LOMA LINDA UNIVERSITY

School of Medicine

*Center for Health Disparities and Molecular Medicine*

# 23rd Annual Health Disparities Research Symposium

Education – Development – Health Disparities Research – Community

***PROGRAM, BIOS, AND ABSTRACTS***

Wednesday, July 31, 2024
2:00 pm – 7:00 pm
Wong Kerlee International Conference Center
Loma Linda University School of Medicine
Loma Linda, California

LOMA LINDA UNIVERSITY
School of Medicine
*Center for Health Disparities and Molecular Medicine*

*23rd Annual Health Disparities Research Symposium*
**Wednesday, July 31, 2024**
**2:00 pm - 7:00 pm, Wong Kerlee International Conference Center**

## Agenda

### Poster Session

**2:00 pm – 4:00 pm** **Poster Presentations by Research Fellows**

Apprenticeship Bridge to College Program (ABC)
Undergraduate Training Program (UTP)
LLU-NIH Initiative for Maximizing Student Development Program (IMSD)
Summer Undergraduate Research Fellowship (SURF)
Behavioral Health Research Training Program
Macpherson Society Scholars
School of Public Health Participant (SPH)
Veterans Affairs Loma Linda Health Care Participant (VA)

**4:00 pm – 4:30 pm** **Refreshments**

**4:30 pm – 5:00pm** **Oral Flash Presentations**

### Evening Program

**5:00 pm – 7:00 pm**

**Welcome** **Marino De León, PhD**
Director, CHDMM

**Invocation** **Eileen J. Brantley, PhD**
Associate Professor, Basic Sciences

**Remarks**

**Tamara L. Thomas, MD**
Dean, School of Medicine

**Ronald L. Carter, PhD**
Provost, Loma Linda University

**Introduction to Keynote Speaker** — **Marino De León, PhD - Chair**
Director, CHDMM

**Keynote Speaker** — **Frank T. Bayliss, PhD**
San Francisco State University, Professor of Biology

**Acknowledgement of Research Fellows**

**Carlos A. Casiano, PhD**
Associate Director, CHDMM

**Dexter M. Frederick, MD**
Associate Dean, Diversity, Equity, and Inclusion

**Johnny D. Figueroa, PhD**
Associate Professor, Basic Sciences, Physiology Division

**Daisy D. De León, PhD**
Professor of Physiology

**Susanne B. Montgomery, PhD**
Associate Dean for Research, School of Behavioral Health

**Marino De León, PhD - Chair**
Director, CHDMM

**Final Remarks and Acknowledgements** — **Marino De Leon, PhD**
Director, CHDMM

## ACKNOWLEDGEMENTS

We would like to acknowledge the contributions of all who were instrumental in making this 2024 Health Disparities Summer Research successful. Teamwork, cooperation, and flexibility are just a few of the skills necessary to successfully implement such a dynamic research program. We also would like to acknowledge the support of the Loma Linda University School of Medicine, the National Institute of General Medical Sciences, NIH (grant 5R25GM060507-22).

**2024 Faculty Research Mentors**

Frankis G. Almaguel, MD, PhD
Fatimah Alramadhan, DrPH, MPH
Eric Behringer, PhD
Danilo Boskovic, PhD
Eileen Brantley, PhD
Carlos A. Casiano, PhD
Daisy De León, PhD
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Johnny Figueroa, PhD
Olivia Francis-Boyle, PhD
Rajesh Gaur, PhD
Stella Goulopoulou, PhD
Samuel Habimana, MPH, PhD(c)
David Hessinger, PhD
Christian Hurtz, PhD
Maud Joachim- Célestin, MD, DrPH
Salma Khan, MD, PhD
William Langridge, PhD
Zephon Lister, PhD, LMFT
Subburaman Mohan, PhD
Christopher Montgomery, MS, MPH
Susanne Montgomery, MS, MPH, PhD
Ying Nie, MD, PhD
Rameshwar Patil, PhD
William Pearce, PhD
Christopher Perry, PhD
Reinhard Schulte, MD
Ryan Sinclair, PhD
Salvador Soriano, PhD
Carmen Soret, MPH
Sophia Truong, PsyD
Seth Wiafe, PhD
Sean Wilson, PhD
DaLiao Xiao, PhD, DVM
David Xu, MD, PhD
Jiang Zhong, PhD

**CHDMM Administrative Staff**

Lorena Salto, Center Manager
Lynn Lopez, Program Manager
Amy Barajas, Senior Administrative Assistant

This is by no means an exhaustive list. We wish to acknowledge all of the unsung heroes who contributed in very significant ways, too numerous to mention.

**2024 Student Research Fellow**

***ABC – Apprenticeship Bridge to College***
Fatimah Ahmed
Elizabeth Alao
Kelechi Amobi
Jackson Baloun
Benjamin Bello
Sharan Bir
Jose Garcia
Hannah Gbondo
Leslie Hernandez
Kate Landeros
Joel Philip
Amiya Richberg
Shriya Roy
Sara Salama
Victoria Tran

***UTP – Undergraduate Training Program***
Raynon Andrews
Josel Bryant
Emilee Duany
Kennedi Ewan
Kaleb Gonzalez
Katherine Granados
Pablo Jaquez
Wendolyn Johnson
Gabriel Molina
Mya St. Louis
Erianne Thomas-Martin
Evan Wang

***IMSD – PhD Graduate Fellows***
Shawnee Angeloni
Danielle Malivert
Bobby Mendez
Pedro T. Ochoa
Oasis Perez
Kayla Sanchez
Krystal Santiago
Julio Sierra
Timothy Simon
Francis Zamora

***SURF – Summer Undergraduate Research Fellowship***
Ryam Abdulhasan
Aidan Lu
Ashley Paik
Ria Perencsik

***Behavioral Health Research Training Program***
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Cristie Granillo
Samuel Habimana
David Lister
Jonathan Lister
Nishita Matangi
Heaven Robles
Ashlynn Yorgesen

***Macpherson Society Scholars***
Luiza Barseghyan
Dan Celestine

***School of Public Health Participant***
James Bergeson

***Veteran Affairs Loma Linda Health Care Participant***
Santiago De La Cruz

**Institutional Affiliations of Student Research Fellows**

***High Schools***

Arroyo Valley High School
Beaumont High School
Centennial High School
Citrus Valley High School
Escondido Adventist Academy
John F. Kennedy Middle College High School
Loma Linda Academy
Middle College High School
Patriot High School
Redlands High School
Riverside STEM Academy
Santiago High School

