UCSF Benioff Children's Hospital
Oakland

BUILDING UNITY in SCIENCE

40th Annual Bertram Lubin Summer Student Research Program Symposium

FRIDAY, AUGUST 6, 2021

August 6, 2021

Welcome to the 40th Annual Bertram Lubin Summer Student Research Symposium! We are here to celebrate 40 years of scientific training of young investigators. The theme of our program this year, 'Building Unity in Science', speaks to the focus of our program since its beginning 4 decades ago: to increase diversity in STEM (science, technology, engineering, math). The Summer Student Research Program (SSRP) was founded by Dr. Bertram Lubin in 1981, the son of a grocer and the first in his family to attend university. Dr. Lubin had the foresight to understand the importance of cultural, economic and ethnic diversity in healthcare, and how unique perspectives enable solutions to complex scientific problems. The wealth of our diversity is represented in abundance in this summers' matriculating class of 39 high school and undergraduate students all considering careers in biomedical research and other health care fields. These SSRP interns represent the creativity and hope for the future in biomedical research.

These students have overcome many obstacles during the pandemic of this past year to achieve their goals. Each struggled through the challenges of a fully virtual educational curriculum, identifying new ways to be successful in a distance learning environment. A number of students had extended family members suffering from COVID or COVID related illnesses and economic stressors requiring them to balance daily caregiving of family members. Yet despite these challenges, these students have been incredibly strong and resilient, a character trait that will prove invaluable in the future.

Today's virtual oral and in-person poster presentations constitute the conclusion of a nine-week long hybrid research program that has featured a rigorous mentored guided research project and education curriculum. We invite you to learn about the original research projects that the trainees were involved in such as, The Investigation of HLA Genes in Type 1 diabetes, Predictors of Low Bone Density in Transgender Youth, and the Impact of Dance on Teens Dealing with Trauma. Other students are focused more on methodological challenges such as the Development of iPSCs as a Genetic Model for NAFLD, Optimization of Blood Mineral Assessments and the Development of a Point-of-Care Device to Monitor Anemia. Please mingle and chat with the all 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 MLK, UCSF Benioff Children's Hospital Oakland, UCSF and UC Berkeley 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 Jennings, and Elijah Goldberg, the core of our leadership team, as well as Kathleen Schultz, Sarah King, Dale Williams, Aaron Streets, Kala Mehta, Maria Garcia, Lily Mirels and all MLK and BCHO staff, guest seminar speakers and other friends of the SSRP for their effort and time, which made this summer's program a huge success. We acknowledge the support and funding provided by the NIH, DDCF, CIRM, ACHPP, the Bert Lubin Scholarship Fund and the Alex Lucas Memorial Fund. We wish the trainees all the very best in their future scientific endeavors; please keep in touch as we are always anxious to hear what are alumni are up to!

Sincerely,

Ellen B Fung

Ellen B Fung, PhD
Associate Scientist, BCH-Oakland
Principal Investigator & Co-Director
Summer Student Research Program

Marsha Treadwell

Marsha Treadwell, PhD
Professor, Pediatrics/Division of Hematology
Principal Investigator & Co-Director
Summer Student Research Program

UCSF Benioff Children's Hospital Oakland

BUILDING UNITY in SCIENCE

building unity in science 40 YEARS

Table of Contents

Support for the 2021 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
Light-A-SPARK
Leveraging Investment in hiGHschool Training:
Summer Program to Accelerate Regenerative medicine Knowledge
EDUC3-08399
PI: Fung EB

Doris Duke Charitable Foundation
SUSTAIN
SSRP Supporting Underrepresented STEM Adapting to Change
#2020-241
Co-PI: Fung EB, Treadwell M

National Science Foundation
Scholarships for Excellence, Achievement, and Professional Competence in Science, Math, and Engineering
Award No. 1564587
Co-PI: Mark Wong, PhD, Seti Sidharta, PhD

The Bertram Lubin Scholarship Fund

The Alex Lucas Memorial Fund

Various Anonymous Donors

Program Advisory Committee Members

Frank Bayliss, PhD
Professor
Director, Student Enrichment Opportunities Office
San Francisco State University

Gino Galvez, PhD
External Evaluator, SSRP
Director, Center for Evaluation and Educational Effectiveness (CEEE)
Associate Professor, Department of Psychology
California State University, Long Beach

Jocelyn Freeman Garrick, MS MD
Deputy Medical Director, Alameda County EMS
Executive Director, ACHPP

Caroline Hastings, MD
Director, Fellowship Program
Hematologist/Oncologist
UCSF Benioff Children's Hospital, Oakland

John Matsui, PhD
Director, Co-Founder, Biology Scholars Program
Assistant Dean, Biological Sciences
University of California, Berkeley

Vasanthy Narayanaswami, PhD FAHA
Professor of Biochemistry
Program Director, MARC U*STAR
California State University Long Beach

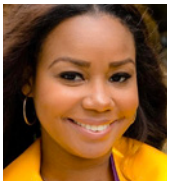
Seti Sidharta, PhD
Director, Center for Science Excellence Program
Contra Costa College

Pamela Simms-Mackey, MD FAAP
Chair of Pediatrics
Chief of Graduate Medical Education at Alameda Health System

Program Leadership Team

Ellen Fung, PhD RD CCD
Principle Investigator
Associate Scientist
Co-Director, SSRP
UCSF Benioff Children's Hospital Oakland

Elijah Goldberg
Student Assistant / Website Creator, SSRP
UCSF Benioff Children's Hospital Oakland



Roialle Jennings
Program Coordinator, SSRP
UCSF Benioff Children's Hospital Oakland

David Killilea, PhD
MLK Core Laboratory Manager, UCSF
Program Manager, SSRP
BCH-Oakland SSRP Site Co-I

Kala Mehta, PhD
Associate Professor
Department Biostatistics & Epidemiology, UCSF
UCSF SSRP Site Co-I

Aaron Streets, PhD
Associate Professor
Department of BioEngineering, UC Berkeley
UCB SSRP Site Co-I

Marsha Treadwell, PhD
Professor, Division of Hematology, UCSF
Co-Director, SSRP
UCSF Benioff Children's Hospital Oakland

Selection Committee Members 2021

Phillip Bollinger
Information Technology Services Lead
Children's Hospital Oakland Research Institute

Karen Daley, MA LMFT
ManyRivers Psychotherapy

Ellen Fung, PhD RD CCD
Associate Scientist
Co-Director, SSRP
UCSF Benioff Children's Hospital Oakland

Ryo Higuchi-Sanabria, PhD
Post-Doctoral Fellow
UC Berkeley

David Killilea, PhD
MLK Core Laboratory Manager, UCSF
Program Manager, SSRP

Marvin Lopez
Director, Student Programs
School of Engineering, UC Berkeley

Steven Mack, PhD
Associate Professor
Department of Pediatrics, UCSF

Christine McDonald, ScD MS
Assistant Professor
Department of Pediatrics, UCSF

Kala Mehta, PhD
Associate Professor
Department Biostatistics & Epidemiology, UCSF

Andrew Modzelewski, PhD
Post-Doctoral Fellow
UC Berkeley

Erin Rosales
CHORI SSRP Alumni 2019
Clinical Research Coordinator Associate
Stanford University

Christine Schudel, MPH
Program Manager, Community Advocacy
Primary Care
UCSF Benioff Children's Hospital Oakland

Marsha Treadwell, PhD
Professor, Division of Hematology, UCSF
Co-Director, SSRP
UCSF Benioff Children's Hospital Oakland

Kathleen Schultz, MS
Research Associate
MLK Core Laboratory, UCSF

Marcela Weyhmiller, PhD
Director, Iron Measurement Program
UCSF Benioff Children's Hospital Oakland

C·H·O·R·I
Children's Hospital Oakland Research Institute

DIVERSITY CHORI

BUILDING UNITY in SCIENCE

Summer Student Research Program Curriculum

Program Objectives:

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

Overview

The virtual curriculum provided during the 2021 Summer Student Research Program (SSRP) will consist of both **required** and **elective** content, which will be organized through the UCSF learning management system known as CLE.

The **required curriculum** consists of synchronous and asynchronous programmatic lectures and videos, as well as research with your mentor. It is expected that these items will take a total of 20-30 hours per week. About half of the required curriculum will be provided through live Zoom sessions presented on Tuesdays & Thursdays from 2-5 pm, and journal clubs will be held Wednesdays from 4-5 pm. You are expected to be present and interactive for these live Zoom sessions. Other required content, including your research design and proposal development, safety training, and assigned training modules will happen outside of the live Zoom sessions at times of your choosing, or with respect to your research, at times convenient for your mentor. It is important that you organize your time to complete these assignments without falling behind. Elements of the required curriculum cannot be substituted, and all required activities must be attended for program completion.

The **elective curriculum** consists of a wide range of optional virtual content that we have curated and have value for your educational enrichment and career development. The elective curriculum will consist of both synchronous and asynchronous options, including UCSF and BCH-Oakland Grand Rounds (hospital-wide presentations given by senior clinical staff) and lecture videos that provide deeper dives into hot topics in science.

Summer Student Research Program Curriculum

Required Items to be Completed During or Prior to the First Week of the Program
Instructions and links to each training module are located on CLE.

- Safety training through UC Learning – 4 modules
- Safety simulation module through Labster – 1 module
- Collaborative Institutional Training Initiative (CITI) courses - 4 modules
- Foundational Training in Diversity, Equity, and Inclusion (DEI) – 1 module

Weekly Required Curriculum

- Attendance at every Tuesday and Thursday Zoom lecture from 2-5pm PST.
- Attendance at intra-program journal club on Wednesdays from 4-5pm PST.
- Each week, iBiology scientific lectures will be posted on CLE that connect to that week's lecture. View the video, content will be reviewed weekly during small group sessions.
- Each week, Labster scientific simulations will be posted on CLE that connect to that week's lecture. Only one is required, but you are encouraged to explore all modules.

Programmatic Requirements

- Pre / Post online survey program evaluations
- X-train documentation due June 18 (**required only for undergraduates funded by NIH**)
- Personal statement due: Friday, June 18 by 5:00 pm
- Research proposal due: Friday, June 25 by 5:00 pm
- Research abstract due: Friday, July 16 by 5:00 pm
- Final presentation or poster due: Wednesday, August 4 by 5:00 pm
- Attendance at symposium: Friday, August 6
    - Required participation: 9:00 – 12:00 pm, optional attendance 2:00 – 5:00 pm

Elective Curriculum

- Weekly office hours with Program Leadership (Times: TBD)
- Grand rounds lectures at BCH-Oakland or UCSF
- Recommendations for videos, movies, simulations & other programming in STEM

Social Networking Opportunities

- SSRP alumni presentation
- Small group discussions: Interns will be divided into small groups led by a returning student and have the opportunity to discuss lecture topics.
- Social networking events

Applications Used in Virtual Programming

- Communications: Slack
- Synchronous Presentations: Zoom

Summer Student Research Program Lecture Series 2021

Date	Speaker	Affiliation & Department or Specialty	Talk Title
6/7/2021	Ellen Fung, PhD RD & David Killilea, PhD	UCSF Benioff Children's Hospital Oakland, Hematology; UCSF, Office of Research	Orientation
6/7/2021	Kelley Meade, MD & Marsha Treadwell, PhD	UCSF School of Medicine, Pediatrics; UCSF, Pediatrics, Psychology, Hematology/ Oncology	Words of Welcome
6/8/2021	David Killilea, PhD	UCSF, Office of Research	Curriculum Review
6/8/2021	Peggy Tahir	UCSF, Library Services	The ABCs of Searching Pubmed
6/8/2021	Ellen Fung, PhD RD & David Killilea, PhD	UCSF Benioff Children's Hospital Oakland, Hematology; UCSF, Office of Research	Getting the Most out of Scientific Literature
6/10/2021	Ellen Fung, PhD RD	UCSF Benioff Children's Hospital Oakland, Hematology	Anatomy of Clinical Research
6/10/2021	Marsha Treadwell, PhD	UCSF, Pediatrics, Psychology, Hematology/Oncology	Understanding and Addressing Sickle Cell Disease Healthcare Disparities.
6/10/2021	Jameelah Hodge		A Patient's Perspective
6/15/2021	Anthony Muñoz, MS	UCSF, Pediatrics, Cardiology	A Day in the Life of a Basic Scientist in Training
6/15/2021	Ellen Fung, PhD RD	UCSF Benioff Children's Hospital Oakland, Hematology	Anatomy of Institutional Review Boards
6/17/2021	David Killilea, PhD	UCSF, Office of Research	How to Make a Flash Talk
6/17/2021	Marci Moriarty, RN BSN	UCSF, Stem Cell Clinic, Bone Marrow Transplant	A Patient Perspective on Bone Marrow Transplant
6/17/2021	Mark Walters, MD	UCSF, School of Medicine	An Update on Gene Therapy Trials
6/22/2021	Elaine Chan, MBA	College Advisor	College Applications & Scholarship Opportunities
6/22/2021	Ryo Higuchi- Sanabria, PhD	UC Berkeley, Molecular and Cell Biology, Dillin Lab	A Day in the Life of A Post-Doctoral Fellow
6/24/2021	Elena Nedelcu, MD	UC San Francisco School of Medicine, Laboratory Medicine, Transfusion Medicine	Blood as a Diagnostic and Therapy Tool
6/24/2021	Jasmine Wong, MD	UCSF, Department of Surgery	Using the Mouse to Model Human Genetic Diseases
6/29/2021	Nancy Sweeters, MS RN	Stanford University, Pediatrics, Hematology/ Oncology	A Day in the Life of a Research Nurse

Summer Student Research Program Lecture Series 2021

Date	Speaker	Affiliation & Department or Specialty	Talk Title
6/29/2021	Emily von Scheven, MD MAS	UCSF, Pediatrics, Rheumatology	Childhood Lupus: Race & Health Disparities
7/1/2021	Aaron Streets, PhD	UC Berkeley, Department of Bioengineering	The Human Cell Atlas Project: A Google Maps for Biology
7/1/2021	Ward Hagar, MD	UCSF Benioff Children's Hospital Oakland, Pediatrics, Hematology	Creativity in Science
7/6/2021	Theodore Roth, MD PhD	Stanford University	From Here to There: Training for a Career in Medicine or Science (or Both!)
7/6/2021	Ellen Fung, PhD RD & David Killilea, PhD	UCSF Benioff Children's Hospital Oakland, Hematology; UC San Francisco, Office of Research	Biomedical Ethics Case Studies
7/6/2021	Joseph Nuñez	UCSF, Clinical Labs	A Day in the Life of a Clinical Lab Scientist
7/8/2021	Esteban Burchard, MD MPH	UCSF, Asthma Collaboratory, Bioengineering	Environmental effects on Health Disparities
7/8/2021	Simon Robertson	KindVR	Using Virtual Reality to Ease Pain
7/13/2021	Jocelyn Garrick, MD	Alameda Health System, Highland Hospital, Alameda County Health Pipeline Partnership	A Day in the Life of an Emergency Room Physician
7/13/2021	Kirsten Bibbins Domingo, PhD MD MAS	UCSF Epidemiology & Biostatistics	COVID and Healthcare Disparities
7/15/2021	Peter Chin-Hong, MD	UCSF Infectious Disease	COVID-19
7/20/2021	Pj Utz, MD PhD	Stanford University, Immunology, Rheumatology	A Day in the Life of an MD PhD
7/22/2021	Piper Below, PhD	Vanderbilt University, Quantitative Human Genetics	The Ethics of Genetics
7/22/2021	Ken Bridges, MD	Global Blood Therapeutics	Sickle Cell Disease-New Therapies from the BIOTECH world
7/27/2021	Kwame Denianke, MD	Kaiser Permanente, Dermatology	A Day in the life of a Dermatologist
7/27/2021	Wilmene Hercule	UC Berkeley, Biosciences, Molecular and Cell Biology	A Day in the Life of Stem Cell Scientists
7/29/2021	Morna Dorsey, MD MS	UCSF, Pediatrics, Allergy, Immunology	Immunotherapy and Food Allergies
7/29/2021	Nirav Pandya, MD	UCSF Pediatrics, Orthopedics, Surgery	Care of the Specialized Athlete

Weekly Student Newsletters

the last year has been very stressful. But we are still here, and continue to thrive.

Part of my stress-coping strategy is morning runs in the Berkeley Hills listening to podcasts. I've recently found one I really like called The Huberman Lab Podcast (https://hubermanlab.libsyn.com). Dr. Huberman is a Neuro professor at Stanford who does a nice job explaining enough physiology to understand complex processes, but then offers clear strategies & hacks to optimize your performance. I really liked the shows on managing stress (e10) and understanding motivation (e12). If you have other practical sciences podcasts you like, please let me know.

Looking forward to 'seeing' you soon. As you prepare for your internship, remember the words of Supreme Court Justice Sonia Sotomayor...

"A surplus of effort could overcome a deficit of confidence."

Volume 9 | Friday July 2, 2021

BUILDING UNITY in SCIENCE

SSRP: FUNg Friday

Week 4 is behind us... Keep up with the latest below...

Flash Talks

Woo Hoo! These students will be our third group of *FLASH TALKers* for Thursday, July 8. See your email for instructions or refer back to David's slides from 6/17.

Gabby, Hanim, Vanessa, Sheila, Nebe, Kayanna and Tam

FLASH TALKS

Symposium - Friday August 6th

Please be sure to mark your calendars. The end of the program Symposium will happen on Friday, August 6th.

Oral Presentations - 8:30 - 1:00 pm

This portion of the program will be held virtually via Zoom. Each student will be asked to give a brief oral presentation on the results of their project. Details to follow.

Afternoon Celebration 2:00 - 5:00 pm

Location: MLK Building Courtyard

Live Music, refreshments, certificate distribution and an opportunity to share in person thru an outdoor poster presentation. Guests may be allowed, RSV More details to follow.

What Did You Think?

Thank you to those who have shared your thoughts about recent speakers with us....we love to hear feedback on the topics covered in our weekly scientific sessions. It helps us plan for next years programming, and the speakers appreciate your comments. Send us a note on SLACK after Thursday programming each week before you forget...

Volume 7 | Friday June 18, 2021

BUILDING UNITY in SCIENCE

SSRP: FUNg Friday

Week 2 is behind us...momentum is picking up. Keep up with the latest below...

Flash Talks

Woo Hoo! These students will be our first group of *FLASH TALKers* for Thursday, June 24. See your email for instructions or refer back to David's slides from 6/17.

Alana, Catherine, Christian, Mattias

Mohamed, Sonali, Zhana

FLASH TALKS

UCSF Email Access

UCSF University of California San Francisco

By now, most of you may have received an email regarding your new UCSF account. We heard from administration today that it takes 24 hours to activate an account, so please try to sign in to your new account (and create your new password) roughly a day after receiving the email confirmation.

NOTE: you will need your UCSF Email for:

- CLE direct access
- Ability to upload your training certificates into CLE
- Access to UC Learning for your training modules
- Creating your new Labster account
- Creating a login to CITI training with direct access to UCSF IRB

SSRP Research Proposals

The first part of your research project is due next Friday. A 3 page proposal that should include a background for your topic, preliminary research (if applicable), your proposed study design/methodology and anticipated results. Please refer to the CLE for proposal templates. After your mentor has had a chance to review it with you, upload yours into CLE by Friday June 25, 5:00 pm.

Volume 5 | Friday June 4, 2021

BUILDING UNITY in SCIENCE

SSRP: FUNg Friday

Program officially starts this coming Monday, June 7th - Woo Hoo! See below for details on programming this week. Can't wait to meet you all.

