anti-resorptive nanocarriers for alleviating osteoporosis.

#OP3

A novel ZIF-8 for dental implants in periodontic diseases

Weihao Yuan, Alireza Moshaverinia, Bo Yu

Objectives: Various materials have been applied to surface coating of titanium-based implants, such as hydroxyapatite (HAP), biomacromolecules and bioactive peptides or growth factors. However, most of developed modification methods show significant limitations (complicated procedures, high cost, short storage time), restricting the widespread use of these modified implants. Therefore, there exists an acute demand for novel coatings that can mediate the continuous delivery of bioactive growth factors, especially the functional coatings which can protect the encapsulated peptides under extreme conditions. **Methods:** We synthesized the ZIF NPs via the mixing of 2-methyl imidazole (2-MeIM) and zinc nitrate (Zn2+) in aqueous solution. We chose the RGD and TCP-25 peptides to study the biomineralization-mediated loading of biomacromolecules. The RGD and TCP-25 peptides were added into the 2-MeIM solution at the concentration of 1 mg/mL, followed by the adding of Zn2+. **Results:** We designed two titanium substrates to test the osteoinduction bioactivities of loaded peptides, including ZIF-coated titanium (ZIF@Ti) and ZIF with peptide encapsulation-coated titanium (Peptide@ZIF@Ti). We found that the Peptide@ZIF@Ti substrates can significantly promote the cell adhesion by the evidence of elevating expression of MAPK in this group. We also performed RT-qPCR for major osteogenic markers at day 3 and 7 of culture on the substrates. We also examined whether our developed coatings could inhibit local inflammation. The M1 polarization marker (NFκB) of macrophages cultured on Peptides@ZIF@Ti substrates was significantly lower than those on ZIF@Ti substrates. The M2 polarization marker (NFκB) of macrophages cultured on Peptides@ZIF@Ti substrates was significantly higher than those on ZIF@Ti substrates. **Conclusion:** The dynamic ligand–ion coordination bonds and highly porous structures in ZIF-8 NPs enable the efficient loading and controlled release of loaded peptides. Moreover, the multiple physical interactions between ZIF-8 shells and BMP-2 proteins restrict the conformational changes of encapsulated peptides, thereby preventing the denature of them under extreme conditions.

#OP4

Vacuum ultraviolet (VUV) treatment of implant healing abutments promotes fibroblast function by reducing local stress

Keiji Komatsu, Takanori Matsuura, Toshikatsu Suzumura, Takahiro Ogawa

Objective: Gingival fibroblast attachment to implant healing abutments is crucial for peri-implant soft tissue healing and health. The aim of this study was to investigate the impact of vacuum ultraviolet (VUV) treatment on fibroblast functions of healing abutments to establish peri-implant health. **Methods:** Healing abutments were treated with VUV for one minute, and untreated healing abutments served as controls. The abutment surfaces were evaluated using scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), and wettability testing. Human gingival fibroblasts were cultured on the abutments to investigate cell attachment, proliferation, and ability of collagen production. Total RNA was also extracted from the fibroblasts and subjected to RNA-sequencing (RNA-seq) analysis to further elucidate the function and underlying mechanism of the fibroblasts. **Results:** The VUV treatment converted the abutment surfaces from hydrophobic to hydrophilic. The number of attached fibroblasts on VUV-treated abutments was consistently 20-50% higher than that on the controls. The cell proliferation rate on VUV-treated abutments was 20% higher than on the controls. Fluorescence microscopy images showed an abundance of cells on the VUV-treated abutment, aligned parallel to the groove, whereas the control abutments had sparse and randomly dispersed cells. Collagen 1 and 3 production on VUV-

treated abutments was approximately 2-fold higher than on untreated abutments. Gene ontology enrichment analysis revealed that the expression of extracellular matrix and cell population/proliferation-related genes was upregulated on VUV-treated abutments, while the genes associated with reactive cytokine and immune responses were downregulated. **Conclusion:** VUV treatment of implant healing abutments promoted the attachment, proliferation, and collagen production of human gingival fibroblasts, in association with the upregulation of the typical functional phenotypes of fibroblasts and reduction of their cellular stress response. This was associated with a hydrophilic and decarbonized surface created by the VUV treatment, which presumably created a local stress-reduced environment for fibroblasts and ultimately promoted peri-implant health.