***Universities***

California State University, San Bernardino
Howard University
La Sierra University
Loma Linda University School of Behavioral Health
Loma Linda University School of Medicine
Oakwood University
Pasadena City College
Southern Adventist University
Southwestern Adventist University
University of Redlands


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**LOMA LINDA UNIVERSITY SCHOOL OF MEDICINE**

CENTER FOR HEALTH DISPARITIES RESEARCH
OFFICE OF STUDENT DEVELOPMENT IN THE BIOMEDICAL PROFESSIONS

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# Keynote Speaker

**FRANK T. BAYLISS, PHD**

KEYNOTE SPEAKER 2024

Dr. Frank T. Bayliss has been a Professor of Biology at San Francisco State University for the past forty-nine years, dedicating his time to enhancing student's participation and success in research careers. In 1992, he initiated the first of the T-32 research training programs targeting minority students which has evolved into the Student Enrichment Opportunities (SEO). Since then, he has established ten STEM programs at San Francisco State University which supports over one hundred students per year in their transition to PhD programs. These programs include NIH Minority Access to Research Careers, NIH MBRS-RISE Undergraduate and Graduate, NIH Community College to BS Bridge, NSF LS-AMP Bridge to the Doctorate, and the Genentech Foundation Scholars Program. To date, 525 of Professor Bayliss' trainees have won admission to PhD programs at top research institutions nationwide. Professor Bayliss has also provided counsel to several research-intensive institutions who want to better serve their own students, including Northwestern, Stanford U., UC Berkeley, U Buffalo, U Michigan, UCLA, UC San Francisco, Harvard U., and the President's Office of the University of California. Dr. Bayliss was selected in July 2009 as a recipient of the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM) and was honored at the White House by President Obama in fall 2009.

# Apprenticeship Bridge to College (ABC) High School Program

**FATIMAH AHMED**
ABC PARTICIPANT 2024

The ABC program has given me a wonderful opportunity to be in a lab setting with professional researchers and take part in an experiment myself. This experience can never be replaced or compared to, and I am very grateful to have been able to secure this opportunity for this summer.

I am from Highland, California and I attend Redlands Senior High School. This is the summer before my senior year. I have always taken classes in the AP and Honors curriculum that entertain scientific topics and always had a fascination for biology and chemistry. As I started volunteering in the Redlands Community Hospital and experienced what it's like working in a hospital environment, I found myself interested in medical research. Once I found the ABC Program, I knew that this would help me see whether or not I can truly see myself doing biomedical research as my career – whether or not I'll come to love it enough to do it for the rest of my life. The ABC Program's research opportunities have allowed me to solidify my decision to work in this kind of research in my career and I hope to make outstanding advancements in the future. Thank you to Dr. Zhong's lab and its members for guiding me through the research and providing me with knowledge and experience I have gained.

**DNA vs. RNA MUTATIONS IN ACUTE MYELOGENOUS LEUKEMIA PATIENT**

Fatimah Ahmed, Yingjie Fu, Henry Trinh, Jiang F. Zhong,
Center for Health Disparities and Molecular Medicine, Basic Sciences, School of Medicine, Loma Linda University, Loma Linda, CA

Acute myeloid leukemia (AML) represents 80% of acute leukemia in adults and is characterized by clonal expansion of hematopoietic stem cells secondary to genomic mutations, rendering a selective growth advantage to the mutant clones. Traditionally, genome sequencing has been focused on using DNA sequences and functions of specific genes to investigate cancer genetic mutations. However, the cellular function of mutations are implemented via proteins which are encoded by RNA. Therefore, it is important to investigate whether DNA mutations are transcribed into mRNA to affect protein functions. Our lab is currently exploring the potential of RNA sequencing for mutation detections. As only RNA mutations could affect the function of its encoded proteins as acting components for cancer cells, so sequencing RNA mutations may possibly give us direct assessment of the mutation functions. In our study, we investigated common mutations in acute myeloid leukemia (AML) in a patient by designing PCR primers specific to DNA or RNA regions of the mutation to amplify both the DNA and RNA from cancer cells. Sanger sequencing was performed to obtain both the DNA sequence and RNA sequence of the mutated regions. Then, we compared the DNA and RNA sequences to identify whether the target DNA mutations were transcribed in to RNA for protein coding. The nucleophosmin 1 (NPM1) gene is mutated in approximately one-third of newly diagnosed acute myeloid leukemia (AML) cases. We identified the mutated regions of the NPM1 gene in both DNA and RNA of an AML patient. The result of Sanger sequencing indicated that both the DNA and RNA carried the same mutation sequences. These findings suggested that NPM1 NPM1mut plays a major role in the process of leukemogenesis and development of overt leukemia. Many novel therapies targeting NPM1 are being developed in various clinical phases and have demonstrated efficacy. Investigating how those NPM1 targeted therapies affecting the expression of NPM1 mutated RNA could facilitate the development of novel therapies for AML.

**ELIZABETH ALAO**

ABC PARTICIPANT 2024

I enjoy baking, reading, playing piano, and arranging gifts for loved ones. I'm a decisive, thoughtful, and quiet person. My goal for my future is to become a pediatric physician. I'm not sure which specialty I want to work in yet, but I am interested in cardiology, pulmonology, and orthopedic surgery. I've attended Loma Linda Academy since the 1st grade, and am a rising junior.

I'm the oldest of 4 kids, a sister, and two brothers. I've always loved being around little children. One of my favorite community service activities is being a teen volunteer at the library. There I help with bilingual story time and assist with crafts and other activities involving children. I also volunteer as a crew leader at Vacation Bible School, where I can interact with kids as they learn more about God during summer.

I'm a part of Dr. Erik Behringer's lab, which is currently focused on Alzheimer's disease and why it's seen in people over the age of 65. I've learned how to use different lab equipment, the importance of being precise in recording data, and a greater understanding of the Circle of Willis' function in the brain. On my first day, I only spent an hour shadowing Fritz Moit, a PhD student, but I learned so much that at home that night I read more about Immunohistochemistry and Alzheimer's disease. Thank you Dr. Behringer's lab, for making this a fun and informative experience, I'll never forget you all.