Orientation - Monday June 7. 12:00 - 3:00 pm

We will start off the program with a brief orientation this coming Monday. This is out of synch with our usual Tu/Th curricular training days, so please plan accordingly. On Tuesday (2-5pm) we will spend time reviewing the details of the curriculum and hosting a workshop on getting the most out of the scientific literature. Here is the Zoom link you will need for these sessions, all future zoom links will be found in our CLE:

https://ucsf.zoom.us/j/96006910618?pwd=QnZmUWZ4UjV6cUdwRFBBZ3pkZGJ2UT09

SSRP on SLACK

slack

We will be using the texting app: SLACK this summer to communicate more easily with each other. We have opened up a "SSRP-2021" SLACK channel. You can login to this channel using this link: https://join.slack.com/t/chorissrp/shared_invite/zt-e5433pjr-r2J5zTKKALtXQTC_guESpQ

Enter your email and a password. You will automatically land on the correct channel.

SSRP on CLE

We will be using the Collaborative Learning Environment (CLE) at UCSF for all of our curricular information: trainings, readings, zoom links, and location for turning in your assignments. We had hoped you would have UCSF access this week, but your individual login is still pending. In the meantime, please use the link below and passcode: SSRP2021

https://courses.ucsf.edu/course/view.php?id=8539

Weekly Mentor Newsletters

Volume 4 | Monday June 28, 2021

BUILDING UNITY in SCIENCE

SSRP: Mentor Monday

4th Week of Programming starts Today

A bit hard to believe, but we will be starting the 4th week of the program today, just 5 weeks remaining. We realize some projects are still being crafted, and a few of us are waiting on IRB approvals. Regardless of where they are in the design process, students are gaining valuable information from the time they are spending with you. Thank you!

SSRP Symposium

building unity in science 40 YEARS SUMMER STUDENT RESEARCH PROGRAM

Mark your calendars, the Bert Lubin SSRP Symposium will be held on **Friday August 6th from 2:00-5:00 pm** in the MLK Building Courtyard. Students will be presenting a summary of their work in the morning via Zoom, then we will celebrate on site with live music, refreshments, scientific posters and words from SSRP Alumni. For the latest agenda of activities, please check out our website: summerstudents.ucsf.edu. We would love to have you join us for this celebration.
Please RSVP using this link in **eventbrite**.

CLE Access

All our program curriculum can be found in our CLE. Future weeks events are hidden to allow students to focus on the current requirements. To access this information go to this link:
https://cours...ucsf.edu/course/view.php?id=8539

Volume 3 | Monday May 24, 2021

BUILDING UNITY in SCIENCE

SSRP: Mentor Monday

Most Mondays you will be getting emails from us with the subject line "Mentor Monday" containing updates and advice for maximum success with your student in the SSRP program. We are repeating some valuable information in this communication.

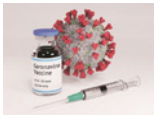
Virtual & Hybrid Programing

Some of you have asked about hosting your student in your clinical or laboratory location. We have contacted students regarding this possibility. If students are local and comfortable with coming in, Ms. Jennings submitted paperwork to allow for this accommodation. Keep in mind that policies for in person activity vary with institution and student age, so if you plan to work with your student on site, it is up to you to work with your department administrator for the most updated information. We have communicated with all students that they must receive the COVID-19 vaccine if they are working on-site at any UCSF campus. *All students regardless of training location will have access to UCSF resources found in the 'MyAccess' portal.*

Reminder: Meet with Your Student

If you have yet to connect with your student, we encourage you to send them a quick message to introduce yourself. If you can't locate your students' contact information, be sure to send an email to our program coordinator, Ms. Roi Jennings at: roialle.jennings@ucsf.edu

COVID-19 Vaccination



All students who will be working in-person, even part time on any UCSF or UCB campus are required to get vaccinated. Information on vaccination locations have been sent to all students.

Volume 5 | Monday July 12, 2021

BUILDING UNITY in SCIENCE

SSRP: Mentor Monday

6th Week of Programming Starts Today

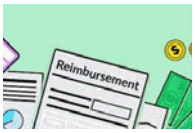
A bit hard to believe, but we are 2/3 way through the program and abstracts are due this Friday. We realize many projects do not have results yet, it is perfectly acceptable to include 'anticipated results'. The abstract is published on the SSRP website so be sure to review the final version before your student submits it at 5:00 pm. Keep in mind, regardless of where your student is in the research process, they are gaining valuable information from the time they are spending with you. Thank you again for all your efforts.

SSRP Symposium Celebration

building unity in science 40 YEARS SUMMER STUDENT RESEARCH PROGRAM

The Bert Lubin SSRP 40th Annual Symposium will be held on **Friday August 6th from 2:00-5:00 pm** at the MLK Building. Students will be presenting a summary of their work in the morning via Zoom. In the afternoon we will celebrate on site, outside with live music, refreshments, scientific posters and words from SSRP Alumni. For the latest agenda of activities, please check out our website: summerstudents.ucsf.edu. To join us for the in-person celebration **you must RSVP to attend**, so let us know you are coming here: **eventbrite**.

Supply Reimbursement



In an attempt to simplify supply reimbursements this year, we will be using a "SmartSheet". Mentors can attach receipts directly and include either a BCH-Oakland Dept ID or UCSF chart string for internal reimbursement. This does not apply to check reimbursements for travel or conferences or purchases made outside of UCSF/BCH-Oakland. Keep your eyes out for an email from Roialle Jennings providing further instructions and a link to

Research Reflections

David's Dais

The second week of the 2021 SSRP is now in the books, and hopefully you are finding the synchronous programming useful for your scientific and professional development. Many of you have likely communicated with your mentor or lab group to begin focusing in on your research project. We had a nice first journal club that homed in on the elements of scientific literature and we had lectures that concentrated on modern therapeutics for blood-borne illness. Clearly the *focus* this week is on being *focused* – we are so meta.

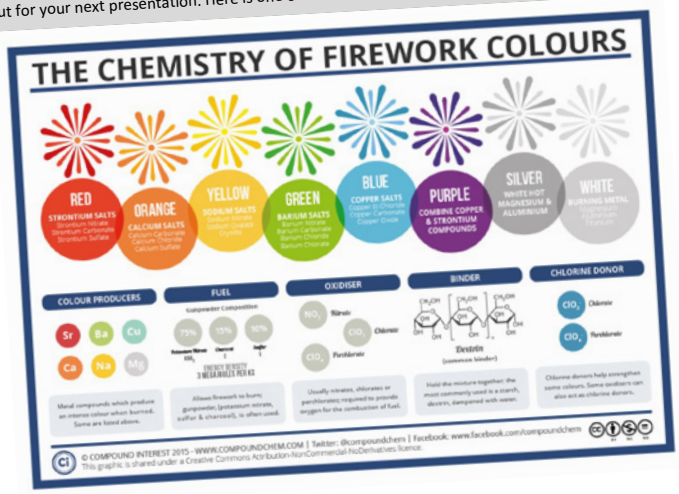
Focusing in on a problem is arguably the backbone to success in clinical and biomedical research. You have a complex question that is often best answered by stripping away variables and assumptions, to see the problem in a more basic form and then create a series of defined steps to address the question and ultimately solve the problem. The power of reductionism is clear and productive. As Steve Jobs said, "***That's been one of my mantras – focus and simplicity. Simple can be harder than complex: You have to work hard to get your thinking clean to make it simple. But it's worth it in the end because once you get there, you can move mountains.***"

Yet despite all the achievements of a focused approach, it's my experience that reductionism doesn't always win the day. Sometimes a little distraction or convolution can be useful to help reframe a problem, especially when you get stuck. Reading and going to lectures outside your niche can often have surprising benefits in terms of new ideas and strategy. And when I get frustrated with something I'm stuck on, I can get re-inspired just by learning about all the amazing science going on around me. For example, here are some cool findings that happened just last week:

David's Dais

As we turn the corner into July, it means that Independence Day is here. Some of my favorite childhood memories growing up on the Gulf Coast happened on this holiday – hanging out at my local beach, playing hours of volleyball in the sand, and eating obscenely large bowls of gumbo. Sure I understood freedom as some patriotic ideal, but I really just wanted to have fun. Now on Independence Day, I find myself thinking more about the dark side of patriotism & nationalism, esp. with what's not going well in our country – gun culture, children in cages at the border, January 6th. I like the distinction from Sydney Harris: "The difference between patriotism and nationalism is that the patriot is proud of his country for what it does [right], and the nationalist is proud of his country no matter what it does; the first attitude creates a feeling of responsibility, but the second a feeling of blind arrogance that leads to war." So yeah, Independence Day is complicated.

At least there are the fireworks! At least fireworks are pan-partisanly regarded as awesome. Did you know that the colors of fireworks are based on the chemistry of metals? And some of you might remember that my research interest is on metals and the periodic table, so this is totally in my lane. Below is an infographic from one of my favorite sites called Compound Interest (www.compoundchem.com), which has a lot of clear images on a variety of topics, so check them out for your next presentation. Here is one on the chemistry of fireworks:



But of course, now I must point out that even fireworks have a dark side too. The most obvious is the fire danger, esp. in these times of drought. I have a friend living in the East Bay hills who stays up all night watching for an errant bottlerocket landing in his yard. And then think of all the domestic and wild animals that are terrified by the noise. More pets are lost on July 4th than any other day of the year. Then there is a lesser known problem related to the chemistry of fireworks. Many of those metals for coloring like barium & strontium are quite toxic when concentrated. Lead & antimony are even worse, and although banned in domestic fireworks, are still found in cheaper imports. Other harmful compounds like perchlorates, nitrogen dioxide, sulfur dioxide, and small particulates (PM2.5) are released into the environment during the shows. I hate to say it, but the science has convinced me that fireworks really cause a lot of harm and should stop. Like many aspects of Independence Day, I imagine this discussion will continue as we wrestle with expressions of patriotism & nationalism in our culture.

David's Dais

We are looking forward to meeting all of you in just a few days. Dr. Fung, Roi, Elijah & I have been busy putting all the set pieces in place for you, so hopefully all goes smoothly despite the complexities of hosting a hybrid program at multiple institutions with different onboarding policies. Following the requests in this issue of Fun-g Friday will help you get a great start in the program. I also encourage you to take some time for prep that you can do before starting your project. Some of your mentors have likely provided resources to look through, which is great. But even taking the time to google your mentor, looking over some of her/his/their papers, or just wikipeding key concepts in the area that you will be working in can be very helpful.

I'm often asked how to best utilize this program, and my answer is always the same – be a sponge. Our programming covers many different aspects of biomedical science, and you never know what might inspire you. Your specific project or research approach may not seem that exciting, but it's part of a bigger picture and you can still give it your best. You may get interested in what other members of your lab or your fellow students work on, or find some interesting angle in your field. This happened to me in graduate school. I chose to work in a lung biology lab, but soon found out that the lung bored me to tears. But during that time, I came across a few papers on how imbalances in iron contributed to lung disease, and it fascinated me. When it was time to move on, I found a great lab at Berkeley looking at all aspects of iron in the body. I later learned that I loved understanding how metals in general act in the body, leading to the current direction of my career. I still go to work excited about what new thing I can learn about metals, and this interest of metals has even spread outside of work, including volunteer work teaching metal chemistry to elementary school classes and even a hobby as an element collector (though the purchase of uranium on eBay probably has me on a government watch list.) If you want to geek out on the periodic table too, see https://periodictable.com

If I had not forced myself to finish my work on pulmonary physiology, I might never have found the area of science that really inspires me. My experience is not uncommon, and in fact most scientists and clinicians do not take a linear path. I encourage you to ask your mentors and fellow lab members about their inspirations and challenges. How did they arrive in their current role? What advice they would give their younger self? Would they choose a completely different field? These are questions you can also ask Dr. Fung and me during our virtual office hours (to be explained at Orientation). In the words of Marie Curie (first female Nobel Prize recipient and discoverer of elements polonium and radium), ***"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less."***

David's Dais

I would also like to welcome you all to the CHORI/UCSF Family. I hope you are finishing your school year strong, but also finding space to take some to relax a bit. I've been asked (by exactly no one) to share some advice and musing each week, and occasionally these might even be useful.

First I'll mention that we have a Facebook site (https://www.facebook.com/CHORISummerResearch/), on the off-chance you still use that Social. If you don't, feel free to ask your grandparents to like us. You can also check out our fledgling YouTube channel to see some presentations from recent students: https://www.youtube.com/channel/UCNy3HqvKKxECxzGfMzI0vsQ

This is a very special year for us, as we are celebrating the 40th anniversary of the program, and navigated through some big changes recently. The founder of the SSRP, Dr. Bert Lubin, passed away last year (https://www.ktvu.com/news/former-president-of-childrens-hospital-in-oakland-dies) resulting in a change in program leadership. Also, CHORI was recently restructured into a formal academic site for UCSF, leading to lots of changes in staffing and policies. Along with the pandemic and major sociopolitical trauma, the last year has been very stressful. But we are still here, and continue to thrive.

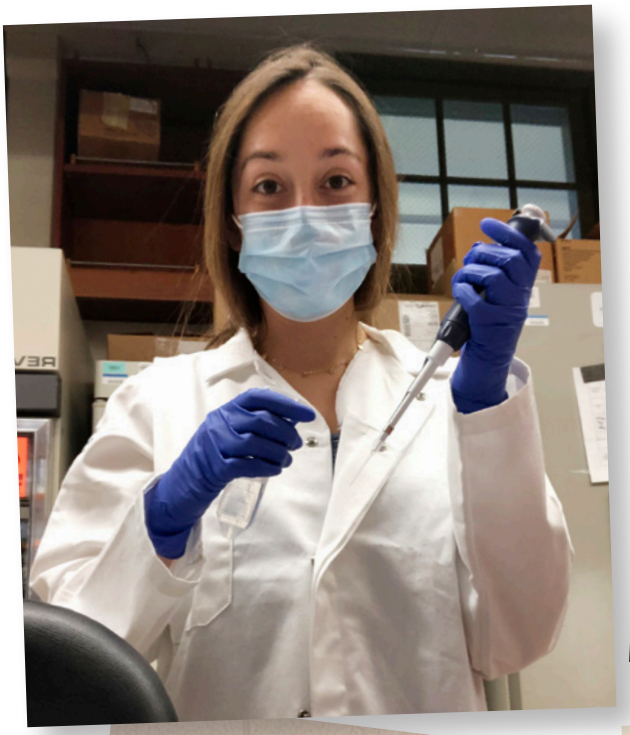
Part of my stress-coping strategy is morning runs in the Berkeley Hills listening to podcasts. I've recently found one I really like called The Huberman Lab Podcast (https://hubermanlab.libsyn.com). Dr. Huberman is a Neuro professor at Stanford who does a nice job explaining enough physiology to understand complex processes, but then offers clear strategies & hacks to optimize your performance. I really liked the shows on managing stress (e10) and understanding motivation (e12). If you have other practical sciences podcasts you like, please let me know.

Looking forward to 'seeing' you soon. As you prepare for your internship, remember the words of Supreme Court Justice Sonia Sotomayor...

"A surplus of effort could overcome a deficit of confidence."

Weekly Journal Clubs

Summer Students 2021



Summer Students 2021

Summer Students 2021

Alana Acuña

Development of a universal vaccine platform by coupling vaccine antigens to abundant Neisserial surface proteins

Mentor: Peter Beernink, PhD

Hello! My name is Alana Acuña and I am a rising senior at UC Berkeley majoring in Molecular and Cellular Biology with an emphasis in Immunology and Pathogenesis. Ultimately, I plan to pursue a career as a physician specialized in women's reproductive health. As an undergraduate, I run a Plan B emergency program for survivors of sexual assault, teach mental health classes to Oakland high schoolers, volunteer at a COVID-19 vaccination clinic, and have served on a medical team in Ghana. Following graduation in 2022, I plan to pursue my Master of Public Health and attend medical school in the hopes of making reproductive healthcare more accessible in the US to underserved women. I would like to thank the SSRP organizers and my mentor, Dr. Beernink, for graciously taking the time to guide me. Thanks to CHORI SSRP, feel more prepared and inspired than ever for a career in science.

INTRODUCTION

Gonorrhea is a very prevalent, sexually transmitted disease with 80 million infections annually worldwide. In the US during 2018, the Centers for Disease Control and Prevention (CDC) estimated that around 1.6 million new gonococcal infections occurred, with more than half occurring in people aged 15-24. Gonorrhea is caused by the gram-negative bacterium *Neisseria gonorrhoeae* (Ng). Many strains of Ng are multiple antibiotic resistant and do not confer protective immunity on their host. And since infected people are often asymptomatic (i.e. lacking clinical manifestations), the incidence of gonorrhea has increased in the last decade. These considerations highlight a significant global public health problem that emphasizes the need for an effective gonococcal vaccine. Our research is focused on developing methods to enable coupling of antigens of interest to an existing Neisserial vaccine platform, which utilizes vesicles derived from the bacterial outer membrane.

OBJECTIVE

We aim to use a novel covalent protein coupling system to allow us to tether *Neisseria gonorrhoeae* (Ng) antigens to outer membrane vesicles to develop a vaccine against gonorrheal diseases.

METHODS

We used polymerase chain reaction (PCR) to amplify our gene of interest, PorB. We then cloned this gene into a cloning vector, pGEM, to allow genetic manipulations. We will then modify the native PorB gene to replace four surface loops with the 12 residue SnoopTag sequence. Once we confirm the mutant clones, we will measure the coupling density of each construct by Western blotting, which will allow us to detect SnoopCatcher by fluorescent labeling and/or infrared dyes.

ANTICIPATED RESULTS

We amplified and cloned the Nm Porin PorB, which is an abundant Neisserial surface protein. We then will genetically modify the PorB gene to incorporate a universal protein tag known as SnoopTag. Finally, we will determine which of the four PorB loops gives the highest amount of protein coupling to SnoopCatcher.

SIGNIFICANCE OF THE PROJECT

The only current treatment for Ng is antibiotics. With dwindling antimicrobial development and rising antibiotic resistance, current gonorrhea management is threatened. These considerations highlight a significant global public health problem that emphasizes the need for an effective gonorrhea vaccine.

Michelle Adutwum

Clinical Findings and Management Guidelines in CRB2-related Syndrome

Mentor: Anne Slavotinek, MD PhD

Contributing Authors: Ghayda Mirzaa, Anna Hurst

Hello, my name is Michelle Adutwum and I am a rising senior at Arroyo High School. Throughout my life, I have been amazed with the possibilities that science has created for me. Ranging from my science class's attempt at growing brine shrimp to extracting DNA from a strawberry, I have learned so much about the natural processes of the world around us. In the future, I hope to go to medical school and to help my community as a physician. As the daughter of Ghanaian immigrants, I understand the value of hardwork and I want to ensure that everyone can get the healthcare they need. My dream is to own a clinic one day; to make healthcare more affordable. This was my first research experience and I am grateful to Dr. Anne Slavotinek for mentoring me throughout. With CHORI SSRP, I am one step closer to achieving my dreams.

INTRODUCTION

The kidneys, which include renal tubules and glomeruli, are essential for the functioning of the urinary system. Bi-allelic variants in *CRB2* cause CRB2-related syndrome that comprises Steroid Resistant Nephrotic Syndrome (SRNS), resulting in edema and proteinuria, and cerebral ventriculomegaly, resulting in a head circumference larger than the expected based on growth charts for a patient's age and sex. In some patients, retinitis pigmentosa is present. CRB2-related syndrome is rare, which is why there is no standard treatment plan for it.

OBJECTIVE

We hypothesize that patients with SRNS caused by CRB2-related syndrome due to pathogenic variants in the *CRB2* gene have greater disease severity compared to patients with nephrotic syndrome (NS) who do not have CRB2-related syndrome.

METHODS

To determine the severity of CRB2-related syndrome, we are conducting a literature review in which all of the clinical findings and treatments used for patients with CRB2-related syndrome are inputted into an Excel spreadsheet. We will reach out to physician colleagues who have unpublished patients with *CRB2* variants to add into our spreadsheet. Standard statistics will be used to complete statistical comparisons for patient findings compared to others with NS. In addition, we will write up these new cases and discuss treatment guidelines for future patients.

