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College of Dentistry
and Dental Clinics

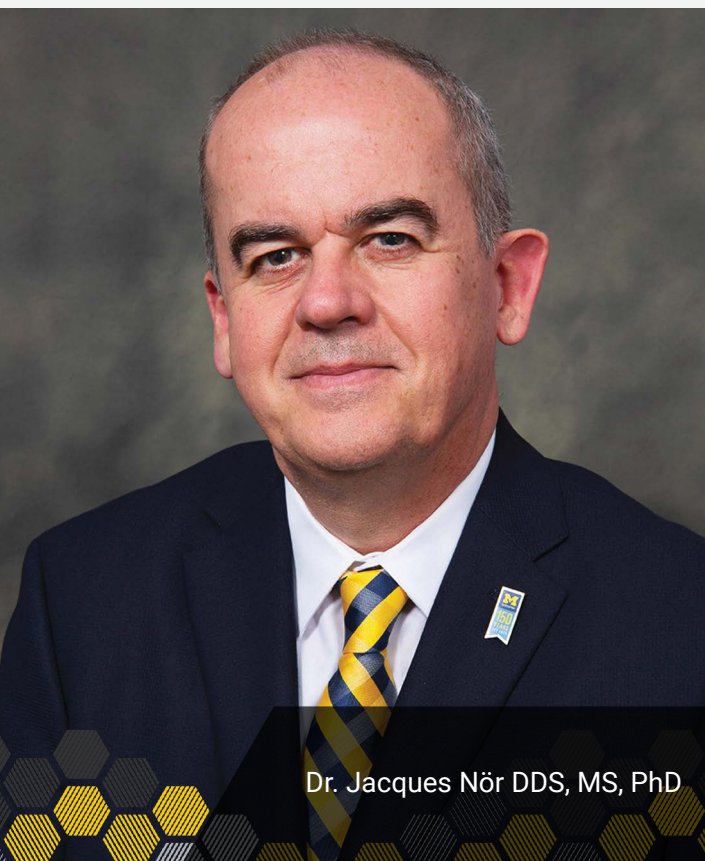
Iowa Section of the
American Association
for Dental, Oral, and
Craniofacial Research

2026

Advancing Integrity and Innovation: From
Scientific Publishing to Clinical Impact

73rd Annual Meeting

Speakers



Dr. Jacques Nör DDS, MS, PhD

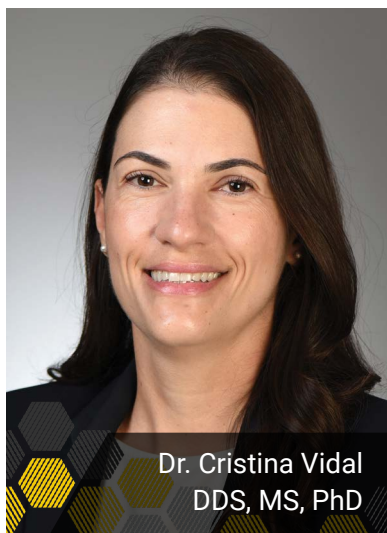
Our Keynote Speaker

Dr. Jacques Nör, DDS, MS, PhD Jacques is the Donald Kerr Endowed Professor and Dean of the University of Michigan School of Dentistry, with joint appointments in Otolaryngology and Biomedical Engineering. He is Past-President of the American Association for Dental, Oral and Craniofacial Research and has held national leadership roles with the NIH and NCI. He has published 245 peer-reviewed papers, has been continuously NIH-funded since 2002, and is a Fellow of the AADR and AAAS. He is Associate Editor of the Journal of Dental Research. His research focuses on cancer stem cell biology in head and neck and salivary gland cancers and on regulation of dental pulp stem cell fate.

Keynote Address: ***Stem cells in dental pulp tissue regeneration***

In this seminar we will discuss the scientific evidence for the use of dental pulp stem cells (DPSC) for tissue regeneration. We will also present and discuss work done in our laboratory to understand mechanisms underpinning the processes of vasculogenic and neurogenic differentiation of DPSC. And we will suggest a possible clinical workflow for the use of DPSC in the regeneration of dental pulps for treatment of necrotic immature permanent teeth.

Our Featured Speakers



Dr. Cristina Vidal
DDS, MS, PhD

Dr. Cristina Vidal is an Associate Professor and DEO in the Department of Operative Dentistry at the University of Iowa College of Dentistry. She earned her DDS and MS in Operative Dentistry from São Paulo State University and a PhD in Dental Materials from the State University of Campinas, Brazil, followed by advanced research training in Finland and the United States. Her research focuses on host-microbiome interactions in caries progression, pulp inflammation, tissue degradation, and repair, with the goal of developing therapies that preserve tooth structure and enhance dentin-pulp repair. Dr. Vidal has authored over 50 peer-reviewed publications and presented her research internationally.

Featured Address: ***Beyond Bacteria: Host-Microbiome Interactions Driving Caries Progression***

Dental caries has traditionally been viewed as a biofilm-driven disease; however, growing evidence highlights the role of host-derived mechanisms in its progression. This presentation examines how shifts in the oral microbiome regulate endogenous proteases such as matrix metalloproteinases (MMPs), which contribute to both dentin degradation and tissue repair. A host-centered perspective provides new insight into caries pathogenesis and informs therapeutic strategies that balance inhibition of destructive processes with promotion of dentin-pulp repair, advancing caries management beyond antimicrobial approaches.



Dr. Christopher Barwacz
DDS, FAGD, FACD, FICD

Dr. Christopher Barwacz is Professor and Chair of the Department of Family Dentistry at the University of Iowa College of Dentistry. He earned his DDS from the University of Iowa, completed an AEGD at Texas A&M, and an Implant Fellowship at the University of Iowa. His work focuses on clinical translational research in oral implantology, and he maintains a faculty practice limited to restorative and implant dentistry.

Featured Address:

Emergence Profile Design at the Biologic–Prosthetic Interface: Translational Evidence Guiding Digital Implant Therapy

The transmucosal emergence profile of a single-tooth implant restoration is a critical interface between prosthetic design and peri-implant biology, influencing soft-tissue stability, peri-implant health, and long-term outcomes. This presentation synthesizes current clinical evidence to examine biologic and prosthetic factors guiding optimal emergence profile design, with emphasis on translational findings from a recent randomized clinical trial at the University of Iowa College of Dentistry demonstrating how digital workflows and CAD/CAM patient-specific abutments support evidence-based clinical decision-making.

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Uncovering the Hidden World of Oral Viruses

Bacteria play a significant role in oral health, whether it's related to gingivitis or tooth decay. But for Dr. Shareef Dabdoub, assistant professor in the Department of Periodontics and the Division of Biostatistics and Computational Biology at the University of Iowa College of Dentistry, viruses may play an equally or perhaps more important role in understanding oral health.

In 2024, Dabdoub received an NIH R03 grant to investigate the oral virome, the vast population of viruses inhabiting the mouth. Although the oral microbiome has been studied extensively, the viral component remains largely uncharted. "Viruses have been overlooked primarily because they're hard to study," Dabdoub explains. "Unlike bacteria, which can often be cultured and identified through common genetic markers, viruses lack similar universal marker genes. Until recently, the technology to study them at scale simply wasn't available."

Advances in high-throughput sequencing have changed that, enabling researchers to capture the full genetic picture of oral samples. Yet challenges remain.

"When we sequence saliva or plaque, most of what we get is human DNA,"

says Dabdoub. "We can lose up to 90 percent of the data just filtering that out. And viruses make up only about five to ten percent of the biomass, so every bit of information matters."



Dr. Shareef Dabdoub receiving Teddy Bear for an R03 grant from Dean of the University of Iowa College of Dentistry and Dental Clinics, Dr. Clark Stanford, DDS, PhD, MHA

Despite these hurdles, early findings suggest that viruses, especially bacteriophages, may play a critical role in oral health. Bacteriophages are viruses that infect bacteria. “We know there are ecological shifts in viral populations between health and disease,” Dabdoub says. “Some viruses appear more often in periodontal disease than in healthy sites. But we don’t yet understand their function or how they may influence disease progression.”

That knowledge gap is what makes this research so compelling. In a single sample, Dabdoub’s team may find thousands of viruses, roughly ten times more than the typical number of bacterial species.

“The battle between bacteria and viruses has been going on far longer than our battle with bacteria,” he notes.

“Bacteria have evolved defense systems to fight off phages and phages have co-evolved anti-defense mechanisms. Understanding these interactions could open new doors for treatment.”

One promising avenue is phage therapy, that is, using viruses to target harmful bacteria. “Many antibiotics are broad-spectrum, which means they wipe out both harmful and beneficial bacteria,” Dabdoub explains. “Phages, on the other hand, are highly specific. If we can identify which phages target disease-associated bacteria, we could develop therapies that restore balance more effectively with fewer side effects.” Such precision could be especially valuable in the oral cavity, where disease often results from shifts in microbial communities rather than the arrival of foreign pathogens.

To make sense of the enormous datasets generated by metagenomic sequencing, Dabdoub employs advanced computational tools, including machine learning. “Deep learning approaches are incredibly useful for identifying viral genomes,” he says.

“Viruses evolve rapidly and often borrow genes from bacteria, so traditional database matching doesn’t work well. Machine learning can detect patterns and predict which sequences belong to viruses, even those we’ve never seen before.”

His team also uses ensemble models to predict virus-host relationships, a critical step toward understanding how phages interact with bacteria. “Knowing which viruses pair with which hosts helps us explore therapeutic potential,” Dabdoub says.

Looking ahead, Dabdoub envisions a future where oral health research integrates multiple layers of data, including DNA, RNA, proteins, and metabolites, to capture a complete picture of disease processes. “We need to move beyond identifying who’s there to understanding what they’re doing and how that fits into a systemic picture,” he says. “Combining genomics with transcriptomics and other approaches will give us an end-to-end view of how viruses, bacteria, and the immune system interact.”



Dr. Shareef Dabdoub

For now, his work is laying the foundation for that future and for a new era in oral health research. “The oral virome is a frontier,” Dabdoub says.

“We’re just beginning to understand its complexity, but the potential impact on patient care is enormous.”

Building a Safer Dental Clinic: Jeremiah Poppen's Research on Incident Reporting

When Jeremiah Poppen joined the University of Iowa College of Dentistry as a first-year student, he already knew research would be part of his journey. He had previously conducted dental research as an undergraduate and saw the Student Research Program as an opportunity to apply classroom learning to real-world challenges.

“I love the idea of problem-solving beyond the textbook,”

Poppen said. “Research gives me the chance to take what I’m learning and apply it to issues that don’t have straightforward answers.”

That mindset led him to a project focused on patient safety, an area he considers essential for his future career in oral surgery. Poppen’s research examined incident reports at the College of Dentistry before and after the introduction of a new reporting system designed to improve documentation and awareness of safety events.

For the purposes of his work, a safety event is an unexpected occurrence that could affect patient or provider well-being or the quality of treatment. These events may include medical issues such as fainting, falls, seizures, or hypertensive episodes, as well as procedural errors or patient-related behavior concerns. Tracking safety events helps identify risks, improve documentation, and strengthen protocols to ensure a safer clinical environment for everyone.

From Fainting Spells to Procedural Errors

The first phase of Poppen’s study analyzed incidents reported under the old system, which primarily captured acute medical events such as fainting or falls. The second phase compared those findings to reports collected after the new forms were implemented. The difference was striking.

“With the new system, we saw a shift toward reporting procedural errors and patient-related behavior issues,” Poppen explained.

“It gave us a more holistic picture of what’s happening in the clinics.”

This change, Poppen believes, reflects an evolving safety culture, one that encourages transparency and preparedness. “Dentists enter the profession to care for patients, but sometimes systems for managing unexpected events aren’t top of mind,” he said. “Better reporting helps us recognize patterns and prepare for what’s most likely to happen.”



Dr. Kecia Leary, Associate Dean for Clinics and Poppen’s mentor

Dr. Kecia Leary, Associate Dean for Clinics and Poppen’s mentor, sees the project as an important contribution to patient care. “Jeremiah’s involvement in patient safety research fosters a culture of learning and continuous improvement that can lead to safer care for all patients and providers,” Leary said.



Jeremiah Poppen presenting a poster at the Iowa Section of the AADOCR.

Lessons for Future Practice

Poppen's findings have practical implications for dental education and clinical protocols. For example, syncope—patients feeling faint—was among the most common incidents in the first year of data.

“As students, we can prevent some of these events by taking simple steps like having a patient sit up in the middle of long procedures,”

he said.

The research also highlighted the complexity of patient health profiles. “I was surprised by how many medications patients are on,” Poppen noted. “It’s a reminder that interactions matter and that some patients are medically complex at higher rates than we might expect.”

Mentorship and Growth

Poppen credits his mentors, Dr. Leary, Dr. Alberto Gasparoni, and Dr. Teresa Morgan, for guiding him through the projects. “Research can go in a hundred directions,” he said. “They helped me focus on what matters most and stay true to the data.”

Poppen speaks glowingly of the Student Research Program, which is something for a person with such a lowkey demeanor. For Poppen, the program reinforced the idea that dentistry is more than daily clinical work. “It’s about contributing to the field and improving patient care,” he said. “Research gives me a lens to evaluate problems and make informed decisions throughout my career.”

Looking ahead, Poppen hopes to continue blending research with practice. “Dentistry will change dramatically over the course of my career,” he said. “Staying connected to research ensures I can adapt and provide the best care possible.”

A Tapestry of Support: Four Professionals Strengthening Iowa Dentistry's Research Enterprise

At the University of Iowa College of Dentistry, research is more than discovery. It is a collaborative effort woven together by individuals who ensure that every study, seminar, and submission is supported with care and precision. Across the college, in addition to our excellent Grant Support Team, we have four other members of the research support team: Sheila Britton, Sara Miller, Abby Thomas, and Michael Tilley, each of whom play distinct roles in sustaining the infrastructure of research. Their work forms a tapestry of support that enables faculty, students, and staff to pursue meaningful inquiry and innovation.

Sara Miller: Coordinating Clinical Research with Care

As a liaison between investigators, sponsors, university offices, and research participants, Sara Miller plays a central role in managing clinical research at Iowa Dentistry. She supports more than 89 principal investigators and oversees the coordination of over 150 research subjects involved in complex, more-than-minimal risk clinical trials. Her work ensures compliance with HIPAA, IRB, Environmental Health and Safety, ClinicalTrials.gov, and IT policies, while also facilitating communication across departments and institutions. With a deep understanding of regulatory frameworks and a commitment to patient-centered research, Miller helps transform clinical ideas into actionable studies.



Abby Thomas: Organizing the Infrastructure of Research Excellence



Abby Thomas provides executive and strategic support to the Office of the Associate Dean for Research. She coordinates monthly research meetings, manages internal grant programs such as Seed Grants and CRISP, and maintains databases that track research metrics, funding, and outcomes. Thomas also supports faculty through promotion and tenure processes, award nominations, and candidate visits. Her attention to detail, organizational leadership, and convivial nature ensure that the college's research operations run smoothly and that faculty have the resources they need to succeed.

Sheila Britton:

Championing Student Research and Training



Sheila Britton's work centers on supporting student researchers and trainees. She coordinates the Student Research Program and the Oral Science graduate programs, managing meetings, registrations, thesis defenses, and celebrations. Britton also plays a key role in the administration of the T90/R90 training grant, organizing mentoring sessions, workshops, and annual progress reporting. Her efforts foster a vibrant research culture among students and trainees, helping them navigate academic milestones and connect with mentors. Britton's event planning and program coordination create a welcoming and structured environment for emerging scholars.

Michael Tilley: Communicating Research with Clarity and Impact

Michael Tilley leads the college's science writing and editorial efforts, supporting faculty in drafting and refining grant applications and peer-reviewed publications. He also writes and edits web articles, newsletters, and research features that highlight the college's achievements. Tilley manages research-related content across internal and public-facing websites and in the collegiate newsletter, the Hawkeye Smile. His work ensures that Iowa Dentistry's research is communicated clearly, professionally, and accessibly connecting discoveries to broader audiences and reinforcing the college's reputation for excellence.



Together, these four professionals, alongside the Grant Support Team of Ann Lawler, Mikaela Rhoads, and Lisa Ringen, exemplify the breadth and depth of research support at Iowa Dentistry. Their roles may differ, but their shared commitment to collaboration, precision, and service strengthens the college's research mission. Like threads in a tapestry, their contributions interweave to form a resilient and dynamic foundation. A foundation that enables Iowa Dentistry to thrive as a leader in oral health research.

Program

Iowa Section of the American Association for Dental, Oral, and Craniofacial Research (AADOCR)
73rd Annual Meeting, Tuesday, February 10, 2026

- | | |
|---------------------------|--|
| 7:30 a.m. | Breakfast
(First Floor Link)
Morning addresses will be presented in the Galagan Auditoria |
| 8:00 a.m. | Welcome Address
Dean Clark Stanford |
| 8:10 a.m. | Welcome Address, and Introduction of Featured Speakers
Associate Dean for Research, Dr. Jeffrey Banas |
| 8:20 a.m. | Featured Speaker
Dr. Cristina Vidal
<i>"Beyond Bacteria: Host-Microbiome Interactions Driving Caries Progression"</i> |
| 8:37 a.m. | Featured Speaker
Dr. Chris Barwacz
<i>"Emergence Profile Design at the Biologic–Prosthetic Interface: Translational Evidence Guiding Digital Implant Therapy"</i> |
| 8:55 a.m. | Keynote Speaker Introduction
Dr. Ariene Leme-Kraus |
| 9:00 a.m. | Keynote Address
Dr. Jacques Nör
<i>"Stem cells in dental pulp tissue regeneration"</i> |
| 9:45 a.m. | Break |
| 10:15 - 11:45 a.m. | Oral Presentations
Session 1: Behavioral Science, Education, Epidemiology & Public Health (W433)
Session 2: Biomaterials, Regenerative Strategies, and Drug Delivery (Galagan A)
Session 3: Clinical Outcomes, Diagnostics, & Treatment Effectiveness (Galagan B)
Session 4: Craniofacial Genetics, Development, & Tissue Patterning (Galagan C)
Session 5: Oral Immunology, Host–Microbe Interactions, & Microbial Pathogenesis (N212 Oral-B) |
| 12:00 - 1:00 p.m. | Poster Presentations
(Iowa Institute for Oral Health Research, Fourth Floor Link, W220 A/B) |

Letter from Dean Stanford

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**College of Dentistry
and Dental Clinics**

Dear Colleagues,

Thank you for joining us for the 73rd Iowa Section of the American Association for Dental, Oral, and Craniofacial Research, held at the University of Iowa on February 10, 2026.

At the University of Iowa College of Dentistry and Dental Clinics, research continues to be a defining part of our mission. Our college has long been recognized for advancing dental, oral, and craniofacial science, and the discoveries emerging from our community of scholars continue to shape clinical practice and improve patient outcomes. This progress is driven by the dedication and curiosity of our faculty, students, and research teams who work every day to push the boundaries of knowledge.

Today's presentations showcase the breadth of innovative work taking place across our college. I am grateful to all presenters, mentors, and the planning committee for their thoughtful contributions to this year's program.

We are honored to welcome Dr. Jacques E. Nor, DDS, MS, PhD, as our keynote speaker. Dr. Nor serves as the Donald A. Kerr Collegiate Professor of Dentistry and Dean of the University of Michigan School of Dentistry. He is also a Professor in the Department of Cariology, Restorative Sciences and Endodontics, and holds an appointment in Otolaryngology–Head and Neck Surgery at the University of Michigan Medical School.

Dr. Nor is internationally recognized for his influential work in cancer biology, stem cell science, and tissue regeneration, and he is an active member of several major research centers, including the Rogel Cancer Center and the Center for Cell Plasticity and Organ Design. His leadership and scientific contributions make him an exceptional voice to help guide and inspire our discussions today.

This gathering is an opportunity to reflect on how research strengthens every dimension of our mission—education, service, discovery, and patient care.

Thank you for your continued commitment to advancing knowledge and improving the health of the communities we serve.

A handwritten signature in blue ink, appearing to read "Clark Stanford", with a long horizontal flourish extending to the right.

Clark Stanford, DDS, PhD, MHA
Dean and Professor
University of Iowa, College of Dentistry and Dental Clinics

Letter from the Associate Dean for Research and the Director of the Iowa Institute for Oral Health Research

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College of Dentistry
and Dental Clinics

Dear Colleagues,

The Annual Meeting of the Iowa Section of the AADOCR is a celebration of the innovation, collaboration, and scientific excellence that define the research mission of the University of Iowa College of Dentistry. This year's gathering reflects the strength of our research enterprise and our deep commitment to advancing oral, craniofacial, and dental health.

In 2025, our investigators received 43 grant awards, securing nearly \$9 million in new external funding from federal, state, and foundation sources. Our internal seed grants and clinical/educational grants are setting up future research successes by developing the infrastructure and pilot studies necessary to generate new knowledge and translate discoveries into improved oral health care.

Our student research program continues to thrive. This past year, it was recognized for having the greatest number of student researchers registered nationally, and with 46 predoctoral students funded this year, Iowa will remain a leader in cultivating the next generation of clinician-scientists. Likewise, our graduate and post-doctoral programs continue to thrive with support from our advanced programs and from our NIH T90/R90 training program.

Today's program highlights the breadth and depth of our research portfolio. We are honored to welcome keynote speaker Dr. Jacques Nor, Dean of the University of Michigan School of Dentistry, who is a global leader in oral cancer and in dental pulp stems cells and vascular biology. We are also pleased to feature Dr. Chris Barwacz and Dr. Cristina Vidal, both of whom are highly accomplished clinician scholars in the fields of implantology and dental materials and caries progression, respectively.

Thank you for your dedication to our shared mission. Your contributions are the foundation of our success, and we are proud to celebrate your achievements today.

Warm regards,



Jeffrey A. Banas, PhD
Associate Dean for Research



Liu Hong, MD, PhD
Professor and Director of the
Iowa Institute for Oral Health Research

Letter from Officers of the Iowa Section of the AADOCR

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College of Dentistry
and Dental Clinics

On behalf of the Iowa Section of the American Association for Dental, Oral, and Craniofacial Research (AADOCR), we are delighted to welcome you to the 73rd Annual Meeting. This year's theme, "Advancing Integrity and Innovation: From Scientific Publishing to Clinical Impact," reflects our shared commitment to rigorous science, transparent communication, and meaningful translation of research into improved patient care.

The University of Iowa College of Dentistry and the Iowa Institute for Oral Health Research continue to lead in advancing knowledge across basic, translational, and clinical domains. Our research enterprise thrives because of the dedication of faculty, students, and staff who pursue discoveries that shape the future of oral and craniofacial health. This meeting is an opportunity to showcase those efforts and foster collaborations that amplify our impact.

We are honored to feature Dr. Jacques Nor, Dean and Professor at the University of Michigan School of Dentistry, as our keynote speaker. Dr. Nor is a world-renowned researcher in pathobiology and cancer therapy, and his experience and knowledge will inspire dialogue on integrity and innovation in science. Joining him are two of Iowa's outstanding investigators: Dr. Chris Barwacz, whose work as a clinician researcher has made him a leader in personalized and optimized implantology, and Dr. Cristina Vidal, whose research in dental adhesion, biomaterials, and caries progression also draws from her expertise as a scientist and clinician. Together, these speakers exemplify the breadth of research that drives progress from bench to chairside.

