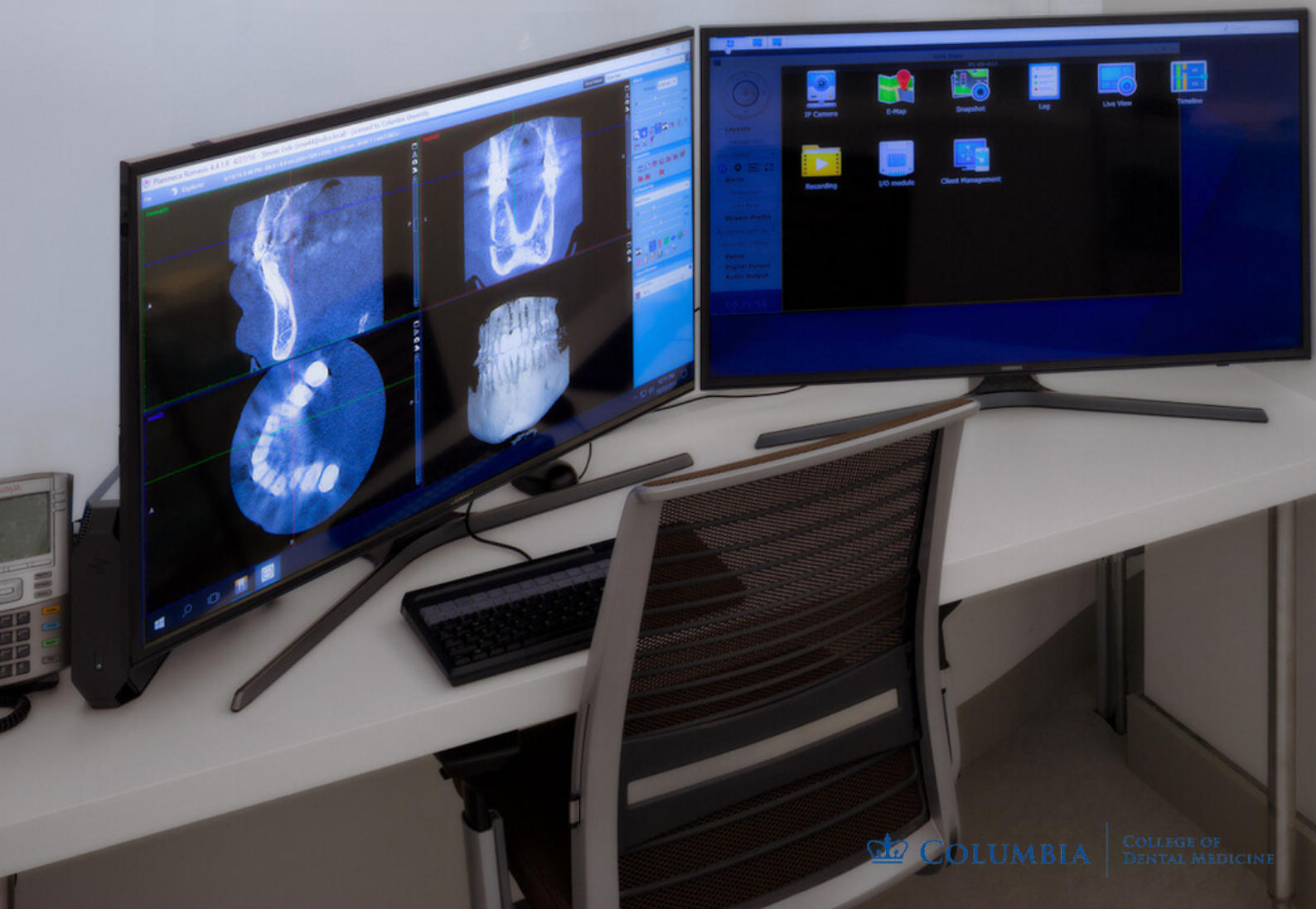


JARVIE

THE JOURNAL OF THE WILLIAM JARVIE RESEARCH SOCIETY

Volume 67
Spring 2024



JARVIE

THE JOURNAL OF THE WILLIAM JARVIE RESEARCH SOCIETY

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Spring 2024

Birnberg Research Program

Wednesday, April 3rd, 2024

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of Dental Medicine**

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Editor-In-Chief

Neil Ming '25

Associate Editors

Alexander Kim '26

Neeve Chen '26

Nicole Lin '26

“When apparently we have reached the limits of possibility, new avenues of progress and advancement are opened to our view and advances which shall make our knowledge of today seem in the light of the future to be but the densest ignorance.”

– William Jarvie, 1905

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A message from the ***Editors & Associates***

As the editor-in-chief for the 2023-2024 academic period and on behalf of the entire Jarvie Editorial team, it brings us great joy to unveil the 67th volume of the Journal of the William Jarvie Research Society. This spring 2024 edition, alongside the presentations at the Birnberg Research Symposium, showcases the remarkable dedication of CDM students and the invaluable support from our faculty mentors. The exceptional contributions to this edition highlight our institution's dedication to outstanding research, collaborative efforts across professions, and a strong foundation in evidence-based education.

This publication's journey from concept to reality was made possible through the tireless contributions of our students, faculty, and administrative staff within the CDM community. We extend our heartfelt gratitude to Dr. Chang H. Lee, Ms. Kelli Johnson, and Deans Roseanna Graham, James Fine, and Dana Wolf for their unwavering support and commitment to fostering student research at CDM. Special thanks are due to our Associate Editors—Neeve Chen, Alex Kim, and Nicole Lin—for their crucial role in assembling this edition of the Jarvie Journal. We must also commend our executive board, notably our Co-Presidents Maya Jeremias and Brianna Margulis, for their outstanding leadership and constant encouragement throughout the editorial process and this entire year. A warm appreciation goes out to the members of the William Jarvie Research Society and our readership, who play an essential role in maintaining our school's dynamic research environment.

Congratulations are in order for everyone who submitted abstracts for this journal. We are honored to feature your research in this year's publication.

Sincerely,

Neil Ming, Editor-in-Chief

As we embark on another exciting year of scientific discovery, it is with great pleasure to showcase the latest edition of the William Jarvie Research Society's journal. The pages of this journal are a testament to the talent, collaboration, and innovation of our student body and faculty mentors. The role of the editorial board is not only to curate content but to witness firsthand the passion and hard work that goes into each research project, and our support from the leadership of the editorial board has been instrumental in bringing this publication into fruition. We are continually impressed by the caliber of submissions we receive and this collection represents the diverse and impactful research conducted within our Columbia community. We invite you to immerse yourselves in the wealth of knowledge and insights presented within these pages and take a moment to appreciate our researchers and mentors, whose collective efforts are driving positive change within the field of dentistry.

Sincerely,

Neeve Chen, Alex Kim, Nicole Lin
Associate Editors



March 27, 2024

Dear Members of the Jarvie Society,

I am delighted to congratulate you on your accomplishments. The College of Dental Medicine places a high value on discovery and I am pleased to welcome you into the ranks of emerging scholars who advance our field through research.

Participation in the William Jarvie Society is one of the most important traditions at CDM and the work contained in this journal is a testament to the curious minds and keen intellects that are a hallmark of CDM students.

Just as your research can pave the way for new knowledge, so too can it foster personal growth and development as you take your place among the leaders of our profession.

I look forward to your continued achievements and I provide my sincere gratitude to your faculty mentors who have given their time, skill, and expertise to support your endeavors.

Sincerely,

A handwritten signature in black ink that reads "Roseanna Graham".

Roseanna Graham, DDS, MA, PhD
Interim Dean, College of Dental Medicine
James Winston Benfield Associate Professor of Dental Medicine at CUMC
Chair, Section of Cariology and Restorative Sciences



COLLEGE OF
DENTAL MEDICINE

Office of Academic Affairs

March 28, 2024

Dear William Jarvie Research Society Members,

Student research enriches the educational experience and promotes a culture of inquiry, discovery, and innovation at CDM. We take great pride in how students and residents at CDM are engaged in scholarly activity. Showcasing student research in the Jarvie Journal and at Birnberg Day is one of our most time-honored traditions. I am very thankful to the members of the Jarvie Society for their efforts in promoting student research and facilitating the dissemination of that research to the CDM community and beyond. I applaud the hard work of all our student researchers. My hope is that you continue to engage in research that elevates our profession and improves oral health for all. Congratulations on your research achievements!

Warm Regards,

Dana L. Wolf, DMD, MS
Senior Associate Dean for Predoctoral Academic and Student Affairs



Office of Postdoctoral
and Residency Programs

*College of Dental Medicine
Columbia University Irving Medical Center*

April 3, 2024

Dear William Jarvie Research Society Members

I am delighted to say that within this great institution you remained true to our traditions and true to CDM's mission reaffirming our commitment to scholarship, research, education, and patient care. I am equally delighted that the Student Summer Research Fellowship program remains strong amongst the Columbia student body as evidence by the mix of basic research and clinical studies.

Research and scholarship are at the core of Columbia University values. The student publication and presentation of their research on Birnberg Day, are part of the College of Dental Medicine's mission of producing leaders in the field of oral health care.

We are very supportive of our student scholars, both pre and post doc who will be the future leaders both academically and clinically. Congratulations to all participating in Birnberg Research Day!

Sincerely,

James B. Fine, DMD
Senior Associate Dean, Postdoctoral Academic & Student Affairs

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March 25, 2024

Dear Members of the Jarvie Society,

It is with immense pleasure that I extend my warmest welcome to each and every one of you to the 67th Birnberg Research Day. This annual event stands as a testament to your dedication, hard work, and intellectual prowess, marking a significant milestone in your academic journey.

I am genuinely impressed by your unwavering commitment to advancing knowledge and your invaluable contributions to multidisciplinary dental research. I have no doubt that your endeavors will continue to make a profound impact on the field of dentistry.

As you prepare for this auspicious occasion, I urge each of you to seize the opportunity to learn from one another, to share your ideas and insights, and to engage in vibrant discussions that push the boundaries of knowledge into new and exciting realms. The chance to interact with fellow members of the CDM and CUIMC research communities on Birnberg Day will undoubtedly prove to be a rewarding experience, providing you with invaluable preparation for presenting your research findings at local, regional, national, and even international dental meetings.

A cornerstone of student research at CDM is the unwavering support provided by our esteemed faculty mentors. As evidenced by the wide array of research topics presented on Birnberg Day, our faculty members are actively engaged in various research domains, spanning from basic biomedical science to translational and clinical research, health policy, and health services research. Let us take a moment to express our gratitude to all faculty mentors for their exceptional leadership, mentorship, and steadfast commitment to supporting students and advancing knowledge within their respective areas of expertise.

Once again, I extend a warm welcome to the 67th Birnberg Research Day. I wish you all the very best, and I eagerly anticipate witnessing the outstanding research work being presented by our esteemed students.

Sincerely,

A handwritten signature in black ink, appearing to read "Chang H. Lee".

Chang H. Lee, PhD
Director of Research
College of Dental Medicine
Columbia University
chl2109@cumc.columbia.edu

Columbia University Medical Center

A message from the
President and Vice President
of the William Jarvie Research Society

The William Jarvie Research Society represents Columbia University in the American Association of Dental, Oral, and Craniofacial Research (AADOCR) and National Student Research Group (NSRG). It is with great pride and excitement that we present the 67th edition of the Journal of the William Jarvie Research Society on behalf of our chapter. Within this journal includes project abstracts from diverse research fields, showcasing the hard work, enduring scientific curiosity and remarkable contributions of our esteemed student researchers and faculty mentors here at Columbia University College of Dental Medicine (CDM) who participate in the annual Birnberg Day Research Symposium.

This annual symposium embodies a commitment to scientific advancement of the field of dentistry and practical application of knowledge beyond the classroom or a textbook. This commitment manifests in various forms, be it through biomedical science and hands-on laboratory experiments, or via surveys and meta-analyses. Furthermore, the applications span a wide spectrum, encompassing areas such as the microbiome, neuroscience, pediatric caries risk assessment, and Medicaid dental programs. Lastly, the participation also extends to many researchers, with forty-one pre-doctoral presenters and seven post-doctoral presenters. These aspects are what make the Birnberg Symposium so enriching, offering an exciting educational experience for both students and faculty alike and thus becoming an established tradition at CDM.

Here at CDM, research serves as a pillar in our comprehensive dental education. In order to recognize its significance, the Summer Research Fellowship was established with the aim of fostering and advancing research initiatives among first year dental students. This initiative promotes students to embark on their dental journey equipped with research involvement from the start, which encourages research continuity throughout their academic pursuits. However, the essence of our student research is incomplete without the invaluable guidance provided by our mentors. We, as CDM students, consider ourselves exceptionally fortunate to be taught and mentored by such distinguished scientists and mentors within our academic community. The relationship between student researchers and their mentors enriches our academic community and propels us forward in our pursuit of scientific and dental innovation.

A multitude of CDM researchers have showcased their work at both local and national conferences. Locally, eighteen Jarvie members proudly represented CDM at the 2023 Greater New York Dental Meeting. On a national scale, a group of eight Jarvie members participated in the 2024 AADOCR/CADR Annual Meeting & Exhibition held in New Orleans, Louisiana. Additionally, a group of seven students took part in the 2024 American Association for Dental, Oral, and Craniofacial Research (AADOCR) and Friends of the National Institute of Dental and Craniofacial Research (FNIDCR) Advocacy Day, held in Washington, D.C.

WJRS is dedicated to providing resources that ignite the passion for research among dental students, enriching their educational journey. We take great pride in nurturing the research community at CDM through various events, including CV Workshops, Finding Research at CDM sessions, and Q&A sessions offering insights into fellowship opportunities. Our Fall 2023 Newsletter featured articles authored by students, while our Mentor Guide highlighted the diverse range of research projects undertaken by our students in 2023-2024. Together with the Jarvie Journal, these publications underscore the remarkable research achievements of our students and signify the progress made in our research community.

We would like to acknowledge Dr. Chang Lee's remarkable dedication as our faculty advisor, alongside our executive board. Dr. Lee's support has enabled the growth of the Jarvie Research Society and has been instrumental in organizing the Birnberg Symposium. Our executive board has worked tirelessly to create opportunities for every CDM student to engage in research. We extend our heartfelt gratitude to our outstanding executive board members—Hyerin Yoon, Samuel Cox, Mark Gettas, Rishab Biswas, and Genesis Sao—whose dedication and contributions have been instrumental in making this year's initiatives possible. Special thanks also go to our exceptional editors—Neil Ming, Nicole Lin, Neeve Chen, and Alexander Kim—who have been the driving force behind the publication of this year's Jarvie Journal. We also want to recognize our Research Committee Members for their role as class representatives and express our appreciation to all members of Jarvie Society. Serving as Co-Presidents of the William Jarvie Research Society has been an immense honor for us. Thank you to everyone for making this year unforgettable, and congratulations to all Birnberg participants!

Sincerely,



Maya Jeremias, Brianna Margulis
WJRS Co-Presidents
Class of 2025

History of the William Jarvie Research Society

The William Jarvie Society for Dental Research was organized on December 16, 1920. At the invitation of Dr. William J. Gies, all the undergraduate students of dentistry at Columbia University conferred with him for the purpose of considering the desirability of organizing a society of students, teachers, and benefactors for the promotion of the spirit of research in the School of Dentistry.

After general discussion, it was unanimously voted to proceed with the proposed organization and Joseph Schroff, MD** was elected temporary chairman. Because of the important relation which Dr. William Jarvie bore to the establishment of the School of Dentistry, and because of high interest in the promotion of dental research, it was unanimously voted that the society be named the William Jarvie Society for Dental Research and that Dr. William Jarvie be elected an honorary member. Dr. Schroff served ably as president during 1922. Dr. Monasch officiated during 1923, and in 1924, because of the amalgamation of the College of Dental and Oral Surgery with the School of Dentistry of Columbia University, interest in the organization diminished and the society ceased its activities in 1925. On February 7, 1929, the society resumed activity and elected officers. Interest revived, and the organization was again brought into prominent place in the extracurricular life of the school.

During 1932-33, several members of the faculty who had contributed greatly to research in dentistry and allied fields addressed the members of the society and their guests. Dr. Charles C. Bodecker, Professor of Oral Histology and Embryology, spoke on "Dental Caries and Allied Subjects" and illustrated his talk with a liberal number of lantern slides. Dr. Bodecker spoke of the various theories and the classification of dental caries and also explained the caries index for recording the extent of caries. He also briefly outlined the work done by various investigators in this field.