ANTICIPATED RESULTS

We anticipate that for patients with severe CRB2-related syndrome, the most effective treatment will be a renal transplant. In other cases, corticosteroids have been shown to be mildly effective, but the NS did not resolve. Other immunosuppressants were also not effective.

SIGNIFICANCE OF THE PROJECT

In past studies, the focus on the clinical findings, specifically in regards to the renal findings, has not identified a specific treatment plan. In this project, we would like to improve the clinical outcomes for patients and families who have CRB2-related syndrome. By compiling clinical and variant findings and developing treatment guidelines for patients with CRB2-related syndrome, clinicians can use the data to aid other patients.

Mikail Gerard Alejandro

Optimizing Nutrient Measurements in Blood

Mentor: David Killilea, PhD

I am a rising fourth-year student at the University of San Francisco majoring in medicinal and synthetic chemistry with minors in biology and theology. Viewing my life as a synthesis reaction, I see this opportunity at CHORI to be the catalyst that helps me achieve being accepted into a MD/PhD program. Prior to joining CHORI, I participated in computational chemistry research on the contributions of quantum tunneling in organic systems involved in intramolecular Diels-Alder reactions with Dr. William Karney. Having no wet-lab experience before CHORI, the project I am contributing to this summer allows me to understand the clinical and non-clinical aspects of research. I would like to thank Dr. David Killilea, Kathy Schultz, and all the staff in the SSRP for their endless guidance and generosity in teaching me wet-lab skills and helping me grow as a scientist.

INTRODUCTION

Collection, processing, and handling of blood can have a substantial influence on the quality of the measurements and interpretation of the results for nutrient measurements. Previous literature shows minerals like copper having two different value ranges—prompting to investigate the ranges of other minerals.

OBJECTIVE

The overall goal is to establish clear evidence-based guidelines for the collection and processing of blood samples for use in measuring nutrient levels. This is essential to address nutrient gaps in at-risk populations. My specific objectives will be (1) assess the agreement between nutrient concentrations in capillary versus venous plasma and serum samples, (2) observe the effects of delayed and suboptimal blood processing on nutrient levels, and (3) determine the stability of nutrient levels through freeze-thaw cycles in plasma or serum.

METHODS

Capillary and venous blood samples of 60 healthy adult participants were taken to the laboratory for plasma and serum separation using standard centrifugation protocols with modifications to minimize hemolysis and contamination. Isolated serum and plasma samples were batched for mineral, protein, vitamin, and hemolysis analyses.

PRELIMINARY RESULTS

Early analysis from project 1 showed differences in nutrient concentrations within plasma versus serum samples. Sodium and phosphorus were higher in serum, whereas iron was higher in plasma. In the analysis of venous versus capillary samples, metals such as calcium, sodium, and iron had higher concentrations in the capillaries. Magnesium showed no differences in either comparison. Additives in the tubes prevented minerals such as potassium and silica from having accurate values. Preliminary data for projects 2 and 3 showed no consistent patterns or differences in zinc cocampncentrations when looking at time-delays, storage at different temperatures, and freeze/thaw cycles.

SIGNIFICANCE OF THE PROJECT

Despite measurement of nutrients being a fundamental step in determining the nutritional status within target populations, there are few best-practice guidelines that detail the mechanics of blood assessment. Our project will help establish these guidelines to improve the consistency and outcomes of future nutrient assessment studies.

Mohamed Alghaithi

Retrospective analysis of remdesivir usage in hospitalized patients with COVID-19 at an academic medical center

Mentor: Katherine Yang, PharmD

Contributing Authors: Sarah Doernberg, MD, and Edward Koo

The name Mohamed Ebraheem Alghaithi I am a graduate student from Oakland International High school. I got interested in science because back in my home country Yemen I started studying Chemistry Biology and Physics from 5th grade up to 10th and in every grade is higher and complicated science. I got more and more interested in science every time I entered the next grade level. Until I came to the U.S school become all about learning English and other things along the way too but it was different. By different I mean it wasn't the same level and I started losing interest in science because all the things I am learning was the same I was learning back in my home country just the language is different. When I heard about this program and what I will be doing I got very excited because I knew that I will be learning about more complicated science and it will be good fit for me before going to UC Davis. I am sure that I am going to learn even more things from my mentor Dr. Yang, Katherine.

INTRODUCTION

According to The New York Times more than 4 million have died and more than 18 million have been sickened from COVID-19 so far worldwide. Remdesivir (Veklury®, Gilead Sciences) a nucleotide analogue prodrug that inhibits viral RNA (ribonucleic acid) polymerases, has shown *in vitro* activity against SARS-CoV-2. Remdesivir binds to the RNA-dependent RNA polymerase and blocks viral replication (repetition) leading to premature termination of RNA transcription. Remdesivir was approved by the FDA (Food and Drug Administration) on October 22, 2020 and is indicated for the treatment of hospitalized patients with COVID-19. According to the NIH (National Institutes of Health) guidelines remdesivir At the UCSF (University of California San Francisco) Hospital, remdesivir was used in patients hospitalized for COVID-19 between March 2020 to April 2021 who requiring supplemental oxygen or mechanical ventilation. This study is a retrospective medication use evaluation (MUE) of remdesivir.

OBJECTIVE

The objective of this study is to determine how remdesivir was utilized in patients hospitalized for COVID-19 at the UCSF Medical Center. Our aim is to explore potential adverse effects due to remdesivir.

METHODS

We performed a medical use evaluation to evaluate response to drug therapy and toxicity, with the aim of improving the patient outcomes. We evaluated demographic data including race, ethnicity, age, gender, and pregnancy status. Inclusion criteria included patients ≥ 18 years of age with a positive PCR (polymerase chain reaction) test for COVID-19 hospitalized for COVID-19. Patients were excluded if they were under the age 18 or if they received investigational remdesivir as part of a clinical trial. Outcome data included days of hospitalization and survival data.Results

We initially identified 565 patients who received remdesivir during the study period. One hundred and three patients were excluded (24 pediatrics; 79 due to participation in a clinical trial), and included 462 patients. There were 232 (50.2%) males and 230 (49.8%) females, including 12 pregnant females. Additional results on remdesivir usage and gross clinical outcome data will be presented.

SIGNIFICANCE OF THE PROJECT

This is significant as the optimal treatment of COVID-19 is still evolving and changing. We anticipate our results will further the understanding of the optimal treatment of hospitalized patients with COVID-19.

Vanessa Anderson

Adolescent Preferences Regarding a Sexual Health Screener for Clinic Settings

Mentor: Lela Bachrach, MD MS
Contributing Authors: Ezra Bisom-Rapp, BS

My name is Vanessa Anderson. I am a third-year at UC Berkeley, majoring in Molecular & Cell Biology. After college, I want to pursue medicine to help underserved populations. I am drawn to medicine because of my scientific curiosity and love for problem-solving. I also enjoy connecting with people from different backgrounds, and I want to have a meaningful and positive impact on their lives. SSRP has reaffirmed my passion for medicine and exposed me to new and exciting topics. This summer has been a life-changing experience. The program staff and my peers have all been friendly and more than willing to help, and I feel uplifted and empowered in a way I've never experienced before. This summer, I did public health research in the form of a reproductive health survey of adolescents at UCSF Benioff Children's Hospital with the generous guidance and support from my mentors Dr. Lela Bachrach and Ezra Bisom-Rapp.

INTRODUCTION

Adolescents account for 9 million of the 19 million new cases of sexually transmitted infections (STIs) each year. Rates of unintended pregnancy in the US are much higher than in other developed nations. Sexual health screeners are a way to gather information about sexual behavior that can help connect patients with needed services. Studies in adults have shown that administering a risk assessment to all patients can help determine eligibility for pre-exposure prophylaxis (PrEP), a pill that prevents human immunodeficiency virus (HIV) infection (Khalili et al., 2020). Goyal et al. studied a sexual health screener in pediatric emergency department settings and found that the majority of participants preferred to answer questions electronically, rather than face-to-face. It is yet to be determined how best to implement a sexual health screener in adolescent clinic settings.

OBJECTIVE

We aim to determine adolescents' preferred question phrasing and format for a universal sexual health screener in adolescent clinics.

METHODS

A convenience sample of participants was recruited in the UCSF Benioff Children's Hospital Oakland Teen Clinic to complete a self-administered computer-based survey. Participants received a gift card for completing the survey. Patients are between the ages of 13 and 24, of all genders.

ANTICIPATED RESULTS

We anticipate that participants may not be aware that they can seek certain sexual health services in the clinic, such as PrEP, IUDs, contraceptive implants, and medication abortion. We expect the older and sexually active patients will find most of the proposed questions acceptable. Patients will likely prefer to take the screener in private, regardless of administration method.

SIGNIFICANCE OF THE PROJECT

Adolescence is a crucial time to learn about healthy sexuality and tools to stay healthy and safe. This study lays the groundwork for a sexual health screener to be administered to all adolescents in clinic. By opening a dialogue on these topics, we can connect patients with services to promote their ongoing health and wellbeing and reduce disparities related to sexual health.

Barry Brand

Spatial Molecular Profiling of Migratory Inhibitory neurons in the Developing Gyrencephalic Brain

Mentor: Mercedes Paredes, MD PhD
Contributing Author: Jaeyeon Kim, PhD

My name is Barry Brand and I am a rising P1 at Xavier University of Louisiana College of Pharmacy with plans to pursue pharmaceutical research which allows me to be the voice of the people by developing drugs to treat diseases that affect underrepresented communities disproportionately. As far back as I can remember I have been fascinated by cells and the complexities of the human body. Growing up in a family with many health problems played a major role in creating my want to end health disparities in my community. I aspire to be an example for the youth to follow so that they can see that their own goals are attainable. This summer I have the pleasure to work in Dr. Paredes's lab to study migratory interneuron. This program has provided an intensive learning experience that has opened my interest and deepened my passion for science.

INTRODUCTION

Cortical inhibitory neurons migrate in the developing postnatal gyrencephalic brains. These migratory interneurons embryonically generated from the progenitor regions called the ganglionic eminence migrate long distances to reach their cortical destinations, unlike cortical excitatory neurons. They target higher cognitive regions in the human brain, such as the prefrontal cortex and the cingulate cortex, for several months in infancy. Opening the possibility that late incorporated interneurons may contribute to acquisition of functional networks. However, the cellular diversity of these migratory interneurons and how their migration is regulated remains unknown.

OBJECTIVE

I will spatially profile the molecular expression of migratory cortical interneurons in postnatal piglet brain and quantify their differential gene expressions across the migratory routes.

METHODS

I will utilize the piglet brain (Sus Scrofa) as a faithful model of developing human brain. I will use the fixed-frozen piglet brain at early postnatal day: P0, or P2. These samples were dissected by coronal serial sections across Anterior to Posterior axis. I will focus on the medial sections containing the clearest migratory streams. Regions of interest (Z1-4) will include areas highly enriched with migratory cortical interneurons. For better identification of our interested population, I will incorporate the immunohistochemistry and In situ hybridization. I will analyze the mRNA expression of Gad1 in DCX protein-expressing cells to identify migratory GABAergic interneurons. I will also look for the mRNA expression of transcription factors to produce interneurons. I will quantify the above mRNA expression within the Z1-Z4.

ANTICIPATED RESULTS

The migratory GABAergic interneurons are molecularly heterogenous population in early postnatal piglet brains. These features are conserved in the developing human brain.

SIGNIFICANCE OF THE PROJECT

Disruptions of cortical interneurons have been frequently linked to the emergence of neurodevelopmental disorders, such as autism spectrum disorder and epilepsy. Thus, it is essential to profile the molecular diversity and identify the developing nature of migratory GABAergic interneuron. Understanding these developmental profiling of cortical interneurons will shed light on the pathogenesis of these conditions and reveal opportunities for therapeutic interventions.

Keila Calderon Ordonez

The Association of Student Race and Economic Status with the School Health Environment

Mentor: Carolyn Rider, MA
Contributing Authors: Janice Kao, Christina Becker, Amanda Linares, Evan Talmage, Gail Woodward-Lopez

My name is Keila Calderon Ordonez. I am a first-generation low-income Latina, entering my second year at the University of California, Berkeley where I am majoring in Biology and Business. When I graduate, I hope to continue my path into medical school to become a physician and have my own clinic that provides for under-resourced, underrepresented, and impoverished people as I once was. I intend to leave an impact on this world! I am continuously inspired when I notice scientists are making world-renowned discoveries that help heal the human body from whatever pain that person might feel. I am very excited to meet some of these scientists and amazing people in this summer's CHORI Research program. I am beyond grateful for working with the Nutrition Policy Institute and for my mentors Carolyn Rider who has been incredibly kind to teach me about her work with the SLAQ recognition system.

INTRODUCTION

Minority (Black, Indigenous, or People of Color) and low-income populations face many health inequities, including higher rates of obesity and diet-related diseases. The Site-Level Assessment Questionnaire (SLAQ) helps low-income schools to improve their nutrition and physical activity environment to promote student health. SLAQ allows schools to track changes in health practices and to recognize room for improvement with one goal being the gradual decrease of obesity rates for children.

OBJECTIVE

To determine the likelihood of a school meeting recognition criteria for excellent nutrition and physical activity practices in relation to student demographic characteristics, including race/ethnicity and household income.

METHODS

The SLAQ was distributed and completed by the school staff of 74 elementary schools in California. Item, section, and overall scores were computed for each SLAQ and used to assign schools to recognition tiers (gold, silver, bronze, or no recognition). We retrieved student demographic data (Free Reduced Price Meal [FRPM] participation, race/ethnicity, and homelessness) for each school from the Data Report on the California Department of Education website. To analyze the student characteristics of schools that received or did not receive the recognition we used a two-tailed T-test ($p<0.05$).

ANTICIPATED RESULTS

Schools that achieved recognition for SLAQ scores had a higher percentage of students in the FRPM program (84.67%) compared to schools that did not achieve recognition (81.36%), a lower percentage of students who are White, Non-Hispanic (11.44%) compared to non-recognition schools(13%), and a lower percentage of students who are homeless (4.15%) compared to non-recognition schools (6.11%) (all $p<0.05$).

SIGNIFICANCE OF THE PROJECT

Further study on the relationships with student demographics and SLAQ will elucidate possible predictors of healthier school environments and provide insight into equitable preventive strategies for obesity and related diseases. Making nutritional health equitable is important to create healthier habits from a young age.

Catherine Campusano

Hepatitis A and Hepatitis B Serologies of marginalized populations living with Hepatitis C

Mentors: Jennifer C. Price, MD PhD, Rachel Kanner, MPH

My name is Catherine Campusano and I am a rising senior in Northwestern University's Honors Program in Medical Education, majoring in Neuroscience with a concentration in Biology. Having participated in CHORI's SSRP in 2018, I found myself entering my undergraduate studies with a strong drive to engage in research. CHORI Investigatorsship and programming helped to demystify research and facilitated my exposure to the vast inequities which permeate every facet of science. In crafting a space where historically underrepresented groups in science can collaborate, SSRP gave me the confidence to enter academic spaces and ultimately pursue acceptance into medical school. I would like to extend my deepest gratitude to my mentors this summer, Dr. Jennifer Price and Rachel Kanner, for their continual support with my research project. I would also like to thank SSRP leadership for their commitment to supporting future scientists, especially while adapting to a virtual format.

INTRODUCTION

Hepatitis A virus (HAV) and hepatitis B virus (HBV) have safe and effective vaccines; however, rates of new cases have increased, particularly in regions characterized as epicenters of the opioid crisis. HBV is often asymptomatic and while acute HBV infection resulting in immunity is observed, chronic infection may also occur. Chronic infection may result in cirrhosis, liver failure, or liver cancer with long-term progression signaled by the onset of symptoms. Although unlike HBV, HAV does not cause chronic hepatitis, HAV can lead to acute liver failure and death in the absence of liver transplant.

OBJECTIVE

The objective of this project will be to determine Hepatitis A and Hepatitis B exposure status in socially marginalized populations in an urban setting who are at high risk of adverse liver-related outcomes.

METHODS

We will utilize HBV and HAV serology data gathered from patients living with HCV receiving care through the community-based No One Waits (NOW) Study or on the DeLIVER Care Mobile Unit. Analysis of the reactivity of four markers: Hepatitis B surface antigen (HBsAg): Hepatitis B surface antibody (anti-HBs): Total hepatitis B core antibody (anti-HBc): and Hepatitis A IgG will be used to HBV and HAV exposure, respectively.

ANTICIPATED RESULTS

We hypothesize that a high proportion of people living with HCV and history of injection drug use will have evidence of prior HBV exposure and that a high proportion will have immunity to HAV from either past exposure or vaccination.

SIGNIFICANCE OF THE PROJECT

Reliable data on HBV infection rates in marginalized populations is vital, because there has been a major shift in the demographics exposed to HBV, with increased prevalence among people who self-reported a history of injection drug use and correlated with national trends of increases in lifetime heroin use in adolescents living in urban areas. Our results will improve on the current reportable HAV and HBV data, which selects for persons with already in contact with healthcare systems and identify gaps in current viral hepatitis vaccination efforts.

Maria Cardenas

Predictors of low bone mineral density in early pubertal transgender and gender diverse youth prior to initiating gonadotropin-releasing hormone agonist therapy

Mentor: Janet Lee, MD MPH MAS

Hello, my name is Maria Cardenas and currently in my last year at Merritt Community College as a Nursing Major. As a first generation student, navigating through college has been difficult but my passion for science and the medical field has allowed me to reach great opportunities. I aspire to become a Pediatric nurse at UCSF Benioff Children's Hospital in Oakland, CA in order to reduce the disparities in healthcare. Becoming a part of CHORI SSRP allowed me to create professional relationships, enhanced my skills in science and introduced me to one a kind experiences. I want to thank Dr. Janet Lee for introducing me to various aspects of the hospital when it comes to pediatric care. Joining Dr. Lee during her clinicals was by far one of the best experiences of this program. I am certain that pediatric nursing is exactly what I want to do with my career!

INTRODUCTION

Transgender and gender diverse (TGD) youth may initiate gonadotropin-releasing hormone agonists (GnRHa) for pubertal suppression once puberty starts. Bone mineral density (BMD), as measured by dual X-ray absorptiometry (DXA), is interpreted with age/sex/race/ethnicity-matched standard deviation Z-scores; low BMD is defined as a Z-score <= -2. Previous studies described low BMD in TGD youth before gender-affirming medical therapy. Our objective was to identify predictors for low BMD in early pubertal TGD youth prior to GnRHa.

HYPOTHESIS

TGD youth with low BMD before GnRHa, when compared to those with normal BMD, are more likely to be designated male at birth, have lower physical activity, dietary calcium intake, serum 25-hydroxyvitamin D, and body mass index (BMI).

METHODS

TGD youth at Tanner Stage 2-3 of puberty initiating GnRHa were prospectively recruited from the UCSF Child and Adolescent Gender Center. Exclusion criteria included metabolic bone disease, medications affecting bone metabolism, and underweight.

BMD was measured by DXA at total body less head, lumbar spine, hip, and forearm. BMD Z-scores were calculated based on chronologic age and sex designated at birth, and adjusted for height Z-scores based on the BMD in Childhood Study. Participants were assigned to the low BMD cohort if BMD Z-scores were <= -2.

Predictors of BMD included physical activity, dietary calcium intake, serum 25-hydroxyvitamin D, Tanner stage, age at puberty blocker, and BMI. We used the modified Slemenda physical activity questionnaire and Calcium Counts!: Food Frequency Interview for Children.

Descriptive statistics, student T-tests, and linear regression models will be used to analyze the data.

ANTICIPATED RESULTS

We anticipate that the low BMD cohort will have lower physical activity and dietary calcium intake than the normal BMD cohort. Our linear regression line will identify these predictors as significant contributors to low BMD in TGD youth.

SIGNIFICANCE OF THE PROJECT

If we are able to identify the predictors for low BMD in early pubertal TGD youth we will be able to enhance treatment protocols.

