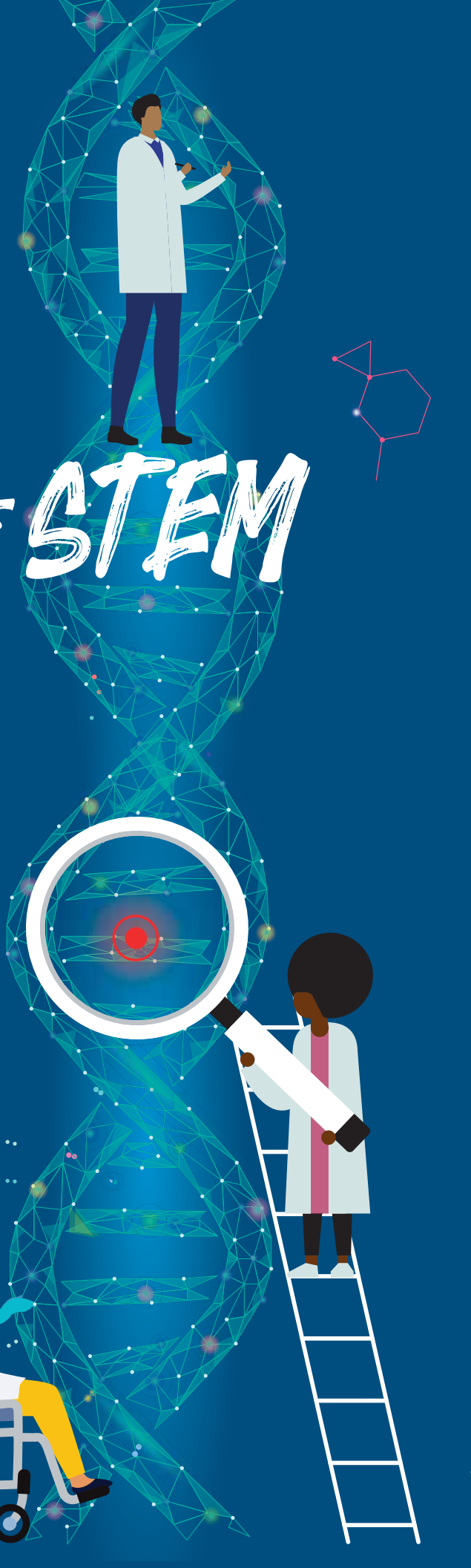
UCSF Benioff Children's Hospital
Oakland

BUILDING THE FUTURE OF STEM TOGETHER



44th Annual Summer Student Research Program Symposium

Friday, August 1, 2025
12:00-5:00 pm
MLK Research Building

Summer Student Research Program
Focusing on our diversity

BUILDING THE FUTURE OF STEM TOGETHER

What's behind the creation of this year's theme

This theme is meant to express hope, possibility, and shared purpose. It evokes a vision of young minds—bright with curiosity and strength—constructing a future step by step with shared commitment for the benefit of our community. For students who have found the path to STEM too steep, our program offers an extended hand. We reimagine access not as a privilege, but as a foundation and scaffold that lifts each student toward discovery and leadership. Together, we are not just building careers; we are rewriting the very code of who gets to lead, one student at a time.

UCSF Benioff Children's Hospital Oakland

BUILDING THE FUTURE OF STEM TOGETHER

August 1, 2025

Welcome to the 44th Annual UCSF Summer Student Research Program (SSRP) Symposium!

Over 4 decades ago the program hosted its first group of summer research interns. Since then, the program has quadrupled in size, expanded to multiple UCSF campuses and now includes high school students. What hasn't changed is our mission. Our goal remains focused on providing a foundational experience in state-of-the-art biomedical research designed to encourage students often under-represented in science to enter and persist in careers within scientific research.

Despite our enthusiasm for the field, this summer has been particularly challenging for many in science. A number of our SSRP scientific mentors and colleagues have lost funding for their research, and for the first time in our 44-year history, SSRP will not have federal funding starting next summer. This devastating news was shared with us in June, at the start of summer programming, yet regardless of these significant barriers and bleak funding on the horizon, we carry on.

We persist not only because science demands it, but because the students you see before you today are our future. Without programs like the SSRP, many of these students would miss out on the opportunity to engage first-hand in the biomedical field. As the academic landscape continues to be more competitive, and students recover from the challenges faced during the COVID pandemic years, many have sought summer internships to fill the gap. Not surprisingly, we had nearly 700 students apply to SSRP this year, the largest number of applicants in our program history. The 37 students selected to participate in the program this year embody not only the beauty of diversity and the joy of creativity but also represent hope for the future in biomedical research.

Our trainees have one common goal - they are considering careers in biomedical research and other health care fields. The presentations today constitute the conclusion of a nine-week long program that has featured a rigorous mentored guided research project and education curriculum. Students asked important basic, clinical and public health research questions, considered ethical dilemmas and struggled with obtuse medical terminology. Today, we invite you to learn about the original research projects that our trainees were involved in. Please mingle and chat with the students, as well as the research scientists and physicians who served as mentors for the trainees. We feel truly privileged and honored to have the trainees in our organization and hope that their summer research experience offered a brief glimpse into the exciting world of biomedical research. Most importantly, thanks to all of the SSRP mentors and supervisors who are the backbone of the program. We appreciate their time, effort, and profound commitment to mentor these students.

A very special note of appreciation also goes out to: David Killilea, Roialle Luckett, and Holly Duden, the core of our leadership team who worked tirelessly since December to put together this stellar program. We would also like to thank Kat Marquez, Gita Jagdish Kumar, Dan Fleming, Jennifer Joe, Alison Killilea and Raquel Manzo and all the guest seminar speakers and other friends of SSRP for their time and expertise which made this summer's program a huge success. We acknowledge the generous funding support provided by the NIH, DDF, CIRM, the Bert Lubin Scholarship Fund and the Bakar Foundation.

We wish the trainees all the very best in their future scientific endeavors. Please keep in touch as we are always thrilled to hear what you are up to!

Ellen B Fung

Ellen Fung, PhD RD
Co-Director, SSRP
Adjunct Professor, UCSF
Department of Pediatrics (Hematology)

Marsha Treadwell

Marsha Treadwell, PhD
Co-Director, SSRP
Professor, UCSF
Department of Pediatrics (Hematology)

Moved by what you experienced today?
Please consider donating to the future of SSRP

UCSF Benioff Children's Hospital Oakland

BUILDING THE FUTURE OF STEM TOGETHER

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Support for the 2025 Summer Student Research Program was generously funded by the following programs and foundations

National Institutes of Health

STIMULUS:
Science & Technology IMmersion for Underrepresented Learners in the US
R25 HL125451
Co-PI: Fung EB, Treadwell M

California Institute for Regenerative Medicine

SUSTAIN-A-SPARK: Supporting Underrepresented STEM Adapting to Change: Summer Program to Accelerate Regenerative Medicine Knowledge
EDUC3-13114
Co-PI: Fung EB, Killilea DW

Doris Duke Foundation

SUSTAIN
SSRP Supporting Underrepresented STEM Adapting to Change
#2023-0361
Program Director: Fung EB

The Bertram Lubin Scholarship Fund

This program was also supported by the generosity of the following donors

John H. Adams & Patricia B. Adams

Barbara and Gerson Bakar Foundation

Suruchi Bhatia & Sonali Pfile

Wendy Boriskin

Lasandra Ivy

Jennifer Johnson

Anonymous Donors

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SSRP 2025 Selection Committees

High School Selection Committee

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SSRP Alumni

Adriana Medina
SSRP Alumni

Thiri Than
SSRP Alumni

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Leslie Lynch
Senior Clinical Research Coordinator
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Kathleen Schultz
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Research Resource Program
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Adjunct Professor
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Peter Beernink, PhD
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Christine McDonald, ScD
Associate Professor
Director, International Zinc Nutrition Consultative Group
University of California, San Francisco

Mai Baalbaki, PhD
Berkeley Free Clinic

Karen Daley, MA, LMFT
Founder, Many Rivers Healing

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SSRP Alumni

Danissa Coffey
SSRP Alumni

Tam Trinh
Pharmacy Intern
University of California, San Francisco

Mina Khalil
SSRP Alumni

Gabby Montenegro
SSRP Alumni

Bonny Alvarenga
SSRP Alumni

Elijah Goldberg
SSRP Alumni

Holly Duden
Lab Assistant, Research Resource Program
University California, San Francisco

UCSF Summer Student Research Program Curriculum

Program Objectives:

- *Develop a basic understanding of research design and methodology*
- *Learn to read and critically evaluate scientific literature*
- *Present scientific topics effectively and succinctly*
- *Develop a professional relationship with a scientific mentor*
- *Create a detailed scientific proposal under the guidance of your mentor*
- *Connect with other like-minded and motivated students*
- *Gain a deeper understanding of careers in the biomedical sciences*

Overview

The curriculum provided during the UCSF Summer Student Research Program (SSRP) will consist of **required** and **elective** content available through the UCSF learning management system known as the Collaborative Learning Environment (CLE). You will receive access to the CLE at the beginning of the program. Refer to the CLE for all links, document turn-ins, and deadlines.

The **required curriculum** consists of synchronous and asynchronous programmatic lectures and trainings in addition to the research project with your mentor. It is expected that these items combined will take approximately 20-30 hours per week. Required curriculum will be provided through synchronous Zoom sessions on most Tuesdays & Thursdays from 2:00-5:00 pm. You are expected to be present and interactive for all synchronous Zoom sessions. The other required content, including your research development and training modules will happen outside of the synchronous Zoom sessions at a convenient time for you and your mentor. It is important to organize your time to complete these assignments so you don't fall behind. The required curriculum cannot be substituted, and all aspects must be attended for program completion.

The **elective curriculum** consists of a wide range of optional content that we have curated and believe to have value for your educational enrichment and career development. The elective curriculum will consist of both synchronous and asynchronous options, including UCSF Grand Rounds (hospital-wide presentations from clinical staff) and previously recorded seminars from past summers. The individual events, including their dates and applicable times, will be posted on the CLE.

Summer Student Research Program Curriculum

Required Items to be Completed During First Week of the Program

- Safety training through UC Learning – 4 modules
- Collaborative Institutional Training Initiative (CITI) courses – 2 modules

Required Items for Weekly Curriculum

- Participation in every Tuesday and Thursday lecture on Zoom from 2-5pm PST
- Participation in journal clubs offered during the weekly curriculum
- Participation in flash talks during the weekly small group time
- Participation in occasional curricular special events

Programmatic Requirements for all students

- Attend Program Orientation on **Monday, June 2nd at 2:00-5:00 pm**
- Fill out pre- and post-program online evaluations
- Turn in Personal Statement by **Wednesday, June 18th by 5:00 pm**
- Turn in Research Proposal by **Wednesday, June 25th by 5:00 pm**
- Turn in Research Abstract by **Wednesday, July 16th by 5:00 pm**
- Attend & present talk by Zoom on **Wed & Thurs, July 30 & 31** (1:00 – 5:00 pm)
- Attend & present poster at Symposium on **Friday, August 1st** (12:00 – 4:00 pm)
- Each funding program (NIH, CIRM & DDCF) also has a few other specific requirements. You will be informed about your funding source during orientation.

Social Networking Opportunities

- Small group discussions led by returning students to discuss lectures & related topics
- Social events with your SSRP colleagues

Applications Used in Virtual Programming

- Synchronous Presentations: Zoom
- Learning Management System: CLE (Moodle platform)

Program Contact Information

Program Co-Director:	Ellen Fung, PhD	ellen.fung@ucsf.edu
Program Co-Director:	Marsha Treadwell, PhD	marsha.treadwell@ucsf.edu
Program Manager:	David Killilea, PhD	david.killilea@ucsf.edu
Program Coordinator:	Roialle Jennings	roialle.jennings@ucsf.edu

Summer Student Research Program
Lecture Series 2025

Date	Event	Event Title	Speaker/Leader
Week 1	**Theme: Orientation & Trainings**		
6/2/25	SSRP Orientation	Introduction	SSRP Leadership
		Curriculum Details	Ellen Fung, PhD
		Professionalism & Etiquette	David Killilea, PhD
		Logisitics - paychecks, badges, access	Roialle Jennings, AMFT
		Surveys & Trainings	Ellen Fung, PhD
		Small Group Time	Small Group Leaders
6/4/25	Lab Bootcamp	Introduction to Research Laboratory	David Killilea, PhD
6/5/25	Thursday SSRP Programming	Searching for Scientific Literature	David Killilea, PhD
		Understanding Lab Scientific Literature	David Killilea, PhD
		Understanding Clinical Scientific Literature	Ellen Fung, PhD
		Ethics in Biomedical Research	Ellen & David
		Checking in	Karen Daley, LMFT
Week 2	**Theme: Hematology & Oncology**		
6/10/25	In-Person Gathering & Team Building	lunch & photos	SSRP Leadership
		Student Introductions	SSRP Leadership
		Team Building	SSRP Leadership
		Tips on making the most of your summer	SSRP Leadership
		Small Group Time	Small Group Leaders
6/12/25	Thursday SSRP Programming	National Marrow Donor Program	Kim Brauner
		Scientific Presentation	Mark Walters, MD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
Week 3	**Theme: Stem Cell Biology**		
6/17/25	Tuesday SSRP Programming	Journal Club 1: Basic Science paper	Ellen & David
		Introduction to Stem Cells	Jenny Lee, BS
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
6/19/25	Holiday	Juneteenth - no programming	
6/20/25	lunch & college panel	College Paths into STEM	Emily King, PhD
	Stem Cell Facility Tour	Stem Cell Workshop	Lisa Bunning, PhD & Brian Shy, MD PhD
	Kanbar Clinical Simulation Workshop	Clinical Simulations	Jillian Olsen, MD & Lauren Harasymiw, MD PhD
	Lunch & career panel	Career Paths into Medicine	Ha Le, MD & Zachary Sandavol, MD

Summer Student Research Program
Lecture Series 2025

Week 4	Theme: Cardiology & Pulmonology		
6/24/25	Tuesday SSRP Programming	Journal Club 2: Cross-Sectional Study paper	Ellen & David
		Day in the life …Student applying to Medical School	Chima Ezeh, SSRP '19
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
6/25/25	Wednesday SSRP Programming	Checking in - mid program	Karen Daley, LMFT
6/26/25	Thursday SSRP Programming	Day in the life …a PhD Nursing Student	Molly Szczech, BSN, SSRP '20
		Scientific Presentation	Charlene Blake, MD PhD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
6/28/25	Social Event	Oakland Roots Soccer Game	All SSRP Invited
Week 5	**Theme: Nutrition**		
7/1/25	Tuesday SSRP Programming	Journal Club 3: Randomized Clinical Trial paper	Ellen & David
		Scientific Presentation	David Killilea, PhD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
7/3/25	Holiday	4th of July - No Programming	
Week 6	**Theme: Endocrinology**		
7/8/25	Tuesday SSRP Programming	Journal Club 4: Case-Control Study paper	Ellen & David
		Day in the life …a MS Biokinesiology Student	Jordan Walton, SSRP '23
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
7/10/25	Thursday SSRP Programming	Day in the life …a Pharmacy Student	Ngoc Tam Trinh, SSRP '21 & '22
		Scientific Presentation	Tariq Ahmad, MD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
7/11/25	Social Event	Lunch & Scavenger Hunt at MLK Building	All SSRP Invited
Week 7	**Theme: New Scientific Tools**		
7/15/25	Tuesday SSRP Programming	Journal Club 5: Retrospective Study paper	Ellen & David
		Scientific Presentation	Steven Mack, PhD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David

Summer Student Research Program
Lecture Series 2025

7/17/25	Thursday SSRP Programming	Day in the life …a Physician's Assistant Student	Tajii Thomas, SSRP '18
		Scientific Presentation	Johannes Schoeneberg, PhD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
Week 8	**Theme: Health Advocacy**		
7/22/25	Tuesday SSRP Programming	Day in the life …a Medical Student	Gabrielle Montenegro, SSRP '20, '21
		Scientific Presentation	Maria Garcia, MD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
7/24/25	Thursday SSRP Programming	Day in the life …NIH PostBac Scientist	Charles Anthony Woodfork, SSRP '22
		Scientific Presentation	Marsha Treadwell, PhD
		Small Group Time	Small Group Leaders
		Office Hours & Problem-Solving	Ellen & David
Week 9	**Theme: Wrapping It Up**		
7/29/25	Tuesday SSRP Programming	Keys to Successful Presentations	Ellen & David
		So now what? How to maximize your SSRP Experience	Ellen & David
		Checking out	Karen Daley, LMFT
7/30/25	SSRP Student Presentations	Oral Presentations Part 1	SSRP Students
7/31/25	SSRP Student Presentations	Oral Presentations Part 2	SSRP Students
8/1/25	SSRP Symposium & Ceremony	Poster Presentations & Celebration	SSRP Students & Mentors

Mentor Monday

Volume 1 | June 2, 2025

SSRP Mentor Monday

Program officially starts today Monday, June 2nd - See below for upcoming details on programming this week. Thank you all for agreeing to mentor these talented youth!

SSRP Mentor Orientation

Mentor Orientation was held via Zoom on Wednesday May 29th
A recording can be found HERE
What was covered: Program Objectives & Logistics, Curriculum Details, Supply Reimbursement, & Mentoring Tips

Mentor Resource Materials

Mentor materials are available for mentoring team to view. The folder is a great resource that has previously recorded workshops, slide decks, templates for student abstracts, and previous correspondences.
abstracts, proposals, and personal statements will be submitted as well as have access to elective information such as grand rounds lectures. Please feel free to log in and view what else your students will be involved with this summer. You can view CLE using your UCSF my access credentials.

Guest access for non-UCSF credentials

Here is the link
https://courses.ucsf.edu/course/view.php?id=12028

Password:
ssrp2025

In-Person Student Gathering

When: Tuesday June 10th
12:00pm - 5:00 pm
Where: MLK Research Building

The in-person student ice-breaker and community building activity is an exception to our regular Tu/Th 2-5 pm curricular training. Please do not plan any meetings with your student during this time.

Additional Activities

When: Friday June 20th

Undergraduate Students
Kanbar Clinical Simulation Training
10:00 - 2:00 pm

High School Students
UCSF GMP Facility Tour
11:30 - 3:00 pm

Research Ethics Training

All students are required to complete 2 modules of the CITI ethics training; Basic Human Subjects and RCR training by Friday 6/6/25. We will be explaining this to the students at the orientation on 6/2/2025. If you have any issues regarding the CITI training please alert **Mrs. Roi Jennings**.

Onboarding & Communication

Your student should receive their UCSF student ID, email and access to UCSF drives/library etc. today, June 2nd.

We have asked students to check their email regularly, but good to check in with your student about best way for the 2 of you to communicate, including how frequently to meet during the week.

SSRP Mentor Monday

As of today we are entering week three of programming. See below for upcoming details on programming this week. We enjoyed getting to interact with all the students as we continue to learn about them and their interest. They are an impressive bunch of students!

- Students have hit the ground running and have done a great job diving into the trainings, our Tues/Thurs seminars, and navigating tech issues with UCSF.
- All students have gone through orientation, badging is still being worked out for some students

What Students Have Been Up To...Week 2

- In-Person Orientation...Community Building Activities
- BioMedical Ethics Case Studies Lecture
- First Formal Presentation from a Representative from the National Marrow Donor Program about the shortage of bone marrow donors and a heart-felt message from Steve Buechler, an AML survivor, cord blood recipient and author about his experiences
- First Scientific Presentation from Dr. Mark Walters, Director of the Pediatric Blood and Marrow Transplant Program at UCSF, about the history of bone marrow transplant and the newer curative therapies for non-malignant hemoglobinopathies

Week 3 at a glance, Theme: Stem Cell Biology
- 6/17 @ 2-5: Tuesday SSRP online seminars (required & on Zoom)
- 6/18: Students Personal Statements due Wednesday at 5PM
- 6/19 : Thursday NO Programming for Juneteenth Holiday
- 6/20 @ 10-2: Kanbar Experience & Career Panel (Undergraduates only - in person)
- 6/20 @ 11-3: Stem Cell Facility Tour and College Panel (in-person)

Trainings/ Certifications:
ALL students were required to complete UCSF required trainings in the following 5 areas.
1. Gender Discrimination & Sexual Harassment
2. Cyber Security
3. Blood Borne Pathogens Safety
4. Biosafety
5. CITI Subject Protection (completed through external training website)

View Your Students Curriculum

Students will be using UCSF's Collaborative Learning Experience (CLE) to access modules pertaining to our weekly themed lectures. Additionally, this is where students abstracts, proposals, and personal statements will be submitted as well as have access to elective information such as grand rounds.
Here is the information for ***GUEST ACCESS***
https://courses.ucsf.edu/course/view.php?id=12028
Password: ssrp2025

Please feel free to log in and view what else your students will be involved with this summer.

Kanbar Simulation for UG Students

When: Friday June 20th
10:00 am - 2:00 pm
Where: UCSF Parnassus Campus
San Francisco, CA

The Kanbar Simulation Center is a medical training facility that offers clinical simulations for learners. Simulation labs will be followed by a physician resident panel and career discussion.

Thermo Fischer GMP Facility Tour for High School Students

When: Friday June 20th
11:30- 3:00 pm
Students will start the afternoon with a discussion about tips for applying for college and participating in research during college, followed by a tour of the UCSF/Thermo Fischer GMP Facility

World Sickle Cell Day is happening on June 19th, with local celebrations on **Sunday, June 22, 2025.** If you might be interested in participating in a tabling event check out the link below.