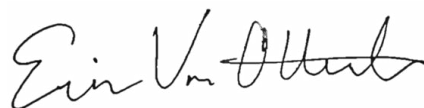
Equally central to our mission is the vibrant student research community. Oral and poster presentations by graduate and dental students highlight emerging ideas and underscore the importance of mentorship and training in shaping the next generation of clinician-scientists. These contributions not only enrich our academic environment but also influence the future of oral health care worldwide.

We invite you to engage fully in today's sessions, share your insights, and explore opportunities for collaboration. Your participation strengthens our collective effort to uphold integrity and accelerate innovation in dental, oral, and craniofacial research.

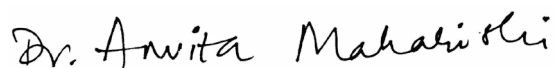
Thank you for being part of this dynamic community. We look forward to an inspiring day of discovery and dialogue.



Ariene Leme-Kraus, DDS, MSc, PhD
President, Iowa Section of the AADOCR
Assistant Professor
Department of Operative Dentistry



Eric S. Van Otterloo, PhD
President-Elect, Iowa Section of the AADOCR
Associate Professor
Iowa Institute for Oral Health Research



Anvita Maharishi, BDS, MS, MMSc
Vice President, Iowa Section of the AADOCR
Assistant Professor
Department of Family Dentistry



Sheila Britton
Secretary/Treasurer, Iowa Section of the AADOCR
Program Coordinator
Iowa Institute for Oral Health Research

Abstracts

Presenters are **underlined** Mentors are *italicized*

Oral Session 1: Behavioral Science, Education, Epidemiology & Public Health

1. Cannabis Use, Dental Anxiety, and Oral Health-Related Quality of Life



Jessica C. Gomez¹, M. Matkovich¹,
L.B. Young¹

¹University of Iowa, Iowa City, IA

Objective: The relationship between dental anxiety, oral health, and cannabis use is inadequately understood. This study asked current cannabis users about their dental anxiety, oral health related quality of life (OHRQoL), and cannabis use.

Methods: An online survey of adult cannabis users was administered via Qualtrics. Cannabis use was measured using the Daily Sessions, Frequency, Age of Onset, and Quantity of Cannabis Use Inventory (DFAQ-CU). It includes six measures: daily sessions, frequency, age of onset, and quantity of marijuana, concentrates, and edibles. The Modified Dental Anxiety Scale (MDAS) and Oral Health Impact Profile (OHIP-14) were also administered. The OHIP-14 total score also comprises seven subscales: functional limitation, physical pain, psychological discomfort, physical disability, social disability, and handicap. Correlation analysis was used with $p < .05$.

Results: Those who completed all three measures comprised the sample ($N = 257$). Eighty-eight participants (34.2%) had used cannabis to manage dental anxiety and 69 (26.8%) had used cannabis to manage oral pain. A logarithmic transformation adjusted for non-normality of age of onset, concentrate quantity, and edible quantity. Kendall's tau correlations were then calculated between the six cannabis use variables and the MDAS and OHIP-14. Only 11 of 54 correlations were significant, and effects were small ($t = 0.09 - .21$). Dental anxiety was associated only with frequency of cannabis use ($t = 0.09$, $p < 0.045$), which was also associated with the OHIP-14 total score ($t = 0.11$, $p < 0.009$) and six of seven subscales. The strongest correlations were between marijuana quantity and OHIP-social disability ($t = 0.21$, $p < 0.008$) and OHIP-handicap ($t = 0.19$, $p < 0.015$).

Conclusion: Managing dental anxiety and oral pain with cannabis is common among current cannabis users. Among this group, frequency of use is positively, but weakly, associated with dental anxiety and poorer OHRQoL.

Supported by: University of Iowa College of Dentistry Student Research Program

2. Epidemiology, Clinicopathologic Features, and Prognosis of Ameloblastoma: A 22-Year Retrospective Study



Kittiphoj Tikkhanarak¹, N. Handoo¹, J.W. Hellstein¹, T. Busch¹, A.L. Petrin¹, E. Zeng¹, H. Sun¹, M. Dunnwald¹, *A. Butali¹*

¹University of Iowa, Iowa City, IA

Objective: Ameloblastoma is the most common odontogenic neoplasm of the jaws, characterized by locally aggressive behavior and high recurrence potential. Although its clinicopathologic

features have been described in global populations, large-scale institutional data from the United States (U.S.) remain limited. This study aims to characterize the epidemiologic and clinicopathologic features of conventional ameloblastoma over a 22-year period and to identify factors associated with recurrence in cases submitted to a single U.S. academic surgical oral pathology laboratory.

Methods: A retrospective review was conducted of 123 cases of conventional ameloblastoma submitted to the Surgical Oral Pathology Laboratory at the University of Iowa which receives specimens from various states in the U.S. Data included patient demographics, tumor site, radiographic findings, histologic subtypes, treatment modality, and follow-up information. Recurrence-free survival was analyzed using Kaplan-Meier and log-rank tests, and predictors of recurrence were evaluated by Cox proportional hazards modeling.

Results: Among the 123 cases, the mean age was 51 years (range: 11-93), and 56.9% were male. Most tumors involved the mandible (91.9%). Of the 90 cases with available radiographic findings, 54.4% were unilocular, 37.8% multilocular, and 7.8% mixed radiolucent-radiopaque. The most common histologic subtype was follicular admixed with other subtypes (61.8%). Among 39 patients with treatment data, 23 (59.0%) underwent resection, 11 (28.2%) had enucleation and curettage, and 5 (12.8%) received enucleation with peripheral ostectomy. Follow-up information was available for 35 patients, of whom 15 (42.9%) experienced recurrence within 8-360 months. Recurrence-free survival differed significantly by treatment modality ($p = 0.004$), with resection associated with markedly improved outcomes compared with more conservative treatments ($p = 0.028$).

Conclusion: This study reinforces the importance of surgical treatment selection in the prognosis of ameloblastoma and highlights the need for careful surgical planning to minimize recurrence. Additionally, mixed histopathologic subtypes within the tumor limited the prognostic value of histologic subclassification.

3. Exploring Procedure Mix Changes Post-2018 Iowa Medicaid Annual Benefit Maximum



Kim N. Vo¹, S. Lewis¹, *J.C. Reynolds¹*,
J.M. Sukalski¹

¹University of Iowa, Iowa City, IA

Objective: In July 2018, Iowa Medicaid introduced a \$1,000 Annual Benefit Maximum (ABM) for adult dental benefits. Despite growing use of ABMs, only one study examined the impact of Medicaid ABMs on dental service use. Our study explores differences 1) between adults pre-policy who would, and would not, have exceeded the ABM, and 2) in procedure mix before and after Iowa's ABM implementation.

Methods: Electronic record data from the Iowa College of Dentistry included new adult patients with Medicaid seeking comprehensive care between July 2017, and June 2019, and attended their first appointment in the fall semester.

Variables include demographics, insurance status, and provider level. Procedure distributions were compared among patients with Medicaid before (July 2017–June 2018) and after ABM implementation (July 2018–June 2019). A subgroup analysis of pre-ABM patients examined those who would and would not have exceeded the ABM.

Results: A total of 428 subjects met inclusion criteria. Among pre-ABM patients (n=238), one quarter would have exceeded the ABM had it been in place. Patients who would have exceeded the ABM were more likely to be from rural areas ($p < 0.001$) and ages 40-59 ($p = 0.009$), compared to patients who wouldn't have exceeded the ABM. From 2017 to 2018, fixed prosthodontics decreased from 7.2% to 1.6% ($p = 0.005$), and oral and maxillofacial surgery decreased from 42% to 30% ($p = 0.09$).

Conclusion: Our study found a significant decline in fixed prosthodontics and oral and maxillofacial care post-ABM, with those living in rural areas and middle-aged adults most likely to be impacted.

Supported by: University of Iowa College of Dentistry Student Research Program

4. MiNDSET: A Modular Framework Evaluating Normalization and Differential Abundance Methods



Priyanka Singh¹, S. Rajaram¹, L. Jayasinghe¹, E. Zeng¹

¹University of Iowa, Iowa City, IA

Objective: The choice of normalization and differential abundance methods can profoundly influence microbiome analysis results. Yet

many studies rely on fixed or convenience-based method combinations, despite wide variation in study designs and key data characteristics such as sparsity, compositionality, and overdispersion. The lack of systematic, data-aware guidance has contributed to inconsistent biological conclusions and limited reproducibility across microbiome research.

Methods: We developed MiNDSET (Microbiome Normalization and Differential Analysis for Statistical Evaluation and Testing), an open-source, modular framework for benchmarking microbiome analysis pipelines. MiNDSET integrates 21 normalization approaches spanning count-based scaling, log-ratio compositional transformations, variance-stabilizing methods, and sparsity and zero-inflation aware normalization strategies. Normalized outputs are systematically paired with 27 differential abundance analysis methods representing count-based probabilistic models, zero-inflated and hurdle frameworks, compositional inference techniques, and regression-based multivariate models. MiNDSET supports binary, multiclass, longitudinal, and zero-inflated study designs and generates standardized diagnostic visualizations including boxplots, MA plots, and volcano plots. Performance was assessed using receiver operating characteristic area under the curve (ROC AUC), sensitivity, false discovery behavior, effect size stability under resampling, and biological coherence.

Results: MiNDSET was evaluated using simulated datasets with known ground truth and real-world metagenomics (MG) and metatranscriptomics (MT) datasets. Performance of normalization-differential abundance combinations is strongly data-dependent, and no single pipeline performs optimally across all settings. ROC AUC-based benchmarking revealed substantial performance variability

across pipeline choices, frequently exceeding differences attributable to biological condition alone. MiNDSET-selected pipelines yield more stable effect estimates, improved reproducibility, and more biologically interpretable results, whereas non-adaptive approaches showed inflated false discoveries or unstable feature rankings.

Conclusion: MiNDSET provides a systematic, data-driven framework for selecting effective normalization-differential abundance combinations tailored to specific microbiome datasets. By enabling transparent benchmarking at scale, MiNDSET promotes reproducibility and best-practice microbiome differential analysis. The source code for MiNDSET can be found on our GitHub repository.

Supported by: James S. and Janice I. Wefel Memorial Research Award

5. Orthodontic Residents' Perceptions of Their Onboarding Experience: A Pilot Study



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Objective: Asynchronous learning content has become increasingly popular and has been shown to increase learning outcomes

for students. This pilot study within the University of Iowa Orthodontic Department aimed to evaluate orthodontic residents' perceptions of their onboarding experience with and without the introduction of asynchronous learning content into the curriculum.

Methods: Fifteen residents engaged in the same onboarding experience focused on preparing the residents to master taking patient records and applying orthodontic brackets. Five other residents (separate cohort) completed the same onboarding with the addition of asynchronous learning content. Thirteen short, asynchronous videos were created using Camtasia software. After completing onboarding, all 20 residents submitted a survey highlighting areas of strength, weakness, and overall effectiveness. Each resident's response was then subjected to qualitative analysis using open coding for themes and valence, where applicable.

Results: The fifteen residents rated the overall effectiveness of onboarding before the introduction of asynchronous content as 7.7 out of 10. After the introduction of asynchronous content, the five residents rated onboarding effectiveness as 9 out of 10. Furthermore, the five residents exposed to the short, asynchronous videos recommend them to future classes but would have preferred to receive them before the residency start date. Emergent themes from all twenty resident responses revealed that the onboarding process is overwhelming with the volume of information presented in a short time frame, but most felt adequately prepared to take clinical records and bond brackets on patients.

Conclusion: Overall, residents exposed to asynchronous learning are more satisfied with their preparation during onboarding training within the Orthodontic Department. Engaging the residents with a survey of their impressions also produced many suggestions to enhance learning effectiveness for future resident cohorts. These findings provide an opportunity to restructure the onboarding curriculum to provide a strong foundation of knowledge for future first-year orthodontic residents.

Supported by: University of Iowa College of Dentistry Department of Orthodontics

6. Desensitizing Agents and Aging Effects on Eroded Dentin Bond Strength



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Objective: To evaluate the influence of different desensitizing agents on the bond strength of sound and eroded dentin after 24 hours and 6 months of aging.

Methods: Eighty extracted sound premolars were flattened on the buccal surface to expose dentin and randomly assigned to sound and eroded groups. Erosion was induced by citric acid cycling (1%, pH = 2.4, 5 min, 3x/day, 5 days) with storage in simulated body fluid (SBF) between cycles. Specimens received: no treatment (control), Gluma, nanohydroxyapatite-based gel (Predicta Bioactive), or silver diamine fluoride with potassium iodide (SDF + KI, RivaStar). After desensitizer application, specimens were stored in SBF (37 °C for 7 days) and restored with Scotchbond Universal adhesive and Filtek Supreme composite following manufacturer's directions. Resin-dentin specimens were sectioned and tested for microtensile bond strength (TBS) at 24h and 6mo of storage in SBF at 37 °C, using a universal testing machine (Zwick/Roell) with a crosshead speed of 0.5 mm/min. Data were analyzed using repeated-measures and one-way ANOVA with Bonferroni and Tukey–Kramer post-hoc tests ($\alpha = 0.05$).

Results: Repeated measures ANOVA revealed significant effects of material (control, Gluma, Predicta, SDF, $p < 0.001$), condition (sound vs. eroded, $p = 0.012$), and time (24h vs. 6mo, $p < 0.05$), with a significant condition $\times$ time interaction ($p = 0.009$). All groups exhibited decreased bond strength after 6 months, except Predicta on sound dentin ($p = 0.278$). At 6 months, Predicta eroded presented significantly lower TBS than sound ($p < 0.001$), and eroded Predicta specimens declined significantly from 24h to 6mo ($p < 0.001$). Overall, Gluma > Predicta > Control > SDF, with eroded dentin showing significant degradation ($p < 0.05$).

Conclusion: Gluma achieved the highest overall TBS, whereas SDF had the lowest TBS. Predicta remained stable on sound dentin. Eroded dentin bond strength was lower at all timepoints regardless of the applied desensitizing agent.

Supported by: Ralph Phillips Student Research Award; James S. and Janice I. Wefel Memorial Research Award

7. Effect of Surface Treatment on Speed Sintered Chairside Graded Zirconia



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Objective: Strength-graded zirconia has a unique distribution of yttria concentration within the block (3 mol% to 5 mol%), whereas color-graded zirconia has variable translucency making them more esthetic. With speed sintering furnaces, sintering can be performed chairside for single-unit restorations in approximately 9 to 18

minutes. Surface treatment on graded zirconia may influence their mechanical properties. The purpose of this study was to investigate strength with varied surface treatments and optical properties of speed sintered chairside graded zirconia blocks.

Methods: Discs, $12 \times 1.2 \pm 0.2$ mm, were milled from three commercially available chairside CAD/CAM graded zirconia blocks (Table 1) (N=54). Milling was performed (Primemill, Dentsply Sirona) to simulate fabrication effects on restorations' intaglio surface. After milling, discs were sintered per manufacturer's recommendations in speed sintering furnaces (Ivoclar Programat CS6, Ivoclar Vivadent and CEREC SpeedFire, Dentsply Sirona) and surface treatments were performed (Table 2). Biaxial flexural strength was measured using a piston-on-three-ball test in a universal testing machine (Instron, Canton, MA) per ISO 6872:2015. Specimens (N=18), $14 \times 14 \times 1 \pm 0.1$ mm, shade A2, were sectioned using a water-cooled slow-speed saw (Isomet, Buehler), sintered in speed sintering furnaces and polished to 2,000 grit SiC abrasive paper. Light transmission was measured in benchtop spectrophotometer (X-rite Ci-7600). Means and standard deviations (SD) were calculated. Analysis of variance and pairwise comparison tests were performed with post hoc tukey's test to evaluate the effects of surface treatment on each material ($P > 0.05$).

Results: One-way ANOVAs indicated different surface treatments have a statistically significant effect on biaxial flexural strength of three materials tested ($p < 0.05$). All layers for three materials differed from one another in absolute light transmission.

Conclusion: Surface treatment with alumina showed a significant reduction in biaxial flexural strength for three commercially available speed sintered graded chairside zirconia blocks. Optical properties were comparable for all materials by location.

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8. Gingival Fibroblasts Derived Nanovesicles Enable Fludrocortisone Delivery for Bone Regeneration



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Objective: Cell membrane-derived nanovesicles (mNVs) have emerged as a promising drug delivery system due to native biocompatibility, tissue homing, and barrier-crossing abilities. Among various sources, mesenchymal stem cell (MSC)-derived mNVs are the most studied, but are limited by invasive harvesting, low yield, and slow proliferation. In contrast, human gingival fibroblasts (hGFs), abundant in gingival tissue, proliferate rapidly and can be obtained through minimally invasive procedures. However, their mNVs have not yet been explored for drug delivery and bone regeneration. The clinical drug fludrocortisone acetate (FA) has shown promise in promoting osteogenesis, although its translational potential remains unexplored. Herein, we developed innovative hGF-derived mNVs loaded with FA and immobilized them onto a polycaprolactone/ hydroxyapatite (PCL/HA) nanofibrous scaffold for potential bone regeneration applications.

Methods: hGF membranes were isolated and loaded with FA to obtain FA@mNVs. Particle size and zeta potential were measured by dynamic light scattering, and cellular uptake by hMSCs was visualized via confocal microscopy. The effects on cell migration were evaluated by Transwell assays, and osteogenic differentiation was assessed by alkaline phosphatase (ALP) activity and Alizarin Red S (ARS) staining. Anti-inflammatory effects were assessed in THP-1 macrophages by ELISA. Finally, HA-coated PCL scaffolds were fabricated and functionalized with mNVs or FA@mNVs for sustained release.

Results: mNVs (≈ 600 nm, -10.25 mV) were efficiently internalized by hMSCs within 6 hours (Fig. 1). Remarkably, FA@mNVs significantly promoted cell migration, upregulated ALP activity, and enhanced mineralization. Additionally, FA@mNVs significantly mitigated the expressions of TNF- α and IL-6. Furthermore, PCL/HA scaffolds achieved over 90% FA@mNV loading efficiency via electrostatic interactions and sustained release over 7 days.

Conclusion: hGF-derived mNVs efficiently delivered FA through effective cellular uptake. FA@mNVs enhanced cell migration, promoted osteogenic differentiation, and inhibited inflammation *in vitro*. Ongoing studies are evaluating the therapeutic efficacy of FA@mNVs-loaded PCL/HA scaffolds in critical-sized bone defects.

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9. Metabolite-Derived Polymer Modulates Cell Metabolism Through Mitochondrial Regulation



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Objective: Chronic inflammation and excessive reactive oxygen species (ROS) accumulation can adversely affect osteogenic differentiation and bone regeneration, at least partially

due to mitochondrial dysfunction and disrupted metabolic homeostasis, as suggested by emerging evidence. Alpha-ketoglutarate (AKG), a key tricarboxylic acid (TCA) cycle intermediate, is vital to mitochondrial energy metabolism and redox regulation. However, the direct intracellular delivery of soluble AKG is limited by its instability and poor membrane permeability. In this study, we synthesized an AKG-derived polymer (PAKG) capable of forming phagocytosable and biodegradable nanoparticles and release AKG intracellularly, to investigate its potential to modulate mitochondrial metabolism under conditions of inflammatory and oxidative stress.

Methods: PAKG nanoparticles (~ 100 nm) were fabricated via condensation polymerization of AKG-based monomers, followed by nanoprecipitation. The phagocytosability was evaluated with MC3T3-E1 cells using Confocal Microscopy. Their ROS-scavenging capacity was quantified using hydrogen peroxide assays. Mouse bone marrow mesenchymal stem cells (mBMSCs) were exposed to IL-1 β or H₂O₂ to induce mitochondrial dysfunction. PAKG was then applied to evaluate its protective effect on mitochondrial activity through ATP quantification, intracellular ROS measurement, JC-1 staining for mitochondrial membrane potential, alkaline phosphatase (ALP) activity assays, and wound-healing migration analysis.

Results: PAKG could be easily phagocytosed by cells and co-localized with the mitochondria. PAKG effectively scavenged hydrogen peroxide and prevented H₂O₂-induced reduction of ALP activity, suggesting its antioxidative potential. Under IL-1 β treatment to simulate inflammation, PAKG significantly restored intracellular ATP production, reduced ROS accumulation, and preserved mitochondrial membrane potential as evidenced by recovery of the JC-1 red/green fluorescence ratio. Furthermore, PAKG treatment rescued IL-1 β -induced inhibition of cell migration, indicating functional restoration of mitochondrial-dependent cellular behaviors.

Conclusion: The metabolite-derived polymer PAKG demonstrated potent antioxidative and mitochondria-protective properties by delivering bioactive AKG intracellularly and modulating mitochondrial metabolism. These findings highlight PAKG as a promising bio-energetic polymer for rescuing impaired mitochondrial function. They suggest its broad applicability in enhancing cell metabolism and tissue regeneration across diverse pathological conditions.

Supported by: NIDCR R01 DE029159, R21 DE033019

10. Pilot Testing of RNA Based Therapeutic Approaches for Bone Regeneration



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Objective: Currently, BMP2 protein is delivered via bone graft and must be delivered in high concentrations to be effective. However, these high concentrations of BMP2 protein

have been shown to result in adverse side effects. The objective of this pilot study is to investigate the osteoblast differentiation capabilities of circular RNA encoding BMP2.

Methods: Circular RNA encoding human BMP2 gene was produced by T4 thymidylate synthase (td) intron-based system. 293T and MC3T3-E1 cells were used to measure RNA transfection efficiency, RNA stability, and osteoblast differentiation capability. GFP protein production was visually inspected using fluorescent microscopy, qPCR was used to assess BMP2 circular RNA and modified linear RNA stability *in vitro*, and ALP was used to quantitatively assess osteoblast differentiation based on ALP protein production.

Results: Over one week, fluorescence measurements showed prolonged expression of EGFP, with the highest expression levels on Day 2 for transfected circular RNA. Over a four-day period, the results of qPCR showed minimal degradation of BMP2 of circular RNA with the highest levels of expression on Day 2.

Conclusion: This pilot study has successfully cloned BMP2 into circular RNA and showed that circular RNA can be efficiently translated *in vitro*. The cloned BMP2 will be useful in future studies to further investigate RNA expression through additional qPCR and ALP testing. Additional optimization of the transfection protocol could further improve the stability and translation efficiency of BMP2. Long term goals of this study are to develop RNA based therapeutic approaches for bone regeneration *in vivo*.