Poster presentations

Basic/translational science category (6 abstracts)

#PB1

Growth and functional improvement of damaged human gingival fibroblasts on vacuum ultraviolet (VUV) light-treated titanium

Takanori Matsuura, Keiji Komatsu, Toshikatsu Suzumura, Stella Stavrou, Mary Lou Juanatas, Takahiro Ogawa

[Objective] Soft tissue sealing is one of the key factors to prevent peri-implant disease. During secondary implant surgery, gingival fibroblasts attach to the implant abutment are damaged due to the incision. The objective of this study was to determine whether VUV-treated titanium can restore the growth and function of damaged human gingival fibroblasts. **[Methods]** To establish the damaged-fibroblast model, human gingival fibroblasts were cultured in medium with various concentrations of hydrogen peroxide (0, 100, 200, 400 µM). The metabolic activity and DNA synthesis were assessed by Water-Soluble Tetrazolium 1 (WST-1) assay and bromodeoxyuridine (BrdU) assay, respectively. Collagen production by fibroblasts was evaluated by Sirius red staining. Titanium alloy rectangular plates (4 x 13 mm, 2 mm thick) with a smooth machined surface were prepared and treated with vacuum ultraviolet (VUV) light for 1 minute. Non -treated Titanium alloy was used as a control. The number of attached and propagated cells on titanium plate up to 6 days after cell seeding and collagen production on the plates was evaluated. **[Results]** Fibroblast metabolic activity and DNA synthesis were significantly impaired by hydrogen peroxide above 200 µM. Collagen production by the damaged fibroblasts decreased in a dose-dependent manner with increasing hydrogen peroxide concentrations. Cell attachment and proliferation were 20-30% higher in VUV-treated titanium compared to non-treated titanium, at all concentrations. Notably, collagen production in fibroblasts damaged with 200 µM on VUV-treated Ti was 15% higher than in fibroblasts on non-treated titanium. **[Conclusion]** VUV-treated titanium has the potential to restore the growth and function of fibroblasts damaged by oxidative stress, indicating that the VUV treatment of titanium may mitigate the negative impact of damaging cells such as radiation therapy.

#PB2

Gelatin Methacrylate Hydrogel with ZIF-8 framework and Bone Morphogenic Protein for Tissue Engineering and Regeneration

Ronit Khade, Weihao Yuan, Alireza Moshaverinia

Objective: To evaluate the rheological properties, surface characteristics, biocompatibility, and osteogenic differentiation of GelMA, GelMA incorporated with ZIF-8 and GelMA combined with ZIF-8 and BMP. **Methods:** We fabricated GelMA by sonicating it for 30 minutes, and ZIF nanoparticles were synthesized using 2-methyl imidazole (2-MelM) and zinc nitrate (Zn^{2+}). A photoinitiator was incorporated into the mixture to be activated by UV light for gel formation. All the samples were tested for degradation and release at several time points. We also analyzed the biocompatibility of our samples using the live death assay with an immunofluorescent dye. Further osteogenic differentiation was measured using immunofluorescent staining and using RT-qPCR. **Results:** Our result shows that GelMA combined with ZIF-8 and BMP has more osteogenic differentiation and better rheological properties than GelMA alone. **Conclusion:** GelMA has a crosslinking structure forming a three-dimensional network. Besides, ZIF has a high surface area and a porous structure, further enhancing the seeding capacity for the stem cells. Moreover, using BMP further enhances the osteogenic potential of the ZIF nanoparticles. Thus, the combination of these can be a significant benefit for bone regeneration.