This information was shared with students who might be interested in participating:

https://doodle.com/sign-up-sheet/participate/97f63dfd-755a-453c-b65b-45a760a2bf23/select

Event Details: (see flyer)
Event Title – World Sickle Cell Day Celebration
Date – Sunday, June 22, 2025
Time – 12:00pm – 4:00pm
Location – De Fremery Park, 1651 Adeline St., Oakland, CA 94607

Mentor Resources

We have created a folder in the Box Drive for all SSRP Mentors. This box file will contain all the 'Mentor Monday' emails in case you miss any, also includes copies of

Mentor Monday

Mentor Monday

Volume 3 | June 23, 2025

SSRP Week 4: Theme Cardiology/Pulmonology

Week 3 In Review: Stem Cell Biology

- David led our first Journal Club with one of the landmark stem cell papers that lead to a Nobel Prize, while Jenny Lee a Research Specialist in Product Development at the UCSF HITCF explained to the students how stem cell therapies are crafted in the lab
- Personal statements were due on Wednesday 06/18
- We observed Juneteenth on Thursday 06/19 (no SSRP curriculum)
- Friday students attended either the GMP Facility Tour or the Kanbar Clinical Simulation

View Your Students Curriculum

Students will be using UCSF's Collaborative Learning Experience (CLE) to access modules pertaining to our weekly themed lectures. Additionally, this is where students abstracts, proposals, and personal statements will be submitted as well as have access to elective information such as grand rounds.
Here is the information for guest access **https://courses.ucsf.edu/course/view.php?id=12028**
Password: ssrp2025

Please feel free to log in and view what else your students will be involved with this summer.

Pic from Friday's experience at the **Kanbar Center for Simulation and Clinical Skills** with our Undergraduate Students! Thanks to our clinical instructors, Jillian Olson, MD PhD: Pediatric Clinical Care Specialist and Lauren Harasymiw, MD, PhD, MPH, Clinical Neonatology Fellow. During lunch, students were able to ask questions about medical school to our career panel: Emergency Medicine/Toxicology Fellow: Kevin Lieu, MD; UCSF Medical Student: Brian Nguyen; 1st Year Pediatric Resident: Erica Duran, MD
and 2nd Year Pediatric Resident: Zachary Sandoval, MD

Thermo Fischer GMP Facility Tour with our SSRP High School Students

REMINDER! RESEARCH PROPOSALS DUE

Wednesday, June 25: 3 page Research Proposals due – students can find templates & examples in CLE

Mentor Monday

Volume 4 | June 30, 2025

SSRP Week 5 Theme: Nutrition

Half way thru the program...Hope you are finding a groove with your student and their research project.

Week 4 In Review: Cardiology / Pulmonology

Day in the Life of Lecture #1: Chima Ezeh: recently accepted to medical school, gave advice on how to manage the many mental struggles of college, while learning how to effectively communicate his own unique story, which he found to be the key to success.

Journal Club: We reviewed an article about the risks of Cannabis use on Heart Disease and explored the use of Odds Ratios in case/control studies

Scientific Lecture: Charlene Blake, MD PhD: gave us a deep dive into pulmonary physiology and some crazy videos of what happens during a lung transplant in the surgical suite.

Day in the Life Of Lecture #2: Molly Szczech, BSN RN spoke about her journey from a labor and delivery nurse at UCDMC to enrolling in a PhD nursing program at Emory University.

Don't forget, you can view your Students Curriculum

Students are using UCSF's Collaborative Learning Experience (CLE) to access modules pertaining to our weekly themed lectures. Additionally, this is where students abstracts, proposals, and personal statements will be submitted as well as have access to elective information such as grand rounds.
Here is the information for guest access **https://courses.ucsf.edu/course/view.php?id=12028**
Password: ssrp2025

Please feel free to log in and view what else your students will be involved with this summer.

Next Big SSRP Deadline:
Research Abstracts Due Wednesday July 16th at 5:00 pm
Abstract templates available in CLE and Mentor Box Drive

SSRP at the Roots!

A group of SSRP Soccer Fans ventured out of the Lab on Saturday Night to watch the Oakland Roots Men's Soccer Team beat Monterrey FC 2-1. Glad to see the Coliseum getting some Love.

Mentor Reimbursements

All mentors may be reimbursed up to $1000. Detailed information was sent out via email. **Here is a brief summary reminder...**

For UCSF Faculty/Staff Mentors: Please order supplies directly through the BearBuy system. The "cart" should then be assigned to Roi Jennings: roialle.jennings@ucsf.edu who will submit the purchase on your behalf with the SSRP chartstring account. **Please send email to Roi once you have sent her your Bear Buy cart.**

For Non-UCSF Mentors (this includes BCH-Oakland): Send list of supplies to Roi Jennings in an email: roialle.jennings@ucsf.edu, and she will send list to purchaser so the items can be ordered in BearBuy. We will try to order the exact item or its equivalent. If items cannot be found in BearBuy, Roi will contact you with an alternative plan.

Thinking about the end of the program Symposium already?....We sure are!

Student Oral presentations
When: Wednesday & Thursday July 30, 31
Time: 1:00 - 5:00 pm
Location: Zoom

Fun-g Friday

Week 1 DONE!

Are you excited to meet your peers in-person? Summer programming is in full swing now!

Don't Forget...In-Person Get Together on Tuesday

Our first in-person get together takes place this coming **Tuesday, June 10, 2025, 12:00 - 4:30 PM at 5700 MLK Jr Way in Oakland**. All students are required to attend! We will take professional pictures (headshots) of you all in addition to a group picture, so please come prepared with your beautiful smiles! We will begin in the courtyard with lunch, and move on from there.

12:00 – 1:00 Lunch, Headshot/Group Pictures
1:00 – 2:30 Community Building Activities
2:30 –4:30 SSRP Programming

Did You Miss Orientation on Monday?

If so, please review the recording asap. We reviewed the curriculum and the trainings you must complete before you start your research. You can access this directly here:

https://ucsf.box.com/s/3ovrm4uu5l0gqi2l44xxesu4ulutxc7d

SSRP Pre-Program Survey

If you have yet to complete the 5 minute pre-program survey, please do so now, using the link below. You will need your SSRP Student ID number when you log in. Your personal SSRP student ID number (which looks like: 1XX-25) was sent to you in a direct email from Ms. Jennings on Monday, June 2.

https://csulb.qualtrics.com/jfe/form/SV_1WVKqWsrNjDuxpk

How Do I get my UCSF Badge?

Different processes for all research locations

UCSF West Bay Campuses: make an appt thru WelD.
Badging offices at Mission Bay & Parnassus

Oakland/HEDCO/Claremont: PreReq Quiz Required. Students will take this quiz with Roi on Tuesday. You will be notified when you are cleared to obtain your badge. Badging office is in the Parking Structure at BCH-Oakland, 2nd floor.

UC Berkeley: Badging organized thru individual labs.

By now...

- You have logged into your UCSF email
- You have accessed the Collaborative Learning Environment (CLE) which contains all materials, due dates, and links for the Summer.
- You have completed ALL required trainings and uploaded your certificates to CLE.
  - If you are having issues completing your trainings, get in touch with Roi or Holly ASAP
- You have gotten in touch with your mentor(s) to discuss expectations and plans for the next 9 weeks.
- You have completed pre-program surveys made available in CLE.

Got Questions?

Program-Specific Questions:
roialle.jennings@ucsf.edu
or
holly.duden@ucsf.edu

Day-to-Day Questions:
Your small group leader

Technology issues:
(415)514-4100
or
it.ucsf.edu

Recordings of all curriculum and copies of most slides will typically be made available within 48 hours in CLE!

Week 2

Summary from This Week's Curriculum

National Marrow Donor Program
https://www.nmdp.org/

Special Guest: Steve Buechler, AML survivor, cord blood recipient, and author...Shared his refreshing story of how he used laughtor and mindfulness to maintain a realistic perspective thru the process. Check out his book: **https://stevebuechlerauthor.com/**

Learned a new term...***Toxic Positivity:*** the belief that people should maintain a positive mindset regardless of the situation, often to the point of denying or invalidating difficult emotions

Dr. Mark Walters
Curative Therapies for SCD and Thalassemia

Some curative therapies have been successful at not only 'fixing' the anemia, but also eliminating the debilitating pain experienced by SCD patients

Learned about
"Swimmers Plots" & "Kaplan Myer Survival Curves"

Remember...
No SSRP Programming on Thursday June 19th- for the Juneteenth Holiday

Did You Miss the In-Person Session Tuesday, June 10?

If so, we missed you. You can find the recording of the didactic session from the meeting now loaded in CLE.

Don't Forget Special Sessions Friday, June 20th

Kanbar Center for Clinical Simulation
When: Friday, June 20th
Time: 10:00 - 2:00 pm
Where to Meet:
The UCSF Parnassus Library at 9:50 am
530 Parnassus Ave, San Francisco
Don't be late, we will start promptly at 10:00 am
Lunch will be provided after the session along with a career panel discussion with UCSF Pediatric Residents.

Thermo GMP Facility Tour

When: Friday June 20th
Time: 11:30- 3:00 pm
Where to Meet:
STEM Kitchen at 11:30 am
499 Illinois St, San Francisco, CA 94158

See all the details in CLE!

SSRP Pre-Program Survey

If you have yet to complete the 5 minute pre-program survey, please do so now, using the link below. You will need your SSRP Student ID number when you log in. Your personal SSRP student ID number (which looks like: 1XX-25) was sent to you in a direct email from Ms. Jennings on Monday, June 2.

https://csulb.qualtrics.com/jfe/form/SV_1WVKqWsrNjDuxpk

Still haven't gotten your badge, here's how:

Different processes for all research locations

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Oakland/HEDCO/Claremont: PreReq Quiz Required. Students will take this quiz with Roi on Tuesday. You will be notified when you are cleared to obtain your badge. Badging office is in the Parking Structure at BCH-Oakland, 2nd floor.

UC Berkeley: Badging organized thru individual labs.

As mentioned today, World Sickle Cell Day is happening on June 19th, with local celebrations on **Sunday, June 22, 2025.** If you might be interested in participating in a tabling event check out the link below. Other BCH-Oakland staff will be there, or ask your small group to see if they want to go together?!
Sign up here: **https://doodle.com/sign-up-sheet/participate/97f63dfd-755a-453c-b65b-45a760a2bf23/select**

Event Details: (see flyer at right for more information)
Event Title – World Sickle Cell Day Celebration
Date – Sunday, June 22, 2025
Time – 12:00pm – 4:00pm
Location – De Fremery Park, 1651 Adeline St., Oakland, CA 94607

Fun-g Friday

Week 4 Recap: Cardiology & Pulmonology

By now, hopefully you are feeling more comfortable in your small groups as we are officially halfway through the summer program. Time is flying!

Day in the Life of Lecture #1: Chima Ezeh: recently accepted to medical school, gave advice on how to manage the many mental struggles of college, while learning how to effectively communicate his own unique story, which he found to be the key to success. Questions for Chima? *chimaezeh7@gmail.com*

Journal Club: We reviewed an article about the risks of Cannabis use on Heart Disease and explored the use of Odds Ratios in case/control studies

Scientific Lecture: Charlene Blake, MD PhD: gave us a deep dive into pulmonary physiology and some crazy videos of what happens during a lung transplant in the surgical suite. Questions for Dr. Blake? charlene.blake@ucsf.edu

Day in the Life Of Lecture #2: Molly Szczech, BSN RN spoke about her journey from a labor and delivery nurse to enrolling in a PhD nursing program at Emory University. Questions for Molly? molly.szczech@emory.edu

Words of Wisdome from Speakers this Week

"Find your flow- what do you do when you lose track of time...explore that when considering what you love to do"

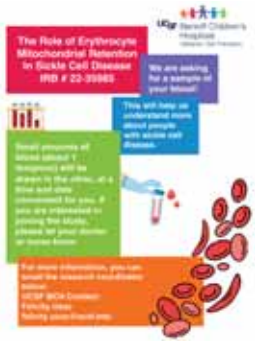
"The more you know....the more you realize what you don't know..."

"No matter what...you can't win the comparison game...best to find your own path"

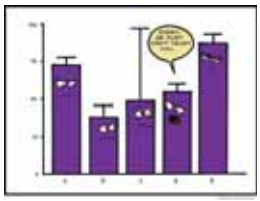
Coming Up!

- Flash talks in your small group
- **Please** turn your cameras on when interacting with speakers. It goes a LONG WAY!
- Have pictures from your experiences this summer? Please upload them to CLE
- **July 4th is a UCSF holiday**. You have the day off, and there is **no SSRP curriculum scheduled** on Thursday July 3rd!

World Sickle Cell Day Celebration pics with Marsha :)



David's Data



Week 5 Recap: Nutrition

Journal Club: RCT focused on the Effect of Intermittent Fasting to Improve Weight Loss
DJ David Shared the about the benefits of whole wheat and
the incredibly strong relationship between whole wheat and mortality!

Coming Up!

- Next week, Endocrinology
  - **Please** turn your cameras on when interacting with speakers. It goes a LONG WAY!
- **Day in the Life of Speakers on this week:**
  - Jordan Walton, SSRP Alumni '23, Masters in Kinesiology, USC
  - Ngoc Tam Trinh, SSRP Alumni '22, PharmD Student, UCSF
- **Research Abstracts due July 16th by 5:00 pm**
  - Need help finding primary literature? Hear from a librarian via the module in CLE.
  - Need a template? Check this document out, and look at previous abstract books on the SSRP website.

Save the Date: UCSF/MLK Building Summer Potluck and Games

- **When**: Friday 07/11, @12:00 - 2:00 pm
- **Where**: MLK Research Building (5700 MLK Jr Way, Oakland) in the courtyard
- **What**: Free food and games, what more could one want?!
- **Who:** SSRP and the MLK Tenants
- **Why:** Fun flex

We Want Your Photos!

Have pictures from your experiences this summer? Please upload them to CLE by July 16th at midnight.

$30 Gift Card Opportunity

Journal Clubs

Journal of the American Heart Association

ORIGINAL RESEARCH

Association of Cannabis Use With Cardiovascular Outcomes Among US Adults

Abra M. Jeffers, PhD; Stanton Glantz, PhD; Amy L. Byers, PhD, MPH; Salomeh Keyhani, MD, MPH

BACKGROUND: We examined the association between cannabis use and cardiovascular outcomes among the general population, among never-tobacco smokers, and among younger individuals.

METHODS AND RESULTS: This is a population-based, cross-sectional study of 2016 to 2020 data from the Behavioral Risk Factor Surveillance Survey from 27 American states and 2 territories. We assessed the association of cannabis use (number of days of cannabis use in the past 30 days) with self-reported cardiovascular outcomes (coronary heart disease, myocardial infarction, stroke, and a composite measure of all 3) in multivariable regression models, adjusting for tobacco use and other characteristics in adults 18 to 74 years old. We repeated this analysis among nontobacco smokers, and among men <55 years old and women <65 years old who are at risk of premature cardiovascular disease. Among the 434 104 respondents, the prevalence of daily and nondaily cannabis use was 4% and 7.1%, respectively. The adjusted odds ratio (aOR) for the association of daily cannabis use and coronary heart disease, myocardial infarction, stroke, and the composite outcome (coronary heart disease, myocardial infarction, and stroke) was 1.16 (95% CI, 0.98–1.38), 1.25 (95% CI, 1.07–1.46), 1.42 (95% CI, 1.20–1.68), and 1.28 (95% CI, 1.13–1.44), respectively, with proportionally lower log odds for days of use between 0 and 30 days per month. Among never-tobacco smokers, daily cannabis use was also associated with myocardial infarction (aOR, 1.49 [95% CI, 1.03–2.15]), stroke (aOR, 2.16 [95% CI, 1.43–3.25]), and the composite of coronary heart disease, myocardial infarction, and stroke (aOR, 1.77 [95% CI, 1.31–2.40]). Relationships between cannabis use and cardiovascular outcomes were similar for men <55 years old and women <65 years old.

CONCLUSIONS: Cannabis use is associated with adverse cardiovascular outcomes, with heavier use (more days per month) associated with higher odds of adverse outcomes.

Key Words: cannabis ■ cardiovascular ■ nonsmoking

Cannabis use is increasing in the US population.[1] From 2002 to 2019, past-year prevalence of US adult cannabis use increased from 10.4% to 18.0%, whereas daily/almost daily use (300+ days per year) increased from 1.3% to 3.9%. Rising diagnoses of cannabis use disorder suggest that this increase in use is not confined to reporting of use.[2,3] At the same time, perceptions of the harmfulness of cannabis are decreasing. National surveys reported that adult belief in great risk of weekly cannabis use fell from 50% in 2002 to 28.6% in 2019.[4] Despite common use, little is known about the risks of cannabis use and, in particular, the cardiovascular disease risks. Cardiovascular-related death is the leading cause of mortality, and cannabis use could be an important, unappreciated risk factor leading to many preventable deaths.[5]

There are reasons to believe that cannabis use is associated with atherosclerotic heart disease.

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This article was sent to Kolawole W. Wahab, MD, Guest Editor, for review by expert referees, editorial decision, and final disposition.

Supplemental Material is available at https://www.ahajournals.org/doi/suppl/10.1161/JAHA.123.030178

For Sources of Funding and Disclosures, see page 9.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MARCH 18, 2021 VOL. 384 NO. 11

Once-Weekly Semaglutide in Adults with Overweight or Obesity

John P.H. Wilding, D.M., Rachel L. Batterham, M.B., B.S., Ph.D., Salvatore Calanna, Ph.D., Melanie Davies, M.D., Luc F. Van Gaal, M.D., Ph.D., Ildiko Lingvay, M.D., M.P.H., M.S.C.S., Barbara M. McGowan, M.D., Ph.D., Julio Rosenstock, M.D., Marie T.D. Tran, M.B., Ph.D., Thomas A. Wadden, Ph.D., Sean Wharton, M.D., Pharm.D., Koutaro Yokote, M.D., Ph.D., Niels Zeuthen, M.Sc., and Robert F. Kushner, M.D., for the STEP 1 Study Group*

ABSTRACT

BACKGROUND

Obesity is a global health challenge with few pharmacologic options. Whether adults with obesity can achieve weight loss with once-weekly semaglutide at a dose of 2.4 mg as an adjunct to lifestyle intervention has not been confirmed.

METHODS

In this double-blind trial, we enrolled 1961 adults with a body-mass index (the weight in kilograms divided by the square of the height in meters) of 30 or greater (≥27 in persons with ≥1 weight-related coexisting condition), who did not have diabetes, and randomly assigned them, in a 2:1 ratio, to 68 weeks of treatment with once-weekly subcutaneous semaglutide (at a dose of 2.4 mg) or placebo, plus lifestyle intervention. The coprimary end points were the percentage change in body weight and weight reduction of at least 5%. The primary estimand (a precise description of the treatment effect reflecting the objective of the clinical trial) assessed effects regardless of treatment discontinuation or rescue interventions.

RESULTS

The mean change in body weight from baseline to week 68 was −14.9% in the semaglutide group as compared with −2.4% with placebo, for an estimated treatment difference of −12.4 percentage points (95% confidence interval [CI], −13.4 to −11.5; P<0.001). More participants in the semaglutide group than in the placebo group achieved weight reductions of 5% or more (1047 participants [86.4%] vs. 182 [31.5%]), 10% or more (838 [69.1%] vs. 69 [12.0%]), and 15% or more (612 [50.5%] vs. 28 [4.9%]) at week 68 (P<0.001 for all three comparisons of odds). The change in body weight from baseline to week 68 was −15.3 kg in the semaglutide group as compared with −2.6 kg in the placebo group (estimated treatment difference, −12.7 kg; 95% CI, −13.7 to −11.7). Participants who received semaglutide had a greater improvement with respect to cardiometabolic risk factors and a greater increase in participant-reported physical functioning from baseline than those who received placebo. Nausea and diarrhea were the most common adverse events with semaglutide; they were typically transient and mild-to-moderate in severity and subsided with time. More participants in the semaglutide group than in the placebo group discontinued treatment owing to gastrointestinal events (59 [4.5%] vs. 5 [0.8%]).

CONCLUSIONS

In participants with overweight or obesity, 2.4 mg of semaglutide once weekly plus lifestyle intervention was associated with sustained, clinically relevant reduction in body weight. (Funded by Novo Nordisk; STEP 1 ClinicalTrials.gov number, NCT03548935).

The authors' affiliations are listed in the Appendix. Address reprint requests to Dr. Kushner at Northwestern University Feinberg School of Medicine, 645 N. Michigan Ave., Suite 530, Chicago, IL 60611, or at rkushner@northwestern.edu.

*A complete list of investigators in the STEP 1 trial is provided in the Supplementary Appendix, available at NEJM.org.

This article was published on February 10, 2021, at NEJM.org.

N Engl J Med 2021;384:989-1002.
DOI: 10.1056/NEJMoa2032183

ASN 2030

Sources of dietary gluten in the first 2 years of life and associations with celiac disease autoimmunity and celiac disease in Swedish genetically predisposed children: The Environmental Determinants of Diabetes in the Young (TEDDY) study

Elin M Hård af Segerstad,[1] Xiang Liu,[2] Ulla Uusitalo,[2] Daniel Agardh,[1] and Carin Andrén Aronsson,[1] for the TEDDY Study Group

[1]Department of Clinical Sciences, Lund University, Malmö, Sweden; and [2]Health Informatics Institute, Department of Pediatrics, Morsani College of Medicine, University of South Florida, Tampa, FL, USA

ABSTRACT

Background: High gluten intake is associated with increased risk of celiac disease (CD) in children at genetic risk.

Objectives: We aimed to investigate if different dietary gluten sources up to age 2 y confer different risks of celiac disease autoimmunity (CDA) and CD in children at genetic risk.

Methods: Three-day food records were collected at ages 6, 9, 12, 18, and 24 mo from 2088 Swedish genetically at-risk children participating in a 15-y follow-up cohort study on type 1 diabetes and CD. Screening for CD was performed with tissue transglutaminase autoantibodies (tTGA). The primary outcome was CDA, defined as persistent tTGA positivity. The secondary outcome was CD, defined as having a biopsy specimen showing Marsh score ≥ 2 or an averaged tTGA level ≥ 100 Units. Cox regression adjusted for total gluten intake estimated HRs with 95% CIs for daily intake of gluten sources.