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11. Using Exogenous Mitochondrial Transfer to Test Cellular Rescue Potential



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Objective: Mitochondrial dysfunction is increasingly recognized as a key factor in impaired bone remodeling and regeneration, particularly in conditions such as periodontal disease. Damaged or aged mitochondria reduce osteogenic capacity and promote inflammatory bone loss, yet therapeutic approaches targeting this dysfunction remain limited. While mitochondrial transfer has demonstrated potential to restore energy production and cellular viability in other tissues, data supporting its application in bone regeneration is sparse. Adipose-derived stem cells (ADSCs) offer an appealing and accessible source of functional mitochondria, creating an opportunity to restore bioenergetic function in bone marrow stromal cells (BMSCs) essential to bone health. The objective of the project is to determine whether mitochondria isolated from ADSCs can spontaneously transfer into BMSCs and whether such transfer can mitigate metabolic dysfunction induced by stress conditions mimicking inflammation.

Methods: Mitochondria were isolated from murine inguinal ADSCs and incubated with BMSCs for 24 hours. Live cell confocal fluorescence imaging confirmed intracellular uptake and co-localization of ADSC mitochondria with endogenous BMSC mitochondria, each distinctly labeled with mitochondria-specific fluorescent dyes. Lipopolysaccharide (LPS) treatment was used to induce cellular stress. Intracellular ATP concentration, total protein, and alkaline phosphatase (ALP) activity were quantified to evaluate potential recovery effects following mitochondrial transfer.

Results: Exogenous ADSC mitochondria successfully entered BMSC cytoplasm and localized with native mitochondrial networks. LPS exposure reduced ATP production and ALP activity across experimental groups; however, mitochondrial transfer did not produce a statistically significant rescue effect, likely due to variability among control conditions and absence of an optimized transfer protocol.

Conclusion: Spontaneous mitochondrial uptake from ADSCs into BMSCs was confirmed, establishing a foundation for future studies investigating mitochondrial transfer as a potential therapeutic strategy to restore metabolic function and support bone regeneration in stress-compromised cells.

Supported by: NIDCR R01 DE029159; University of Iowa College of Dentistry Student Research Program

Oral Session 3: Clinical Outcomes, Diagnostics, & Treatment Effectiveness

12. Advanced Assessment of Forces During Rapid Maxillary Expansion



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Objective: Maxillary transverse deficiency is a prevalent clinical condition often associated with dental crowding, functional mandibular shifts, posterior crossbites, and potentially asymmetric growth. Rapid maxillary expansion (RME) is commonly employed to correct this discrepancy by separating the midpalatal suture. However, few studies have quantified the forces generated during active expansion. This study aimed to establish a novel *in vivo* methodology for measuring expansion forces and to evaluate how maxillary anatomical characteristics influence the magnitude of forces and their transmission patterns.

Methods: Fifty-eight patients aged 7–16 years were treated with either two- or four-banded Hyrax-style RMEs. Inter-molar width and palatal height were recorded at baseline using 3Shape Ortho System software. Each appliance was calibrated prior to placement. Patients returned daily for two jackscrew activations over a 10–17-day period until transverse correction was achieved. Forces were recorded. Standardized intraoral photographs, midline diastema measurements, and digital scans were obtained at each visit, and maxillary occlusal radiographs were taken after active expansion. Expansion-resisting forces were calculated using appliance-specific calibration curves and compared with anatomical measurements before and after sutural separation.

Results: Preliminary results demonstrated expansion forces ranging from 0–20 lbs, with no consistent reduction in force after midpalatal suture separation, suggesting that resistance to expansion extends beyond the suture alone. Older patients (>12.5 years) exhibited higher overall expansion forces and steeper initial loading rates compared with younger patients. Patients with higher palatal vaults had greater force changes pre- and post-diastema formation. No significant differences in skeletal expansion were observed between two- and four-banded RMEs.

Conclusion: Older patients demonstrated greater resistance and higher initial force accumulation during expansion, with resistance often persisting after visible diastema formation. Maxillary palate anatomy seems to influence force patterns during the expansion, while appliance banding configuration did not significantly influence skeletal outcomes.

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13. Apical Size Impacts Effectiveness of Gentlewave Against Root Canal Biofilm



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Objective: This study evaluated the influence of apical size on the effectiveness of the GentleWave System (GWS) in removing bacterial biofilm from infected root canals.

Methods: Fifty extracted human mandibular premolars with single canals were prepared to apical sizes 20/.04 to 35/.04 and randomly assigned to five groups (n=10 per group): Control (Group I) and GWS-treated groups (Groups II–V). A

three-species biofilm (*E. faecalis*, *P. gingivalis*, *F. nucleatum*) was developed in all samples. Following disinfection with GWS, bacterial reduction was assessed using quantitative PCR (qPCR), confocal laser scanning microscopy (CLSM), and scanning electron microscopy (SEM). qPCR samples were collected pre- and post-treatment, and DNA was extracted using the QIAamp DNA Mini Kit. Species-specific 16S rRNA primers were used to quantify bacterial load. CLSM and SEM confirmed biofilm disruption and reduction. Statistical analysis included paired t-tests, one-way ANOVA with Tukey's HSD, and Kruskal-Wallis tests with Dunn's post-hoc comparisons.

Results: All GWS-treated groups showed significant bacterial reductions compared with baseline ($p < 0.05$ for all), while the control group exhibited no change. Mean $\pm$ SD bacterial reductions were 9.12 ± 6.91 (GWS-20), 9.19 ± 3.38 (GWS-25), 8.22 ± 5.28 (GWS-30), and 7.08 ± 3.27 (GWS-35) CFU/mL. One-way ANOVA demonstrated no significant difference among the four GWS groups. However, the Kruskal-Wallis test including all five groups revealed a significant difference in bacterial reduction ($p=0.014$), with Dunn's post-hoc analysis identifying GWS-25 as significantly more effective than the control ($p = 0.013$). CLSM confirmed a marked reduction in biofilm coverage across all GWS-treated groups compared with the control.

Conclusion: These results suggested that apical size may influence GWS efficacy, with an apical preparation of at least 25/.04 demonstrating optimal performance in bacterial biofilm removal.

14. Automated Objective Evaluation of Tooth Preparation Margin Designs Using Artificial-Intelligence



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Objective: Tooth preparation is a fundamental procedure in prosthetic dentistry; however, traditional evaluation methods rely on subjective visual inspection, which is vulnerable

to examiner variability. This study aimed to develop and validate an artificial intelligence (AI)-based automated algorithm for evaluating the finish line of tooth preparations.

Methods: A total of 170 premolars and molars prepared by 85 dental students on typodont models were scanned using a 3D intraoral scanner to obtain STL files. Vertical cross-sectional images in the buccolingual and mesiodistal planes were extracted from these files. The finish lines of the tooth preparations were categorized by two prosthodontists as knife-edge, standard chamfer, heavy chamfer, or modified shoulder margins. The dataset was split into training and test partitions with preserved class balance. A pretrained deep learning-based image classifier was trained on the cross-sectional images with minimal preprocessing and anatomy-preserving data augmentation. For benchmarking, a subset of cases was independently scored by clinicians and by the model using the same cross-sections. Agreement was summarized with intraclass correlation coefficients (ICCs), alongside standard classification metrics.

Results: Our model achieved high overall accuracy with macro-averaged precision and recall in classifying margin designs. Performance was highest for modified shoulder and lowest for heavy chamfer, with most errors reflecting confusion between heavy and standard chamfers, which show similar curvature in 2D sections. Model repeatability and between-run consistency for the AI were excellent, whereas human ratings showed moderate-to-good reliability.

Conclusion: An image-based AI approach provides accurate, consistent recognition of finish-line design and may reduce variability inherent to visual inspection without changing routine data capture or workflow. These findings support AI-assisted, objective, and reproducible evaluation of tooth preparations and establish a practical proof of concept for clinical integration.

Supported by: University of Iowa College of Dentistry Seed Grant

15. Influence of Isolation Method on Longevity of Direct Restorations



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Objective: This study investigated the longevity of direct restorations placed under different forms of isolation using a retrospective cohort study design based on electronic dental records.

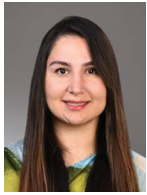
Methods: Records were extracted from the University of Iowa's Axium database for patients who had an intracoronal restoration placed between July 2016 and October 2024. The text of each chart note was searched, and cases that mentioned exactly one form of isolation (cotton roll (CR), rubber dam (RD), Isolite/Isovac (IS)) were retained. Each case was followed from its placement date until replacement (failure) or until the last recorded recall exam if it did not fail (censored). Failure was defined as any subsequent restoration in the same tooth that involved one or more surfaces of the initial restoration. The initial restorations were stratified into amalgam, resin-based composite (RBC) and glass-ionomer cement (GIC) groups. Cox proportional hazards models were used to determine hazard ratios (HR) for the variables of interest, which included sociodemographic, health history, and tooth-related factors. Variables selected for the regression models were determined using the Bayes Information Criterion, and all models were required to include variables for anterior/posterior location and isolation type.

Results: Using CR as the reference, IS was associated with a significantly higher hazard ratio for GIC restorations (HR = 1.41; 95% CI: 1.03–1.94). No statistically significant differences in hazard ratios were observed between CR and RD isolation for amalgam or RBC restorations.

Conclusion: For amalgam and RBC restorations, the choice between CR and RD made no statistically significant difference in restoration longevity, but IS was associated with decreased restoration longevity for GIC restorations.

Supported by: James S. and Janice I. Wefel Memorial Research Award

16. Longitudinal Immunoprofiling of Adolescents Undergoing Orthodontic Treatment: Preliminary Findings



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Objective: Approximately 4.5 million Americans start orthodontic treatment annually in the United States for esthetics or to improve function. Despite these advantages, orthodontic therapy carries potential risks, including compromised oral hygiene and increased susceptibility to dental caries, gingival inflammation, and gingival recession, all of which are largely mediated by host-microbial interactions. This study aims to longitudinally evaluate the impact of fixed orthodontic therapy (FOT) on the host immune response by analyzing cytokines and immune mediators in gingival crevicular fluid (GCF)

Methods: Twenty-five healthy adolescents undergoing fixed orthodontic treatment were enrolled in the study. Gingival crevicular fluid (GCF) samples were collected at multiple time points, including baseline; 3, 6, 12, and 18 months of treatment; debonding; and 3- and 6-month retention visits. In this study, an additional fourteen samples from this cohort were analyzed, expanding upon seven samples that had been evaluated previously. Unstimulated GCF samples were stored at -80 °C. Cytokine and chemokine concentrations were quantified using multiplex assays, and longitudinal changes were analyzed using spline modeling.

Results: Fixed orthodontic therapy was associated with significant shifts in cytokines and chemokines across treatment stages, with distinct patterns observed in the subgingival environments. IL-1A levels were highest at initial stages and decreased as therapy progressed. Chemokines such as CXCL10 and CXCL9 showed increasing trends during treatment. Interestingly, components of the IL-1 family, including IL-1A and IL-1RA, demonstrated consistently high levels.

Conclusion: These findings suggest that FOT induces dynamic, environment-specific immunologic changes that reflect the host's adaptive response to treatment and support the findings of previous studies that evaluated seven samples from this cohort. Continued analysis of saliva samples, in addition to GCF samples, will provide a more comprehensive characterization of immune profiles throughout orthodontic

therapy. Collectively, these results underscore the importance of monitoring immune responses to optimize patient outcomes and inform personalized therapeutic strategies

Supported by: NIDCR R03 DE030527; University of Iowa College of Dentistry Department of Orthodontics

17. Nonsurgical Root Canal Treatment and Retreatment Outcomes Using GentleWave



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Objective: Although a few outcome studies have evaluated the success of the GentleWave (GW) procedure using periapical radiography, no published data exist employing 3D volumetric analysis. This study aimed to compare treatment outcomes of nonsurgical root canal treatment (NSRCT) and nonsurgical root canal retreatment (NSRTX) performed with GW versus conventional needle irrigation (CNI), based on changes in endodontic lesion volume assessed by cone beam computed tomography (CBCT).

Methods: Preoperative and follow-up (≥12 months) lesion volumes of cases treated with GW or CNI were measured using 3D Slicer software. Data normality was assessed with the Shapiro-Wilk test. Between group comparisons of lesion volume were performed using a two-sample t-test or Wilcoxon rank sum test. Within-group comparisons of pre- and follow-up lesion volume were analyzed using a paired t-test or Wilcoxon signed-rank test ($\alpha=0.05$).

Results: Ten NSRTX patients (one tooth per patient; 5 GW, 5 CNI) were included to estimate sample size requirements. No significant differences were observed between GW and CNI for preoperative ($p=0.323$) or follow-up ($p=0.060$) lesion volumes. Within groups, lesion size decreased significantly for CNI ($p=0.047$) and approached significance for GW ($p=0.063$). Change in lesion size did not differ between groups ($p=0.261$). A sample size of 46 participants per group is required to detect a mean difference in change between GW and CNI with 80% power.

Conclusion: NSRTX appears effective in reducing endodontic lesion size with both GW and CNI. Further data collection is ongoing to evaluate the impact of GW on outcomes for NSRCT and NSRTX.

University of Iowa College of Dentistry
Department of Endodontics

Oral Session 4: Craniofacial Genetics, Development, & Tissue Patterning

18. Ectoderm-Mediated Patterning of the Mandible During Mouse Development



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Objective: A principle of embryonic development is the sharp partitioning of a homogenous tissue into defined domains, the disturbance of which can lead to defects in normal tissue

patterning. We recently identified a functional opposing network establishing the oral-aboral axis of the mandibular epithelium. While initially diffuse and overlapping, transcription factor (TF) SOX2 forms a complementary expression domain with the TF TFAP2 (AP-2 α and AP-2 β) in the ectoderm of the oral-aboral axis, respectively. Highlighting the functional significance of these opposing networks, loss of aboral TFs led to the expansion of oral programs aborally, culminating in the production of oral structures (teeth) in the otherwise skin-fated epithelium. Since previous studies of this axis have focused on mesenchymal contributions, our discovery of early ectodermal partitioning suggests an unexplored mechanism

for patterning the mandible. Downstream of these TFs, we also found evidence that within the ectoderm TFAP2 impinges upon the recently described SHH axis, potentially through regulation of WNT-signaling to reinforce oral-aboral programs in the mandibular mesenchyme. Our findings suggest competition between intricate ectodermal networks provides the guidance cues necessary to initiate mesenchymal organization.

Methods: Ongoing work includes using *in vivo* mouse genetics and *ex vivo* pharmacological manipulation of mouse tissue to identify how these opposing networks are initially established, and which factors are sufficient to induce domain specification. Our model provides a tractable genetic system to dissect principles of tissue partitioning.

Results: Analysis of mice overexpressing the WNT ligand, *Wnt1*, in the ectoderm shows minimal expansion of the mature (E17.5) aboral signaling domain into the oral domain, and no early developmental differences. In contrast, exogenous addition of SHH-soaked beads into *ex vivo* early mandibles showed some repression of the aboral marker, TFAP2B.

Conclusion: These results suggest that while SOX2, TFAP2, and SHH are required to pattern the mandibular epithelium, elevated WNT-signaling is not sufficient to alter this axis.

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19. Epigenetic Landscape and Phenotypic Variation in Van der Woude Syndrome



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Objective: Van der Woude Syndrome (VWS) is an autosomal dominant disorder and the most common syndromic form of orofacial clefting. VWS is caused by mutations in *IRF6* (70%), *GRHL3* (5%), and *PRKCI* (2-3%) and classically presents with combinations of lip pits (LP), cleft lip (CL), cleft lip and palate (CLP), or cleft palate (CP), with markedly phenotypic discordance even amongst individuals carrying the same mutation, suggesting a role for epigenetic factors as phenotypic modifiers. *IRF6*, *GRHL3*, and *TP63* interact during craniofacial development to coordinate epithelial proliferation and differentiation. We hypothesize that differential DNA methylation (DNAm) in cpg sites within regulatory regions of *IRF6*, *GRHL3* and *TP63* are associated with VWS phenotypic discordance.

Methods: We used pyrosequencing to measure DNAm levels of cpg sites located in the promoters of *IRF6*, *GRHL3*, and *TP63*, and in a known *IRF6* enhancer element (MCS9.7) in 133 individuals with VWS (Blood DNA=94; Saliva DNA=39) grouped within 5 phenotypes: 1=CL/P+LP, 2=CL/P, 3=CP+LP, 4=CP, 5=LP. One-way ANOVA on ranks with the post-hoc Tukey-Kramer test ($\alpha=0.05$) was used to compare DNAm levels for each site.

Results: Significant DNAm differences were observed in saliva samples in 2 cpg sites located in *IRF6* promoter ($p=0.019$ and $p=0.035$). Post-hoc analyses further revealed that individuals with CP+LP phenotype (Cleft Palate with Lip Pits) show elevated DNAm compared to individuals with LP alone ($p=0.018$) and compared to individuals with CP alone ($p=0.032$). No significant differences were detected in blood samples. Efforts are ongoing for MCS9.7, *GRHL3* and *TP63*.

Conclusion: Results indicated that hypermethylation of the *IRF6* promoter is associated with a more severe phenotype (CP+LP) compared to LP only and CP only in saliva samples. We demonstrate an epigenetic contribution to VWS clinical variability and provide key findings to understand disease expressivity that can ultimately inform genetic counseling for affected families.

Supported by: University of Iowa College of Dentistry Department of Orthodontics

20. Perinatal and Cellular Characterization of Ameloblast Specific MEMO1 Function



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Objective: Enamel is the only mineralized tissue derived from epithelial cells. Genetic perturbations during enamel development can lead to amelogenesis imperfecta (AI), characterized by abnormal enamel formation. Although numerous genes are linked to AI, approximately 50% of cases have an unknown etiology, necessitating identification of additional proteins involved in amelogenesis. An underexplored area is the role of the dynamic cytoskeleton in ameloblasts and how disruptions in this network contribute to enamel defects such as AI.

Previously, we identified Mediator of Cell Motility 1 (MEMO1) as a critical regulator of enamel development. Conditional deletion of *Memo1* in the oral ectoderm of mice produced a phenotype resembling human AI. However, these findings were based on aged mice, leaving questions about early developmental effects of *Memo1* loss. Here, we examined our mouse model at earlier developmental stages to (1) assess the tooth phenotype immediately after eruption and (2) further define the role of MEMO1 during tooth development using an *in vitro* model.

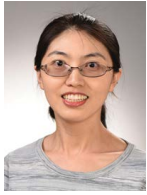
Methods: Using an *in vivo* approach, we conditionally deleted *Memo1* from the oral ectoderm and compared early enamel phenotypes between mutants and littermate controls using μ CT, SEM, and EDS. To begin to understand the molecular basis for these defects we generated a knockout ameloblast-like cell line.

Results: Our analysis revealed that the mutants exhibit a significant reduction in enamel mineralization and volume compared to controls with changes in trace elements. We found that loss of *Memo1* results in a reduction of proliferation both *in vivo* and *in vitro*. Additionally, we observed alterations to cell area and cell migration, *in vitro*. Bulk RNA-sequencing identified MEMO1 facilitates cytoskeletal dynamics of ameloblast-like cells.

Conclusion: Taken together, our results highlight a previously unknown role for MEMO1 during amelogenesis. Ongoing efforts are focused on uncovering the mechanisms by which MEMO1 regulates enamel mineralization, with the goal of improving diagnostic strategies and risk assessments for enamel-related mineralization defects.

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21. Roles of Mesenchymal SHH and WNT Pathways for Tooth Initiation



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Objective: The development of teeth is regulated by reciprocal interactions between dental epithelium and the underlying neural

crest derived mesenchyme, which involves many transcription factors (TFs) and signaling pathways. The cellular and molecular programs controlling tooth initiation is still unknown.

Methods: Tooth morphology starts from the formation of dental lamina. We analyzed mandibular epithelium and mesenchymal gene expression in lingual and labial domains during tooth initiation in wildtype embryos. Additionally, we examined how mesenchymal domains were impacted upon perturbation of epithelial programs in two knockout mouse models: *Pitx2* general knockout (*Pitx2* KOs) and *Tfap2a/Tfap2b* ectodermal double knockout (*Tfap2a/b* EDKO) mouse models.

Results: We found *Foxf1* and *Foxf2*, known SHH downstream readouts, were enriched in lingual mesenchyme, while *Msx1*, *Msx2*, and *Lef1*, known BMP and WNT readouts, were enriched in labial mesenchyme. With two knockout mouse models: *Pitx2* KOs (dental lamina-specific TF) and *Tfap2a*; *Tfap2b* EDKOs (ventral surface specific TFs), we found dorsal expansion and upregulation of WNT activity along with a reduction of SHH activity in the lingual mesenchyme in *Pitx2* KOs. Whereas in *Tfap2a*; *Tfap2b* EDKOs, we found a reduction of WNT activity and expansion of SHH activity in the labial domain. Besides, we found a convergence of SHH-WNT readouts underneath the ectopic incisor in *Tfap2a*; *Tfap2b* EDKOs. To study the mechanisms of WNT pathway in tooth development, we established tooth organoid culture system and characterized the identity of tooth germs by H&E and Immunofluorescence staining.

Conclusion: The complementary SHH-WNT pathway activity interface at the site of wild-type incisor formation and define the location of the ectopic incisor in *Tfap2a*; *Tfap2b* EDKOs. In the future, we will inhibit or overexpress WNT activity during tooth germ organoid culture to study the mechanisms of WNT pathway in tooth development.

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22. Whole Genome Sequencing Identifies Deleterious Variants in Puerto-Ricans with Clefts



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Objective: The non-coding genomic regions contribute to orofacial clefts (OFC) development. We investigated deleterious variants within craniofacial enhancers that may affect transcription factor (TF) binding and disrupt the expression of important craniofacial genes.

Methods: We conducted whole-genome sequencing on 35 Puerto-Rican case-parent trios with OFC. Variants were identified and annotated using GATK. Very rare (MAF <0.1%) and novel variants in putative craniofacial enhancers were filtered with VarSeq. These enhancers were overlapped with in-vivo validated enhancers. We prioritized enhancers containing deleterious variants (CADD score ≥ 15) and those predicted by RegulomeDB to alter TF binding. Also, deleterious variants within conserved center of enhancer peaks were prioritized. We used JASPAR motif analysis to predict affected TF. Proximal genes were identified using UCSC Genome Browser and their roles in craniofacial development were investigated using MGI database.

Results: We identified 3012 high-confidence novel/very rare variants in 1836 putative craniofacial enhancers. Among these, 731 enhancers had more than one variant, and 49 overlapped with functionally validated enhancers that were active in mice craniofacial tissues. Twenty-four of these 49 enhancers harbor 33 deleterious variants. RegulomeDB predicted nine of these deleterious variants to disrupt TF binding. Another five deleterious variants were within conserved center of enhancer peaks. Motif analysis predicted that nine of these variants affect binding of TF linked to craniofacial development. Four of these variants are in enhancers near craniofacial genes. A novel variant chr11:76048449A>G in the enhancer chr11:76047931–76048761 lies near *SERPINH1*. Three very rare variants are in enhancers near *ZNF503*, *SPRY2*, and *RUNX*; respectively. Mouse models for *SERPINH1*, *SPRY2* and *RUNX2* exhibit clefts, while *ZNF503* model exhibit abnormal craniofacial phenotype.