**THE EFFECTS OF CANNABIDIOL ON GUT MICROBIOME IN EARLY STAGE OF ALZHEIMER'S DISEASE**

Elizabeth O. Alao, Ankita Hooda, Phoebe P. Chum, Erik. J. Behringer
Department of Basic Sciences, School of Medicine,
Loma Linda University, Loma Linda CA

Alzheimer's Disease (AD) is a progressive neurodegenerative disorder that damages memory, emotional regulation, and daily physical functions, by ultimately weakening neuronal communication. Gut dysbiosis, which is an imbalance of microorganisms, contributes to the pathology of AD by allowing pathogenic bacteria past the blood-brain barrier. Antibiotics may be prescribed to AD patients, in order to regulate neuroinflammation caused by gut dysbiosis. However, when overused, the bacteria in the body stops responding to the antibiotics. Antibiotic resistance proteins (ARPs) are developed by bacteria to weaken the efficacy of antibiotics. This is problematic, because hindering antibiotics may allow harmful bacteria to accumulate in the body. Cannabidiol (CBD), a non-psychoactive substance, is being explored as a possible anti-inflammatory treatment for AD. Additionally, CBD may modify microbial populations by obstructing prokaryotic cell membranes, and potentially without stimulating systemic antibiotic resistance responses in the body. To examine CBD's microbial properties during the onset of AD pathology, fecal samples were collected from CBD-treated (80-100 mg/kg/day; 8 wk duration) and vehicle mice (wild-type B6129SF2/J & 3xTg-AD, n=5 males/group). Intestinal samples were also removed from each animal at the end of the treatment period. All samples were sent to ZymoResearch to obtain a Metagenomics Sequencing report. Our preliminary data show that CBD may selectively target tetracycline resistant ribosomal protection protein Tet(M). In contrast, the number of ARPs that comprise resistance to beta-lactam (=3) and fosfomycin (=1) were the same across CBD-treated and vehicle 3xTg-AD mice at the end of the treatment period. Overall, the microbial effects of CBD are complex and will require further examination among interactions of various gut bacterial strains, their respective ARPs, and classes of antibiotics and probiotics.

**KELECHI AMOBI**

ABC PARTICIPANT 2024

From a young age, I was nicknamed Florence Nightingale (after the British pioneer in statistics and nursing) and "the family doctor" because I showed a keen interest in helping my family when someone needed any form of medical assistance. At the age of nine, I began researching different medical issues and devices and hypothesizing different ways I can cure the disease/condition with an established medical device or one I (realistically) made up. Nevertheless, over the years, my love and passion for medicine, research, and helping others only grew with age and inevitably led me to Loma Linda's ABC Program and Doctor Brantley's lab last summer, and now, Dr. Patil's lab this summer, which played a pivotal role in my academic and medical career.

I am a recent graduate from Citrus Valley High School in Redlands, California and an incoming freshman at UCLA. For the past four years I've been at Citrus, I founded the Multicultural Dance Club, became the secretary of the Black Student Union, treasurer of the Environmental Club, student elected School Site Council board member, was the captain of the Varsity and JV Girls Basketball team, and section leader in the advanced girls' choir. Outside of school, I volunteer at the San Bernardino Community Hospital and I was the secretary and student commissioner for the City of Redlands' Human Relations Commission. My future goals are to become an Obstetrician/Gynecologist while conducting cancer research.

I sincerely thank Dr. Patil, Mr. Cedric, Mr. Serge, and Dr. Perry for mentoring me and molding me into an exceptional future physician/scientist.

## OPTIMIZING GOLD NANOSPHERE SYNTHESIS AND CHARACTERIZATION FOR BORON NEUTRON CAPTURE THERAPY (BNCT) OF MALIGNANT GLIOMAS

Kelechi Amobi*, Ryam Abdulhasan, Raynon M. Andrews, Cedric Lansangan, M.S., Serge Rudensky, M.D., Menka Khoobchandani, Ph.D., Christopher Perry, Ph.D., and Rameshwar Patil Ph.D.

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Glioblastoma multiforme (GBM) presents a formidable challenge in neuro-oncology due to their aggressive nature, infiltrative growth patterns, and resistance to conventional therapies. GBM, the most common and malignant form of glioma, accounts for 54% of all glioma cases and 16% of all primary brain tumors. The incidence rate is approximately 3.19 per 100,000 person-years. Despite advances in surgical techniques, radiotherapy, and chemotherapy, the prognosis remains poor, with a median survival of only 12-15 months following diagnosis.

Boron Neutron Capture Therapy (BNCT) has emerged as a promising treatment modality for malignant gliomas, leveraging the selective accumulation of boron-10 within tumor cells. To enhance the efficacy of BNCT, the development of suitable boron delivery agents is crucial. Gold nanoparticles offer a versatile form of drug delivery vehicle for BNCT due to their uniform size, tunable surface properties, and efficient conjugation of boron-10 compounds. This study focuses on refining the synthesis of gold nanospheres to achieve ideal physicochemical properties to selectively deliver high concentration of boron-10 to malignant cells for effective BNCT. We investigated variations in reaction time and final reaction pH with the goal of achieving favorable nanosphere size, morphology, and stability. We performed UV-Vis spectrophotometry to determine the particle size and 2-mercaptobenzothiazole to assess surface concentration.

The findings from this research contribute to the ongoing efforts to develop advanced nanostructured materials for targeted therapies in neuro-oncology. By optimizing the synthesis of gold nanospheres,

we aim to facilitate the translation of BNCT from preclinical studies to bedside applications, offering new hope for patients facing the prognosis of malignant gliomas.

**JACKSON BALOUN**

ABC PARTICIPANT 2024

In my life, I aim to achieve many things. After graduating from Loma Linda Academy (Class of 2025!) I'd like to study chemistry and neural networks at Caltech. I'm overjoyed to say that the ABC program has contributed strongly to this goal, by providing ample opportunities in microbiology and computer programming. In microbiology, Kayla (primary mentor) Jake (also primary mentor), and I are studying the effects of NPC and CMT on patients, and the role ferroptosis plays. In addition to these two lovely mentors, I've also been blessed with an amazing PI, Dr. Soriano. From our first interaction, I knew Dr. Soriano would be an amazing leader in lab pursuits and personal projects. I was graciously offered a chance to take up a research project all on my own, which uses machine learning to diagnose Parkinson's patients. Of course, this project plays into my major choices for college. I'm super happy to have been able to participate in Sori lab escapades, whatever that may have been. I'll always remember the times I've had here and the friends I've made.

There is no understatement in the professionalism and quality of people in the Sori lab. Not only are its members kind and passionate about science, but they are also positive and quick to forgive. Special thanks to Kayla, Jake, and Dr. Soriano, my little family at LLU.