Results: During follow-up, 487 (23.3%) children developed CDA and 242 (11.6%) developed CD. Daily intake of ≤158 g porridge at age 9 mo was associated with increased risk of CDA (HR: 1.53; 95% CI: 1.05, 2.23; $P = 0.026$) compared with no intake. A high daily bread intake (>18.3 g) at age 12 mo was associated with increased risk of both CDA (HR: 1.47; 95% CI: 1.05, 2.05; $P = 0.023$) and CD (HR: 1.79; 95% CI: 1.10, 2.91; $P = 0.019$) compared with no intake. At age 18 mo, milk cereal drink was associated with an increased risk of CD (HR: 1.16; 95% CI: 1.00, 1.33; $P = 0.047$) per 200-g/d increased intake. No association was found for other gluten sources up to age 24 mo and risk of CDA or CD.

Conclusions: High daily intakes of bread at age 12 mo and of milk cereal drink during the second year of life are associated with increased risk of both CDA and CD in genetically at-risk children. *Am J Clin Nutr* 2022;116:394–403.

Keywords: celiac disease, children, gluten foods, HLA, TEDDY

Introduction

Celiac disease (CD) affects the intestinal epithelium and is caused by an immunologic response against gluten in individuals carrying the risk-haplotypes human leucocyte antigen (HLA)-DQA1*05:01-DQB*DQ02:01 (DQ2.5), DQA1*02:01-DQB*DQ02:01 (DQ2.2), and DQA1*03:01-DQB1*DQ03:02 (DQ8) (1). The global incidence of CD is increasing (2) and has been reported to be particularly high in countries with high wheat

Supported in part by NIH/National Center for Advancing Translational Sciences (NCATS) Clinical and Translational Science Awards UL1 TR000064 (to the University of Florida) and UL1 TR002535 (to the University of Colorado).

The TEDDY Study is funded by grants U01 DK63829, U01 DK63861, U01 DK63821, U01 DK63865, U01 DK63863, U01 DK63836, U01 DK63790, UC4 DK63829, UC4 DK63861, UC4 DK63821, UC4 DK63865, UC4 DK63863, UC4 DK63836, UC4 DK95300, UC4 DK100238, UC4 DK106955, UC4 DK112243, UC4 DK117483, U01 DK124166, and U01 DK128847 and contract no. HHSN267200700014C from the National Institute of Diabetes and Digestive and Kidney Diseases, National Institute of Allergy and Infectious Diseases, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institute of Environmental Health Sciences, CDC, and JDRF. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Supplemental Tables 1–4 are available from the "Supplementary data" link in the online posting of the article and from the same link in the online table of contents at https://academic.oup.com/ajcn/.

Address correspondence to CAA (e-mail: carin.andren_aronsson@med.lu.se).

Abbreviations used: CD, celiac disease; CDA, celiac disease autoimmunity; HLA, human leucocyte antigen; TEDDY, The Environmental Determinants of Diabetes in the Young; tTGA, tissue transglutaminase autoantibodies.

Received December 9, 2021. Accepted for publication April 1, 2022.

First published online April 8, 2022; doi: https://doi.org/10.1093/ajcn/nqac086.

Please cite this article in press as: Glanville et al., Snake venom protection by a cocktail of varespladib and broadly neutralizing human antibodies, Cell (2025), https://doi.org/10.1016/j.cell.2025.03.050

Cell

CellPress

Article

Snake venom protection by a cocktail of varespladib and broadly neutralizing human antibodies

Jacob Glanville,[1,4,5,*] Mark Bellin,[1,4] Sergei Pletnev,[2,4] Baoshan Zhang,[2,4] Joel Christian Andrade,[1] Sangil Kim,[1] David Tsao,[1] Raffaello Verardi,[2] Rishi Bedi,[1] Sindy Liao,[1] Raymond Newland,[1] Nicholas L. Bayless,[1] Sawsan Youssef,[1] Ena S. Tully,[2] Tatsiana Bylund,[2] Sujeong Kim,[1] Hannah Hirou,[1] Tracy Liu,[2] and Peter D. Kwong[2,3,*]

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[3]Aaron Diamond AIDS Research Center, Columbia University Vagelos College of Physicians and Surgeons, and Department of Biochemistry and Molecular Biophysics, Columbia University, New York, NY 10032, USA
[4]These authors contributed equally
[5]Lead contact
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https://doi.org/10.1016/j.cell.2025.03.050

SUMMARY

Snake envenomation is a neglected tropical disease, with 600 species causing over 100,000 deaths and 300,000 permanent disabilities in humans annually. Broadly neutralizing antibodies and broad chemical inhibitors have been proposed as solutions, but how to develop a therapeutically effective cocktail and the number of required components have been unclear. To address this gap, we iteratively recovered two broadly neutralizing antivenom antibodies from the memory B cells of a hyperimmune human donor with extensive snake venom exposure. The antibodies recognized conserved neutralizing epitopes on prevalent long and short snake neurotoxins, with crystal structures revealing antibody mimicry of the interfaces between these neurotoxins and their host target, the nicotinic acetylcholine receptor. We combined and tested these antibodies and the phospholipase inhibitor varespladib. A 3-component cocktail rescued animals from whole-venom challenge of all species in a 19-member WHO Category 1 and Category 2 elapid diversity set, with complete protection against most snakes observed.

INTRODUCTION

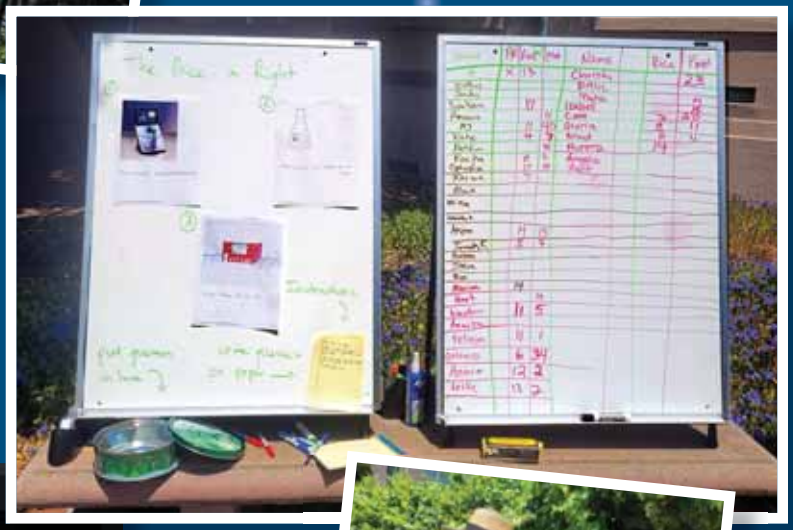
Snake-bite envenoming, which was added to the World Health Organization (WHO) list of neglected tropical diseases in 2017,[1] causes 81,000–138,000 deaths and 300,000–400,000 permanent disabilities annually.[2,3] For over a century, the standard treatment has been antivenom—a polyclonal serum derived from animals immunized with venom from one or more species of snakes.[4]

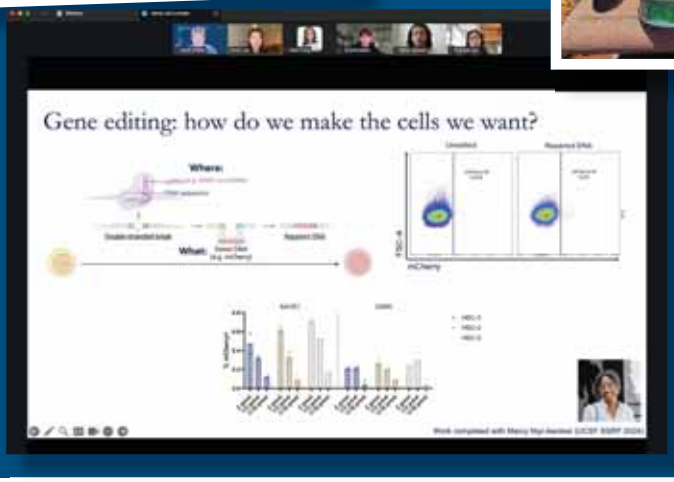
Antivenom serotherapies, although often effective, face significant challenges. The diversity of venom toxins across 600 venomous snake species means antivenoms typically work only against a single or a few related snakes. As a result, most snake species lack a specific antivenom, and efficacy can vary widely even within a species due to geographic genetic variations. Correctly identifying the snake, to provide the appropriate antivenom, is often difficult for victims or healthcare workers.[5,6] Treatments derived from non-human serum can cause adverse reactions like serum sickness and anaphylaxis, with increased risks if used again in the same patient.[7] While the modern practice of digesting antivenom immunoglobulin G (IgG) to antigen-binding fragments (Fabs) reduces reactogenicity, it also shortens half-life, requiring frequent dosing. The potency of current antivenom is further reduced by contamination with 5%–22% non-antibody proteins, and a low reported proportion (estimated at 9%–15%) of venom-specific antibodies in the case of polyvalent polyclonal antivenoms.[5,6,8] Research into improved antivenoms is hampered by venom heterogeneity, low market incentives in developing regions, and fragmented markets due to species-specific antivenoms.[10]

A single broad-spectrum antivenom has not been achieved, primarily due to the complexity of snake venom and the diversity of snake species. Globally, over 600 genetically diverse venomous snake species exist, spanning 167 million years of *Toxicofera* evolution.[11] Among these, 85 species are of highest medical relevance to humans—31 classified as WHO Category 1 and 54 as Category 2. The rest are either potentially lethal but rare, like coral snakes, or have less potent venom.[12] Each snake produces 5–70 unique protein toxins with significant polymorphism, even within a single species.[13] Consequently, even if antivenom agents were found for every toxin, combining them into a single antivenom would be impractical, as the required dose would far exceed safe administration levels for humans.[14–16]

In principle, a cocktail of broadly neutralizing agents against common snake toxins could provide a path to a universal

Summer Students 2025

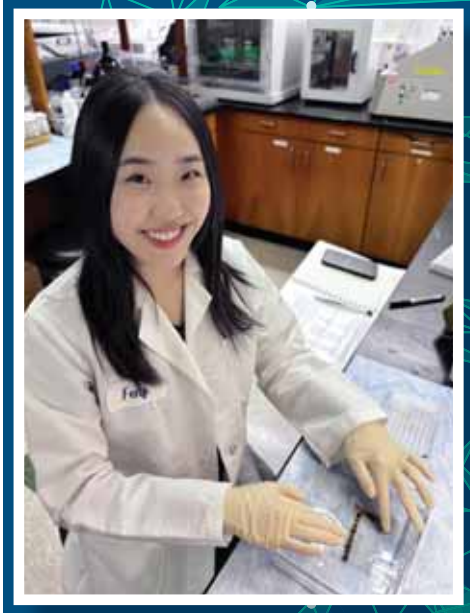




Summer Students 2025

Summer Students 2025

Summer Students 2025



Summer Students 2025

Summer Students 2025

Alexa Adutwum

Pathogens Associated with Acute Infectious Conjunctivitis in South India

Mentor: Thuy Doan, MD, PhD
Contributing Authors: Kelly Ngo; Cindi Chen

Hello! My name is Alexa Adutwum, and I am a rising senior at Arroyo High School. Growing up, I always knew I had an interest in medicine, specifically public health, which stemmed from stories of health disparities experienced by my Ghanaian family. Later, during the pandemic, I went through issues regarding my confidence that were caused by acne and my dark complexion. With this, interests in dermatology and research were sparked as I underwent many trials and experimentation to see what worked best for and made me feel confident in my appearance. As I approach college applications, I have a desire to continue my education focused on biochemistry and public health. I would like to give great appreciation to my mentor this summer Dr. Thuy Doan, alongside the staff of SSRP, for giving me a chance to explore my curiosity in research at such a young age through identifying pathogens in samples of acute infectious conjunctivitis from southern India.

INTRODUCTION

Infectious conjunctivitis (pink eye) epidemics pose a global public health burden. In the United States and its territories, outbreaks lead to missed school days, missed workdays, and lost wages. Despite their large socioeconomic impact, these global epidemics remain poorly understood due to their sporadic nature in time and location. Moreover, diagnostic samples are rarely collected for testing. Therefore, studying global sites is essential to understanding the spatial and temporal patterns of the infectious agents involved. In our interconnected world, emerging pathogens arising from natural disasters, zoonotic transmissions, or co-infections create global health concerns everywhere.

HYPOTHESIS/OBJECTIVE

The hypothesis posits that we will detect both known and unknown pathogens from samples collected from patients with acute infectious conjunctivitis in southern India.

In this study, we aim to do this by using metagenomic RNA deep sequencing.

We will analyze conjunctival and anterior nasal swabs collected from patients at Aravind Eye Hospital in Madurai, southern India.

METHODS

Patients with acute, presumed infectious conjunctivitis were identified by treating physicians at Aravind Eye Hospital in Madurai, India. Sterile applicators were used to swab the lower fornix of each eye and both nares, then placed into DNA/RNA Shield (Zymo Research). After RNA extraction, the samples were converted to cDNA and prepared for library sequencing to detect any pathogen in the clinical sample in an unbiased manner. This approach allows for the detection of bacteria, fungi, parasites, DNA and RNA viruses.

ANTICIPATED RESULTS

Previously sequenced samples from the region found the cause of infectious conjunctivitis to be varied, with bacterial, viral, and fungal pathogens being potential culprits. For this project, we anticipate similar results, identifying both known and novel pathogens in the tested samples using RNA sequencing.

SIGNIFICANCE OF PROJECT

This research aims to enhance our understanding of conjunctivitis epidemics globally by identifying the pathogens involved. We hope to improve prevention methods and help to curtail the spread, thus reducing the burden on cost and human ocular morbidity.

Ellis Anderson

Evaluation of Wraparound Care at BLOOM

Mentor: Dayna Long, MD; Akua Agyekum
Contributing Authors: Cherri Harris; Nina Feldman

Hello! My name is Ellis Anderson, and I will be a second year student at the University of Pennsylvania this coming year. My motivation to be involved in medical research stems from the detrimental impacts of the lack of research that centers women, people of color, and LGBTQ+ people, as well as a lack of representation of minority healthcare workers. I want to increase comfortability for both patients and healthcare workers of underrepresented groups by promoting diverse representation. My specific interests in neuroscience, sociology, and gender & sexuality studies stem from my experience growing up in Oakland and competing in gymnastics at the highest level. Throughout my life, I have gained a firsthand understanding of environmental and sociological impacts on neural development and reproductive health. I am so grateful to the SSRP leaders and my mentor, Dr. Dayna Long, for allowing me to explore this field further, thanks to their passion for creating research opportunities for students like me.

INTRODUCTION

The BLOOM: Black Love Opportunity and Outcome Improvement in Medicine Clinic provides racially concordant, wraparound care to Black families in the Bay Area. Families are able to see a doctor, social worker, FINDconnect navigator, and lactation specialist, all in one place, by a team of healthcare professionals of color. It was co-founded in 2023 by UCSF pediatricians Dayna Long, MD, and Javay Ross, MD, specifically to change the realities of healthcare for Black families.

HYPOTHESIS/OBJECTIVE

The wraparound services provided at the BLOOM Clinic enhance patients' and families' primary healthcare experience by addressing medical, emotional, and social needs in a holistic manner.

METHODS

This mixed-method study involves defining each provider type, determining the percent of total appointments (of 50 patients from 7/21/2023 - 6/6/2025) in which each provider type provided service, and conducting qualitative interviews of BLOOM patients. The interviews are used to evaluate patient experience and investigate how the way patients use the clinic impacts their experience.

ANTICIPATED RESULTS

I anticipate that patients will report positive experiences with wraparound care at BLOOM. It may decrease the stress of creating many appointments through different platforms, decrease the time spent traveling to and from appointments, and allow for increased access to social workers and crucial resources. Overall, I expect that the combination of racially concordant care and wraparound services will create a more comfortable healthcare environment where patients feel seen, heard, and understood by their providers.

SIGNIFICANCE OF PROJECT

This experiment could prove that having many different types of providers in one place is a good option for families. This could change the reality of healthcare services and inspire other clinics to adopt the wraparound care technique, especially in predominantly Black and/or low-income areas, where social work and financial assistance are helpful, making and getting to doctors appointments are difficult, and distrust of healthcare workers is common. Wraparound services may also help reduce physician burnout by ensuring that patients' more specialized needs are met by other professionals within the care team.

James Bell

Fibroblast-Epithelial Interactions in Barrett's Esophagus: Mechanisms Driving Cancer Development

Mentor: Matthew Stachler, MD, PhD
Contributing Author: Annesha Chatterjee

Hi, my name is James Bell, and I am a native Bay Area resident born and raised in the East Bay. I attend Santa Clara University as a fourth year student, majoring in Bioengineering with an emphasis on medical devices. Ever since I was a child, I knew that I wanted to be an engineer, but it was not until I took a biotechnology class senior year of high school that I started to grow my interest in bioengineering. The intersectionality of the human body with engineering continually makes me want to grow my knowledge and make a difference. Through this program, I have gained an immense amount of knowledge that I am eager to apply to my schoolwork and future role in the industry. I want to give a special thank you to Dr. Stachler for being my mentor throughout this entire process, guiding me and teaching me more than I can ask for. Also, a thank you to Dr. Fung, Dr. Killilea, and Roialle Jennings for giving me this opportunity.

INTRODUCTION

Barrett's esophagus (BE) is a precancerous condition where the normal squamous epithelium of the lower esophagus is replaced by columnar cells with intestinal features. While BE does not always lead to cancer, high levels of dysplasia significantly increase the risk. The most common cause of BE is gastroesophageal reflux disease (GERD). Preliminary data show a correlation between the co-culture of fibroblasts from the lower esophagus and increased proliferation of Primary Barrett's epithelial cells. To better understand this relationship, we aim to investigate how the distance between fibroblasts and epithelial BE organoids influences proliferation, and whether the fibroblasts must be precancerous or if healthy fibroblasts can also enhance epithelial cell growth.

HYPOTHESIS/OBJECTIVE

This study aims to identify conditions under which fibroblasts promote increased proliferation of Primary Barrett's epithelial cells, contributing to cancer progression.

METHODS

The experiment will utilize a 6-well transwell plate, with five wells dedicated to distinct co-culture conditions between primary human fibroblasts and BE organoids. The Transwell system allows for both direct and indirect interactions through its thin, porous membrane. The four conditions are: (1) cancer-associated fibroblasts (CFs) and organoids in direct co-culture, (2) CFs and organoids in indirect co-culture, (3) normal fibroblasts and organoids in direct co-culture, (4) normal fibroblasts and organoids in indirect co-culture, and (5) no fibroblasts. Plates will be incubated at 37°C for one week, with media changed every other day to maintain optimal culture conditions. After the experiment, samples will be fixed and processed for hematoxylin and eosin staining and KI-67 immunofluorescence.

ANTICIPATED RESULTS

We expect that CFs in direct co-culture with Primary Barrett's epithelial cells will cause the highest proliferation rate among the four conditions.

SIGNIFICANCE OF PROJECT

Understanding how BE progresses to cancer can help clinicians develop more effective treatments and prevention strategies for esophageal cancer. Although BE is usually benign, as treatment options become limited once cancer develops, identifying and treating the patients who are progressing early is essential.

Sophia Calderon Mendez

Investigating RF-Induced ROS Production in Hippocampal Neurons and Astrocytes Expressing ferritin-coupled ion channels

Mentor: Miriam Hernández-Morales, PhD

Hello! My Name is Sophia Calderon Mendez and in the fall I will be starting my first year at UC Davis. I Picked the major Biochemistry and Molecular biology since I have plans to eventually do something in the medical field with strong interests in Surgery. From a young age I've been passionate about medicine as well as the importance of diverse communication with patients. I experienced how vital this was when I'd join my grandmother to her doctor appointments and watch her attempt to communicate in broken english. Since then I've not only made it a main mission of mine to integrate myself into the medical field through learning and doing research, but also by taking several opportunities to help me better communicate with a variety of patients as part of my personal concern in patient advocacy. With this program I hope to move further down this pathway to eventually reach my goals. In addition to this I'm also incredibly excited to be working with someone that has so much knowledge and wisdom to teach me. I'm as always thankful and eager to see what I learn by the end of this.

INTRODUCTION

Magnetogenetics is a group of techniques that use magnetic fields to control cell activity. One type of magnetogenetics, FeRIC (Ferritin-iron Redistribution to Ion Channels), utilizes radiofrequency (RF) magnetic fields to control cells by activating TRPV1 and TRPV4 channels coupled with ferritin. FeRIC has been used to manipulate the activity of diverse cell types in both in vitro and in vivo experimental models, including neurons and astrocytes. The activation of ferritin-coupled channels has been monitored using electrophysiological techniques, calcium and voltage imaging, and calcium-dependent gene expression. In ferritin-based magnetogenetics, RF interacts with ferritin, an iron storage protein, inducing the ferritin-dependent generation of reactive oxygen species (ROS) and subsequent activation of the coupled TRPV channels. The RF-induced ROS generation has been indirectly proven by detection with DCFDA or the use of ROS inhibitors and antioxidants. However, direct experimental evidence is limited.

HYPOTHESIS/OBJECTIVE

Hypothesis: The RF stimulation induces ROS production in cells expressing ion channels coupled to ferritin.

Objective: To utilize cultured hippocampal neurons and astrocytes expressing FeRIC channels to detect the generation of ROS using the novel genetically encoded ROS sensor oROS-G.

METHODS

We will employ two different in vitro models, 1) enriched astrocyte cultures and 2) co-culture of neurons and astrocytes. We will optimize the chemical transfection protocol to co-express FeRIC channels and oROS-G in neurons and astrocytes. We will test Lipofectamine 2000 and Lipofectamine LTX for transfections. Next, we will conduct live cell ROS imaging in neurons and astrocytes co-expressing FeRIC channels and oROS-G.