Dr. Byron Stookey, Associate Professor of Neurological Surgery, addressed the next open meeting, which was held as a feature of the alumni day activities. His topic was, "The Interpretation and Treatment of Painful Affections of the Trigeminal Nerve." In a most interesting and instructive lecture, Dr. Stookey showed the relationship of diseases of this nerve to dental diagnosis. He explained the past work done in this field and the newer methods of surgical treatment, illustrating his talk with many lantern slides. He also presented several patients to demonstrate the effectiveness of his surgical treatment of this disease.

The Jarvie Society recorded another year of activity and accomplishment. Student interest in the organization was never greater, and a long and vigorous future for the society seems assured. The future of dentistry lies in its research into the problems that beset it, and the Jarvie Society has done its share in stimulating interest in this long-neglected phase of our work.

**An excerpt from the Dental Columbian, 1933.*

***Editor's Note: Dr. Joseph Schroff, MD, one of the first two students admitted to the dental school through the Columbia admissions process, became the first student to receive the Columbia DDS degree in 1922. Dr. Schroff subsequently joined the SDOS faculty, teaching Oral Surgery to generations of students until his retirement as head of Oral and Maxillofacial Surgery in the early 1950s.*

Birnberg Research Award

The Birnberg Research Medal Award of the Dental Alumni of Columbia University was established by the Alumni Association of the Columbia University School of Dental and Oral Surgery in the early 1950s to encourage dental research of excellence and to help stimulate public interest in support of dental research. The award is named in honor of Dr. Frederick Birnberg (1893–1968), class of 1915, who helped to establish a research fund. The College of Dental Medicine faculty research committee, in conjunction with the school's Alumni Association, considers individuals who have made important contributions to dentistry through both research and mentoring for selection as Birnberg Lecturer and recipient of the Birnberg Research Medal Award of the Dental Alumni of CU. Sixty-four outstanding scientists and teachers have been honored as the Birnberg Lecturer since the first Birnberg Research Medal Award was presented in 1954.

Birnberg Lecturer and Award Recipients

1954 DR. CHARLES F. BODECKER	1992 DR. GEORGE R. MARTIN
1955 DR. JOSEPH APPLETON	1993 DR. RICHARD SKALAK
1956 DR. ISAAC SCHOUR	1994 DR. ZE'EV DAVIDOVITCH
1957 DR. RALPH PHILLIPS	1995 DR. IVAR MJOR
1958 DR. REIDER F. SOQNNAES	1996 DR. LORNE M. GOLUB
1959 DR. JOHN KNUSTON	1997 DR. BRUCE J. BAUM
1960 DR. MAXWELL KARSHAN	1998 DR. KENNETH ANUSAVICE
1961 DR. GEORGE PAFFENBARGER	1999 DR. JAMES D. BADER
1962 DR. ELI GOLDSMITH	2000 DR. LARS HAMMERSTRÖM
1963 DR. EDWARD V. ZEGARELLI	2001 DR. DAVID T. W. WONG
1964 DR. FRANCIS A. ARNOLD	2002 DR. HENNING BIRKEDAL-HANSEN
1965 DR. SEYMOUR KRESHOVER	2003 DR. BARBARA DALE-BOYAN
1966 DR. PAUL GOLDHABER	2004 DR. PAUL B. ROBERTSON
1968 DR. SHOLOM PEARIMAN	2005 DR. BRUCE L. PIHLSTROM
1970 DR. MELVIN MOSS	2006 DR. JEFFREY D. HILLMAN
1971 DR. IRWIN MANDEL	2007 DR. RALPH V. KATZ
1973 DR. LESTER CHAN	2008 DR. ROBERT J. GENCO
1975 DR. RUSSELL ROSS	2009 DR. DEBORAH GREENSPAN
1976 DR. JEROME SCHWEITZER	2010 DR. SALLY J. MARSHALL
1977 DR. GEORGE GREEN	2011 DR. MICHAEL LONGAKER
1978 DR. DAVID SCOTT	2012 DR. R. BRUCE DONOFF
1979 DR. BERGE HAMPAR	2013 DR. PETER J. POLVERINI
1981 DR. RONALD DUBNER	2014 DR. HENRY GINSBERG
1982 DR. MARTIN A. TAUBMAN	2015 DR. LAURIE K. MCCAULEY
1983 DR. LOUIS T. GROSSMAN	2016 DR. RENA D'SOUZA
1984 DR. SOLON A. ELLISON	2017 DR. GEORGE HRIPCSAK
1985 DR. NORTON S. TAICHMAN	2018 DR. JEANETTE M. WING
1986 DR. RONALD J. GIBBONS	2019 DR. GORDANA VUNJAK-NOVAKOV
1987 DR. ROBERT J. GORLIN	2020 DR. ANIL K. RUSTGI
1988 DR. ENID A. NEIDLE	2021 DR. ANIL K. RUSTGI
1989 DR. DAVID H. PASHLEY	2022 DR. RITA CHARON
1990 DR. WILLIAM H. BOWEN	2023 DR. MUREDACH PATRICK REILLY
1991 DR. HAROLD C. SLAVKIN	2024 DR. ERIC J. NESTLER



2024 Birnberg Speaker and Research Awardee

Dr. Eric J. Nestler
MD, PhD

Eric Nestler, the Nash Family Professor of Neuroscience and Dean of Academic Affairs at the Icahn School of Medicine at Mount Sinai, is celebrated for his pioneering research in neuropsychopharmacology and molecular neuroscience. A graduate of Yale University and its School of Medicine, Nestler's educational journey laid the foundation for his illustrious career exploring the molecular intricacies underlying drug addiction and depression.

In Nestler laboratory, innovative research techniques such as viral-mediated gene transfer and advanced machine learning approaches are employed to establish causal links between molecular and behavioral phenomena in animal models. His addiction research centers on transcription factors like Δ FosB and CREB, investigating the epigenetic remodeling associated with addiction and depression. Through meticulous experimentation, Nestler's work sheds light on the molecular mechanisms driving these complex psychiatric disorders.

His remarkable contributions to neuroscience have garnered widespread recognition and acclaim, receiving numerous awards including the Pfizer Scholars Award, Sloan Research Fellowship, and the Rhoda and Bernard Sarnat International Prize in Mental Health. His dedication to advancing scientific knowledge and promoting mental health awareness has earned him accolades from esteemed organizations in the field such as the American College of Neuropsychopharmacology and the Society for Neuroscience.

In 2020, Nestler was awarded an honorary degree from Concordia University in Montreal for his groundbreaking research in depression and drug addiction, as well as his unwavering commitment to equity, diversity, and inclusion in academic. His research legacy continues to inspire researchers worldwide as he remains the forefront of scientific discovering in the field of neuropsychopharmacology. The William Jarvie society is proud to recognize Dr. Eric Nestler as the 2024 Birnberg Speaker and Research Awardee.

BIRNBERG RESEARCH PROGRAM

Schedule of Events for Wednesday, April 3rd

Faculty Club / 4th Fl., 630 W. 168th St. and School of Nursing / 7th Fl., 560 W. 168th St.

Birnberg Research Program Lecture

(Faculty Club / 4th Fl., 630 W. 168th St.)

12:00-1:00 PM Neurobiology of Drug Addiction

Speaker and Birnberg Research Awardee:

Eric J Nestler, MD, PhD

Nash Family Professor of Neuroscience

Director of the Friedman Brain Institute

Dean for Academic Affairs at the Icahn School of Medicine at Mount Sinai

Chief Scientific Officer of the Mount Sinai Health System

Faculty & Student Luncheon

(Faculty Club / 4th Fl., 630 W. 168th St.)

1:00-2:00 PM

Student Table Clinic and Research Poster Session

(School of Nursing / 7th Fl., 560 W. 168th St.)

2:00-3:00 PM Judging Session

3:00-5:00 PM Open Session to Public

William Jarvie Society Members

2023-2024

Kathryn Armstrong
Meira Axelrod
Meryl Axelrod
Morris Azrak
Alan Banner
John Bishop
Jessica Chen
Harsh Chheda
Nik Christoffel
Hillary Deane
Deena Rahhal
Wagdy Eissa
Roxana Garcia
Elizabeth Gershater
Espen Grasdahl
Ashton Gurrola
Ann Hoang
Daniel Ilyayev
Akasha Imtiaz
Omid Jamshidi

Isabel Ji
Yashica Kagithapu
Emily Kanellos
Min Seo Kang
Jasleen Kaur
Vivek Khatri
Yunbin Kim
Bintee Koirala
Pooja Kolli
Kayla Lavelle
Fei-Perng Law
Janet Lee
Kimyagarov Levi
Michael Levit
Alexandria Lo
Joseph Marsello
Allison McGrath
Lauren Monette
Leana Nektalova
Justin Ng

Hui Lin Pan
David Pellei
Marina Portuondo
Shuang Qing
Alexa Rothschild
Nick Saber
Jennifer Shamash
Brennan Speier
Bessie Stamm
Evan Stiapno
Kayla Thomsen
Gabriele Thornton
Tsai-Yen (Yoyo) Wang
Ruotong Wang
Xiaoyuan (Sherry) Yang
Kevin Yang
Matthew Yee
Esther Yu
Darren Zhan

Executive Board

Maya Jeremias	<i>Co-President</i>
Brianna Margulis	<i>Co-President</i>
Sam Cox	<i>Vice President</i>
Hyerin Yoon	<i>Secretary</i>
Mark Gettas	<i>Treasurer</i>
Rishab Biswas	<i>Communications Chair</i>
Neil Ming	<i>Editor-in-Chief</i>
Alexander Kim	<i>Assistant Editor</i>
Neeve Chen	<i>Assistant Editor</i>
Nicole Lin	<i>Assistant Editor</i>
Genesis Seo	<i>Advocacy Representative</i>
Soomin Shannon Park	<i>D4 Representative</i>
Shukran Babkir	<i>D3 Representative</i>
Parina Bhuvu	<i>D2 Representative</i>
Jessica Chen	<i>D1 Representative</i>

Predoctoral Abstracts

**Molecular, Cellular,
Tissue, System,
Regenerative Medicine,
Organism, Biology & Physiology**

1. Identifying New Risk Genes Associated with Congenital Craniofacial Anomalies

Vishrutha Arun¹, Wenshan Gao², Yufeng Shen*²

¹Columbia University College of Dental Medicine, New York, New York, ²Columbia University College of Systems Biology & Biomedical Informatics, New York, New York

Introduction: Cleft lip and cleft palate are complex congenital anomalies resulting from disruptions in the fusion of embryonic facial structures during critical periods of gestational development. These conditions present significant challenges to affected individuals, including feeding difficulties, impaired speech articulation, and a myriad of dental anomalies. The multifaceted nature of these anomalies necessitates a comprehensive understanding of their genetic etiology to facilitate targeted interventions and improve patient outcomes.

Objectives: This study aimed to address overarching questions concerning the identification and characterization of novel risk genes implicated in congenital craniofacial anomalies and associated developmental disorders. Additionally, it sought to assess the potential of advanced analytical methods and genomic datasets in enhancing the discovery of these genes. To achieve these objectives, a multifaceted approach was undertaken, integrating bioinformatics pipelines, single-cell gene expression data analysis, and statistical methods.

Materials & Methods: Progressive methodologies were employed to advance our understanding of the genetic etiology underlying congenital craniofacial anomalies and associated developmental disorders. A comprehensive approach was adopted, integrating bioinformatics pipelines for whole-genome analysis and single-cell gene expression data analysis (N = 900). The Variational Bayes Analysis of Single-Cell Sequencing data (VBASS) method facilitated the integration of de novo mutation data with single-cell expression profiles to identify candidate risk genes and potential therapeutic targets.

Results & Conclusions: The burden analysis of whole-genome data revealed significant associations ($p < 2.5 \times 10^{-6}$) between loss-of-function non-pLI genes and cleft conditions. Specifically, genes such as ATP5F1B, CCN1, TFAP2A, and IRF6 emerged as potential contributors to cleft lip and palate pathogenesis. These findings underscore the importance of these genes in the genetic landscape of craniofacial anomalies, although further validation and functional studies are required to elucidate their precise roles.

Discussion: The integration of advanced methodologies in this study has advanced the understanding of the genetic factors underlying congenital craniofacial anomalies and associated developmental disorders. Through bioinformatics pipelines, single-cell gene expression analysis, and statistical methods, potential therapeutic targets were identified and the importance of loss-of-function non-pLI genes in the pathogenesis of cleft lip and palate is emphasized. These findings pave the way for personalized treatment strategies and improved patient outcomes. Moving forward, interdisciplinary efforts, validation analysis, and function studies are crucial for further elucidating the roles of identified genes and developing tailored interventions, ultimately enhancing the overall quality of care for affected individuals.

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2. The Use of Dominant Negative G-protein to Study GPCR G-Protein Interaction

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Introduction: G proteins play a vital role as molecular switches in signal transduction cascades initiated by the activation of G protein-coupled receptors (GPCRs). Upon binding with its specific ligand, a GPCR forms a complex with a trimeric G protein. This interaction triggers a series of conformational changes in the G protein, ultimately resulting in its dissociation into $G\alpha$ and $G\beta\gamma$ subunits that play a crucial role in transmitting downstream signals. Thus, understanding the interaction between GPCR and G-protein is crucial to the research of overall GPCR signal pathways. However, the transient nature of GPCR/G-protein interaction has made the study elusive. Here, we generated a tool to enhance GPCR/G-protein complex stability. We use an engineered G-protein with dominant negative (DN) mutations to limit the $G\alpha$: $G\beta\gamma$ dissociation, rendering a stable state of the GPCR/G-protein complex.

Objectives: The goal was to create a construct encoding a DN G-protein that can facilitate the formation and purification of the GPCR/Receptor complex, which can be used for future study.

Materials & Methods: Initially, site-directed mutagenesis was performed using the QuikChange mutagenesis system to generate mutant constructs. Alternatively, NEBuilder HiFi DNA Assembly was used to generate mutant constructs. Constructs with desired mutations were later used in the Bac-to-Bac expression system for protein expression. Complex formation study was performed by co-expressing and co-purifying the GPCR and DN G-protein. Complex formation was initiated by adding agonists to GPCR/DN G-protein mixture. The complex was first purified by affinity chromatography. Size exclusion chromatography (SEC) and SDS-PAGE analysis were then used to assess complex formation efficiency of the purified sample.

Results & Conclusions: The QuikChange method yielded no transformants carrying desired plasmids. The HiFi assembly method successfully generated desired constructs. Thus, the HiFi assembly method may represent a substantial improvement over QuikChange methods in our case. The use of DN-G-protein allowed us to successfully purify the GPCR/G-protein complex. The SDS-PAGE analysis of our samples collected at target elution volume (~13.8ml) verify complex formation by showing a band corresponding to the $G\alpha$ subunit around 37 kDa.

Discussion: SDS-PAGE analysis indicated that the complex formation was successful. However, the band corresponding to $G\alpha$ is not as strong as the band corresponding to GPCR, indicating that the complex formation efficiency is not optimal. There are two possible reasons. First, the complex formation conditions can still be optimized. Second, this receptor may have a weak G-protein binding nature when compared to other GPCR. Future studies such as single particle cryo-EM analysis may be used to illustrate and compare the G-protein coupling mode of this specific GPCR to other GPCRs.

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3. In Vitro Joint Model For Multi-tissue Crosstalk In Meniscus Healing

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Introduction: The knee meniscus and temporomandibular joint disc are complex fibrocartilaginous tissues, characterized by varied cell types, matrix phenotypes, and vascularity. These tissues often fail to heal after tears or perforations, leading to joint damage and osteoarthritis due to limited treatment options. The healing of these tissues is better understood in the context of the complex joint environment surrounding the articular disc.

Objectives: We developed a 3D joint model consisting of meniscus, synovial membrane, and engineered fat pad to investigate the role of tissue crosstalk in inflammation modulation and meniscus recovery, as well as to provide insights on TMJ tissue healing.

Materials & Methods: Synovial membrane (syM): Two layers of gelatin methacryloyl (GelMA) bioink laden with macrophages and synovial mesenchymal stem/progenitor cells (syMSCs), respectively. Engineered adipose tissue (eAT): Human adipose tissue-derived stem/progenitor cells were embedded in 3D printed polycaprolactone (PCL) scaffolds with collagen bioink and cultured for 4 weeks. Meniscus explant: Longitudinal incisions were made on avascular zone bovine meniscus explants, and CTGF and TGF β 3 were applied to the defect site with syMSCs suspended in media. In vitro joint model: Semi-permeable membranes were installed in polydimethylsiloxane (PDMS) molds to compartmentalize the chambers for syM and eAT. Single tissue groups, syM with meniscus (syM/M), meniscus with eAT (M/eAT), and all three tissues (syM/M/eAT) were prepared. IL-1 β was applied to induce inflammation.