Chirstian Castillo

Development of iPSCs as a genetic model of NAFLD

Mentors: Antonio Muñoz, MS, Marisa Medina, PhD

Hello everyone, my name Is Chirstian Castillo, and I'm an incoming freshman at Haverford College. I plan on completing the Pre-Med track while majoring in either Data or Computer Science. There was no one singular experience in my life that caused me to want to go into STEM. Ever since I was little, I knew that I wanted to work in medicine and the rest of my journey has been trying to discover what specialty I will strive to join. Throughout this journey, I came to learn about and experience firsthand how social determinants of health are affecting my community. This led me to participate in CHORI SSRP, in hopes of realizing whether or not research would be my preferred method in combating these injustices.

INTRODUCTION

Nonalcoholic fatty liver disease, also known as NAFLD, currently affects 20-30% of adults in the industrialized world. NAFLD is characterized by fat accumulation in the liver (steatosis) and encompasses a spectrum of liver disorders including nonalcoholic steatohepatitis (NASH), cirrhosis, and liver cancer. Induced pluripotent stem cells (iPSCs) are donor derived and can differentiate into any cell type, making them useful to model the genetic underpinnings of diseases such as NAFLD. Common genetic variants in patatin-like phospholipase domain-containing protein 3 (PNPLA3) rs738409 ("G" allele) and transmembrane 6 superfamily 2 (TM6SF2) 58542926 ("T" allele) are associated with increased risk of NAFLD development and progression. *PNPLA3* and *TM6SF2* risk variants lead to increased accumulation of intracellular lipids. The Medina laboratory recently found that iPSCs from individuals who carry *PNPLA3* and/or *TM6SF2* risk alleles have greater intracellular lipid accumulation in response to a fatty acid challenge compared to non-risk allele carriers.

OBJECTIVE

Determine whether iPSCs can be used as a cellular model to examine the role of genetic factors on fatty-acid induced cell death (known as lipotoxicity), a process relevant to NAFLD progression.

METHODS

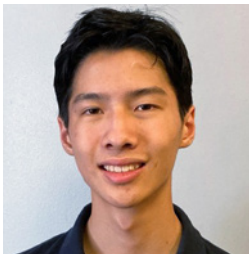
iPSCs will be cultured in mTESR1 at 37ºC and 5% CO2 and passaged using accutase. Cells will be incubated with 2mM palmitate, an unsaturated fatty acid that is known to be cytotoxic, or a BSA control. After 24 hours, cell viability will be quantified using the MTT Assay Kit, and markers of apoptosis (caspase 3 and 7) will be measured in fixed cells using the EarlyTox Caspase-3/7 assay.

ANTICIPATED RESULTS

iPSC lines from donors that have PNPLA3 rs738409 "G" allele and/or TM6SF2 58542926 "T" allele will be more sensitive to palmitate-induced lipotoxicity compared to iPSCs that do not have these variants.

SIGNIFICANCE OF THE PROJECT

Our study will demonstrate whether undifferentiated iPSCs can be used to model inter-individual differences in lipotoxicity. If successful, this system could be used to discover novel genetic and molecular factors that contribute to NAFLD progression, which may inform the development of precision medicine standards for the identification of identify individuals most as risk.



Jonathan Chen

Development of a Point-Of-Care Device to Monitor Anemia Treatments

Mentors: Frans Kuypers, PhD and Sandra Larkin, MS
Contributing Author: Marisa Sundu

Hello! My name is Jonathan Chen and I'm a rising senior at Lowell High School. When I was younger, my older sister was diagnosed with diabetes after days spent chalking up her condition to "just a bad flu" and countless misdiagnoses. Through this experience I was introduced to medicine, the field of unforgiving mistakes, treatment errors, but also the field of saving lives and changing peoples' lives for the better. Through this summer in SSRP, I hope to dive into one of the most lethal problems in medicine: time. If the doctors diagnosed my sister just a few hours later, she could've died. An early diagnosis of cancer, heart disease, diabetes, can mean the difference between life and death for millions of people around the world. And that's why I'm looking forward to working with Dr. Kuypers and Dr. Larkin this summer. For more accessible medicine. For early diagnosis.

INTRODUCTION

Anemia (an - without, and haima - blood) is a condition of a decrease in blood's oxygen affinity (ability to carry oxygen), leading to symptoms such as severe chronic muscle weakness, and heart attacks and brain failure. In 2019, anemia affected around 22.8% of the global population. Clinical trials and available treatments for anemia include bone marrow stem cell therapy drugs which increase oxygen affinity.

OBJECTIVE

To develop a portable and inexpensive device which can rapidly test the oxygen affinity from a patient's blood sample.

METHODS

To test blood oxygen affinity, our device measures:

- Blood sample temperature using a temperature sensor
- Partial pressure of oxygen (pO_2) calculated using 1) blood % dissolved oxygen (measured by a Vernier optical dissolved oxygen probe) and 2) surrounding pO_2 at ground-level atmosphere
- % Hemoglobin oxygen saturation using infrared (IR) and red light spectroscopy

While maintaining:

- Blood sample temperature at 37ºC using a heating pad
- Partial pressure of oxygen (pO_2) using air (≈80% nitrogen, ≈20% oxygen) and nitrogen gas purified from air by sodium dithionite

ANTICIPATED RESULTS

Functional Arduino sketch (acquisition software) that acquires data from probes for temperature, oxygen, and light sources. Determination of sodium dithionite concentration necessary to maintain low pO_2 for >30 minutes with a set air flow rate. Testing of hemoglobin saturation measurement at varying pO_2.

SIGNIFICANCE OF THE PROJECT

The device's cost and weight gives us a light, portable device that takes hundreds of dollars to make compared to similar devices which cost thousands and weigh ~50lbs. Upon completion, this device can measure a blood oxygen affinity curve (% Hemoglobin Saturation ~ pO_2

Danissa Barrios Coffey

The Role of Early Life Stress in Cognitive Dysfunction for Persons Living with Human Immunodeficiency Virus

Mentor: Felicia Chow, MD
Contributing Author: Shreya Swaminathan

Hi, my name is Danissa Barrios Coffey. I'm from Santa Cruz, CA, and recently graduated from my community college Cabrillo College. I am transferring to UC Santa Cruz this fall pursuing my Neuroscience BS. My fascination with science began after I overcame health challenges during my first year of college. My experiences allowed me to realize firsthand how meaningful and extraordinary science and medicine are, inspiring my ambitions to become a physician and clinical researcher. I desire to contribute to discovering cures for presently incurable brain diseases. UCSF and CHORI inspire me tremendously and I have been dreaming of working at UCSF for years. I am very grateful to the wonderful SSRP staff, the NIH, and my brilliant and dedicated mentors Dr. Felicia Chow for this opportunity of a lifetime to explore my major and career path through exposure to neuroinfectious diseases like HIV in Dr. Chow's lab and clinic.

INTRODUCTION

People living with human immunodeficiency virus (PWH) have been shown to experience disproportionately elevated levels of early life stress (ELS), including abuse and neglect in childhood which may be associated with worse cognition. Few data are available on the link between ELS and long-term health outcomes in PWH. Studies have shown that ELS and cognitive dysfunction are connected in women living with human immunodeficiency virus (HIV). However, less is known about the relationship between ELS, depression, and cognitive dysfunction in men living with HIV.

OBJECTIVE

Primary Aim: Higher ELS will be associated with worse cognitive function in PWH.
Secondary Aim: Depression will correlate with ELS and will also be associated with worse cognition.

METHODS

We will perform a cross-sectional analysis of data collected for the EPIC Neuro Sub-Study, an investigation of stress and cardiovascular disease (CVD) risk in PWH. All EPIC participants are forty years of age or older, on a stable antiretroviral therapy regimen with undetectable HIV viral load, and with a history of CVD or of one or more CVD risk factors. At the baseline visit, participants completed stress questionnaires, including the Adverse Childhood Experiences (ACEs), Perceived Stress Scale, Chronic Burden Scale, and Post Traumatic Stress Disorder (PTSD)-Civilian Checklist, along with the Patient Health Questionnaire (PHQ-9), which measures depression. Participants also underwent neuropsychological testing. Data on demographics, education, CVD risk factors, health-related behaviors, and HIV-related variables are also collected at the baseline visit. We will use linear regression models for our analysis.

ANTICIPATED RESULTS

We anticipate finding an association between ELS and cognitive dysfunction in PWH. We expect a positive correlation between ELS and depression, which may attenuate the association of ELS with cognitive function.

SIGNIFICANCE OF THE PROJECT

Impaired cognition is a major long-term health consequence of HIV infection. This study will investigate the link between ELS and cognition, with the goal of identifying targets for therapeutic interventions to mitigate cognitive dysfunction in PWH.

Carolina Cornejo Ayala

Survey of on-line resources for clinicians caring for children with musculoskeletal conditions

Mentor: Coleen S. Sabatini, MD MPH
Contributing Author: Barbara Pierre Louis

My name is Carolina Cornejo, and I will be attending St. Olaf College in the Fall. I am currently undecided. However, I do have high hopes of becoming a podiatrist and being part of the small percentage of LatinX women in the medical field. Ever since I was young, I noticed my father's complications, including toenail fungus, ingrown toenails, and diabetes. As soon as I realized how much these issues were affecting his life, I decided to do research, watch informational videos, and give my father pedicures. After a year of working on his feet, I began to see results. I can now say confidently that I played a role in the improvement of his health and self-esteem. I am thrilled to be a part of the CHORI community, and I know that with the support and encouragement from all of the Investigatorss, my passion for science will only grow.

INTRODUCTION

Surgical information and techniques have increased exponentially over the past decades and access to this information is important for providing optimal care for patients. However, access to this information is not equitable globally. Surgeons in low-income countries (LICs) may not have the financial and/or internet resources needed to access this content.

OBJECTIVE

Our aims are to evaluate what pediatric orthopaedic content is available to clinicians caring for patients with musculoskeletal problems and to assess what content is available for free, without membership or log-on requirements.

METHODS

Utilizing the Google search feature, investigators identified relevant websites using search terms, such as *pediatric orthopaedics, pediatric musculoskeletal, clubfoot, pediatric fractures,* etc. For each website, investigators reviewed and collected data on Google SpreadSheets on whether the sites require fees, are password encrypted, require a membership, and types of content. Google Spreadsheets was used to organize and assist in analyzing the data collected.

ANTICIPATED RESULTS

Through extensive searches using a range of terms, 164 websites with orthopaedic educational content were found, 81 of them with pediatric orthopaedic content. Of the 81, 58 required membership/log-in (72%) and 23 did not require any credentials to access content (28%). With regard to cost, 32 websites provided content free of charge (40%), 5 were free but with membership requirements, 30 required payment (range 20-1000 USD annually), and 14 could not yet be confirmed. Of the 81 websites with pediatric orthopaedic content, the number of websites that were free and did not require membership or log-in were 22 (31%). The number of pediatric orthopaedic websites that were available only in English was 49 (61%). 15 websites were in English plus at least one additional language (range 2-38 other languages) and 17 were non-English (including 7 Spanish).

SIGNIFICANCE OF THE PROJECT

The purpose of this study is to investigate the availability of pediatric orthopaedic educational resources for surgeons and other clinicians in LICs. Furthermore, we want to understand what, if any, limitations exist in accessing these resources with the goal to use this information to improve pediatric orthopaedic on-line content and accessibility to clinicians around the world in order to improve the care of children with musculoskeletal conditions.

Leamon Andrés Crooms IV

BAAND (Build Amino Acid and Nucleotide Dataframe); a Bioinformatic Resource to Facilitate HLA Research Investigators

Mentor: Steve Mack, PhD

My name is Leamon Andrés Crooms IV and I am a rising senior at the University of Arizona studying Biology. From raising butterflies to nature documentaries, I was always fascinated with biology and science as a kid. My interest in a medical career began when I was six years old and my grandmother passed from liver cancer brought on by Hepatitis C. During that time, Interferon was the only recognized treatment and was about half as effective for African Americans as compared to Caucasians. This was my first experience with differing health outcomes and it inspired me to want to make a difference in medicine for my community. The CHORI program has helped me understand my role as a scientist and physician and inspired me to work to ensure equitable access to medicine and research for all groups of people. Working with my mentor, Dr. Steven Mack, on HLA genetic analyses specifically focused on underrepresented groups in genetic research has shown me how important it is to consider and design research projects to serve diverse populations. Thank you to Dr. Mack and CHORI for this wonderful opportunity.

INTRODUCTION

When a new HLA nucleotide sequence variant is documented, a new four-field allele-name is assigned and added to the IPD-IMGT/HLA Database, which is a central resource for the HLA, and histocompatibility and immunogenetics community. The allele nomenclature for genes in the HLA region is very complex and consists of individual names that classify alleles using a hierarchical set of four colon-delimited fields. Currently, the nucleotide and amino acid sequence information of HLA alleles are only available as static, human-readable files available from either the IPD-IMGT/HLA Database or the ANHIG/IMGTHLA Github repository (Robinson 2016). Both of these databases do not allow querying of loci, cannot be easily read or formatted, and contain inconsistencies in formatting across data files.

OBJECTIVE

Develop a bioinformatic tool that consumes static nucleotide alignment files for HLA genes, allowing complex queries of allelic variants, individual nucleotide positions and sets of positions (motifs).

METHODS

I will build a set of R functions that extracts nucleotide sequence information from the ANHIG/IMGTHLA GitHub repository for all HLA alleles, reformats the data accounting for idiosyncrasies, and generates an R list object that includes computable nucleotide and amino acid alignments. I will include 'data sanity' checks into each function to ensure that files are being handled properly, and will manually (visually) review progress with direct comparisons to the original sequence files.

ANTICIPATED RESULTS

The bioinformatics tool will be able to consume nucleotide and amino acid sequence information for various loci, generate computable tables, and query for specific nucleotide and amino acid positions.

SIGNIFICANCE OF THE PROJECT

Creating an informatic tool that can consume a database of allele names and their corresponding amino acid or nucleotide sequences and search for alleles with specific motifs will allow greater access to the information in the IPD-IMGT/HLA Database and a greater understanding of how groups of mutations affect allele phenotype.

Mattias de los Rios Rogers

Sensing and Signaling ER Stress by Neurons

Mentor: Ryo Higuchi-Sanabria, PhD
Contributing Authors: Stefen Homentcovschi, Arushi Sahay, Andrew Dillin

My name is Mattias de los Rios Rogers; I graduated from Berkeley High School this past spring, and in the fall I will be attending UCLA majoring in molecular, cellular and developmental biology. I have always had a strong passion for science and asking questions but biology has drawn me in the most. Gaining a better understanding of basic biology is not only incredibly interesting but will allow us to develop new treatments for diseases and let us live healthier lives. This summer, I was lucky enough to be part of the CHORI Summer Student Research Program for a second year. Through the program I have received an invaluable opportunity to both develop my research skills and explore my interests. I would like to thank my mentors Dr. Higuchi-Sanabria, Dr. Dillin and the whole Dillin lab for their time and all that they have taught me.

INTRODUCTION

The endoplasmic reticulum (ER) is responsible for the production of over one third of the cells' proteins and lipids. Mechanisms exist to maintain ER homeostasis, such as the unfolded protein response of the ER (UPR^{ER}). In the presence of ER stress the ER transmembrane protein IRE-1 induces translation of XBP-1, the UPR^{ER}'s master transcription factor, to promote ER proteostasis and lipid metabolism. Neuron specific *xbp-1s* overexpression is able to extend lifespan and promote ER homeostasis by activating UPR^{ER} in the periphery (non-neuronal cells) through cell-nonautonomous signaling. This activation depends on serotonergic neurons to induce a chaperone response and dopaminergic neurons in order to induce a lipid metabolism response and other neuronal subtypes may play distinct but undiscovered roles in UPR^{ER} signaling.

OBJECTIVE

We hypothesize that neurons act as gatekeepers of stress and can initiate organism-wide stress responses and aim to investigate the signaling pathways that enable these responses.

METHODS

To investigate how UPR^{ER} stress signals are communicated by different neuronal subtypes, we performed an RNAi screen to determine which genes are important for UPR^{ER} signaling by serotonergic and dopaminergic neurons, and we performed lifespan analysis of animals overexpressing *xbp-1s* in GABAergic, octopaminergic, and glutaminergic neurons. Furthermore, we used RNAi screens to determine the interaction between ER and cytoskeletal stress.

ANTICIPATED RESULTS

We find that many neuronal subtypes regulate the UPR^{ER} and all those tested were capable of extending lifespan. Furthermore, we found several novel candidate genes functioning downstream of serotonergic and dopaminergic neurons that influence UPR^{ER} response in the periphery. The most promising candidate includes a carbohydrate-binding receptor that has a high affinity to mannose, a sugar chain that is found to increase upon ER stress post-infection.

SIGNIFICANCE OF THE PROJECT

The UPR^{ER} is known to play important roles in aging and is linked to fatty liver disease, obesity, diabetes, and other diseases. Therefore, gaining a deeper understanding of its function will allow us to better treat these diseases and live longer healthier lives.

Meron Gebre

Surveillance imaging for detection of recurrence in children following treatment for Ependymoma: Is it too much?

Mentors: Caroline Hastings, MD, Christina Coleman, MD, Aisha Hanif, DO MPH, Robert Ward Hagar, MD

Hello, my name is Meron Gebre and I recently graduated from Oakland Technical High School. In the fall, I will be attending UC Davis where I plan to study Environmental Policy Analysis and Planning with a minor in Public Health Sciences. I have always been captivated by science, and my prior experience in a biomedical engineering competition showed me that medical research has the ability to change lives for the better. After learning from a seminar covering the social determinants of health my sophomore year, I became passionate about the intersection between environmental injustices and the effect it has on our health especially in marginalized communities. I would like to thank the CHORI SSRP staff for giving me the chance to explore my interests and my amazing mentors, Dr Hastings and Dr. Coleman Abadi for giving me the opportunity to have such a valuable experience conducting research this summer.

INTRODUCTION

Ependymoma is a rare type of tumor within the brain or spinal cord that begins with the uncontrolled growth of the ependymal cell which lines the cerebrospinal pathways and spreads to other regions of the CNS. For children, the most typical treatment for ependymoma will include surgical resection, adjuvant radiation therapy, or chemotherapy. Standard of care imaging surveillance with MRI is initiated immediately following treatment with a frequency of approximately every 3 months for 2 years. This surveillance is done to assess for possible tumor recurrence and monitor late effects related to the therapy, including second malignancies, vascular or parenchymal changes.

OBJECTIVE

We hypothesize that when utilizing image frequency for detection of recurrence in ependymoma in children ahead of symptoms that more scans that necessary are being performed.

METHODS

We are conducting a retrospective chart review of all patients diagnosed with ependymoma at UCSF Benioff Children's Hospital Oakland from 2000-2020. The variables recorded include the type of surveillance imaging done and frequency, recurrence (site), and if the recurrence was detected by imaging alone or based on clinical suspicion (as documented in the history and physical). Data will be analyzed by Kaplan-Meir and Cox Regression to explore whether recurrent tumors were detected by scheduled surveillance MRI or by patient symptoms. The length of time between surveillance imaging will also be examined to see what time interval is optimal.

ANTICIPATED RESULTS

We anticipate that the data may provide insights into how access to care (in surveillance imaging) may affect outcomes.

SIGNIFICANCE OF THE PROJECT

When children are being put through repetitive imaging following treatment, it requires anesthesia that could impair their developing brains, increase medical cost for their families, create false positive results, and cause anxiety. The significance is that our data could possibly be used to back the development of a guideline for surveillance imaging for children with ependymoma so that we could mitigate the issues outlined.