ANTICIPATED RESULTS

If our hypothesis is accurate, we will observe increases in the fluorescence of oROS-G, which corresponds to an increase in ROS levels, in neurons and astrocytes expressing FeRIC channels following RF exposure. We expect to detect increases in oROS-G fluorescence indicating ROS production at the subcellular level.

SIGNIFICANCE OF PROJECT

Currently, a majority of studies rely on indirect methods to infer ROS production during stimulation in ferritin-based magnetogenetics. The results obtained here will provide direct evidence of RF-induced ROS by interacting with ferritin, thereby filling a gap in the field.

Samantha Collins

Comparing Optimal Hepatitis C Virus (HCV Testing) with the Implementation of New Point-of-Care (POC) HCV RNA Testing

Mentor: Jennifer Price, MD, PhD
Contributing Authors: Sri Seetharaman; Yesenia Laguardia; Cecilia Rivas Alfaro; Rosaura Camberos; Pauli Gray

Hello, my name is Samantha Collins, and I am a rising senior at UC San Diego, majoring in Human Biology with a minor in Sociology. From a young age, I knew science was the direction I would follow. Last year's SSRP was one of the most incredible experiences of my life, and I am beyond excited to return as a mentor, as well as shift my research focus towards HCV testing. My spark for the human body began with my first human physiology course in high school and has lasted even throughout my parents' respective illnesses. Although my sister and I endured countless and emotionally-draining hours in hospitals aside our bed-ridden parents, my passion for medicine stayed consistent. I would first and foremost thank my parents, I promise to make both of you proud. I would like to thank my mentor, Dr. Jennifer Price, for her guidance and the SSRP staff for providing me with this opportunity.

INTRODUCTION

Hepatitis C virus is often undiagnosed, especially among marginalized groups. Factors such as access, prioritization by provider, and experiences of stigmatizing are the strongest barriers preventing screening and treatment. The new fingerstick RNA POC test provides results within an hour, replacing the venipuncture testing that required days for results.

HYPOTHESIS/OBJECTIVE

Prior hepatitis C testing data can inform the optimal HCV model for implementing the new point-of-care (POC) hepatitis C virus (HCV) RNA test.

METHODS

De-identified data from HCV testing at sites across San Francisco performed on the UCSF DeLIVER Care Van from January 1, 2023 to Dec 31, 2024 will be used to evaluate outcomes of two different HCV POC models: 1) HCV antibody followed by HCV RNA if positive (two-step testing) and 2) HCV RNA (viral first testing). Data from intake surveys and testing results will be used to create an optimal flow chart that will reduce test waste and limit unnecessary tests.

ANTICIPATED RESULTS

This research project anticipates higher efficiency for timely and accurate patient results and reduction of resource-waste given the implementation of a new workflow, starting with different prompts. The project will focus on whether triaging patients for POC RNA testing based on prior HCV diagnosis and/or risk factors affects testing options. The new algorithm would fast-track patients who have tested positive previously to a rapid HCV RNA test with same-day results.

SIGNIFICANCE OF PROJECT

The significance of this project lies in implementation of the newly FDA-approved HCV POC RNA test, a novel approach to one-step screening that could change the way screening is done for HCV and may ultimately lead to increased treatment via rapid test-and-treat models. The DeLIVER Care van is grateful to be the first location in California to implement the new POC HCV RNA test. The goals are to improve patient care efficiency, reduce testing resource waste, and increase HCV treatment uptake.

Sophia Alessandra Cunanan

Usefulness of head ultrasound for detecting preoperative brain injuries in neonates with congenital heart disease

Mentor: Lauren Harasymiw, MD, PhD
Contributing Authors: Shabnam Peyvandi; Patrick McQuillen; Keianna Pineda; Duan Xu; Amy Kuang

My name is Sophia Cunanan, and I'm a third year biology and neuroscience student at the University of San Francisco! My love for science can be traced back to kindergarten; I never got the memo that it was ever boring. I found my calling to medicine when my mom had a subarachnoid hemorrhage during my freshman year of high school. Brains became my special interest; to know how it grows, learns, functions, and gets sick, in both the physical and the psychological sense. Forever grateful for SSRP, I plan to use this opportunity to affect change around me, and to reach my goal of becoming a surgeon, giving back to the family and community that has supported me throughout this journey. I am happy to add my mentor, Dr. Lauren Harasymiw, and her wonderful research team to this community. Thank you for guiding my first steps into research!

INTRODUCTION

Neonates with congenital heart disease are at high risk for brain injury. Strokes, intraventricular hemorrhage, and a spectrum of white matter injuries are most common in this population. Altered brain development and acquired brain injuries place infants with CHD at future risk for neurodevelopmental deficits.

HYPOTHESIS/OBJECTIVE

The objective of this study was to assess the concordance of preoperative HUS and MRI in identifying preoperative brain injuries.

METHODS

To assess the concordance between head ultrasound (HUS) and magnetic resonance imaging (MRI) in detecting preoperative brain injuries—specifically white matter injury (WMI), stroke, and intraventricular hemorrhage (IVH)—we will calculate Cohen's kappa coefficients for each injury type. Kappa values will be interpreted using standard benchmarks (e.g., <0.2 poor, 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 substantial, >0.80 almost perfect agreement). For the second aim, we will evaluate factors associated with the accuracy of HUS (using MRI as the reference standard). Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of HUS will be calculated for each type of brain injury. We will stratify these analyses by type of brain injury (WMI, stroke, IVH) and cardiac diagnosis category (e.g., single-ventricle vs. biventricular physiology).

ANTICIPATED RESULTS

We expect to find a high rate of preoperative brain injury in our sample. Further, we anticipate that HUS will be more accurate in detecting IVH and periventricular leukomalacia, than white matter injuries, strokes, or cerebellar injuries.

SIGNIFICANCE OF PROJECT

It is imperative to have an efficient method of screening for brain injuries in infants with CHD. Two of the most common ways are HUS and MRI. Although ultrasound is relatively inexpensive compared to MRI and easier to be used on newborns by bedside, the efficiency of ultrasound as a preoperative tool in term neonate surgery for CHD is not widely investigated.

Caroline De La Cruz

Develop TEER assay to measure placental barrier integrity

Mentor: Stephanie Gaw, MD, PhD; Hsuan-Yuan Wang, PhD
Contributing Author: Suchaya Osatis

My name is Caroline De la Cruz and I'm a rising senior at University High School. From a young age, I have always been interested in learning more about the human body, especially how diseases develop and how treatments restore health. This interest was initially sparked after my grandmother's colon cancer diagnosis. Motivated by her experience, I began reading every bit of information I could find related to her illness. Growing up in a community with limited access to healthcare, I've also become increasingly aware of the existing barriers for accessing healthcare in minority communities, hoping to one day bridge these gaps through research and medicine. I am very excited to join the renowned Gaw lab this summer to learn more about Obstetrics, Gynaecology, and Reproductive Science research because of its substantial impact in both maternal and fetal health outcomes. This summer, I will specifically focus on research in placental biology and infectious diseases, in the context of maternal-to-fetal health. As an aspiring physician-scientist, working with Dr. Gaw, an outstanding physician scientist, will offer me valuable insights into the daily life and responsibilities of this profession. I'm beyond thankful to my mentors, Dr. Stephanie Gaw and Hsuan-Yuan (Sherry) Wang, and the SSRP team for providing me with unwavering support and knowledge!

INTRODUCTION

Placenta is a transient but vital organ that develops during pregnancy, serving as the primary interface for the exchange of nutrients, oxygen, and metabolic waste between the mother and fetus. A key function of the placenta is its role as a selective barrier, protecting the fetus from potentially harmful substances. To study placental barrier in vitro, the BeWo B30 placental cell line has been widely used to investigate how chemicals such as pesticides infiltrate through the placental barrier. Transepithelial or Transendothelial Electrical Resistance (TEER) assay is frequently applied to assess the integrity and permeability of cell barrier. The TEER value is recorded by measuring the resistance after applying an A.C. voltage signal through Voltohometer.

HYPOTHESIS/OBJECTIVE

The organophosphate pesticide Naled is anticipated to compromise the barrier integrity of the BeWo B30 placental cell line model, as evidenced by a reduction in TEER values.

METHODS

The BeWo B30 cell line was cultured in cell inserts to identify the appropriate seeding density to simulate the cellular monolayer. Once the monolayer was established, the BeWo B30 cell line was incubated with Forskolin to induce syncytialization, an essential process for healthy placentation. The syncytialized cell line was later incubated with different doses of pesticide Naled and the barrier permeability was monitored through measuring TEER values to determine if there was a dose-dependent effect.

ANTICIPATED RESULTS

We expect that exposure of the pesticide Naled will cause a decrease in TEER values, suggesting the placental barrier becomes more permeable post exposure. The degree of change in TEER values will vary, depending on the concentration of Naled. The higher concentration of Naled suggests a leakage in the placental barrier, thereby we anticipate seeing a lower TEER value.

SIGNIFICANCE OF PROJECT

Having an impermeable placental barrier is crucial for a successful pregnancy. Applying the BeWo B30 placenta cell line model, we can simulate what would happen to the placental barrier when exposed to environmental chemicals. This study aims to assess the impact of Naled on the placental barrier, thereby enhancing our understanding of pregnancy health and contributing to improved maternal and fetal outcomes.

Vivian Galvez

When pain gets in the way: Thalassemia and the will to exercise

Mentor: Ellen Fung, PhD, RD

Hello, my name is Vivian Galvez and I am a rising senior at Sato Academy of Mathematics and Science in Long Beach. I enjoy reading, listening to pop music and spending time with my family. From a young age, I have been drawn to all things STEM from going to science summer camps and watching science fiction movies. As I have gotten older I have realized pursuing a career in medical sciences is my passion whether it be research or working with patients. I decided to participate in this program to not only gain hands-on research experience but also explore the wide range of opportunities within STEM fields. Through this experience I have gained many skills and made great connections with like-minded peers who are passionate about the sciences. I am super grateful for the support I received from my mentor Dr. Fung who brought me into the world of clinical research.

INTRODUCTION

Thalassemia (Thal) is a rare inherited blood disorder that results in a reduction in hemoglobin production. Many patients require repeated blood transfusions combined with daily iron chelator medications to sustain life. Despite these therapies, chronic pain is commonly reported in patients with Thal, and has been associated with increased erythropoietic activity, vitamin D deficiency and physical inactivity. In non-Thal populations, chronic pain has been shown to limit exercise adherence and decrease overall quality of life. However, very little is known about the adherence to exercise in patients with Thal in relation to pain and other potential motivational factors.

HYPOTHESIS/OBJECTIVE

Subjects with Thal who self-report less chronic bodily pain, as assessed by a composite pain score, will have better adherence to a weekly exercise regimen, measured by average step counts, compared to individuals who report high amounts of chronic bodily pain.

METHODS

Nineteen subjects with Thal were recruited to participate in a 12 week usual activity period (UA) followed by a 12 week exercise intervention (EXER). During the intervention, subjects were asked to complete a minimum of 30 min/day, 5x/week of moderate level activities. The FitBit wearable device was used to measure exercise adherence via stepcount between UA and EXER periods where 100% adherence was defined as 10,000 steps/day in adolescents (14-19 y) and 8,000 steps/day in adults (20-40 y). The SF-36 v2 questionnaire was used to measure self-reported overall health and quality of life via eight domains and the BPI-SF measured subjects› pain intensity and interference with daily life.

ANTICIPATED RESULTS

We anticipate that patients with Thal who experience more severe and frequent body pain will have reduced weekly physical activity. We expect that additional physical, motivational, and mental health factors will also be identified that correlate with chronic pain that impact the relationship with exercise adherence.

SIGNIFICANCE OF PROJECT

It has been shown previously in non-Thal populations that exercise benefits both physical and mental health. Exercise has the potential to improve not only bone health but overall quality of life for patients with Thal. Understanding the emotional and physical barriers patients with Thal face in regards to pain and exercise adherence may help promote more successful interventions and a healthier quality of life.

Sianny Guzman

Evaluating Resident Physicians Knowledge on recognition and treatment of Sepsis

Mentor: Prachi Singh, DO, FAAP

Hello! My name is Sianny Guzman and I am a rising senior at Mercy High School Burlingame. I am currently interested in pursuing a career in behavioral neuroscience or molecular biology. From a young age, I was always fascinated by how thoughts, emotions, and memories are formed because of our brains' intricate wiring. My curiosity deepened once I began to learn more about the mechanisms that govern life through my biology and chemistry classes. When I began volunteering at my local rehabilitation/senior center, I often observed how patients struggled with various neurological disorders that have no real cure. For me, this highlighted how essential scientific research is to improving lives. I am thankful for the mentorship of Dr. Prachi Singh, along with the support of the SSRP staff, because of how they provided me the opportunity to continue to explore my love for science.

INTRODUCTION

Sepsis remains a leading cause of morbidity and mortality worldwide, accounting for an estimated 11 million deaths per year. It occurs when the body's response to infection causes widespread inflammation, tissue damage, and sometimes organ failure. Early recognition and prompt initiation of management strategies are critical to improving survival outcomes. Clinical guidelines such as the Surviving Sepsis Campaign and Sepsis-3 emphasize the importance of timely administration of antibiotics, fluid resuscitation, and monitoring lactate within the first hour of recognition.

Despite the clear evidence of decrease in mortality with early recognition, there are often delays in recognition which can be associated with variability in physician knowledge and training. Resident physicians are often the first to respond in emergency and inpatient settings, therefore they play a critical role in the early recognition of sepsis. Understanding their knowledge base and identifying the gaps in their knowledge is essential to improving patient outcomes.

HYPOTHESIS/OBJECTIVE

There is a gap in understanding the level of knowledge and competence of resident physicians to recognize and manage pediatric sepsis.

METHODS

Resident physicians at UCSF Benioff Children's Hospital, Oakland were invited to participate in an online questionnaire. Questionnaire outlined knowledge and awareness of sepsis recognition within the hospital. Survey will be distributed to 50 residents across the pediatric residency program. Data will be analyzed using descriptive statistics for years of training and correlation studies with Kruskal-wallis test with years of training and number of cases seen.

PRELIMINARY RESULTS

Variation in knowledge is expected based on year of training and clinical exposure to pediatric sepsis. 14 residents have completed the survey. Preliminary findings reveal average confidence score on a scale of 1-5 in PGY1, 2 and 3 as 2.5, 2.75 and 3.8 respectively. Findings will help identify specific areas for improvement in sepsis recognition and management training.

SIGNIFICANCE OF PROJECT

This study seeks to evaluate resident physicians' knowledge of how to appropriately identify sepsis and inform what educational intervention should be taken.

Antonio Harris

Investigating the role of iron availability's impact on magnetotactic bacteria grown under carbon-limited conditions

Mentor: Felisa Wolfe-Simon, PhD

Hi! My name is Antonio Harris, and I am a transfer student from Contra Costa College, where I will be attending UCLA to major in Biology. My passion for science was sparked after an ACL tear in football during my senior year of high school, and I have been captivated by how science can help others ever since. I am most excited about human health biology, but have also aimed to broaden my knowledge in other biological fields. This summer, I'm working with Dr. Felisa Wolfe-Simon, where we are studying microbes that create and store iron minerals. We suspect these minerals may be used as an alternative energy source for life. My long-term goal has evolved over time, but currently, I hope to become a research professor and open a clinic supporting children without parental support and neurodivergent youth. I would like to thank Dr. Wolfe-Simon and the SSRP leadership for their empowering guidance and unwavering patience as I pursue this research. Also, thank you, NASA, for funding my research experience!

INTRODUCTION

This research addresses key questions raised in the 2023 Astrobiology Decadal Survey: *Origins, Worlds, and Life* - specifically, the limits of life and the diversity of energy sources it can use.

All known life relies on energy, carbon, and electrons. Interestingly, only two biological energy sources are currently known: sunlight (photons) and chemical gradients (redox reactions). Other abundant energy forms in the Universe are not known to fuel life. We asked - why not?

According to Faraday's Law, a changing magnetic field can induce electric current in a conductor. Proteins can conduct electrons, thus: could an organism with internal magnets use magnetism as an energy source?

Magnetotactic bacteria (MTB) are a diverse group of microbes that biomineralize magnetic iron (Fe) oxide crystals, forming organelles called magnetosomes. These magnetite crystals, 20–100 nm in size, act like microscopic compasses. While magnetosomes help MTB align with Earth's magnetic field, producing them costs ~150% more energy than not producing them. We asked: could this energy-intensive structure actually serve as a novel, alternative energy source for life?

HYPOTHESIS/OBJECTIVE

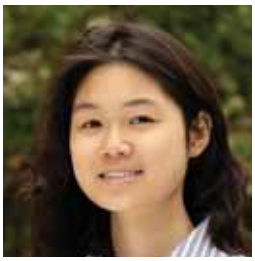
Under carbon-limited conditions, how does iron availability impact the growth of magnetotactic bacteria?

METHODS

We grew the MTB Magnetospirillum magneticum (AMB-1 WT) and a non-magnetic mutant (NMM) in sealed glass tubes under anaerobic conditions in standard MG media containing 6.5 mM total organic carbon (TOC: succinic acid, tartaric acid and sodium acetate) and 30 μM Fe. We also tested four additional Fe conditions: 50% (15 μM Fe), 10% (3 μM Fe) and 1% (0.3 μM Fe) as well as a 0% added Fe control. We then grew them with only 10% TOC (645 μM) across the same Fe concentrations. Using a spectrophotometer, we measured the coefficient of magnetization and followed growth using the change in optical density over time. We also measured total intracellular Fe using inductively coupled plasma optical emission spectroscopy and characterized intracellular magnetosome morphology with transmission electron microscopy.

ANTICIPATED RESULTS

If WT cells use magnetosomes for energy, they should increase magnetosome production under low TOC, requiring more intracellular Fe. Since magnetosome synthesis requires Fe, this adaptation would also necessitate greater intracellular Fe accumulation. Thus, Fe limitation should reduce WT growth, especially when TOC is also low. We expect WT cells to boost Fe and magnetosomes as TOC decreases, until Fe becomes limiting. NMM cells may show similar trends, but effects of Fe limitation should be less pronounced under standard TOC, since they don't produce magnetosomes.



Karina He

Evaluating Lipid Nanoparticles for mRNA Delivery to Podocytes: A Potential Gene Therapy Approach for SPLIS

Mentor: Saber Gharagozlou, MD
Contributing Authors: Julie Saba, MD, PhD; Babak Oskouian, PhD

Hello, my name is Karina He and I am a rising sophomore at Carleton College with a prospective major in biology. Growing up in a monolingual household, my family has often faced barriers to accessing healthcare. I remember times when my family hesitated to visit the hospital due to the difficulties in booking appointments and communicating with healthcare providers. These experiences, combined with my passion for the sciences and my desire to help my community, inspired me to pursue a career in medicine. I aspire to be a physician who reduces barriers to healthcare accessibility, particularly by addressing language barriers and cultural stigma surrounding certain diseases and disorders. Additionally, as research is essential to developing novel and effective treatments, I aim to actively engage in research throughout my career to provide informative care and the best possible treatment to patients. I am truly honored to participate in the UCSF SSRP. I would like to thank the organizers of this program for creating such a purposeful curriculum, Saber Gharagozlou, my mentor, for the support and guidance throughout my time in the program, and Dr. Julie Saba, my Principal Investigator, for allowing me to work in her lab this summer.

INTRODUCTION

Sphingosine-1-phosphate lyase insufficiency syndrome (SPLIS) is a rare metabolic disorder characterized by steroid-resistant nephrotic syndrome (SRNS), primary adrenal insufficiency, immunodeficiency, and neurodevelopmental delay. The condition is caused by a mutation in the SGPL1 gene, which encodes sphingosine-1-phosphate lyase (SPL), an enzyme that catalyzes the last step of sphingolipid metabolism. While adeno-associated virus (AAV)- mediated gene therapy has shown promise in restoring SPL function in SGPL1 knockout mice, the safety risks and high manufacturing costs of this method suggest that alternative approaches need to be explored.

HYPOTHESIS/OBJECTIVE

We hypothesize that lipid nanoparticles (LNPs) can efficiently deliver functional mRNA into podocytes, enabling intracellular expression of therapeutic genes for Sphingosine-1-phosphate lyase insufficient syndrome (SPLIS).

METHODS

Twelve proprietary LNP formulations from a University of Toronto collaborator containing GFP mRNA will be tested for mRNA delivery efficiency in human podocytes. As a pilot, GFP expression was confirmed using GFP-only plasmid transfection via PEI and lipofectamine. Fluorescence microscopy and flow cytometry were used to assess expression and establish baseline transfection and viability parameters. For the main experiment, podocytes will be plated in 24-well plates, incubated overnight at 37 °C to halt SV40Tag-driven proliferation, and treated with 10 µL of each LNP in duplicate. After 24 hours, cells will be harvested, stained with propidium iodide (PI), and analyzed via flow cytometry to evaluate transfection efficiency and cytotoxicity.

ANTICIPATED RESULTS

We anticipate that multiple formulations will yield robust GFP expression with minimal cytotoxicity, with the most efficient and least toxic LNPs nominated for future in vivo studies to deliver SGPL1 mRNA in vivo to SPLIS mouse models for analysis of kidney targeting and therapeutic efficacy.

SIGNIFICANCE OF PROJECT

This project aims to establish an efficient virus-free mRNA-based gene therapy for SPLIS using lipid nanoparticles. Unlike AAV-gene therapies, which introduce safety risks, LNPs offer a safer and cost-effective delivery system. This method could establish a foundation for a virus-free gene therapy approach for SPLIS.