Results & Conclusions: When stimulated by IL-1 β , meniscus healing was notably disrupted in meniscus alone and syM/M groups after 4 weeks of co-culture, likely due to inflammation-induced matrix degradation. M/eAT and syM/M/eAT groups showed improved meniscus healing even under IL-1 β stimulation. Adiponectin, PPAR γ , and leptin expressions were significantly reduced by IL-1 β in M/eAT groups, but such reduction was attenuated in syM/M/eAT groups. IL-1 β and IL-6 were up-regulated in syM when treated by IL-1 β in syM/M groups, while pro-inflammatory cytokines were reduced in syM/M/eAT groups. Discussion: Our 3D in vitro joint model has significant potential to serve as an efficient experimental platform to help understand the interactions between joint tissues in the injury and healing of knee meniscus and TMJ. The study's limitations include the possibility of tissue breakdown in long-term co-cultures with IL-1 β stimulation and the unexplored effects of CTGF and TGF β 3 from the bioactive glue on syM and eAT. Moving forward, we will attempt to expand the in vitro model designed for this study to conduct experiments on TMJ disc healing in the context of the complex native joint environment.

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4. Micro-Scale Spatial Mechanobiology as a Potential Biophysical Marker for Oral Cancer

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Introduction: Identifying accurate and reliable markers for oral cancer diagnosis and prognosis has been an unmet clinical need. The current gold standard is to perform a histological evaluation of biopsy samples of which accuracy and consistency suffer from people-derived variances associated with a pathologists' experience. This study aims to evaluate the potential of micro-spatial mechanobiological analysis as a novel biophysical marker for oral cancer.

Objectives: The goals for this project were to optimize the resolution for preliminary micro-scale modulus mapping, as well as, measure and analyze biomechanical moduli over selected areas in cancerous, pre-cancerous, and healthy tissue samples.

Materials & Methods: Per our established procedure, micro-scale modulus mapping was performed using Piuma™ nanoindenter on non-cancerous, pre-cancerous, and cancerous biopsy tissue sections obtained from Columbia College of Dental Medicine Pathology (IRB exempted). Indentation moduli were mapped over selected 1000 μm x 1000 μm areas at 20 and 100 μm intervals. The individual moduli values were used to generate dot-plots and heatmaps in MATLAB, which were then overlaid onto corresponding histological images. Statistical analyses evaluated both the number of high modulus values (>30MPa) and the average effective modulus between the tissue types.

Results & Conclusions: The overlaid dot-plots onto the histology images revealed that micro-level areas with high modulus coincided with areas of cellular dysplasia in the cancerous tissue samples. Furthermore, the number of high modulus values and the average effective modulus showed a significant difference in the cancerous and pre-cancerous samples compared to healthy tissues (n = 3 per group; p < 0.05). High-resolution analysis with 20 μm intervals showed a notable heterogeneity in micro-scale mechanical properties, with significantly higher proportions of effective moduli over 30MPa in cancerous and pre-cancerous tissues in comparison with healthy tissue samples.

Discussion: Our findings suggest that micro-scale mechanobiology is a promising biophysical marker for oral cancer. Both low- and high-resolution analyses supported this conclusion with the percentage of high modulus values in cancerous and pre-cancerous tissues being significantly higher than in healthy samples. A limitation of this study is the small sample size and thus we are currently working towards expanding the study with a larger number of patient-matched tissue samples. Moreover, we are looking to quantitatively compare modulus values between pre-cancerous tissues that progress to cancer compared to those that remain healthy. Further work in this space has significant clinical potential to support the clinical identification and prognosis of oral cancers through the use of quantitative analysis.

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5. Probiotic Adhesion to Electrospun Fibrous Scaffolds as a Function of Fiber Diameter

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Introduction: Probiotics are microbes that have been shown to confer a health benefit to their host. Advancements in genetic engineering technology have allowed for significant control over various traits of microbes resulting in a broadening class of probiotics in medicine. In applying these treatments, a significant consideration is in delivery and localization. As such, the cellular behavior of probiotics in conjunction with a biomaterial system is paramount for effective function of applied probiotics. Electrospinning is a method of creating fibrous scaffolds able to influence cell attachment and growth; this is of interest in delivering probiotics.

Objectives: To evaluate the effect scaffold properties, specifically fiber diameter, has on the adhesion and growth behavior of probiotic bacterium *Lactococcus lactis*.

Materials & Methods: Nanofiber scaffolds were created utilizing a custom electrospinning setup. Scaffolds were fabricated with gelatin in 50% acetic acid at concentrations of 20%, 27.5%, and 40% w/v. *L. lactis* was grown overnight under aerobic conditions in BHI media. The culture was standardized to an OD₆₀₀ of 0.3. Scaffolds were incubated at 37°C for either 0.5, 2, 6, or 18 hours at a 1:100 dilution. The number of bacteria attached to scaffolds was evaluated via CFU assay (N=5). Scanning electron microscopy (N=2) was also performed to evaluate the morphology of scaffolds, cells, and biofilm production.

Results & Conclusions: Nanofibrous scaffolds were successfully fabricated at three statistically different fiber diameters. The diameter of the fibers correlated linearly to gelatin concentration. *L. lactis* attached more effectively to scaffolds with larger fiber diameters. This enhanced attachment resulted in increased cell growth on the 400 nm diameter scaffold from 6 hours of culture onwards. Additionally, greater infiltration of cells was seen in larger diameter scaffolds.

Discussion: The fiber diameter of the scaffolds proved to have a significant effect on the adhesion of the relevant probiotic, *L. lactis*. More specifically, with a fiber diameter of 200 nm, smaller than the *L. lactis* cell itself, there was significantly reduced attachment and growth. The 400 nm fiber diameter supported significant growth; this mechanism is still to be determined. It will be important to continue similar experiments in order to provide insight into the effect composition and morphology of nanofibers has on optimal adhesion and growth.

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6. Effects of Plasma Treatment on the Strength of Bonding to Ceramic Surfaces in Orthodontics: A Comprehensive Review

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Introduction: Orthodontic treatment is increasingly sought after by adults, who tend to have undergone restorative dental procedures using materials that have a higher rate of bracket debonding than does enamel. Use of plasma to modify the restorative material surface appears to be a promising solution to this problem. The adhesive strength and quality of the resulting bond can be assessed through shear bond strength (SBS) and failure mode testing, respectively.

Objectives: The first objective was to identify plasma treatment methods suitable for intraoral chairside surface modification of dental restorative materials, while the second was to assess the effect of these protocols on the SBS and failure mode of ceramics bonded to resin cement.

Materials & Methods: MEDLINE (PubMed) and Google Scholar were searched using the keywords “ceramic” AND “plasma” & “zirconia” & “plasma.” Case reports, reviews, opinions, and letters to the editor were excluded. The references of selected articles were screened and hand-searched. Relevant information about protocols (i.e. type of ceramic and primer/bonding agent) and results (i.e., SBS and failure mode test data) was collected. The “% of Control SBS” value was calculated by dividing experimental SBS values by their respective control SBS value.

Results & Conclusions: Cold atmospheric plasma (CAP) was only plasma treatment found to be suitable for intraoral use. Of twenty CAP studies, six reported a protocol did not combine CAP with surface modification methods other than primer, used non-toxic or unspecified gas(es), and produced an SBS value that was within or very close to the accepted range and significantly statistically greater than the control. Due to the variation across these protocols, further *in vivo* research is needed to ascertain the efficacy of specific CAP treatments on bond strength.

Discussion: The increase in SBS value was considerable, ranging from around 30% to over 100%. Treatment times of 80-120 seconds tended to have a greater effect on SBS than did shorter times. A greater incidence of cohesive and/or mixed failure compared to the control was also reported, which likewise indicates that CAP treatment improves the ceramic-resin cement bond.

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7. Nano-layered Tendon Patch Orchestrates Timely Interplay between Macrophages and Tendon Stem/Progenitor Cells

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Introduction: Macrophages are actively involved in tendon healing from the early inflammatory phase to the late remodeling phase through M1 and M2 polarization, respectively. We previously reported small molecules (SMs), Oxo-M and 4-PPBP, leading to the regeneration of tendon and PDL by promoting endogenous stem/progenitor cells. Given the distinct roles of Oxo-M and 4-PPBP, attenuating M1 polarization and promoting M2 polarization, respectively, we applied a layer-by-layer (LbL) nanofabrication to apply timely controlled, sequential release of Oxo-M and 4-PPBP, for timely regulation of macrophage polarization during healing.

Objectives: We aim to investigate the effects of LbL tendon patch on gene expression profiles at the single cell level, potentially associated with interactions between macrophages and stem/progenitor cells.

Materials & Methods: Per our established method, Oxo-M and 4-PPBP were loaded onto 3D-printed polycaprolactone (PCL) patches in between nanolayers of cationic and anionic polymers. In each of the healthy male rat patellar tendon models, an incision was made. Then, we applied LbL tendon patches on fully transected rat patellar tendons (n=10). LbL patch without SMs served as a control (n=5). At 1- and 2-weeks post-op, tendons were harvested from both groups for histological analysis, mechanical tensile testing, and scRNA-seq with CellChat analysis.

Results & Conclusions: We observed an increase in M2-like population under immunofluorescence studies and scRNA-seq analysis after a sequential release of Oxo-M and PPBP molecules compared to control groups. Additionally, in scRNA-seq analysis, we see differential gene expressions between control and experimental groups (e.g. Mif, Tenascin, CXCL, and Postn). Our study has optimized the nano-scale coatings and consecutively layered LbL fabrication as a method of drug delivery. We have shown that timely controlled release of Oxo-M and 4-PPBP from the Lbl PCL patch efficiently orchestrates the tendon healing processes involving inflammation, matrix synthesis, and remodeling phases. Our LbL nanofabrication may also serve as an efficient method for achieving controlled delivery of other bioactive cues, applicable for a wide range of complex tissues such as periodontal ligaments.

Discussion: Our findings indicate that the timely released Oxo-M and 4-PPBP from the LbL tendon patch guide regenerative tendon healing by regulating macrophage polarization and intercellular interactions, with significant implication in periodontal regeneration.

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8. Optimization Of A Novel Meniscus-On-A-Chip Model

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Introduction: The synovial joint is a complex multi-tissue organ where the crosstalk between multiple tissues plays important roles in homeostasis, function, and disease initiation and progress. However, we have a very limited understanding of how the multiple joint tissues interact for joint homeostasis, disease initiation, and progression, or in response to therapeutics. Our lab has investigated various bioengineering approaches to regenerate knee meniscus and temporomandibular joint (TMJ) discs by harnessing endogenous stem/progenitor cells. In this study, we propose a novel meniscus-on-a-chip (MoC) model as a versatile platform to study interactions between the meniscus and other joint tissues during the healing process.

Objectives: Our overall objective is to develop a functional and reliable MoC platform. The specific research goal of this study was to optimize liquid sealing, flow connectivity, and structural integrity of the MoC model and evaluate the sustainability of cells in the MoC.

Materials & Methods: The MoC with 4 different compartments: engineered fat pad, synovial membrane, articular cartilage, and meniscus was created using polydimethylsiloxane (PDMS). The mold was assembled using water-wash resin 3D printing and cured under UV light. 3 μ m porous polyester membrane filters were used to separate the cellular and perfusion layers. 15% gelatin methacryloyl (GelMA) bioink was injected into each cell compartment to confirm liquid sealing. Synovial mesenchymal stem cells (MSCs) were used to culture meniscus and articular cartilage spheroids while adipose-derived MSCs were used for the intracellular fat pad.

Results & Conclusions: We have fine-tuned the micro-chamber and channel designs and the mold assembly procedures to establish a functional MoC model. A diffusion barrier gap of 350 μ m resulted in optimal liquid sealing. An experimental procedure was also established to build stem cell spheroids to engineer each type of tissue in the respective microchambers in the MoC. Homogenous, viable spheroids (200 μ m – 500 μ m) were successfully prepared from mesenchymal stem/progenitor cells, suitable for being injected into their microchambers.

Discussion: We have designed a functional MoC model with a microfluidic system, allowing biochemical communications between the different joint tissues. The limitation of this study is the lack of consistent reproducibility of the MoC. Thus, we are continuing to refine the protocol used to fabricate the MoC. Upon optimization of the MoC, it will serve as a potential gateway for future studies that will examine inter-tissue interactions in the context of meniscus homeostasis, disease, and repair/regeneration processes. Future works include validating the functionality of the MoC with inflammatory cross-talks. This study also has implications for modeling human temporomandibular joint disorders (TMJD).

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9. Detection of Caries around Restorations on Bitewings using Deep Learning

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Introduction: Secondary caries lesions adjacent to restorations, a leading cause of restoration failure, require accurate diagnostic methods to ensure an optimal treatment outcome. Traditional diagnostic strategies rely on visual inspection complemented by radiographs. Recent advancements in artificial intelligence (AI), particularly deep learning, provide potential improvements in caries detection.

Objectives: This study aimed to develop a convolutional neural network (CNN)-based algorithm for detecting primary caries and secondary caries around restorations using bitewings.

Materials & Methods: Clinical data from 7 general dental practices in the Netherlands, comprising 425 bitewings of 383 patients, were utilized for this retrospective study. Prior to model development, the bitewings underwent three rounds of annotations to provide the reference lesions for the AI model using the Darwin Platform. The study used the Mask-RCNN architecture, for instance segmentation, supported by the Swin Transformer backbone. The model was implemented using MMDetection (v. 3.1.0) based on Pytorch 2.1.0. After data augmentation, model training was performed through a ten-fold cross-validation. The diagnostic accuracy of the algorithm was evaluated by calculating the area under the Free-Response Receiver Operating Characteristics curve, sensitivity, precision, and F1 scores.

Results & Conclusions: The model achieved areas under FROC curves of 0.806 and 0.804, F1-scores of 0.689 and 0.719, sensitivity values of 0.742 and 0.702 and precision values of 0.676 and 0.754 for primary and secondary caries detection, respectively. An accurate CNN-based automated system was developed to detect primary and secondary caries lesions on bitewings, highlighting a significant advancement in automated caries diagnostics.

Discussion: The study successfully developed a CNN-based automated system for both primary and secondary caries lesion identification in dental radiographs. The findings highlight the system's accuracy in distinguishing between caries types, with comparable performance for both primary and secondary lesions. This advancement signifies a significant step forward in AI applications for dental diagnostics, offering promise for improved patient care as well as diagnostic and treatment planning capabilities. However, certain limitations, such as sample selection bias and the need for further adjustments to enhance specificity, should be considered. Future studies could explore refinements to the algorithm and its integration into clinical practice to optimize diagnostic accuracy and patient outcomes.

10. Alveolar Bone Loss and Periodontitis in Pre-Menopausal Women with and without HIV

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Introduction: Before the advent of antiretroviral therapy (ART), people with HIV had increased gum inflammation, measured by bleeding on probing (BOP) and probing depth (PD), and increased periodontal destruction, measured by clinical attachment loss (AL) and alveolar crestal height (ACH). Oral inflammation and periodontitis have been found to be associated with proinflammatory cytokines such as IL-1 β , IL-6, and TNF- α . We have previously shown that even with effective ART, post-menopausal women with HIV have greater alveolar bone loss and greater tooth loss accompanied by higher expression of RANKL compared to women without HIV, but the effect on pre-menopausal women has not been studied.

Objectives: To determine if pre-menopausal women with HIV have increased periodontal disease compared to pre-menopausal women without HIV

Materials & Methods: 70 self-reported pre-menopausal women (21 HIV+ with virological suppression on ART, 49 HIV-; 34% African American, 54% Hispanic, and 11% White) were recruited in a prospective study at Columbia University Irving Medical Center. A full-mouth periodontal examination was performed to record PD, AL, and BOP on all teeth excluding third molars at six sites per tooth: mesio-buccal, mid-buccal, disto-buccal, mesio-lingual, mid-lingual, and disto-lingual. Intraoral radiographs were used to measure ACH in up to 24 teeth at two sites per tooth (mesial and distal), excluding third molars and canines. Gingival crevicular fluid (GCF) samples were collected and assayed for the following cytokines: IFN- γ , TNF- α , IL-1 β , IL-2, IL-5, IL-6, IL-7, IL-8, IL-10, IL-12p70, IL-13, IL-17 α , osteoprotegerin (OPG), and RANKL. Whole-mouth mean for each measurement was calculated. Unpaired Student T-tests were used to determine differences between the two groups. Statistical significance was recorded at $p < 0.05$.

Results & Conclusions: Pre-menopausal women with HIV had significantly greater mean PD (3.46 +/- 0.98 mm vs. 2.84 +/- 0.69, $p < 0.01$), AL (3.63 +/- 1.00 mm vs. 2.94 +/- 0.85, $p < 0.01$), % BOP (0.38 +/- 0.27 vs. 0.23 +/- 0.20, $p = 0.0137$) and ACH (2.90 +/- 1.04 mm vs. 2.31 +/- 0.82, $p = 0.0188$). Additionally, there was a significantly higher expression of IL-1 β , IL-13, IL-17 α , and OPG in women with HIV.