**FERROPTOTIC ENVIRONMENTS PRODUCED BY RSL3 AND IRON DYSHOMEOSTASIS LEADING TO CELL DEGRADATION IN NIEMANN-PICK DISEASE TYPE C**

Jackson Baloun, Kayla L. Sanchez, Salvador Soriano

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Niemann-Pick disease type C (NPC) is a rare genetic disorder caused by mutations in either the NPC1 or NPC2 genes, leading to impaired intracellular transport of cholesterol and other lipids. Approximately 95% of NPC cases are due to mutations in the NPC1 gene, while the remaining 5% are associated with the NPC2 gene. Although the etiology of NPC is still not fully understood, recent studies suggest multiple degenerative pathways, including RSL3-induced ferroptotic responses through GPX4 inhibition and mitochondrial iron saturation. This study investigates ferroptosis susceptibility and explores potential therapeutic interventions using RSL3, a ferroptosis inducer, and J147, an anti-ferroptotic compound, in primary dermal fibroblasts from NPC patients.

RSL3 inhibits the antioxidant glutathione peroxidase 4 (GPX4), leading to toxic lipid peroxide accumulation. Conversely, J147, an ATP synthase inhibitor, reduces mitochondrial ATP production and subsequent reactive oxygen species (ROS) accumulation. Using western blot analysis and live cell imaging, we observe increased oxidative stress and ferroptotic cell behavior in NPC fibroblasts.

Iron dysregulation plays a crucial role in ferroptotic stress, as NPC cells demonstrate atypical iron regulation compared to wild-type cell lines. Transcriptome analysis corroborates theories of iron dysregulation in NPC mitochondria, resulting in elevated ROS production. We hypothesize that iron dyshomeostasis and increased ROS contribute to a ferroptotic environment, affecting NPC cell viability.

This research may establish a direct link between ferroptosis and NPC, potentially identifying a root cause of NPC degeneration. These findings are significant, as they could pave the way for developing novel therapies and treatments for NPC patients.

**BENJAMIN BELLO**

ABC PARTICIPANT 2024

Starting my summer in 2024 with Loma Linda's ABC program was the best thing I could do as it retested my commitment to the world of research. This program forced me to learn concepts that I otherwise wouldn't know until college; to which I am eternally grateful. Working with statistics allowed me to understand how vital collecting data is when working with surrounding communities.

Entering my freshman year at Southern Adventist University in Tennessee, I plan on majoring in Biology with a research emphasis and minoring with a Literature degree. Fueled by my interest in the human brain and human interactions, I plan on applying to Loma Linda University School of Medicine in order to continue my journey to become a neurosurgeon. Some accomplishments I have been participating in the Mikva Challenge and their first National Youth Summit, joining Riverside Youth Council, interning here at Loma Linda through the ABC Program, and a couple awards I received from the state of California. The research I joined observed how cycling affects adolescent psychosocial well-being. Partnering with the Outride organization, our project—Riding For Focus—allows children throughout the nation to ride bikes as we collected data, aiming to prove a positive relationship between riding bicycles and mental health.

A special thank you to Dr. Sean Wilson and his team for taking me in and I hope to continue working with them the following year.

## EVALUATING THE INFLUENCE OF A MIDDLE SCHOOL CYCLING PROGRAM ON ADOLESCENT MENTAL HEALTH AND WELL-BEING: EXPLORING MODIFIABLE RISK FACTORS

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After the COVID-19 pandemic, a notable increase in psychosocial disorders such as ADHD, depression, and anxiety has been observed in adolescent children. This study examines the potential of Outride's middle school exercise intervention program to improve adolescent psychosocial well-being. The R4F program is a 6-8 week cycling education program with at least an hour of bike riding every week. We analyzed anonymous survey data from 3924 youth participants before the R4F program and 3289 adolescent participants after the R4F program. Surveys contained two psychosocial well-being metrics: the Pediatric Symptoms Checklist (PSC-17-Y) and the World Health Organization Well-Being Index (WHO-5), which includes five non-invasive questions to measure depression. We saw an overall positive WHO-5 increase after the program. This study focused on examining two modifiable risk factors: student sleep habits and screen time. We utilized non-parametric test statistics to compare responses before and after the program. We found that 43% of students failed to meet the daily recommendation of 8 hours of sleep each night and 65% used their devices longer than 2 hours each day. Regression analysis revealed that adolescent mental health was correlated to the hours of both sleep and screen time; less screen time and longer sleep showed better well-being results. The results of these analyses contribute to our understanding of how cycling and the R4F program can positively influence adolescent psychosocial well-being as it relates to the use of electronic devices and sleep patterns.

**SHARAN BIR**

ABC PARTICIPANT 2024

Since I was young, I have known that I wanted to gain an education and career in the medical field. Whenever I was asked what I wanted to be when I grew up, that was the answer. This decision was driven based on the experiences of others I saw around me, such as the lack of access to affordable healthcare many have been exposed to, and the want to help those in that situation.

As a rising senior at Centennial High School in Corona, I strive to make the greatest positive impact on my peers and the overall community. After high school, I plan to major in biochemistry at a University of California, and eventually hope to pursue a degree in medical school. I hope to be able to do community work as well as learn about the impact that the medical field has on society. As such, I am extremely grateful for this opportunity to research at Loma Linda's ABC Program, not only for their fascinating projects, but also for their focus on prevalent health disparities around the world.

I would like to sincerely thank Dr. Rajesh Gaur for welcoming me into his lab and providing me with the opportunity to learn more about the research process and scientific topics at hand.

## TARGETING LEDGF/PSIP1 ALTERNATIVE SPLICING IN CANCER

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Cancer Center, Division of Transplant & Cell Therapy/Hematological Malignancies, Children's Hospital, Department of Basic Sciences, Center for Health Disparities and Molecular Medicine, Loma Linda University School of Medicine, Loma Linda, CA