Alexander Heuer

Social Epidemiology of Early Adolescent Multidimensional Sleep Health

Mentor: Jason Nagata, MD, MSc

Contributing Authors: Christiane K. Helmer; Isaac Frimpong; Keira Beltran Murillo; Oliver Huang; Elizabeth J. Li; Colbey Ricklefs; Orsolya Kiss; Kyle T. Ganson; Alexander Testa; Jinbo He; Fiona C. Baker

My name is Alexander Heuer, a rising senior at San Francisco State University, majoring in Kinesiology, along with a minor in Biology. Growing up, I never imagined I would decide to pursue medical school until the summer before my junior year. Belonging to a background largely underrepresented in STEM, especially in medicine, and the first in my family to venture this path, my journey has been deeply shaped by both my experiences in higher education and the impact of witnessing my father's health challenges and the care he received. These experiences have driven my passion to explore issues of health disparities, access to care, and the systemic factors that disproportionately affect marginalized communities. I want to sincerely thank Dr. Nagata for his mentorship and generosity, and the entire Nagata lab research team for creating a space that is both intellectually enriching and genuinely welcoming.

INTRODUCTION

Insufficient and irregular sleep patterns are a major concern in adolescents. Notable sleep disparities across racial, ethnic, and socioeconomic lines. Despite these implications, there is limited data on the sociodemographic associations of irregular sleep patterns, such as chronotype and social jet lag, in early adolescence.

HYPOTHESIS/OBJECTIVE

This study aimed to characterize sleep duration, chronotype, and social jet lag in early adolescents and examine how these sleep characteristics vary by sociodemographic factors.

METHODS

We examined cross-sectional data from Year 3 (2019–2021) of the US Adolescent Brain Cognitive Study (N=10,082). Sleep duration and efficiency (school-days and free days), chronotype (midpoint of sleep on free days), and social jet lag (difference between sleep onset on free days and school-days) were assessed using the Munich Chronotype Timing Questionnaire. Multiple linear regressions were conducted, adjusting for sex, race/ethnicity, age, sexual orientation, household income, and parental education.

ANTICIPATED RESULTS

Among 10,082 adolescents (mean age 12.9 ±0.7), average sleep duration was 8.9 (±1.5) hours, chronotype was 28.3 (midpoint 4:13 a.m.), and social jet lag was 2.3 hours. Older age was associated with shorter sleep duration (B=-0.24; 95% CI -0.29, -0.19), later chronotype (B=0.26; 95% CI 0.17, 0.34), and greater social jet lag (B=0.19; 95% CI 0.14, 0.25). Males showed no differences in average sleep outcomes, though they had slightly longer weekday sleep duration and shorter weekend sleep duration compared to females. Gay/bisexual adolescents had shorter sleep duration (B=-0.40; 95% CI -0.55, -0.26), later chronotype (B=0.71; 95% CI 0.49, 0.92), and greater social jet lag (B=0.37; 95% CI 0.22, 0.52) than heterosexual peers. Minority races and ethnicities were associated with poorer sleep outcomes. Lower-income households had shorter sleep duration (B=-0.05; 95% CI -0.20, 0.10), later chronotype (B=0.61; 95% CI 0.34, 0.87), and greater social jet lag (B=0.58; 95% CI 0.42, 0.75). Black adolescents from higher-income and higher parental education households were more likely to experience poorer sleep outcomes compared to Black adolescents from lower-income and lower parental education households.

SIGNIFICANCE OF PROJECT

This study highlights sociodemographic disparities in multidimensional sleep health among a diverse, national sample of adolescents (12–13 years). Findings underscore the need for early, targeted interventions to address inequalities in adolescent sleep and associated health risks.

Nhu Huynh

Investigating Heterotopic Ossification Following Prolonged Dental Jaw Extension and Its Impact on the Temporomandibular Joint

Mentor: Sunita Ho, MS, PhD

Hello! My name is Nhu Huynh, and I am an incoming sophomore at the University of California, Los Angeles! I am currently majoring in Computational and Systems Biology on the pre-dental track. As a daughter of immigrants, and an immigrant myself, my journey with science has been everything but linear. Up until my first quarter in college, I was convinced I wanted to pursue a career in Computer Science and technology–yet I became intrigued in the pursuit of biological studies, which I've had limited exposure to before college. Despite struggling through my first year, I am so beyond grateful for the opportunity to pursue research this summer, which will be my first time doing a full research project ever. I am so incredibly excited to pursue research that combines both dentistry and technology, studying the intersection between biomechanics and biomineralization alongside my mentor, Dr. Sunita Ho. Her guidance and unwavering support has made my experience both challenging and rewarding, and I could not ask for a better first experience in research. Participating in SSRP has opened doors for me to explore innovative research at the crossroads of community impact and healthcare, which I wouldn't have had the opportunity to do otherwise. I feel truly fortunate for the mentorship, resources, and collaborative environment that are, and will continue to, help me grow both academically and personally.

INTRODUCTION

Heterotopic ossification (HO) can occur in response to trauma, surgery, or repetitive mechanical stress. The presence of HO in the TMJ can result in restricted movement, ankylosis, and chronic pain, significantly impairing oral function. HO is a defective repair process driven by mesenchymal stem cell activation in response to inflammation and mechanical stimuli. Mechanical stress, such as that imposed by prolonged jaw extension, can initiate this pathological process by promoting osteogenic differentiation. These findings align with the increasing number of clinical reports linking postoperative or procedural TMJ limitations to ectopic ossification.This study will contribute critical data to clarify whether routine dental practices involving sustained mouth opening could increase HO risk, especially in predisposed patients. A better understanding of TMJ HO development could shape procedural protocols and inspire new preventative measures in oral surgery.

HYPOTHESIS/OBJECTIVE

Heterotopic ossification in the temporomandibular joint (TMJ) often starts after physical stress or injury. We expect to find that imaging and histological analysis will reveal early signs of mineralization in stressed soft tissues, supporting the idea that mechanical stress contributes to HO formation. Additionally, we may observe secondary effects on nearby neural structures, suggesting potential implications for pain or jaw function.

METHODS

This controlled study will use a rodent model to simulate dental jaw extension. Imaging and tissue analyses will be conducted to tract its effects on the TMJ. Thirty adult male Sprague-Dawley rats will be used due to their consistent response to mechanical stress and well-documented anatomical characteristics relevant to musculoskeletal studies. Rats will be anesthetized and subjected to calibrated mouth opening using a retraction device for durations of 0, 1, or 3 hours. Tissue will be harvested at 1 day, 1 week, and 3 weeks post-procedure.

Micro-CT will assess mineralization in soft tissues surrounding the TMJ. Collected TMJ tissues will be stained with Alizarin Red to identify bone formation stages and assess cartilage and connective tissue changes. Immunohistochemistry will quantify local cytokine levels (IL-1□, TNF-□) and examine markers of HO progression. Adjacent brainstem tissue will be analyzed secondarily for GFAP and Iba1 expression to assess downstream inflammation.

ANTICIPATED RESULTS

We anticipate that prolonged jaw extension will lead to early signs of heterotopic ossification in TMJ-adjacent soft tissues, marked by mineralization detected through micro-CT and Alizarin Red staining. Inflammatory markers (IL-1□, TNF-□) are expected to be elevated in overloaded joints, supporting a stress-induced osteogenic response.

SIGNIFICANCE OF PROJECT

This project aims to clarify how sustained mechanical loading during routine dental procedures could initiate heterotopic ossification in the TMJ. By identifying early structural and molecular changes, the study may reveal critical windows for intervention. The findings could inform safer clinical protocols and guide preventative strategies in at-risk patients.

Alison Ishikawa

The effects of milling and baking processes on the content and profile of gliadin proteins in wheat

Mentor: David Killilea, PhD

Hello! My name is Alison Ishikawa and I am a Masters of Nutritional Science and Dietetics student at UC Berkeley. It has always been one of my career goals to become a capable dietitian to provide accurate and evidence-based care and information to my patients. After completing my first year of my graduate studies, I have seen how crucial scientific research is for the study of nutrition as well as for dietetic practice guidelines for professionals. As I approach the second and final year of my graduate program, I am very appreciative of the research experience that the SSRP staff and my program have provided me with this summer for my capstone project. I have had the most wonderful opportunity to work alongside Dr. David Killilea in his lab on his whole wheat project to determine whether milling and baking processes have an impact on allergenic gliadin proteins in grains. I would like to especially thank my mentor for his patience and support throughout this learning experience as I would not have been able to achieve the results I desired without him.

INTRODUCTION

Understanding how food processing techniques, specifically milling and baking, affect the gluten protein composition and abundance of wheat is crucial for both food scientists and the commercial food industry, as well as for clinical and nutrition specialists addressing dietary sensitivities and nutritional quality. Gliadins, a major protein group within the gluten protein family, have been identified as a trigger in autoimmune reactions present in Celiac Disease and other gluten sensitive conditions. Current research suggests that both milling and baking processes could influence the quantity and structure of gliadins and other gluten fractions in wheat flour and bread. The choice of milling technology, particle size, and baking method can alter gluten protein composition, aggregation, and bread-making performance.

HYPOTHESIS/OBJECTIVE

Milling and baking processes will significantly change both the quantity and structure of gliadin proteins in wheat, leading to measurable changes in gliadin abundance and distribution.

METHODS

Gliadin proteins will be solubilized and extracted from various wheat and wheat-based samples, and the protein concentration will be determined with a protein assay. Using gel electrophoresis, the pattern of proteins from the collected gliadin proteins will be determined. There are 5 flours and 15 breads (triplicates from 5 flours) in this sample set.

ANTICIPATED RESULTS

The study expects to provide quantitative and qualitative data showing that both processing steps of milling and baking can lead to changes in gliadin protein patterns, which may have important discoveries for the allergenicity and nutritional quality of wheat products. Preliminary results indicate that there are no significant differences in the protein pattern due to the milling process.

SIGNIFICANCE OF PROJECT

With more people developing wheat sensitivities and intolerances, the impact on wheat proteins of current industrial practices is an important topic of study to elevate the public's understanding of wheat sensitivity and nutrition.

Miles Jackson

Modeling Host-Microbiome Interactions in Inflammatory Bowel Disease(IBD) Using Stem Cell-Derived Intestinal Organoids

Mentors: Carlotta Ronda, PhD; Patricia Santana, PhD; Minjoo Kim, PhD

Hello, my name is Miles Jackson and I'm going into my first year of college at San Jose State University studying Molecular and Cell Biology. I've always felt an interest in going into the medical field but my aspirations became more extreme when my sister was diagnosed with an autoimmune disease, I want to be able to help people like her who struggle every day, and try to alleviate the pain these patients and their families go through. I want my research to be meaningful and have a real-world impact. Through the SSRP program I feel like I'm allotted an amazing opportunity to work with peers who have the same goals and aspirations as me, while giving me strong and profound leaders to look up to and learn from, through this program I feel like I can be taught the necessary skills and tools to be successful in the medical field. I am more than thankful for the opportunity to work with Dr. Carlotta Ronda, and for the organizers of this program for allowing our project and stories to be heard.

INTRODUCTION

Crohn's Disease and Ulcerative Colitis, the two main forms of Inflammatory Bowel Disease(IBD), are chronic conditions that cause inflammation in the gastrointestinal tract, severely affecting the health and quality of life for millions worldwide. Though the causes are very complex, disruptions in the gut microbiome, a weakened intestinal barrier, and abnormal immune responses are major contributors. Environmental and microbial triggers can activate the immune system through receptors like the aryl hydrocarbon receptor(AhR), which plays a key role in gut inflammation. To better understand these diseases, we use human intestinal organisms, which are lab-grown models that closely mimic the intestinal lining, to study how microbes and immune signals interact in IBD.

HYPOTHESIS/OBJECTIVE

We hypothesize that microbial factors associated with IBD alter host epithelial inflammatory responses and protein localization in human stem cell-derived intestinal organoids. In this project, we aim to characterize the human intestinal organoids we will use further and check if different media formulations affect the expression of CDX2. We hope our findings may lead to informing mechanisms of mucosal dysfunction and support therapeutic exploration of epithelial or receptor-based targets.

METHODS

Organoids will be generated from hiPSCs and the expression of some markers will be investigated by qPCR for CDX2 and MUC2. Additionally immunofluorescence for markers like VILLIN will be performed and confocal imaging will be used to assess protein expression and localization.

ANTICIPATED RESULTS

We expect that the organoids will express CDX2 protein, marker of differentiated organoids.

SIGNIFICANCE OF PROJECT

This project provides a platform to explore how microbial exposures contribute to intestinal inflammation in IBD. By using stem cell-derived intestinal organoids, we can model disease mechanisms more accurately than we can with animal models. This work has the potential to uncover molecular pathways driving epithelial dysfunction, which could support the development of targeted therapies. Understanding these mechanisms may improve treatment strategies and quality of life for the millions of people affected by IBD worldwide.

Anoushka Kolluru

Investigating the effect of antipsychotic drug Pimozide on LKB1 phosphorylation and interactions with PRKCz in Hepatic Fibrosis

Mentor: Jennifer Chen, MD
Contributing Authors: Nidhi Nautiyal; Vijay Prathigudupu

My name is Anoushka Kolluru, and I'm entering my second year at Brown University, where I'm concentrating in neuroscience and visual arts while following the premed track. I've always been fascinated by the brain and the intricate ways our bodies function as a system of interconnected parts. This curiosity, combined with my passion for helping others and my love of hands-on learning, has inspired me to pursue a career in medicine and research. In the future, I hope to build a medical career focused on inclusivity and accessibility, particularly in underserved communities. I'm incredibly grateful to Dr. Jennifer Chen, Vijay, Sachin, Nidhi, and the entire SSRP programming staff for providing me with this incredible opportunity to explore my interests in both research and medicine.

INTRODUCTION

End-stage liver disease accounts for two million deaths annually and represents 4% of all deaths. The mortality rate of alcoholic and non-alcoholic liver disease has increased over the years due to alcohol abuse, obesity, viral (HBV and HCV), and metabolic risk factors. Until now, there remains no effective treatment targeting to reverse fibrosis and effectively manage chronic liver diseases. During fibrosis regression, hepatic stellate cells (HSCs) revert to their quiescent state and reduce their collagen and extracellular matrix (ECM) production. Targeting the inactivation of HSCs may facilitate the development of effective antifibrotic therapies.

HYPOTHESIS/OBJECTIVE

Preliminary studies have identified the compound pimozide as a promising antifibrotic agent that inactivates hepatic stellate cells (HSCs), acting through the YAP/TAZ, AMPK, and LKB1 signaling cascade. We hypothesized that pimozide increases the phosphorylation of LKB1 by regulating the Protein Kinase C-zeta pathway to inhibit YAP/TAZ signaling in activated HSC, which ultimately results in the reduction of fibrosis in the liver.

METHODS

To investigate the involvement of PKCz in pimozide-mediated signaling pathways, we will deplete PKCz in HSCs through siRNA. For this, cells will be treated with siPKCz for 48 hours and then treated with pimozide (15 μM) or DMSO control for 1 hour. The cells will then be lysed, and the protein will be isolated for the expression of pYAP, pAMPK, and pLKB1.

HSCs will also be plated in a 24-well plate and incubated for 24 hours. In parallel, cells will be treated with siPRKCz for 48 hours, followed by a 3-hour pimozide treatment. YAP/TAZ localization will then be assessed via confocal imaging.

ANTICIPATED RESULTS

We anticipate that the Pimozide will activate PKC zeta, leading to LKB1 phosphorylation and inhibition of YAP/TAZ signaling in HSCs.

SIGNIFICANCE OF PROJECT

The results of this project would highlight the novel therapeutic use of pimozide and promise insights into the molecular mechanisms underlying hepatic fibrosis regression.

Frances Lee

Evaluation of intrinsically fluorescent proteins in iPSCs

Mentors: Aras N. Mattis MD, PhD; Shahrbanoo Keshavarz Aziziraftar, PhD
Contributing Authors: Mohammad H. Mehraban, PhD; Luis Jasper

Hello! My name is Frances Lee and this fall I will be going into my first year of college at UC Irvine majoring in Biology. My interests in science originally stemmed from my hobby as a young animal-loving artist, but soon grew into a passion for biology. As I carve my own path using my curiosity as a guide, I've expanded my knowledge and discovered my interest in lab work. Specifically, I aim to continue research to inspire and make a difference by empowering those in need through the UCSF SSRP. This opportunity has given me a better understanding of how a lab environment functions and the ability to expand my knowledge with the generous support of my mentors, Dr. Aras Mattis and Dr. Shahrbanoo Keshavarz Aziziraftar. I'm immensely grateful for my mentors who have introduced me to new pathways and encouraged me to explore different opportunities in a lab setting as I start my journey in undergraduate studies. As part of their team, I hope to contribute to their stem cell research on MASLD and continue to grow as a scientist and hopefully pursue a MD/PhD in the future.

INTRODUCTION

Metabolic dysfunction-associated steatotic liver disease (MASLD) is a chronic nonalcoholic liver disease affecting greater than 30% of the global population. MASLD causes a build-up of lipids in the liver known as steatosis and is associated with cardiac diseases, obesity and type 2 diabetes. This build up of lipids causes stress within liver cells which can lead to metabolic dysfunction-associated steatohepatitis (MASH), characterized by serious inflammation and lipid build up, leading to liver cancer. Specifically, the excess intrahepatic lipids causes an imbalance in the cell known as lipotoxicity, resulting in endoplasmic stress (ER Stress), fibrosis, and inflammation.

HYPOTHESIS/OBJECTIVE

In order to develop efficient readouts of protein expression in real-time, we are testing a number of intrinsically fluorescent proteins within iPSCs. The goal of this project is to image and quantify the brightness, detectability and location of the fluorescent proteins within iPSCs. Secondarily, successful fluorescent proteins will be added to the C-terminus of proteins to detect changes in real-time in live cells.

METHODS

We will transduce undifferentiated iPSCs from healthy donors with lentiviral vectors carrying gene-specific guides and fluorescent protein genes. The fluorescence will indicate gene activation and allow us to observe corresponding phenotypes, such as lipid accumulation or fibrosis markers, under metabolically stressful conditions.

ANTICIPATED RESULTS

We anticipate to see more fluorescent proteins when activating certain genes associated with MASLD. We expect to identify genes whose expression shows MASLD-like features in IPSCs. These results will inform us further about MASLD pathways, different genetic factors, and further therapeutic studies that can be measured in real-time..

SIGNIFICANCE OF PROJECT

Despite growing research about MASLD, there is still limited knowledge about the genetics behind MASLD which prevents effective preventative and corrective measures. Gaining insight on the underlying catalysts for MASLD will create a more comprehensive understanding of this disease for new targeted therapies and more efficient diagnosis. Testing the genomes will allow us to fully and unbiasedly screen for genes that could alleviate MASLD symptoms when targeted.

Angela Leon-Alvarez

Dietary Intake and Quality of Patients using GLP-1 Agonists

Mentor: June Tester, MD, MPH

Hi! My name is Angela Leon-Alvarez and I am a student at Holy Names High School. My love for medicine has been apparent since I watched Doc McStuffins as a young child. I was interested in how physicians magically cured patients and how researchers discovered unknown facts, and I realized I wanted to possess the same abilities. I attend a female-only school, which emphasizes women empowerment, and the value stuck in the same manner as my passion for medicine. My values contributed to my dream of becoming an OB-GYN, a position where I will wholeheartedly practice my values. The UCSF Summer Student Research Program has enabled me to take the next steps toward my goal, deepened my curiosity for medicine, and helped me grow as a researcher and student. I am extremely thankful for the enriching experience I had this summer and for my mentor, Dr. Tester, for her undeniable support and encouragement.

INTRODUCTION

The volunteering patients participating in the diet recalls all have obesity and are taking a GLP-1 agonist such as semaglutide, which is known as Wegovy and Ozempic. These medications lower appetite, which the majority experience, but it usually takes a toll on their dietary intake/quality. They are not hitting the recommended calorie intake and are not ingesting the necessary nutrients. In particular, patients taking a GLP-1 should have 25-35% of their calories coming from protein, more than the general 10-35%. However, patients rarely intake the recommended percentage of protein which does harm their dietary quality.

HYPOTHESIS/OBJECTIVE

Weight loss among individuals taking GLP-1 agonists results from a decrease in total caloric intake. We hypothesize that dietary composition among adolescents newly taking GLP-1 agonists for weight loss may show imbalance of nutrient intake, in particular with respect to protein.

METHODS

I will recruit about 10 patients from clinic, generally during a visit that I have observed. All will be currently taking GLP-agonist medication.

I will be using ASA 24, to conduct a total of three 24-hour diet recalls for each patient, and will use it to analyze dietary intake metrics such as percent of calories from protein and total calories. Demographic information and other logistics will be kept in a secure file in Box.

The patients will be compensated an electronic target gift card of $15. Furthermore, to add educational value for their diet recall output, I will be modifying a visually-appealing template to present my findings about dietary intake to the patients. In the presentations I will highlight the goal amount of calories they should be ingesting everyday and compare that to their reality.

ANTICIPATED RESULTS

I anticipate that the patients are not eating enough protein to satisfy the recommended 25-35% of calories.

SIGNIFICANCE OF PROJECT

The research that will take place will enable the chance to find patterns within the dietary intake of real-life patients who struggle with weight management to better their meal quality and overall health.

Austin Ly

Assessing the Efficacy of the iLet Bionic Pancreas in Managing Type 1 Diabetes at UCSF Benioff Children's Hospitals

Mentor: Tariq Ahmad, MD

Hello! My name is Austin Ly, and I'm a rising junior at Saint Joseph Notre Dame High School. From a young age, serving my community has always been a value in my life. Whether it's volunteering at food banks with my family or leading a youth-led community service club at my school to initiate change, these experiences have fueled me in discovering my passion for helping others. Thus, pursuing a career in medicine would enable me to make a greater impact. In the future, I plan to attend a four-year university on the pre-med track. Through SSRP, I'm not only able to contribute to valuable clinical research but also create lasting friendships with diverse, like-minded individuals within the community. I'm incredibly thankful to my mentor, Dr. Tariq Ahmad, for fostering a supportive and welcoming environment at UCSF BCH, motivating me to continue uplifting my community through healthcare and beyond.