#PB3

Supercharged NK cells lyse both CSCs/poorly differentiated and well differentiated tumors

Yash Jain

Objective: To establish that Supercharged Natural killer (sNK) cells have the capability to induce lysis in both poorly differentiated and well-differentiated tumors. **Methods:** We conducted a comparison of the cytotoxicity of sNK cells and NK cells against various cell lines including OVCAR 4, OVCAR 8, OSCC, OSCSC, MP2, and PL-12. We employed two methods to measure the lysing capacity: the Chromium 51 assay and impedance measurement using novel e-sight technology. **Results:** A higher killing capacity of supercharged NK (sNK) cells compared to regular NK cells. Additionally, we demonstrated that the supernatant of sNK cells is capable of inducing differentiation in poorly differentiated tumors. **Conclusion:** Superchared NK cells lyse both CSCs/poorly differentiated and well differentiated tumors. Hence, considering the crucial role of sNK cells in targeting cancer stem-like and differentiated tumors and their numerous ither essential functions, it is imperative to prioritize sNK cells in the arsenal of tumor immunotherapy.

#PB4

Silicon Nitride, a new bioactive ceramic for dental implant

Wayne Gonzales, Ronit Khade, Takeru Kondo, Akishige Hokugo, Ismail Fahad, Takahiro Ogawa, Ichiro Nishimura

Statement of problem: Silicon Nitride (SiN) is a new generation bioceramic material currently applied as spinal fusion implants in orthopedic surgery. Previous studies indicated osteoconductive activity and antimicrobial effect of SiN in-vitro; however, the potential of SiN for dental implants has not been evaluated. Purpose: The purpose of this study was to conduct an exploratory study investigating the suitability of SiN as a dental implant material, comparing it with current dental implant materials. **Material and methods:** For in-vitro study, SiN disc was compared with machined titanium (MTi), acid etched titanium (ATi) and zirconia (Zr) discs. Discs were characterized for surface topography and behavior of human bone marrow mesenchymal stromal cells (hBM-MSC) in growth medium. hBM-MSC were further cultured on biomaterials under osteogenic conditions and Alizarin Red staining, in vitro mineralization and gene expression were evaluated. SiN, MTi and ATi implant samples (0.8 x, 6 mm) were placed in mouse femurs and the degree of osseointegration was determined by implant-push in test. The in-vivo bone formation around the implant was determined by microCT. **Results:** Surface topography of ATi was significantly rougher than SiN, MTi and Zr. When hBM-MSCs were cultured under osteogenic condition, Alizarin Red S staining was significantly increased in the SiN group as compared to MTi, ATi and Zr groups. The implant push-in test revealed the significantly larger mechanical withstanding force of SiN implant than MTi implant, while ATi implant showed the largest push-in value. MicroCT evaluation demonstrated that SiN implant formed significantly more trabecular bone in the 100 µm peripheral zone than MTi and ATi implants. **Conclusions:** Our data strongly supports the osteoconductive activity of SiN, which may induce osteogenic differentiation of bone marrow cells. SiN may present a bioactive ceramic material for dental implant suitable for achieving osteointegration through increased bone formation.

#PB5

Enhanced Cytotoxicity of Osteoclast-Expanded Supercharged NK Cells against Endometrial Cancer Cell Lines

Edward Sher

The study aimed to investigate the effects of primary NK (pNK) cells and osteoclast-expanded supercharged NK (sNK) cells on the cytotoxicity of uterine cancer cells, specifically AN3CA and HEC-1B. Additionally, interleukin-2 (IL-2) and probiotic sAJ4, which contains a combination of four gram-positive bacteria, were utilized to activate primary NK (pNK) cells to evaluate their impact on NK cell cytotoxicity. The results showed that sNK cells alone had the highest cytotoxicity against both AN3CA and HEC-1B cell lines in the Cr-51 release assay. The impedance assay also demonstrated that IL-2 and IL-2 + sAJ4 treatment of pNK cells resulted in increased cytotoxicity against AN3CA and HEC-1B cells. However, sNK cells still exhibited higher cytotoxicity than pNK with treatments against the two cell lines. Interestingly, the less differentiated AN3CA cell line was found to be more susceptible to NK cell cytotoxicity than the more differentiated HEC-1B cell line. This finding highlights the potential of NK cells as an effective therapeutic agent for undifferentiated uterine cancer cells. The study demonstrates that using sNK cells, or pNK in combination with IL-2, may provide an effective strategy for treating uterine cancer. Moreover, the probiotic sAJ4 can enhance the cytotoxicity of primary NK cells, which may have potential implications for cancer immunotherapy. Overall, the results suggest that osteoclast-expanded sNK cells may have potential therapeutic applications in cancer treatment, particularly for highly aggressive and undifferentiated tumors. Furthermore, the study provides insights into the mechanisms underlying NK cell cytotoxicity against uterine cancer cells and highlights the potential of probiotics as adjuvants in cancer immunotherapy.