Conclusion: Our data suggests that a novel variant near *SERPINH1* and very rare variants near *ZNF503*, *SPRY2*, and *RUNX* may affect regulation of these genes and contribute to OFC. Functional validation experiments are in progress.

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23. *Xbp1* Knock-out in Dental Epithelium Alters Enamel Formation in Mice



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Objective: Developmental enamel defects are common in clinics and increase susceptibility to hypersensitivity, rapid wear, and dental caries, reflecting perturbation of amelogenesis. Proper enamel formation relies on precisely programmed epithelial-mesenchymal signaling and stage-specific differentiation and proliferation of ameloblasts to enable the appropriate secretion and maturation of enamel. However, the cellular mechanism regulating the amelogenesis remains unclear. Here, we hypothesize that the expression of transcription factor X-box binding protein-1 (*Xbp1*) in dental epithelium is required for the intact formation of enamel during odontogenesis in mice.

Methods: The development of dental enamel starts early in the embryogenesis. We designed *Pitx2Cre;Xbp1* transgenic mice to investigate the role of *Xbp1* in the development of enamel and use wild-type mice as negative control. In detail, we sacrificed adult *Pitx2Cre;Xbp1 flox/flox* and wild-type mice (4-8 months) and decapitated. Micro-computed tomography (micro-CT) were performed for mouse skulls to evaluate the gross enamel morphology and mineral density. In parallel, processed tissues were microtome sectioned for histological staining to characterize microscopic enamel formation.

Results: We found that in mice with *Pitx2Cre* conditional deletion of *Xbp1*, the overall dentition patterning appeared preserved, with no obvious change in tooth type and number compared to littermate negative controls though

macroscopic image of mouse skull revealed whiter incisors in *Pitx2Cre;Xbp1 flox/flox* mice. Micro-CT scan showed reduced thickness in both dental enamel and dental dentin in incisors in *Xbp1* conditional knock-out mice. Consistent with this, histological H&E staining confirmed the reduction in enamel matrix in the *Xbp1* expression-deficient mice.

Conclusion: Perturbance of *Xbp1* expression in the early tooth germ development alters the formation of enamel, which exhibits enamel defects in matured erupted incisors in adult mice. We will assess the change in mineralization and investigate how *Xbp1* regulates the development and secretory function of ameloblasts.

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Oral Session 5: Oral Immunology, Host–Microbe Interactions, & Microbial Pathogenesis

24. Distinct Oral Virome Signatures Associated With Oral Squamous Cell Carcinoma



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Objective: Multiple studies have demonstrated that the oral microbiome plays an important role in oral squamous cell carcinoma (OSCC), one of the most common head and neck cancers. However, potential contributions of the oral virome remain largely unexplored. Building upon our recent study of the oral virome in metabolic syndrome and a prior meta-analysis of 16S datasets in OSCC, this project aimed to characterize viral community differences between tumor and non-tumor oral sites and to explore potential viral–bacterial interactions associated with OSCC.

Methods: Metatranscriptomic data generated by Yost et al. (2018) from 4 healthy controls and 4 subjects with OSCC (sampled at both matching tumor and adjacent buccal sites) for a total of 15 samples, were re-analyzed using an integrated viral discovery workflow incorporating MEGAHIT/SPAdes, geNomad, VirSorter2, and CheckV. Viral abundance tables were generated with CoverM and analyzed with QIIME2 and MaAsLin2, with alpha and beta diversity assessed via Simpson and Bray–Curtis metrics. To provide functional evidence for RNA viruses, predicted proteins were additionally analyzed using LucaProt to detect RNA-dependent RNA polymerase (RdRP)–associated signatures.

Results: This secondary analysis revealed shifts in viral composition between control and OSCC subjects across tumor and buccal sites. Simpson diversity trended higher in OSCC samples, with enrichment of bacteriophages infecting *Fusobacterium* and *Prevotella* in tumor-site samples. Differential abundance analysis identified 123 viral contigs enriched in patient samples with site-specific signatures. LucaProt analysis detected widespread RdRP-associated protein signals across all samples (range: 9–8,518 candidate proteins per sample), supporting the presence of diverse and fragmented RNA viral sequences in the oral microenvironment.

Conclusion: This oral virome analysis demonstrates that OSCC is accompanied by distinct viral community patterns potentially interacting with disease-associated bacterial taxa. The results highlight the relevance of viral components in tumor-associated dysbiosis and support continued integration of virome and microbiome analyses in oral cancer research.

Supported by: NIDCR T90 DE023520

25. Interleukin(IL)-27 Inhibits Periodontal Bone Loss by Restraining an IL-17 Response



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Objective: We previously found that the lack of type I interferon response in mice resulted in severe bone loss in a ligature-induced periodontitis (LIP) model. Such severe bone loss was associated with a downregulation of IL-27, a cytokine that profoundly modulates T cell differentiations, in the mouse gingiva. Here we aimed to dissect the mechanistic role of IL-27 in the LIP model.

Methods: The periodontal bone level in mice with the IL27 receptor A deletion (*Wsx^{-/-}*) was compared to wildtype (WT) control mice. The CD45+ cells isolated from the *Wsx^{-/-}* mouse gingiva were sorted through FACS, and the marker genes for the polarization of different Th subsets were compared to WT controls. Transcriptomic analysis for the effect of IL-27 on the ex vivo isolated splenic naïve CD45+ T cells under a Th17 differentiation was also performed. The bone level of double knockout mice with the deficiency of both *Wsx* and *Act1* (*Wsx^{-/-}/Act1^{-/-}*), a gene that encodes an adaptor protein that mediates all IL-17 responses, was compared to *Wsx^{-/-}* mice.

Results: *Wsx^{-/-}* mice had significant bone loss in the second molar in the LIP model than the WT controls. The CD45+ cells from *Wsx^{-/-}* mouse gingiva had significantly higher transcriptomic levels of *Il17a*, and significantly lower levels of *Il10*, *Gata3*, *Ifng*, and *Tbx21* than the WT control cells. The IL-27 treatment of the naïve CD45+ T cells under the Th17 polarization potentially inhibited the IL-17 secretion and suppressed the transcription of *Rorc*, a specific transcription factor for IL-17 expression. The bone loss from the *Wsx^{-/-}/Act1^{-/-}* mice in the LIP model was significantly less severe than that of the *Wsx^{-/-}* mice.

Conclusion: The IL-27 pathway mitigated periodontal alveolar bone loss in the LIP model. Such a protective role of IL-27 was mediated through the inhibition of an IL-17 response.

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26. Longitudinal Shifts in the Oral Microbiome Following Weight Loss



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Objective: Obesity affects over one-third of U.S. adults and is associated with an increased risk for type 2 diabetes, cardiovascular disease, and periodontitis. Work from our group has identified reduced subgingival microbial diversity and enrichment of pathogenic species in obese individuals, even in the absence of clinical periodontitis. However, it remains unclear whether such dysbiosis improves following weight loss. This longitudinal study investigated the impact of weight reduction through bariatric surgery or dietary intervention on the oral microbiome.

Methods: Thirty periodontally healthy adults were recruited and divided into three groups: normal-weight healthy controls (NWH), obese individuals undergoing bariatric surgery (Obs. BS), and obese individuals on a very-low-fat diet (Obs. VLFD). Subgingival plaque samples were collected longitudinally. Microbial DNA was extracted, V3-V4 regions amplified, and 16S rRNA gene sequenced using the Illumina MiSeq (2×300 bp) platform. Quality-filtered sequences were annotated against the Human Oral Microbiome Database. Each participant served as their own control, and longitudinal analyses were performed using timeOmics to identify significant temporal changes in microbial communities.

Results: Both the Obs.BS and VLFD groups demonstrated significantly reduced bacterial diversity compared to the NWH. Over time, there was an increase in commensal taxa such as *Neisseria*, *Veillonella*, and *Rothia aeria*, accompanied by a decrease in disease-associated species including *Prevotella denticola* and *Tannerella* sp. following weight loss in the Obs.VLFD group. In the Obs.BS group, commensal taxa such as *Schaalia* sp., *Saccharibacteria* sp., *Leptotrichia* sp., *Corynebacterium* sp., increased at the 3-month post-operative time point, while disease-associated species such as *Porphyromonas* sp., *Prevotella* sp., *Treponema* sp., *Fusobacterium nucleatum* were decreased at the same time point.

Conclusion: Weight loss interventions were associated with microbial shifts favoring health-associated taxa, suggesting potential restoration of microbial balance. Long-term follow-up studies are needed to determine the stability of these microbial changes over time and to evaluate how these changes occur in periodontal disease.

Supported by: NIDCR R03 DE030527

27. Organism-Resolved Multi-Omics Analysis Reveals Functional Patterns of the Oral Microbiome



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Objective: Oral microbiome studies increasingly use multi-omics data to understand microbial activity and host interactions, yet most workflows analyze each data type independently and are optimized primarily for bacteria. In oral samples, high host contamination and incomplete reference databases lead to inconsistent taxonomic and functional profiles, particularly for non-bacterial organisms, limiting reliable integration and biological interpretation across omics layers.

Methods: We developed MoMo-MAP (Multi-Omics, Multi-Organism Microbiome Analysis Pipeline), a modular, reproducible framework for robust taxonomic and functional profiling of host-associated microbiomes with explicit false discovery control. Rather than introducing new analytical tools, MoMo-MAP repurposes validated, best-performing methods into a unified workflow supporting metagenomic, metatranscriptomic, metaproteomic, and metabolomic analyses across bacteria, viruses, fungi, archaea, and known eukaryotic pathogens. The pipeline implements rigorous host contamination removal using two independent human reference genomes, updated microbial databases, decoy-based strategies, and stepwise quality checks at each processing stage.

Results: We evaluated MoMo-MAP using real-world oral and host-associated datasets by integrating multiple omics combinations, ranging from paired metagenomics–metatranscriptomics to three-omics analyses. Across the datasets analyzed, none contained all four omics layers for joint integration. Still, the modular design allowed flexible selection of two to three omics layers and is structured to support expansion as additional data becomes available. MoMo-MAP reduced spurious taxonomic and functional assignments, improved recovery of non-bacterial organisms, and generated standardized outputs readily compatible with multi-omics integration frameworks such as mixOmics. Integrated analyses revealed coordinated patterns of microbial presence and activity that were not detectable using single-omics workflows.

Conclusion: To our knowledge, this work presents the first framework to enable integration across multiple omics layers and microbial kingdoms within a single, unified workflow for microbiome research including oral microbiome studies. By revealing coordinated functional patterns that are not apparent in single-omics analyses, this work establishes a robust foundation for future integrative studies of microbial ecology and disease.

Supported by: James S. and Janice I. Wefel Memorial Research Award

28. Sexual Dimorphism in Periodontitis is Regulated by the *miR-141/200c* Cluster



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Objective: Sexual dimorphism in periodontitis reflects intrinsic molecular regulation of host responses, mediated by microRNAs that act on immune, inflammatory, and hormonal pathways. We aimed to elucidate how the autosomal *miR-141/200c* cluster impacts sex-specific susceptibility to experimental periodontitis and its underlying mechanisms.

Methods: To determine sex-specific influences of the *miR-141/200c* cluster on the oral microbiome and inflammation, oral microbiota and serum inflammatory cytokines were analyzed in *miR-141/200c* knockout (KO) mice of both sexes using 16S rRNA sequencing and an inflammatory cytokine array. We further analyzed sex-specific functions of the *miR-141/200c* cluster on gingival inflammation and bone metabolism in a mouse model of periodontitis by gingival transcriptomic profiling and micro-CT analysis. Key molecular mechanisms identified from transcriptomic data were validated in primary human gingival fibroblasts.

Results: Oral microbiome composition showed higher alpha diversity and more distinct beta diversity clustering in females than in males. Notably, while it has limited effects in males, knocking out the *miR-141/200c* cluster significantly affected females and eliminated sex differences. KO mice also showed enrichment of more gingival inflammatory pathways than wild-type (WT) mice.

In ligature-induced periodontitis, while KO had limited effects in males, KO females exhibited significantly less bone loss than WT and eliminated the differences compared to males. Correspondingly, KO females had reduced serum proinflammatory cytokines. KO females also reversed the enrichment of inflammation-related pathways, restored estrogen signaling, and upregulated angiotensin-converting enzyme 2 (*Ace2*), a periodontal inflammatory mediator located on the X-chromosome. While circulating estrogen levels were unchanged, KO females had an upregulated estrogen receptor (*Esr*) 1 and *Esr2* in the gingival tissues. The increased expression of *Esr1* and *Ace2* in the KOs was confirmed in primary human gingival fibroblasts treated with a *miR-200c* inhibitor.

Conclusion: The *miR-141/200c* cluster regulates sexual dimorphism in periodontitis through modulation of oral microbiome composition, inflammation, and estrogen signaling.

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Posters

29. Assessing the Practice Management Curriculum in U.S. Dental Schools



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Objective: Practice management (PM) skills are critical for safe, sustainable dental practice, yet their integration in U.S. dental curricula is inconsistently documented. This study aimed to describe PM course structure, instructional hours, content emphasis, teaching methods, and implementation challenges.

Methods: PM syllabi were first collected from course directors and academic deans to inform survey design. A national Qualtrics survey was then distributed to academic deans of all U.S. dental schools. Data included institutional characteristics, course format, hours by year (D1–D4), topic-specific allocation, teaching strategies, assessment practices, and ranked challenges.

Results: Fourteen schools completed the survey; 71% were public institutions. PM courses were required in nearly all programs. Delivery formats varied: 43% offered standalone courses, 43% combined standalone and integrated formats, and 14% used only integrated approaches. Schools reported a median of three distinct PM courses (range 1–10). Instructional time increased in D3/D4 years, with median hours of 2.25 (D1), 6 (D2), 18 (D3), and 32 (D4). Ethics/professionalism

received the highest median allocation (6 hours), followed by technology/digital tools (4), interprofessional collaboration (3.25), and leadership/team building (3). Core business and regulatory topics averaged 2–2.75 hours, while artificial intelligence was rarely covered. Teaching methods included lectures, case-based learning, simulations, standardized patients, guest experts, and online modules; approximately 77% aligned objectives with Bloom's taxonomy. Major challenges were faculty workload and competing priorities (mean rank ~2.79) and limited curriculum time (~3.07).

Conclusion: PM education in U.S. dental schools is widely required, concentrated in later years, and delivered through diverse didactic and experiential methods. However, faculty capacity and time constraints limit depth, particularly for emerging topics. Enhancing simulation resources, expanding hands-on learning, and sharing instructional assets may help standardize and strengthen PM training nationally.

Supported by: University of Iowa College of Dentistry Student Research Program

30. Comparing D1 Versus D4 Students' Willingness to Treat Underserved Populations



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Objective: This longitudinal study assessed how dental students' willingness to treat underserved populations changed from the first-year (D1) to the fourth-year (D4).

Methods: A 21-item questionnaire was administered annually to all D1 and D4 students (D1: 2008–2020; D4: 2011–2025; N=1,120). Participants indicated their anticipated willingness to treat 14 underserved populations five years post-graduation. Responses were dichotomized as "yes" versus "yes, but a limited number of patients," "unsure," or "no." Corresponding D1 and D4 surveys were matched. Means and frequencies were calculated. McNemar's tests evaluated changes in participants' willingness to treat each population. Fisher's exact tests assessed which participant demographic variables were associated with willingness to treat each population. ($\alpha=0.05$)

Results: 643 surveys were matched (response rate=57%). Except for known drug users and patients with HIV/AIDS, fewer D4 than D1 respondents were willing to treat each underserved population (i.e. "yes"). However, when considering the change by proportions, a larger percentage of respondents became more positive than more negative for 6 populations (e.g. medically complex), while a larger percentage of respondents became more negative than more positive for 7 populations (e.g. Medicaid). Participants who identified as Hispanic, Black/African American, Asian/Pacific Islander, or other/mixed demonstrated greater willingness to treat 6 populations compared to non-Hispanic, Caucasians. Participants whose mothers or fathers had < high school education were more likely to treat 3 or 1 population, respectively. Females were more likely to treat 2 populations, while participants from higher socioeconomic backgrounds were more willing to treat 1 population.

Conclusion: This study suggests that changes in dental students' willingness to treat underserved populations are population specific. Overall, there was a general decline in willingness; however, approximately half of the populations saw a greater proportional shift from more negative to more positive. With the exception of race and ethnicity, participants' demographic variables were rarely associated with willingness to treat.

Supported by: University of Iowa College of Dentistry Student Research Program

31. Critical Thinking: Symbiotic Network of Skillsets, Outcomes, and Learning Moments



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Objective: Although critical thinking is widely recognized as essential in education, there are few structured ways to develop and assess it. This study aimed to help students build critical thinking skills by creating a set of exercises across multiple departments. These exercises formed a connected, or "symbiotic," network where students can learn from the expertise of the clinician's skillsets with the goal of students applying these skills in outcome-based assessments and then explore deeper insights to what we call "learning moments."

Methods: Third year dental students (n=80) were provided with a standardized PowerPoint template and a learning guide. After conducting comprehensive medical and dental examinations, students entered patient data into the template and responded to guided critical thinking questions designed to simulate expert clinical reasoning.

Results: Two factors were seen to contribute to the symbiosis of learning guides among different departments: use of standardized learning guide and outcomes-based assessment. The use of a learning guide based on a designated thought process combined with use of a common outcomes-based assessment were also associated with subsequent rich and varied learning moments distinctive for each exercise.

Conclusion: This emulation-based approach fostered the development of critical thinking and encouraged deeper outcome driven learning experiences. With little literature on learning outcomes for critical thinking, the emulation learning model based on the thought processes of the master clinician led to development initially of multiple critical thinking skillsets followed by interactions of exercises. The result was a symbiotic network with rigorous demonstration of a skillset followed by a rich exploration of nuances.

Supported by: University of Iowa College of Dentistry Student Research Program

32. Dental Care Access for Adults With Disabilities: Barriers and Facilitators



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Objective: Adults with disabilities face barriers to accessing dental care and experience poorer oral health outcomes compared to the general population. This study aimed to identify the main barriers and facilitators for this population to access dental services as seen from the perspectives of patients, caregivers, patient advocacy organizations, and dental providers.

Methods: A mixed-methods approach was employed. Participants were recruited through patient advocacy organizations and healthcare organizations in Iowa, and the University of Iowa College of Dentistry. Qualitative data were collected from patients (n=5), caregivers (n=12), individuals working for patient advocacy organizations (n=15) and providers (n=6) through seven focus groups and four 1:1 interviews conducted from June-October 2025. Quantitative data were collected from responses to an electronic survey (n=36). Deductive thematic analyses were conducted, guided by the five dimensions of access to healthcare (Penchansky and Thomas, 1981).

Results: The main barriers to accessing dental care included: difficulties in finding providers who accept Medicaid and are willing to treat individuals with disabilities, long distances to receive care, extensive wait times to obtain appointments, issues with patient-provider communication, and lack of various accommodations. Increasing Medicaid reimbursement rates, additional training for providers, and greater flexibility regarding appointment scheduling were highlighted as potential facilitators.

Conclusion: This study identified the main barriers to accessing dental care for this vulnerable population as seen from the perspectives of multiple stakeholders. In addition, the findings identified several policy-level changes and educational interventions that could improve access.

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33. Dental Implications of Nutritional Profiles of Protein Powders and Shakes



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Objective: High-protein diets are a popular dietary trend, and consumers often turn to protein powders, which are generally mixed with a milk product, or protein shakes to increase protein intake. These protein drinks have the potential to affect oral health. We hypothesize that plant-based products will have fewer nutrients and be more likely to adversely impact the oral environment than traditional animal-based products. The objective was to examine the nutrient profiles of plant- and animal-based protein shakes, protein powders, and milk products and to consider how the nutrient profiles might impact oral health.

Methods: Nutritionix.com was used to identify the top ten commonly used products for each of the following categories: plant-based protein powders, animal-based protein powders, plant-based protein shakes, animal-based protein shakes, plant-based milk alternatives, and animal-based milks. The products' nutrient composition (i.e., protein, added sugars, starches, micronutrients) and ingredient list (i.e., non-nutritive sweeteners and acids) were identified.

Results: All protein products contained whole proteins; the protein density of plant-based products was lower than that of animal-based products. Ten percent of protein powders contained added sugars and starches, while all plant-based protein shakes and one animal-based shake contained added sugars. Most plant-based milks contained added sugars, although unsweetened versions were available. Seventy-two percent of products contained non-nutritive sweeteners, including stevia, acesulfame potassium, and sucralose. There were no acidic ingredients except in one protein powder. The nutrient composition of products varied considerably. All plant-milks were fortified with calcium; the majority had vitamin D.

Conclusion: Fortification of plant-based products (i.e., calcium, vitamin D) normalized these micronutrient concentrations to animal-based products; however, protein concentrations were generally lower in plant-based products. Most protein powders and shakes do not increase caries or erosion risk, although some products are potentially cariogenic.

Supported by: University of Iowa College of Dentistry Student Research Program

34. Dental Insurance Literacy Varies by Role Within a Dental School



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Objective: The aim of this study was to determine the dental insurance literacy of dental students, residents, faculty, and staff at the University of Iowa College of Dentistry.

Methods: A survey was created in Qualtrics, and IRB approval was obtained. The survey assessed individuals' knowledge of dental insurance terminology (10 questions), their ability to calculate out-of-pocket treatment costs (5 questions), and their perceptions of selecting and using dental insurance, rated as 1=not very confident to 7=very confident. The survey was sent four times via email to all members of the College between June-September 2025. Descriptive and bivariate analyses were performed. (alpha=0.05)

Results: N=131. The majority of responses were from staff (39.7%), students (31.3%), and faculty (25.2%). Knowledge scores ranged from 2 (0.8%) to 10 (47.3%), and calculation scores ranged from 0 (16.8%) to 5 (11.5%). Students had significantly lower mean knowledge scores (8.1) compared to faculty (9.2), residents (9.6), and staff (9.4; p<0.05). Similarly, students were less likely to correctly calculate out-of-pocket costs (2.4) compared to faculty (3.3; p=0.02); however, students' scores were not significantly different from residents (3.2) and staff (2.8). Nearly 1/3 of respondents reported they understand dental insurance "very well." In contrast, 50.4% reported understanding it "somewhat," and 18.3% reported "not very well." Overall, respondents reported moderate confidence choosing (mean=4.54) and using (mean=4.67) dental insurance.

Conclusion: Although all mean knowledge scores were high, students possessed significantly lower knowledge of dental insurance terminology compared to others. Respondents were less knowledgeable about calculating out-of-pocket costs, and more than 2/3s of respondents indicated a lack of understanding about dental insurance. Dental schools could benefit by providing dental insurance literacy training to all providers and staff who interact with patients.

Supported by: University of Iowa College of Dentistry Student Research Program

35. Dental Student Professionalism: Identifying Education Gaps and Developing Assessment Strategies



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Objective: The need to teach and assess professionalism has increased in recent years, as standards of conduct have notably declined, both in society at large and among dental students. The purpose of this study is to describe the multi-year efforts of the University of Iowa College of Dentistry to develop a common understanding of professionalism, identify gaps in professionalism among students, consider ways to cultivate professionalism, and develop more consistent assessment across classroom, laboratory, and clinical contexts.

