

EXPLORATIONS

JOHN C. GREENE SOCIETY NEWSLETTER
SUMMER ISSUE 2021



Illustration: Maria Stavreva

This summer, 25 rising second-year students are embarking on their research projects as Dental Student Research Fellows. So stay tuned! Turn to **page 4** for a recap of Dean Reddy's presentation on dentistry as a data-driven field and bridging the gap between oral health and systemic health and **page 7** for an interview with public health dentist Dr. Ronni Brown on her experiences with providing dental care at a correctional facility.

Inside This Issue

- 2 Letter from the President
- Embracing Precision and Data Science in Dentistry: Dean Michael Reddy
- 4
- 7 Jail Dentistry and Meth Mouth Research: Ronni Brown
- 9 COVID-19 Vaccine Testimonials
- 10 COVID-19 Vaccines Explained
- 11 RNA Therapeutics: Stephen Floor
- 12 2021 Dental Student Research Fellows

LETTER FROM THE PRESIDENT



Dear Members of the UCSF Dental Community,

My name is Meredith, and I'm honored to introduce myself as the new President of the John C. Greene Society.

Starting dental school during the COVID-19 pandemic was bizarre to say the least, but I have nothing but appreciation for the faculty, staff, and administration who had to make countless, unprecedented changes so that we students could receive an uninterrupted education.

I am particularly grateful for the research community here at the dental school. I owe tremendous thanks to Roger Mraz, Dr. Lisa Berens, and Dr. Stuart Gansky for their support of JGS and dental student research as a whole. Especially in a time when we weren't able to meet one another in person, they have actively welcomed us into the UCSF community and taken significant time to personally provide us with guidance and resources. Despite all the hurdles, dental students last year persevered and successfully completed research projects in a wide array of fields. We are also proud to have another cohort of dental students embarking on research this year, and we look forward to seeing what they accomplish.

Within this issue, we are importantly reminded of our responsibilities as dentists and oral health care professionals: to always learn with the guidance of research, and to use that evolving knowledge to serve our communities. Read on to find an exclusive interview with a public health dentist whose research in methamphetamine use informs her care for inmate populations. And finally, we will get a close look at the groundbreaking research surrounding RNA therapeutics – and its most recent application in COVID-19 vaccines.

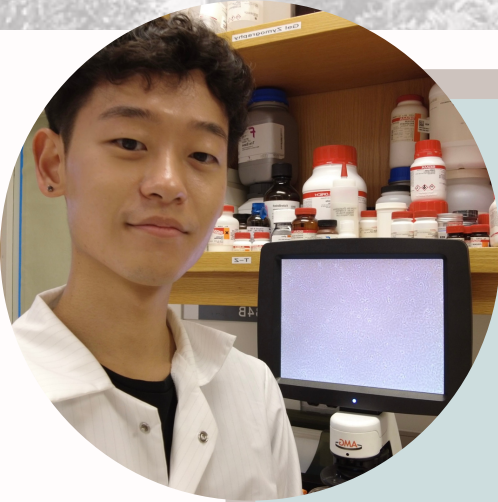
As we take steady steps toward a new normal, I look forward to working with faculty, administration, and fellow students to continue to uphold JGS's track record of excellence and commitment to the research community here at UCSF. If you have any questions or concerns, please feel free to reach out to me or to any of the JGS board members. I am genuinely excited to embark on this journey with you all!

Sincerely,

A handwritten signature in black ink, appearing to be 'M. Zhou'.

Meredith Zhou

THE JOHN C. GREENE SOCIETY



The John C. Greene Society was founded in 2002 under the mentorship of Dr. John S. Greenspan and Dr. John C. Greene, who were instrumental to the dental school's rise to prominence as a premier research institution. A major goal was to encourage active student participation in meaningful research, bringing student research into alignment with the quality investigations being conducted by the UCSF dental faculty.



Since that time, the John C. Greene Society has grown into one of the most recognized and respected student groups on campus. Student research participation at UCSF is at an all-time high, with dozens of students conducting fellowships each year, and many more traveling to present their findings at conferences across California, the country, and the world.



2021 Summer Research fellows conducting their respective research: **Wonhee Cho '24** (Top) at the Kapila lab, **Selina Huang '24** (Middle) at the Bush lab, **Alyssa Moy '24** (Bottom) doing remote research with Dr. Guo-Hao Lin.