Discussion: Our results support that even with effective ART, pre-menopausal women with HIV have increased periodontal soft tissue inflammation and destruction compared to women without HIV. Furthermore, proinflammatory cytokines such as IL-1 β and IL-17 α are elevated in women with HIV, thereby stimulating local osteoclasts and inducing alveolar bone resorption. However, our results surprisingly indicate an increase in IL-13 and OPG levels, which warrants further investigation. Longitudinal studies are needed to assess periodontal disease progression in women with HIV through the menopause.

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11. Ultrasound Characterization of Alveolar Bone Changes During Orthodontic Tooth Movement

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Introduction: Several studies have examined the link between orthodontic tooth movement and vertical bone changes, but none have examined the vertical bone changes in the facial bone over small intervals of time. Infrequent imaging is due to limitations with the radiation dose accumulation necessary to longitudinally track morphological changes of the facial bone.

Objectives: The aim of this study is to observe patients undergoing orthodontic treatment via fixed appliances and to utilize ultrasound sonography to quantify the amount of vertical bone loss on the facial of the maxillary anterior teeth in the first month of treatment. This study informs the use of ultrasound in the current ongoing studies investigating the vertical alveolar bone changes during orthodontic intrusive bone movement in clear aligner and fixed appliance patients.

Materials & Methods: This study examined 10 orthodontic patients at the post-graduate orthodontic clinic of Columbia University College of Dental Medicine. Included patients were starting orthodontic treatment for any type of malocclusion with the straight wire appliance. Ultrasonography (ZS3, Mindray, Mahwah, NJ) was performed on the facial surface of the maxillary anterior teeth at the time of baseline and at the 1 month follow up appointment (visit 1). The distance from the area between the base of the bracket and the gingival wings to the tip of the facial crestal bone was measured directly on the ZS3 ultrasound with the included caliper. A Pearson correlation coefficient to evaluate Intraexaminer and Interexaminer reliability. Subsequently, we computed the mean change in bone loss across all patients.

Results & Conclusions: Correlation analysis yielded a Pearson's correlation coefficient of 0.600 to 0.978, indicating a high reliability in both Intraexaminer and Interexaminer assessments. A significant decrease in facial vertical bone level from Baseline to Visit 1 of .20mm was observed. The preliminary results of the ongoing project utilizing ultrasonography to visualize bone changes suggest a relationship between anterior intrusive forces using Invisalign and bone loss.

Discussion: The results of this study are in agreement with previous CBCT studies that found decreases in vertical bone level during orthodontic movement. This data can help clinicians anticipate periodontal changes in orthodontic patients, and potentially develop a monitoring program for periodontally involved teeth. Limitations of this study include the short study duration, alterations of the brackets resulting in the removal of the tooth from the study, and the time consuming nature of ultrasound imaging. The current expansion of the project, which includes clear aligner orthodontic tooth movement and comparing the vertical bony changes to those seen with fixed appliances, has the potential to improve the tracking of tooth movement by orthodontists and reduce the need for refinements.

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12. Dual Inhibition of AURKA and Bcl-xL is Synthetically Lethal in Glioblastoma Models

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Introduction: Glioblastoma (GBM) is the most common type of malignant brain tumor in adults. With a poor prognosis of only 12-18 months, novel treatments are urgently needed. Cell-based therapies may provide a highly effective means to kill GBM cells when combined with other treatment modalities. Approaches to reduce the viability of GBM cells are critically needed.

Objectives: Overall, the objective of the study was to demonstrate that loss of function of Aurora kinase A (AURKA) and Aurora kinase B (AURKB) reduces the viability of GBM cells. A specific aim of the study was to test the hypothesis that loss of function of AURKA through combination inhibitor treatment with AURKA inhibitor Alisertib and Bcl-xL inhibitor ABT 263 would enhance killing of GBM cells in vitro.

Materials & Methods: U251 GBM cell lines were cultured and several drug combinations were devised incorporating AURKA and AURKB inhibitors (Alisertib and Barasertib, respectively). Additionally, combination drug therapies including ABT 263, a potent Bcl-xL inhibitor, was incorporated into the AURKA inhibitor treatments with Alisertib. GBM cell lines were treated with various inhibitor and combination treatments and cell viability was assessed using the CellTiter-Glo luminescent cell viability assay.

Results & Conclusions: GBM cell lines treated with AURKA inhibitor and ABT 263 experienced significantly more killing of GBM cells and consequently, significantly reduced cell viability compared to control and single-agent treatments (Aurora kinase A/B inhibitor only). Using mathematical models, the combination index (CI) was used to determine the degree of drug interaction. The CI values for combination treatments reported in the study were all <1 demonstrating robust drug synergism.

Discussion: Taken together, the results suggest that dual inhibition of AURKA and Bcl-xL is synthetically lethal in GBM models. Alisertib combination treatments with ABT 263 produced a significantly more potent and efficacious response compared to traditional single-agent treatments. The combination treatment had a strong and synergistic effect on decreasing GBM cell viability, portraying the therapeutic value of combination treatments for GBM patients. Ultimately, the goal is to test this approach in in vivo models of preclinical GBM and conduct a phase I clinical trial in patients.

Aaron Naim was supported by the Columbia University College of Dental Medicine Summer Research Fellowship.

13. In-Depth Immunophenotyping of Cell Populations in Peripheral Blood in IgA Nephropathy

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Introduction: Immunoglobulin A nephropathy (IgAN) is a rare disease but one of the most common forms of glomerulonephritis. The primary defect that has been identified is the dysregulation of immunoglobulin A1 (IgA1), and the mechanisms of IgA1 dysregulation remains unclear. Previous research has implicated immunological, genetic, and biochemical factors, specifically in the elevated production of IgA1. The generation of the antibodies, such as IgA1, from the memory B-cell and antibody secreting cell populations, requires help from the T-cells. Greater characterization of the immune cell populations is essential to understand the mechanisms and pathways of the immune responses in autoimmunity and infectious diseases. However, in-depth characterization of the immune cell populations in the peripheral blood of IgAN patients and how these populations differ from healthy individuals has not been elucidated.

Objectives: The main objective was to use a multiparameter flow cytometry panel to identify populations of B-cells, T-cells, myeloid cells, and innate cells, and the respective sub-populations in the peripheral blood of healthy individuals and IgAN patients. This would determine if there were alterations in the lymphocyte and myeloid populations in IgAN patients compared to healthy individuals.

Materials & Methods: Immune cells isolated from peripheral blood of healthy controls (n=7), and IgA nephropathy patients (n=6) were deep phenotyped using a spectral flow cytometer (Cytek Aurora). The samples were analyzed using the FlowJo software allowing the identification of multiple myeloid cell and lymphocyte populations.

Results & Conclusions: We identified lymphocyte and myeloid cell populations, and the respective subtypes in the peripheral blood of both IgAN and healthy individuals. We focused on the IgA positive B-cell population and demonstrated a significant increase in IgA positive B-cells per 1,000,000 CD45+ cells in the peripheral blood mononuclear cells isolated from IgAN patients compared to healthy individuals. Analysis of additional cell surface markers associated with the IgA+ B-cells demonstrated an increased number of IgA+ CCR6hi in IgAN patients compared to healthy controls.

Discussion: The increased number of IgA1+ B-cells in the circulation may result in the elevated levels of IgA1 observed in IgAN patients. Using a multi-parameter flow cytometry panel allows the deep phenotyping of specific immune cell populations that can identify alterations and phenotypic differences of specific immune cells. This will help the development of functional assays to fully understand how alterations in the immune cell population impact the immune response.

Sahar Oliaei was supported by an NIH Summer Research Fellowship.

14. Icariin-releasing 3D-Printed Scaffolds for Cleft Bone Regeneration

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Introduction: One in every 1,600 babies is born with cleft lip with cleft palate in the US, and satisfactory reconstruction is still unattained. Three-quarters of cleft lip and cleft palate patients require alveolar cleft osteoplasty using an autologous graft derived from the iliac crest, and as much as 45.7% of the patients develop acute or chronic graft disturbances post-surgically. Previous studies have tested 3D-printed scaffolds embedded with cells for cleft grafts with suboptimal outcomes. Icariin (ICA) has been shown to promote osteogenic differentiation of stem/progenitor cells.

Objectives: Here, we explored the potential of 3D-printed scaffolds with controlled delivery of ICA to promote the recruitment, integration, and formation of endogenous alveolar bone stem cells.

Materials & Methods: Polycaprolactone (PCL) embedded with 0.3% wt ICA and control scaffolds (PCL) was prepared per our well-established protocol, followed by 3D-printing scaffolds (3mm diameter, 1mm thickness, pore size of 200 μ M ~ 250 μ M). Mechanical properties of the scaffold were conducted with the Univert CellScale (Univert, Ontario, CA) on 5mmx5mmx1mm PCL (n=5) and ICA-loaded scaffolds (n=5). Male SD rats 350-400 grams were purchased from (Charles River Laboratories International, Inc., Massachusetts, US) and kept under specific-pathogen-free conditions (n=14). Each animal was induced with 1-5% isoflurane and was delivered a ketamine (40-100 mg/kg) and xylazine (5-13 mg/kg) cocktail. Ethiqx XR (0.6mg/kg) was delivered directly to the surgical site. A 1cm incision was made with a 15-blade bard-parker scalpel following the maxillary incisal midline. The periosteum was lifted bilaterally and a 3mm diameter drill bill was used to create a full-thickness defect. The mucosal flaps were closed using an absorbable suture after the scaffolds were implanted. The baseline body weight was recorded and followed after the first 3 days after the surgery. In vivo μ CT scanning of rats was performed at a supine position, set-up parameters (FOV 40mm, scan time 4.5min, 444 mGy) with PerkinElmer Quantum FX μ CT (PerkinElmer Inc., Massachusetts, USA) at 2-week, 4-week, 6week, and 8-week. 3D constructed images were analyzed with Analyze11.0 (Analyze, Kansas, US) and the premaxilla was collected for sampling.

Results & Conclusions: 2-week μ CT scans of rat models (PerkinElmer Quantum FX; PerkinElmer Inc. Massachusetts, USA) were analyzed for new bone volume compared to the original defect volume. Significant ($p < 0.05$) new bone formation could be seen in the ICA-loaded PCL scaffold group within 2 weeks post-operations, showing (1.1 ± 0.26 mm³) new bone formation compared to PCL only (0.42 ± 0.06 mm³) and defect only (0.37 ± 0.07 mm³). Young's Modulus of 5mmx5mmx1mm PCL scaffold (28.1 ± 4.0 MPa) was significantly more ($p < 0.001$) than 0.3% ICA/PCL scaffold (20.8 ± 3.3 MPa) at 20% strain with constant compression at 1mm/min.

Discussion: 0.3% ICA/PCL scaffolds surgically placed in an in vivo rat model resulted in significantly more new bone formation at 2 weeks of implantation.

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15. Gut Microbiome Dysbiosis and its Correlation with Neurologic PASC and ME/CFS

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Background: An increasing number of patients with Neurologic Post-Acute Sequelae of SARS-CoV-2 (PASC) exhibit symptoms of myalgic encephalomyelitis/ chronic fatigue syndrome (ME-CFS), a neurocognitive condition characterized by prolonged fatigue, cognitive dysfunction, neuropathy, and dysautonomia. Both Neurologic PASC and ME-CFS have shown to have gut microbiome dysbiosis. Even after restoration of bacterial abundance, patients with long-term ME-CFS (>10 years) continue to have metabolic dysfunctions. Similarly, many studies have seen gut microbiome dysbiosis of patients in early recovery from SARS-CoV-2 (<1 year) with reduced alpha diversity and a decrease in short-chain fatty acid (SCFA) producing species, notably the butyrate-producing microbes. Butyrate is a multi-functional SCFA in the gut that plays a major role in establishing connections between neurologic, digestive, and inflammatory disorders. Given the multifaceted effect of butyrate, it may play a pivotal role in establishing a pathological link of gut microbiome dysbiosis in patients with mild acute COVID-19 and neurologic PASC. However, the longitudinal implications of gut dysbiosis in neurologic PASC among individuals with mild acute COVID-19 remain largely unexplored.

Materials and Methods: The COVID-19 Persistent and Immunology Cohort (C-PIC) is an ongoing observational study encompassing over 650 participants, both with and without PASC. Neurologic PASC was defined as self-reported fatigue, cognitive dysfunction, or dysautonomia. At 3-6 month intervals, rectal swabs or stool samples were collected alongside comprehensive clinical metadata of symptoms and questionnaires. Zymo MagBead and the Zymo MagBead DNA/RNA kit were used for DNA extraction, and the MiSeq platform was utilized for sequencing the V3/V4 region of the bacterial 16s rRNA gene. Species-level differential abundance testing was conducted using DESeq2, while alpha diversity was assessed via Chao scores for richness. Comparative analyses were conducted between 151 C-PIC participants with mild acute COVID-19 not requiring hospitalization, distinguishing those with (63%) and without (37%) neurologic PASC.

Results and Conclusion: Examination of fecal samples collected at study enrollment revealed a decreased relative abundance of butyrate-producing species (such as *Faecalibacterium prausnitzii*, *Eubacterium* spp., and *Bacteroides* spp.) among individuals reporting neurologic PASC ($p < 0.05$). Additionally, a noteworthy trend towards increasing alpha diversity (Chao index) was observed over time across 371 longitudinal samples.

Discussion: Our findings of increased alpha diversity post-SARS-CoV-2 recovery, alongside a diminished abundance of butyrate-producing species in neurologic PASC patients, mirror late convalescent observations in ME-CFS. These insights underscore the potential role of the gut microbiome in neurologic PASC and may indicate species-level correlations with ME-CFS. Further investigations are warranted to delineate gut microbiome targets for clinical interventions.

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16. Role of Immune Checkpoints in Periodontal Disease

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Introduction: Periodontitis is a chronic inflammatory disease that irreversibly damages the periodontium. The pathogenesis is multifaceted, involving microbial aggression from subgingival dental biofilm, host immune response, and environmental factors. Studies utilizing single-cell RNA-sequencing, spatial transcriptomics, and flow cytometry revealed cellular subtypes and pathways potentially influential in the pathogenesis of periodontitis. A particular focus has been on tissue-resident macrophages and T-cell subsets alongside myeloid cells, which navigate the balance between protective and destructive immune responses. At the center of immune regulation are the checkpoint molecules PD-1 and PD-L1, vital for modulating T-cell functions and maintaining immune tolerance. Recent insights suggest their potential involvement in periodontitis, with elevated expression in saliva. Overexpression of PD-L1 in gingival epithelium basal keratinocytes correlated with reduced periodontal inflammation and alveolar bone resorption. There is still much to be discovered about immune cell distribution, PD-1/PD-L1 sources, and the spatial coordination of immune cells in gingival health.

Objectives: We investigated the immunological landscape of periodontal disease (PD) with a special focus on the PD-1/PD-L1 pathway, an important axis of tolerance in inflammatory conditions.

Materials and Methods: We collected gingival tissue samples from racially diverse patients with both healthy and periodontitis-affected oral sites (n=56). Tissue microarrays (TMAs) were prepared from formalin-fixed, paraffin-embedded tissue. The TMAs had at least two distinct blocks, representing different areas of the same site affected by active PD or healthy tissue sites. We identified immune cell subtypes with multiplex immunofluorescence and spatial analyses. We used AI-based segmentation and image analyses to identify cellular compositions, co-localizations, and PD-1/PD-L1 expression in gingival tissue. Correlations were established using multivariable regression. P value < 0.05 was considered statistically significant.

Results and Conclusions: Patients with PD had a significantly greater percentage of CD3+ cells, cytotoxic (CD8+) T cells, T helper (CD4+) cells, PDL1+ cells, PD-1+ cells, CD4+FoxP3+ cells, and double negative T cells (CD3+/CD4-/CD8-), than healthy controls. The ratio of PD-1+CD8+/CD8+ cells, PD-1+CD4+/CD4+ cells, and PD-L1+CD68+/CD68+ cells increased in PD. Macrophages were the main source of PD-L1 in the gingival tissue followed by epithelial cells. There was no correlation between age or biological sex with the PD-L1 level. However, we found a significant negative association between severity of PD and levels of PD-L1+ CD8+ cells in gingival tissue, indicating a possible protective mechanism mediated by PD-L1+CD8+ cells to control immune activation. Patients with advanced periodontitis, stages III-IV, had lower levels of PD-L1+CD8+ compared to those in stages II-III. Black individuals had fewer PD-L1+CD8+ T cells in gingival tissue than White individuals.