Maryum Haidari

Assessing changes in bone mineral density over time in patients with transfusion dependent thalassemia

Mentors: Alison Reed, MD and Tariq Ahmad, MD FAAP

My name is Maryum Haidari and I am a rising senior at UC San Diego. I am studying Human Biology and Global Health and am planning to pursue a career in medicine. I have been interested in science and medicine from a young age and was fortunate to have participated in 2019's SSRP which was an extremely valuable learning experience. I am excited to engage in a new project this summer under the mentorship of pediatric endocrinologists, Dr. Ahmad and Dr. Reed. I hope that from this summer I will be able to conduct a project that allows me to further develop my skills in understanding scientific methodology, medicine, social determinants in healthcare and communicating research.

INTRODUCTION

Beta-thalassemia is an inherited blood disorder caused by abnormalities in the synthesis of the beta-globin chain of hemoglobin. The mutation in the beta-globin chain results in a decreased amount of hemoglobin and functional red blood cells, leading to a need for blood transfusions. The dependency on blood transfusions can result in iron-overload. The excess iron deposits in various tissues is toxic to their function. The endocrine glands are particularly vulnerable and many patients with beta-thalassemia can develop endocrinopathies such as diabetes, hypogonadism, growth-hormone deficiency, hypoparathyroidism, and hypothyroidism. Among all the potential sequelae of transfusion dependent thalassemia, bone pain and bone fractures are the most common.

OBJECTIVE

We predict that patients with transfusion-dependent beta-thalassemia will decrease their bone mineral density over the course of their life and that endocrinopathies and ferritin levels may contribute to this decrease in bone mineral density.

METHODS

A dataset consisting of patients with transfusion-dependent beta-thalassemia was acquired from the Thalassemia database at UCSF Benioff Children's Hospital. The primary objective was to investigate the changes in DEXA spine z-scores over time. Data was extracted on spine z-scores for all transfused patients and then separated by gender. These data points were plotted over time for each patient. A secondary objective was to associate contributing factors to low spine z-scores. Looking at laboratory studies +/- 6 months from the most recent DEXA scan, two groups were identified based on a spine z-score <2 SD. Laboratory studies, including ferritin, fructosamine, testosterone, estradiol, IGF-I, IGFBP-3, PTH, calcium, phosphorus, 25(OH) vitamin D, TSH, and free thyroxine, were examined to establish prevalence of endocrinopathies between the two groups.

ANTICIPATED RESULTS

We anticipate that patients with transfusion-dependent thalassemia will have worse bone mineral density over time. We also expect to see a higher prevalence of endocrinopathies among those with DEXA spine Z-scores < 2 SD compared to those with normal spine z-scores.

SIGNIFICANCE OF THE PROJECT

By monitoring bone mineral density over time, we can identify when significant changes occur over the lifespan of those with transfusion dependent thalassemia and by looking at other associated endocrinopathies, we can establish better screening guidelines. These observations can lead to potential interventions to help improve quality of life by preventing bone pain and skeletal fractures.

Lydia Haile

BCH Patient Experience Analysis by Identity Markers of Race, Ethnicity, and Language

Mentor: Henry Ocampo, MPH

Hi! My name is Lydia Haile and I am a rising senior majoring in neuroscience at Pomona College. Presently, I am an aspiring healthcare provider interested in using education and communication to improve global health outcomes. Being so, I am excited for this summer with CHORI as it will be an active application of my creativity and patience. I have the joy of working alongside Henry Ocampo and Dr. Marsha Treadwell on the DEI Council. I look forward to investigating topics relating to diversity, equity, and inclusion in healthcare as in the future, I plan to use cultural competency and empathy in order to ensure proper treatment of each and every individual that I come across.

INTRODUCTION

Examining the patient care experience through the lens of diversity, equity, and inclusion (DEI) is an essential component in addressing and improving the disparities present within our system. Now more than ever, hospital administration and staff have a growing responsibility to acknowledge the biases that reside within themselves and their workplace in order to better serve the patient population.

OBJECTIVE

If one's Race, Ethnicity, and Language inform their experiences within society, and we examine patient satisfaction surveys using a diversity, equity, and inclusion (DEI) lens, then we expect to find variance among the rates of satisfaction by Race, Ethnicity, and Language.

METHODS

For our data analysis we will look at the demographics from roughly the 17,000 inpatient and 400,000 outpatient BCH populations. We will also examine the patient care experience surveys filled out by about 80,000 of our patients. We plan to interpret the survey responses on the basis of identity markers to determine if there is any variation in elements such as trust, treatment, and comfort. This data comes from the NCR database and will be both complied and visualized using Excel software. Lastly, our conclusions will be condensed and compiled into a patient care report that includes suggestions for BCH on becoming more equitable from the patient perspective.

ANTICIPATED RESULTS

Given the preview of data we have received; we expect for our hypothesis to hold true and for there to be variations amongst patient satisfaction. Being so we hope to address the factors that are reinforcing these differences in order to minimize them.

SIGNIFICANCE OF THE PROJECT

By examining the identity markers of our population in combination with their feedback we hope to tailor our methods to best fit their needs. This works seeks to use cultural competency and empathy to ensure that progress towards a more comfortable, communicative, and equitable healthcare sector takes place.

Kayanna Harris

Multi-omics analysis of the Metabolic Phenotypes of Mammary Epithelial Cells

Mentor: Kevin Tharp, PhD

I am Kayanna Harris, a first-generation, Jamaican migrant residing in Oakland, California. I am a transfer student to UC Berkeley majoring in Chemical Engineering. My passion for Science and Technology has been rooted in childhood, where gardening with my grandparents and using herbs as medicines became the foundation for my interest in the research and production of medicines. I have recognized the importance of equitable healthcare; therefore, I have been motivated in playing my part in achieving this goal. I am honored by this opportunity to participate in the CHORI Student Research Program this summer. I am thankful for the connections made, my incredible mentor, Dr. Kevin Tharp, and their support in empowering me as a woman of color pursuing a STEM career. This is a wonderful enrichment program that gives me the chance to explore my interests, enhance my understanding and learn new possibilities that will shape my career.

INTRODUCTION

Mammary tumors are physically distinct from healthy tissues. Tumor rigidity is thought to promote aggressive characteristics of cancer cells. Because aggressive cancer cells demonstrate altered metabolism that supports their aggressive behavior, we investigated if the physical properties of the cellular microenvironment affect cellular metabolism. Metabolism is the set of chemical reactions in the functionality and maintenance of cells or organisms. Depending on enzyme abundance, cancer cells employ biochemical processes to generate energy for growth and proliferation.

Tumors and tissue functionality are studied through transcriptome analysis of RNA sequencing and differential expression levels. However, measurements of the abundance of mRNAs that encode these metabolic enzymes do not always correlate with protein abundance or metabolic reaction rates. Also, the functional regulation of proteins through post-translational modifications. Therefore, multi-omics analysis assesses correlations between metabolites, enzymes, and mRNAs that encode metabolic enzymes in mammary epithelial cells (MEC) so we can determine the relationship between tumor rigidity and metabolism.

With MEC cultured in environments that mimic the rigidity of tumors or normal mammary tissue, a metabolic flux with isotopic glucose was performed. We found that MEC grown in tumor-like environments are associated with altered glycolytic metabolism, likely through the upregulation of cofactors that enable glycolysis (NAD+/ NADH). Glycolysis flux fosters cancer growth through transcriptional and translational regulation of enzymes. Further studies are underway to compare these regulation discordances to understand how they affect metabolism.

OBJECTIVE

Are the metabolic characteristics of cancer cells due to a metabolic response to the physical properties of the tumor microenvironment?

METHODS

The algorithm Metaboverse is used to contextualize metabolic and global patterns of biological systems through the integration of transcriptomics, proteomics, and metabolomics data. We qualitatively assess genetic regulation to enzyme interactions of the environment to determine alterations. Analyzing the glycolysis metabolism, each pattern type exhibit the significance of measurements, the activation or inactivation of receptors, and any perturbation in cellular metabolism of MEC.

SIGNIFICANCE OF THE PROJECT

Metabolic perturbations have been associated with human diseases. Mapping metabolic network with tumor rigidity during post-transcriptional, post-translational, or the regulation of receptors and transcription factors can reveal unexpected enzyme inhibitors or catalysts; or the formation of new enzyme products that influence the aggressive phenotype of cancer.

Norzin Lhadon

Food sources of iron, zinc, folate, and vitamin B12 among non-pregnant women of reproductive age in Punjab, India

Mentors: Yvonne Goh, PhD; Mari Manger, PhD; and Christine McDonald, ScD

My name is Norzin Lhadon, and I am a rising senior at Holy Names High School. Herbal medicine was always present in my life growing up as my parents were traditional Tibetan herbal medicine practitioners. However, at school, I was taught about Western medicine, and it was very different from what I learned from my parents. Intrigued, I paid even more attention in science class, and it quickly became my favorite subject because it answered my questions about the world we live in and fueled my desire to know more. It is this curiosity that makes me excited for the CHORI SSRP because it is an opportunity to learn more about my interests and contribute to research. Lastly, I would like to express my gratitude to the CHORI staff and my mentors: Dr. McDonald, Dr. Manger, and Dr. Goh, for their support, guidance, and compassion.

INTRODUCTION

Deficiencies of zinc, iron, folate, and vitamin B12 are widespread among women of reproductive age (WRA) in India. The aim of the Multiply Fortified Salt (MFS) study, a community-based randomized, controlled trial, is to test the efficacy of salt fortified with zinc, iron, folate, and vitamin B12 in improving biochemical markers of these micronutrients among non-pregnant WRA (18-49 years) in Punjab, India. The formative phase of the study included a comprehensive dietary assessment of 100 WRA.

OBJECTIVE

This current analysis will estimate the dietary sources of zinc, iron, folate, and vitamin B12 to guide the interpretation of the estimated micronutrient intakes of the study population.

METHODS

The MFS study dietary data were collected between December 2020 and February 2021. Weighed food records were collected from 100 WRA and repeated on a subgroup of 40 WRA to adjust for usual intakes using the IMAPP program. Food intakes were categorized into food groups using the FAO classification system, however mixed dishes were kept as a distinct food group. A study-specific food composition table was compiled using the Indian, Bangladeshi, and USDA food databases to calculate mean nutrient intakes with appropriate nutrient retention and yield factors. The percent contribution of food groups to total daily nutrient intakes were then calculated and summarized.

ANTICIPATED RESULTS

The diet of the study population is mainly plant-based with dairy products commonly consumed. Thus, we expect that the food sources of zinc, iron, and folate will come from grains, legumes, and vegetables. Phytic acid is relatively high in grains and legumes and will reduce the bioavailability of zinc and iron. Vitamin B12 will be mostly from dairy products.

SIGNIFICANCE OF THE PROJECT

This analysis will provide insight into the dietary sources of the four critical micronutrients and assist in defining the micronutrient gap that will be addressed by the MFS trial.

Kathy Li

Culture, Trust, and Nursing

Mentor: Baylee DeCastro, MPP

My name is Kathy Li and I am a rising senior at Arroyo High School. Ever since my visit to my parents' village in China, I have been fascinated with the link between education, wealth, and health disparities. I have come to realize that there are so many nonmedical aspects that come in play outside the hospital that have a huge impact on the overall health of a patient. Therefore, I aspire to be an advocate for underrepresented communities and patients both in and out of a healthcare setting. CHORI allowed me to not only express and explore my interest in advocacy but also inspired me to pursue a career healing communities directly through patient care and indirectly through research. I am so grateful to have been able to work with Ms. DeCastro and other CHORI staff as they have been a huge guidance both educationally and professionally.

INTRODUCTION

Growing up in Oakland, I have met people from all different cultures and backgrounds; every single one is unique. However, we tend to find comfort in knowing there are those who are similar to us. Knowing this, how does culture concordance and discordance play a role in affecting the level of trust between nurses and patients, specifically Asian Americans?

OBJECTIVE

Patient provider ethnic concordance between nurses and Asian American patients will increase feelings of trust, a critical factor for better healthcare outcomes. If this is true, understanding why and using that answer to help lower the level of mistrust between patients and providers from a different culture is essential to improving quality of care.

METHODS

We will conduct informative interviews with Asian and nonasian providers. The answers given by providers will be analyzed to better understand how culture concordance and discordance plays a role in controlling levels of trust from a providers perspective. These interviews will be recorded so they can be referred back to.

ANTICIPATED RESULTS

It is expected that nurses who come from the same culture as their patients will unconsciously be given more trust to begin with.

SIGNIFICANCE OF THE PROJECT

Open communication between patients and providers is essential for providers to be able to provide the best quality of care. The more the provider knows, the better their care plan can be catered towards the patient specifically. However, I have seen countless times where patients, specifically Asian patients, withheld information or lied to providers because the provider was of a different ethnic background. Situations like these can prevent providers from giving the best quality of care and sometimes can even be dangerous. Understanding why there tends to be an initial mistrust between patients and providers with different ethnical backgrounds is the first step to solving this overlooked problem in the healthcare system and will improve quality of care.

Endia McCowan

Examining the Impact on Dance on Teens Dealing with Trauma

Mentor: Christine Schudel, MSW MPH

My name is Endia McCowan. I am an incoming senior at Fremont High School in Oakland. I can't tell you what makes me interested in science because there are various reasons. As a child, I've always been spectacularly curious, whether it be me asking, "How do we know the earth is round? " or " Why don't birds get electrocuted when they land on Electric wires?" I know curiosity made me want to explore this internship. In the past few years of my high school experience, I explored other career options such as media, although I enjoyed media. I wanted to further my career in helping people in need. Having the ability to help is the biggest passion I could have due to my grandma passing away due to health problems. I'm excited to gain knowledge and accept any challenge heading my way.

INTRODUCTION

Trauma is normally exposed at or before the age of 12 (Lowey et al., 2019). Trauma can be very stressful and lead to health issues like depression, anxiety, or chronic diseases such as hypertension. One of the main factors used to help lessen the impact of Trauma is family or friends giving their moral support (Center on the Developing Child at Harvard University, 2011). What if there was another way to approach to lessening the impact of trauma experienced by teenagers? It is well documented that Physical Exercise is a great way to relieve stress. What is less known is whether dance can be used for as source of exercise and a way to lessen the impact of trauma. When experiencing a traumatic event, it can leave you feeling unresolved. Exercise is known to be a beneficial way to brain recovery and sense of well-being (Jeri et al, 2016). Although dance is a great way to relieve stress, it can also build social connection (ExtendED Notes, 2018)

OBJECTIVE

Teens who attend the resilience clinic at UCSF Children's Hospital Oakland with a PEARL score of 3 or higher will report social support benefits after participating in dance, a potential mitigating factor in childhood trauma.

METHODS

Caregivers of teens that have been refer from resilience clinic will be approached prior to their teens' visits via a phone call. Of those willing to participate, the research team would meet with the caregiver and youth 30 minutes prior to their resilience clinic visit to obtain consent and assent. Those enrolled in the study will participate 3 different genres of dance. Each genre of dance will have 5 classes and last no longer than 60 minutes. The dance class will be a group activity. Each participant will be interviewed by a member of the research team before and after completion of all dance classes using questions designed at understanding their feelings of social connectedness during their dance class. The Research team will observe their body language and how their emotions are. All data collected will be kept in a locked cabinet in the faculty advisor's secure office. Only the research team will have access to the data and be allowed to review it for data collection and analysis purposes. Study data will be transcribed and explored for codes and themes.

ANTICIPATED RESULTS

We anticipate finding a way for dance to be an increase of social support.

SIGNIFICANCE OF THE PROJECT

This study can help improve greater insight into how dance mitigates the harmful effects of trauma.

Jocelyn Medina Zepeda

Impact of COVID-19 on Access to Care and Well-Being for Individuals with Sickle Cell Disease

Mentors: Marsha Treadwell, PhD and Ome-Ollin Ruiz

My name is Jocelyn Medina Zepeda, and I am a rising fourth-year student at UC Berkeley, studying Molecular and Cell Biology. As a first-generation Latinx student, I struggled being the first in my family to pursue STEM, even though my most vivid memories involved answering questions I had through science. I decided to pursue medicine to serve my community, a goal I had from an early age since I understood the challenges constantly faced in healthcare. This summer, I am honored to be mentored by Dr. Marsha Treadwell, Olivia Chen, and Ome-Ollin Ruiz, all who are passionate about science and community wellness. Alongside them, I will analyze the social and physical impacts of the COVID-19 pandemic on individuals with sickle cell disease, which I am excited to be working on. SSRP has given me confidence in my scientific abilities because I have a support system that is guiding me towards my future path in science--whether as a physician or a researcher. Through this program, I hope to continue acquiring necessary research skills and life-changing experiences.

INTRODUCTION

During the COVID-19 pandemic, visible disparities, including barriers to accessing healthcare, disproportionately impacted Black communities. Individuals with sickle cell disease (SCD) are primarily Black and are medically vulnerable, facing limited access to and pervasive stigma in the healthcare system, which along with negative healthcare experiences are rooted in structural racism. We surveyed individuals enrolled in the Sickle Cell Disease Implementation Consortium (SCDIC) Registry to understand healthcare accessibility and well-being during the pandemic.

OBJECTIVE

Primary: Individuals with SCD will report that they were unable to receive needed emergency care at a rate higher than the 67% reported prior to the pandemic. **Secondary:** Individuals with SCD will report that their mental health, finances, and relationships worsened during the pandemic.

METHODS

Individuals with SCD, ages 17 – 49 years, completed a COVID-19 Impact Survey as part of the SCDIC Registry annual follow-up. Standardized questions asked about barriers to care; healthcare utilization; COVID-19 status; and changes in mood, finances and relationships, during and after the outbreak. Data was entered into a centralized database and our site's data was extracted for descriptive analysis.

ANTICIPATED RESULTS

The n = 173 respondents were 59.5% female; 96% Black; 6% Hispanic; mean age 31 years; annual household income for almost half (prior to COVID-19) <$25,000. 62% had been tested for COVID-19, 6% tested positive. 64% reported they had avoided going to the emergency room, even when necessary, at least once during the pandemic. 47% reported worse mood, 43% worse finances and 26% worse relationships as a result of the pandemic.

SIGNIFICANCE OF THE PROJECT

Participants reported challenges with accessing emergency care during the pandemic, similar to pre-COVID-19. Their reports of worse mood were more frequent than the general population, but relationships were not as impacted. Many reported financial losses, in the context of already low incomes. Working to eliminate health inequities is critical so that the sickle cell population can receive the care that they need and deserve, particularly during a public health crisis.

Gabrielle Montenegro

Pediatric Bone Mineral Accrual In Thalassemia

Mentor: Ellen Fung, PhD RD CCD

Hello, my name is Gabrielle Montenegro and I am a rising junior at Macalester College, majoring in Biology with a Biochemistry emphasis and minoring in Chemistry. Upon graduating, I plan to attend medical or nursing school. Growing up in a household where I often played the role of an adult, I discovered my passion for caretaking. I became fascinated with anatomy and biology while taking courses at Berkeley High. However, my love for medicine and science is truly rooted in the death of my grandmother to cancer. These experiences led me to seek a career in medicine where I will get to care for patients and conduct research on illness. This summer I am excited to work under my mentor, Dr. Ellen Fung, studying the effects of Thalassemia on bone accrual in youth, focusing on factors such as pubertal status, comorbidities, calcium intake, race, age, sex, and body size. I am extremely grateful for the knowledge and experience CHORI has provided me with and would like to thank my Investigators for taking the time to manifest in my aspiration to pursue a career in medicine.

INTRODUCTION

In healthy children, roughly 80% of bone mass is gained by 18 years of age. However, for children with chronic disease, bone gain may be altered, putting them at risk for fracture in adulthood. Our group studies patients at risk for poor bone development, in particular, those with thalassemia (Thal). Thal is an inherited blood disorder characterized by anemia, growth deficits, hypogonadism, and nutritional deficiencies. Up to 60% of adults have low bone mass, though bone accrual has not been studied.