DEAN MICHAEL REDDY

EMBRACING PRECISION AND DATA SCIENCE IN DENTISTRY

Michael Reddy, DMD, DMSc is the dean of UCSF School of Dentistry and Associate Vice Chancellor of Oral Health Affairs. He served as the dean of the University of Alabama School of Dentistry for nearly seven years prior to joining UCSF in June 2018. Here, we recap Dean Reddy's presentation for the Data Science for Health Professionals elective: Dentistry as a Data-Driven Field and Integration of Oral Health into Overall Health.

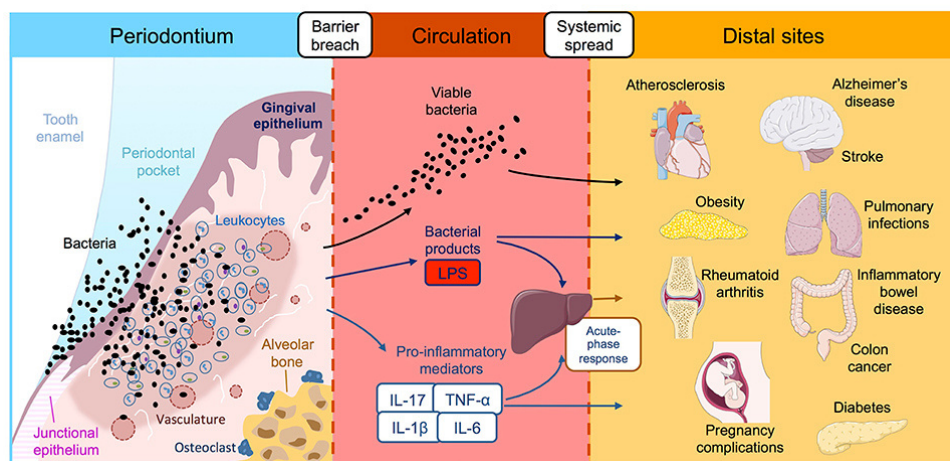


An internationally renowned periodontist, Dean Reddy has received a Doctorate of Dental Medicine and certificate in periodontology from the Harvard School of Dental Medicine and a Doctorate of Medical Science from Harvard University. He has led research on regenerative medicine and the interaction of oral health with systemic health.

According to Dean Reddy, the field of dentistry remains as isolated pockets of data, which can be aggregated for population health. Dental clinics remain a great opportunity to recruit people and collect samples for the oral microbiome. For instance, saliva can be used as a diagnostic fluid to identify biomarkers for pre-clinical signs and critical transitions. Furthermore, dentists can collaborate with precision medicine experts to incorporate genotyping and -omic approaches and to improve upon dental diagnostic exams.

It is well established that oral health is linked to overall health, yet oral and systemic healthcare delivery remain separate. Dentists are the first point of contact in healthcare and should be trained to recognize pathological signs concerning overall health.

The oral microbiome is crucial to health, and it can cause both oral and systemic diseases. In health, the oral microbiome maintains harmony in a state of equilibrium. However, microbial imbalances that push it to a state of disequilibrium can promote pathogenesis.



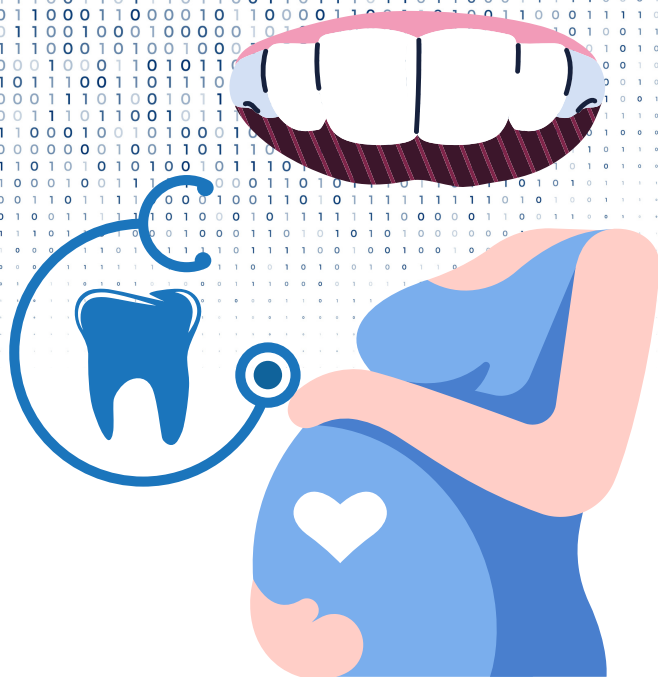
Above: Reported associations between periodontitis and systemic diseases. Periodontitis is caused by inflammation at the gingival epithelium. Chronic inflammation in this area can cause leakage of bacteria into the bloodstream or gastrointestinal tract to reach distal tissue sites and cause a shift in biofilm. Diagram from "Distal Consequences of Oral Inflammation" by J. Konkell et al., (2019)