Discussion: Colocalization of PD-1 and PD-L1 with specific immune cells provides insights into gingival tissue immune interactions in PD. These findings could guide future research towards targeted immunotherapies for periodontitis.

Bessie Stamm was supported by the Columbia University College of Dental Medicine Summer Research Fellowship.

17. Epigenetic Editing through CRISPR Activation of Periodontal Regulators

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Introduction: Periodontitis is the eleventh most prevalent medical condition worldwide affecting 20-50% of the global population. Current treatments facilitate the attachment of long junctional epithelium to root surfaces rather than generate new connective periodontal tissues. Additionally, single gene therapy is ineffective in promoting periodontal tissue regeneration, suggesting a need for multiple levels of gene activation. Simultaneous activation of key periodontal regulator genes, Scleraxis (SCX), Mohawk (MKX), and CTGF, may lead to increased periodontal ligament tissue regeneration.

Objectives: We have recently explored the potential of CRISPRa to activate key periodontal transcription factors, SCX and MKX, for endogenous periodontal ligament (PDL) regeneration. Although we achieved robust activation of SCX in various cells, MKX demonstrated a suboptimal outcome. To overcome this limitation, we aim to design new guide RNAs (gRNAs) targeting the promoters of CTGF, a growth factor upregulating SCX, in addition to new MKX gRNAs. The goal is to promote PDL healing through the simultaneous activation of regulators, SCX, MKX, and/or CTGF.

Materials & Methods: CRISPRa components included SP-dCas9 with VP64-p65-Rta (VPR), with eight and four guide RNAs (gRNAs) targeting MKX and CTGF respectively. gRNAs were designed to maximize ligation efficiency into a psb700-GFP plasmid. Guide screening was performed by transfecting constructs into HEK-293T cells with LipofectamineTM Stem. Cells were imaged for GFP intensity and harvested after 48 hours. Gene expression was evaluated using qPCR with a GAPDH control.

Results & Conclusions: High levels of CTGF upregulation in HEK-293T cells were achieved for two CTGF gRNAs while redesigned MKX gRNAs displayed low levels of MKX upregulation. Multiplexing of best-performing CTGF and previous SCX gRNAs (n=3) resulted in 172- and 33-fold upregulation of SCX and CTGF, respectively, with low MKX upregulation.

Discussion: CRISPRa can simultaneously upregulate transcription factors CTGF and SCX to achieve an overall goal of direct lineage reprogramming for PDL healing. We speculate that the difficulty in MKX upregulation may be due to epigenetic factors such as DNA methylation inhibiting MKX gene expression. Possible epigenetic use of valproic acid may be helpful in increasing MKX expression. Multiplexed gene activation using CRISPRa allows for a multi-transcriptional network regulation with potential for endogenous PDL regeneration.

Albert Wang was supported by the Columbia University College of Dental Medicine Summer Research Fellowship.

18. The Role of Speckled Protein SP140 in Tumor-Associated Macrophages within Head and Neck Squamous Cell Carcinoma

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Introduction: Head and neck squamous cell carcinoma (HNSCC) represents the predominant form of cancer in the head and neck region. Tumor-associated macrophages (TAMs) play a pivotal role in cancer dynamics, aiding in tumor eradication. The presence of ProMyelocytic Leukemia Nuclear Bodies (PML-NBs) is crucial for DNA processes that suppress tumor growth. Speckled protein 140 (SP140), which localizes in PML-NBs and interacts with DNA and chromatin, has been identified as a significant factor in the survival rates of HNSCC patients, particularly those with TAMs expressing high levels of SP140. This underscores the necessity for further exploration into SP140's influence on macrophage functionality, specifically regarding phagocytosis and exosome production.

Objectives: This study delves into the role of SP140 within macrophages, focusing on: 1) The effect of SP140 on the production of exosomes by macrophages. 2) The influence of SP140 on macrophage phagocytic activity. 3) The role of aging in immune response to HNSCC tumors.

Materials & Methods: The study utilized macrophages with SP140 knockdown (KD) achieved through SP140 silencer RNA transfection, alongside two control groups—one with scrambled RNA transfection and another without any transfection. Exosome production was measured using Nanosight NS300 analysis of macrophage supernatants. Phagocytosis was assessed by treating transfected macrophages with pHrodo Green *E. coli* BioParticles and quantifying fluorescence using ImageJ software. Flow cytometry was employed to evaluate tumor immune cell composition and infiltration, with three samples per group.

Results & Conclusions: The research indicates that disrupting SUMOylation, essential for PML-NB formation and SP140 recruitment, significantly diminishes exosome production and phagocytic activity in macrophages with SP140 KD. However, no notable differences in tumor immune infiltration were observed between younger and older mice.

Discussion: The findings highlight SP140's critical role in macrophage-mediated phagocytosis and exosome generation. While the study suggests SP140's potential clinical relevance, further research is warranted to fully understand its implications. The lack of significant differences in tumor immune infiltration between age groups may be attributed to the limited sample size, suggesting the need for further investigation with a larger cohort.

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19. Decellularized Perichondrium Hydrogels for TMJ Repair

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Introduction: TMJ osteoarthritis (TMJ OA) is a degenerative joint disease leading to pain and disability. Our lab discovered that TMJ perichondrium (PC) harbors niche cells that support cartilage homeostasis. Decellularized extracellular matrix (dECM) hydrogels preserve native tissue environment and have been exploited for regenerative medicine applications. However, whether decellularized ECM hydrogels derived from PC (dPC-hydrogel) can be utilized to repair cartilage or support chondrogenesis is unknown.

Objectives: Our objectives are to 1) develop a dPC-hydrogel from native TMJ tissues and 2) determine dPC-hydrogel's therapeutic efficacy to repair cartilage in a post-traumatic TMJ OA rabbit model.

Materials & Methods: Hydrogels were developed from decellularized mini-pig TMJ PC and condylar cartilage (CC) and assessed via rheometer (n=4 pigs). Chondrogenic potential was tested by seeding primary human PC-cells or CC-chondrocytes onto dPC-hydrogels, dCC-hydrogels, or Matrigel, subcutaneous injection on nude mice dorsum (n=24 mice), and histological analysis at eight weeks. Therapeutic efficacy was determined following once/month intra-articular injection of dPC-hydrogel, dCC-hydrogel, or PBS in a post-traumatic rabbit TMJ OA model (n=16 rabbits). At three months, TMJs were analyzed relative to sham by immunohistochemistry.

Results & Conclusions: DNA assay and histology confirmed tissue decellularization in dPC-hydrogel and dCC-hydrogel; dPC-hydrogel retained collagen and proteoglycan. Rheometry demonstrated dPC-hydrogel possessed improved gel-like properties (time-sweep, temperature-sweep) and shear-thinning behavior relative to dCC-hydrogel. In nude mice xenografts dPC-hydrogel and Matrigel, but not dCC-hydrogel, induced PC-cells to form cartilage and CC-chondrocytes to form bone (Safranin O+). Histological analysis of injured rabbit TMJs showed that relative to PBS, the dPC-hydrogel treatment group had significantly improved OARSI structure scores and significantly reduced MMP13 expression.

Discussion: Taken together, we demonstrate that dPC-hydrogel possesses gel-like properties critical for injectability, support chondrogenesis, and can improve cartilage structural integrity in TMJ OA. These data indicate a new tissue source for natural hydrogels. Future studies include testing dPC-hydrogel as a drug delivery system.

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Predoctoral Abstracts

**Social & Behavioral,
Education, Geriatric Oral
Health, Health Service, and
Global Oral Health**

20. Relapse After Clear Aligner Therapy and Fixed Orthodontic Therapy

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Introduction: After active orthodontic therapy, life-long retention is recommended with the use of a retainer. Oftentimes, patients receive removable Essix retainers which require patient compliance to prevent and minimize relapse. Previous research showed that the degree of post-retention anterior crowding has been found to be unpredictable (Little,1990). This study aims to better understand orthodontic stability of fixed appliances and clear aligners and the necessity for retreatment from the perspective of the clinician and lay person evaluated at 1-month post-treatment.

Objectives: (1) Obtain a better understanding of fixed appliances and clear aligners on their influence on achieving stable ideal occlusion. (2) Compare the indications for retreatment from both the clinician and lay person at 1-month post-orthodontic treatment.

Materials & Methods: Prospective cohort study of patients who completed orthodontic treatment at Columbia University College of Dental Medicine from December 2023 to February 2024. Patients ranged in age from 13-56 years old. Exclusion criteria included patients who were undergoing retreatment or have lost or broke their retainers. Intraoral and extraoral photos, and Itero scans were collected at the debond and 1-month retention visits. Likert scale and Little’s Irregularity Index (LII) were used to determine the need for retreatment. 3 orthodontists were assigned to be responsible for completing the Peer Assessment Rating (PAR). Orthodontists were blinded to the treatment modality of patients and did not assess their own de-bonds to avoid bias in grading.

Results & Conclusions: The study included 14 orthodontists, 7 first- and 7 second- year residents, and 26 patients- 19 fixed appliances and 7 clear aligners. Due to the limited sample size, our findings were not statistically significant (t-value = 1.35; degree of freedom of 24; critical t-value = ± 2.064 ; $\alpha = 0.05$) to conclude a difference in the orthodontists’ average Likert scores assigned to the two treatment groups for retreatment 1-month after active therapy. The LII values and Likert scores greatly varied for one patient in terms of need for retreatment, and this suggests that LII can be limited in its ability to evaluate post-orthodontic changes.

Discussion: Orthodontic relapse is unpredictable and can have financial, social, and health implications. Data is still being gathered for the study, but due to its small sample size, the available results cannot be used to make generalizations. A larger sample size would help identify limitations of treatment modalities and the role compliance with retainers plays in the need for retreatment. The PAR scores from orthodontists are still under review and will provide an objective measure that takes into account multiple orthodontic variables. The need for retreatment from lay people is still being collected and will be compared to values obtained from orthodontists.

21. Enrollment Yield Based on Various Recruitment Strategies for Electronic Medical Records & Genomics (eMERGE) Study

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Introduction: With advancements in personalized medicine, the clinical use of genomic information has increased to improve the management of disease risk for patients. Data known as Genome Informed Risk Assessment (GIRA) is collected from patients and given to providers as a tool to individualize care. The eMERGE study site at CUIMIC recruits patients across various clinics with mixed methods of recruitment to assess the efficacy of the implementation of GIRA in a clinical environment. With personalized medicine growing, it is vital to make these clinical conclusions based on a diverse study population that can adequately reflect the general population. Such criteria will ensure that strides are made towards better prevention and earlier treatment to a larger scope.

Objectives: The goal of this study was to investigate and identify the best recruitment method that gets the highest enrollment yield to achieve the desired diverse study population for a genetic testing study. Along with recruitment methods used for the study, age, and language were taken into account when determining the most effective recruitment method.

Materials & Methods: Background research was conducted to evaluate the current understanding of the influence of age and language on genetic screening/clinical trials. Information about age, language, and status of enrollment for patients contacted for recruitment in the eMERGE study was collected from RedCap (data management tool). Patients selected for analysis (N=625) were contacted by one researcher between June 12, 2023 to August 18, 2023. Recruitment strategies for the study were either (1) call & email, (2) text & email, or (3) call, text, & email. Enrollment status was determined on the last date of data collection with 4 options: passive decline, full decline, passive enroll, and full enroll. A chi-squared test was performed to identify the relationships between enrollment status and recruitment strategy based on the patient's age group or language.

Results & Conclusions: Significant differences in enrollment status for patients within the Baby Boomer (p-value = 3.4×10^{-17}), Gen X (p-value = 6.1×10^{-11}), and Millennial (p-value = 2.2×10^{-4}) generations were found with the most efficient enrollment rate for patients who were contacted with the triple method. A significant difference for English-speaking patients (p-value = 1.5×10^{-14}) was found and indicated the triple method to be the most efficient. For Spanish-speaking patients (p-value = 9.4×10^{-2}) the findings were not statistically significant, thus a conclusion could not be formed about the most effective recruitment strategy for that study group.

Discussion: Based on the conclusions of the study, the most effective enrollment method for the eMERGE study is the triple method. These findings were implemented at the CUIMC site with increased use of the triple method when recruiting patients. Nonetheless, limitations were present with this analysis as the sample can only reflect the population at CUIMC. Additionally, for the various recruitment methods, the order and time gap between each contact with a patient varied, thus introducing a confounding variable that could influence the findings.

Parina Bhuvu was supported by the Columbia University College of Dental Medicine Summer Research Fellowship.

22. Pediatrics Dental Residents' Views on Impact of Child Sensory Processing Information on Dental Visits and Provider Experience

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Introduction: Sensory integration issues refer to difficulties in processing and organizing sensory information from the environment and the body. In the context of pediatric dentistry, children with sensory integration issues may experience challenges in responding to various sensory stimuli associated with dental care. It remains unclear how pediatric dentistry residents will view the use of a caregiver-completed sensory intake form (SIF) and its effect on care delivery.

Objectives: The purpose of the pilot study is to enhance training for the care of patients with sensory integration sensitivities or special healthcare needs. Using a novel SIF, this study aims to assess how CDM pediatric dental residents view the use of sensory history intake forms on care during pediatric dental visits.

Materials & Methods: Over a 10-week period, a convenience sample of caregivers accompanying patients to recall appointments at the Pediatric Dentistry resident clinic were recruited by front desk staff. For caregivers interested in participating, informed consent was obtained, and a novel SIF was completed in either English or Spanish. The completed SIF form was then given to the provider to allow for tailoring of the visit. After the visit, providers filled out a post-visit survey on patient and provider experience. Descriptive statistics were analyzed using SAS. This study was approved by the CUIMC IRB (Protocol# AAU3628).

Results & Conclusions: 40 post-visit provider surveys were collected (N=40). Providers reported that 56.2% of patients presented with a behavioral or sensory challenge (anxiety, fear, specific sensory sensitivity, etc.) while 43.8% of patients presented with no challenges. 40.6% of providers reported that they utilized the sensory questionnaire to modify their patient's visit and 76.9% of those reported that they adjusted by adding music or white tones. 71.0% of the providers either strongly agreed or agreed that the sensory intake form helped provide a better experience for their patient, with 22.6% being undecided and only 6.4% disagreeing or strongly disagreeing.

Discussion: The study suggests that the SIF positively impacted dental visits by informing providers about their patient's sensory sensitivities. Limitations included a small sample size, due to lengthy questionnaires and the protocol being limited to patients presenting for recall visits. In a future study, the survey instruments should be streamlined to reduce respondent burden and facilitate greater participation. Future research can delve deeper into the effectiveness of SIFs in improving the customization and effectiveness of dental care strategies.

Kunaal Edekar and Christina Qing were supported by the Columbia University College of Dental Medicine Summer Research Fellowship.

23. Augmented-Reality-Assisted Intraoral Scanning (ARIOS): An In Vitro Proof-of-Concept Study

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Introduction: Augmented Reality (AR) integrates virtual images with the physical environment in real time. AR has the potential to assist in both dental education and procedures through virtual guidance. One procedure that may benefit from AR is intraoral scanning (IOS). Augmented-reality-assisted intraoral scanning (ARIOS) has the potential to improve the efficiency of intraoral scanning procedures by providing direct, chair-side visual feedback via AR and allowing the clinician to view the oral cavity and the digital impression simultaneously.

Objectives: This study sought to compare the scanning time and image count to complete optical scans between IOS and ARIOS and compare participant related outcomes between IOS and ARIOS.

Materials & Methods: A multi-session within-subject experiment was conducted to compare IOS and ARIOS using an intraoral scanner. 31 dental students were recruited to participate in the study. Each participant completed a trial consisting of two sets of intraoral scans of a typodont. For the IOS condition, participants used a stationary monitor to view scanning status. For the ARIOS condition, the stationary monitor was mirrored by a video capture device connected to a computer running software written for a real-time 3D platform that drives the AR headset. The time required to complete the scan, number of images taken, and participant feedback were recorded. A Wilcoxon signed-rank test was used to compare the total time spent to complete the scan and the number of images taken between IOS and ARIOS. Participants were asked to complete entry and exit surveys and a post-trial unweighted NASA Task Load Index (NASA-TLX), which gauged their perceived cognitive workload for both IOS and ARIOS.

Results & Conclusions: The present study found a 6.8% increase in preference for ARIOS from entry to exit survey. Slightly more participants favored the ARIOS set up compared to IOS: 54.8% of participants favored use of ARIOS, 9.7% were indifferent, and 35.5% favored IOS. NASA-TLX subscale ratings were higher for IOS in general apart from mental demand. Overall, participants reported increased cognitive workload for IOS compared to ARIOS. There were statistically significant differences in scanning time and image count for the mandible and maxilla. However, scanning time and image count increased from IOS and ARIOS by 19.84% (mandible scanning time), 18.05% (maxilla scanning time), 13.73% (mandible image count), 12.07% (maxilla image count).