#PB6

A novel microrough titanium surface with rounded peaks for enhanced osteoconductivity

Gauri Vanjari, Toshikatsu Suzumura, Keiji Komatsu, Takanori Matsuura, Takahiro Ogawa

Objectives: Ever since the advent of micro-rough surfaces, acid etching and sand blasting in past years, there has been no considerable progress in enhancing titanium's capacity to fuse with bone. The objective of this study was to investigate the effect of Flame treatment on biological characteristics of micro rough round surface of Grade IV Titanium (Ti) and generate a surface with uniform topography that enhances osseointegration. **Method:** Three groups; 1.Machine cut Ti. 2.Ti samples prepared by Hybrid Sandblasted and acid etching (HSA). 3.Test surface samples prepared by flame treating (F-HSA). The surface topography of each sample was observed using Scanning electron microscopy (SEM). Contact angle test was performed to determine the hydrophilic status of the samples. Cell attachment, proliferation and differentiation of rat femur-derived osteoblasts on samples were examined by WST-1 and ALP assay respectively. **Results:** Low magnification SEM revealed test F-HSA samples had rounded surfaces compared to HSA sample. Higher magnification images of the same showed rounded surfaces that were uniformly roughened by combination of ultramicroscopic indentations and micro-pits scattered over the surface. Machined surfaces did not have a clear topography except for the linear traces of machining. All samples showed hydrophobicity. Water contact angle of HSA and F-HSA were over 90 degrees, indicating a water-repellent surface. The no. of cells attached was found to be highest for Machine cut sample followed by F-HSA and HSA on Day 2,4 and 6 of WST-1 assay respectively. ALP assay on Day 2 and Day 4 revealed that the osteoblast differentiation was maximum for F-HSA which was approx. 30% higher compared to that on HSA. **Conclusion:** Osteoblast functions (cell attachment, proliferation, and differentiation) were increased on a new microrough titanium surface with rounded peaks compared to the conventional microrough surface.

Poster presentations

Material science category (4 abstracts)

#PM1

Behavior and Function of Human Gingival Fibroblasts on Laser-Textured Healing Abutment with a Combined Topography of Meso-channels and Micro-ridges

James Cheng, Denny Chao, Keiji Komatsu, Takahiro Ogawa

Objective: Surface treatments on implant fixtures to enhance osseointegration have been a major focus on increasing implant success rates. However, effects of implant surface modifications on soft tissue compatibility remain poorly understood. We hypothesized that BioHorizons' Laser-Lok Healing Abutment provides a novel surface morphology that creates an environment that would enhance the healing of connective tissue surrounding an implant healing abutment. **Methods:** Fibroblasts were cultured onto BioHorizons healing abutments with and without Laser-Lok technology, with fibroblastic attachment on all sloped surfaces of both implant modalities. Fluorescent microscopy was utilized to qualitatively assess fibroblast morphology differences. WST-1 assays were used to determine cell attachment of the fibroblasts. Sirius Red Staining (SRS) was utilized to determine Collagen-1 and Collagen-3 deposition. PCR was utilized to assess collagen, integran alpha-3, fibronectin-1, and integran beta-1 gene expression to determine adhesive strength. To confirm PCR results, mechanical agitation was utilized with simple cell counting to determine levels of detachment. **Results:** Laser-Lok fibroblasts exhibited an elongated morphological shape parallel to the strip whereas non Laser-Lok fibroblasts retained a circular shape. WST-1 showed nonsignificant differences between Laser-Lok and control. SRS showed nonsignificant differences between Laser-Lok and control. FN-1 and ITGB1-1 gene expression was significantly upraised in Laser-Lok samples. Cell counts of control showed a significant drop in fibroblastic attachment, whereas Laser-Lok maintained attachment and had a nonsignicant change in fibroblastic attachment. **Conclusion:** Based on the results, Laser-Lok may be a promising avenue on creating a more robust environment for connective tissue attachment for implant surfaces. Future directions that would strengthen this hypothesis includes having samples with only Laser-Lok surface morphology on the slopes.