Lens epithelium-derived growth factor (LEDGF) is a multifunctional protein encoded by the *PSIP1* gene. It acts as a transcriptional co-activator that promotes cell survival and resistance to chemotherapy in multiple human cancers, particularly prostate cancer (PCa). These functions are associated with its ability to interact with multiple chromatin proteins and transcription factors to promote DNA repair, mRNA splicing, and stress survival gene expression. LEDGF plays an essential role in the initiation of MLL-mediated leukemia by forming a multiprotein complex involving MLL and Menin. In addition, LEDGF overexpression in PCa cells promotes resistance to the clinically relevant chemotherapeutic drug docetaxel (DTX). LEDGF pre-mRNA undergoes alternative splicing to generate a short p52 and a long p75 mRNA splice isoforms. We hypothesized that a cell and tissue specific ratio of LEDGF short-to-long splice-isoform is essential for cellular homeostasis, and its dysregulation promotes cancer. The overall objective of this work is to understand the underline mechanisms that regulate LEDGF alternative splicing in the context of its functions, i.e., transcription coactivator and proto-oncogene. To this end, we decided to examine the levels of LEDGF mRNA splice isoforms in leukemia and PCa cell lines. We isolated total RNA from a panel of leukemia (HB1119, RS4:11, KOPN8, SEM) and PCa lines (DU145, PC3, 22RV1 and DTX resistant versions). The expression of LEDGF splice isoforms was examined by semiquantitative RT-PCR using primers that specifically amplify short or long isoform. We found that the expression of p52 mRNA isoform is significantly higher irrespective of the cancer type. These results are strikingly different from reports wherein the p75 protein isoform is expressed at a higher level than p52 in cancer cells. Together, these data suggest that p75 undergoes cytoplasmic mRNA decay influenced by translation machinery. We have constructed LEDGF minigene splicing reporters to determine the exact role of its long and short isoforms in driving leukemogenesis and PCa drug resistance.

**JOSE GARCIA**

ABC PARTICIPANT 2024

I am thankful for the opportunity to have participated in the ABC program this summer. I will be majoring in Biomedical sciences at Cal Baptist University this fall. One of my biggest accomplishments, in addition to participating in the ABC program this summer, was participating in the Kaiser summer youth program in 2023 along with my academic awards. I have over 25 hours of shadowing physicians which has been an amazing opportunity along with 50 hours of volunteering in my community which include food drives, community clean ups, and blood drives. My career goal is to become an Interventional Cardiologist because I've always been fascinated by the heart and the way it operates and because heart diseases is the leading cause of death in the US (has been for 100 years). Currently, I am conducting research in the center for perinatal Biology. My mentor is Dr. William Pearce, and my colleagues are Lonie, James, and Desirey's. The most interesting part of the research to me is how hypoxia has a significant impact on the cerebral artery. One of my favorite hobbies is playing basketball whenever I have the free time. What I've learned from being a part of this summer program is that it truly requires passion and love, which brings me to one of my favorite quotes from the Bible "Let all you do be done with love." 1 Corinthians 16:14. I mention this because whatever you do in life you should always make sure you are doing it with love.

**IN NEONATAL CEREBROVASCULAR SMOOTH MUSCLE, mtDNA COPY NUMBER, SDH ABUNDANCE AND OXYGEN CONSUMPTION ARE HIGHLY DEPENDENT ON PO2 AND ARTERY TYPE**

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Advances in microrespirometry have fueled rapid growth in studies of mitochondrial biology. This study extends those studies to immature cerebrovascular mitochondria, which to date have been unstudied. Given the critical role mitochondria play in structural and functional vascular maturation, this study explores the clinically important idea that hypoxia-induced mitochondrial dysfunction may contribute significantly to multiple types of neonatal cerebrovascular morbidity. Correspondingly, this study focused on the mitochondrial effects of graded hypoxia on mitochondria in neonatal (5-8 day) ovine middle cerebral (MCA) and posterior cerebral (PC) arteries. Through measurements of mtDNA plasmid copy# per cell, hypoxia increased mtDNA copy# per cell between 7% and 30%, and more so in MCA than PC arteries. The relative abundance of Succinate Dehydrogenase A (a subunit of Complex II in the Mitochondrial Electron Transport Chain), increased up to 68% in PC arteries. Hypoxia increased Basal Mitochondrial Oxygen Consumption (OCR) by 33% - 40% in PC arteries, and by 40% to 60% in MCA. Hypoxia enhanced depolarization-induced increases in OCR 78% to 242% in PC arteries, and by 53% to 57% in MCA. Hypoxia also enhanced leak currents by 53% to 167% in PC arteries, and by 12% to 29% in MCA. Preliminary findings that transfection with Pre-miR-210 attenuated the effects of hypoxia on ATP-synthesis coupled OCR in PC arteries, but dramatically enhanced it in MCA suggest that multiple effects of hypoxia on mitochondrial characteristics may be mediated by miR-210. Overall, these results demonstrate that graded hypoxia significantly influences mtDNA plasmid copy# per cell, SDHa mass per mitochondrion, and multiple aspects of mitochondrial respiration in a highly artery-dependent manner.

**HANNAH GBONDO**

ABC PARTICIPANT 2024

Growing up, I had a daily tradition that included starting mornings with a dose of Doc McStuffins. Watching her show introduced me to the qualities a doctor should possess: compassion, empathy, and humanity. From there, my passion for medicine and aspiration to become a physician grew. Seeing a character who represented these values inspired me to gain insight into the importance of healthcare representation and sparked my passion for medicine.

As I prepare for my junior year at Santiago High School, I am thrilled to continue my psychology and neuroscience studies. My dedication to science and advocacy for community members drives me to actively participate in multiple organizations aimed at improving that community. Volunteering in healthcare settings is one of the most fulfilling ways I contribute to my community. These experiences have taught me that healthcare is more than just providing services; it is about treating people with empathy and compassion, qualities I first admired in Doc McStuffins. Medicine was my first true passion and always will be. This passion extends beyond the classroom, and volunteer work into my personal life, where I write about healthcare and my experiences on my blog.

I am incredibly grateful to Dr. Figueroa, Timothy Simon, and Julio Sierra for their mentorship and guidance. Ultimately, the ABC program has solidified my desire to contribute to the medical field and underscored the importance of compassionate patient care. With these experiences, I am more determined than ever to pursue a medical career.

## CONSEQUENCES OF ADOLESCENT PSYCHOSOCIAL STRESS ON BINGE EATING-LIKE BEHAVIORS IN RATS

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Adolescence is a time full of new experiences and extensive neurodevelopment, making it a highly vulnerable period. Psychological stress can disrupt brain maturation, potentially resulting in mental disorders and harmful coping strategies such as binge eating (BE). Studies demonstrate that females are more likely to develop BE than males, generating a health disparity that needs investigation. Improving understanding of how stress-induced environments during adolescence affect eating behaviors is essential to address this disparity. To address this gap, we developed a stress-induced binge-eating model in which adolescent rats are exposed to psychological stressors. Then, we allowed intermittent access to a Western-like high-fat diet (41% kcal from fat) in adulthood. The BE model consisted of 3 cycles of WD re-exposure for three weeks. Initial results demonstrate that female rats are more vulnerable to stressed-induced WD eating than males, validating the animal model. Interestingly, during the second cycle, we found that stressed females consumed more WD while stressed males consumed less relative to controls. We identified differences in brain structural connectivity. Building on previous findings that highlight the involvement of inflammation, we have initiated plans for experiments involving immunohistochemistry (IHC) and flow cytometry to investigate microglia's role in these alterations. Chronic stress impacts microglia differently in male and female rat brains, particularly in the dendritic elements of regions associated with compulsive behaviors and binge eating, such as the prefrontal cortex. Future work will continue investigating the contribution of inflammation to stress eating.