Discussion: The study did not find a performance advantage for ARIOS compared to IOS, though user experience favored ARIOS. The lack of andragogical practice may have contributed to confusion in the ARIOS conditions, highlighting the importance of training in adopting new technology like IOS. NASA-TLX scores indicated that participants perceived less workload with ARIOS, possibly due to improved ergonomics and ease of orientation. The study's limitations included the use of inexperienced dental students, a small sample size, a large single trackable, and a relatively small field of view in the AR glasses. Future research should explore the impact of training practices, different trackable systems, and ideal AR headsets for dental applications.

24. An Evaluation of CAMBRA Informed Health Education on a Child's Caries Risk

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Introduction: Dental caries is one of the most prevalent chronic diseases of childhood with approximately 1 in 4 preschoolers in the US experiencing caries in their primary dentition. As caries management moves away from a restorative model to one of chronic disease management, caries risk assessment tools have been introduced as a core part of dental practice. Caries Management by Risk Assessment (CAMBRA), is a caries risk assessment tool that weighs a variety of biological, environmental, and social factors. In dentistry, the responsibility for caries prevention counseling traditionally rests upon the provider. However, various constraints often hinder their effectiveness in delivering such counseling.

Objectives: The goal of this pilot randomized control trial is to examine the impact of a caries risk informed, health educator led counseling session on the risk of future caries experience in young children (age 0-5). We hypothesize that the integration of caries risk assessment to guide tailored caries prevention education in a non-clinical space by trained health educators may reduce caries risk in children. By delegating this fundamental piece of caries prevention to a trained individual, we may also reduce the burden placed on providers.

Materials & Methods: This randomized control trial recruited 42 of 60 child-parent/caregiver dyads presenting for routine exams with pediatric residents from Columbia University Pediatric Dental Clinic (recruitment ongoing). Residents are blinded with regard to the child's intervention or control assignment and record clinical outcome measures, CAMBRA and simplified oral hygiene index (OHI-S) scores, as standard components of the exam. Post dental visit, the parent/caregiver completes a 25-item knowledge, attitude, and behaviors (KAB) survey. This evaluates their understanding of childhood caries and existing behaviors. Based on the child's CAMBRA score and parent/caregiver KAB, the intervention group receives a customized health education session with a health educator. After 3 months, the child-parent/caregiver dyad returns for a re-evaluation of CAMBRA, OHI-S, and KABs. With this data, we measure if a risk-informed individualized education session with a health educator reduces the child's caries risk. Spearman's rho was used to determine statistical significance of the preliminary data.

Results & Conclusions: No significant correlation was found between parent/caregiver knowledge scores and child CAMBRA caries risk scores. There is a significant negative correlation between parent/caregiver self-efficacy score and child CAMBRA caries risk; $p=0.035$. According to the current data, parent/caregiver knowledge scores have no significant relationship with child CAMBRA caries risk scores but, as parent-caregiver belief in their ability to prevent dental caries in their child increases, child caries risk decreases.

Discussion: This pilot study aims to evaluate whether the implementation of caries risk informed, health educator led counseling has an impact on children's caries risk. The study plans to recruit the remaining 18 participants, re-collect CAMBRA and OHI-S scores from returning participants, obtain KAB post-surveys from parents/caregivers, and evaluate complete data sets.

Kiara Infante and Caroline Salazar were supported by funding from CVS Aetna.

25. The Current Status of Value-Based Purchasing in Medicaid Dental Programs

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Introduction: Value-based purchasing (VBP) is a healthcare payment model that compensates providers based on care outcomes in contrast to the prevalent fee-for-service (FFS) model that is driven by service volume. To control costs while enhancing healthcare efficiency and effectiveness, the Centers for Medicare & Medicaid Services is driving VBP delivery and payment reforms in state Medicaid programs. Although the full landscape of these VBP endeavors in dentistry is unknown, we predicted that these endeavors vary across states.

Objectives: To qualitatively explore the status of VBP implementation in dental Medicaid programs and associated alternative payment models (APMs), metrics, and adoption motivating and limiting factors.

Materials & Methods: Under IRB supervision (protocol # AAU7922), the study was conducted between July 2023 to December 2023 in two phases: formative and interview. The first involved a comprehensive review of peer, white, and grey literature and informal conversations with key personnel in oral healthcare delivery. The second consisted of interviews with state Medicaid program personnel in RI, NH, OR, MS, and PA using a structured key informant interview guide.

Results & Conclusions: Literature suggests that some states are experimenting with VBP in dentistry by incorporating APM requirements and quality-improvement initiatives into their capitated arrangements with managed care organizations. However, most state dental contracts are FFS with or without incentives for improved access and utilization. None of the 5 interviewed states have implemented APMs with both upside and downside risks, suggesting that progress toward true VBP implementation is considerably slower in dentistry than medicine. States indicate that to facilitate progress, they need population data that identifies high-risk patients; robust, standardized oral health outcome metrics; and enhanced provider participation in Medicaid. One interviewed state has implemented submission of ICD-10 codes in Medicaid dental claims and 3 states are evaluating oral health outcomes through annual percentage decrease of high-risk patients as determined by caries risk assessment. The reliability of this metric for a larger population is yet to be determined. All 5 states are formulating strategies to address provider accountability and increase preventive service utilization by beneficiaries. It will be imperative to monitor the progress of various VBP initiatives throughout the next 3 to 5 years.

Discussion: A system that rewards positive health outcomes would require (1) defined and measurable quality and outcome metrics, (2) capacity to report, (3) incentives to report, and (4) use of diagnostic codes to track oral health outcomes. None of the 5 states meets all four criteria to be qualified as a true VBP system. Although using various metrics and methods, all five are in the process of linking quality of care to the dollars allocated to dental care.

Youri Jung was supported by the Columbia University College of Dental Medicine Summer Research Fellowship.

26. Online Diagnosers and Oral Health Information

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Introduction: The emergence of medical and dental consumerism, characterized by patients proactively seeking and impacting their oral health choices, has been greatly influenced by the availability of online mobile-accessible resources. Approximately 80% of adults in the US use the web to seek health information online. These “online diagnosers” come from diverse demographics, spanning various age groups, educational backgrounds, and socioeconomic statuses. However, research indicates that certain groups, such as younger adults, individuals with higher education levels, and those with chronic health conditions, are more likely to utilize the web for health-related information seeking.

Objectives: The initial objective of this study is to delineate the precise themes, inquiries, and apprehensions expressed by the general populace regarding dental and oral health.

Materials & Methods: The investigation surveyed online communities and dental-related thread boards across five distinct platforms (Dentistry Forums, Health Boards, Mothering, Quora, and Reddit's AskDentists) to gather insights into the nature of inquiries individuals are directing toward peers or experts. Employing keywords such as "dental," "oral," "adult," "children," and "health," threads from the past five years were targeted for analysis. Each thread underwent independent evaluation by one third-year dental student.

Results & Conclusions: Queries from five online communities were assessed (n(total)=94,962; n(Dentistry Forums)=742; n(Health Boards)=136; n(Mothering)=639; n(Quora)=37,600; n(Reddit)=55,845). Quora and Reddit were further examined due to these two collectively representing the majority of queries (58.8%; 39.6%, respectively). Of those, titles of 500 questions were extracted. Utilizing the American Dental Association (ADA), 500 questions were distilled to 117 initial topics. These were then condensed into 11 overarching categories using an artificial intelligence model and prompt (ChatGPT). For Quora, areas of concern were orthodontics (n=52 (20.8%)), oral surgery (n=43 (17.2%)), and dental caries (n=32 (12.8%)). On Reddit were oral surgery (n=50 (20%)), oral pathology (n=45 (18%)), and restorative dentistry (n=44 (17.6%)). Combined, the most common to least common areas of concern were oral surgery (n=93 (18.6%)), orthodontics (n=72 (14.4%)), oral pathology (n=64 (12.8%)), restorative (n=63 (12.6%)), dental caries (n=59 (11.8%)), prevention (n=41 (8.2%)), patient information (n=36 (7.2%)), disease treatment (n=28 (5.6%)), diet and nutrition (n=17 (3.4%)), behavior and anesthesia (n=16 (3.2%)), and non-traditional remedies (n=11 (2.2%)).

Discussion: Most inquiries posed online fall within the realm of topics comprehensively addressed by the ADA. A notable deviation lies in the heightened curiosity surrounding non-traditional remedy approaches. Given this trend, the development of resources and a general policy regarding the use of non-traditional remedies for the prevention and management of common oral diseases may be warranted, which could prove invaluable to practitioners.

27. Exploring the crossover patient population served by primary care medical and dental clinics

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Introduction: Though diet and nutrition in oral health and disease has been cited for over a century, integration of nutrition counseling and patient referrals in dental training and clinical practice has lagged. Little is known about the nutrition counseling needs and history of dental patients served by academic medical centers in primary care dental and medical clinics. Insight into the nutrition counseling needs and referral history of this crossover patient population is needed to advance dental-nutrition integration and help meet patients' holistic health needs.

Objectives: As part of a parent study to enhance understanding of the nutrition counseling needs of dental patients and inform the development of a model for academic dental-nutrition integration in education and clinical practice, this retrospective chart review aims to: (1) describe the demographic characteristics of "active crossover patients" at a large urban academic medical center, defined as Columbia University College of Dental Medicine (CDM) clinic patients of record with a documented visit at a Columbia University/New York Presbyterian (NYP) Ambulatory Care Network Primary Medical Care clinic within the past 24 months (May 2021 - May 2023); (2) assess and describe the subset of patients who have a documented nutrition referral; (3) describe clinics making referrals for nutrition counseling; and (4) explore associations between documented nutrition referrals and patient characteristics.

Materials & Methods: Data from active crossover patients (ages 0+; n = 7528) were abstracted from Epic electronic health records. Data were descriptively analyzed to evaluate demographic characteristics (age, sex, race, ethnicity, primary language) of the total active crossover patient population and subset who received outpatient nutrition counseling referrals. Associations between patient characteristics and receipt of referral were evaluated using Chi-square.

Results & Conclusions: Among this patient sample, 0.05% (n = 391) have documented nutrition referrals. Significantly more Females were referred than Males (12.71% vs. 10.19%; p<0.0009). Age averaged 32.5 years among All Patients; 36.75 years among Referees. Referees were older (p<0.0001) than those not referred (M = 31.94 years), with nearly half of Referees <12 years old (49.78%, n = 179). White patients were significantly less likely to be referred (9.79%) than Black (12.25%) and Other races (12.73%; p< 0.01). Preferred language did not differ and was mostly English for All Patients (51.66%)/Referees (53.85%) or Spanish (45.07%; 43.42%, respectively).

Discussion: Though limited to documented referrals, findings serve as the foundation for dental-nutrition integration in education and practice reflective of the population served. The proportion of counseling follow-through was not evaluated, but follow-on research could assess referral success and patient outcomes. Ongoing evaluation of diet-related oral and systemic diseases among crossover patients is underway to understand their nutrition counseling needs.

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28. The State of Mental Health in Health Professions Students in 2023 – A Global Survey

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Introduction: In recent years, it has become well-documented that medical students are particularly susceptible to mental health problems and illness. This issue has been attributed to the high pressures of demanding curricula, as well as financial and housing concerns. The age bracket of this demographic and certain personality characteristics associated with medical students have also been suggested as possible reasons. These adverse mental health conditions can impact professionalism, subsequently affecting the quality of patient care.

Objectives: This study makes use of the varied international population of the International Collaboration & Exchange Program (ICEP), an anatomy course-based global networking program, to assess the mental health concerns of current health professions students.

Materials & Methods: Participants were recruited from the ICEP in the fall of 2023. An online, validated survey was distributed to 480 students to assess their sources of stress, mental health problems, burnout, and substance use. We used the Oldenburg Burnout Inventory (OLBI), the General Health Questionnaire 12 (GHQ-12), and the CAGE questionnaire, a screening test for problematic alcohol drinking. RStudio Version 2023.3.0.386 (2023) was used for analysis.

Results & Conclusions: Results reveal that 3.97% of participants were diagnosed with a mental health condition while in school, and 54.60% of all participants identified academic studies as the primary source of their stress. Utilizing the OLBI, 37.90% screened positive for burnout, with 52.46% indicating disengagement and 50.32% for exhaustion. The GHQ-12 identified 20.21% of participants to be in psychological distress, and the CAGE screened 5.21% of participants positive for alcohol issues. There was no significant variation across regions for any of these scores. There was a significant positive correlation between scores on the OLBI and GHQ-12 ($r = 0.457$, $p < 0.001$). Our results show that mental health concerns are consistently high amongst students in many regions of the world. Many students report signs of burnout with more than half of our sample indicating both disengagement and exhaustion, and more than half considered their academic studies their main source of stress. This is notable considering the many global regions captured in this sample.

Discussion: These preliminary findings show that trends toward burnout and poor mental are significant enough in this sample to warrant further attention. They lend themselves to analysis that would indicate how these themes of mental ill-health affect students by global region to identify trends and potential interventions to support the mental health of students. This study is subject to certain limitations, including variations in sample sizes across countries, the collection of data at a single point in time, and the administration of the survey at the beginning of the semester, a period when some students are well into their education while others have just begun.

29. Aging in America: Care and Communication Across the Field

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Introduction: The New York Department of Health defines older adults as those over 65, recognizing aging as a diverse process encompassing cognitive, physical, experiential, and social changes. Communication barriers between medical professionals and older adult patients are significant, stemming from language disparities, health literacy, cognitive abilities, and provider-patient communication gaps.

Objectives: This study aimed to develop an intervention that addresses an education gap in understanding the unique needs of older adults. The workshop was designed to equip participants with “Best Practices” that are clinically applicable communication techniques that address barriers such as sensory, cognitive and literacy changes.

Materials & Methods: The workshop included didactic discussions, role-play scenarios, and interprofessional group activities. It was implemented during Columbia University Irving Medical Center's (CUIMC) Interprofessional Education (IPE) Day in 2023, allowing students from various programs to participate. The pre-workshop survey comprised Likert scale and short answer questions, along with scenario-based questions. The post-workshop survey mirrored the pre-workshop survey with additional questions on workshop feedback.

Results & Conclusions: The participants referenced the “Best Practices” throughout the small group discussion amongst their group mates and during the post-survey questionnaire. The mechanisms of implementing these tools amongst the diverse professional cohort were discussed during the small group discussions. Limited participation in IPE Day affected the workshop, decreased the engagement levels for each session and led to fewer survey responses. A fundamental contributor to the impact of our workshop is the interprofessional collaboration that took place after receiving the various patient scenarios. The scenarios addressed aspects of caring for the aging population that can be experienced in any profession, such as declined cognitive status, sensory losses with Parkinson's, or lack of access to resources.

Discussion: The goal of designing this workshop was built on inadequate training in communicating and caring for our aging population. Our participants indicated that 50% of respondents of varying educational backgrounds felt “somewhat prepared” to communicate with older patients experiencing sensory declines, confirming the necessity for such intervention. Our workshop aimed to address the lack of educational resources throughout doctoral or graduate training at CUIMC. Caring for the aging population requires empathy, understanding, and readiness to address medical complexity and social determinants of health. Our providers must be informed on how to recognize unique barriers to healthcare.

Brianna Margulis was supported by an Aging in America Fellowship.

30. A Novel, Culturally-Sensitive Approach to Medical Spanish Instruction

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Introduction: Columbia University Irving Medical Center (CUIMC) is located in Washington Heights, a predominantly Hispanic New York City neighborhood. In aims to address the needs of its growing patient population with a non-English primary language (NEPL), two linguocultural extracurricular initiatives, Dígame and Bienvenidos (D&B), were created over a decade ago (2013), contributing to the well-rounded formation of students and healthcare professionals graduating from CUIMC schools (Medicine, Dentistry, Nursing, and Public Health).

Objectives: To determine the decade-long impact of the novel, culturally-sensitive medical Spanish programs D&B, as tools to address the needs of the Hispanic population, and to demonstrate the necessity of formalizing a medical Spanish education as part of the official curriculums of CUIMC, while laying the foundations for a robust and sustainable method of instruction for future medical Spanish and cultural education in the US.

Materials & Methods: Our target population was CUIMC graduates who participated in D&B between 2013 and 2023. All potential interviewees were invited to engage in the study via email. A phone survey was then conducted to willing participants by our team, who recorded the answers anonymously via Qualtrics. The questionnaire consisted of a standardized set of short qualitative and quantitative questions about the D&B impact, presented verbally to each participant in the same order and fashion. The data collection and analysis followed a non-randomized/non-interventional research method.