In this proposed model on the left, dysbiosis in the oral microbiome can promote tumorigenesis, obesity, and other diseases. Dean Reddy spoke about the potential applications of recent findings of the oral microbiome and its systemic clinical relevance. For instance, we can screen for colorectal cancer by detecting microbial imbalance of the oral flora.

There is still a lot to uncover when exploring the precision mechanism of inflammation. Inflammation caused by dysbiosis can trigger a cascade of immune response and epigenetic phenomena. This influences gingival crevicular fluid, saliva, blood, and the surrounding tissues as part of the dynamic network of data.

Moving Dentistry beyond Phenotype

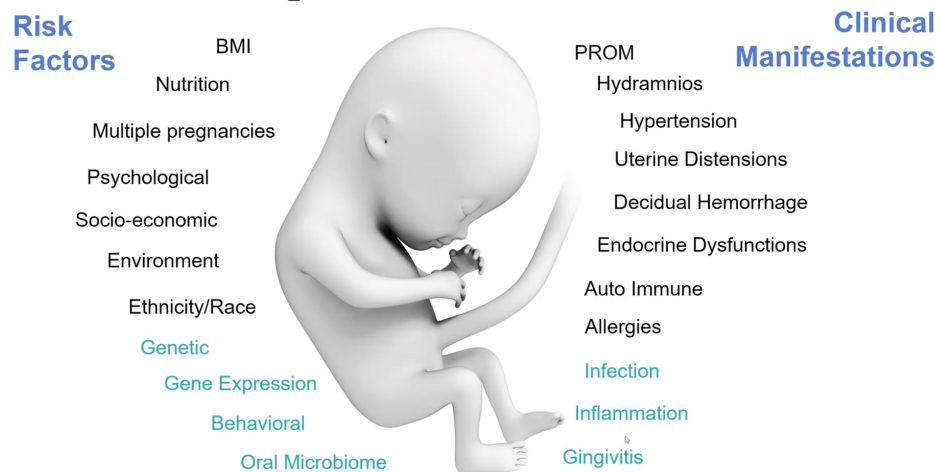
Dean Reddy believes we still have a long way to go in embracing the full potential of precision oral health. The current division of dental healthcare is the following: 10% care delivery, 40% behavior, 30% genetic, and 20% social and physical environment. Patients are told to see the dentist twice a year, brush, and avoid sugar. However, we are looking at a complex set of interactions when we observe poor oral health with multiple risk factors and multiple clinical manifestations.



Dean Reddy's own research explores the connection between inflammation of the gums (gingivitis) and an epigenetic risk for preterm birth. Pregnancy gingivitis is an altered inflammatory response to the microbiome during pregnancy, and poor oral health has been associated with preterm birth. In this study, pregnant women of high risk were given oral hygiene instructions, "smart" toothbrushes to monitor home care, and daily mobile interventions through text messages.

Research findings show a significant reduction in plaque score and in the level of inflammatory mediators. Furthermore, the risk for preterm birth was significantly reduced, especially for high-risk individuals after these interventions.

A Complex Set of Interactions



Left: Dean Reddy shares an example of how pregnancy can be medically complex: seeing one's health as a complex set of interactions with multiple risk factors and clinical manifestations.

Pregnancy gingivitis and other infections are risk factors, yet not every woman with gingivitis delivers early. Studies of oral health and epigenetic mechanisms can help explain the risk and allow for more precise interventions. Thus, a better understanding of the pathogenic mechanism can interrupt the multifactorial cascades and hold the promise to targeted intervention.