OBJECTIVE

1. Calculate bone accrual in youth with Thal (5 to 19 yrs) using previously collected DXA scans.
2. Compare bone accrual in youth with Thal to published data from a healthy cohort.
3. Evaluate the effect of age, sex, height, hypogonadism, and calcium intake on bone accrual in youth with Thal.

METHODS

A retrospective study will be conducted in 25 patients with Thal who have had a minimum of 2 dual-energy x-ray absorptiometry (DXA) scans between 2011 and 2021. Abstracted subject data will include bone mineral density (BMD), age, height, tanner stage and calcium intake. Bone accrual in Thal will be compared to that from 1,837 healthy youth (5 to 19 yrs) enrolled in the Bone Mineral Density Cohort Study (Kelly et al 2018).

ANTICIPATED RESULTS

Bone accrual will be reduced in patients with Thal compared to healthy controls, and the level of deficit will be associated with advancing age, male gender, growth failure and delayed onset of puberty.

SIGNIFICANCE OF THE PROJECT

Though there have been many studies focusing on identifying risk factors for poor bone health in youth with Thal, none have looked longitudinally at the development of peak bone mass in this at-risk patient population. It is important to evaluate bone accrual in youth with thalassemia during the most critical period of bone development- childhood and adolescence- in order to manage the health and care for patients affected by this devastating disorder.

Faith Niyi-Awolesi

Challenges to Enrolling Adolescents in Social-Needs Platforms

Mentor: Dayna Long, MD

My name is Faith Niyi-Awolesi and I'm a rising senior at Jesse Bethel High School. My love for science stems from my experience growing up in Nigeria. I adored the medical professionals that took care of me when I got severe malaria and that experience has instilled in me a passion for helping others and pursuing scientific research. I haven't had many opportunities to pursue my love for science until I joined the CHORI Summer Program and I'm grateful for this opportunity because it has shown me that I can make a difference, no matter how small. This program has not only strengthened my desire to pursue medicine but has also introduced me to biochemistry, public health, and health equity, topics that I hope to pursue further in college and beyond. I'm very grateful to my mentor, Dr. Dayna Long, and the CHORI program for giving me this life-changing experience.

INTRODUCTION

Social determinants of health play a significant role in the health and well-being of people, especially children and adolescents. The FINDconnect platform addresses social needs by providing resources and a support system through a navigator, which research has shown significantly reduces the risk of child hospitalization. But the platform needs to be updated in order to be able to serve the adolescent population as well as it serves caregivers, adults, and younger children.

OBJECTIVE

Adolescents are not able to fully utilize social-needs platforms because of the need for a caregiver for certain resources provided and because most resources aren't tailored to their needs.

METHODS

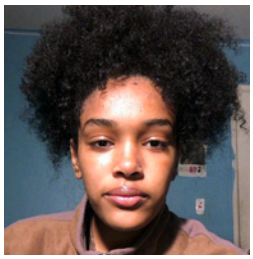
Both qualitative and quantitative data will be collected and analyzed—from the school-based health center staff and the FINDconnect database respectively—to determine the reasons for the low utilization of social-needs platforms by adolescents. Semi-structured interviews will be held with school-based health center staff in order to gather data on adolescent utilization and interaction with the platform.

ANTICIPATED RESULTS

It is expected that the platform's set-up and issues with enrolling adolescents—including the need for a guardian for certain questions and the family-oriented language used on the platform—will be a limitation to adolescent enrollment. It is also expected that different approaches compared to those used for caregivers would have to be implemented in reaching out to adolescents and getting them enrolled and active with the social-needs platform.

SIGNIFICANCE OF THE PROJECT

Adverse childhood experiences and social needs play an important role in the health and well-being of a child. Positive childhood experiences and addressing social needs allow children to grow up to become healthy adults, but adolescents are not utilizing this resource as much as they should. Finding the reasons for the significantly low rate of adolescent utilization will allow for improvements to social-needs platforms, allowing for more adolescent usage, thereby improving their health.



Hanim Nuru

Investigation on DRB1 gene features for Type-1 Diabetes in Sudan, Bangladesh, Azerbaijan, and Pakistan populations (Non-European Countries)

Mentor: Steve Mack, PhD

Hi! My name is Hanim Nuru and I am a rising senior at Berkeley High School. My interest in science grew during my high school career, when I began to notice how science is really structured. Science has endless possibilities and discoveries which are not limited by any factor. Applying to SSRP was influenced by my interest in certain aspects of biology while taking my high school biology course. It was also influenced by my desire to gain a better understanding of biomedical research and experience a professional lab environment. I am very thankful and excited for this opportunity.

INTRODUCTION

The Human Leukocyte Antigen (HLA) genes are responsible for detecting foreign proteins and directing an immune response to potential pathogens.

The HLA gene includes six polymorphic loci divided into class I and class II groups, depending on the type of T-cell they interact with. The HLA-DRB1 allele, a class II gene, has over 3,700 known alleles. Type-1 Diabetes (T1D) is an autoimmune disease that has been found to be highly associated with the HLA-DRB1 allelic variation.

T1D is an autoimmune disease in which the body's immune system attacks and destroys insulin-producing pancreatic islet cells. Without insulin, T1D patients' cells cannot process glucose, and when T1D is untreated, most patients die within a few weeks. T1D is a disease that primarily affects children.

Instead of using allele names as identification for the type of nucleotide polymorphism, which does not describe the polymorphism of alleles at an HLA gene, we will use GFE notation (Gene Feature Enumeration). With the enumeration of unique nucleotide sequences for each gene feature in an HLA gene and recording of GFE notations, the GFE approach is a more effective method for polymorphic genes.

OBJECTIVE

Identify any common specific gene-feature sequences in the HLA-DRB1 alleles that are associated with T1D in 4 different non-European populations (Sudan, Azerbaijan, Bangladesh, and Pakistan).

METHODS

The BIGDAWG R package runs Hardy-Weinberg Equilibrium case-control analysis, generating allele frequencies, calculating odds ratios, confidence intervals and p-values for every allele. Using BIGDAWG, BIGFEAT converts the HLA allele name data into GFE notations for analysis and then passes the GFE notations to BIGDAWG for analysis, then packages the results.

With these datasets, I will be able to convert the data gathered from the four population's DRB1 allele names to GFE's. Allowing me to build new tools to compare BIGFEAT's generated association for the DRB1 gene feature variants across all 4 populations to find common predisposing/protective features.

ANTICIPATED RESULTS

I expect to discover an association between T1D and the GFE notations in the four populations. Research has concluded that in European Population, where T1D is most common, the DRB1*03:01 and *04:01 alleles are highly associated with T1D.

SIGNIFICANCE OF THE PROJECT

HLA-DRB1 allelic variation has a significant association with T1D. Being able to identify specific gene-feature sequences that are significantly associated with T1D across multiple DRB1 alleles (predisposing/protective) helps medical professionals to better understand this complex genetic disease and potentially provide insulin-therapy to children at risk for T1D. By investigating T1D association in individuals' gene features, rather than allele names, we may identify the underlying functional elements contributing to susceptibility to or protection from T1D.

T1D research in non-European populations has not been investigated extensively. Through a collaboration with the Life For a Child Foundation, we have access to the HLA-DRB1 allele data for T1D patients and unrelated controls from Azerbaijan, Bangladesh, Pakistan, and Sudan.

Anna Pelegrino

Workouts that Work: establishing feasible weight-bearing exercises for patients with Thalassemia

Mentor: Ellen Fung, PhD RD CCD

Hello! My name is Anna Pelegrino and I am a rising senior at Berkeley High School. I am passionate about Public Health and aspire to practice clinical medicine with a focus on preventative care and compassion. I think representation is crucial, especially in the medical feild, and I am grateful and inspired to be working with my Investigators and fellow interns in this program. I adore interacting with people and can't think of anything quite so exciting as walking around a hospital in scrubs, doing what I can do prevent, mitigate, and manage patient's distress. Being first generation Brazilian-American, I draw strength from my cultural background, perspective from the sacrifices of my family, and above all a drive to rectify the disparities I have seen in my community.

INTRODUCTION

Thalassemias (Thal) are autosomal recessive diseases characterized by incomplete production of either the alpha or beta globin of hemoglobin leading to severe anemia. Patients with Thal suffer from complications associated with anemia such as fatigue, weakness, pain, growth retardation, and cardiac complications. Due to these symptoms, patients are less physically active than healthy controls, and this inactivity exacerbates their risk for osteoporosis. Although drug therapies are often used to treat osteoporosis, they are not ideal for use in children due to their many side effects. Alternative, non-invasive patient-centered therapies focused on bone formation must be considered. Exercise has been shown to enhance bone health in non-Thal populations but has not been well studied in Thal.

OBJECTIVE

1. Determine the feasibility of daily weight-bearing exercise in patients with Thal, and
2. Explore which exercises are most compatible with success in patients with Thal

METHODS

10 patients (> 15 years of age) that regularly attend the Thal Comprehensive Clinic at BCH-Oakland will be invited to participate in the 8-week study. Before beginning, enrolled subjects must attend an hour-long orientation with a Physical Therapist to review best practices for safe exercise. Subjects will be provided with exercise equipment (resistance bands & tubing, step block) and asked to participate in at least one aerobic and/or strength training activity per day from a provided list. At the end of each day, subjects will complete a daily survey regarding exercise participation. Surveys will be summarized, and patterns regarding successful feasibility and/or adherence to exercise will be explored.

ANTICIPATED RESULTS

We anticipate that daily participation in weight-bearing exercise is feasible for patients with Thal and associated with social support and prior experience with exercise.

SIGNIFICANCE OF THE PROJECT

This study focuses on the feasibility of daily exercise in Thalassemia, the first step in developing a large, interventional trial. In addressing the bone density-related challenges that come with Thalassemia and in order to develop interventions, it is crucial to understand what types of exercise patients are willing and able to do. This non-invasive study is patient-centered and provides an opportunity for patients to take control of an aspect of their treatment.

Sonali Pfile

Extracellular Vesicles in the Urine of Kidney Stone Formers

Mentor: Sunita Ho, MS PhD

My name is Sonali Pfile, and I am a rising junior studying Microbial Biology at UC Berkeley. In elementary school, my mother bought me a book that chronicled the various parasites, bacteria, and viruses that make themselves at home in our bodies, and my interest was piqued. Since then, I have sought to discover as much as possible about biology, both in the classroom and in the lab. The CHORI program has given me the opportunity to learn from the wonderful program directors alongside my inspiring peers, and from my amazing mentor in the lab. Exploring the causes and impact of kidney stones has been challenging and rewarding. Many thanks to Dr. Sunita Ho, whose interdisciplinary approach to research proves that there are always new and beautiful discoveries to be made, and to Dr. Putu Ustriyana, who has patiently and kindly guided me through my research alongside Dr. Ho.

INTRODUCTION

Extracellular vesicles (EVs) represent an exciting avenue of research as biomarkers for various pathologies including biominerals within a kidney. They are small lipid nanoparticles that encapsulate physiological and pathological messages. These messages are carried to target cells.

OBJECTIVE

We hypothesize that the size, number, and morphology of EVs in the urine of kidney stone formers will be significantly different from that of non-stone formers.

METHODS

Urine will be collected from patients (IRB #14-14533) that form kidney stones (stone formers – SF). Urine from those that do not have kidney stones will serve as the controls (IRB #20-32471) (non-stone formers – NSF). EVs will be isolated from the urine using low speed centrifugation and ultracentrifugation. EVs will be isolated using size exclusion chromatography and further characterized for size using nanoparticle tracking analysis. This combination will allow delineation of differences in size and number of EVs within, and across SF and NSF groups. Furthermore, the isolated EV pellet will be freeze dried, encased in resin, and ultrasectioned into thin slices for electron microscopy. The visualized ultrasections from both groups will be analyzed for morphological differences in EVs.

ANTICIPATED RESULTS

The size, number, and morphology of EVs in the urine of SF and NSF patients will be statistically different.

SIGNIFICANCE OF THE PROJECT

This project seeks to identify measurable differences between SF and NSF patients, and identify if these patient-specific EVs can be used as a biomarker for renal disease, in particular, stone disease. The results could serve as a preliminary validation of a non-invasive method to alert patients who are at a higher risk to form kidney stones.

Zhana Prince

Rates of Depression among Pregnant Patients Based on Socioeconomic Status

Mentor: Kim Rhoads, MD MS MPH

Hello, my name is Zhana Prince. I am a rising senior at UC Davis, pursuing a degree in Psychology, and I plan to attend Medical school after graduation. I am interested in providing and improving the quality of healthcare to those who struggle to afford it. Growing up, my mother and I were in and out of the healthcare system, and witnessed first hand the disparities in treatment that lower income people of color receive. Those struggles have inspired me to work toward changing the system by eliminating the healthcare inequities. Over the course of my internship with SSRP, I am most excited to gain experience within research. I am very grateful to have been paired with my mentor, Dr. Kim Rhoads, a surgeon and disparities researcher. Through this experience, I hope to gain more valuable insights into the medical field and systematic impact I can make.

INTRODUCTION

According to the CDC, 1 in 8 women (approximately 10-20%) will experience Postpartum Depression (PPD) (2021, CDC)(Bauman et al., 2020).The rate has increased by seven fold between 2000 and 2015 (2021, CDC)(Haight et al., 2019). Women in low SES categories were at five times greater risk for symptoms of PPD. (Mukherjee et al., 2017)

OBJECTIVE

We hypothesize that women with lower socioeconomic status and resources will have higher scores on the Edinburgh Postnatal Depression Scale (EDPS) a measure of PPD.

METHODS

Anonymized, serial EDPS scores (from March 19, 2020 to August 4, 2021) will be obtained from patients using Lifelong Medical Care. These scores were collected weekly during the pregnancy and postpartum in the time frame described. Corresponding census tract data will be used to define SES categories. The data set will also include race/ethnicity, the date of delivery, their age during the pregnancy, and number of prior live births. The analysis will compare EDPS scores by SES characteristics as well as other demographic and clinical factors.

ANTICIPATED RESULTS

Summary statistics on EDPS score by patient characteristics (SES, age, race/ethnicity, the date of delivery, their age during the pregnancy, and number of prior live births) will be generated. Direct evaluation of the hypothesis will include a comparison of the EDPS score by SES.

SIGNIFICANCE OF THE PROJECT

More access to mental health programs and paid maternal/paternal leave for parents should be considered for options of improvement on mental health during pregnancy for all women. The results from my research will demonstrate that these policies should be implemented. According to the Mukherjee study, approximately 88% of those participating did not receive a checkup or treatment for the depression they were experiencing. We could see improvement in the rates of treatment after scores if we provide resources in lower socioeconomic areas. This demographic does not have the ability of taking time off with the lack of pay and often do not have as many resources that can provide the assistance with mental health problems such as PPD. These psychological problems could pose long term problems for the mother as well as the child during development.

Hermela Russom

Does mitochondrial morphology vary between cell types in the model nematode *Caenorhabditis elegans*?

Mentor: Samantha Lewis, PhD
Contributing Author: Jessica Leslie

Hello, my name is Hermela Russom.I am currently a high school graduate from Encinal high school in Alameda. I am going to go to San Francisco State University for my undergraduate degree in Nursing. I have always wanted to do something in the medical field since I was a child and surprisingly, I have never changed my mind about that.Instead as I started to grow older,I started to have the feeling that I can do much more than just having a career in the medical field like being a human right activist due to the fact that I am black and an immigrant who has been through and seen a lot of tough situations. I believe that these two career and life goals go hand in hand in producing a safe environment for everyone regardless of gender or race. Thanks to CHORI and my mentors who are helping me achieve my goals in the medical field by exploring and being more familiar with it hence making it easier to decide on the exact speciality that I want to pursue.

ABSTRACT

Mitochondria is an organelle often referred to as the PowerHouse of a cell. They turn sugars and fats we take from food into chemical energy that the cell can use, in the form of a molecule called ATP. Mitochondrial shape and behavior are important for organellar function and vary between cell types depending on specific metabolic demands. In highly energized tissues like muscle, cells tend to have more mitochondria that are spherical in shape than cells that need less ATP. We are using the model nematode Caenorhabditis elegans as a model for studying tissue specific differences in mitochondrial shape and function. Carrying out super-resolution imaging of mitochondria inside of multiple cell types from C. elegans, including differentiated muscle and mitotic gonadal stem cells. In the long term of this project, it might be helpful in identifying therapeutic targets for developing drugs that could treat diseases where mitochondria aren't functioning optimally due to defects in their morphology or dynamics.

Sameeha Salman

Identifying the Presence of Haptoglobin in the Midzone Region of Lipoprotein Particles and Association with Cardiovascular Disease Risk

Mentors: Ronald Krauss, MD and Sarah King, PhD

My name is Sameeha Salman and I am an incoming sophomore at UC Davis studying Neurobiology, Physiology, and Behavior. My interest in science began when I was in kindergarten, participating in my school's science fair, where I won first place for my 'eggs in vinegar' experiment. I continued to take part in the science fair every year since, going on to compete in the regional and state-level competitions as well. But my greatest interest lies in the field of human biology and medicine, which sparked my career goal of becoming a cardiothoracic surgeon. This summer, under the guidance of Dr. Sarah King and Dr. Ronald Krauss, I was fortunate enough to conduct research on lipoprotein profiles, specifically the "midzone" region which is largely understudied but can aid in the assessment of heart disease risk in patients. I used magnetic bead separation technique to learn more about the presence of haptoglobin in the "midzone" region by using western blotting and Ion Mobility (IM) lipoprotein fractionation. This experience, along with the supplemental lectures provided by the program has equipped me with more knowledge about cardiovascular health-related diseases, and given me a head start towards my career goals.

INTRODUCTION

There has been a well-established correlation between the concentration of lipoproteins in an individual's blood and their risk for cardiovascular disease. Lipoprotein particles carry triglyceride and cholesterol to tissues and are characterized by size. There is an unexplored region between the LDL and HDL particle size region, preliminarily called the "midzone" region. The process of separating and identifying proteins that lie in this region has been challenging due to the nature of the region's particles.

Recent data shows that there is a significant presence of Haptoglobin (Hp) in the lipoprotein plasma fraction, specifically in the "midzone" region. However, the specific location and function of haptoglobin in this region still remains unanswered.

OBJECTIVE

I hypothesize that haptoglobin is present on lipoprotein particles in the "midzone" size region, which is subclass of lipoprotein particles ranging from 14.5 to 18.0 nm; haptoglobin may contribute to the cardiovascular disease risk associated with particles in this size range have an impact.

METHODS

We will use immuno-techniques to remove haptoglobin from plasma lipoprotein fractions and then characterize the particles that co-immunoprecipitate with the haptoglobin.

We will use magnetic bead (Dynabeads) techniques with anti-Haptoglobin-α-antibody to deplete haptoglobin from plasma lipoprotein fractions, followed by Western blotting and Ion Mobility analysis to observe the size distribution of the particles eluted from the beads.

ANTICIPATED RESULTS

We expect to successfully pull down haptoglobin from lipoprotein extracts/fractions. In the fractions of haptoglobin-depleted samples, we expect that the concentration of midzone particles will be reduced. We hope to identify a correlation between haptoglobin levels and midzone particle concentrations.

SIGNIFICANCE OF THE PROJECT

The midzone region is associated with CVD risk assessment, and there is experimental evidence suggesting correlation between inflammatory markers and midzone particles; several proteins that participate in the immune function and inflammatory processes have been identified in this region. Additionally, the Haptoglobin phenotype is associated with coronary endothelial dysfunction in individuals with diabetes.

Sylvia Sawislak

Evaluation of red blood cell transfusion triggers in adult versus pediatric populations

Mentor: Elena Nedelcu, MD

My name is Sylvia Sawislak and will be a junior at the University of California Santa Cruz this fall, majoring in Human Biology. One of my favorite classes in high school was Honors Anatomy and Physiology and absolutely loved the lab days where we got to do animal heart dissections. I am extremely passionate about science and admire the way it happens on its own but is also something humans can be a part of and learn more about. I want to continue exploring these ideas throughout the rest of my time in college and hope to pursue medical school or graduate school to further my education in a field that is always on the brink of something new and exciting! I want to thank my mentor Dr. Elena Nedelcu, a clinical pathologist and hematologist who gave me the opportunity to study with her and research the administration and process of blood transfusions.