Methods: This case analysis includes qualitative data collected at the September, 2021, faculty retreat addressing faculty perceptions of the elements of professionalism and faculty examples of unprofessional student behavior. These data were analyzed and presented at the September, 2023, faculty retreat, where quantitative survey data were collected addressing current professionalism assessment practices and desired support.

Results: Twelve themes emerged in faculty definitions of professionalism. Four themes have exact counterparts in ADEA's 6 values defining professionalism, but competence and service-mindedness were not emphasized by faculty. Examples of unprofessional student behavior were offered by 62 faculty, several offering multiple and egregious examples in contexts ranging from the classroom to the lab to the clinic. Quantitative survey data indicated 45% had experienced "critical" levels of unprofessional student behavior, significantly undermining patient care or working relationships. Faculty most commonly reported unprofessional behavior occurred monthly (35%) or once a semester (32%). Although significant majorities advocated formal professionalism assessment, only 25% were comfortable confronting student behavior. Majorities requested more education on assessment (61%) and a professionalism rubric (53%), which subsequently was developed.

Conclusion: Faculty conceptualizations of professionalism may differ from more formal definitions. Although faculty regularly encounter unprofessional student behavior in a range of contexts, they are uncomfortable addressing it and prefer education and rubrics to better assess professionalism and provide useful feedback to students.

36. Food Insecurity Among WIC-Enrolled Pregnant Women



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Objective: Food insecurity, defined as limited access to adequate and nutritious food, affects approximately 1 in 10 pregnant women due to increased caloric needs and financial strain. Early childhood nutritional challenges have been associated with adverse oral health outcomes, underscoring the importance of maternal nutrition during pregnancy.

Methods: This secondary analysis included 634 survey responses from WIC-enrolled pregnant women participating in the longitudinal *Birth to Three – Cavity Free* study, a trial of an intervention to improve care behaviors and reduce ECC. Food insecurity was assessed using a validated questionnaire. Baseline demographics and maternal behaviors were compared by food insecurity status using two-sample t-tests for continuous variables and chi-square or Fisher's exact tests for categorical variables. All tests were two-sided, and p-values are reported for descriptive purposes only.

Results: Participants had a mean age of 26.98 years (SD = 5.67). Overall, 43.3% reported worrying about food not lasting through the month, and 35.0% reported that food did not last. Compared to those who never experienced food insecurity, participants reporting food insecurity were significantly more likely to be pregnant for the first time (49.1% vs. 31.9%, $p < 0.001$), unemployed (31.4% vs. 23.0%), have very low income (<\$5,000: 25.6% vs. 17.6%, $p = 0.005$), exhibit less predictable eating patterns (75.1% vs. 66.1%, $p = 0.027$), consume fewer daily meals (≥ 3 meals/day: 52.9% vs. 65.8%, $p = 0.001$), and eat breakfast less frequently (≥ 5 times/week: 39.3% vs. 58.1%, $p = 0.004$).

Conclusion: Food insecurity among WIC-enrolled pregnant women was common and associated with socioeconomic disadvantage and suboptimal eating behaviors. These findings highlight the need for targeted interventions that address food access, promote consistent meal patterns, and integrate oral health support during pregnancy to benefit both mothers and their infants.

Supported by: NIDCR UH3 DE029443

37. Food Noise and Behaviors Associated with Dental Caries Risk



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Objective: Food noise, defined as persistent thoughts about food, may influence eating behaviors that contribute to dental caries risk.

Dietary patterns and food-related behaviors are established risk factors for caries. Our objective was to examine the relationship between food noise and caries risk behaviors.

Methods: An online Qualtrics® survey was distributed to adults (18+ years) via the University of Iowa's listserve and posted on social media. The survey queried demographics, diet-related caries risk behaviors, and food noise. Diet-related caries behaviors included eating frequency, meal structure, sugar-sweetened beverage (SSB) behaviors, and candy/lozenge frequency. Food noise was measured using a validated five-item assessment questionnaire with scores ranging from 5 to 25; higher scores indicate greater food noise. Statistical significance was set at $p < 0.05$.

Results: Of 887 respondents, 834 were included in the final analysis after excluding 53 surveys with <25% completion. Respondents were predominantly female ($n=644$), aged 18-24 years ($n=342$), and non-Hispanic White ($n=704$), with some college education ($n=237$), and full-time employment ($n=421$). The mean (standard deviation) food noise score was 13.8 (5.1) and ranged from 5-25. Food noise scores were associated with caries risk behaviors. Individuals with higher food noise scores were more likely to consume only one meal/day ($p=0.049$), snack more than three times/day ($p < 0.001$), have unstructured meal patterns ($p < 0.001$), consume more SSBs ($p < 0.001$), consume SSBs over longer time periods ($p < 0.001$), and consume sugared candy/lozenges more frequently ($p < 0.001$) than individuals with lower food noise scores.

Conclusion: These findings suggest that higher food noise is associated with behaviors increasing risk of dental caries. Consideration of food noise may be relevant when evaluating behavioral contributors to caries risk in dental populations.

Supported by: Finkelstein Professorship

38. Front-Line Staff Attitudes and Experiences with Teledentistry Scheduling in Academics



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Objective: This qualitative study's objective was to examine front-line staff attitudes and experiences with scheduling teledentistry visits. It explores coordination challenges, perceptions of teledentistry as a care model, and factors affecting scheduling efficiency, as well as its impact on patient care and satisfaction. Feedback from staff will guide recommendations to improve scheduling processes and inform the future of teledentistry as a method of dental care delivery.

Methods: The methods involved interview front-line staff from the COD Admissions Clinic about their experiences scheduling teledentistry visits. Approximately fifteen staff were invited to participate via email, with consent indicated by their response. Interview questions were developed from existing telehealth literature and refined with supervisor input. Data were analyzed thematically, with both researchers independently coding transcripts and collaboratively identifying final themes.

Results: Resulting participants included one supervisor from the call center and three front-line schedulers. All described positive experiences implementing and scheduling teledentistry appointments. They agreed that teledentistry positively impacts patient care, particularly by reducing travel time for those living farther away. The most common challenge involved creating and managing Zoom, which participants suggested could be better automated. Two participants also proposed offering a patient self-scheduling option.

Conclusion: In conclusion, teledentistry appointments are an effective way to expand access to care. Schedulers unanimously shared the sentiment that any extra steps are minor and well worth the effort to help more patients. While small improvements could increase efficiency, these issues do not substantially add to workload or diminish enthusiasm for continuing teledentistry.

Supported by: University of Iowa College of Dentistry Student Research Program

39. HPV Vaccine Referrals in Dentistry: A Qualitative Study



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Objective: Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States and causes over 70% of oropharyngeal cancers (OPC). Iowa has the highest OPC rate in the nation alongside lower-than-average HPV vaccination rates, indicating a critical gap in prevention efforts that dental professionals could help address. This study assessed changes in dental staff knowledge, attitudes, and practices following implementation of an HPV vaccine education and referral training program.

Methods: A three-hour training program was developed and delivered to staff at two dental offices, focusing on HPV epidemiology, OPC prevention, strategies for vaccine education, recommendation, and referral. Over a six-month implementation period, staff educated patients about HPV and OPC, recommended the HPV vaccine to eligible individuals, and provided referrals to vaccination sites. Materials including patient brochures, educational flipcharts, and referral pads facilitated integration into practice workflows. Following the intervention, staff participated in semi-structured interviews exploring changes in their knowledge, attitudes, and clinical behaviors. Interview transcripts were analyzed qualitatively using thematic analysis.

Results: Twelve staff members completed post-intervention interviews. Nearly all participants (92%, $n=11$) reported improved understanding of HPV, OPC, and HPV vaccination. Initial concerns about discussing a sexually transmitted infection with patients decreased substantially, with four staff (33%) expressing pre-training hesitation compared to zero after training. Staff found patients highly receptive to these conversations: *"I would just say how receptive the parents were and how grateful so many of them were that we were discussing this."* Participants successfully integrated the intervention into existing practice through collaborative approaches, as one dentist explained: *"The hygienist would plant a seed and talk about HPV and oropharyngeal cancer and [...] I would come in and talk about the vaccine and the recommendation."*

Conclusion: Training dental staff in HPV vaccine education and referrals is feasible, acceptable, and may contribute to reducing Iowa's OPC burden.

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40. Long-Term Effects of Chlorinated Pools on the Oral Cavity



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Objective: Competitive swimmers spend extensive time in chlorinated water, which may alter enamel integrity and the oral microbiome. However, evidence on whether

swimming frequency correlates with increased tooth sensitivity or microbial shifts remains limited. This study assessed whether there is a higher prevalence of tooth sensitivity in competitive swimmers versus non-swimmers.

Methods: 55 participants (29 swimmers, 26 non-swimmers) aged 18-25 were surveyed on tooth sensitivity using a Likert-scale questionnaire as part of a cross-sectional study. Two sample permutation t-tests were used to compare sensitivity measures between groups, and ordinal logistic regression models were used to analyze whether years of swimming or weekly hours of pool exposure predicted responses among swimmers alone. Salivary samples (n=31) were cultured on SB-20 and blood agar plates to quantify *S. mutans* and total microflora colony counts (CFU/mL) respectively, for swimmers and non-swimmers.

Results: Swimmers reported lower anxiety about tooth sensitivity ($p=0.029$) and were less likely to modify eating behavior due to discomfort ($p=0.011$) than non-swimmers. No significant differences were observed for overall sensitivity or avoidance of specific foods ($p>0.05$). Within swimmers, neither years of experience nor hours of weekly exposure significantly predicted sensitivity outcomes (all 95% confidence intervals contained 0). Mean *S. mutans* counts and total microflora colony counts did not significantly differ between swimmers and non-swimmers on either blood ($p=0.54$) or SB-20 agar ($p=0.44$).

Conclusion: Contrary to our hypotheses, competitive swimmers did not exhibit greater tooth sensitivity or lower *S. mutans* concentrations than non-swimmers. In fact, swimmers appeared less reactive to sensitivity-related discomfort, suggesting potential enamel adaptation or behavioral desensitization. While the sample size was small, these findings highlight the need for longitudinal studies to clarify the long-term oral effects of chlorinated pool exposure.

Supported by: University of Iowa College of Dentistry Student Research Program

41. Obesity Stereotypes, Biases, and Prejudices Amongst Academic Dental Professionals



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Objective: Shaped by societal emphasis on thinness, individuals with obesity frequently encounter stereotypes, bias, and prejudice

(SBP), which has been documented among healthcare professionals. This study examined obesity-related SBP among dental professionals in an academic setting, hypothesizing patterns similar to other healthcare workers.

Methods: Faculty, staff, graduate students/residents, and students affiliated with the University of Iowa College of Dentistry in Fall 2024 were invited. A 37-item Qualtrics® survey collected demographic information and assess obesity-related SBP using the validated Antifat Attitudes Questionnaire and Fat Phobia Scale. Chi-square or Fisher's exact tests were used for categorical bivariate analyses, and a two-sample t-tests or ANOVA with Tukey-Kramer post-hoc tests for group comparisons ($\alpha=0.05$).

Results: A total of 230 responses were received (70.3% female, 83.0% White; 44.8% <30 years). Most disagreed with, "I tend to think that people who are obese are a little untrustworthy" (90.4%) and "Although some obese people are surely smart, in general, I think they tend not to be quite as bright as normal weight people" (88.5%). Conversely, 58.1% agreed, "People who weigh too much could lose at least some part of their weight through a little exercise." Responses were mixed for, "One of the worst things that could happen to me would be if I gained 25 pounds" (disagree=29.5%; neutral=24.2%; agree=46.1%). Mean Fat Phobia Score was 3.53 ± 0.56 ; participants <30 years had the highest scores compared to those 40-59 and 60+ (3.71 ± 0.50 vs. 3.37 ± 0.60 and 3.29 ± 0.54 ; $p<0.001$), with no significant difference from form participants 30-39.

Conclusion: Obesity-related SBP are present among dental professionals, consistent with other healthcare fields. While most rejected associations between obesity and dishonesty or lack of intelligence, substantial agreement remained with negative obesity stereotypes and weight-related concerns, particularly anxiety about personal weight gain.

Supported by: University of Iowa College of Dentistry Student Research Program

42. Oral Health Knowledge among WIC-Enrolled Pregnant Women



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Objective: The purpose of this study is to assess expecting mothers' baseline knowledge about their oral health and their future baby's oral health. The objective is to reduce ECC incidence by ensuring that mothers, particularly those from underserved populations, are equipped with the knowledge and resources necessary to foster oral health from the earliest stages of their child's life.

Methods: This secondary analysis included 634 baseline survey responses from WIC-enrolled pregnant women in longitudinal the *Birth to Three – Cavity Free* study, a trial of an intervention to improve care behaviors and reduce ECC. Maternal oral health knowledge was assessed using a 32-item questionnaire scored from -2 (strongly incorrect) to +2 (strongly correct), summed to create a total score. Univariable linear regressions examined associations between total knowledge score and demographics (age, education, employment, income, marital status, dental insurance, ethnicity). Regression coefficients, 95% confidence intervals (CI), and p-values are reported.

Results: Participants had a mean age of 27 years (SD = 5.7); most held a high school diploma/GED (63.9%), and nearly half were single (46.9%). Income was low, with 21.1% reporting \$0–5,000 annually; 67.4% had Medicaid coverage. Higher total knowledge scores were associated with age [+0.383 points/year (95% CI: 0.24–0.53; $p < 0.001$); education [two-year college (+11.703; $p = 0.004$), four-year college (+13.315; $p = 0.001$) vs. ≤ 8 th grade]; employment [full-time (+5.325; $p < 0.001$), part-time (+2.489; $p = 0.031$), and homemaker (+7.883; $p < 0.001$) vs. unemployed]; dental insurance [Medicaid (+4.589; $p < 0.001$) and private (+6.756; $p < 0.001$) vs. no insurance], income [$\geq \$30,000$ (+7.710; $p < 0.001$) vs. \$0–5,000]. Single mothers had lower scores than married (–4.003; $p < 0.001$). Hispanic ethnicity and student status were not significant. Item-level analyses revealed persistent misconceptions about fluoride toothpaste and bedtime brushing, even among higher knowledge groups.

Conclusion: Maternal oral health knowledge is strongly linked to socioeconomic factors. Targeted education strategies for single, low-income, and less-educated mothers is critical to reduce ECC disparities.

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43. Oral Health Perceptions and Behaviors Among Low-Income Pregnant Women



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Objective: Describe baseline demographics, self-reported oral health perceptions, and dietary and oral hygiene behaviors of pregnant participants enrolled in the *Birth to Three – Cavity Free* UH3 study through Iowa's WIC program.

Methods: Secondary analysis utilized baseline data from Iowa WIC-enrolled pregnant women enrolled in a randomized clinical trial evaluating the efficacy of autonomy-supportive oral health messages based on self-determination theory compared to control in preventing early childhood caries in their future children. Participants completed comprehensive questionnaires capturing demographic information, oral health perceptions, and dietary and oral hygiene behaviors. Univariate analyses were conducted to generate an overall profile of the study population.

Results: To date, 602 participants (94% of the final sample size of 634) have completed the initial visit. The mean age was 27 ± 5.71 years; 73% identified as Caucasian, 48% were single, 23% reported annual incomes below \$5,000, and 19% identified as Hispanic. The largest percentages rated their natural teeth as being in good condition (31%), did not believe they had gum problems (40%) or cavities (32%), and had not visited a dental provider since becoming pregnant (65%). Dietary behaviors included consuming three meals (58%) and more than three snacks (45%) daily, with 69% reporting unstructured eating patterns. Beverage consumption between meals included regular soda (42%), 100% juice (47%), and water (94%). Oral hygiene behaviors performed daily included toothbrushing (90%), fluoride toothpaste use (80%), and flossing (29%).

Conclusion: The oral health perceptions and behaviors reported by these pregnant women suggest potential risks for their future children's oral health. Understanding and addressing these behaviors during pregnancy is critical, as maternal habits and knowledge significantly influence early childhood caries outcomes.

Supported by: NIDCR UH3 DE029443; University of Iowa College of Dentistry Student Research Program

44. Patient Characteristics Associated with Dental Fear: A Retrospective EHR Study



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Objective: This study examined variables associated with dental fear (DF) by comparing patients who reported fear-related avoidance of dental appointments with those who did not.

Methods: Deidentified electronic health record data from over 50,000 patients at the University of Iowa College of Dentistry (2010–present) were analyzed. Variables related to demographics, dental history, and medical history were assessed. Descriptive and bivariate statistics compared patients with and without self-reported DF. Multivariable logistic regression was conducted to identify factors associated with self-reported dental fear.

Results: Dental fear was reported by 20.5% of patients. Bivariate analysis revealed that patients reporting dental fear had a significantly higher mean number of untreated carious teeth (DF: 4.06 ± 4.08 , No DF: 2.38 ± 2.75 , $p < 0.001$). Additionally, patients with dental fear had fewer filled teeth on average than those not reporting dental fear (DF: 4.74 ± 4.26 ; No DF: 5.60 ± 5.16 , $p < 0.001$). Diastolic blood pressure was positively associated with dental fear, while systolic blood pressure showed no significant association. Eight binary variables were significantly associated with DF with adjusted odds ratio ([AOR] ≥ 1.50): history of previous problems with dental treatment (AOR = 3.75, CI: 3.50–4.03), dissatisfaction with smile (AOR = 2.25, CI: 2.14–2.37), general anxiety (AOR = 1.77, CI: 1.67–1.88), current dental pain (AOR = 1.71, CI: 1.62–1.81), generalized tooth sensitivity (AOR = 1.67, CI: 1.57–1.77), tobacco use (AOR = 1.60, CI: 1.51–1.69), female gender (AOR = 1.54, CI: 1.46–1.63), and history of recreational drug use (AOR = 1.50, CI: 1.40–1.61).

Conclusion: Dental fear is associated with many psychological, behavioral, and clinical factors. These findings support the development of targeted screening tools and interventions to reduce oral health disparities among patients reporting dental fear.

Supported by: University of Iowa College of Dentistry Student Research Program

45. Pregnant Women's Knowledge and Use of Fluoridated Tap Water



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Objective: Community water fluoridation (CWF) is an effective and equitable strategy for preventing caries. Many individuals, particularly those from socioeconomically disadvantaged groups, avoid tap water due to safety concerns or limited fluoride knowledge. Pregnant women's water choices may influence early childhood caries risk. This study examined demographic factors associated with tap water use, concern about tap water safety, and fluoride knowledge among pregnant participants in the *Birth to Three – Cavity Free* study.

Methods: This secondary analysis included survey responses from pregnant women enrolled in the *Birth to Three – Cavity Free* study (n=614), a trial of an intervention to improve care behaviors and reduce early childhood caries. Descriptive statistics summarize demographics and drinking water behaviors. Group differences were evaluated using chi-square tests. Associations were examined across three domains: drinking water source, concern about tap water safety, and fluoride knowledge, with significance set at $p < 0.05$.

Results: Tap water was the primary drinking source for 34.0% of participants, while 66.0% primarily consumed non-tap water. Tap water use was significantly associated with household income ($p < 0.001$), education level ($p < 0.001$), marital status ($p = 0.016$), Hispanic ethnicity ($p = 0.020$), and race ($p < 0.001$). Tap water users more often reported higher incomes ($\geq \$35,000$: 35.8% vs. 18.9%) and identified as White (75.6% vs. 56.0%). Tap water safety concern was associated with lower income ($p = 0.015$); 28.1% vs. 19.2% reported incomes $< \$5,000$. Fluoride knowledge revealed misconceptions, including the belief that bottled water contains ideal fluoride levels.

Conclusion: Pregnant women's avoidance of tap water and limited understanding of fluoride benefits may undermine CWF's effectiveness and exacerbate oral health disparities. Targeted educational interventions addressing fluoride misconceptions and tap water safety concerns are essential, particularly for socioeconomically disadvantaged and minority populations. Enhancing CWF awareness among expectant mothers can improve oral health outcomes for both mothers and children.

Supported by: NIDCR UH3 DE029443

46. Socioeconomic Indicators of Caries Incidence in an Iowa Pediatric Cohort



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Objective: This study seeks to investigate the relationship between parental stress and children's diet, sugary beverage consumption, hygiene, and DMFT scores.

Methods: Our study population included children aged 2-6 undergoing elective surgeries under general anesthesia at the University of Iowa Stead Family Children's Hospital and a primary caregiver. Caregivers of eligible participants completed a questionnaire collecting data on demographics, oral hygiene habits, diet, systemic health, socioeconomic status, safety, and psychological distress. Intraoperative dental examinations were conducted on the children to assess participants' dmft/DMFT scores.

Results: Higher levels of parental stress were significantly associated with poorer dietary patterns ($p = 0.034$) and increased sugary beverage consumption ($p = 0.0413$). No statistically significant associations were observed between parental stress and DMFT scores. Additionally, parental stress was not significantly associated with children's oral hygiene practices.

Conclusion: Parental stress appears to influence children's dietary behaviors, particularly increasing sugary beverage intake, but was not linked to oral hygiene or caries experience. These findings highlight the need to address psychosocial factors in promoting healthy dietary habits. Given the small sample size and qualitative nature of the data, further research with larger cohorts is warranted to clarify the pathways through which parental stress impacts pediatric oral health.

Supported by: Colgate Award for Research Excellence; University of Iowa College of Dentistry Seed Grant

47. Flexure Strength Comparison: 3Y, 4Y, 5Y TZP & Lithium Disilicate



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Objective: 1: flexural strength of 3Y, 4Y, and 5Y-TZP zirconia, and lithium disilicate using standardized testing methods

2: effect of elemental composition of 3Y, 4Y, and 5Y-TZP zirconia, and lithium disilicate on mechanical properties such as flexural strength and translucency

Methods: A digital STL file will be generated using digital software, incorporating dimensions of $25 \times 4 \times 3$ mm. This file will be 3D designed with the aid of **Exocad** software. A total of **10 samples per group** will be acquired. This methodology facilitates a comparative analysis of the mechanical properties among the four groups.

Flexure strength evaluations of conventionally milled zirconia (**Y-TZP**) material: Flexural strength and flexural modulus will be determined by three-point bend testing. **3-point-bending test** specimens, measuring $25 \times 4 \times 3$ mm (ISO 6872).

Scanning Electron Microscope (SEM): samples will be subjected to SEM for evaluation of surface characterization and elemental composition analysis.

A total of 10 samples per group will be acquired to evaluate the structural analysis using SEM (Scanning Electron Microscopy).

By biostatistics and computational biology within the University of Iowa College of Dentistry: The **Shapiro-Wilk test**, with a significance level of **0.05**, will be employed to assess the normal distribution of the data. This test will be conducted separately for each group, and a **sample size of 48** will be used.

Results: Results show that the milled **3Y TZP** has the highest flexural strength, followed by **4Y, 5Y**, and lithium disilicate. In addition, elemental composition and structural analyses support the degree of compactness of particles and yttria composition available in each group, both being contributing factors to flexural strength and esthetics (translucency).