DR. RONNI BROWN

An Inside Look on Jail Dentistry and Meth Mouth Research

Ronni Brown, DDS, MPH is a public health dentist, speaker, and researcher whose work in a medium security correctional facility has largely influenced today's understanding of substance abuse in the context of oral health and dental diseases. She is a graduate of the University of California, Los Angeles School of Dentistry and the School of Public Health, and she is the author of A State of Decay: Your Dental Guide to Understanding and Treating "Meth Mouth." Here, she discusses her work and research.

What drew you to jail dentistry?

In dental school, I always gravitated towards public health experiences and volunteering with the community. 5 years after graduation, I was working in private practice but realized my passion was still in public health. Then one week, I saw an ad in the Sunday paper for a dentist at the jail. I spoke to the recruiter and was fascinated by it--it would give me the opportunity to treat and manage the dental needs of approximately 900 inmates. It would also be an opportunity to work in an underserved population and help direct the vision of dental services in the facility. That was in 1997, and I have been there ever since. It has allowed me to grow professionally and to really utilize my public health hat to put policies in place to direct and deliver dental care to this population.



How is dental care different in a correctional facility?

The jail environment has a very transient population. People are typically there for a short period of time, and as a result, the delivery of dental care is primarily emergency-focused. We're managing infections, dealing with trauma, treating pain, and trying to stabilize the population. It's equivalent to delivery in the emergency room. In private practice, we try to create the best outcome for one individual, but in a public health setting, we focus on preventing the worst outcome and delivering care to as many people as possible.

What is your research about?

I investigated the oral effects of methamphetamine, specifically drug use patterns and the impact of dental care access on the severity of meth mouth. My research looked at a variety of variables including method, duration, and frequency of use; the routes of administration; and whether or not they were co-abusing with alcohol to determine which variables were impacting both the severity of decay and the number of teeth impacted by decay. We found that years of use was a significant variable--those who used methamphetamine for over 10 years had more teeth impacted with decay than those who had only used it for a short period of time. We also found that those who were smoking methamphetamine had a more severe form of impact than those who were administering it non-orally through intranasal or intravenous use.

“

It's not enough to just have a substance abuse question on a medical history form. Clinicians need to know how to interview around that question and what to do when a patient checks that box "yes". How do you lean in, what do you ask, and how do you ask it?

”

How do you talk to patients about sensitive topics, such as drug use?

Early on in my career at the jail, I realized that many of the things that I had learned in dental school weren't applicable to my patients. After a few months, I saw that a common factor in many cases of rampant caries was methamphetamine use. The challenge at that time was that there weren't a lot of dental journals on methamphetamine, let alone its oral impact. So I had to go to other journals, and, more importantly, I relied on my patients. I had candid conversations with them, and I overlaid those with proven motivational interviewing techniques. It is a hard conversation to have, but it's a conversation that allows us to keep our patients safe, to develop treatment plans that are going to be effective, and to allow us to connect them with professionals that could help them get recovery and sobriety support.

COVID-19 VACCINE TESTIMONIALS

"I was so grateful that we could receive the vaccine. I got the vaccine as soon as it was available to us because I believe my actions will protect my family, friends, and community. After getting the vaccine, my arms were a little sore. But it was a small cost to pay for the greater good."

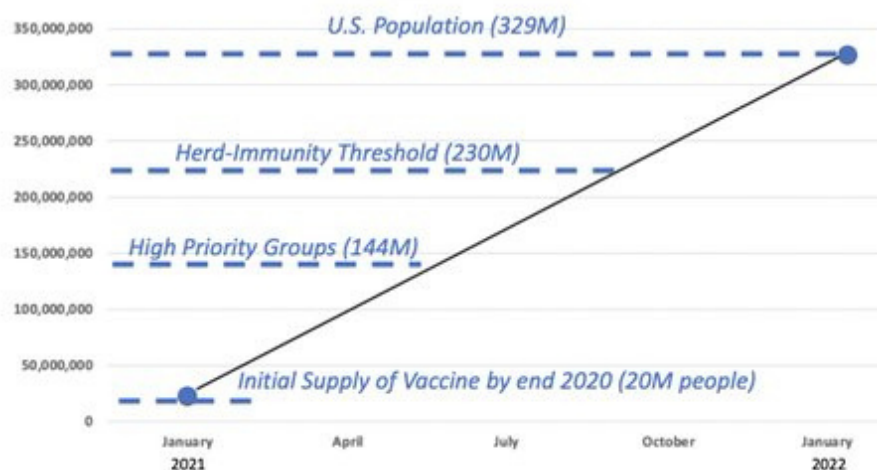
- Brian Lee, incoming D2



"It was a bit surreal because I had been waiting for 9 months for this moment with bated breath. It was amazing to think about how many intelligent and hardworking people worked together to create the contents of the small syringe that was being injected into my arm."