#PM2

VUV (vacuum ultraviolet) light expedites carbon decomposition and removal on titanium

Toshikatsu Suzumura, Takanori Matsuura, Keiji Komatsu, Takahiro Ogawa

Objective: UV treatments are known to remove the organic compounds present on the surface of the implants by the process of direct photolysis and photocatalytic effects in order to increase its osteointegrative capacity. Vacuum UV(VUV) are electromagnetic wave of higher energy and shorter wavelengths. The effect of VUV treatment on the surface of titanium implants seems to exhibit promising potential, but it has not been studied extensively with respect to the field of dentistry. Thus, the purpose of this study was to determine the effect of VUV treatment on organic matter degradation and to compare its degradation ability with that of current photo devices. **Methods:** UV-transparent ampules containing methylene blue solution were prepared. The ampule with or without a titanium plate were treated with VUV. To quantify organic matter degradation ability of VUV, the amount of methylene blue remnant after VUV treatment was measured by a microplate reader at 650 nm absorbance. VUV treatment time was configured from 20s to 100s in 20-second increments. The photocatalytic effect was determined from the difference in the amount of methylene blue remnant with and without titanium. After determining the most effective UV time, the degradation ability was compared with two types of current photo devices and low-pressure mercury halogen lamps (UV-C). **Results:** Irrespective of 'with or without' titanium plate, it was observed that after VUV treatment, the methylene blue remnant decreased in a time dependent manner up to first 60 secs and then reached a plateau afterwards. Photocatalytic effect was observed at all point. As the treatment time

increased, the direct photolysis was enhanced and the photocatalytic effect was relatively decreased. The methylene blue degradation of VUV was higher than that of the two photo devices and higher than that of UV-C. In all devices, the ample with a titanium plate degraded more methylene blue in comparison to the ample without a titanium plate. **Conclusion:** VUV removes organic compounds more efficiently than current UV photo devices. From these results, VUV treatment is expected to be versatile in the dental field due to its rapid and high direct photolysis.

#PM3

VUV (vacuum ultraviolet) light remarkably increases bond strength between titanium and glass ionomer cement

Tomomi Baba, Toshikatsu Suzumura, Eri Komatsu, Yukako Matsuura, Julia Kim, Takanori Matsuura, Keiji Komatsu, Takahiro Ogawa

Objective: Titanium is a metallic material widely used for casting and milling restorations. The purpose of this study is to test the hypothesis that vacuum ultraviolet (VUV) treatment of titanium surfaces can enhance the bond strength of glass ionomer cements. **Methods:** Titanium rectangular plates (14 mm × 6 mm, 2 mm in thickness) were divided into two groups: (a) machined surfaces and (b) airborne-particle-abraded (sandblasted) with aluminium oxide. Titanium plates underwent VUV treatment for one minute and was compared to untreated control plates. Standardized titanium plates were bonded onto the test surfaces with glass ionomer cements, and the shear bond strength was tested at a rate of 1 mm/minute. The value was recorded in MPa. Observations with scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS) were conducted to confirm the status of cement fracture. The area of residual cement after shear testing was measured relative to the adhesive area using image analysis. **Results:** Irrespective of the surface characteristics (machined and sandblasted) of titanium, the shear strength of cement was found to be enhanced by VUV treatment. On machined surfaces, the shear strength of cement was increased more than six-fold by VUV treatment, reaching the level of untreated sandblasted surfaces. On sandblasted surfaces, VUV treatment improved the shear strength by more than two-fold, with an average of 20.5 MPa. The untreated machined surfaces displayed very little cement residue, whereas on VUV-treated surfaces, over 50% of the bonded surface remained with cement. Cement residue was detected on the sandblasted surfaces with and without VUV treatment, however, SEM and EDS analysis revealed more cement residue on the VUV treated surfaces. **Conclusion:** VUV treatment of titanium increases remarkably the bond strength of glass ionomer cement to titanium, thereby providing a novel strategy and solution and a proof-of-concept to enhance materials bonding in the field of dentistry and engineering.