Results & Conclusions: The final sample (n=109) included 55 physicians, 18 dentists, 16 nurses, 16 Public Health professionals, and 4 participants who responded "other" when asked about their current profession. 90.8% of the interviewees agreed that their time in D&B helped them improve their relationship with patients during their professional health training. The study also showed that D&B programs had a positive impact on clinical encounter comprehension with NEPL patients (93.3%), cultural awareness and sensitivity (97.1%), interaction with different cultural backgrounds (96.1%), and interprofessional teamwork (75.9%).

Discussion: This study provides data to support the idea that CUIMC could benefit from a formal curricular implementation of Medical Spanish Education, a cultural approach to address language and health equity. Our team considers a good way to demonstrate the importance of incorporating Medical Spanish education into the official programs of Medicine, Dentistry, and Public Health could be through evaluations on the effectiveness of the homolog courses in Nursing and Physical Therapy, where medical Spanish is already part of their formal curriculum.

Roxana Martinez Bermejo was supported by the Columbia University College of Dental Medicine Summer Research Fellowship.

31. Effects of a Supplemental Oral Health Mini-course on Columbia VP&S Students

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Introduction: We focused on bridging the gaps between primary and oral health care by addressing the inconsistency between the education provided to medical and dental students. For years now, many U.S. dental schools, including Columbia University, have integrated medical courses into their programs. However, few medical schools incorporate oral health into their curriculum. A 2020 study found 80% out of 119 surveyed medical providers reported minimal training in oral health, and 85% reported no interprofessional involvement with oral health care providers. Physicians need to recognize oral disease to make referrals accordingly. The uncertainty is whether supplemental oral health education could be an effective solution.

Objectives: The goal was to determine if supplemental oral health lectures would demonstrate an increase in VP&S students' knowledge of the relationships between oral and systemic diseases. Additionally, we sought to find the specific gaps in their oral health knowledge.

Materials & Methods: We recruited 33 VP&S students excluding the first year class. Participants were de-identified via a randomly assigned 3-digit numerical code. In this longitudinal study, data was collected from each of the participants at three separate points using Google Forms. First, the immediate pre-test responses, followed by post-quiz and survey responses which were collected after a 2-week study period. Study materials consisted of 3 PowerPoint modules. Lastly, retention quiz responses were collected one month following post-quiz submission.

Results & Conclusions: After analyzing the 20-point quizzes, the mean scores of all participants increased from 5.48 to 10.16 from the pre- to post-quiz, whereas the retention quiz had a mean of 9.15. From the pre- to post-quiz, most scores increased. Two unpaired t-tests were run: one comparing pre-quiz scores between the 20 participants that completed the study to 9 who dropped out afterwards; one comparing post-quiz scores between the 20 participants and the 5 who dropped out afterwards. No statistically significant differences were found. A one way ANOVA test compared the three quiz scores between the 20 participants who completed the study. There was a significant difference between pre- and post-quiz ($Q = 7.16$) and between pre-quiz and retention quiz ($Q = 5.40$). No statistically significant difference was found between post-quiz and retention quiz ($Q = 1.76$). Gaps in knowledge included most presented topics.

Discussion: The low quiz scores may suggest lack of time to study for a supplemental course, in addition to its necessity. The small recruitment size may be due to the students' rigorous schedules. The increase in mean scores supports the efficacy of the study materials. As for the high dropout rate, it may be due to expectations for a smaller commitment. The oral cavity is the gateway to the body and should be treated as such. Limitations include random guessing. Future research includes conducting a similar study in the School of Nursing.

Alan Mograby and Anthony Sulvetta were supported by the Steve Miller Fellowship from the Department of Pediatrics at the Vagelos College of Physicians and Surgeons (VP&S) at Columbia University.

32. Building the Foundation for Successful Nutrition Integration in Dental Education and Practice

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Introduction: Nutrition's influence on oral health has been cited for over a century, yet the fields have yet to be fully integrated in academia, limiting clinical integration. No single definition or model of integration exists, resulting in disparate efforts across programs.

Objectives: To assess faculty's perceived value and challenges to dental-nutrition integration in co-located Commission on Dental Accreditation (CODA) accredited dental and Accreditation Council for Education in Nutrition and Dietetics (ACEND) accredited nutrition programs.

Materials & Methods: A scoping review of publicly-available data identified 45 co-located programs. A convenience sample of 10 key informants (5 dental, 5 nutrition faculty, staff, leadership) was targeted from programs with which the study team has contacts then by snowball sampling until n=10 or data saturation is achieved. Recruitment emails with 1-week follow-up inform recruits of the opportunity to participate in a Zoom interview scheduled via Calendly link. Verbatim transcription of audio recordings enabled qualitative analysis.

Results & Conclusions: 12 dental and 11 nutrition informants were initially contacted, resulting in 3 completed interviews. An additional 34 contacts (17 dental, 17 nutrition), yielded a fourth interview. Dental faculty interviewed were in programs with an average 1st year enrollment of 186. One program is a private DDS-offering institution, the other 2 are public (one DDS, one DMD). The nutrition program enrolls 60 1st year students and offers a BS degree. When asked in what ways students benefit from the integration, all 3 dental program interviewees stated it allows students to provide comprehensive care: "They're not just doing carpentry, they're caring for a whole patient." The nutrition interviewee stated students "recognize that they can make valuable contributions educating the community." When asked how professional organizations support integration, all 3 dental faculty noted CODA has no standard for integration and should have, "more demanding requirements for nutrition education." The nutrition interviewee stated ACEND "commented on [integration] as being quite invaluable." When asked about experienced or perceived challenges to integration, all 3 dental interviewees cited curricular constraints, "not enough time in the curriculum to do it." The nutrition interviewee cited challenges, "Making sure [clinic] is kept kind of consistent and they have the same learning outcomes."

Discussion: Integration appears to be valued, but faculty report challenges finding time in the curriculum. While ACEND's support was acknowledged, the same was not true for CODA, with faculty wishing it gave more importance to integration. This suggests that nutrition was included in accreditation requirements, dental schools may be encouraged to fit it into curricula. Results are limited by recruitment challenges yielding a 6.56% interview completion; but, recruitment is ongoing. Findings provide needed insight to inform integration efforts in academic programs.

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33. Caregiver Participation in Pre-visit Sensory History Intake & Views on Impact on Child Dental Visit

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Introduction: Individuals with sensory processing disorder (SPD) have challenges processing sensory input, leading to behaviors that can cause barriers to oral health care. To address the barriers, a sensory history intake form (SHIF) was developed to identify sensory sensitivities and triggers before pediatric patients' dental visits. However, caregivers' perceptions of the utility and impact of the SHIFs are unknown.

Objectives: This pilot study aims to 1.) assess caregivers' use of SHIFs to identify children's challenges, and potentially increase dental providers' awareness, and 2.) investigate caregivers' assessment of the impact and usability of SHIFs during pediatric dental visits.

Materials and methods: Under IRB supervision (protocol AAU3628), during July and August 2023, a convenience sample of pediatric patients' caregivers (N=40) completed two paper-based bilingual (English or Spanish) surveys at their child's dental visit at CDM. Before the visit, a pre-dental visit survey was completed by caregivers and then given to pediatric dental resident providers to facilitate potential visit adjustments. After the visit, caregivers completed a post-dental visit survey. Qualtrics was used for data entry and descriptive analyses were performed using SAS.

Results and conclusions: 40 caregiver responses for each of the pre- and post-survey were obtained. 22.5% of children were reported by their caregivers to have a special care needs diagnosis. Caregivers reported better overall child performance than their anticipation (42.5% pre-visit excellent vs 72.5% post-visit excellent) and better visit experience than that in the past (75% excellent or very good vs 90% excellent or very good). Caregivers perceived providers more competent to adjust the setting in the clinic (e.g., using music, white tones, etc.) based on their child's needs and provide a positive experience. More than 90% of caregivers reported improvement in their child's comfort level and ability to tolerate treatment during the visit.

Discussion: Results suggest that caregivers were able to use the SHIFs to report their child's sensitivities and challenges to dental providers, which may be related to the reported improvements in their child's dental visit experience and increased confidence in dental providers. These findings support future usage and study of sensory history questions to enhance patients and caregivers' experiences in the pediatric dental clinic setting. A limitation of the study was a smaller than anticipated sample size because some potential participants had inadequate time available for a survey prior to their child's visit.

Christina Qing and Kunaal Edekar were supported by the Columbia College of Dental Medicine Summer Research Fellowship.

34. Understanding Barriers Leading to Patient Attrition by Surveying Attitudes and Perceptions of CDM Faculty, Staff, and Students

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Introduction: Patient attrition poses a significant challenge in educational centers focused on comprehensive oral healthcare delivery, negatively impacting quality of care, patient experience, and provider experience. Understanding the drivers of patient attrition can help inform curriculum development and operational excellence to enhance patient engagement strategies and promote better outcomes.

Objectives: To investigate the barriers to care leading to patient attrition within the context of the Columbia University College of Dental Medicine (CDM) predoctoral clinic by surveying the attitudes and perceptions of CDM administrators, faculty, staff, and students.

Materials & Methods: A cross-sectional, Qualtrics survey was distributed via email to 172 pre-clinical personnel at CDM, including administrators, faculty, staff, and students. The survey, comprising 6 questions, aimed to identify primary factors leading to patient attrition, current patient engagement strategies, and potential future mitigation initiatives. A quantitative analysis was conducted utilizing Excel, supplemented by a chi-square goodness of fit analysis.

Results & Conclusions: We collected 43 responses (25% response rate), with distribution among respondents as follows: 27.9% (12) were administrators/faculty, 26% (11) were staff, and 46.5% (20) were senior dental students. The primary barriers identified leading to attrition included the fees for dental procedures, extended wait times during both appointment scheduling and duration of the visit; statistical analysis indicated no significant difference in responses ($p > 0.05$). The most effective strategies for maintaining patient engagement comprised clear communication of treatment plans, establishment of strong patient-provider relationships, and consistent communication regarding appointments - no significant difference was observed ($p > 0.05$). Strategies proposed for minimizing attrition encompassed refining communication methodologies, augmenting existing patient engagement initiatives (e.g., incentivized completion programs), and offering flexible payment arrangements or discussing financing options. Statistical analysis revealed no significant difference ($p > 0.05$).

Discussion: Our study identifies substantial barriers associated with patient attrition in academic dental settings, notably cost concerns and wait times, suggesting targeted interventions for enhancing patient retention. These findings underscore the critical importance of addressing attrition to optimize both academic educational goals and patient care experiences. However, study limitations include reliance on self-reported data, limited survey scope, and a small sample size. Future research should assess the effectiveness of intervention strategies, long-term patient retention rates, and additional factors influencing attrition to refine tailored interventions.

Varun Rangnekar was supported by the Columbia College of Dental Medicine Summer Research Fellowship.

35. Demographic, Risk Factor, Comorbidity, and Procedure Trends for the Surgical Correction of Upper Airway Etiologies of Obstructive Sleep Apnea from the ACS-NSQIP 2008-2022

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Introduction: Obstructive sleep apnea (OSA) is a disorder of repeated nocturnal episodes of airway collapse. In afflicted patients, the risk of systemic hypertension, cardiac arrhythmia, coronary artery disease, heart failure, and cerebrovascular disease is tripled. With 80-90% of the population remaining undiagnosed, OSA represents a significant public health burden. Therefore, improving current screening, diagnosis, and treatment practices is critical to public health and safety.

Objectives: This study aims to analyze trends in surgical interventions addressing anatomical issues of OSA patients in the context of advancements in the management of OSA and shifting patient demographics.

Materials & Methods: Data from 2008-2022 from the American College of Surgeons National Quality Improvement Program (ACS-NSQIP) were analyzed using analysis of variance (ANOVA) and chi-square test. This study was approved by the Institutional Review Board at the Columbia University Irving Medical Center.

Results & Conclusions: Demographic shifts from 2008-2022 saw a rise in younger patients (age 18-39) from 36.6% to 49.1%, while those aged 40-64 decreased from 59.1% to 46.4% ($p < 0.001$). White patient proportion dropped from 83.2% to 70.8%, with increases in Asian (2.7% to 7.9%) and Black/African American patients (13.8% to 16.5%) ($p < 0.001$). The male patient proportion remained stable at 76.8% ($p = 0.074$). Smoking prevalence declined from 19.7% to 12.3% ($p < 0.001$). Upper pharyngeal procedures averaged 96.4% from 2008-2022, but uvulopalatopharyngoplasty (UPPP) decreased from 84.5% to 68.2%, while adenoidectomy/tonsillectomy rose from 26.9% to 54.0% ($p < 0.001$). Nasal procedures increased then declined to 22.5%, with turbinate reduction and septoplasty following similar trends. Lower pharyngeal and laryngeal procedures decreased to 13.5% ($p < 0.001$). Glossectomy/lingualplasty declined to 6.2%, while hyoid suspension increased to 5.3% ($p < 0.001$). One-level cases decreased to 53.9% then increased to 70.5%, with opposite trends for two and three-level cases ($p < 0.001$).

Discussion: With a rising proportion of patients aged 18-39 undergoing surgery, further study of age-related risk is warranted. Shifting patient demographics should be examined in the context of broader population changes and interventions to reduce disparities. Procedural trend analysis is hindered by CPT code limitations, particularly in distinguishing between procedure variants such as for UPPP. Identification of the specific procedure may therefore require access to patient charts though the NSQIP does not permit this. Additionally, the datasets are limited in scope due to lacking cases from non-participating facilities. Future research may explore differences in surgical practices between hospital and private practice settings.

36. Does the position of a bottle during infant feeding influence the jaw's postural position?

A Case Study

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Introduction: Anterior crossbite is a condition in which maxillary anterior teeth are positioned lingually in relationship to mandibular anterior teeth. Previous studies evaluating the primary dentition suggest that malocclusions, including anterior crossbite, are associated more with bottle-feeding than breastfeeding, but none have related the cause of malocclusions to bottle or nipple angle. Early correction of anterior crossbite in the primary dentition can encourage proper growth and development of the maxilla and mandible, reducing the need for future orthodontic therapy. Correction is typically initiated after the age of three when a fixed or removable appliance can be fabricated and worn. To date, no orthodontic interventions for anterior crossbite prior to three years of age have been previously reported, and no interventions related to bottle feeding have been reported.

Objectives: The purpose of this study was to investigate whether the position of a bottle during infant feeding can influence the jaw's postural position. It was hypothesized that because infants grow rapidly and their bones are pliable, a small force such as consistent bottle-feeding angle, if repeated frequently, may change the jaw and teeth position and affect facial development—both in contributing to anterior crossbite or correcting anterior crossbite.

Materials & Methods: A bottle-fed 10-month-old boy presented with anterior crossbite. It was determined that the patient's parents had fed the child mainly in position B, an upward tilting angle (which was hypothesized to have contributed to the anterior crossbite). The parents were recommended to change the feeding position from feeding position B to position C, a counterbalancing downward tilting angle.

Results & Conclusions: Correction of the anterior crossbite was achieved in 5 months by changing the bottle position to a counterbalancing angle, position C. The subsequent use of position A maintained the patient's normal overjet. Two years later, at the age 3, the patient presented for reevaluation and presented with all teeth in a Class I occlusion or normal occlusion. This case study describes an instance of exceptionally early intervention through bottle feeding (before the age of 3) without the use of an appliance. Although this technique warrants further investigation, replication, and research, it has the potential to reduce the need for and length of future procedures.

Discussion: Currently, no standardized bottle-feeding angle recommendations have been found. If the hypothesis presented above regarding bottle position during feeding is confirmed, educational programs can be established to inform and encourage parents to use proper positioning during bottle-feeding. Practitioners can provide early correction of developing occlusion, allowing patients to avoid or reduce complicated, lengthy, and painful orthodontic procedures. Finally, proper bottle positioning may improve a child's facial esthetics, thereby contributing to a healthy psychological, social, and emotional development.

Postdoctoral Abstracts

37. Identifying New Risk Genes Associated with Congenital Craniofacial Anomalies

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Introduction: Early Childhood Caries (ECC) is recognized as the most prevalent chronic disease among children, with nearly one out of every five children under the age of five experiencing dental decay. Due to the toll ECC takes on children's overall health and life quality, the American Academy of Pediatric Dentistry (AAPD) currently promotes chronic disease management (CDM), while also recognizing the need for restorative care. CDM is rooted in pharmacological, behavioral, monitoring and minimally invasive dental approaches to treat the etiology of the condition and lower the high costs and social burdens associated with it.

Objectives: To evaluate ways in which AAPD members report managing ECC among pre-cooperative children and to identify trends in adherence to CDM guidelines.