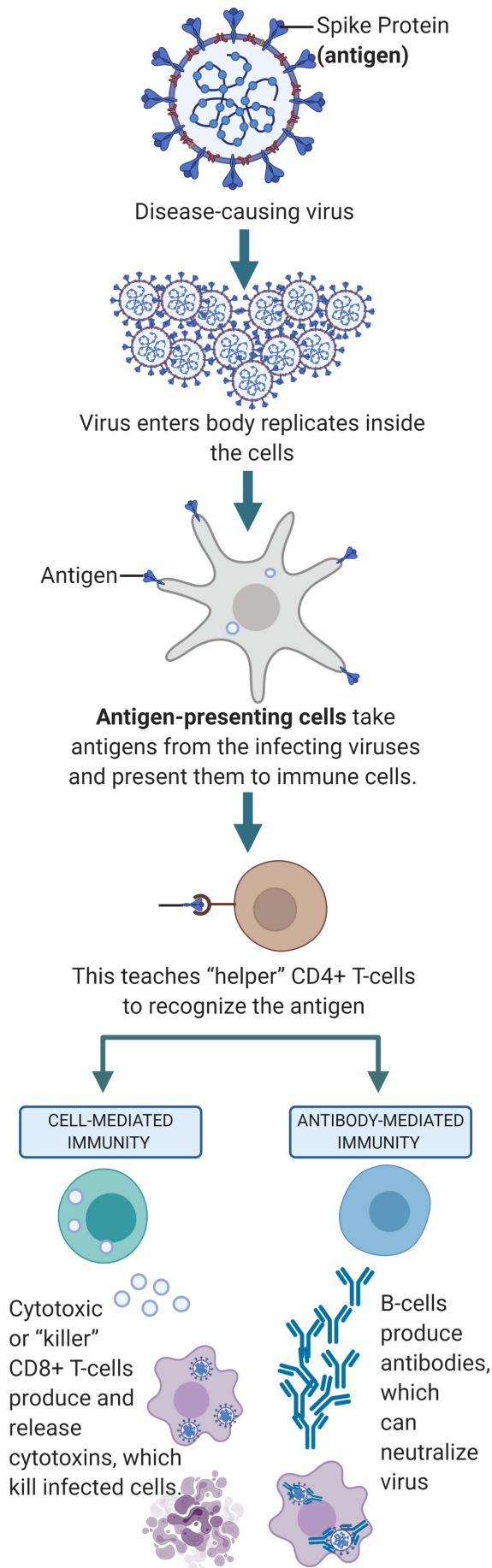
- Helena Viets, D3

U.S Vaccine Availability and Eligible Groups



Above: Dr. Bob Wachter, Professor and Chair of the Department of Medicine at UCSF, shared a timeline for when the U.S. population will be vaccinated against COVID-19 back in December 2020.

IMMUNE RESPONSE



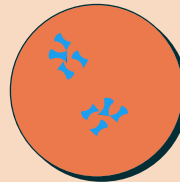
Explained: COVID Vaccines Types



Nucleic Acid Based

These vaccines use messenger RNA (mRNA) encoding for SARS-CoV2 antigenic proteins

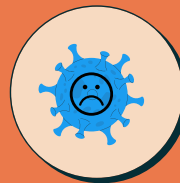
i.e. Pfizer-BioNTech; Moderna



Subunit Based

These vaccines use antigenic proteins derived from the SARS-CoV2 virus without any genetic material. They require multiple doses and adjuvants for long-term immunity and stronger response.

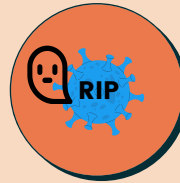
i.e. Novavax



Live Attenuated

These vaccines contain live virus particles that have been weakened or killed/inactivated whole virus particles to keep them from causing disease.