#PM4

Analysis of Retention Loss of Bar Attachments for Various Materials

Daniel Tahhan, Denny Chao, Daniela Orellana, Kumar Shah, Jay Jayanetti

Tissue bars made from zirconia have recently gained popularity in maxillofacial prosthetics due to its favorable soft tissue response especially around skin. However, its long term retention with clips remains unknown. **Purpose:** To evaluate the loss of retention of nylon Hader clips when used in conjunction with zirconia Hader implant tissue bars. The null hypothesis is that there are no significant differences in the loss of retention between Hader bars made from various materials. **Methods:** 4 groups of 8 Hader bar specimens were tested: Group 1: casted via gold alloy. Group 2: milled from cobalt chromium base metal alloy. Group 3: milled from titanium metal alloy. Group 4: milled from zirconia. Group 1 was waxed conventionally while groups 2, 3, 4 were designed digitally. An acrylic block with an embedded external hex implant analog was utilized to hold each specimen for testing. Specimens were subjected to 7300 cycles of pull-out tests which simulates 4 insertion and removal daily over a period of 5 years. A quantitative assessment of retention loss was recorded. **Results:** All groups demonstrated a sharp loss of retention from the 1st cycle to the 2nd. Over the course of 7300 cycles, the Gold

and CoCr groups reached a plateau in retention around 1000 cycles and maintained that retention for the remainder of the cycles. Titanium and Zirconium bars demonstrated a continuous loss of retention. Zirconia bars lost the most retention from cycle 1 to 7300 compared to the other groups. Zirconia also reached the lowest retention force values by the end of the testing cycles. **Conclusion:** Zirconia Hader bars demonstrate a continuous and greater loss of retention compared to bars of other materials and may require more frequent clip changes.

Poster presentations

Clinical Science category (9 abstracts)

#PC1

Implementation & Impacts of Patient & Family Advisory Boards in Special Patient Care Dentistry

Meagan Smith-Bocanegra, Michael O'Hara, Eric Sung, Reeva Mincer, Kelly Vitzthum

The efficacy and value of patient input is well-established in patient service organizations. Research shows patient engagement improves health outcomes and creates a more humanistic experience for both care providers and patients. Patient and Family Advisory Boards (PFABs) in health care settings provide a mechanism by which patient input can be garnered to improve care processes, by advising on practices and contributing to quality improvement. Although there is currently no published literature on their application to dental care settings, PFABs may offer significant value to specialized dental clinics that serve vulnerable patient populations. Patients with special health care needs are one such vulnerable population that experiences significant health care disparities and currently is not well-represented in health care decision-making, dental care included. This poster aims to describe the implementation of a PFAB within the UCLA School of Dentistry's Special Patient Care clinic. It also considers issues around recruitment and stakeholder roles, as well as the desired impact on clinical care.

#PC2

Prosthodontic Treatment Considerations for Patients with Obstructive Sleep Apnea

Tess Moran, Kumar Shah

Obstructive sleep apnea (OSA) is a sleep-related breathing disorder characterized by loud snoring and apneas/hypopneas despite continued respiratory movements. The worldwide prevalence of OSA is difficult to study, with estimates ranging from 936 million to 1 billion and, diagnoses are expected to increase in the coming years. Both treated and untreated OSA have implications on prosthodontic treatment: untreated OSA is often associated with caries, temporomandibular joint pathology, loss of restorative space from heavy wear, and breakdown of natural and restored dentition, while long term successful treatment of OSA has been shown to cause significant changes in occlusion. Therefore, considerations for treatment of these patients must be made pre-prosthetically, during treatment, and in the maintenance phase. In this case report, a 58 year old male patient with severe OSA presents in need of full mouth rehabilitation. A review of the current literature on prosthodontic treatment considerations for patients with OSA is presented.