INTRODUCTION

Type 1 diabetes (T1D) is a life-long, autoimmune disease where the immune system attacks pancreatic β-cells, which produce insulin for the body. Individuals with T1D receive insulin to maintain ideal blood sugar levels. The HbA1c goal is <7%. The SEARCH for Diabetes in Youth Study (2022) revealed that adolescents aged 15-19 with T1D have an average HbA1c of ~9.3%. In recent years, the rise of automated insulin delivery (AID) devices has offered an alternative T1D management strategy that is potentially less burdensome. While traditional AID devices require information from the healthcare provider and the patient's input of carbohydrates, the iLet Bionic Pancreas is a unique insulin delivery system that only requires the patient's weight to start and offers an insulin dosing interface based on the user's reported meal size. This obviates the need for carbohydrate calculations and simplifies care.

HYPOTHESIS/OBJECTIVE

The iLet Bionic Pancreas will help optimize glycemic control in patients with T1D.

METHODS

Approximately 20 individuals from UCSF Benioff Children's Hospitals who use the iLet pump were examined. The individual's insulin pump log and diabetes management were reviewed before and after the use of the iLet pump, through the iLet Bionic Report. The electronic medical record was used to record additional demographic and clinical data. To evaluate changes in glycemic control and any statistical significance, we conducted a Wilcoxon signed-rank test.

ANTICIPATED RESULTS

We expect that patients with T1D who switch to the iLet pump will have increased time-in-range glucose levels (>70%) and an improvement in HbA1c levels. Furthermore, patients are likely to experience a decrease in hyperglycemic and hypoglycemic events, ultimately leading to an enhanced quality of life.

SIGNIFICANCE OF PROJECT

The iLet Bionic Pancreas was FDA-approved in May 2023. The goal of our retrospective observational study is to determine this novel pump's impact on glycemic control, particularly for those who may fail on other AID systems. The results may also be relevant and useful for outside healthcare providers.

Samantha Ma

A peptide-protein fusion antigen as a vaccine against multidrug-resistant gonorrhea

Mentor: Peter Beernink, PhD

Hello! My name is Samantha Ma and I am a rising 4th year at UC Santa Cruz studying molecular cellular and developmental biology. I am most interested in immunology, microbiology, and infectious disease because I love learning about host-pathogen relationships and how the human body protects us from threats. Coming into this program, I was on the fence about pursuing graduate school. I wasn't sure if it was the right path for me, but my positive experience this summer has made me more confident in my skills and potential in research. I greatly appreciate the UCSF SSRP staff for giving me this opportunity to not only strengthen my technical lab skills, but also to improve my scientific communication in a supportive and collaborative environment. Thank you, Dr. Beernink, Maha, and Isabel for welcoming me into your lab and supporting me through my project this summer!

INTRODUCTION

Neisseria gonorrhoeae is the second leading cause of bacterial sexually transmitted infections. Lipooligosaccharide (LOS) is an abundant surface antigen that elicits bactericidal antibodies. To avoid LOS toxicity, a peptide, PEP1, was identified that mimics LOS and elicits bactericidal activity in mice. Our hypothesis is that fusing PEP1 to Cross-reacting material 197 (CRM197), a carrier protein used in conjugate vaccines, will make it easier to produce in *Escherichia coli*, and will increase the immunogenicity of the peptide antigen.

HYPOTHESIS/OBJECTIVE

1. Construct a fusion protein between gonococcal LOS mimetic peptide, PEP1, and genetically detoxified diphtheria toxin, CRM197.
2. Test whether anti-LOS monoclonal antibody 2C7 binds to the PEP1 portion of the fusion protein.

METHODS

We produced a plasmid encoding PEP1 fused to CRM197 through insertional PCR mutagenesis and verified the sequence of the fusion antigen. We transformed the plasmid into *E. coli* SHuffle T7 to express the fusion protein. The PEP1-CRM197 fusion protein contains a carboxyl-terminal hexa-Histidine tag, which will be used to purify the fusion protein through affinity chromatography. To test whether mAb 2C7 binds to the fusion protein, we will perform an immunoassay (ELISA) with mAb 2C7 and anti-human IgG conjugated with alkaline phosphatase (AP). AP allows visual detection, which is quantified in a plate reader, and corresponds with the relative binding of mAb 2C7 to PEP1-CRM197. If binding is detected, we will immunize mice with PEP1-CRM197 and measure serum bactericidal antibodies against gonococci.

ANTICIPATED RESULTS

We expect that mAb 2C7 will bind to PEP1-CRM197, indicating that CRM197 does not interfere with recognition of the antigen and allowing further testing for vaccine efficacy.

SIGNIFICANCE OF PROJECT

Despite *N. gonorrhoeae* being one of the leading causes of sexually transmitted infections, there is currently no vaccine that protects against this pathogen and multidrug-resistant strains are a growing concern. Fusing PEP1 to the CRM197 carrier protein could augment immune responses to produce an efficacious vaccine antigen against *N. gonorrhoeae*.

Mira McDavitt

Development and Implementation of Adult Neuropsychological Screening and Evaluation Services for Sickle Cell Disease: Findings from a Pilot Program

Mentors: Marsha Treadwell, PhD; Judy Cavazos, PhD

Hello! My name is Mira McDavitt. I am a rising senior at the University of California, Berkeley, majoring in Psychology and African American studies. As a first-generation Black woman from a rural background, I initially lacked exposure to the processes central to clinical psychology research. Through the SSRP program, I have transformatively deepened my understanding by working alongside Dr. Marsha Treadwell and Dr. Judy Cavazos in the Sickle Cell Center for Excellence where I have shadowed a psychologist's role in a hospital setting, and fostered dialogue with practitioners in fields such as neuropsychology and social work. Further, I have integrated my passion for research and addressing the racial health disparities of care associated with chronic illness in the Black and Brown community. I'm grateful for the program organizers and my mentors for their thoughtful guidance, which will be invaluable in my journey toward making meaningful contributions to the field of psychology.

INTRODUCTION

Among the many complications associated with the inherited blood disorder sickle cell disease (SCD), neurocognitive challenges are prevalent and can greatly impact quality of life. Further, individuals with SCD and their families experience emotional distress at a higher rate compared with similar populations. The association between these issues remains unexplored.

HYPOTHESIS/OBJECTIVE

Adults with SCD will demonstrate a high prevalence of emotional distress and cognitive impairment. Increasing emotional distress will be associated with worse cognitive impairment. Additionally, adults with SCD receiving neuropsychological assessments will express a high level of satisfaction with a pilot clinical program.

METHODS

This retrospective study analyzed patients› neuropsychological assessments, emotional distress, and satisfaction surveys collected as part of a neuropsychological screening and evaluation pilot program for adults living with SCD. Domains of working memory, executive functioning, and processing speed were examined using standardized tests and self-reports. Patients completed inventories of anxious and depressive symptoms and completed a survey assessing aspects of satisfaction with the assessments. Descriptive statistics were generated and non-parametric analyses conducted.

PRELIMINARY RESULTS

Participants were 23 adults (median age 25 years), primarily female identified (87%), with sickle cell anemia (65.2%); 39.1% had a history of stroke. Neurocognitive challenges were prevalent: 76.2% demonstrated below average to impaired processing speed, working memory (65%) and on some aspects of executive functioning (planning, organization, attention – 56.5%). However, 84.2% rated their executive functioning as average or above. 31.5% reported severe anxiety symptoms and 17.4% reported severe depressive symptoms. Significant associations between neurocognitive functioning and emotional distress were not found using nonparametric tests. Participants reported high satisfaction with the evaluation process (87.5%), and with the usefulness of the recommendations (83.33%). Half of the sample (50%) felt the neuropsychological assessments and recommendations positively impacted their quality of life.

SIGNIFICANCE OF PROJECT

While our hypotheses were partially supported, with high rates of neurocognitive impairment and severe emotional distress compared with the general population, with our small sample, future analyses might include examining moderate levels of emotional distress to potentially capture the association with neurocognitive impairment. It is critical to broaden access to neuropsychological assessment for adults with SCD.

Heidi Mendez Mejia

Development of Patient Educational Material Through the Assessment of Patients' Base Understanding of Latent TB Treatment

Mentor: Mai Baalbaki, MD, MSc

Hello! My name is Heidi Mendez Mejia and I am a rising senior at Holy Names High School. I have a strong interest in the medical field particularly in Pharmacology and Public Health. My curiosity began in my childhood, as I spent a lot of time in the hospital. I was either poked by a needle or given medication daily. As a child, it was difficult being surrounded by doctors, given medication, and restricted by my health. However, these experiences sparked my interest in understanding what was happening to me. I began to ask questions and seek out information, which led me to develop a passion for learning more about medicine and healthcare. With the support of those around me, I've continued to explore these interests and pursue opportunities in the field. I'm excited to continue this journey with Dr. Mai Baalbaki and grateful for the opportunity to participate in this program!

INTRODUCTION

Tuberculosis (TB), caused by the bacterium *Mycobacterium tuberculosis*, remains a significant public health concern within the U.S., particularly in California, where San Francisco has seen cases triple since 2023. Limited public awareness and resources may delay TB diagnosis and treatment. TB disproportionately affects at-risk populations, including immigrants, the uninsured, and the unhoused. TB can be categorized as either latent TB infection (LTBI) or active TB disease. LTBI is asymptomatic and non-infectious, while active TB is symptomatic and transmissible through aerosolized droplets. TB can be diagnosed through blood tests, skin tests, or X-rays. Treating LTBI prevents progression to active TB, and shorter LTBI treatment regimens improve patient adherence, helping reduce the overall public health burden.

HYPOTHESIS/OBJECTIVE

Patient surveys will allow for the identification of barriers to accessibility for TB treatment services. Once obstacles have been identified, clinic staff can implement measures to improve healthcare services, referrals, and patient experience.

METHODS

We conducted a verbal questionnaire at the Berkeley Free Clinic (BFC) to assess barriers impacting patients› understanding of TB pathophysiology, access to healthcare, and TB treatment. Adult BFC patients undergoing TB testing in July 2025 were invited to participate in the study. The questionnaire employed a mixed-methods approach, including Likert scale, closed-ended, and free-form questions. Descriptive statistical analysis was conducted using Microsoft Excel, Google Forms, and Dedoose. The data collected will inform patient education materials and the development of a TB advocacy group.

ANTICIPATED RESULTS

The findings of the survey will allow BFC care staff to modify patient resources to increase awareness of TB pathophysiology and treatment. This is expected to increase patient retention, improve community participation in TB testing, and enable patients to make informed decisions regarding their healthcare.

SIGNIFICANCE OF PROJECT

Improving patient engagement with TB testing will enhance patient outcomes and inform individuals about the services available to them. Increasing community awareness around TB testing and treatment will help lessen the public health burden of TB in the East Bay.

Amaan Mohammed

Modeling Genetic Risk for MASLD Using iPSC-Derived Hepatocytes: A Comparative Study of Lipid Accumulation in High and Low PRS Cell Lines

Mentors: Marisa Medina, PhD; Yuanyuan Qin, PhD

Hello! My name is Amaan Mohammed. I'm an incoming freshman at UC Riverside and plan to major in Cellular, Molecular, and Developmental Biology. My interest in scientific research began after hearing from guest speakers at my high school, including physicians and biomedical researchers, who were focused on helping save patients' lives from both the bench and the bedside. My brother, who is currently in medical school, has also been a huge inspiration and has shown me how a career in medicine can be both meaningful and fulfilling. Outside of research, I enjoy photography and its ability to preserve memories while allowing for creative expression. In the future, I hope to combine my curiosity, creativity, and passion for science as an MD/PhD working to develop new therapeutics. SSRP has provided me with an amazing stepping stone into stem cell research. I'm deeply grateful to Dr. Medina, Dr. Qiu, and everyone in the Medina Lab for their mentorship and for introducing me to iPSCs and core lab skills.

INTRODUCTION

Metabolic Associated Steatotic Liver Disease (MASLD) is a widespread chronic liver disorder linked to obesity and diabetes and is characterized by an imbalance between lipid acquisition and lipid disposal. It affects nearly a quarter of adults and, if left untreated, can progress to cirrhosis and even liver failure, which would require a liver transplant. Despite its growing prevalence, effective therapies remain limited, with the only FDA-approved drug working in less than a third of patients. Genome-wide association studies (GWAS) have identified multiple SNPs linked to MASLD across a number of different genes. Polygenic risk scores (PRS) integrate the cumulative effects of many genetic variants across the genome to estimate an individual's inherited risk for diseases with complex genetic makeup, such as MASLD. However, most preclinical models inadequately capture the complexity of polygenic risk and patient-specific variation, limiting the translation of genetic insights into therapeutic interventions.

HYPOTHESIS/OBJECTIVE

This study aims to utilize patient-derived induced pluripotent stem cells (iPSCs) to model MASLD in vitro by stratifying donor cell lines based on MASLD-specific polygenic risk scores (PRS). The goal is to examine whether genetic risk is functionally reflected in hepatocellular lipid handling.

METHODS

iPSC lines representing the highest and lowest 20th percentile of the PRS distribution are differentiated into hepatocyte-like cells (iHeps) using a standardized hepatic differentiation protocol involving endoderm induction, hepatic specification, and maturation. Following differentiation, cells are treated with 400 μM of oleate for 24 hours to induce steatosis, a hallmark of MASLD. Lipid accumulation is quantified using BODIPY 493/503 staining followed by flow cytometry to assess intracellular lipid accumulation across PRS-defined risk groups.

ANTICIPATED RESULTS

We hypothesize that high-PRS iHeps will show significantly more lipid accumulation compared to low-PRS lines under oleate exposure. This would support a functional link between polygenic risk and lipid buildup in hepatocytes. Additional analyses may identify distinct gene expression or metabolic phenotypes related to PRS status.

SIGNIFICANCE OF PROJECT

These findings could refine our understanding of how polygenic risk contributes to MASLD pathogenesis and support the development of genetically informed models for personalized treatment strategies based on genetic risk.

Lina Nguyen

Investigating the Effects of SUGP1 Overexpression on Intracellular Lipid Accumulation in iPSCs

Mentors: Keshavarz Aziziraftar, PhD; Aras Mattis, MD, PhD

Hello! My name is Lina Nguyen, and I'm a rising senior at Skyline High School in Oakland, CA. Being from East Oakland, I've witnessed the impacts of environmental racism and healthcare inequity firsthand, from unsafe air quality in my neighborhood to limited access to preventative care. These lived experiences have fueled my passion for using science as a tool for justice. I joined SSRP to strengthen my skills in research and scientific communication, and to grow in an industry where people with identities like mine are still underrepresented. I plan to pursue a pre-med track in college and hope to become a pathologist, combining my interest in science with my commitment to public health. I'm incredibly grateful to be part of the SSRP community and to have the support of such dedicated mentors. Thank you to the SSRP selection committee for believing in my potential as a future scientist. A special thank you to the Mattis Lab and my mentor, Dr. Shahrbanoo Keshavarz Aziziraftar, for helping me grow in confidence and inspiring me to continue on this research journey.

INTRODUCTION

Metabolic dysfunction–associated steatotic liver disease (MASLD) is a common liver condition caused by excess fat buildup in the liver. Unlike alcohol-related liver disease, MASLD results from poor regulation of fat metabolism. Recent research identifies SUGP1, a splicing factor gene, as a novel regulator of cholesterol metabolism. Splicing factors help cells cut and rearrange RNA before it›s translated into protein. In liver cells, SUGP1 alters HMGCR RNA splicing, impacting cholesterol production. iPSCs, which retain the donor's DNA, allow us to study how genetic variation affects diseases like MASLD—even before cells fully differentiate, revealing how early-stage fat processing may be affected. This project aims to bridge gene regulation with disease modeling to better understand how splicing factors like SUGP1 contribute to metabolic disorders.

HYPOTHESIS/OBJECTIVE

Overexpressing SUGP1 will reduce lipid accumulation under fatty acid stress by altering lipid metabolism.

METHODS

Plasmids containing the SUGP1 overexpression construct and packaging plasmids (psPAX2, PMD2.g) were extracted and co-transfected into HEK-293 cells to produce lentivirus. Supernatants were collected at 24, 48, and 72 hours and concentrated. Lentiviral titers were measured, and iPSCs were transduced. Antibiotic selection isolated successfully transduced cells. SUGP1 expression was confirmed by RNA extraction, cDNA synthesis, and qPCR. A SUGP1-KO iPSC line was validated by PCR. An oleate challenge assessed lipid accumulation across control, SUGP1-knockout, and overexpressing lines.

ANTICIPATED RESULTS

SUGP1-overexpressing iPSCs will show reduced lipid accumulation, especially under oleate challenge, compared to control or knockout cells. Lower lipid levels would support the hypothesis that SUGP1 regulates lipid metabolism in response to stress.

SIGNIFICANCE OF PROJECT

If SUGP1 contributes to lipid buildup, it may be a promising therapeutic target for reducing liver fat and cholesterol-related damage. Understanding how SUGP1 affects fat metabolism under stress could reveal new molecular pathways involved in MASLD and identify novel treatment targets. This research may contribute to future precision medicine approaches.

Gloria Ochoa

The Power of Movement: Improving Body Composition and Bone Density in Thalassemia

Mentor: Ellen Fung, PhD, RD

Hello! My name is Gloria Ochoa and I am a rising senior at El Cerrito High School. For the entirety of my life, I've been interested in skin and taking care of it. So, eventually, I will fulfill my dream of working with skin - as a dermatologist! After exploring the different science courses at my school (physiology, biology, and AP chemistry), I found my curiosity for dermatology to have grown even stronger. The world of science is complicated at times, but the challenges and knowledge it presents will forever be vastly interesting to me. The UCSF Summer Student Research Program is yet another step that I can take to tackle my interest in science and medical work, but my peers, mentors, and SSRP leadership have made a huge impact on my journey. I have deep gratitude for everyone who has guided me, with special thanks to my mentor Dr. Ellen Fung!! :)

INTRODUCTION

Thalassemia (Thal) is a rare, autosomal recessive blood disorder that affects the amount of hemoglobin produced. Either partial or complete deficiency of the α or β-globin sub-unit leads to differing severities of the disease resulting in severe anemia, endocrine dysfunction, osteoporosis, and fatigue. Patients with Thal typically have low lean body mass and higher body fat, which is thought to be related to inactivity, testosterone or estrogen deficiencies, and/or nutritional deficiencies. Individuals with increased body fat often have higher visceral adipose tissue, which has been associated with the risk of diabetes and heart disease. In non-Thal populations, exercise has been shown to decrease fat mass, increase muscle mass and improve bone health, though there are no studies that have assessed the effect of exercise on body composition in patients with Thal.

HYPOTHESIS/OBJECTIVE

Subjects with Thal who adhere to a short-term exercise intervention will have a greater positive change in lean body mass and bone mineral density (BMD) compared to individuals with Thal who are not adherent.

METHODS

Nineteen subjects with Thal were recruited to participate in a 12-week usual activity period, followed by a 12-week exercise intervention. During the intervention, subjects were asked to complete moderate level activities at a minimum of 30 min/day, 5x/week. Body composition (total body lean mass, fat, and visceral adipose tissue), and BMD were assessed using DXA. Protocol adherence was assessed using daily self-reported surveys combined with a wearable FitBit device that measured daily steps, calories burned, and time spent in moderate activities.

ANTICIPATED RESULTS

In subjects who are more adherent to exercise (self-reported data showing at least 60% daily adherence), we expect to see a greater increase in lean mass, decrease in total body fat mass and visceral adipose tissue compared to those who are less adherent. As muscle mass is a strong precursor to BMD, we anticipate that as subjects continue with the exercise intervention, we may also see improvements in BMD.

SIGNIFICANCE OF PROJECT

There are no non-pharmacological approaches to improving bone health in patients with Thal. Exercise is a low-risk, easily accessible, self-administered intervention that may not only improve mood, self-confidence, sleep habits and overall quality of life, but if proven effective in this pilot study, has the potential to decrease osteoporosis and fracture risk, some of the most pervasive clinical challenges.

Belem Osorio

Digital Mental Health Screening and Youth Perspectives on AI-Based Support: A Mixed-Methods Study

Mentors: Ramya Ramadas, MD; Lela Bachrach, MD, MS

Hi! My name is Belem Osorio, a rising second-year at UC San Diego, majoring in Cognitive and Behavioral Neuroscience. Growing up in the Bay Area as a first-generation student sparked my passion for bridging underrepresented communities to healthcare/education. My work as a Spanish medical interpreter in Tijuana, clinical volunteer at the UCSD Eating Disorder Center, and role as a peer educator, have all strengthened my drive to go into this field. I am deeply grateful for the people that have supported my journey since day 1, making me realize the importance of having a strong support system. I am honored to return as an SSRP alumni, learning alongside Dr. Bachrach and Dr. Ramadas on how AI can be used to provide more accessible mental health services to adolescents via Sonar. Finally, I would like to thank Dr. Killilea, Dr. Fung, Holly, and the SSRP staff for the support.

INTRODUCTION

Globally, anxiety and depression are some of the leading mental health disorders that are disproportionately impacting adolescents. The COVID-19 pandemic exacerbated an already limited mental health service sector, with an increase in the average waiting time to receive therapy, growing to an average of 13 weeks. The downstream effects for adolescents bring a call to action for sustainable solutions to improve mental health access. For this reason, many digital mental health-based services have been developed to assist patients while they are awaiting services with a behavioral health professional.

HYPOTHESIS/OBJECTIVE

Assess youth attitudes towards AI-based mental health support applications as an adjunct to traditional mental healthcare in assisting with mild to moderate anxiety and depressive symptoms.