Materials & Methods: This initial assessment analyzed qualitative data from a subset (n=119; 20 educators and 99 non-educators) of the 1,639 AAPD member participants in a Zoom-based interview study that were recruited via email invitation. Open-ended responses to, "For pre-cooperative children – that is children who are developmentally too young to tolerate conventional restorative treatment – how do you and your staff currently manage ECC?" were categorically coded in the order reported as: Restorative, Minimal, Monitor, Behavioral, Pharmacology, Antibiotic. Prompted responses were excluded, yielding 18 educator and 95 non-educator responses descriptively analyzed.

Results & Conclusions: Nearly 4-out-of-5 respondents (79.6%) reported using restorative approaches to ECC management and none reported antibiotic management. Use of the pharmacological CDM approach was cited often (77%), followed by behavioral (38.9%), minimally invasive (38.1%) and monitoring (36.2%). Nearly 1-in-6 respondents (17.7%) mentioned behavioral management as their first response; over half (61.1%) did not mention behavioral. No difference noted between educators and non-educators in reporting behavioral.

Discussion: Despite potential limitations related to selection bias among the subset of respondents analyzed, there appears to be a greater awareness and utilization of pharmacologic approach to CDM among the majority of respondents, with fewer considering behavioral, minimally invasive, and monitoring approaches. Given the chronic nature of this behaviorally-mediated disease, findings suggest a need to promote behavior-based management. Follow-on research to expand analysis of additional responses is recommended.

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38. Language Preference as Indicator of Caries Experience and Visit Adherence

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Introduction: Sociodemographic factors such as race/ethnicity and poverty are known to influence oral health outcomes, with early childhood caries (ECC) being a prevalent concern, particularly among children from minoritized backgrounds who often face barriers to preventive oral health care. While language is critical for accessing healthcare, research on its relationship to appointment attendance and oral health status is limited.

Objectives: This retrospective chart review examined the association between parental language preference and children's caries experience and appointment adherence among dental patients at a large academic medical center in Washington Heights, New York City.

Materials & Methods: Data from 200 electronic health records were analyzed, including parental language preference, treatment notes, and appointment attendance. Oral health status was assessed using the decayed, missing, or filled teeth (dmft) score, and appointment adherence was measured by the percentage of missed visits.

Results & Conclusions: The mean dmft score was significantly lower among patients with English-speaking caregivers compared to those with non-English-speaking caregivers. However, patients with non-English-speaking caregivers had higher appointment adherence rates. These findings suggest a complex relationship between language preference, caries experience, and appointment adherence. Further research is needed to understand the role of acculturation and language in oral and systemic health disparities, with potential interventions to improve oral health outcomes for patients with non-English-speaking caregivers.

Discussion: The study highlights the importance of considering language preference in dental care settings and its implications for oral health outcomes. Future research should explore the mechanisms underlying the observed differences and develop targeted interventions to address disparities in oral health among linguistically diverse populations.

39. Qualitative Review of Dental-Nutrition Integration in Co-located ACEND-Accredited Nutrition Programs

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Introduction: The most prevalent and consequential oral conditions— caries and periodontitis – are largely preventable and significantly related to daily dietary behavior. Addressing behavioral and nutrition-related factors remains largely absent from current disease management strategies, contributing to unacceptably high prevalence and relapse rates. The role of diet and nutrition has been cited in professional dental literature for over a century; however, there remains a paucity of literature on evolving dental and nutrition curricula to support integration.

Objectives: This scoping review of ACEND (Accreditation Council for Education in Nutrition and Dietetics)-accredited nutrition/dietetics programs co-located in institutions with CODA (Commission on Dental Accreditation)-accredited dental programs aims to describe dental-nutrition integration and evaluate related Academy of Nutrition and Dietetics (AND) and ACEND guidelines and standards to inform development of a model for dental-nutrition education.

Materials & Methods: Publicly-available online data were reviewed to identify co-located U.S. academic programs and abstract data (e.g., course content, lectures, experiential experiences, etc.) from program websites, accreditation standards and AND policy statements and practice guidelines. Data were qualitatively analyzed using key terms (e.g., prevention, fluoride), coded to identify common themes, and descriptively analyzed.

Results & Conclusions: 45 co-located nutrition programs were identified, most offering only Masters degrees (n=23; 51%). Curricula reviews identified 17 dental-related terms in course titles/descriptions. Similar terms collapsed (e.g., life cycle, pediatric, geriatric) yielding 6 explicit (e.g., fluoride) and 8 general (e.g., pediatric) categories. Key terms appeared 77 times, mostly in general categories (n=58, 75%). The most frequently cited included “life cycle” (n=16; 36% programs), “prevention” (n = 6; 13%), and “nutrition assessment” (n=7; 16%). No terms were identified in 44% of programs. ACEND standards do not include dental-nutrition integration; yet AND details didactic, research and clinical guidance for nutrition/dietetics and dental programs.

Discussion: Available data suggest ACEND-accredited programs lack integrated dental-nutrition content, despite AND recommendations; however, most have existing courses suitable for integration (e.g., Lifecycle Nutrition, Public Health Nutrition and Prevention, Epidemiology, Clinical Nutrition). Findings are limited by availability of online data, which may inaccurately reflect curricular content. A follow-on interview study of program leadership is underway to gather additional data. Formalizing a dental-nutrition integration model and updating accreditation standards accordingly would foster interprofessional education and practice to address the largely preventable diet-related drivers of oral diseases, advancing a more cost-effective, collaborative, and comprehensive approach to both oral and systemic healthcare.

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40. Oral Genesis & Radiant Rescue: Innovating Pharmacotherapy For Acute Radiation Syndrome

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Introduction: Acute radiation syndrome (ARS) is an acute medical condition precipitated by rapid exposure to substantial ionizing radiation levels, typically eliciting symptoms characteristic of acute hematopoietic syndrome (H-ARS) and gastrointestinal syndrome (GI-ARS). The primary pathophysiological mechanism underlying GI-ARS is the depletion of GI stem cells necessary for maintenance and renewal of intestinal epithelium. Additionally, the compromised integrity of the mucosal barrier leads to a heightened susceptibility to infections, culminating in mortality rates exceeding 50%. Current therapeutics are efficacious in stimulating recovery of hematopoietic cells populations only. However, to date, there is an absence of pharmacological interventions capable of enhancing the resilience or promoting the regeneration of intestinal cell populations in context of GI-ARS. This therapeutic gap underscores the necessity for development of medical countermeasures to mitigate the detrimental effects of high-dose radiation on the GI.

Objectives: The objective of this investigation is to devise an oral deliverable, polymeric nanoparticle-based therapeutic medical countermeasure (MCM) targeting high dose ionizing radiation exposure, leveraging Granulocyte Colony-Stimulating Factor (G-CSF)

Materials & Methods: Chitosan grafted polyethleimine (CS-g-bPEI) polymer was synthesized by the reaction of the chitosan with succinic acid, followed by carbodiimide conjugation with polyethleimine. The purified cationic CS-g-bPEI was allowed to complex coacervate with anionic G-CSF vector using a microfluidic system to generate nanoparticles (CS-PEI@GCSF), and further coated with yeast solution (YS@CS-PEI@GCSF). *In vitro* toxicity and transfection were conducted with HCT116 cells. *In vivo*, biodistribution studies of YS@CS-PEI@Cre-Ai9LR pDNA were conducted in Ai14 transgenic mice, and survival studies were carried out on Balb/c mice. These mice were subjected to oral administration of the nanoparticles after exposure to a radiation dose of 6.25 Gy, to assess the therapeutic potential of the nanoparticle treatment in a model of radiation-induced damage.

Results & Conclusions: The synthesized CS-g-bPEI polymer was determined to have a degree of succination of 31.8% and formed nanoparticles with G-CSF vector of size 47.1 nm. Introduction of the yeast solution (YS) further increased the nanoparticles size to 108.3 nm. The NPs of ratio 22:1 showed increasing transfection efficacy in HCT116 cells even at Day 3, this optimized ratio was utilized for the coating studies. YS coating of the NPs did not compromise the transfection efficiency. Oral delivery of YF@NP with Cre-Ai9LR pDNA to Ai14 mice showed *gene disruption* in the intestine and the liver. The NPs have improved the survival of the irradiated mice as compared to PBS group.

Discussion: There is currently no approved treatment for GI-ARS, there is a clear unmet need to develop therapeutic treatment to improve the survival of entities subjected to high dose exposure of ionizing radiation at ≥ 2 Gy. Here, we developed an orally administered YS@CS-PEI@GCSF NPs that has low toxicity and high transfection efficacy. The NPs have demonstrated potential for use as a therapeutic MCM for high dose ionizing radiation exposure.

41. Comparison of dimensional changes and ridge contour around ovate pontics inserted immediately after extraction with different grafting procedures in the Esthetic Zone

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Introduction: Hopeless teeth or root tips in the esthetic zone must be properly managed immediately from the time of extraction to ensure a predictable restorative outcome. A properly contoured ovate pontic placed immediately into a fresh extraction socket may be adequate to maintain the soft tissue architecture. The possible biological explanation is that the ovate pontic forms a “prosthetic socket-sealing device” to stabilize the fibrin clot and to allow wound healing to be initiated via secondary intention. While this “prosthetic socket-sealing” concept has been tested in immediate implant scenarios, the ability to preserve gingival tissue architecture has yet to be evaluated when implantation is not being done.

Objectives: The purpose of this prospective clinical cohort investigation is to evaluate the extent to which an ovate pontic with alveolar ridge preservation (ARP) can contribute to soft tissue preservation when inserted immediately after extraction into a socket with bilateral adjacent natural teeth and with or without buccal bone wall intact in the Esthetic Zone.

Materials & Methods: Patients presenting for treatment with a restoratively hopeless tooth in the maxillary esthetic zone (2nd premolar to 2nd premolar) bound by natural adjacent teeth were informed of the study and asked to participate. Enrollment was completed with verbal and written consent of the patient. All surgical and restorative procedures were done by a single operator. At the time of extraction, sites were categorized according to the socket type (I - buccal bone plate and soft tissue present, II - no buccal bone plate but adequate soft tissue present), and a measurement of the intact vertical bone height at time of extraction was made using a pre-calibrated periodontal probe. The non-restorable tooth was then extracted with a non-traumatic flapless procedure, and a properly contoured ovate pontic was placed with ARP. For each patient, impressions were made before the extraction, at 3 months, and at 6 months follow-ups. Impressions were poured into master casts and optically scanned. Linear measurements were made using the 3Shape TRIOS Patient Monitoring feature. These data were then statistically analyzed to compare the free gingival height and buccolingual changes.

Results & Conclusions: Total of 21 patients were enrolled in this study. For type 1 extraction socket, the mean vertical dimensional loss at 3 months was 1.0 ± 0.7 mm, and at 6 months was 0.9 ± 0.6 mm. The mean horizontal dimensional loss at 3 months was 1.1 ± 0.6 mm, and at 6 months was 1.4 ± 0.6 mm. For type 2 extraction socket, the mean vertical dimensional loss at 3 months was 1.3 ± 0.7 mm, and at 6 months was 2.4 ± 0.7 mm. The mean horizontal dimensional loss at 3 months was 1.0 ± 0.2 mm, and at 6 months was 1.5 ± 0.1 mm. Immediate application of the ovate pontic provisional restorations with ARP suggest minimal post-extraction changes with a better maintained midfacial cervical contour. The results validate the use of an ovate pontic provisional restoration with ARP to minimize post-extraction dimensional loss and to preserve the soft tissue architecture in the esthetic zone. Such measures may lead to adequate site development for future implant placement or provide an optimal foundation for an FPD.

Discussion: Without any additional treatment, post extraction sites presented an average loss of 1 to 4 mm in height and 3 to 5 mm in width. In comparison, the present study showed that when an ovate pontic in conjunction with ARP is utilized, a mean dimensional loss of 0.9 ± 0.6 mm in height and 1.4 ± 0.6 mm in width for type 1 extraction sockets, and 2.4 ± 0.7 mm in height and 1.5 ± 0.1 mm in width for type 2 extraction sockets can be expected at 6 months postoperative. Limitations of the present investigation include a small sample size, potential errors in impression/cast fabrication and data merging, and difficulties in fabricating a consistent morphology of the fixed provisional restoration. Further research with larger sample size is indicated to corroborate these preliminary findings.

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42. Traumatic Dental Injury Management and Assessment of Orthodontic Risk Factors

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Introduction: Traumatic dental injuries (TDIs) are prevalent among children and adolescents, with 22.7% occurring in primary dentition and 15.2% in permanent dentition globally. Managing TDIs presents challenges in dental practice, necessitating a tailored approach considering factors like age, medical history, pre-existing dental conditions, and patient's ability to tolerate treatment. Understanding TDI prevalence and orthodontic risk factors can assist clinicians in effective management and proactive guidance.

Objectives: To evaluate the prevalence and treatment of TDIs in children and adolescents and investigate orthodontic factors associated with orofacial trauma.

Methods: A retrospective chart review was conducted using electronic health records of patients aged 1 to 17 years seeking care for TDIs at a large academic medical center from January 2020 to October 2023. Data included demographic characteristics, dental history, TDI type and classification, and orthodontic characteristics.

Results & Conclusions: The study involved 94 children (53 male, 41 female) with a mean age of 8 years. A total of 167 traumatized teeth were reviewed, including 76 primary and 92 permanent teeth. Maxillary central incisors were the most commonly injured teeth in both dentitions. Subluxation injury was predominant in primary dentition (49%), while enamel-dentin fractures without pulpal involvement were common in permanent dentition (39%). Fifty-one percent of children with TDIs received orthodontic consultation, with 67% having an overjet >3mm and 14% >7mm. These findings underscore the importance of recognizing orthodontic risk factors for effective TDI management.

Discussion: The study provides insights into TDI types and management in children, emphasizing differences between primary and permanent dentition. It reaffirms the increased incidence of TDIs in maxillary central incisors and highlights the importance of identifying orthodontic risk factors. However, limitations due to the study's retrospective nature warrant further research to explore long-term outcomes and management strategies' impact on orthodontic treatment.

43. Nutrition in Dental Education: A Scoping Review of Co-located Programs

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Introduction: Despite a century-long recognition of the synergistic nature of oral health and nutrition in dental literature, the two fields have remained largely siloed in both education and practice. To date, there is no singular definition of dental-nutrition education or model for integration in U.S. dental and nutrition curricula. Nutrition plays a central role in the development and progression of the two most prevalent oral diseases – caries and periodontitis; likewise, compromised integrity of the oral cavity can influence an individual’s ability to obtain nutrition. Disease prevalence, progression, and recurrence remain unacceptably high, in part due to a failure to address the underlying behavioral etiology. Needed is an integrated dental-nutrition education model that could be employed within existing academic curricula and clinical training programs.

Objectives: This scoping review aims to describe dental-nutrition education integration within CODA (Commission on Dental Accreditation)-accredited programs co-located within institutions administering ACEND (Accreditation Council for Education in Nutrition and Dietetics)-accredited nutrition programs and how it is described in accreditation and professional guidelines.

Materials & Methods: Publicly-available online data were reviewed evaluating: (1) predoctoral dental program curricular content (e.g., websites, publications, reports) from 48 co-located programs (as of 2020-21); (2) CODA accreditation standards related to nutrition/dietetics; and (3) professional dental organization recommendations (e.g., AAPD/ADA policy statements and practice guidelines) supporting dental-nutrition integration. Data were qualitatively analyzed, recurring concepts were then collapsed and categorized into five key terms (e.g., “diet”, “nutrition”), coded to identify common themes and summarized using descriptive statistics.

Results & Conclusions: Curricular content data reveal 19% of programs include a course named “Nutrition”; and 50%, 23%, and 19% mentioned “nutrition” (n=24), “prevention” (n=11), or “diet” (n=9) in course descriptions, respectively. No course descriptions included the terms “snacks”, “sugar”, and/or “sugar-sweetened beverages”. Nutrition-related curricular content was more frequently identified among 27 programs with larger (≥80 students) versus 21 programs with smaller enrollment (<80 students). Of 29 CODA Accreditation Standards, 3% mention “nutrition” and “diet.” Among policy statements and practice guidelines, 3% of the 76 ADA and 7% of 54 AAPD relate to nutrition/diet.

Discussion: Findings are limited by availability and accuracy of online curricular data. Though standalone dental program curricula were not assessed, available data on co-located dental programs suggests limited integration of dental-nutrition education. This aligns with the limited mention of integration in academic dental accreditation guidelines and professional dental organizations’ policy statements. Guidance in support of integration from professional dental organizations and accrediting body may provide structure and strengthen motivation for programs to include nutrition-related content in dental courses. Given the interdependent nature of oral health and nutrition, efforts to better integrate dental-nutrition education are warranted.

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