#PC3

Preprosthetic Treatment Modalities of Severely Resorbed Mandibular Ridges

Jeong (Julia) Kim, Kumar Shah

Severely resorbed edentulous mandibles pose a great challenge to the clinician to manage both prosthetically and surgically. For patients with severely resorbed mandibular ridges, wearing a conventional denture can be difficult due to insufficient retention, stability and support thereby causing inadequacies in comfort, speech and mastication. Furthermore, the close proximity of the alveolar crest and the mental nerve can subject denture wearers to pain, paresthesia, or numbness. Thus, preprosthetic surgery is often considered to treat the superficializiation of the alveolar nerve to prevent neurosensory pain, as well as to incorporate dental implants for a more retentive and stable prosthesis. A 57-year-old

female patient presents with chief complaint of denture instability and neurosensory pain on lower left jaw. Patient has a dental history of wearing dentures for 30 years and presents with a severely resorbed mandibular ridge. The aim of this case report is to review and compare the scientific literature and clinical reports of current preprosthetic treatment modalities and discuss the considerations and potential risks for treatment of severely resorbed edentulous mandibles. Treatment options of severely resorbed edentulous mandible ridges will be reviewed and discussed.

#PC4

Prevalence of MRONJ in patients with a history of antiresorptive therapy receiving surgical dental intervention: A retrospective chart review

Daniel Bicknell, Reeva Mincer, Veronica Greene, Eric Sung

Aim: Antiresorptive (AR) medications have become commonplace in the management of osteoporosis as well as some cancer treatments. Medication related osteonecrosis of the jaw (MRONJ) is a known adverse outcome associated with AR medications. However, for individuals with a history of AR treatment the literature fails to consider the risk of MRONJ in the event of surgical dental intervention. Given such, we believe that the prevalence of MRONJ associated with AR medications is significantly underestimated in the current literature. **Methods:** A retrospective chart review from January 2003 to December 2022 was completed for patients with a history of AR medications. The 436 patients, who met patients met inclusion criteria for this study, were divided into 2 groups: patients receiving surgical dental intervention (n=255) and those without intervention (n=181). Those that received surgical dental intervention were further divided based on those receiving treatment for osteoporosis (n=218) and those receiving treatment for cancer (n=37). Type of AR medication, length of time on the AR medication, use of a drug holiday, age, and comorbidity polypharmacy score (CPS) were evaluated. **Results:** The development of MRONJ in cancer patients was significantly higher than those receiving AR treatment for osteoporosis (p=3.2x10^-12). Age, length of time on the medication and the use of a drug holiday all showed significance in the development of MRONJ in patients on Fosamax (p=0.0002, 0.0063, 0.0174). MRONJ lesions had a strong preference for the mandible (73.7%). **Conclusions:** Our study shows a much higher prevalence of MRONJ as compared to the current literature. Future studies are needed to evaluate how significant surgical dental intervention is in the development of these lesions.

#PC5

Augmenting patient monitoring during intravenous moderate sedation with artificial intelligence

Melanie Mincer, Reeva Mincer, Veronica Greene, Eric Sung

AIM: A precordial stethoscope (PS) is essential for ensuring clear breath sounds during open airway sedations, however with a conventional PS there is little ability for mutliple personnel to listen to the airway concurrently. Bluetooth speaker systems allow for multiple providers to listen at any given time, however this does not address the concern of background noise. An artificial intelligence (AI) PS allows multiple providers to monitor concurrently, as well as provide a visual display and noise cancellation. **METHODS:** A survey was created to compare an AI PS to a conventional PS based on clarity, breath sounds, loudness, ease of monitoring, comfort, presence of artifacts, teaching ability, concurrent monitoring by multiple providers and visual accuracy. **RESULTS:** 16 individuals invovled in sedations (3 attending dentists, 1 dental anesthesiologist, 7 dental residents, and 5 dental assistants), were polled with a 100% response rate. 37.5% of participants agreed that clarity was much improved using the AI PS. 50% of participants agreed that breath sounds and comfort were much improved using the AI PS and assisted in continuous monitoring throughout the procedure. 56.3% reported the AI PS was beneficial in allowing attendings to concurrently monitor a sedation case alongside dental residents. 100% of assistants

reported that the AI PS benefited their participation in sedation cases. **CONCLUSION:** As there are advancements in technology, it is important that we as providers continue to evovle and implement things such as AI to improve our ability to monitor patients and educate residents.