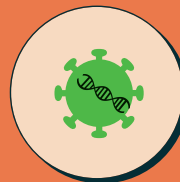
i.e. Codagenix



Inactivated

These vaccines contain killed/inactivated whole virus particles to keep them from causing disease.

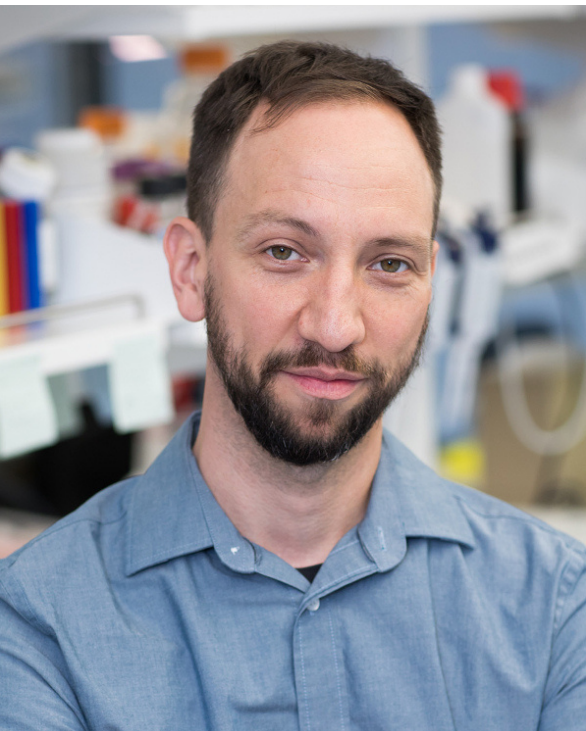
i.e. Sinovac; Sinopharm



Non-Replicating Viral Vector

These vaccines use low-pathogenic viruses and alter them into viral vector. These vectors cannot replicate inside the body but activate immune response.

i.e. Oxford-AstraZeneca; Sputnik V



Dr. Stephen Floor

One year ago in our Summer 2020 issue, we met with Stephen Floor, PhD, whose research team was studying potential antiviral drug targets to treat COVID-19. Now, we discuss how far the race for a vaccine has come and his lab's ongoing research in the field of RNA therapeutics.

Dr. Stephen Floor is an Assistant Professor and researcher in the Department of Cell and Tissue Biology at UCSF. His lab studies the role of RNA in human gene expression and protein synthesis through methods of genome editing, functional genomics, biochemistry, and cell biology. One of the major research areas that the Floor lab is focusing on is the use of RNA as a therapeutic messenger to treat specific diseases and genetic mutations in the body.

The Pfizer-BioNTech and Moderna COVID-19 vaccines utilize this therapeutic RNA approach to protect against the virus. When injected, the vaccine provides our cells with the instructions to make a protein, the antigen, that is found on the surface of the COVID-19 virus and that triggers an immune response in our bodies. Our immune cells are then able to produce antibodies that can recognize these antigens and protect from future infection. RNA therapeutics thus provide a way to synthesize proteins that are not readily made in the body or are mutated in specific human diseases.

Challenges to the use of RNA therapeutics include uptake of the RNA sequence and localization of the protein products. Current research is exploring possible targets outside of the coding sequence and lipid nanoparticle delivery systems.

The Stephen Floor Lab is currently using emerging technologies in high throughput sequencing and nucleotide synthesis to further understand how different elements of an mRNA sequence interact with each other and in different cell types. The lab is working with Twist, a Bay Area start-up, to synthesize large sequence libraries with different combinations of the mRNA elements.





Dean Michael Reddy



Dr. Stuart Gansky

2021 Dental Student Research Fellowship Program



Dr. Lisa Berens



Roger Mráz



Donna Baldetti



Kenny Cho



Won Hee Cho



Zachary Dai



Sudeep Dutta



Lara Fu



Esther Gao



Liza Harutyunyan



Rose Hinson



Selina Huang



Jai Eun Huh



Gi Ahn Jung



Natalie Khalili



Kayla Lieuw



Kairong Lin



Alyssa Moy



Carolyn Nguyen



Nam Nguyen



Vivian Nguyen



Stanley Onuegbu



Tianna Pham



Sam Rustia



Carol Sandoval



Olivia Yu



Meredith Zhou

The UCSF School of Dentistry Dental Student Research Fellowship Programs welcomes the incoming research fellows pictured above. These students will be working closely with their chosen faculty mentors to conduct research between their first and second years of dental school. The 25 research fellows will be investigating a broad range of topics spanning the fields of public health, policy, and wet lab.