**LESLIE HERNANDEZ**

ABC PARTICIPANT 2024

The study of living organisms and how their bodies function has been an interest of mine for as long as I can remember. This year I was extremely blessed to be selected as a participant in the Apprenticeship Bridge to College Program at Loma Linda University. This program has already taught me so much about the meticulous details that PhD and MD doctors must pay attention to. Not only that, but I have also learned about the importance of health disparities on a broader scale. I still have so much more to learn, as the summer is not yet over, and I eagerly await what God has in store for me each day.

I am currently a rising senior at Patriot High School, in Jurupa Valley, California. For the past three years here, I have challenged myself to expand my knowledge and give back to the community to achieve my goal of becoming a future Pediatrician. This is a very important goal of mine because I want to be that doctor in a child's life who fights for them when they feel like they have no more power in them to fight. Serving the community and helping others is something that I am significantly passionate about. I believe that it is very important for everyone around the world to help one another, especially when one sees someone struggling.

I would like to thank Dr. Langridge for being an inspiring mentor and teaching me the necessary skills for life and research.

## PLANT-BASED MUCOSAL VACCINE FOR PROTECTION AGAINST RESPIRATORY VIRUSES

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The Coronavirus (SARS-CoV-2) is a contagious respiratory virus that has killed over 7 million people worldwide. The SARS-CoV-2 mRNA vaccine was constructed and given to millions of people by injection. While the mRNA vaccines were proven effective, they did not eliminate the risk of breakthrough infection and reinfection. To circumvent this problem, we constructed a mucosal vaccine in bacteria by linking the cholera-toxin B subunit mucosal adjuvant (CTB) to the virus receptor binding domain (SARS-CoV-2-ACE-2-RBD). This vaccine was shown to be effective in suppressing coronavirus infection in vitro. Delivery of the vaccine in edible plants could increase its effectiveness due to the slow release of the vaccine in the digestive tract, which could prolong immune protection against virus breakthrough and reinfection.

A strain of bacteria known as, Agrobacterium tumefaciens, was shown to transfer foreign genes into plants. To initiate this process, we attempted to transfer the vaccine gene from E. coli into Agrobacterium. To verify vaccine gene transfer, our objective was to isolate the plasmid carrying the vaccine gene from A. tumefaciens by a mini-prep vaccine isolation procedure.

**KATE LANDEROS**

ABC PARTICIPANT 2024

The Curiosity has always fueled my journey, allowing me to take leaps of faith into uncharted territories. This drive to explore and discover has shaped me into a thinker who constantly seeks new experiences and growth. By embracing curiosity, I have ventured into diverse fields, expanding my horizons and deepening my understanding of the world.

I attend Beaumont High School and, as an incoming senior, my plans for college include pursuing biomedical science with a minor in Chicano studies to explore social inequities. Recognized by the National Hispanic Recognition Program and as a Hispanic Scholarship Fund scholar, my dreams for the future involve ensuring that everyone, especially marginalized communities, has a chance to succeed in life and bridging social gaps.

Currently, I am working in Dr. Daisy De Leon's Breast Cancer research lab alongside mentors Qianwei Tan and Katherine Granados, who have been instrumental in my growth as a researcher. The most fascinating aspect of research for me is discovering new methods and ideas, learning something new every day, and growing through challenges and mistakes.

Through the ABC program, I've learned the importance of community service and the personal growth that research fosters. These experiences have enabled me to persevere through challenges and doubts, finding comfort in discovery and solutions. As I look to the future, I am eager to deepen my understanding and contribute meaningfully to healthcare and policy. Opening the gates to this next chapter, I embrace a continuous journey of learning, growth, and discovery.

## EPITHELIAL SPLICING REGULATORY PROTEINS 1 AND 2 (ESRP1 and ESRP2) ARE REGULATED BY INSULIN-LIKE GROWTH FACTOR 2 (IGF2): EFFECT ON APOPTOTIC PROTEINS

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IGF2 promotes cell proliferation, inhibits apoptosis and induces chemoresistance of Breast Cancer (BC) cells. We showed that IGF2 achieves this by inhibiting pro-apoptotic proteins and by stimulating anti-apoptotic proteins targeting the mitochondria to prevent cell death and to promote tumor growth and chemoresistance. Our preliminary data demonstrated that IGF2 regulated ESRP1 and ESRP2 in BC cells. ESRPs contribute to rapid tumor growth and development by alternative splicing of a gene from a proapoptotic form to antiapoptotic form. In BC, ESRP1 is considered an oncogenic protein while ESRP2 is considered a tumor suppressor. The aim of this study is to test the hypothesis that IGF2 regulation of ESRPs promote antiapoptotic proteins by gene splicing. We used breast cancer cells that produce high IGF2 (CRL-2335) which were established from a tumor from an African American woman and a cell line established from these cells and cloned with anti-IGF2 (anti-IGF2 CRL-2335) cells. rtPCR was used to assess the mRNA, Western blotting to detect the proteins and confocal imaging to detect cellular ESRP1, ESRP2, BCLX and BCL2. Our WB and confocal studies results showed that CRL-2335 cells produced high ESRP1 and low ESRP2. In contrast, anti-IGF2 CRL cells produced low ESRP1 and high ESRP2. This provides a potential mechanistic pathway of how IGF2 can prevent apoptosis by regulating ESRPs to produce antiapoptotic proteins from the same gene by differential splicing. Thus, in this system, IGF2 inhibits the tumor suppressor ESRP2 while it increases the expression of the oncogenic protein ESRP1 to achieve rapid tumor growth.

**JOEL PHILIP**

ABC PARTICIPANT 2024

Everything we can and cannot see has come about in some way to shape the world around us. My curiosity for how such mechanisms work led me to my first research experience in the summer of 2021, where I used bioinformatics to understand the function of uncharacterized gene LRRC36 in motile cilia construction and wrote a research paper detailing my work. The thrill of my discovery deepened my fascination with genetics and molecular biology and drove me to apply for the 2023 ABC Summer program - under Dr. Casiano and his laboratory team, I further immersed myself in the research process under the mentorship of established professionals. I investigated the potential for therapy cross-resistance between the chemotherapuetic drug docetaxel and the DNA-damaging agents doxorubicin, etoposide, and cisplatin in prostate cancer cells.