INTRODUCTION

Red blood cell transfusions are a type of blood product that is obtained via a whole blood donation or apheresis. Transfusion of blood products should follow specific guidelines in order to prevent unnecessary exposure to the risk of blood transfusions.

For adults and older pediatric patients in need of an RBC transfusion, using a restrictive transfusion threshold is suggested. For neonates and infants, studies are still underway, investigating whether a restrictive or liberal threshold is indicated. Hemoglobin levels should be about 7.0 g/dL for critically ill but hemodynamically stable infants (McCormick et al, 2020), while for adults, hemoglobin levels can be 7 or 8 g/dL including adult patients who are hospitalized but hemodynamically stable (Carson et al, 2016). Other factors that are relevant for neonates and older childrens is transfusion dosage which should be 10-20 mL/kg for neonates and 10-15mL/kg for children and adolescents. From McCormick et al, authors recommend that hemodynamically stable children even if critically ill, should not receive RBC transfusions for hemoglobin levels over 7.0g/dL. Pediatric populations have also been reported to have higher rates of inappropriate transfusions of blood products compared to adults (Bahadur et al, 2015).

OBJECTIVE

The transfusion of red cells in pediatric populations and adult populations have the same hemoglobin triggers.

METHODS

Collected data is deidentified and maintained in a password-protected computer. Demographics, patients characteristics, and transfusion triggers will be summarized using descriptive statistics with mean, standard deviation, median and range for continuous outcomes, and frequency and proportion for categorical outcomes. Descriptive statistics, graphs and t-test will be performed using Microsoft Excel and or GraphPad Prism.

ANTICIPATED RESULTS

We anticipate that the null hypothesis will be rejected and that the hemoglobin pre-transfusion triggers are different in adult vs pediatric populations.

SIGNIFICANCE OF THE PROJECT

While over 400,000 units of blood and blood products are transfused to pediatric patients every year (McCormick et al, 2020), pediatric transfusion guidelines are less well established than adult guidelines. This study aims at establishing whether there are differences in triggers for red blood cell transfusions.

Elyes Serghine

The role of astrocytic XBP1s in energy expenditure

Mentor: Ashley Frakes, PhD

My name is Elyes Serghine and I am currently a rising senior at Mission San Jose High School. I always found biology related topics very intriguing; the more I learned, the more I realized how little we knew. For example, when looking at a cell, it appears to be a simple entity; however, we only unlocked a small portion of it's secrets. I sometimes see biology as a series of mysteries that we need to solve to understand the many phenomena that regulate the mechanisms of living bodies and improve our lives. This is one of the reasons I gravitated towards biology related events during high school, where I joined the school's Science Olympiad team. This is also what led me to join CHORI, to not only solidify my knowledge, but also for the opportunity to work on a research project, which was very novel and exciting. Thankfully, under the mentorship of Dr. Ashley Frakes and Dr. Ryo Higuchi-Sanabria, my goal this summer is to conduct research on changes in an organism's metabolism and gain clinical experience suited to my interests.

INTRODUCTION

The endoplasmic reticulum (ER) has an important role in maintaining protein homeostasis, and when the capability of the ER to process proteins becomes saturated, ER stress occurs. To counter the effects of ER stress, the unfolded protein response (UPR) is activated. Increasing expression of Xbp1s (a transcription factor in UPR) in the astrocyte-like glial cells of C. elegans resulted in animals that were more resistant to ER stress and that were long-lived. To determine if this mechanism is conserved in mammals, we overexpressed XBP1s in mouse astrocytes and fed these mice a high fat diet (HFD) to cause ER stress or control chow. The GFAP-XBP1s mice gained less weight on a HFD compared to the mice without XBP1s overexpression. However, both groups ate the same amount of food. Our work will seek to identify whether GFAP-XBP1s mice exhibit an increase in energy expenditure to account for the reduced weight gain on a HFD.

OBJECTIVE

We hypothesize that increasing production of astrocytic XBP1s in mice will induce expression of genes associated with heat production in brown and inguinal white adipose tissue, causing an increase in energy expenditure.

METHODS

We will design 4 groups of mice which will vary based on diet and expression of Xbp1s. BAT and iWAT will be collected and then grinded up. Afterwards, an RNeasy kit will be used to isolate the mRNA from the homogenized tissues. mRNA is then converted to cDNA using a Qiagen Quantitect kit, following by performing a qPCR on the cDNA to measure expression of the genes Elovl6, Dio2, Cidea, UCP1, Prdm16, and Ppargc1α.

ANTICIPATED RESULTS

We expect to see an increase in the genes associated with heat production (Elovl6, Dio2, Cidea, UCP1, Prdm16, and Ppargc1α) for the mice that exhibit Xbp1s overexpression.

SIGNIFICANCE OF THE PROJECT

This project will allow us to observe what effect the UPR in glial cells has on the energy expenditure of mammals, potentially identifying a novel therapeutic target for metabolic disease and aging.

Yusra Sultan

Association of HPV and *C. trachomatis* Infection among women with and without Abnormal Histopathology and Cervical Cancer in Quito, Ecuador

Mentors: Deborah Dean, MD MPH and Emily Chou

My name is Yusra Sultan and I am a rising sophomore at California State University, East Bay majoring in psychology and minoring in human development. I have always been intrigued by the never ending findings and research processes that scientists perform. Every aspect of science is very specific yet intricate, which ultimately sparked my interest in wanting to gain more expertise in basic and clinical research. I am very excited to work with a driven cohort where I will be given the opportunity to participate in a variety of labs and insightful lectures. I would like to that my mentors, Dr. Dean Deborah, and Emily Chou for being my guides throughout this research project. I am thankful to be given the opportunity to grow in an environment where I am constantly supported and aided.

INTRODUCTION

Cervical cancer is the fourth leading cause of cancer death among women worldwide and is due to persistent human papillomavirus (HPV) infection. Only a fraction of HPV infections progress to malignant lesions suggesting the HPV infection is a necessary but not sufficient contributor to cervical cancer. This suggests that a host-specific or microbial cofactor must be involved in HPV-induced carcinogenesis. Recent studies suggest that concurrent sexually transmitted infection with *Chlamydia trachomatis* is associated with a higher risk of developing cervical cancer.

OBJECTIVE

C. trachomatis is significantly associated with HPV in women with cervical histopathology and cancer.

METHODS

Between July and October 2007, 252 women were enrolled at the SOLCA Cancer Hospital in Quito, Ecuador. Cases were defined as having biopsy-proven CIN-1, -2, -3, AIS or ICC. Two age-matched controls were selected for each case. Participants were administered a questionnaire to collect demographic information and to evaluate risk factors for sexually transmitted infections; endo- and ectocervical samples were obtained from all women. Genomic DNA was extracted from endocervical samples and evaluated for *C. trachomatis omp*A genotype and HPV type using conventional Sanger sequencing. The strength of associations were estimated by odds ratio and 95% confidence intervals. Statistical significance was established using a Chi-squared or Fisher Exact test in R studio.

ANTICIPATED RESULTS

Chlamydia trachomatis will be significantly associated with HPV in women with histopathology or cervical cancer but not with women without histopathology or cervical cancer.

SIGNIFICANCE OF THE PROJECT

HPV is a significant cause of preventable cervical cancer in Hispanic populations. Regional incidence and mortality rates are largely influenced by the extent of screening programs and of HPV vaccination. These interventions are more likely to be available in developed nations, and there has been a 75% decrease in the incidence and mortality of cervical cancer in developed countries over the past 50 years. More than 90% of new HPV infections spontaneously resolve within two years, and only a fraction of uncleared infections progress to premalignant cervical lesions and invasive cervical carcinoma. This progression suggests that HPV infection is a necessary but not sufficient contributor in the development of cervical. This study will determine the association of *C. trachomatis* with HPV and cervical pathology/cancer in Quito that will inform screening and treatment strategies that can be implemented by the Ministry of Health.

Sheila Teker

The Relationship Between TMEM55B and Intracellular Lipid Accumulation

Mentors: Yuanyuan Qin, MBBS PhD and Marisa Medina, PhD

As a rising senior at Campolindo High School, the all-too-familiar question regarding what I aspire to pursue as a profession has only been elucidated by my acceptance to the SSRP program. Growing up, I have always loved learning about everything that I had the opportunity to delve into, but also as someone who emphasizes compassion in interactions with others, I knew that science—particularly medicine—was the perfect manner by which I could intertwine and express these two major aspects of my personality. Moreover, this program has opened my eyes to a significantly more in-depth level of scientific study that I have previously never been exposed to and which nurtures my insatiable curiosity; likewise, knowing that the research I conduct with my mentors will be beneficial for others makes me only more willing to continue challenging myself and following my dream of medicine—what seemed like a mere dream before!

INTRODUCTION

Approximately 40% of adults worldwide and 24% of people in the US are afflicted by nonalcoholic fatty liver disease (NAFLD), which is characterized by excess triglyceride accumulation in the liver. Unfortunately, there are currently no targeted interventions for its prevention or treatment. Our lab recently found that knockdown of Transmembrane Protein 55B *(TMEM55B)*, a newly discovered regulator of intracellular cholesterol metabolism, led to triglyceride accumulation in human hepatoma cell lines and in the livers of Western diet-fed murine models. Furthermore, we measured that hepatocyte-like cells derived from induced pluripotent stem cells of NAFLD patients had higher levels of *TMEM55B* compared to healthy controls. More recently, our lab demonstrated that undifferentiated induced pluripotent stem cells (iPSCs) can also be an informative cellular model to evaluate molecular factors contributing to intracellular triglyceride accumulation.

OBJECTIVE

To evaluate whether the relationship between *TMEM55B* and intracellular triglyceride accumulation can be observed within undifferentiated iPSCs.

METHODS

iPSCs from 10 donors will be cultured in 1.5 mL mTeSR1 media at 37°C and 5% CO 2. RNA will be extracted, reverse transcribed into cDNA, and *TMEM55B* transcript levels quantified via real-time qPCR. Subsequently, we will incubate iPSCs in media containing 100 μM oleic acid or a BSA control. After 24 hours, cells will be stained with Nile red, a neutral lipid dye, and triglyceride levels will be quantified by flow cytometry. Pearson correlation will be used to test for a relationship between *TMEM55B* transcript levels and the intracellular triglyceride levels.

ANTICIPATED RESULTS

iPSCs that express lower levels of *TMEM55B* will have greater intracellular triglyceride accumulation than iPSCs with higher levels of *TMEM55B*.

SIGNIFICANCE OF THE PROJECT

Since mechanisms involved in the development of NAFLD are not fully understood, identifying molecular processes that impact the disease can aid the development of novel therapeutics. In addition, our research will also highlight the utility of undifferentiated iPSCs as a model for diseases. These findings will inform future investigations into the genetic predisposition for NAFLD.

Janice Tran

Investigating the Role of Rpl41 in Development and Fertility

Mentor: Andrew Modzelewski, PhD

Hello. My name is Janice Tran and I am a rising senior at Holy Names High School. There have been various transformative experiences throughout my life that has molded my aspiration to become a research scientist. Something as simple as isolating a cell under a microscope or reading articles about the latest discoveries in the scientific community reaffirms my desire to pursue a career in research. Being a part of the CHORI program allows me to broaden my perspective of the field of science by learning about different fields and occupations through lectures, build valuable skills, and friendships, even in a virtual environment. I want to walk away from this experience inspired that I can contribute to the field of science as I further my academic pursuits. I would like to thank the CHORI SSRP staff for providing me with this opportunity and my mentor, Dr. Andrew Modzelewski for guiding me and always remaining patient and supportive when I have difficulty grasping a concept.

INTRODUCTION

Ribosomes are complex organelles composed of two subunits responsible for protein synthesis. Rpl41 is a highly conserved protein, suggesting that it serves an important role in all mammals, including humans. The absence of ribosomal proteins has caused severe mutations that lead to death and disease in humans, called ribosomopathies. Previously, it was predicted that knocking out the Rpl41 gene using CRISPR-Cas9 gene-editing, will cause the mice to have lethal consequences because of its highly conserved nature, but it instead resulted in infertility in female mice and subfertility in male mice. The ovary functions to produce hormones and develop oocytes until fertilization with the assistance of ovarian follicles. Therefore an interruption in endocrine hormonal signaling would compromise oogenesis.

OBJECTIVE

I hypothesize that deletion of Rpl41, a highly conserved ribosomal protein, causes disruptions in oocyte viability, is associated with improper follicle formation, embryo development, and reduced hormone signaling due to defective or inefficient translation.

METHODS

H&E stained ovaries were digitally quantified and classified based on the characteristics of oocytes in one of the four follicular stages. In addition, unclassifiable oocytes were put into a fifth category and their abnormalities were described for further analysis. Slides were compared side by side to minimize the possibility of double-counting and follicle counts were tracked and analyzed in Excel.

ANTICIPATED RESULTS

We anticipate seeing signs of defects at the beginning of fertility, 2 months, that contribute to the female mice's infertility. The follicle counts in wildtype will be representative of a normal cycling ovary, and in comparison, I hypothesize that knockout will have a disrupted proportion of oocytes, potentially due to hormonal imbalances. In addition, the knockout oocytes frequently present regions with cyst formations, and are predicted to have greater abnormalities in this area. Furthermore, surviving embryos after being exposed to various stressful conditions were able to restore translation or bypass the need for translation if given suitable chemical additives; likely in response to reduced burden of synthesizing their own proteins.

SIGNIFICANCE OF THE PROJECT

This research is significant because studying the function and mechanism of ribosomal proteins can advance efforts towards creating treatments for ribosomopathies and related diseases involved in metabolism, immunity and presented here, the first link to fertility and reproduction. Furthermore, there is currently not much literature that explores the functioning of Rpl41 in the context of fertility. As our society is slowly pushing childbearing to a later age, this research is significant in advancing therapeutic strategies and other fertility methods to help keep our population at a healthy size.

Ngoc Tam Trinh

Pharmacy team's responsibility in community-based rapid hepatitis C treatment

Mentor: Jennifer Price, MD PhD

Hi everyone, welcome to my post! My name is Ngoc Tam Trinh. I'm currently a Chemistry student at Contra Costa College and a member of Center for Science Excellence Program (CSE). Growing up with small arguments between my grandma's Chinese remedies and my mom's western medicine whenever I feel unwell, has sparked my inspiration and curiosity on pharmacy. After 4 years since I immigrated to the US, I finally have the courage to shift my major completely from business to pursue pharmaceuticals. As for summer 2021, it is a pleasure for me to land a CHORI internship position where I can work with an amazing advisor team as well as connect with other future scientists. A huge thanks to Dr. Price, my mentor, her team and UCSF pharmacy team for giving me a chance to shadow real-life research pharmacists, interact with patients professionally and broaden my knowledge about liver disease treatments. It is an honor for me to be part of the DeliverVan/NOW project which brought, is bringing and will bring so much benefit for our community.

INTRODUCTION

Hepatitis C virus (HCV) is a hepatotropic virus which infects the human liver once they find the entry to the body. It is one of the major causes of liver disease worldwide. Several FDA- approved medications can cure HCV regardless of genotype. However, for marginalized communities, linkage-to-care services often aren't enough to overcome insurance-related barriers. We aimed to determine the feasibility of providing 2-week HCV treatment starter packs at the point of HCV diagnosis.

METHODS

The No One Waits (NOW) Study enrolls participants at risk for HCV. HCV antibody testing is performed, followed by confirmatory HCV RNA testing if positive. If HCV RNA results come back positive, participants are offered enrollment into same-day HCV treatment initiation and are provided 2-week-sofosbuvir/velpatasvir (SOF/VEL) free of charge. Simultaneously, insurance information is requested to complete the remainder of the treatment course (12 weeks total). If not available via insurance, SOF/VEL is provided in 2-week increments using study supply.

ANTICIPATED RESULTS

From July 2020-July 2021, 61 participants were diagnosed with active HCV and initiated treatment on the same day. The majority (95%) had health insurance, and among them 71% had Managed Medicaid, 13% had Medicare, 12% had Medi-Cal, and 3% had Kaiser. For 43 (70%) participants, insurance authorization occurred within 2 weeks of starting treatment (average time to approval): 2.8 days [SD=2.6]), enabling transition to insurance-covered therapy after the starter pack.

18 participants (29%) required additional study supply of SOF/VEL to prevent treatment gaps due to: not having insurance at enrollment (n=5), pharmacy requiring consent to coordinate medication delivery (n=6), insurance denial (n=5), missing insurance information (n=1) and lost medication (n=1). Eleven of the 18 were able to transition to insurance-covered drug by Week 4, one by Week 6, and one by Week 10. Five remained on study drug throughout treatment.

SIGNIFICANCE OF THE PROJECT

Our high rate of transitioning to insurance-covered SOF/VEL after a 2-week starter pack emphasizes the crucial responsibility of a pharmacy team on successful HCV test-and-treat models. However, barriers to insurance approval remain with some participants.

Nebeyat Zekaryas

Investigating Mineral Micronutrients in Lungs of a Sickle Cell Mouse Model

Mentor: Angela Rivers, MD PhD

My name is Nebeyat Zekaryas and I am entering into my final semester at Diablo Valley College. I am beginning the application process to nursing programs. Service to others has been instilled in me by my grandparents and mother and I dream of a job where I can help people in some way. I hope to one day provide healthcare to communities that have been neglected by the disparities in this country's health care system. I never believed that someone like me belonged in academic circles, but the SSRP is opening my eyes to the possibilities. I am extremely excited to explore the opportunities afforded to me and expand my knowledge of the scientific research process as well as get to know like-minded young people. Thank you to Dr. Angela Rivers and Hart Horneman for guiding me through this process.

INTRODUCTION

Sickle cell disease (SCD) is a group of blood disorders caused by the inheritance of mutated hemoglobin. People who inherit one altered gene are known to have sickle cell trait. Individuals with SCD suffer from chronic hemolytic anemia, painful crises, and multisystem organ damage impacted by SCD. Nutritional deficiencies in SCD are associated with hypermetabolism. Micronutrients are vitamins and minerals needed in the body in very small amounts. There is limited information on micronutrients in the lung in SCD.

OBJECTIVE

There are different proportions of micronutrients present in the lungs of mice with sickle cell disease, mice with sickle cell trait and control mice.

METHODS

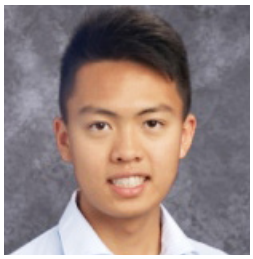
Lung samples were collected from HbAA (control), HbAS SCD (trait), and HbSS(sickle cell) and frozen. 50mg of tissue was used and dried in oven at 60 degrees. The dried samples were digested in 0.25mL OmniTrace 70% HNO3. Remaining particulates were removed by 4000xg spin for 10 minutes at ambient temperature. The samples will be analyzed by the ICP-OES.

ANTICIPATED RESULTS

Magnesium was higher in HbAS (0.58 ± 0.03 mg/g) as compared to HbAA (0.53 ± 0.32 mg/g) with a p value of 0.03. Potassium was higher in HbAS (12.13 ± 0.32 mg/g) than HbAA (11.21 ± 0.78 mg/g) with a p value of 0.02. Sodium was lower in HbAS (6.302 ± 0.64) than HbAA (7.4 ± 0.40) with a p value of 0.05. Zinc had higher levels in HbAS (0.078 ± 0.0039 mg/g) than HbAA (0.071 ± 0.0037 mg/g) with a p value of 0.017. Copper was greater in HbSS (0.010 ± 0.0012 mg/g) than HbAA (0.009 ± 0.001 mg/g) with a p value that was close to statistical significance (p=0.07).