Fellows and Faculty Mentors

Donna Baldetti (Mentor: Dr. Sharof Tugizov)

Kenny Cho (Mentor: Dr. Matthew Kutys)

Wonhee Cho (Mentor: Dr. Yvonne Kapila)

Zachary Dai (Mentor: Dr. Jay Gupta)

Sudeep Dutta (Mentor: Dr. Yukiko Nakano)

Lara Fu (Mentors: Drs. Elsbeth Kalenderian and Alfa Yansane)

Esther Gao (Mentor: Dr. Benjamin Chaffee)

Liza Harutyunyan (Mentors: Drs. Cristin Kearns and Stuart Gansky)

Rose Hinson (Mentor: Dr. Brent Lin)

Selina Huang (Mentor: Dr. Jeffrey Bush)

Jai Eun Huh (Mentors: Drs. Ralph Marcucio and Jeffrey Bush)

Gi Ahn Jung (Mentors: Drs. Ophir Klein and Licia Selleri)

Natalie Khalili (Mentor: Dr. Kristin Hoeft)

Kayla Lieuw (Mentors: Drs. Bonnie Halpern-Felsher and Kristin Hoeft)

Kairong Lin (Mentor: Dr. Pamela Den Besten)

Alyssa Moy (Mentor: Dr. Guo-Hao Lin)

Carolyn Nguyen (Mentor: Dr. Christine Hong)

Nam Nguyen (Mentor: Dr. Sunita Ho)

Vivian Nguyen (Mentor: Dr. Alice Goodwin)

Stanley Onuegbu (Mentor: Dr. Elizabeth Mertz)

Tianna Pham (Mentor: Dr. Wenhan Chang)

Samantha Rustia (Mentors: Drs. Sneha Oberoi and Rumpa Ganguly)

Carol Sandoval (Mentor: Dr. Joel White)

Olivia Yu (Mentor: Dr. Licia Selleri)

Meredith Zhou (Mentor: Dr. Yan Zhang)

2021-2022 UCSF JGS Board Members

JOHN C. GREENE SOCIETY

2021-2022 OFFICERS



Meredith Zhou
President



Jennifer Jai Eun Huh
Vice President



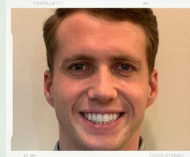
Brian Lee
Secretary



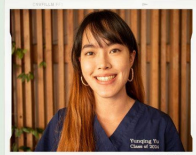
Sean Ganther
Senior Journal Club Co-coordinator



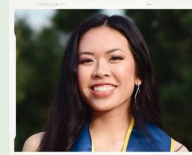
Brandon Saavedra
Senior Journal Club Co-coordinator



Adam Hinshaw
Treasurer



Olivia Yu
Graduate and Communications Liaison



Vivian Nguyen
Newsletter Editor in Chief



Lara Fu
Senior Advocacy Chair



Kayla Lieu
D2 Rep



The John C. Greene Society



www.jgsucsf.com



JGS@UCSF.edu



[@jgsucsf](https://www.instagram.com/jgsucsf)

Special thanks to...

Lisa Berens, DDS, MPH
Roger Mraz



Newsletter Editor Notes

As we transition from one academic year to the next, we reflect on how far we have come as students and as a community. This tumultuous year has taught all of us a lesson about perseverance, dedication, and tenacity. Thus, in this issue, we celebrate the hard work that all the researchers, clinicians, and healthcare professionals have done to advance us in the fields of oral, systemic, and public health, not only in this past year, but also beyond. With the rollout of the COVID-19 vaccine, we have our sights on what is to come for the future of healthcare and research. Congratulations to our incoming research fellows--we look forward to seeing all of the work you do, and here's a warm welcome to all the incoming D1 students!

Sincerely,

Jennifer Jai Eun Huh (JaiEun.Huh@ucsf.edu),
Vivian Nguyen (Vivian.Nguyen2@ucsf.edu)