Conclusion: The **3% yttria-stabilized** zirconia provides the ideal outcome when it comes to the flexural strength of the material. The yttria content available plays an important role in the degree of strength development, post-sintering consolidation of the TZP particles, and different degrees of translucency. Lithium disilicate provides the most translucency due to its elemental composition (glass matrix with embedded crystalline particles).

Supported by: University of Iowa College of Dentistry Student Research Program

48. Impact of Designed Porosity on SBS of 3D-Printed Y-TZP



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Objective: This study aims to evaluate the influence of designed porosity on the mechanical properties and dimensional accuracy of 3D-printed yttria-stabilized tetragonal zirconia polycrystal (Y-TZP). The aim of this study is to determine how variations in pore design affect the diameter, thickness, and shear bond strength (SBS) of printed zirconia specimens, providing insight into how porosity influences the precision and reproducibility of additive manufacturing processes

Methods: Digital STL file was generated using a software, incorporating dimensions of 12 diameter x 5 mm. For the experimental phase, the test disks (n=20) consisted of two distinct groups (n=10). Groups were separated by no surface treatment (Control) and design pores of 50X50 microns 200 µm apart (G1:50). The designs were exported as a standard tessellation language (STL) file and used to additively manufacture (AM) the disks with different surface textures using an SLA 3D printer and a zirconia material (3DMix ZrO₂ paste, 3DCeram Co). The diameter and thickness of all AM specimens were measured with digital calipers. A bond strength testing machine measured SBS of all AM specimens. Microstructural surface characterization was evaluated using a Scanning Electron Microscope (SEM). Mean standard deviation was calculated for each group regarding the volumetric changes (diameter and thickness). Data presented a normal distribution (Shapiro-Wilk test, p>0.05). The groups were compared using an independent-sample t-test. The significance level adopted was p<0.05 for all tests.

Results: There was a significant difference in diameter (t= -4.546; p<0.001) with higher mean values for the porosity group, and no statistical difference for thickness (t= 0.470; p=0.644).

Conclusion: Although additive manufacturing offers a promising alternative to conventional subtractive techniques for producing zirconia crowns, optimizing design parameters and maintaining strict process control are essential to achieve dimensional accuracy, preserve material integrity, and enhance clinical outcomes.

Supported by: University of Iowa College of Dentistry Student Research Program

49. pH of Nano-Hydroxyapatite Containing Oral Care Products in Simulated Saliva



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Objective: This study evaluated the pH of commercially available nHAp oral care products after dilution in artificial saliva, with implications for oral pH homeostasis and remineralization potential.

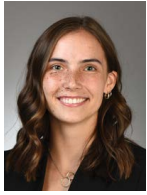
Methods: Fourteen oral care products including toothpaste gels (BOKA, Fygg, Ollie, Dr. Jen, Great Oral Health, Mouthology, Davids Hydroxi Fluoride Free) and tablets (WhiteBite Pro, NoBS, Boka, Huppy, Bite, Duo) were dissolved in artificial saliva (BioChemazone BZ323, pH = 6.8). Each sample was mixed at a ratio of 1 mL of artificial saliva per unit of toothpaste (1 tablet or 250 mg of gel, simulating a pea-sized amount) to reflect typical oral dilution. Triplicate samples were prepared for each product. pH measurements were recorded at 1 and 5 minutes post-mixing using a calibrated pH meter. Mean pH values and standard deviations were calculated for each product.

Results: pH values ranged from 6.46 to 8.73 across all products. The lowest mean pH was observed in NoBS Tablets (6.46 ± 0.05 at 1 min; 6.59 ± 0.06 at 5 min), while the highest was found in Davids Hydroxi Fluoride Free toothpaste (8.70 ± 0.10 at 1 min; 8.74 ± 0.11 at 5 min). Most products maintained a neutral to slightly alkaline pH, with tablets generally showing greater variability than paste formulations.

Conclusion: The pH of nHAp-containing oral care products varies significantly by formulation after mixing with artificial saliva. Our findings support further investigation into formulation-dependent effects on oral health outcomes of nHAp-containing oral care products.

Supported by: University of Iowa College of Dentistry Student Research Program

50. Remineralization Efficacy of Desensitizing Agents Following Dentinal Erosion



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Objective: Dentin demineralization occurs when acids from dietary, bacterial, or intrinsic sources dissolve tooth minerals, leading to hypersensitivity and reduced structural strength. Remineralization (formation of a new mineralized layer on exposed dentin) can reduce patient pain and restore dentinal properties.

This study investigated the efficacy of three desensitizing materials (Teethmate (calcium phosphate slurry), Predicta (10% nanohydroxyapatite paste), and ClinPro (2.1% NaF varnish)) in restoring mineralization and mechanical properties of eroded dentin using x-ray diffraction and microhardness testing.

Methods: 28 extracted premolars had buccal dentin surfaces exposed and underwent erosive cycling with citric acid (pH2.4, 5 min, 3x/day, for 5 days) and simulated body fluid (pH7.0). Pre- and post-erosion microhardness were measured to standardize erosion. Baseline (eroded) values were measured prior to desensitizing agent application. Samples were treated with Predicta, Teethmate, ClinPro varnish, or control (deionized water), then immersed in remineralization media (1 hour in both 1M CaCl₂ and 1M KH₂PO₄ solution). X-ray diffraction and Knoop microhardness testing assessed hydroxyapatite formation and mechanical recovery. Microhardness of the specimens before (eroded) and after desensitizing agent and remineralization was analyzed using repeated measures ANOVA ($\alpha=0.05$), and one-way ANOVA was used to compare fold-change between groups ($\alpha=0.05$).

Results: ClinPro produced a statistically significant increase in microhardness between eroded and remineralized specimens ($p=0.036$). Predicta ($p=0.36$) and Teethmate ($p=0.22$) showed numerical, though non-significant increases. Fold-change analysis indicated hardness recovery of 1.3-fold for Predicta, 1.1-fold for Teethmate, and 0.94-fold for control ($p=0.075$). All treated groups showed restoration of sharp diffraction peaks in hydroxyapatite ranges compared to blunted x-ray diffraction peaks in eroded specimens.

Conclusion: All desensitizing agents promoted dentin remineralization, evidenced by increased microhardness and hydroxyapatite formation. ClinPro 2.1% NaF varnish demonstrated the greatest improvement in mechanical properties, suggesting superior efficacy in restoring eroded dentin strength.

Supported by: University of Iowa College of Dentistry Student Research Program

51. The Novelty of Dental Ceramic: New Advances in Lithium Disilicate



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Objective: Specific Aim 1: This aim seeks to understand the influence of 10-MDP on bonding efficacy, which is critical for the durability and longevity of the restorations.

Specific Aim 2: Assess the flexural strength and modulus of elasticity of the newly available CAD/CAM lithium disilicate glass-ceramic block CEREC Tessera.

Specific Aim 3: Evaluate the marginal fit discrepancy of the new CAD/CAM lithium disilicate glass-ceramic block CEREC Tessera.

Methods: Standardized CAD/CAM blocks (CEREC Tessera, IPS e.max CAD, Celtra Duo, GC Initial LiSi) were sectioned into specimens for Notchless Triangular Prism fracture toughness testing and three-point bending for flexural strength and modulus evaluation. Specimens were bonded with a 10-MDP resin cement system (Panavia V5) and stored in 37 °C water for either 24 h or 90 days. Digital scanning and dual-scan superimposition were used to measure marginal fit via Geomagic Control software. Statistical analysis will include two-way ANOVA and Weibull analysis ($\alpha = 0.05$).

Results: Preliminary results indicate consistent specimen preparation and bonding standardization across all groups. Early observations suggest that CEREC Tessera exhibits clinically acceptable marginal gaps comparable to IPS e.max CAD. Initial mechanical testing trends indicate favorable handling and crack resistance in Tessera specimens, aligning with reported high biaxial flexural strength values. Final fracture toughness and flexural strength data are currently under processing and will be presented at the meeting.

Conclusion: CEREC Tessera demonstrates promising marginal adaptation and mechanical behavior consistent with established lithium disilicate ceramics. Although full mechanical data analysis is ongoing, preliminary trends indicate comparable performance to current clinical gold standards. These findings support the potential clinical adoption of advanced lithium disilicate materials for esthetic and functional restorations.

Supported by: University of Iowa College of Dentistry Student Research Program

52. Associations Between Weight Loss Medications and Oral Health



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Objective: Use of pharmacological treatments for weight loss has increased in recent years, yet their effects on oral health remain unclear. This study aimed to address this gap by examining associations between weight loss medication (WLM) use and oral health outcomes.

Methods: A cross-sectional study was conducted among adult patients (18+ years old) who received comprehensive examinations at the University of Iowa College of Dentistry between January 2017 and December 2024. Participants were categorized as either WLM users with self-reported use of at least one WLM at the time of their exam or nonusers who reported no WLM use. WLM users were matched 1:1 to nonusers based on gender, age (± 1 year), and exam date (≤ 365 days). Demographic, socioeconomic, systemic health, and dental variables were collected from electronic dental records. Associations between WLM use and oral health were assessed using Pearson's chi-square and Wilcoxon rank-sum tests ($\alpha=0.05$).

Results: Among the 381 matched pairs of WLM users and nonusers, the average age was 52.6 ± 13.7 years, and 66.7% of participants were female. Compared to nonusers, WLM users had significantly higher BMIs ($p=0.001$) and a greater prevalence of Type 2 diabetes ($p=0.002$). Heart disease ($p=0.014$) and alcohol use ($p=0.004$) were also more common among WLM users. Additionally, WLM users reported higher candy consumption ($p=0.042$), were more likely to run out of food ($p=0.042$), and experienced greater difficulty maintaining a sufficient food supply ($p=0.023$) compared to non-users. No significant differences were observed between groups in caries experience (DMFT) or dental erosion. However, WLM users had fewer teeth than nonusers ($p=0.041$). The prevalence of periodontal disease, denture use, and dry mouth did not differ significantly between groups.

Conclusion: These findings do not support an association between WLM use and increased risk of caries, erosion, or periodontal disease.

Supported by: University of Iowa College of Dentistry Student Research Program

53. Clinical Survival of Band and Loops Versus Crown and Loops



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Objective: This study compared clinical survival rates of band & loop (B&L) and crown & loop (C&L) space maintainers placed at the University of Iowa College of Dentistry.

Methods: A retrospective cohort study was conducted using electronic health records between July 1, 2014, and June 30, 2024. A convenience sample of the first 200 pediatric patients was selected from all patients that received a space maintainer during that time period. Outcomes were categorized as success (appliance intact until eruption of the permanent successor or no evidence of failure at follow-up appointments) or failure (premature dislodgement, loss, or need for replacement). Univariate data is reported.

Results: A total of 285 unilateral space maintainers were placed in our sample of 200 pediatric patients. 220 of them were B&Ls and 65 were C&Ls. Out of 220 B&Ls, 92 were successful, 65 failed, and 63 were lost to follow-up, for a survival rate of 42%. Out of 65 C&Ls, 28 were successful, 11 failed, and 27 were lost to follow-up, for a survival rate of 43%.

Conclusion: Band & loop and crown & loop space maintainers have similar survival rates when used in the primary and mixed dentitions in a college of dentistry setting.

Supported by: University of Iowa College of Dentistry Student Research Program

54. Comparative analysis of AI-based mandibular segmentation software for CBCT-derived 3D reconstruction of edentulous mandibles



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Objective: Accurate jaw segmentation of cone beam computed tomography (CBCT) data is fundamental to three-dimensional (3D) modeling in digital dental implant workflows. Artificial intelligence (AI)-based jaw segmentation has emerged as a promising alternative; however, evidence regarding its performance remains limited. The objective of this study was to compare 3D reconstructions generated by commercially available AI-based mandibular segmentation software.

Methods: Forty de-identified Cone Beam Computed Tomography (CBCT) datasets of completely edentulous mandibles were selected from an institutional database after screening 250 datasets, adhering to strict inclusion criteria that excluded the presence of teeth, implants, fractures, or artifacts. These DICOM files were segmented using four different software platforms: BlueSky Bio, RealGuide, CoDiagnostix, and ReLu. The segmented models were then exported as STL files and imported into Geomagic Design X, where a best-fit global and fine registration algorithm was utilized to align all models. Global surface-to-surface deviation was quantified through root mean square (RMS) error assessments for the entire mandible and specifically for the anterior region mesial to the mental foramen. Additional parameters analyzed included surface area, volume, number of vertices, and resolution density. Statistical analysis was conducted using a linear mixed-effects model with restricted maximum likelihood estimation to determine if clinically significant differences exist among the AI segmentation platforms regarding mandibular reconstruction, with linear measurements taken at a midline cross-section (height and width) and between bilateral gonial angles. Furthermore, color deviation maps were generated for qualitative assessment of the results.

Results: The surface characteristics and reconstructed areas of the 3D models varied depending on the segmentation software used. The global surface-to-surface deviation results indicated that CoDiagnostix exhibited the greatest variation relative to the other software programs, both for the entire mandible and for the anterior segment. In the measurement of intergonial linear distance, Blue Sky Bio showed significantly larger values, whereas no statistically significant differences were found among ReLu, CoDiagnostix, and RealGuide. A similar tendency was observed in the 2D linear measurements of bone height and width in the anterior region.

Conclusion: The 3D geometric modeling of the edentulous mandible was influenced by commercially available AI-based jaw segmentation software; however, the deviations among the software programs remained within the clinically acceptable range.

55. Cross-System Patient Matching Between Epic and Axium Using Transformer-Based Embeddings



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Objective: Integrating general hospital and dental records across heterogeneous electronic health record (EHR) systems

remains challenging due to differences in data sources, coding standards, and documentation practices.

This study evaluates BERT-based language models for research-oriented patient matching between Epic (hospital EHR) and Axium (dental EHR), focusing on performance across multiple clinical data channels.

Methods: Patient representations were constructed from Epic and Axium using structured and semi-structured clinical data, including diagnoses, procedures, medications, and questionnaire-derived text. Record-level embeddings were generated using pretrained transformer models, including MiniLM, MPNet, Bio_ClinicalBERT, and SapBERT. Patients were represented using Epic-only, Axium-only, or combined cross-system embeddings. Evaluation was conducted in two stages. First, patient self-matching was assessed by computing cosine similarity between Epic- and Axium-derived embeddings and ranking all pairwise matches. Performance was summarized using top-k accuracy, defined as the proportion of patients whose true cross-system match appeared among the top-k candidates. Second, channel-wise analyses quantified the contribution of individual data sources, followed by development of a weighted multi-channel fusion framework integrating medication and contextual embeddings. All analyses were conducted strictly for research and methodological evaluation and were not intended for clinical or operational identity resolution.

Results: General-purpose sentence embedding models demonstrated more stable cross-system matching performance than domain-specific clinical models. SapBERT and MiniLM achieved the highest top-k accuracy across multiple data combinations, while several clinical-domain models were less robust to heterogeneous record structures. Channel-wise analyses showed that medication and contextual information contributed disproportionately to matching accuracy. The weighted fusion framework further improved performance and reduced case-level mismatches compared to single-channel representations.

Conclusion: These findings emphasize the importance of systematic benchmarking for cross-system EHR integration. Lightweight general-purpose embeddings combined with targeted multi-channel fusion may provide a more robust and scalable approach for patient-level matching between hospital and dental EHR systems than reliance on domain-specific clinical models alone.

Supported by: University of Iowa Strategic Initiatives Fund P3; University of Iowa CTSA Award; University of Iowa College of Dentistry CRISP Grant

56. Dentist Reports of Patient Dental Anxiety and Procedural Pain Management



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Objective: This study aimed to assess dentists' perceptions and experiences regarding patient-reported procedural pain and anxiety.

Methods: A 23-item electronic survey was distributed through the University of Iowa College of Dentistry's alumni email list. Questions addressed patient anxiety and anesthesia challenges, including prevalence, provider confidence, interventions, training sources, and documentation practices. Descriptive and bivariate analyses were conducted by gender, years in practice, and provider attitudes toward patient pain tolerance ($\alpha=0.05$).

Results: Ninety-seven dentists completed the survey (56.7% males, mean years in practice: 21.1 ± 13.7). The most anxiety-inducing aspects for patients were fear of injections (57.9%) and pain during the procedure (31.6%). Overall, 62.9% of respondents agreed that patients should tolerate mild procedural discomfort. The median estimated percentage of difficult-to-numb patients was 10% (mean $\pm$ SD: $14.5\% \pm 12.2\%$).

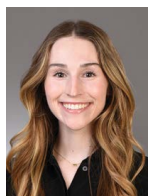
Commonly reported management strategies included changing injection sites (92.8%), PDLs injections (84.5%), and switching anesthetic agents (74.2%). More than 60% reported "often" or "always" providing additional anesthetic routes. Sources of knowledge most often cited were personal trial-and-error (42.6%), followed by dental school training (24.5%) and continuing education courses (16.0%). Only one-third felt well prepared by their dental school education.

Confidence in anesthetizing difficult-to-numb patients was generally high (74.2%), but varied by gender and experience. Male dentists were more likely than females to report high confidence (83.5% vs. 63.4%, $p=0.024$). Confidence also increased with years of practice (<10 years: 60.0%, 10-25 years: 68.7%, >25 years: 86.8%, $p=0.015$). Similarly, reports that dental injections were "often" or "always" perceived as painless increased with experience (<10 years: 44.0%, 10-25 years: 59.4%, >25 years: 78.9%, $p=0.005$).

Conclusion: Dentists varied in their assessment of dental fear, procedural pain, and patient pain tolerance, with less variability in their applied management strategies. Strengthened educational and clinical efforts are warranted to better address the persistent prevalence of dental fear and anxiety.

Supported by: University of Iowa College of Dentistry Student Research Program

57. Dentists' Opinions on Transitioning Care for Adolescents With Special Needs



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Objective: Dental care transition is shifting from child-centered to adult-centered dental care. For adolescents with special health care needs (SHCN), unsuccessful transition can lead to gaps or loss of care. This nationwide survey aimed to assess pediatric and general dentists' attitudes toward transitions for adolescents with SHCN.

Methods: A 25-item survey was distributed to three national dental organizations representing pediatric (American Academy of Pediatric Dentistry), general (National Network for Oral Health Access), and special needs dentists (Special Care Dentistry Association). Questions addressed access to care, provider comfort in treating adults with SHCN, timing of transitions, strategies to improve transition, as well as demographic and practice-related information.

Results: 225 pediatric dentists and 101 general dentists responded to the survey. Most general dentists reported treating pediatric patients in their practices, suggesting readiness for adolescent care, and a majority (98%) had experience treating patients with SHCN. Among pediatric dentists, 76% reported seeing patients over age 18. Both groups expressed comfort with preventive, diagnostic, and minor surgical procedures; however, general dentists were more comfortable with crowns and removable prosthodontics, while pediatric dentists were not. Neither group felt comfortable providing implant services for adults with SHCN. While 61% of general dentists reported receiving referrals from pediatric dentists for patients aged 12–14, both groups agreed that the optimal transition age for adolescents with SHCN is 15–21 years and emphasized independence and emotional readiness as important factors in the process. Medicaid was identified as a key facilitator for transition, while private insurance was considered less influential.

Conclusion: While pediatric and general dentists agree on the importance of transitioning dental care for adolescents with SHCN, significant differences exist in provider comfort with various dental procedures. Both groups favored a structured transition process and shared concerns about potential barriers to its successful completion.

Supported by: 2024 Alfred Healy Leadership Award in Developmental Disabilities; University of Iowa College of Dentistry Student Research Program

58. EDIL3 Promotes Invasion of Mesenchymal-like OSCC Cells



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Objective: Epithelial-to-mesenchymal transition (EMT) drives invasion of several neoplasms but is understudied in oral squamous cell carcinoma (OSCC). A novel *in vitro* model of EMT in OSCC identified *EDIL3* as a gene that is upregulated in mesenchymal-like cells compared to epithelial-like cells, with higher expression in invasive vs non-invasive mesenchymal-like cells. The objectives were to compare the localized expression of EDIL3 protein in epithelial-like and mesenchymal-like OSCC cells and assess its role in invasion.

Methods: Epithelial and mesenchymal-like OSCC cells were stained with anti-EDIL3 under non-permeabilized or permeabilized conditions to observe cellular EDIL3 expression. Relative signals were qualitatively compared between conditions. For functional analysis, *EDIL3* in SCC-9 E and SCC-9 M cells was knocked down via siRNA prior to a Matrigel invasion assay. Control and *EDIL3* knockdown SCC-9 E and SCC-9 M cells were plated in serum free media on a 10% Matrigel matrix membrane, with media containing 20% fetal bovine serum added to the bottom chamber. Following 18-hour incubation, invaded cells were fixed, stained with DAPI, and imaged. Invaded cells were quantified by counting DAPI-positive cells per 20x field from 5 fields per well. ANOVA with a Sidak multiple comparison tests were used to interpret data.

Results: EDIL3 expression in non-permeabilized conditions appears punctated and localized to the cell membrane of SCC-9 M cells vs low expression on the SCC-9 E cells. Invasion assays reveal differential patterns of invasion between untreated SCC-9 E and SCC-9 M cells, with higher invasion in untreated SCC-9 M cells vs siEDIL3-treated SCC-9 M cells.

Conclusion: Immunofluorescent staining and imaging suggests that EDIL3 is secreted in greater quantities by SCC-9 M cells vs SCC-9 E cells. Furthermore, EDIL3 promotes invasion of SCC-9 M cells. Identifying the roles of EDIL3 in invasion may inform new therapeutic targets for OSCC and perhaps be a novel diagnostic biomarker of malignancy.

Supported by: Holden Comprehensive Cancer Center; University of Iowa College of Dentistry Student Research Program

59. Evaluating Silver Diamine Fluoride (SDF) Application Frequency in Pediatric Dentistry



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Objective: Current evidence and American Academy of Pediatric Dentistry (AAPD) guidelines recommend biannual silver diamine fluoride (SDF) application for optimal caries

arrest outcomes in pediatric patients. However, adherence to these recommendations in clinic settings remains uncertain. In this research, we evaluated the frequency and patterns of SDF application in pediatric patients treated at the University of Iowa College of Dentistry Department of Pediatric Dentistry over ten years. We analyzed application patterns across providers to identify trends, potential gaps, and areas of improvement in managing caries through SDF.

Methods: Using a retrospective observational approach, we analyzed 10 years of patient records from the Department of Pediatric Dentistry (July 1, 2014 - June 30, 2024). With the assistance of the College of Dentistry's IT department, we gathered electronic health records from axiUm to identify pediatric patients who received at least one application of 38% SDF (procedure code D1354) and subsequent applications within 365 days of the initial treatment. We assessed changes in SDF utilization across the study period and compliance among different providers with adherence to guidelines.

Results: A total of 5,013 pediatric patients received at least one SDF application during the study period. Of these, 1,039 (20.7%) received one reapplication, 155 (3.1%) received two, 31 (0.6%) received three, and only 3 (0.1%) received four reapplications. Overall, fewer than one in four patients received at least two SDF applications within 12 months. SDF utilization increased significantly from 121 patients in 2016 to 768 in 2024, reflecting its increase in acceptance. While utilization of SDF increased, reapplication rates remained low relative to recommended guidelines.