SIGNIFICANCE OF THE PROJECT

This project is innovative because it is the first to investigate the role of mineral micronutrients in the lungs of sickle cell disease mice. These studies could point to a new strategy for intervention in SCD and could identify a new predictive marker for disease severity.



Raymond Zhang

Predicting Protein Transporters Involved in Environmental Chemical Transfer Across the Placenta

Mentor: Joshua Robinson, PhD

Hello, my name is Raymond Zhang, and I am a rising junior studying Integrative Biology at UC Berkeley. I became interested in science, particularly biology, at a fairly young age. Like all children, I had an innate curiosity about the natural world, and fortunately I was able to nurture that curiosity through reading an animal encyclopedia and observing local wildlife. As I grew older, I furthered this interest by keeping some reptiles and insects, with mantises being my favorite. This hobby has taught me to be more responsible, caring, and eager to act on my curiosity and passion, all of which are important attributes in research and medicine. CHORI helped me explore my interests, build new skills, and connect with like-minded peers and inspiring faculty members. I would like to thank my mentor Dr. Joshua Robinson for his guidance and the SSRP leaders for such an engaging and meaningful program.

INTRODUCTION

The placenta plays critical roles in supporting the growing embryo/fetus. It acts as a selective barrier, regulating the passage of nutrients, gases, hormones, and waste products. Such transport takes place at the maternal-fetal interface by passive or active transportation via specialized proteins along the border of the placental surface (i.e., syncytium). Major types of transporters include glucose, amino acid, lipid, and hormone transporters. Environmental chemicals (ECs) are also known to transfer across the placental barrier and accumulate in the embryo/fetus, which may cause toxicity and contribute to developmental disease.

OBJECTIVE

Using data-driven and computational modeling approaches, we will predict chemicals that accumulate in the human embryo/fetus by hijacking endogenous transporters in the placenta. We will develop a prioritized list of human placental transporters based on expression and location to utilize in computational analyses aimed at predicting exogenous EC-transporter activities.

METHODS

We summarized literature and identified human transporters. Public datasets were mined to determine expression and localization of transporters in placental cells/tissues (e.g., syncytiotrophoblasts). Prioritized transporters with defined protein structures were then identified. Computational analyses were performed to predict EC-transporter interactions, suggesting specific compounds that selectively transfer to the embryo/fetus via these mechanisms.

ANTICIPATED RESULTS

We identified 527 human transporters and explored their expressions in placental cells/tissues. Seventy percent of transporters were found to be expressed in the placenta, with twenty-four percent of them expressed at high levels. In syncytiotrophoblasts, we discovered 69 transporters to be highly expressed, which included amino acid (e.g., SLC38A2), glucose (e.g., SLC2A1), lipid (e.g., MFSD2A), and drug efflux transporters (e.g., ABCF1). Using this protein subset and in silico approaches, we will identify novel transporters that facilitate embryo/fetal bioaccumulation of ECs.

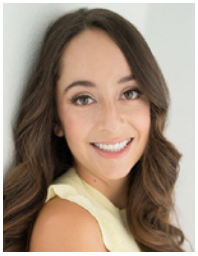
SIGNIFICANCE OF THE PROJECT

Exposure to ECs is linked to pregnancy complications and developmental disease. A more thorough understanding of EC-transporter activities will inform studies aimed at defining mechanisms underlying the accumulation of ECs in the embryo/fetus, thereby increasing our ability to identify EC hazards and human populations vulnerable to toxic exposures during pregnancy.

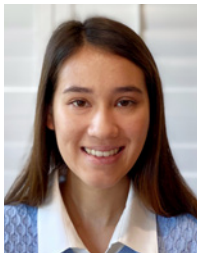
BUILDING UNITY in SCIENCE

40th Annual Summer Student Research Program Symposium

National Institutes of Health (NIH) Scholars

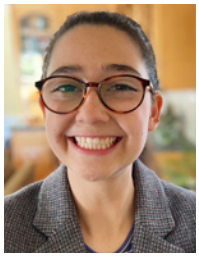

Alana Acuña


Mikail Alejandro


Vanessa Anderson


Catherine Campusano


Maria Cardenas


Danissa Coffey


Keila Calderon Ordonez


Maryum Haidari


Lydia Haile


Kayanna Harris


Gabrielle Montenegro


Sonali Pfile


Sameeha Salman


Sylvia Sawislak


Yusra Sultan


Nebeyat Zekaryas


Jocelyn Medina Zepeda


Raymond Zhang

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 from all over 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 weekly scientific and educational enrichment activities and will be presenting the findings of the results from their project in today's morning symposium session.

BUILDING UNITY in SCIENCE

40th Annual Summer Student Research Program Symposium

California Institute for Regenerative Medicine (CIRM) Scholars

Christian Castillo

Jonathan Chen

Hermela Russom

Elyes Serghine

Sheila Teker

Janice Tran

This group of students was funded by the California Institute for Regenerative Medicine (CIRM)- Leveraging Investment in High School Training Summer Program to Accelerate Regenerative Medicine Knowledge: Light –A-SPARK. Their summer research project's focused primarily on stem / progenitor cell or translational research. In addition, they engaged in patient focused activities, blogged about their research activities, and attended numerous additional education activities regarding stem and bone marrow transplant. These students will have the opportunity to present their results twice, today during the morning session of the SSRP research symposium and again at the CIRM-SPARK annual conference along with the other CIRM trainees from California.

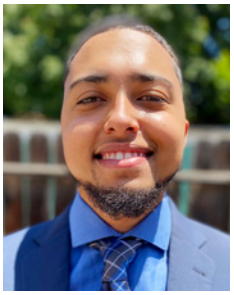
BUILDING UNITY in SCIENCE

40th Annual Summer Student Research Program Symposium

Doris Duke Charitable Foundation (DDCF) Scholars


Michelle Adutwum

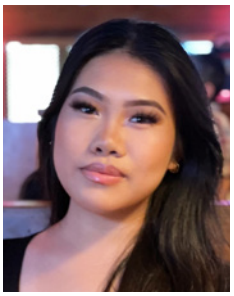

Mohamed Alghaithi

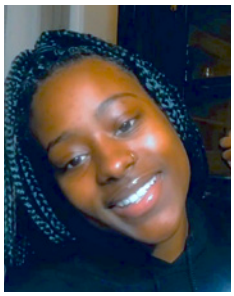

Barry Brand


Carolina Cornejo

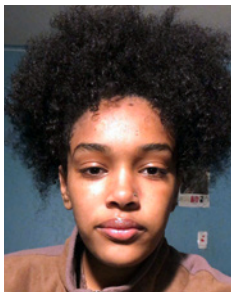

Meron Gebre

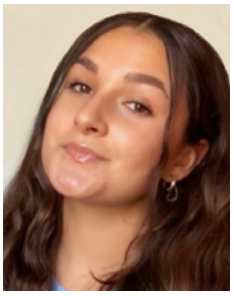

Norzin Lhadon


Kathy Li


Endia McCowen


Faith Niyi-Awolesi


Hanim Nuru


Anna Pelegrino

These students were funded by a grant from the Doris Duke Charitable Foundation, SUSTAIN grant, *SSRP Supporting Underrepresented STEM Adapting to Change.* Both high school and returning CHORI DDCF Scholars who are now undergraduate students are funded under this program. All students are interested in pursuing careers in bioscience and/or health care. Each DDCF funded student developed their own hypothesis driven project with the assistance of their mentor, carried out this project over our 9-week program, created a detailed individual development plan (IDP), and participated in weekly mentoring meetings and educational enrichment activities. Each student is presenting the results of the findings from their project at the morning session of the symposium today.

BUILDING UNITY in SCIENCE

40th Annual Bert Lubin Summer Student Research Program Symposium

Bertram Lubin Scholarship Scholars and and National Science Foundation Scholars

Leamon Crooms IV

Zhana Prince

Ngoc Tam Trinh

Funded by the Bertram Lubin Scholarship Fund & The National Science Foundation

This group of undergraduate students was funded by the Bertram Lubin Scholarship Fund and the National Science Foundation. These students were selected from a competitive pool of undergraduates from all over the United States. Each 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 weekly scientific and educational enrichment activities and will be presenting the findings of the results from their project in today's morning symposium session.

Recent Publications of SSRP Alumni

SSRP Alumni frequently present the research from their summer experiences at national research conferences. Occasionally, students continue to work with their summer mentors, and the work results in a research publication. Below are a few examples of recent publications from previous SSRP alumni.

Mentor	Student	Program Year	Publication
Sandy Calloway, PhD	ABR Goncalves	2015	Shih SY, Bose N, Goncalves ABR, Erlich HA, Calloway CD. Applications of Probe Capture Enrichment Next Generation Sequencing Assay for Whole Mitochondrial Genome and 426 Nuclear SNPs for Forensically Challenging Samples. Genes 2018; 9:1,E49.
Ellen Fung, PhD RD	Elijah Goldberg	2017	Goldberg E, Neogi S, Lal A, Higa A, Fung EB. Nutritional deficiencies are common in patients with transfusion-dependent thalassemia and associated with iron overload. Journal of Food Nutrition Research, 2018; 6(10):674-681.
Ellen Fung, PhD RD	Elijah Goldberg	2018	Goldberg EK, Fung, EB. Precision of the Hologic DXA in the Assessment of Visceral Adipose Tissue. Journal Clinical Densitometry 2020;23:4:664-672.
Ellen Fung, PhD RD & Marcela Weyhmiller, PhD	Haven Allard	2015	Allard H, Weyhmiller M, Lal A, Fung EB. In-accuracy of spine bone density measurements in patients with hemoglobinopathies and iron overload. Journal Clinical Densitometry 2019;22:3:329-337.
Ellen Fung, PhD RD	Elijah Goldberg	2018	Nutrition in Thalassemia: A Systematic Review of Deficiency, Relations to Morbidity, and Supplementation Recommendations. Journal Pediatric Hematology Oncology 2021, In press.
Ellen Fung, PhD RD	Siddhant Talwar	2012	Fung EB, Gildengorin G, Talwar S, Hagar L, Lal A. Zinc Status affects Glucose Homeostasis and Insulin Secretion in Patients with Thalassemia. Nutrients 2015;7(6):4296-307.
Ellen Fung, PhD & David Killilea, PhD	Neelam Phalk	2015	Chung J, Phalk N, Hastings C, Killilea DK, Feusner J, Fung EB. Zinc Deficiency and its Association with Treatment Related Toxicity in Children with Cancer. Pediatric Blood Cancer 2021 Sep;68(9):e29104.
Dan Granoff, PhD	Edwardo Lujan	2015	Lujan E, Pajon R, Granoff DM. Impaired Immunogenicity of meningococcal Neisserial surface protein A in human complement factor H transgenic mice. Infect Immun. 2015 Nov 23;84(2):452-8.
Ryo Higuchi-Sanabria, PhD	Alex Ahilon-Jeronimo	2018	Higuchi-Sanabria R, Shen K, Kelet N, Frankino PA, Durieux J, Bar-Ziv R, Sing CN, Garcia EJ, Homentcovschi S, Sanchez M, Wu R, Tronnes SU, Joe L, Webster B, Ahilon-Jeronimo A, Monshietehadi S, Dallarda S, Pender C, Pon LA, Zoncu R, Dillin A. Lysosomal recycling of amino acids affects ER quality control. Science Advances 2020 Jun 26;6(26):eaaz9805.

Recent Publications of SSRP Alumni

Mentor	Student	Program Year	Publication
Ryo Higuchi-Sanabria, PhD	Mattias de los Rios Rogers	2020	Higuchi-Sanabria, R, Durieux J, Kelet N, Homentcovschi S, de los Rios Rogers M, Monshietehadi S, Garcia G, Dallarda S, Daniele JR, Ramachandran V, Sahay A, Tronnes SU, Joe L, Dillin A.Divergent Nodes of Non-autonomous UPR ER Signaling through Serotonergic and Dopaminergic Neurons. Cell Rep 2020 Dec 8;33(10):108489
Felipe Jain, PhD	Abu Sikder	2017	Sikder AT, Yang FC, Schafer R, Dowling GA, Traeger L, Jain FA. Mentalizing Imagery Therapy Mobile App to Enhance the Mood of Family Dementia Caregivers: Feasibility and Limited Efficacy Testing. JMIR Aging. 2019 Mar 21;2(1):e12850
Carter Lebares, MD	Aditi Desai	2017	Lebares CC, Hershberger AO, Guvva EV Desai A et al. Feasibility of formal mindfulness-based stress-resilience training among surgery interns: a randomized clinical trial. JAMA Surg 2018;153:10:e182734.
Carter Lebares, MD	Troy Coaston	2019	Lebares CC, Coaston TN, Delucchi KL, Guvva EV, Shen WT, Staffaroni AM, Kramer JH, Epel ES, Hecht FM, Ascher NL, Harris HW, Cole SW. Enhanced Stress Resilience Training in Surgeons: Iterative Adaptation and Biopsychosocial Effects in 2 Small Randomized Trials. Ann Surg 2020 Jul 8, Online ahead of print.
Jennifer Price, MD PhD	Robin Yu	2017	Kardashian A, McKinney J, Huynh N, Yu R, Catalli L, Price JC. Post-sustained virologic response liver stiffness may underestimate fibrosis after direct acting antiviral-containing therapy. Clin Infect Dis. 2018 Nov 2 Epub ahead of print.
Lorrene Ritchie, PhD RD	Raquel Traseira	2018	Lee DL, Traseira R, Navarro S, Frost N, Benjamin Neelon S, Cradock A, Hecht K, Ritchie L. Alignment of state regulations with breastfeeding and beverage best practices for childcare centers and family childcare homes, United States. Public Health Rep 2020;136.
Coleen Sabatini, MD	Bernice Fuentes	2015	Greene NE, Fuentes-Juárez BN, Sabatini CS. Access to Orthopedic care for Spanish speaking patients in CA. J Bone Joint Surg Am. 2019 Sep 18;101(18):e95.
Marsha Treadwell, PhD	Amber Fearon	2017	Fearon A, Marsh A, Kim J, Treadwell M . Pediatric residents' perceived barriers to opioid use in sickle cell disease pain management. Pediatr Blood Cancer. 2018 Nov 1:e27535.

This Year's Mentors

Mentor	Location	Division/Department/Specialty
Alison Reed, MD	UCSF Benioff Children's Hospital Oakland	Endocrinology
Andrew Modzelewski, PhD	UC Berkeley	Molecular and Cell Biology, Lin He Lab
Angela Rivers, MD PhD	UCSF Benioff Children's Hospital Oakland	Hematology
Anna Martin, PhD	UC Berkeley	Nutrition Policy Institute
Anne Slavotinek, MD PhD	UC San Francisco	Pediatrics, Medical Genetics
Antonio Muñoz, MS	UC San Francisco	Pediatrics, Cardiology
Ashley Frakes, PhD	UC Berkeley	Molecular and Cell Biology, Dillin Lab
Baylee DeCastro, MPP	UCSF Benioff Children's Hospital Oakland	Center for Child and Community Health
Caroline Hastings, MD	UCSF Benioff Children's Hospital Oakland	Hematology/Oncology
Carolyn Rider, MA	UC Berkeley	Nutrition Policy Institute
Christine McDonald, ScD	UC San Francisco	Pediatrics, Gastroenterology, Nutrition
Christine Schudel, MSW MPH	UCSF Benioff Children's Hospital Oakland	Community Advocacy, Primary Care
Coleen Sabatini, MD MPH	UC San Francisco	Pediatric Orthopaedics
Danielle Lee, MPH RD	UC Berkeley	Nutrition Policy Institute
David Killilea, PhD	UC San Francisco	Office of Research
Dayna Long, MD	UCSF Benioff Children's Hospital Oakland	Pediatrics
Deborah Dean, MD MPH	UC San Francisco	Pediatrics, Infectious Disease
Ellen Fung, PhD RD CCD	UCSF Benioff Children's Hospital Oakland	Hematology
Frans Kuypers, PhD	UCSF Benioff Children's Hospital Oakland	Hematology
Felicia Chow, MD	UC San Francisco	Neurology, Infectious Disease
Hart Horneman, PhD	UC San Francisco	Pediatrics, Hematology/Oncology
Henry Ocampo, MPH	UC San Francisco	Office of Diversity, Equity, and Inclusion
Jaeyeon Kim, PhD	UC San Francisco	Neurology
Janet Lee, MD MPH MAS	UC San Francisco	Pediatrics, Endocrinology
Jennifer Price, MD PhD	UC San Francisco	Hepatology and Liver Transplantation
Joshua Robinson, PhD	UC San Francisco	Obstetrics & Gynecology, Reproductive Sciences
Julia Chu	UC San Francisco	Pediatrics, Neurology
Katherine Yang, PharmD	UC San Francisco, School of Pharmacy	Clinical Pharmacy
Kathleen Schultz, MS	UC San Francisco	Office of Research
Kevin Tharp, PhD	UC San Francisco	Surgery, Center for Bioengineering & Tissue Regeneration

This Year's Mentors

Mentor	Location	Division/Department/Specialty
Kim Rhoads, MD MS MPH	UCSF Hellen Diller Family Comprehensive Cancer Center	Epidemiology & Biostatistics
Lela Bachrach, MD MS	UC San Francisco	Pediatrics, Adolescent Health
Lisa Calvelli, MA	UCSF Benioff Children's Hospital Oakland	Bone Density Clinic
Livia Tran, MS	UC San Francisco	Bioinformatics
Lorrene Ritchie, PhD RD	UC Berkeley	Nutrition Policy Institute
Mari Manger, PhD	iZINC	International Zinc Nutrition Consultative Group
Marisa Medina, PhD	UC San Francisco	Pediatrics, Cardiology
Marsha Treadwell, PhD	UC San Francisco	Pediatrics, Psychology, Hematology/ Oncology
Mercedes Paredes, MD PhD	UC San Francisco	Neurology
Elena Nedelcu, MD	UC San Francisco	Laboratory Medicine, Transfusion Medicine
Ome-Ollin Ruiz	UC San Francisco	Pediatrics
Olivia Yumei Chen	UCSF Benioff Children's Hospital Oakland	Pediatrics, Psychology, Hematology
Peter Beernink, PhD	UC San Francisco	Pediatrics, Virology, Immunology
Rachel Kanner, MPH	UC San Francisco	Pediatrics, Hepatology
Robert Ward Hagar, MD	UCSF Benioff Children's Hospital Oakland	Pediatrics, Hematology
Ronald Krauss, MD	UC San Francisco	Pediatrics, Cardiovascular Research Institute
Ryo Higuchi-Sanabria, PhD	UC Berkeley	Molecular and Cell Biology, Dillin Lab
Salu Ribeiro, MSc	Renegade Bio	
Samantha Lewis, PhD	UC Berkeley	Molecular and Cell Biology, Lewis Lab
Sandra Larkin, MS	UCSF Benioff Children's Hospital Oakland	Pediatrics, Hematology
Sarah King, PhD	UC San Francisco	Cardiovascular Research Institute
Steve Mack, PhD	UC San Francisco	Pediatrics, Genetics, Allergy, Immunology, Bone marrow Transplant
Sunita Ho, MS PhD	UCSF School of Dentistry	Preventative and Restorative Dental Sciences
Tariq Ahmad, MD FAAP	UCSF Benioff Children's Hospital Oakland	Pediatrics, Endocrinology
Yuanyuan Qin, MBBS PhD	UC San Francisco	Pediatrics, Cardiology
Yvonne Goh, PhD	UC San Francisco	Pediatrics, Gastroenterology, Nutrition
Cassandra Vega, MPH	UCSF, Zuckerberg San Francisco General Hospital	Center for Child and Community Health

Notes

Notes

40th Annual Bertram Lubin Summer Student Research Program Symposium

FRIDAY, AUGUST 6, 2021

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