#PC6

Factors influencing applicants when applying to PGY-1 dental residencies

Kenneth Gozali, Reeva Mincer, Veronica Greene, Eric Sung

Graduating dental students can apply for an additional year of training (PGY-1) in programs such as an Advanced Education in General Dentistry (AEGD) or General Practice Residency (GPR). This study serves to evaluate the population of dental graduates who decide to pursue PGY-1, as well as factors that are most important to applicants. 765 applicants who matched into a PGY-1 program (AEGD or GPR) were contacted via email to complete an online survey. The survey included 14 quantitative and qualitative questions that aimed to gather information on applicant demographics, amount of student loan debt, and factors that influenced the decision to complete an additional year of training. The mean rank score for each factor was used in the analysis. 119 individuals completed the survey, which correlates to a 15.6% response rate. Overall, the most important factors were applicants' impressions of the program on interview day, current residents' feedback about the program, and program location. The factors of overall least importance were research opportunities, ability to moonlight, spouse/partner job opportunities. The data was further analyzed based on gender, age, and amount of student loan debt. The results of this study can benefit program directors to better attract residents and craft the best experiences for incoming residents.

#PC7

Assessing the degree of radiation-induced xerostomia in patients receiving radiation therapy for head and neck cancer

Maalik Konop DeFreitas, Reeva Mincer, Veronica Greene, Eric Sung

Head and neck cancers (HNC) are typically treated with surgical excision and/or radiation therapy (RT). RT is associated with secondary effects that have a negative impact on health-related quality of life, one of which is xerostomia. Newer RT, such as intensity modulated RT (IMRT), volumetric modulated arc therapy (VMAT), and stereotactic body RT (SBRT) spare adjacent, non-cancerous tissues to a greater degree than conventional three-dimensional conformation RT (3D-CRT). As a result, these newer therapies are associated with decreased levels of xerostomia, however the current literature does not assess the various levels of xerostomia among the different RT modalities for HNC. Stimulated salivary flow rates were evaluated among patients that underwent various RT modalities for HNC, as compared to baseline salivary flow rates.

#PC8

Morbidity outcomes associated with comprehensive dental treatment under general anesthesia in obese individuals: A retrospective chart review.

Justina Esuola, Reeva Mincer, Veronica Greene, Eric Sung

There has been a global increase in obesity over the past few decades, such that the Center for Disease Control and Prevention (CDC) has categorized obesity as an epidemic in both adults and children. Obesity is especially prevalent among individuals with special healthcare needs, who are often the individuals that require dental care under general anesthesia

due to a lack of cooperation for routine dental treatment. Given the increased sedation risks associated with large neck circumference, central obesity and lower functional reserve volume, individuals with obesity are at increased risk for perioperative complications. While it is well established that obese patients are more likely to develop post-operative acute respiratory failure and have higher rates of pneumonia, prolong mechanical ventilation and weaning difficulty, there is limited literature assessing the risks of performing elective dental treatment in a hospital setting under general anesthesia. A retrospective chart review from January 2016 to December 2022 was conducted for patients with special healthcare needs that presented to UCLA Ronald Raegan Medical Center for comprehensive dental care under GA. We evaluated 301 patients, 98 of which were classified as obese. Morbidity outcomes were evaluated for all individuals to evaluate a relative prevalence of peri- and post-operative complications among obese individuals with special healthcare needs, who necessitate GA in the hospital setting in order to tolerate routine dental care.

#PC9

Prevalence of odontogenic infection leading to systemic sequelae: A retrospective chart review.

Kenneth Glenn, Reeva Mincer, Kelly Vitzthum, Eric Sung

Patients presenting to the hospital with sepsis, bacteremia, leukocytosis, endocarditis, or fever of unknown origin (FUO) undergo an extensive workup to determine the source of infection, part of which includes a dental consultation. The literature is sparse regarding how many of these infections are related to an odontogenic source. This study aims to evaluate the prevalence of odontogenic infections leading to systemic infections. From July 1, 2021 to April 1, 2023, 95 patients were admitted for the aforementioned reasons and the hospital dentistry service was consulted to rule out an odontogenic source of infection.