I am 17 years old and will be attending UCLA in the fall studying Computational and Systems Biology with a focus on Neurosystems. I have always been set on becoming a physician, particularly a neurosurgeon, however, the ABC program has offered me insight into the field of research, and I am now considering a career as a scientist as well. Both professions entice me as they offer an intellectually stimulating and constantly developing workplace where I can apply myself to help others.

I would like to thank Dr. Casiano and his laboratory members, especially Pedro Ochoa, for welcoming me back into the lab and for guiding me through the research process as well as supporting me throughout this invaluable opportunity.

**POTENTIAL ROLE OF HEAT SHOCK PROTEIN 27 IN PROSTATE CANCER THERAPY CROSS-RESISTANCE**

Joel Philip, Pedro T. Ochoa, Evan Wang, Evelyn Sanchez-Hernandez, Isaac Kremsky, Carlos A. Casiano

Center for Health Disparities and Molecular Medicine, Department of Basic Sciences, Loma Linda University School of Medicine

Prostate cancer (PCa) is the second-leading cause of cancer mortality for men in the United States, with 1 in 8 men expected to develop this malignancy in their lifetime. PCa statistics reveal a health disparity in which African American (AA) men have a higher incidence and mortality rate compared to other racial groups. Although the five-year survival rate for localized PCa is nearly 100%, once the disease progresses to advanced stages patients ultimately develop resistance to standard-of-care treatments such as anti-androgen therapy (e.g. enzalutamide, ENZ) and chemotherapy (e.g. docetaxel, DTX), and the survival rate drops to 30%. Understanding the mechanisms by which cancer cells develop therapy resistance is crucial for developing new treatment options. Various mechanisms of PCa therapy resistance have been identified including the increased tumor expression of AR-v7, glucocorticoid receptor (GR), and Lens Epithelium Derived Growth Factor p75 (LEDGF/p75). An emerging concept in PCa research, therapy cross-resistance, is a phenomenon where the overlapping mechanisms of action between different drugs (e.g. ENZ vs DTX) confer resistance to one another. Based on previous observations from our group indicating that GR and LEDGF/p75 are upregulated in both ENZ-resistant and DTX-resistant PCa cells, we sought to investigate if resistance to these distinct drugs could be mediated by commonly expressed genes. Using publicly available RNA-seq data, we identified 46 overlapping differentially expressed genes (DEGs) between ENZ-resistant and DTX-resistant PCa cells. A particular gene of interest that emerged from this analysis is heat shock protein 27 (HSP27), a target gene of LEDGF/p75 that is overexpressed in PCa and promotes

tumorigenicity and resistance to apoptosis and chemotherapy. Western blotting analysis confirmed the overexpression of HSP27 in a panel of ENZ- and DTX-resistant PCa cell lines. Based on these preliminary results we hypothesize that HSP27 promotes therapy cross-resistance in PCa and that targeting this protein will attenuate this cross-resistance. Further studies will evaluate this hypothesis by targeting HSP27 genetically and pharmacologically in therapy-resistant cells to further evaluate its potential contribution to PCa cross-therapy resistance.

**AMIYA RICHBERG**

ABC PARTICIPANT 2024

The summer of 2024 has been transformative as I explored the fascinating research of cnidarian biology at the ABC Program. Under the mentorship of Dr. Hessinger and working with undergraduate student Aidan Lu, I am working on the intricacies of how anemones discharge their nematocysts. These cells, essential for defense and catching prey, are immensely complex when considered at the molecular level. I am currently a rising senior at Riverside STEM Academy aspiring to become a Pediatric Nurse Practitioner. My passion for nursing comes from a desire to provide holistic care, be an important partner in patient health, and be a first responder in critical situations. Nurses are important as the eyes and ears of hospitals, and I am excited to be part of a profession that holds such moral value. To highlight my healthcare aspirations and ABC participation, I engage in diverse extracurriculars. Serving as junior class vice president and an upcoming member of Riverside Youth Council builds my leadership, while tennis sharpens skills of discipline and teamwork. Tutoring students at Riverside STEM Academy and Reach Leadership STEAM Academy proves my commitment to education and mentorship. My participation in newspapers and yearbooks further developed my communication skills, which are extremely important in healthcare. Outside school, I enjoy niche activities such as thrifting and community service. Some of my social innovations include a cooking club with friends to teach independent skills and the importance of nutrition, and volunteering with local conservation efforts at the Riverside Corona Resource Conservation District to show my appreciation for nature. Through this summer research program, I've learned the significance of careful experimentation and the diversities of scientific investigation. Studying cnidarian biology, and the nematocysts of anemones, is a great example of the complexity of biological systems and the necessity of continuity in searching for scientific knowledge. These experiences hardened my goal of becoming a Pediatric Nurse Practitioner with a solid research background by adding a real commitment to the wellness of patients.

I am deeply grateful and thankful —both professionally and personally—to Dr. Hessinger and colleagues for their mentorship and support.

## ANEMONE BK CHANNEL ALTERNATIVE EXONS DISPLAY PROTEIN KINASE A "HOTSPOTS"

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BK channels are calcium-activated, voltage-gated potassium channels that conduct large potassium (K+) currents across cell membranes. We've recently shown that BK channels in sea anemones localize to vibration-sensitive nematocytes and are involved in triggering discharge of their nematocysts to sting target organisms (Lu et al., 2023). Stimulated surface chemoreceptors associated with such nematocytes activate cAMP-dependent protein kinase (PKA) to frequency-tune vibrations sensors to match prey swimming movements (Watson and Hessinger, 1989). In non-mammalian vertebrates, Splice variants of BK channels frequency-tune hearing in vertebrates (Pyott and Duncan, 2016; Tang et al., 2024), and we've recently shown that anemone BK channels also undergo splice variation (unpublished). We now hypothesize that anemone BK channel splice variants will exhibit a high density of PKA phosphorylation motifs within expressed alternative exons. To test this hypothesis, we bioinformatically examined BK splice variants exons to determine their PKA phosphorylation sites and PKA motif densities. We find that PKA motifs are expressed at higher density and diversity within alternative exons than in neighboring constitutive regions of BK channels. Furthermore, splice

variation of BK channels is greater among actinian cnidarians (i.e. sea anemones) than hard corals, and not at all among other cnidarian clades. This trend supports the view that PKA "hotspots" inserted into BK channel alternative splice sites modulate BK channel activity through involvement in frequency-tuning nematocytes. Moreover, our findings imply that vibration-sensitive nematocytes may be restricted to anthozoan cnidarians.