METHODS

A mixed methods study was conducted using both focus group and cross-sectional survey data. For the focus groups, a convenience sample of 12 youth participants were recruited via media platforms (Instagram, Slack, and Gmail). Two online focus groups were conducted in English. Interviews were transcribed using the Fathom AI scribe App and thematically analyzed using deductive and inductive methods. In addition, digital social screen data was used to report aggregate cross-sectional descriptive measures on anxiety and depression within the teen clinics. All data was stored on secure, encrypted platforms, protecting confidentiality of patients.

ANTICIPATED RESULTS

A significant number of youth served at the adolescent clinics of the UCSF BCHO will be impacted by mood disorders. App-based mental health services (such as Sonar) will be of interest to youth, especially as a bridge to in-person behavioral health services.

SIGNIFICANCE OF PROJECT

There is limited literature on the utility of AI-based support for mental health services in adolescents. Through this study, we will assess adolescent interests in a specific AI-based mental health support app, Sonar, via focus groups. This will serve as a part of a future feasibility study, evaluating Sonar as a bridge to traditional adolescent mental healthcare and its impacts on mental health outcomes.

Abigail Rivera-Gu

Regulating Gene Expression in Neurons with CRISPR Epigenome Editing

Mentors: James Nuñez, PhD; Peter Colias; Da Xu, PhD

Hi! My name is Abby Rivera-Gu, and I am an incoming freshman at Johns Hopkins University majoring in Chemical and Biomolecular Engineering. For the longest time, I couldn't imagine enjoying biological research—my interests leaned more toward theory than test tubes. But everything changed last summer when I began developing a diagnostic tool for colorectal cancer. Somewhere between the whirring of centrifuges and the rhythm of pipetting, I found myself falling in love with the lab. This led me to UCSF SSRP, where I have been lucky enough to gain exposure to cutting-edge stem cell research in the Nuñez lab at UC Berkeley. I'm incredibly thankful for the SSRP team, the opportunity provided by Dr. James Nuñez, and my mentors, Dr. Da Xu and Peter Colias, for their endless support and an eye-opening learning experience.

INTRODUCTION

Gene therapy has recently emerged as a means of preventing, treating, or curing diseases. Traditional genome editing tools, such as CRISPR-Cas9, enable targeted genetic modifications but raise concerns about permanent DNA alterations and genotoxicity due to double-stranded breaks (DSBs). Epigenome editing has shown promise in providing a safer alternative by modulating gene expression without changing the underlying DNA sequence. This approach uses a catalytically inactive Cas9 protein (dCas9), a programmable DNA binding protein, fused to chromatin effector domains and guided by single-guide RNA (sgRNA) to specific loci in the genome. By modifying epigenetic marks like DNA methylation and histone methylation, epigenome editing enables precise and reversible gene regulation for both research and therapeutic applications.

HYPOTHESIS/OBJECTIVE

CRISPR-based epigenome editing can be used to regulate gene expression in iPSC-derived neurons without altering the underlying DNA sequence.

METHODS

First, we will use RENDER—a virus-like particle-based delivery platform developed in the Nuñez Lab—to deliver CRISPRoff, a dCas9-based epigenome editor, into neurons. We will package CRISPRoff and sgRNA targeting the tau gene into virus-like particles (VLPs). We will then differentiate human iPSCs into neurons and treat them with CRISPRoff-VLPs. Following treatment, we will perform antibody staining and flow cytometry to measure tau protein levels as well as nanopore sequencing to profile DNA methylation at the tau locus and assess epigenetic changes induced by the editor.

ANTICIPATED RESULTS

We anticipate CRISPRoff-VLP treatment will increase DNA methylation at the tau locus and decrease tau protein levels in neurons.

SIGNIFICANCE OF PROJECT

This project demonstrates a programmable approach to gene silencing in human neurons without changing the underlying DNA sequence. By targeting the neural epigenome, this approach offers potential therapeutic applications for neurodevelopmental and neurodegenerative disorders.

Josue Rodriguez

Effect of Duffy Antibody Status on Blood Counts in Persons with Sickle Cell Disease

Mentor: Robert Hagar, MD

Hello! My name is Josue Rodriguez, and I am a rising senior at Pittsburg Senior High School. I'm currently interested in studying anything related to STEM. While I haven't chosen a specific major yet, I hope to figure that out this summer through the SSRP program. Some of my hobbies include playing video games from multiplayer to story mode games, listening to music, and watching TV shows across many genres. Growing up, I always watched a lot of shows like House and Grey's Anatomy. Although I know that it is very different from the real world it sparked my interest in the medical field. That's why the SSRP program felt like the perfect opportunity for me to expand my scientific knowledge and gain some insight on the things people in the medical field work on so I can reevaluate my path for the future. I'm very excited to be working with Dr. Robert Hagar and would like to thank him for giving me the opportunity to be his mentee for this summer.

INTRODUCTION

The Duffy Antigen(FY) is a glycoprotein that is found on the surfaces of RBC's and, like sickle cell disease (SCD), they are common in regions such as sub-Saharan Africa due to their association with resistance to malaria. The two main Duffy antigens (Fya, Fyb) can either be positive (Fya+) or negative (Fya-). Previous research has shown that in various cases any Fy+ was associated with higher white blood cell count (WBC) counts and higher rates of treatment with hydroxyurea (HU); a treatment used to help ease the symptoms of SCD, than the WBC count in Fy- persons. This may be because the Fy- status alone lowers the WBC apparently limiting the use of HU.

HYPOTHESIS/OBJECTIVE

Patients with sickle cell disease and Duffy positive antigens will have higher WBC counts than patients who have the Duffy negative genotype..

METHODS

After IRB approval, all the electronic medical records for patients attending the Adult SIckle Cell Center were abstracted for basic demographics, Duffy antigen status, and standard hematological measures. Patients without Duffy values were cross checked with the blood bank for data not in the health record. A combined database is being constructed and will be analyzed in Excel and in Stata to assess the association of Duffy status with hematologic markers.

ANTICIPATED RESULTS

We anticipate finding a relationship Duffy antigen status has on neutrophils and other hematological counts. We further anticipate finding a dose effect of the number of the two antigens (Fy+) and (Fy-) and the degree of changes in the values of neutrophils,lymphocytes, platelets, and hemoglobin levels.

SIGNIFICANCE OF PROJECT

Duffy antigen status is said to correlate with neutrophil levels. Determining the white cell and other hematologic ranges in our clinics for different Duffy antigens will help monitor the effects of several drugs used on patients with SCD, such as hydroxyurea. By finding accurate white blood cell counts, the maximum tolerated dose and benefit of hydroxyurea can be found.

Camille Rogers

Investigating Calcium Dysregulation and Reactive Oxygen Species in Sickle Cell Disease

Mentor: Angela Rivers, MD, PhD
Contributing Author: Hart Horneman

Hello, my name is Camille Rogers, and I am a rising senior at College Park High School. I have always been very inquisitive about how the world works; however, my Principles of Biomedical Science and my AP Psychology classes have allowed me to become invested in the various aspects and applications of science in my everyday life. I am currently interested in the intersection of medicine, biomedical research, and social justice. I plan to pursue a degree in either neuroscience, biology, or molecular biology, with a focus on a pre-med pathway in college. During this summer, I have had the pleasure of working in the Rivers lab at the Children's Hospital Oakland Research Institute. As I am interested in social justice, working in sickle cell research has been particularly important to me as sickle cell research is underfunded and primarily affects African Americans. I would like to thank my mentors, Dr. Angela Rivers and Hart Horneman, for allowing me to undertake this research and for their patience and kind support throughout my project.

INTRODUCTION

Sickle cell disease (SCD) is a recessive red blood cell disorder characterized by a crescent-shaped red blood cell. This disease is caused by a mutation of the hemoglobin (Hb) protein in red blood cells. The sickled blood cells clump together and block blood and oxygen flow to the body. In addition to these blockages, blood cells can split apart and release reactive oxygen species and calcium. These abnormal components in the bloodstream cause painful vaso-oclusive events.

HYPOTHESIS/OBJECTIVE

This study aims to develop in vitro cellular models for investigating calcium dysregulation and reactive oxygen species (ROS) signaling pathways in SCD to find potential therapeutic modulators of calcium homeostasis and ROS-mediated cellular responses.

METHODS

In this study, we will use mice models that have sickle cell disease (HbSS) and control (HbAA), and volunteer SS and AA human samples from volunteers at UCSF Benioff Children's Hospital. We will place the samples on a 96-well plate and determine the concentration of the cells and agents. We will add Fluo-4 AM to measure calcium levels, tetramethylrhodamine methyl (TMRM) to measure mitochondrial levels, and CellROX Deep Red to measure ROS production. The samples will be analyzed with the Fortessa HTS, an instrument that measures fluorescence intensity based on the dyes. Then we will complete the same experiment but incubating the SS with Endari (L-glutamine), a ROS modulator, and BAPTA-AM, a calcium chelator, to investigate if that can reduce ROS and calcium levels.

ANTICIPATED RESULTS

Based on preliminary data, we expect that the sickle cell models will show elevated intracellular calcium levels, increased ROS production, and reproducible dose-dependent responses to known modulators.

SIGNIFICANCE OF PROJECT

Sickle cell disease is a significant cause of early mortality in children, but there is limited number of drugs to help minimize the struggles and pain that sickle cell causes. Other therapies like bone marrow transplants and gene therapies are expensive, and it can be difficult to find the correct antibody type that the patient needs in some areas. By conducting this study, we hope to create more new drugs to relieve some of the pain that sickle cell patients face.

Isabella Rossl

Interviewer-Assisted ASA24 Recalls via Zoom Are a Feasible Method for Collecting Dietary Intake in Hispanic/Latino Adults Undergoing Weight Loss Treatment

Mentor: June Tester, MD, MPH

My name is Isabella and I am a Master's student in Nutritional Sciences and Dietetics at UC Berkeley. One of my deepest career goals is to become a compassionate and evidence-based dietitian who can provide culturally sensitive care to diverse communities. This summer, I've had the incredible opportunity to work with Dr. June Tester on my capstone research project utilizing ASA24 dietary recalls to assess dietary patterns in a predominantly Hispanic/Latino population. Through this project, I've developed a greater appreciation for the role of nutrition research in shaping clinical guidelines and improving health equity. I am especially grateful for the opportunity to shadow Dr. Tester and other dietitians working in diabetes care, where I've been able to observe the impact of culturally competent nutrition counseling—often delivered in Spanish—on patient outcomes. This experience has deepened both my research skills and my commitment to community-centered clinical practice.

INTRODUCTION

Accurate and feasible dietary assessment is a critical component of evaluating nutrition interventions, particularly among underserved populations. The Automated Self-Administered 24-Hour Recall (ASA24) is a validated web-based dietary recall tool, but challenges exist for individuals with limited digital literacy, including many Hispanic/Latino adults. This study explores the feasibility, usability, and perceived burden of administering ASA24 recalls with real-time interviewer assistance in Spanish-speaking adults participating in a clinical weight loss program.

HYPOTHESIS/OBJECTIVE

We hypothesize that providing interviewer assistance via Zoom during ASA24 administration will enhance feasibility, acceptability, and usability of the dietary recall process for Spanish-speaking Hispanic/Latino adults receiving weight management care.

METHODS

We are recruiting up to 10 Hispanic/Latino adult participants from an ongoing weight loss intervention program at a university-based clinic. Participants complete the ASA24 recall with guided assistance over a HIPAA-compliant Zoom call in either Spanish or English. Following the dietary recall, participants complete a brief survey assessing the perceived difficulty, usability, and acceptability of the process. Qualitative notes and survey data will be analyzed to assess common themes related to barriers, facilitators, and overall user experience.

ANTICIPATED RESULTS

We anticipate that the majority of participants will report that interviewer-assisted ASA24 is easy to follow, reduces confusion, and makes the dietary recall experience more accessible. We expect that participants will identify fewer usability issues compared to fully self-administered use, and that this method will be well received, especially among those with limited literacy or digital skills.

SIGNIFICANCE OF PROJECT

This project aims to improve equitable access to validated dietary assessment tools in research and clinical practice. By exploring an adapted approach to using ASA24 in a culturally relevant and supportive format, this work may inform future efforts to increase participation, data quality, and inclusivity in nutrition studies involving underrepresented populations, particularly Spanish-speaking communities.

AJ Schroeder

Assessing the Impact of Titanium on Total Iron Binding Capacity (TIBC) Assays and Serum Iron Assays

Mentors: David Killilea, PhD; Alice Cha, MD
Contributing Author: Kathy Schultz, MS

Hello, my name is Aj Schroeder. I will be entering my fourth year at Lewis & Clark College as a Biochemistry and Molecular Biology major, with minors in Data Science and Chemistry. My academic interests stem from early and ongoing exposure to the medical field through a lengthy personal medical history that has fostered a curiosity for the mechanisms that determine human health. I became particularly fascinated by the molecular basis of symptom causation and specifically how small molecule interactions contribute to physiological outcomes. This interest has driven me towards laboratory based chemistry that has direct applications to clinical research and patient outcomes. I am deeply grateful for the opportunity to explore these intersections this summer through the UCSF SSRP under the guidance of Dr. David Killilea and Dr. Alice Cha. I sincerely thank my mentors, as well as all members of the Killilea lab and SSRP program, for preparing me for a future in research and for introducing me to the field of mineral bioactivity.

INTRODUCTION

Increasing systemic exposure to titanium through biomedical implants, ingestion, and environmental factors has led to elevated serum titanium levels in some patients. Titanium has been shown to bind to transferrin, a key iron transport protein in serum, with greater affinity than iron itself. This raises concern about the reliability of clinical iron assays for patients with elevated serum titanium, particularly Total Iron Binding Capacity (TIBC) and Serum Iron tests, which depend on transferrin iron binding for accurate quantification.

HYPOTHESIS/OBJECTIVE

Determine whether elevated serum titanium interferes with the accuracy of clinical iron assays.

METHODS

A clinical assay based on colorimetric iron determination will be conducted using serum supplemented with physiologically relevant concentrations of titanium. In parallel, simplified assay models excluding serum were previously performed to evaluate the iron detection accuracy of colorimetric iron indicators Ferrozine and Ferene in the presence of titanium. Titanium's impact on iron detection was evaluated via absorbance spectroscopy.

ANTICIPATED RESULTS

Based on preliminary data, Ferrozine and Ferene demonstrated accurate iron detection performance in the presence of titanium at or above reported physiological titanium serum levels independent from transferrin, suggesting that titanium does not directly impact the iron detection mechanisms under tested conditions. No significant interference with TIBC or Serum Iron was observed in absorbance signals. Further experimentation will be performed to confirm this outcome and determine required levels of titanium for interference.

SIGNIFICANCE OF PROJECT

Understanding the threshold at which titanium interferes with clinical iron assays is vital for diagnostic accuracy in patients with biomedical implants. These findings contribute to the validation of current clinical protocols and inform future assay design that improves patient outcomes.

Shea Stubblefield

Investigating the role of endocrine-disrupting chemicals in endometriosis pathogenesis

Mentor: Joshua Robinson, PhD
Contributing Authors: Lin Li, MD, PhD; Amanda Gutierrez; Jessica Chen

My name is Shea Stubblefield, and I'm a rising fourth year at UC Berkeley double-majoring in Integrative Biology and Molecular and Cell Biology. I am honored to be a returning student with SSRP and to have mentored a small group of students whose growth, passion, and wit I am so deeply proud of. As an aspiring OB/GYN, it has been an incredible opportunity to research endometriosis and the environmental chemicals that may influence its onset and severity. In the wake of DEI programs across the nation being gutted by the new administration, I am especially grateful to the donors who made this summer's SSRP cohort possible, and I call on those in positions of power to continue supporting programs like this. Thank you to Dr. Joshua Robinson, Dr. Lin Li, Amanda, Boos, and everyone else around the lab who has nurtured my interests, encouraged me, and answered my many questions. And a special thank you to my Uncle Sal, who made all my work in the lab possible by driving me to BART every morning.

INTRODUCTION

Endometriosis, a reproductive disorder affecting ~10% of women worldwide, is characterized by the abnormal growth of endometrial tissue outside the uterus and is commonly associated with pelvic pain, dysmenorrhea, and infertility. Genetic and environmental factors contribute to its pathogenesis. Widespread exposure to endocrine-disrupting chemicals (EDCs), including bisphenols, flame retardants, pesticides, dioxins, and per- and polyfluoroalkyl substances (PFAS), raises concerns due to their accumulation in reproductive tissues. While their role in endometriosis remains unclear, EDCs may contribute by damaging endometrial and ovarian cells, disrupting hormone signaling and inducing inflammation, oxidative stress, or cell death. Nontargeted mass spectrometry (MS) provides novel insight into the exposome in reproductive disease, enabling identification of environmental contributors to endometriosis.

HYPOTHESIS/OBJECTIVE

EDCs contribute to endometriosis.

METHODS

We will leverage a nontargeted MS dataset of plasma samples from endometriosis cases (n = 162) and controls (n = 86) generated by the California Department of Toxic Substances Control (DTSC). From the 2,000 annotated molecular features, we will identify compounds corresponding to classes of EDCs and examine correlations within and across classes to determine co-exposure patterns and potential shared sources. Associations between prioritized EDCs and endometriosis will be assessed using statistical approaches to assess differential relative abundance and differential detection between cases and controls. Lastly, relevant cell models and assays will be identified via literature to experimentally validate key findings.

ANTICIPATED RESULTS

We have identified multiple EDCs widely detected in the cohort, including legacy (e.g., PFOA and BPA) and emerging EDCs (e.g., BDPP, an organophosphate flame retardant). We anticipate significant correlations within chemical classes due to shared sources and expect associations with endometriosis, particularly for compounds or classes previously linked to reproductive toxicity. We will identify novel EDCs linked to disease that warrant follow-up in experimental models.

SIGNIFICANCE OF PROJECT

This project aims to clarify the role of EDCs in endometriosis, a common and debilitating reproductive disease, by advancing understanding of environmental contributors and informing future research and prevention efforts.

Cristhel Temoxtle

Assessing Barriers to Latent TB Treatment to Inform Patient Education

Mentor: Mai Baalbaki, MD, MSc

Hello! My name is Cristhel Temoxtle, and I am a rising sophomore at UC Berkeley intending to major in bioengineering. I am passionate about pursuing a career in the medical field and aspire to continue my studies in graduate school, either through a bioengineering program or by attending medical school where I would like to specialize in cardiology. As a low-income first-generation Latina college student, being granted this wonderful opportunity has provided me with invaluable resources and knowledge to propel my journey in healthcare. I would like to thank Dr. Mai Baalbaki for giving me the opportunity and guidance to do clinical research on tuberculosis. Through her guidance I was able to further fuel the reason I want to pursue a career in health, to give back to patients, just as so many dedicated professionals once helped me regain my vision and gave my cousin a second chance at life. I would also like to thank the SSRP leadership team for allowing me to be part of this inspiring cohort. This experience has not only deepened my interest in healthcare but also empowered me to envision a future where I can make a lasting impact in underserved communities.

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis (M.tb)*, which remains a public health concern in California. TB disproportionately impacts the most vulnerable populations: non-U.S.-born, the unhoused, and immunocompromised individuals, due to inequities in care and living conditions. The majority of patients present with latent TB infection (LTBI), in which *M.tb* infection has occurred, but individuals are non-contagious and asymptomatic due to control of bacterial growth by the immune system. In active TB, deficiencies in the patients' immune system allow the *M.tb* infection to grow, resulting in patients becoming symptomatic, contagious, and, without treatment, death. M.tb infection often goes undetected and untreated. Early interventions are crucial to minimize public health risk of TB. Barriers such as poverty, stigma, lack of insurance, and language needs are some primary obstacles preventing patients from accessing TB screening services and treatment.

HYPOTHESIS/OBJECTIVE

Patient surveys will identify barriers that complicate patient access to LTBI treatment. Once identified, these barriers can be addressed to improve patient outcomes and provide equitable healthcare services.

METHODS

A verbal questionnaire with free-response, closed-ended, and Likert scale questions was designed to identify barriers to LTBI care and patients' understanding of transmission and treatment. The questionnaire was offered to asymptomatic adults accessing TB testing services at the Berkeley Free Clinic, July 2025. Descriptive statistics and thematic analysis will be used to analyze quantitative and qualitative data. The results will inform the creation of patient education materials on LTBI treatment and inform a TB advocacy initiative for patients undergoing treatment.

ANTICIPATED RESULTS

The data collected will provide insight into patients' knowledge of TB pathophysiology and barriers they are experiencing in accessing healthcare. The dissemination of patient-informed educational materials and the establishment of a patient advocacy group could improve participation in TB testing, enhance LTBI treatment adherence, reduce loss to follow-up, and improve patient outcomes.

SIGNIFICANCE OF PROJECT

Designing patient educational materials informed by patients will improve their ability to make informed decisions regarding their healthcare, improving health outcomes, and lowering active TB risk.

Brianna Tong

Milk Type in Toddlers (Milk-TOT): Whole vs Low-fat Milk effects on Dietary Intake for Toddlers Aged 2-3

Mentor: Kassandra Bacon, MPH
Contributing Authors: Lorrene D. Ritchie, PhD, RD; Anisha I. Patel, MD, MSPH, MSHS

Hi, my name is Brianna Tong and I am a rising senior at UC Davis studying Clinical Nutrition with a minor in public health. Throughout my childhood, I always grew up very unaware of how critical nutrition played a role in shaping our health in the future. My goal is to be a pediatric dietitian focusing on preventing childhood obesity and the first 1000 days by ensuring every child has access to basic nutrition education and nutrition-dense foods. I believe no child should grow up confined to having access to only energy-dense foods without any knowledge of how nutrition lays the foundation for our health status for the rest of our lives. I joined UCSF SSRP to expand my knowledge through research trials and hands-on experiences on how we can help our communities understand nutrition from a young age. I am very thankful for the organizers behind UCSF SSRP for giving me the opportunity into the world of nutrition research. I would also like to thank Kassandra Bacon and Lorrene Ritchie for everything they have taught me as I will carry these lessons with me into my future career.