Conclusion: Our findings highlighted a gap between evidence-based recommendations and current clinical practice in SDF application for pediatric patients. This emphasizes the need for standardized recall protocols to enhance SDF treatment effectiveness and consistency.

Supported by: University of Iowa College of Dentistry Student Research Program

60. Factors Influencing Intravenous Moderate Sedation Dosage in Periodontal Surgery Procedures



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Objective: Intravenous moderate sedation is routinely employed during periodontal surgical procedures to alleviate patient anxiety and discomfort. Precise titration of the sedative medications is critical to prevent unintentional deep sedation and potential airway complications. While factors like age and weight are known to influence sedation requirements, limited literature has evaluated a broader range of patient- and procedure-related variables within the outpatient dental environment.

This study retrospectively evaluates how patient-related factors (e.g., age, BMI, ASA classification) and procedure-related factors affect the dosage of administered sedation medications, with the goal of supporting safer, more personalized planning and administration of moderate sedation.

Methods: A retrospective cohort study was conducted using electronic health records (Axium) of 175 patients who received intravenous moderate conscious sedation for periodontal surgical procedures at the University of Iowa College of Dentistry between 2014 and 2024. Several patient- and procedure-related variables were analyzed including, but not limited to, age, medical and social history, BMI, ASA classification, Mallampati score, and dosages of sedation medications. Statistical analysis was performed to evaluate the relationship between these variables and total sedative medication dosage.

Results: The mean age of the patient cohort was 52.78 ± 18.04 years, with 66.9% being female. The mean BMI was 26.63 ± 5.37 . Most patients were classified as ASA II (71.2%). Airway assessment was favorable, with 73.7% of patients having a Mallampati score of 1 or 2. The two most frequently administered sedatives were midazolam (mean = 10.26 mg, SD = 5.01) and fentanyl (mean = 69.01 mcg, SD = 39.40).

Conclusion: Preliminary findings suggest that a combination of demographic, clinical, and procedural factors may significantly influence the total sedative dosage required during intravenous moderate sedation. Identifying these relationships can help clinicians more accurately anticipate patient-specific sedation needs, refine dosing protocols, and enhance safety during periodontal and other outpatient dental procedures.

Supported by: University of Iowa College of Dentistry Student Research Program

61. Finite Element Analysis of Mandibular Arch Collapse and Molar Drift



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Objective: Relapse of aligned mandibular anterior teeth and the progressive collapse of the mandibular anterior arch are striking problems for orthodontists. The etiology of this collapse, and the cause of mesial molar drift, are unknown. However, light continuous (quasi-continuous) intra-oral loads applied to the mandibular dentition over years have been implicated. The purpose of this study was to investigate the influence of these loads (tongue pressure, lip-cheek pressure, and interdental force) on mandibular arch collapse and mesial molar drift.

Methods: Dentitions of three-dimensional finite element mandibular models were subjected to a wide range of simulated tongue pressures, lip-cheek pressures, and transseptal fiber-mediated interdental forces reported in the literature. Resulting crown displacement measurements from these isolated loads were made along with measurements resulting from simultaneous combined application of literature-defined mean tongue pressure, lip-cheek pressure, and interdental force.

Results: Tongue pressure alone results in generalized arch expansion and tooth spacing while lip-cheek pressure and interdental force results in generalized arch collapse, anterior crowding, and mesial molar displacement. Simultaneous application of combined tongue pressure, lip-cheek pressure, and interdental force mean values results in incisor crowding, intercanine width reduction, and mesial molar displacement.

Conclusion: Mandibular incisor crowding, intercanine width reduction, and mesial molar displacement result from simultaneous application of tongue pressure, lip-cheek pressure, and interdental force.

62. Utilization of Hall Stainless Steel Crowns in Dental School Setting



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Objective: To evaluate utilization patterns of Hall stainless steel crowns (SSCs) compared with conventional SSCs at the University of Iowa College of Dentistry over a 12-year period.

Methods: Following Institutional Review Board approval, a retrospective chart review was conducted using axiUm, the College of Dentistry's electronic health record. In 2011, a unique procedure code was created to track Hall crown placement. Records from January 1, 2012, through December 31, 2024, were reviewed for pediatric patients receiving either a Hall SSC or a conventional SSC. Data collected included crown type, provider type (faculty, resident, predoctoral student), patient age, and tooth number. Descriptive statistics characterized utilization of conventional SSCs vs. Hall technique.

Results: Hall crown utilization increased steadily over the 12-year study period with a statistically significant slope of $p < 0.001$. Pediatric dental residents placed the most Hall Crowns of all provider types. Initially, crowns were primarily placed by faculty and residents, but predoctoral students increasingly adopted the technique toward the latter part of the study period. Hall crowns were placed on children ranging from 1 – 12 years old. Five-year-old children had the highest number of Hall crowns placed. Mandibular first primary molars were the most frequent teeth treated with Hall crowns.

Conclusion: The Hall Technique has become an increasingly utilized restorative option in a U.S. dental school setting. Growth in adoption among residents and predoctoral students highlights the importance of integrating minimally invasive strategies into pediatric dental training.

63. Impact of an Intervention on Dental Incident Reports



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Objective: To assess safety events in the College of Dentistry before and after an intervention based on incident reports.

Methods: Incident reports at the College of Dentistry from January 1, 2022 to May 31, 2025 were reviewed, including both patient and nonpatient events. Collected data included age, gender, weekday, time, event type, clinic, response personnel, and ambulance use. For patient incidents, additional variables included number of medications and chronic illnesses, presence of generalized anxiety disorder (GAD), timing relative to procedure, and patient type (comprehensive vs. limited care). Descriptive and bivariate analyses were conducted using chi-square or Fisher's exact tests and two-sample t-tests ($\alpha=0.05$).

Results: A total of 122 incident reports were reviewed, including 73 pre- and 49 post-intervention. Mean patient age was 52.5 ± 22.4 years, approximately two-thirds female, and 64.3% were comprehensive care or emergency patients. Most incidents occurred mid-procedure (63%), and ambulances were used in 29.4% of cases. Common events included procedural errors (16.5%), falls (14.1%), unspecified patient events (11.6%), and syncope (10.8%), occurring most frequently in the Prosthodontics (14.3%), Endodontics (13.5%), and Family Dentistry (11.8%) departments. Patients reported an average of 4.8 ± 2.7 medications and 3.5 ± 2.0 chronic illnesses; most common medication categories were endocrine, behavioral/developmental/mental health, and muscle/bone/connective tissue, while chronic illnesses were primarily endocrine and cardiovascular. About 31% reported GAD.

Patient demographics and health profiles did not differ significantly between periods. Event types differed significantly ($p < 0.001$): neurologic/syncope (40.3%) and safety/exposure (22.2%) predominated pre-intervention, whereas procedural/clinical (51.0%) and safety/exposure (40.8%) predominated post-intervention. Campus security responses increased post-intervention (9.1% vs. 3.0%), though not significantly.

Conclusion: Findings indicate a shift in reporting practices, with increased documentation of procedural and safety-related events, potentially reflecting more comprehensive incident tracking beyond acute medical emergencies.

Supported by: University of Iowa College of Dentistry Student Research Program

64. Impact of Systemic Health and Canal Quality on Endodontic Outcomes



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Objective: To evaluate the prevalence of systemic health (SH) conditions in patients who completed endodontic treatment, assess the radiographic quality of root canal therapy (QRCT) performed by predoctoral dental students (DPS), and determine their combined impact on endodontic outcomes (EO).

Methods: This ongoing retrospective study analyzes patients treated between January 2021 and September 2025. Following IRB approval, data are being extracted from 1,000 patient records at a university clinic. Preliminary results are based on the first 628 cases with complete nonsurgical root canal therapy. Variables analyzed include age, gender (male, female, others), presence of systemic health conditions (categorized from medical histories), periapical lesion (assessed radiographically), and quality of root canal treatment. EO was defined by absence of pain, periodontal health, and periapical healing (PAI = 2 or Estrella classification).

Results: The mean age of the sample was 30.45 years (median: 28.0 years; SD: 14.77 years). The majority of patients were female (61.7%), followed by male (37.6%) and others (0.7%). Systemic health conditions were present in 56.21% of cases. Periapical lesions were observed in 44.13% of patients, while satisfactory quality of root canal treatment was achieved in 85.35% of cases. Endodontic outcomes was satisfactory in 75% of 200 evaluated cases. Further analysis will employ bivariate tests and logistic regression to assess associations between SH, QRCT, and EO, adjusting for confounders.

Conclusion: This study provides baseline data on SH prevalence, QRCT quality, and EO, aiming to identify predictors of success and guide improvements in clinical education and patient care. We are currently conducting detailed data analysis; due to time constraints, complete results cannot be included at this stage. Comprehensive findings will be presented at the conference, and we appreciate your consideration of this request.

Supported by: Brazil Ministry of Education CAPES; University of Iowa College of Dentistry Department of Endodontics

65. Iowa Dentists' Practices and Perspectives on Complete Dentures



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Objective: As the global population ages, the number of edentulous patients continues to grow. Consequently, prosthodontic care, such as complete dentures, remains essential for this patient population. The aim of this study was to identify facilitators and barriers for dentists to offer complete denture care in their practice.

Methods: We conducted a secondary analysis of 82 one-on-one interview transcripts from practicing Iowa dentists. Participants were asked about their attitudes, behaviors, and experiences with completing denture services in their practice. Data were analyzed qualitatively to identify themes using direct thematic analyses. Transcripts were coded in Dedoose.

Results: Our final analysis included 78 participants; 4 were excluded because they received their dental education internationally, which represented a different training experience from U.S. dental programs. Of the 78 dentists, 91% (n = 71) actively provide complete denture services in their clinical practice while 9% (n = 7) do not provide complete denture services. Transcripts were coded to identify facilitators and barriers to providing complete denture services, which were then organized into distinct thematic factors. For facilitating factors - altruistic factors of the dentist were reported the most frequently (n = 126, 31%), with education received (n = 112, 28%) being the second highest reported facilitating factor. The most prominent barrier identified was psychological inflexibility of the patient (n = 107, 25%) with the second highest being financial (n = 81, 19%).

Conclusion: Among the Iowa dentists interviewed, the majority of dentists provide complete dentures to their patients. Altruistic motivation of the dentist emerged as the primary facilitator of offering this service, while psychological inflexibility of the patient was the prominent barrier to delivering complete denture care.

Supported by: University of Iowa College of Dentistry Student Research Program

66. Local Anesthetic Diffusion Through Cortical Bone: An *in vitro* Model



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Objective: This study investigates the diffusion of two commonly used dental local anesthetics through cortical bone of standardized thickness using an *in vitro* model, aiming to clarify the role of bone permeability in anesthetic efficacy.

Methods: A custom-designed vertical diffusion cell system was used to assess the diffusion of 2% lidocaine and 4% articaine. Cortical bone samples were harvested from sheep tibias, embedded in acrylic molds, and sectioned to a uniform thickness of 0.50 mm. The donor chamber contained 6 mL of unmodified anesthetic solution, while the receptor chamber was filled with 6mL of isotonic saline. Ten experimental runs were conducted over a 10-minute period under two conditions: atmospheric pressure and 10 psi air pressure applied to the donor chamber to enhance diffusion.

Results: No detectable diffusion was observed with UV-Vis spectroscopy under atmospheric pressure for either anesthetic. Two trials from the pressure-enhanced condition were excluded due to significant deviation from group means. Under 10 psi of pressure, the mean diffusion percentage was $0.980 \pm 0.446\%$ for lidocaine and $1.189 \pm 0.466\%$ for articaine. The difference between the two anesthetics was not statistically significant ($p = 0.406$).

Conclusion: Articaine demonstrated a slightly higher mean diffusion through cortical bone compared to lidocaine, though the difference was not statistically significant. These findings suggest that articaine's enhanced clinical efficacy in infiltration anesthesia may be attributed more to its higher concentration or active transport mechanisms through soft tissues and vasculature, rather than passive diffusion through cortical bone.

Supported by: University of Iowa College of Dentistry Student Research Program

67. Patient Appointment Compliance Trends in a Dental Education Setting



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Objective: To evaluate the relationship between self-reported dental fear and other patient-related factors influencing appointment outcomes in a university-based dental clinic

Methods: Deidentified patient data was extracted from electronic dental records at the University of Iowa College of Dentistry. Inclusion criteria were patients age 18 years or older who had at least one appointment between January 2024 and August 2025 and responded either "Yes" or "No" to a dental fear question on the health history form. Appointments noted as "Cancelled by Office" were excluded from the analysis. Descriptive statistics were generated, then bivariate analyses were conducted to evaluate associations between dental fear and appointment outcomes (categorized as kept, cancelled, or failed; $\alpha=0.0001$).

Results: Approximately 150,000 appointments from over 29,000 patients (58.2% female) were analyzed, of which 19.77% reported dental fear. Patients with dental fear were significantly more likely to have cancelled (20.48% vs. 17.32%, $p<0.0001$) or failed (4.87% vs. 3.58%, $p<0.0001$) appointments compared to those without dental fear. The odds ratios (OR) of cancelled or failed outcomes relative to kept were higher among appointments associated with fearful patients (Failed appointments: OR = 1.44; 95% CI: 1.35–1.54. Cancelled appointments: OR = 1.25; 95% CI: 1.21-1.30). Appointment failures were found to have an indirect correlation with age (highest: 18-24 years (6.67%); lowest >75 years (1.30%). A higher failure rate was found in patients insured with Medicaid (5.72%) compared to privately insured (2.06%) and self-pay patients (4.05%). The highest rates of appointment cancellations and failures were observed in predoctoral clinics (Cancel: 18.9%, Failed: 4.98%) compared to faculty practice (Cancel: 15.79%, Failed: 2.06%) and resident clinics (Cancel: 17.78%, Failed: 4.42%).

Conclusion: Dental fear, insurance status, and patient age were significantly associated with increased rates of cancelled and failed appointments in adult patients. These findings underscore the importance of identifying and addressing dental fear to improve patient attendance and continuity of care in academic dental settings.

Supported by: University of Iowa College of Dentistry Student Research Program

68. Polypharmacy and Self-Reported Clenching/Grinding: A Network Analysis



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Objective: Most drug-induced bruxism evidence comes from case reports, with selective serotonin reuptake inhibitors (SSRIs) implicated in 74% of published cases. However, population-level evidence remains limited. This study investigated: (1) association between central nervous system (CNS) medication classes and self-reported teeth clenching or grinding after adjustment for confounders, (2) relationships between polypharmacy and self-reported teeth clenching or grinding risk, and (3) high-risk drug class combinations using network analysis.

Methods: We conducted a retrospective cohort study of 14,643 dental school patients who self-reported clenching or grinding their teeth (IRB: 202505023). Medications were standardized using RxNorm API. We selected 27 medications associated with bruxism in published literature and grouped them into 14 pharmacologic classes. Multivariable logistic regression adjusted for age, sex, respiratory conditions, and polypharmacy. Network analysis evaluated 57 pairwise drug class combinations, with synergy assessed using multiplicative models.

Results: Overall, self-reported clenching or grinding prevalence was 54%. After adjustment, methylphenidate (CNS stimulant) (aOR=1.40, p=0.003), clonazepam (benzodiazepine) (aOR=1.37, p=0.005), albuterol (short acting beta agonist) (aOR=1.22, p<0.001), and duloxetine (serotonin norepinephrine reuptake inhibitor (SNRI)) (aOR=1.35, p=0.013) were associated with increased risk, whereas hydrocodone (opioid) was protective (aOR=0.82, p=0.004). Notably, SSRIs showed no independent association (aOR=1.0, p>0.7), contrasting with case-report literature. A significant pattern was observed (p<0.001): self-reported clenching or grinding rates increased from 52% among patients taking no CNS medications to >70% among those taking >5 drug classes. Network analysis revealed 37% of drug combinations exhibited synergistic effects. The SSRI + SNRI combination showed substantial synergy (synergy ratio=2.1) while benzodiazepine + beta-blocker exhibited the strongest synergy (synergy ratio=2.5).

Conclusion: This population-level electronic health record (EHR) study suggests an "SSRI paradox": despite dominating case reports, SSRIs were not independently associated with self-reported clenching or grinding after adjustment. Instead, polypharmacy burden and synergistic drug combinations appear to be key drivers of risk. Dental screening protocols may benefit from prioritizing patients receiving multiple CNS-active medications, particularly SSRI + SNRI combinations, over individual drug classes.

69. Retrospective Analysis of Implant Survival in a State-Sponsored Dental School



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Objective: This retrospective clinical study aims to quantify dental implant failure at the University of Iowa College of Dentistry (COD) and to identify factors that might predict such failures.

Methods: De-identified COD electronic health records (EHRs) were examined between 2009 and 2024. All patients receiving the D610 current dental terminology (CDT) code were included in the analysis. Failure was broadly identified as implant removal or additional surgical intervention defined by CDT codes D6100, D6105, D6010, D6081, D6101, D6102, D6103, D6016, and D4273. In addition to demographic data, studied variables included tobacco use, diabetes history, antiresorptive medication use, ridge preservation, protocol for implant placement and restoration, other grafting procedures, clinician experience level, surgical department, and restorative department.

Results: Among 5386 individuals, 9366 implants were identified, with an overall failure rate of 6.4% (n=599). Preliminary bivariate analysis was completed using an independent Cox Proportional Hazard model for all predictors, and the Holm method of p-value correction was used to obtain the utilized q-value. The resulting preliminary bivariate analysis found two significant predictors: D7953 (bone replacement graft for ridge) (HR = 7.46, q<0.001) and D6104 (bone graft at time of implant placement) (HR = 1.97, q<0.041).

Conclusion: The overall failure rate appears to agree with previous similar studies. As D7953 ridge preservation is generally thought to improve implant success, its identification as a failure predictor was unexpected. The forthcoming multivariate survival analysis should provide additional insights into factors influencing implant survival.

Supported by: University of Iowa College of Dentistry Student Research Program

70. Retrospective Study of Incomplete Primary Root Canal Treatments and Retreatments



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Objective: Patients may discontinue endodontic treatment for various reasons, yet factors associated with incomplete treatment and their influence on disease and

patient-based outcomes remain underexplored. This study examined tooth-specific and patient-related characteristics linked to initiation of root canal treatment (RCT) or retreatment (ReTx) without completion in an academic setting.

Methods: Demographic and clinical data were extracted from axiUm at the University of Iowa College of Dentistry for patients treated between July 2009 and July 2022. A total of 629 patients (566 incomplete primary RCTs, 63 incomplete ReTx) met the inclusion criteria. Demographic, diagnostic, and procedural variables were compared using Wilcoxon rank-sum and chi-square or Fisher's exact tests ($\alpha=0.05$).

Results: Females represented a similar proportion in both groups (68.4% vs. 68.3%). ReTx patients were older (43.8 ± 17.4 vs. 35.7 ± 16.3 years; $p < 0.001$) and more likely to have private insurance (38.1% vs. 20.0%; $p=0.004$). Treatment classification differed notably: incomplete primary RCTs most commonly discontinued treatment without completing definitive care (66.8% vs. 44.4%), whereas incomplete ReTx were more frequently classified as non-restorable (31.8% vs. 18.4%; $p < 0.001$). Symptomatic apical periodontitis predominated among incomplete primary RCTs (59.4% vs. 39.7%), while chronic apical abscess and asymptomatic apical periodontitis were more common in ReTx (19%+22.4% vs. 7%+6.9%; $p < 0.001$). Molars were the most frequently involved tooth type in both groups (61.8% vs. 57.1%).

Conclusion: Incomplete primary RCTs were more often associated with painful pulpal and periapical diagnoses, whereas incomplete ReTx were more strongly associated with older age and higher rates of private insurance coverage.

Supported by: University of Iowa College of Dentistry Student Research Program

71. State Variation in Pediatric Dental Medicaid Utilization and Related Factors



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Objective: This study aimed to evaluate state variation in Medicaid dental care utilization across child age groups and examine associations with state-level factors.

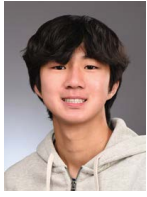
Methods: Data were obtained from the 2023 CMS-416 state Medicaid reports. Outcomes included annual rates of any dental, preventive dental, and treatment dental visits and dental services provided by non-dentists across eight age groups (< 1, 1-2, 3-5, 6-9, 10-14, 15-18, 19-20, and 0-20). State-level independent variables included reimbursement rates, Medicaid dentist participation, dentist supply, Medicaid managed care, and adult dental Medicaid coverage. Associations between continuous predictors and utilization were assessed using Pearson or Spearman's correlations, while group differences used two-sample t-tests, Wilcoxon rank-sum tests, or one-way ANOVA. Holm-Bonferroni adjustments accounted for multiple comparisons ($\alpha=0.05$).

Results: Utilization varied substantially by state and age. Texas had the highest rates of dental services among the youngest and all children 0-20 (61%). Medicaid managed care was significantly associated with lower utilization of dental services and preventive services across several age groups; children in states with managed care had lower rates than those in states without. Greater dentist supply correlated with higher utilization across age groups, with significant associations for preventive services in infancy (< 1 year: $r=0.46$, adjusted $p=0.007$) and treatment services in late adolescence (19-20 years: $r=0.45$, adjusted $p=0.008$).

Conclusion: Dentist supply was the most consistent factor associated with higher utilization, while Medicaid managed care was linked to lower utilization, highlighting the importance of workforce and policy factors in improving access to care.

Supported by: University of Iowa College of Dentistry Student Research Program

72. Targeting Sexual Bias in Oral Squamous Cell Carcinoma



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Objective: Oral squamous cell carcinoma (OSCC) is a highly aggressive cancer with high recurrence and mortality rates and exhibits significant sex differences in epidemiology and clinical presentation. The tumor suppressor microRNA-200c (*miR-200c*) is downregulated in OSCC and represents a promising therapeutic approach due to its ability to inhibit proliferation and epithelial-mesenchymal transition. *miR-200c* expression and function are tissue- and sex-specific. The objective of this study was to characterize the biological activity of *miR-200c* delivered to human OSCC cells using a non-viral nanoparticle delivery system consisting of a mixture of calcium carbonate (CaCO₃) and protamine sulfate (PS), specifically on genes known to have a sexually biased expression and affecting the outcome of the disease.

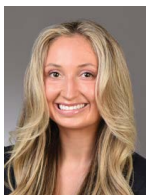
Methods: HSC-3 cells, an OSCC cell line isolated from a male patient with tongue squamous cell carcinoma, were treated with the CaCO₃/PS nanocomplex loaded with a plasmid DNA encoding *miR-200c*. 48 hours after transfection, total RNA was extracted from the collected cells, and gene expression profiles were assessed using quantitative polymerase chain reaction. Target genes selected for quantification included *miR-200c*, Xlinked inhibitor of apoptosis protein (*XIAP*), angiotensin-converting enzyme 2 (*ACE2*), and estrogen receptors alpha (*ESR1*) and beta (*ESR2*).

Results: Plasmid DNA encoding *miR-200c* delivered using the optimized CaCO₃/PS nanocomplex successfully overexpressed *miR-200c* in HSC-3 cells. The expression of the *miR-200c* target gene *XIAP* was reduced, while *ACE2*, which is also targeted by *miR-200c*, showed no changes. Similarly, both *ESR1* and *ESR2* remained unchanged in the *miR-200c* group compared to the empty vector.

Conclusion: *miR-200c* inhibits *XIAP* in human OSCC cells, a gene located on the X chromosome that is known to be upregulated in OSCC to block cell apoptosis and is associated with poor outcomes in other female cancers. This study opens a new avenue for developing personalized gene therapy for oral cancer.

Supported by: NIDCR R56 DE026433

73. Workflow for Patient-Specific Detachable 3d-Printing Models for Impacted Tooth Extraction



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Objective: This study aimed to develop and demonstrate a digital workflow for fabricating patient-specific, multi-material 3D-printed models of impacted teeth to enhance both surgical planning and predoctoral dental education. The workflow combines radiographic and intraoral data into one streamlined process to create accurate, modular models that offer tactile and realistic simulations beyond standard digital or typodont-based methods.

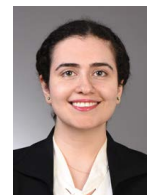
Methods: Two cases, a fully impacted maxillary third molar and a mesiodens, were used to demonstrate the workflow. Cone-beam computed tomography (CBCT) and intraoral scans were merged in a dental design software program (RealGUIDE, 3DIEEME) to segment teeth, bone, and gingiva. Boolean operations were used to merge crowns and roots, generate sockets, and create modular assembly features. Models were printed using a digital light processing (DLP) 3D printer (SprintRay Pro 2) with photopolymer resins of varying rigidity to simulate tooth, bone, and gingiva (layer thickness: 50–100 µm).

Results: The models showed high anatomical accuracy and stable assembly between modular components. A 0.40 mm offset provided optimal fit between teeth and sockets, while a 0.20 mm offset ensured smooth engagement between bone and gingiva. The modular design enabled stepwise simulation of flap design, osteotomy, and tooth extraction. Flexible gingival material allowed realistic soft-tissue manipulation. Both models accurately reproduced patient-specific anatomy, enhancing three-dimensional visualization and procedural rehearsal for students and clinicians.

Conclusion: This study demonstrates a streamlined workflow that integrates CBCT and oral scans to create a patient-specific, detachable 3D printing model. The method produced multi-material anatomical models and enabled clear, stepwise visualization of the impacted tooth site, confirming its feasibility for preoperative assessment.

Supported by: University of Iowa College of Dentistry Student Research Program

74. Functional Analysis of Oculo-Auriculo-Vertebral Spectrum PDGFRA Variant in Zebrafish



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Objective: Oculo-auriculo-vertebral spectrum (OAVS) is a craniofacial disorder affecting 1 in 3,500 births and characterized by mandibular hypoplasia, macrostomia, and ear anomalies. The genetic mechanisms underlying OAVS remain unclear. Whole-genome sequencing of a three-generation OAVS family identified a heterozygous missense variant in *PDGFRA*, a gene crucial for craniofacial mesenchyme signaling. This project aims to define the functional impact of this variant by testing whether human *PDGFRA* (wild-type or R914Q) mRNA can rescue phenotypes in *pdgfra* mutant zebrafish embryos.

Methods: Heterozygous *pdgfra* mutant zebrafish were crossed to generate embryos. One-cell-stage embryos were microinjected with no mRNA, wild-type human *PDGFRA* mRNA, or the OAVS-associated *PDGFRA* R914Q-variant mRNA. Initial attempts to synthesize human *PDGFRA* mRNA were unsuccessful; therefore, commercially synthesized mRNA was used. Western blot analysis confirmed successful translation of the injected mRNA. At five days post-fertilization, larvae were stained with Alcian blue to visualize craniofacial cartilage structures. To assess gene expression in the pharyngeal arches, *dlx2* riboprobes were used for in-situ hybridization.

Results: Our previous work demonstrated that PDGFRA knockdown using morpholino oligonucleotides resulted in craniofacial malformations, including shortened Meckel's cartilage and widened oral commissures resembling macrostomia. Here, we show that injection of wild-type PDGFRA mRNA partially rescued these phenotypes, while embryos injected with the R914Q variant displayed variable, often incomplete, recovery. In-situ hybridization using *dlx2* riboprobes was initiated to assess gene expression patterns; however, signal detection has not yet been successful. Ongoing refinements aim to improve probe penetration reliability. Continued optimization of staining and imaging workflows has enhanced experimental consistency.

Conclusion: These findings confirm PDGFRA's role in craniofacial morphogenesis and suggest that the R914Q variant identified in an OAVS family disrupts normal signaling. Although further optimization is needed to visualize *dlx2* expression, the zebrafish rescue model provides a system to dissect PDGFRA pathogenic mechanisms and inform future studies on OAVS etiology and therapeutic strategies.

Supported by: University of Iowa College of Dentistry Student Research Program

75. Methylation Profiling *GRHL3* in Patients With Van der Woude Syndrome



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Objective: Van der Woude Syndrome

(VWS), the most common syndromic orofacial cleft, exhibits remarkable phenotypic variability and is caused by mutations in *IRF6*, *GRHL3* and *PRKCI*. This variability suggests epigenetic modulation of disease severity. We previously demonstrated that *IRF6* promoter hypermethylation correlates with severe phenotypes (n=87). Here, we investigate *GRHL3* methylation patterns in an expanded cohort (n=202) to elucidate epigenetic mechanisms underlying phenotypic heterogeneity.

Methods: We analyzed 202 VWS patients systematically categorized by phenotype: CL/P+LP (n=110), CL/P (n=43), CPO+LP (n=31), CPO (n=8), and LP (n=10). DNA from blood (n=163), saliva (n=39) underwent bisulfite conversion and pyrosequencing. We quantified methylation at CpG sites within a critical *GRHL3* regulatory element where *IRF6* binds to regulate *GRHL3* expression. Statistical analysis employs one-way ANOVA on ranks with Tukey-Kramer post-hoc testing ($\alpha=0.05$) to compare methylation patterns across phenotypic groups.

Results: Our expanded cohort (n=202) represents the largest epigenetic study in VWS to date, with 2.3-fold increase from our initial cohort, providing robust statistical power to detect methylation differences across phenotypic groups. The systematic phenotyping allows for detailed correlation analysis between epigenetic modifications and clinical presentation. Analysis of *GRHL3* regulatory elements, particularly *IRF6*-binding sites, will elucidate whether *GRHL3* methylation patterns parallel our previous *IRF6* findings.

Conclusion: This comprehensive study addresses a critical knowledge gap regarding *GRHL3* epigenetic regulation in VWS. By examining both *IRF6* and *GRHL3* methylation in a large, well-characterized cohort, we aim to establish a complete picture of how epigenetic modifications influence the *IRF6-GRHL3* regulatory network. These findings will enhance genetic counseling accuracy and may identify therapeutic targets for orofacial clefting disorders.

Supported by: University of Iowa College of Dentistry Student Research Program

76. Testing a Putative Dominant OAVS PDGFRA Variant During Zebrafish Development



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Objective: Oculo-auriculo-vertebral spectrum (OAVS) is the second most common craniofacial malformation and affects approximately 1 in 3500 people born. Our group recently identified a putative PDGFRA variant in an OAVS pedigree. The goal of this study was to investigate the potential dominant negative impact of the variant using zebrafish craniofacial development as a tractable model system.

Methods: To generate mRNA for zebrafish microinjections, a plasmid template encoding full length human PDGFRA, the PDGFRA variant (PDGFRA R914W), or eGFP was linearized and mRNA synthesized *in vitro* using the mMessage mMachine kit. Wild-type adult zebrafish were paired and spawning induced by light stimulation. Subsequently, fertilized eggs were collected for further processing. To assess the ability of human PDGFRA mRNA to influence craniofacial development, newly fertilized zebrafish embryos were microinjected at the 1-cell stage with a mixture of eGFP mRNA and either WT or R914W PDGFRA. Injected embryos were processed for cartilage staining and imaged. To visualize craniofacial development, 5 day-post-fertilization (dpf) larvae were fixed in paraformaldehyde, followed by alcian blue staining and subsequent clearing. Samples were imaged on a dissecting microscope.

Results: Following plasmid linearization, mRNA was efficiently produced from all 3 templates (e.g., eGFP, PDGFRA, PDGFRA R914W). After microinjection of each mRNA, larvae were raised to 5 dpf and further separated by injection efficiency (eGFP expression) and successfully processed for alcian blue staining. Ongoing work involves imaging and characterizing craniofacial phenotypes in injected groups.

Conclusion: Our group has identified a potential pathogenic PDGFRA variant underlying OAVS in an affected pedigree. The zebrafish model provides a tractable system in which to functionally test this variant and explore its potential pathogenic activity during normal craniofacial development. Our findings have the potential to provide clear mechanistic information into disease etiology.

Supported by: University of Iowa College of Dentistry Student Research Program

77. Cholesterol and SM Pathways Influence EGFR Function in *C. elegans*



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Objective: Epidermal Growth Factor Receptor (EGFR) is a key oncogenic driver in head and neck cancers (HNC), requiring plasma membrane (PM) localization and clustering for effective signaling. This localization and clustering is facilitated by PM cholesterol, whose homeostasis is regulated by the sphingomyelin (SM)-ceramide balance. We previously demonstrated that SM pathway inhibitors suppress EGFR homolog LET-23-driven multivulval (MUV) development in *Caenorhabditis elegans*. Additionally, knockdown of endo-lysosomal genes involved in cholesterol trafficking, *tsp-7* (CD63), *sulp-8* (SLC26A11), and *gana-1* (GLA), enhanced the MUV phenotype, implicating their role in regulating the EGFR ortholog LET-23. In this study, we investigated whether cholesterol mediates the effects of SM pathway inhibition and endo-lysosomal gene knockdown on LET-23 signaling.

Methods: L1 larvae were treated with SM pathway inhibitors (Fumonisin B1, GT11, K1) alongside cholesterol supplementation (5, 10, or 20 mg/ml). Separately, *tsp-7*, *sulp-8*, and *gana-1* were knocked down in L1 larvae, followed by cholesterol supplementation at the same concentrations. Adult worms were scored for the MUV phenotype under a stereomicroscope.

Results: Cholesterol supplementation in the presence of SM inhibitors led to a dose-dependent increase in the MUV phenotype, indicating enhanced LET-23 signaling. Similarly, knockdown of *tsp-7*, *sulp-8*, and *gana-1* in combination with cholesterol supplementation further amplified the MUV phenotype in a dose-dependent manner.

Conclusion: These findings demonstrate that cholesterol mediates the effects of SM pathway inhibition and endo-lysosomal gene regulation on LET-23 activity. This highlights the importance of cholesterol homeostasis in EGFR signaling and suggests novel therapeutic targets for HNC.

Supported by: University of Iowa College of Dentistry Student Research Program

78. Inflammatory Response of Dental Pulp Stem Cells Following Photodynamic Therapy



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Objective: To evaluate the biological effects of photodynamic therapy (PDT) on the inflammatory response of dental pulp stem cells (DPSCs), comparing its performance with conventional disinfection using sodium hypochlorite (SH) in both healthy and lipopolysaccharide (LPS)-stimulated DPSCs.

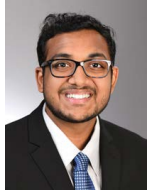
Methods: Certified human DPSCs (Lonza, USA), at passages 4–6, were cultured in α -MEM supplemented with 10% fetal bovine serum (FBS) and 1% antibiotic-antimycotic and maintained at 37°C with 5% CO₂. After reaching confluence, cultures were exposed to increasing concentrations of *Escherichia coli* LPS (1–50 μ g/mL), methylene blue (MB) (0.00125–0.05 mg/mL), or sodium hypochlorite (SH) (0.0001–0.002%). These concentrations were tested to identify biologically relevant conditions capable of inducing an inflammatory stimulus or disinfection-related cellular stress while preserving DPSC viability. Following treatments, supernatants were collected for LDH-based cytotoxicity assessment, and intracellular metabolic activity was evaluated using the MTT assay (n=9).

Results: Pilot assays demonstrated concentration-dependent effects of LPS, MB, and SH on DPSCs. LPS at 10 μ g/mL induced an inflammatory profile without significant detrimental effect on viability, whereas higher concentrations increased cytotoxicity ($p < 0.05$). MB at 0.05 mg/mL significantly decreased LDH release ($p < 0.05$), while 0.01 mg/mL did not differ from lower concentrations and was therefore selected. SH exhibited marked cytotoxicity at higher concentrations ($p < 0.05$), whereas lower concentrations (0.0001–0.001%) preserved metabolic activity. These findings enabled the selection of experimental conditions that induce inflammation while maintaining DPSC viability.

Conclusion: The pilot results established biologically relevant and non-cytotoxic concentrations of LPS, MB, and SH for direct application on DPSCs, providing a robust methodological basis for subsequent evaluation of PDT-mediated biological effects.

Supported by: Brazil Ministry of Education CAPES;
University of Iowa College of Dentistry CRISP Grant

79. Longitudinal Analysis Reveals Reduced Pro-Inflammatory Salivary Cytokines Following Weight-Loss Interventions



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Objective: Obesity affects 41.9% of U.S. adults and is characterized by chronic low-grade inflammation that extends to mucosal surfaces, including the oral cavity. Work from our group has shown that obesity is associated with a distinct pro-inflammatory immune signature in saliva, even in the absence of clinical periodontal disease. However, whether these inflammatory profiles improve following weight loss remains unclear. This study aimed to longitudinally evaluate the salivary immune response following bariatric surgery or dietary intervention in obese adults.

Methods: Salivary samples were collected from two cohorts: patients undergoing bariatric surgery (n = 10; baseline, 1-month, and 3-month follow-up) and patients undergoing a medically supervised dietary intervention (n = 11; baseline and 8 weeks). Weight loss and metabolic parameters were measured at baseline and follow-up. A 48-plex bead-based immunoassay quantified cytokines and chemokines associated with inflammation, angiogenesis, and immune regulation. Each participant served as their own control, and longitudinal analyses were performed using *timeOmics*, which applies linear mixed-model spline fitting to identify temporal changes in omics datasets.

Results: Several pro-inflammatory mediators were significantly reduced following weight-loss interventions. In the bariatric surgery cohort, MCP-1, RANTES, PDGF-AA/BB, IL-12p40, and IL-18 decreased significantly compared to baseline. In the diet-modification cohort, MIG (CXCL-9), G-CSF, TNF- α , MDC, and IP-10 were reduced after 8 weeks. Both interventions demonstrated overall attenuation of salivary cytokines, though the magnitude and temporal pattern of reduction varied between surgical and dietary approaches.

Conclusion: Weight-loss interventions, both surgical and dietary, reduce salivary pro-inflammatory cytokines associated with obesity. These findings highlight the oral cavity as a responsive mucosal site reflecting systemic inflammatory status. Salivary immune profiling may serve as a non-invasive biomarker for monitoring metabolic improvement and evaluating the efficacy of obesity treatments.

Supported by: NIH R03 DE030527; University of Iowa College of Dentistry Student Research Program

80. Metformin-Induced Protection Against *S. gordonii* via SKN-1 and MDT-15



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Objective: Mitis group streptococci are opportunistic pathogens that reside in the oral cavity and generate hydrogen peroxide (H₂O₂) as a major contributor to their pathogenesis. Previously, we established that the mitis group mediates killing of the nematode *Caenorhabditis elegans* via H₂O₂. Further, we showed that pretreatment of worms with metformin mediates protection from streptococcal-derived H₂O₂ and is attributed to the activation of the oxidative stress response transcription factor SKN-1. Using SKN-1C::GFP strain, we have shown that p38 mitogen-activated protein kinase (MAPK) pathway and the transcription mediator complex protein MDT-15 are required for the activation of SKN-1 by metformin.

Methods: To assess PMK-1 (p38 MAPK) activation in response to metformin and its dependence on the upstream pathway components NSY-1 and SEK-1, we compared phosphorylated PMK-1 (p-PMK-1) levels in wild-type (WT), *nsy-1*, and *sek-1* mutant worms pretreated with or without metformin using Western blot analysis. We next compared the p-PMK-1 levels in WT and *mdt-15* mutant worms as described above. Additionally, we performed global label-free proteomics on *mdt-15* mutant worms relative to WT worms in the presence and absence of metformin to identify the differentially regulated proteins.

Results: Metformin treatment significantly increased p-PMK-1 levels in WT worms and dependent on *nsy-1* and *sek-1*. In contrast, *mdt-15* mutants exhibited elevated p-PMK-1 levels compared to wild type under both basal conditions and following metformin treatment. This data indicate that MDT-15 is not epistatic to the p38 MAPK pathway, as loss of *mdt-15* does not significantly alter p-PMK-1. Instead, MDT-15 appears to act downstream or in parallel to p38 MAPK signaling to regulate SKN-1 nuclear localization. Proteomic analysis comparing *mdt-15* mutant and wild-type worms revealed that metformin-dependent regulation of oxidative stress proteins requires MDT-15.

Conclusion: Collectively, these findings demonstrate that metformin activates SKN-1 through the p38 MAPK pathway in coordination with MDT-15, orchestrating a protective response against *S. gordonii*.

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81. MMP and TIMP Expression in Dental Pulp Stem Cells



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Objective: This study investigated the expression of matrix metalloproteinases (MMPs) and their tissue inhibitors (TIMPs) in human dental pulp stem cells (DPSCs) exposed to bacterial by-products associated with caries. Specifically, it focused on changes in protein levels of MMP-3 and TIMP-1, -2, and -4.

Methods: DPSCs were cultured in alpha-minimal essential medium (α -MEM) supplemented with 10% fetal bovine serum (FBS) and 1% antibiotic-antimycotic solution. Cells were stimulated for 24 hours (n=9) with *Escherichia coli* lipopolysaccharide (LPS, 10 μ g/mL), *Bacillus subtilis* lipoteichoic acid (LTA, 15 μ g/mL), or 25% filter-sterilized supernatants from *Streptococcus mutans* (SM) and *Lactobacillus rhamnosus* (LR). SM and LR filtrates were prepared by culturing isolates on blood agar for 48 h, followed by 24 h in DMEM with 2% FBS and 1% MEM vitamin. Protein levels of MMP-3, TIMP-1, TIMP-2, and TIMP-4 were quantified using ELISA. Data were analyzed using one-way ANOVA ($\alpha = 0.05$).

Results: LPS and LTA significantly increased MMP-3 levels, with LPS showing the strongest effect ($p < 0.05$). No significant changes in MMP-3 were observed with SM or LR filtrates. TIMP-1 and TIMP-2 levels remained unchanged across all treatments ($p > 0.05$), and TIMP-4 was undetectable.

Conclusion: Bacterial by-products selectively upregulate MMP-3 in DPSCs, while TIMP expression appears unaffected. These findings suggest that specific bacterial components may disrupt the MMP/TIMP balance in dental pulp during caries progression, potentially through mechanisms not involving TIMP-mediated inhibition.

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82. Obesity is Associated with Subclinical Oral Inflammation and Inflammasome Activation



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Objective: Obesity is a chronic inflammatory condition that affects over one-third of the US population. Work from our group has identified that obesity modifies the subgingival microbial and immune profiles even in patients without clinical periodontal disease. However, the mechanisms by which obesity contributes to subclinical oral inflammation and inflammasome activation remain unclear.

Methods: Gingival crevicular fluid (GCF) samples (n = 54) from periodontally healthy normal-weight, obese, and periodontitis patients were analyzed using a multiplex immunoassay to quantify inflammatory cytokines (IL-1 β , IL-6, TNF- α , IFN- β , Casp-1, and others). Statistical differences were evaluated using Tukey's HSD test. Gingival tissue biopsies from a subset of these patients were cryo-sectioned and stained for macrophage (CD68) and leukocyte (CD45) markers to validate immune infiltration. Primary gingival epithelial and fibroblast cells were isolated from obese and normal-weight periodontally healthy individuals and co-cultured with THP-1-derived macrophages. Following stimulation with *P. gingivalis* (MOI 50) or LPS (0.5 μ g/mL), gene expression of inflammasome mediators (NLRP3, GSDMD, IL-1 β , IL-6, TNF- α , IFN- β , Casp-1) was quantified by qPCR, and statistical significance determined using ANOVA.

Results: Multiplex analysis revealed significantly elevated IL-1 β , TNF- α , IFN- β , IL-6, and Casp-1 in obese individuals compared with controls. Immunostaining confirmed increased CD68 macrophage and CD45 leukocyte infiltration in periodontally healthy obese tissues, consistent with subclinical inflammation. Primary epithelial and fibroblast cells from obese periodontally healthy patients exhibited heightened expression of NLRP3, GSDMD, and downstream cytokines following microbial stimulation, further amplified in macrophage co-cultures. Notably, GSDMD expression was attenuated in epithelial cells from obese donors under basal conditions, suggesting adaptive pyroptotic regulation.

Conclusion: Obesity enhances inflammasome activation and immune cell recruitment in the gingival environment even in the absence of clinical periodontitis. The use of patient-derived primary cells offers a physiologically relevant model that retains donor-specific immune-metabolic characteristics, providing greater translational fidelity than immortalized lines.

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83. Yogurt Starter Strains Effects on Biofilm Formation and Dental Caries



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Objective: Extracellular polysaccharides (EPS) improve biofilm formation of microorganisms. EPS in yogurt cultures may affect oral biofilm in cariogenic

bacteria reducing or promoting caries formation. We hypothesized that EPS-producing bacterial species in yogurt may stimulate dental plaque development. The objective of this study was to test how yogurt starter cultures with different EPS profiles promote biofilm formation in-vitro, and how they affect caries formation in an ex-vivo model.

Methods: Biofilm formation was tested in saliva-coated well plates with Brain-Heart Infusion Broth with and without 1% sucrose or lactose. Yogurt starter culture strain *Lactococcus lactis* ssp. *cremoris* (EPS+) and its EPS-negative mutant (EPS-) were used as well as *Streptococcus mutans* (SM) both on its own and in combination with *L. lactis* strains. Biofilm biomass was quantified by a crystal violet assay. To evaluate cariogenic potential, first and second molars from mice hemimandibles (n=15) were incubated with single strains or strain combinations for 5 days in media containing lactose and sucrose. Caries were scored according to ICDAS classification at baseline and at the end of the 5 days of strain exposure.

Results: EPS- and EPS+ strains did not differ significantly in biofilm formation when tested individually compared to each other. Each significantly reduced the total amount of biofilm biomass formed by SM when compared to SM alone in media containing lactose and/or sucrose. However, SM with *L. lactis* EPS+ formed significantly more biofilm than SM with *L. lactis* EPS- in the presence of sucrose but significantly less with lactose plus sucrose. Only SM plus *L. lactis* EPS- was less cariogenic in the ex vivo model than SM alone in the presence of sucrose and lactose.

Conclusion: The production of EPS by yogurt starter strains does not enhance SM biofilm formation, but its effect on caries warrants additional study.

Supported by: University of Iowa College of Dentistry Student Research Program

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