INTRODUCTION

Childhood obesity has been rising over the years, reaching an all-time high of 19.7% prevalence in the U.S. in 2024. Studies have found that early intervention regarding dietary habits and lifestyle is critical to preventing the rise from continuing. The Dietary Guidelines for Americans recommend that children switch from whole fat to 1% low-fat milk once they are 2 years old; however it has not been proven that this milk type is optimal for preventing obesity and improving dietary quality.

HYPOTHESIS/OBJECTIVE

The objective is to analyze the effects of a child drinking whole or low-fat milk on their dietary intake and quality. We will examine ASA24 dietary recalls using the 2020-2025 Dietary Guidelines for Americans (DGAs) to score dietary components and generate cumulative scores on dietary quality. We hypothesize that compared to 2-3-year-old children drinking low-fat milk, children drinking whole milk will have lower intakes of fat, total Kcals, and added sugars, thus having overall higher diet quality.

METHODS

Each participant will provide 24-hour dietary recall data from 2 weekdays and 1 weekend (3 total timepoints). The data will be entered into the online ASA24 software. Then, data is imputed into Excel to create a mean intake for all dietary components, and the dietary quality will be assessed using the Healthy Eating Index based on the 2020-2025 DGAs.

ANTICIPATED RESULTS

We anticipate that compared to 2–3-year-old children drinking low-fat milk, children drinking whole milk will have lower intakes of fat, total Kcals, and added sugars thus having overall higher diet quality.

SIGNIFICANCE OF PROJECT

The results of the Milk-TOT study can educate and inform policies on the most optimal milk type for children aged 2-3 and can be implemented into federal nutrition assistance programs such as SNAP (formerly known as Food Stamps, and termed CalFresh in California) and WIC. Furthermore, the study can inform pediatricians for recommendations when young children wean off breastmilk or formula.

Yuvraj Walia

Hair and Nail Biomarkers as Noninvasive Indicators of Micronutrient Status and Systemic Health in Celiac Disease

Mentor: Mala Setty, MD
Contributing Author: David Killilea, PhD

Hello! I'm Yuvraj, a rising sophomore at UCLA studying Biology and Political Science, interested in shaping healthcare systems and policy to better serve underserved and chronically ill populations. As a patient with an autoimmune disorder, I have long been passionate about improving the lives of others facing similar challenges through advocacy, volunteering, and community outreach. Now—thanks to the UCSF SSRP—I am excited to directly improve patient care through scientific research. I am investigating micronutrient deficiencies and immunodeficiency in individuals with Celiac disease, aiming to improve diagnostic and long-term monitoring practices and elevate the standard of care for patients. As a physician, I hope to continue fighting for patients with GI and autoimmune disorders, empowered by the SSRP. Thank you to Dr. Mala Setty and Dr. David Killalea for their guidance and mentorship!

INTRODUCTION

Celiac disease (CD), an autoimmune disorder related to gluten ingestion, affects 70 million people worldwide and is only growing more prevalent each year. CD often leads to malabsorption of essential micronutrients, including zinc, iron, and other trace elements. The gluten-free diet (GFD) may also alter exposure to environmental toxins like arsenic and impact long-term nutritional balance. Hair and nail tissues, which reflect long-term micronutrient exposure, are promising, noninvasive biomarkers for monitoring patient health. Yet, no studies have evaluated these biomarkers in relation to clinical measures in CD patients.

HYPOTHESIS/OBJECTIVE

To investigate associations between trace metal concentrations in hair and nails and clinical indicators—including bone mass density, ferritin, body mass index, and nutrient deficiencies—to improve CD monitoring and diagnosis.

METHODS

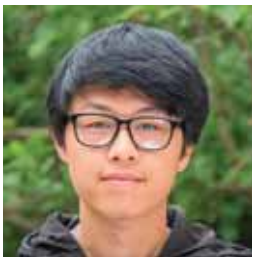
Hair and nail samples from UCSF Celiac Disease Registry participants were analyzed via inductively coupled plasma mass spectrometry (ICP-MS) to quantify concentrations of 21 trace elements. These data were linked to clinical records, including CD symptoms, DEXA scans, body composition, blood panels, and mineral labs. Clinical reference ranges were used to classify metal status (deficient, normal, high) and identify individuals "at risk" based on ±1 SD thresholds. Statistical analyses included linear regression, Welch's t-tests, Fisher's exact tests, and Spearman correlation to determine relationships between trace metals and clinical parameters.

ANTICIPATED RESULTS

We anticipate a substantial proportion of CD patients will exhibit deficient or at-risk zinc levels. We expect higher nail zinc levels to correlate with better bone mineral metrics, such as whole-body BMD. We also anticipate inverse correlations between zinc and its metabolic competitors, such as copper and iron.

SIGNIFICANCE OF PROJECT

This project demonstrates the utility of hair and nail samples as noninvasive, stable, and integrative biomarkers of nutritional status in celiac disease. Understanding trace metal imbalances can inform new CD monitoring strategies and shed light on long-term risks like osteoporosis or chronic metal exposure. Ultimately, this work aims to improve patient outcomes through more comprehensive and accessible tools for tracking systemic health in CD.



Ziyao Yuan

Optimization of Non-viral Knock-in in Hematopoietic Stem Cells

Mentors: Jenny Lee; Ke Li, PhD; Brian Shy, MD, PhD

Hello! My name is Ziyao Yuan and I am a rising senior at Alameda Science and Technology Institute High School. Ever since I took my first biology course and heard about figures like Charles Darwin and Gregor Mendel, I have been fascinated by the depth of this field. I realized that although these people may be long gone, their work continues to help others even hundreds of years later. This is what inspires me to pursue science and create contributions like these through research, and I am incredibly grateful to SSRP for giving me this opportunity to learn more about the field of biomedicine. I would also like to thank my mentors Jenny Lee, Dr. Ke Li, Dr. Brian Shy and everyone else at Shy Labs for orienting me throughout the first few weeks and for showing me what being a scientist is really like.

INTRODUCTION

CRISPR/Cas9 is a genome editing technology that enables targeted modification of DNA sequences in living cells. Shy et al. have developed a CRISPR-Cas9 engineering approach using modified single-stranded DNA templates that allows us to eliminate the use of viruses while achieving high knock-in efficiencies and yields. Hematopoietic stem cells (HSCs) are uniquely capable of self-renewal and differentiation into all blood and immune cell lineages, making them an ideal target for addressing numerous inherited and acquired conditions.

HYPOTHESIS/OBJECTIVE

We aim to develop a highly-efficient, GMP-compatible editing platform to engineer CD34+ HSCs by optimizing critical process parameters: safe harbor sites, electroporation buffer and pulse codes, as well as HDR template (HDRT) concentration.

METHODS

Thawed CD34+ Cells were plated at a density of 100k Cells/mL and expanded for two days before editing. The expanded cells were then electroporated on the MaxCyte GTX with HDR templates, Cas9s, and sgRNAs targeting either the AAVS1 or CCR5 safe harbor sites. After 5 days, the edited cells were counted and analyzed through flow cytometry to measure the toxicity, non-viral knock-in efficiency, and yield of successfully edited cells that are mCherry+ or mNeon+.

ANTICIPATED RESULTS

From a pilot experiment, we saw that higher electroporation pulse codes resulted in higher knock-in (KI) efficiency in AAVS1 without introducing additional toxicity. Similarly, higher HDRT concentrations also resulted in greater KI efficiency, albeit leading to higher toxicity.

SIGNIFICANCE OF PROJECT

HSC editing through CRISPR-Cas9 can help scientists develop new therapy methods for conditions such as sickle cell disease, β-thalassemia, and many primary immunodeficiencies. Furthermore, autologous editing of a patient's HSCs minimizes the risk of graft-versus-host-disease (GVHD), increasing the safety and efficacy of treatment. What sets CRISPR-Cas9 apart from its precursors (ZFN and TALENs) lies in its lower cost of use, multiplexed editing, and variant applications. By optimizing CRISPR/Cas9-mediated knock-in at safe harbor sites in HSCs, researchers aim to improve the efficiency and safety of gene editing approaches for treating blood disorders and advancing cell-based therapies.

Winston Zapet Bamac

Cathepsin B-Cystatin C Correlation in Human SCD Patients and Pharmacological Inhibition of CTSB in Sickle Cell Mouse Models lowers cystatin C

Mentor: Angela Rivers, MD, PhD
Contributing Authors: Eric Soupene, PhD; Hart Horneman

My name is Winston Zapet Bamac and I am an incoming junior at the University of Puget Sound pursuing a B.S. in Biochemistry. I am interested in pursuing an MD/PhD with a career in translational medicine to bring the bench to the bedside and the bedside to the bench. The ability to develop answers to seemingly daunting questions surrounding disease intrigues me, and using experiences from direct patient care to develop new questions only fuels the investigative fire that procures novel breakthroughs. I am incredibly grateful to Dr. Angela Rivers and Dr. Eric Soupene for their mentorship and the warm members of the Rivers Lab for welcoming me. I would also like to thank the SSRP Team for their dedication to providing students from marginalized backgrounds the opportunity to explore a career in science. I could not dream of a career filled with mentorship without the immense support of my previous and current mentors, so I am grateful for the continued support that helps me turn my dreams into reality.

INTRODUCTION

Sickle Cell Disease (SCD), an inherited genetic disorder, causes the abnormal sickle shape of red blood cells (RBC) which often leads to other comorbidities like kidney dysfunction. RBC function requires removal of cytosolic organelles before being released into circulation. Cathepsin B (CTSB) is a known negative-regulator of this process, and its elevated levels have been linked to heart and kidney disease. Our preliminary experiments revealed that both the amount and enzymatic activity of CTSB was SCD patients. Kidney function is assessed by measuring Cystatin C levels in the blood, which are often elevated for individuals with SCD due to associated kidney dysfunction. Additionally, Cystatin C is a known inhibitor of CTSB, so their levels may be correlated.

HYPOTHESIS/OBJECTIVE

We hypothesize that Cystatin C and CTSB levels will show a positive correlation in human samples, with elevated CTSB activity corresponding to increased Cystatin C expression as a compensatory regulatory response to control excessive proteolytic activity. Additionally, the pharmacological inhibition of CTSB will result in decreased CTSB enzymatic activity and a reduction in Cystatin C levels, demonstrating that Cystatin C expression is regulated by CTSB.

METHODS

RBC, whole blood (WB), and plasma samples were collected from patients with SCD at UCSF Benioff Children's Hospital. SCD mice were administered 80mg/kg of CA-074 CTSB inhibitor for 8 weeks, then sacrificed. RBC, WB, plasma, and tissue were collected from mice and snap frozen. Sample lysates were extracted from all human and mice samples. The amount of Cystatin C and CTSB in the lysates was measured using an ELISA assay kit, and an enzymatic activity kit was used to measure protein activity.

ANTICIPATED RESULTS

CTSB levels are positively correlated to Cystatin C levels, and inhibiting CTSB leads to lower levels of Cystatin C.

SIGNIFICANCE OF PROJECT

Establishing CTSB's regulatory role of Cystatin C levels contributes to CTSB's potential as a therapeutic target for SCD.

44th Annual Summer Student Research Program Symposium

National Institutes of Health (NIH) Scholars


Ellis Anderson


James Bell


Samantha Collins


Sophia Alessandra Cunanan


Karina He


Alexander Heuer


Nhu Huynh


Anoushka Kolluru


Samantha Ma


Mira McDavitt


Belem Osorio


AJ Schroeder


Shea Stubblefield


Cristhel Temoxtle


Brianna Tong


Yuvraj Walia


Winston Zapet Bamac

This group of undergraduate students was funded by the National Institutes of Health (NIH), STIMULUS grant (Science & Technology IMmersion for Underrepresented Learners in the US). The students were selected from a competitive pool of undergraduates who attend schools throughout the United States. Each NIH funded student developed their own hypothesis driven project, carried out this project during the 9-week one-on-one mentored program, presented a brief 'flash talk' about their work to their peers, participated in a half-day clinical simulation experience, weekly journal clubs, ethics discussions, scientific and educational enrichment activities and will be presenting the findings of the results from their project in both oral and poster presentation formats during the SSRP symposium sessions.

California Institute for Regenerative Medicine (CIRM) Scholars

Miles Jackson

Frances Lee

Amaan Mohammed

Lina Nguyen

Abigail Rivera-Gu

Ziyao Yuan

This group of high school students were funded by the California Institute for Regenerative Medicine (CIRM) Sustain-A-SPARK grant (Supporting Underrepresented STEM Adapting to Change: Summer Program to Accelerate Regenerative Medicine Knowledge). Their summer research project's focused primarily on stem cell, progenitor cell or stem cell translational research. In addition to their research, they presented a brief 'flash talk' about their work to their peers, they engaged in patient focused activities, blogged about their research activities, and attended numerous additional education activities regarding stem and bone marrow transplant. Students also had the opportunity to tour the Thermo Fisher GMP facility at the UCSF Mission Bay Campus, where gene therapy products for human clinical trials are produced. These students will have the opportunity to present their results twice, at the CIRM-SPARK annual conference in San Diego in August with the other CIRM SPARK trainees from California, and again at our SSRP research symposium.

Doris Duke Foundation (DDF) Scholars


Alexa Adutwum


Sophia Calderon Mendez


Caroline De La Cruz


Vivian Galvez


Sianny Guzman


Angela Leon-Alvarez


Austin Ly


Heidi Mendez-Mejia


Gloria Ochoa


Josue Rodriguez


Camille Rogers

This group of high school students were funded by a grant from the Doris Duke Foundation, SUSTAIN grant (SSRP Supporting Underrepresented STEM students AdaptINg to Change). Both high school and returning SSRP DDF Scholars who are now undergraduate students are funded under this funding mechanism. All students are interested in pursuing careers in bioscience and/or health care. Each DDF funded student developed their own hypothesis driven project with the assistance of their mentor, carried out this project over our 9-week program, presented a brief ‘flash talk’ about their work to their peers, participated in weekly journal clubs, scientific and educational enrichment activities. Students also had the opportunity to tour the Thermo Fisher GMP facility at the UCSF Mission Bay Campus, where gene therapy products for human clinical trials are produced. Each student is presenting the results of the findings from their project in both oral and poster presentation formats during the SSRP symposium sessions.

NASA Scholar

Antonio Harris

This undergraduate student was funded by a grant from NASA (National Aeronautics & Space Administration) entitled: “Magneto-metabolism: A potentially new biosignature for the astrobiology community. A pilot study.” As part of his summer internship, he participated in all SSRP curriculum activities, including weekly journal clubs, ethics discussions, scientific and educational enrichment activities and will be presenting the findings of the results from his project in both oral and poster presentation formats during the SSRP symposium sessions. In addition, he gave a brief oral presentation to scientists at a local NASA campus on the significance of his independent research activities.

UCB Masters in Dietetics Internship

Alison Ishikawa

Isabella Rossl

For the second consecutive year, we collaborated with administrators from the Master’s Degree in Dietetics Program at the University of California, Berkeley. This 2-year Clinical Dietetics program requires each student to complete a summer research ‘CAP Stone’ project. These students, part of the UCB Master’s program, were selected from a highly competitive pool of applicant from all over the United States, With the guidance of their research mentors, they developed their own hypothesis driven project, carried out their project during the 9-week ono-on one mentored program, presented a brief ‘flash talk’ about their work to the peers, participated in weekly journal clubs, scientific and educational enrichment activities. They are presenting the results of the findings form their project to the UC Berkeley Nutrition Faculty at their research symposium as well as to the UCSF community as par of the SSRP symposium sessions.

44th Annual Summer Student Research Program Symposium

Highlighting our SSRP Small Group Leaders

Samantha Collins
SSRP ‘24 & ‘25
UC San Diego, 2028

Belem Osorio
SSRP ‘24 & ‘25
UC San Diego, 2026

Shea Stubblefield
SSRP ‘24 & ‘25
UC Berkeley, 2026

Winston Zapet Bamac
SSRP ‘24 & ‘25
University of Puget Sound, 2027

Each year, a small group of students are selected to participate in the SSRP programming for a second year as ‘Alumni.’ These students are selected on the basis of leadership potential, research curiosity, drive and passion for science. They applied to the program because they valued their SSRP research experience and had a desire to dig deeper into a research project related to their first SSRP internship or a completely novel research area. In addition to their own independent research, they are responsible for leading weekly small group sessions, supporting fellow interns as they negotiate research obstacles, and develop a sense of community amongst the interns. We are incredibly proud of this group of alumni and thank them for their assistance this summer. We look forward to following the career trajectories of these bright young students.

This Year's Mentors

Mentor	Department, Division	Location
Akua Agyekum, BS	Clinical Research Coordinator	UCSF Benioff Children's Hospital Oakland
Tariq Ahmad, MD	Pediatrics, Endocrinology	UCSF Benioff Children's Hospital Oakland
Mai Baalbaki, MD	Department of Pediatrics	UCSF Zuckerberg SF General
Lela Bachrach, MD MS	Pediatrics, Adolescent Health	UCSF Benioff Children's Hospital Oakland
Kassandra Bacon, MPH	Nutrition Policy Institute	UC Berkeley
Peter Beernink, PhD	Pediatrics, Virology	UCSF, MLK Research Building
Sonali Belapurkar, MD	Pediatrics, Endocrinology	UCSF Benioff Children's Hospital Oakland
Sirirak Buarpung, DVM, PhD	Obstetrics & Gynecology	UCSF, Parnassus Campus
Judy Cavazos, PhD	Psychology	UCSF Benioff Children's Hospital Oakland
Jennifer Chen, MD	Hepatology	UCSF, Parnassus Campus
Peter Jon Colias, BS	Molecular Cell Biology	UC Berkeley
Thuy Doan, MD, PhD	Opthalmology	UCSF, Parnassus Campus
Ellen Fung, PhD, RD, CCD	Pediatrics, Hematology	UCSF Benioff Children's Hospital Oakland
Stephanie Gaw, MD, PhD	Obstetrics & Gynecology	UCSF, Parnassus Campus
Saber Gharagozlou, PhD	Hematology	UCSF, MLK Research Building
Jessica Gonsalves, BS	Project Manager	UCSF, Parnassus Campus
Ward Hagar, MD	Hematology	UCSF Benioff Children's Hospital Oakland
Lauren Harasymiw, MPH, MD, PhD	Neonatology	UCSF, Parnassus Campus
Miriam Hernandez-Morales, PhD	Electrical Engineering & Computer Science	UC Berkeley
Sunita Ho, MS, PhD	Dentistry	UCSF, Parnassus Campus
Hart Horneman, BS	Pediatrics, Hematology	UCSF, MLK Research Building
Shahrbanoo Keshavarz Aziziraftar, PhD	Pathology	UCSF, Mission Bay Campus
David Killilea, PhD	Office of Research	UCSF, MLK Research Building
Minjoo Kim, PhD	Innovative Genomics Institute	UC Berkeley
Jenny Lee, BS	Investigational Cellular Therapy	UCSF, Mission Bay Campus
Ke Li, PhD	Investigational Cellular Therapy	UCSF, Mission Bay Campus
Dayna Long, MD	Pediatrics	UCSF, Claremont Clinic
Aris Mattis, MD, PhD	Pathology	UCSF, Mission Bay Campus
Marisa Medina, PhD	Pediatrics	UCSF, MLK Research Building

This Year's Mentors

Mentor	Department, Division	Location
Mohammad Mehraban, PhD, MS	Pathology	UCSF, Mission Bay Campus
Robert Mok, BS	Pediatrics	UCSF Benioff Children's Hospital Oakland
Jason Nagata, MD, MSc	Pediatrics	UCSF, Mission Bay Campus
James Nunez, PhD	Molecular Cell Biology	UC Berkeley
Babak Oskouian, PhD	Hematology	UCSF MLK Research Building
Jennifer Price, MD, PhD	Hepatology	UCSF, Parnassus Campus
Yuanyuan Qin, PhD	Pediatrics	UCSF, MLK Research Building
Ramya Ramadas, MD	Adolescent Health	UCSF Benioff Children's Hospital Oakland
Angela Rivers, MD, PhD	Pediatrics, Hematology	UCSF Benioff Children's Hospital Oakland
Joshua Robinson, PhD	Obstetrics & Gynecology	UCSF, Parnassus Campus
Carlotta Ronda, PhD	Innovative Geonomics Institute	UC Berkeley
Julie Saba, MD, PhD	Hematology	UCSF, MLK Research Building
Patricia Santana, PhD	Innovative Genomics	UC Berkeley
Kathy Schultz, MS	Office of Research	UCSF, MLK Research Building
Mala Setty, MD	Gastroenterology	UCSF Benioff Children's Hospital Oakland
Brian Shy, MD, PhD	Investigational Cellular Therapy	UCSF, Mission Bay Campus
Prachi Singh, DO, FAAP	Pediatrics, Infectious Diseases	UCSF Benioff Children's Hospital Oakland
Matthew Stachler, MD, PhD	Molecular Pathology	UCSF, Parnassus Campus
June Tester, MD MPH	Pediatrics	UCSF Benioff Children's Hospital Oakland
Marsha Treadwell, PhD	Pediatrics, Psychology/Hematology	UCSF Benioff Children's Hospital Oakland
Hsuan-Yuan Wang, PhD	Obstetrics & Gynecology	UCSF, Parnassus Campus
Felisa Wolfe-Simon, PhD		Bay Area Environmental Research Institute
Da Xu, PhD	Molecular Cell Biology	UC Berkeley
Susan Yang, BS	Clinical Research Coordinator	UCSF Benioff Children's Hospital Oakland
Yuqing Zhang, BS	Pediatrics, Cardiology	UCSF, MLK Research Building

Notes


UCSF Summer Student Research Program
2025

Summer Student Research Program
Focusing on our diversity

Summer Student Research Program
5700 Martin Luther King Jr. Way
Oakland, CA 94609
summerstudents.ucsf.edu