**SHRIYA ROY**

ABC PARTICIPANT 2024

Throughout my life, I have been fascinated by the world of biomedical research. The concept of scientific experimentation and interpretation captured my attention from an early age, as it offered an opportunity to analytically create active change in clinical care. Empowering others to live healthily and confidently has been a personal motivation that I have focused on applying in various practices, most notably through science-related pursuits.

In my recent years at Citrus Valley High School in Redlands, California I co-founded the SpreadStem initiative at my school, a STEM outreach program which connects high school volunteers with elementary school students, serving as vice president while also leading the National Science Bowl Team as captain. Moreover, my curiosity for research led me to volunteer in the University of California Riverside Department of Bioengineering over the past year, where I learned about using computer simulations to examine the allosteric pathways involved in applications of the CRISPR-Cas12a genome editing system. This summer, the opportunity to work in Dr. Frankis Almaguel's lab through the ABC Program with the help of Dr. Alfonso Duran and Krystal Santiago, who have shown me incredible consideration and patience, has been transformative, truly solidifying my aspirations of pursuing an MD-PhD after graduating from high school. Our project has focused on investigating the possibilities of alpha-enolase as an alternative theranostic target for radio ligand therapy in neuroendocrine prostate cancer. I am immensely grateful to have received this opportunity to further my learning.

## GENETIC SILENCING OF ENOLASE-1 (ENO1) FOSTERS ANTI-CANCER EFFECTS IN DOCETAXEL-RESISTANT NEUROENDOCRINE PROSTATE CANCER

Shriya Roy, Krystal Santiago, Alfonso Duran, Kristen Whitley, Baskhar Das, Carlos A. Casiano, Frankis Almaguel

Center for Health Disparities and Molecular Medicine, Department of Basic Sciences, School of Medicine, Cancer Center, Loma Linda University, Loma Linda, CA

Prostate cancer (PCa) is the second most commonly diagnosed cancer in American men and exhibits significant racial disparities, with elevated incidence and mortality in men of African ancestry. Although taxane-based chemotherapy is the last line of defense for metastatic Castration Resistant Prostate Cancer (mCRPC), it often fails due to chemoresistance. The protein-specific membrane antigen (PSMA) is an effective target for the imaging and therapy of mCRPC. Although PSMA radioligand therapy (PSMA-RLT) is a theranostic option for men with advanced PCa, about 30% have limited response. Some reports indicate that PSMA expression is suppressed in neuroendocrine PCa (NEPC), making it an unreliable theranostic target for this aggressive subtype. The glycolytic enzyme Enolase-1 (ENO1) is a promising theranostic alternative due to its cell surface localization in many human tumors. We hypothesized that ENO1 is abundant on the surface of NEPC-like cell lines and can be targeted with small molecule inhibitors that could potentially be used as theranostic agents. Previously, we demonstrated that ENO1 is abundant in the surface of docetaxel (DTX)-resistant PCa cells grown in high glucose medium. To determine the anti-cancer effects of ENO1 inhibition, a transient knockdown (KD) of this protein was performed in DTX-resistant and -sensitive NEPC-like cells grown in both standard and high glucose media using specific siRNAs. Confirmation of efficient ENO1 KD was performed by immunoblotting. Following ENO1 KD, immunoblotting analysis revealed a potential compensatory mechanism involving the upregulation of another enolase, ENO2. While cell viability was not affected in the ENO1 KD cells, as assessed by MTT assays, we observed dramatic changes in cellular morphology using Hoffman Modulation microscopy imaging.

Furthermore, clonogenic assays showed reduced colony formation in ENO1-depleted DTX-resistant cells. These results show that ENO1 is critical for clonogenic growth in DTX-resistant NEPC-like cells and support our long-term goal to identify an alternative theranostic option for patients with neuroendocrine Pca.

**SARA SALAMA**

ABC PARTICIPANT 2024

I am an upcoming junior at John F. Kennedy Middle College High School in Norco. My fascination with science and medicine led me to discover the incredible ABC Program at Loma Linda University. Ever since I was young, science has always fascinated me, and I've always been interested in how it operates. This curiosity inspired me to pursue a career as a doctor. Although I'm still uncertain about the specific type of doctor I want to be, I know that I want to pursue this path.

I learned early on that achieving my dreams would require a lot of hard work. I therefore finished middle school as the salutatorian of my class. However, I also understood that service is just as important as grades. I frequently volunteer at my church and also go to homeless shelters to complete my service hours. My dream is to work as a doctor and help others in the name of the Lord.

This summer, I had the opportunity to work in the Health Geoinformatics Lab with Dr. Seth Wiafe. Given that I had never used the software he was teaching me, I would like to thank him for his kindness and consideration. This program has shown me that, while I am very interested in research, I still want to be able to work directly with patients.

## SOCIODEMOGRAPHIC AND GEOGRAPHIC VARIATIONS IN GUN VIOLENCE IN CALIFORNIA

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Gun violence is a major public health issue that impacts thousands of lives each year in the United States. The negative effects of gun violence are unevenly distributed across different geographic areas and sociodemographic groups. Although, in California, the tightening of gun laws has resulted in the firearm mortality rate dropping from 9.5 per 100,000 people in 2005 to 8.5 in 2020, it is unclear which specific communities are most affected. This project aims to analyze the sociodemographic and geographic variations in gun violence across California. Two datasets were obtained from the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) at the census tract level and Gun Violence Archive (2019-2022). Using IBM SPSS Statistics V29, two multivariable models were created to assess the correlation between SVI and gun violence: four SVI themes and overall SVI as well as fifteen SVI social factors. ArcGIS Pro V3.2 was used to conduct geospatial analysis (Moran's I and Kernel Density) and create descriptive maps. Descriptive statistics indicate gun violence in California decreased slightly over time (2019-2022). Regression analysis of the four themes showed that the odds of gun violence among people with high socioeconomic status (SES) were 6% compared to those with low SES. Overall, SVI was positively associated with gun violence, as were poverty, unemployment, not completing high school, living in multi-unit structures, and having no vehicle. Moran's I statistic confirmed a significant ($p<0.05$) spatial autocorrelation between SVI and gun violence, indicating the dataset is more spatially clustered than would be expected. Knowledge gained from this project could be instrumental in guiding policymakers and public health officials in developing programs that address the root causes of gun violence and support the most vulnerable communities.

**VICTORIA TRAN**

ABC PARTICIPANT 2024

I am an upcoming senior, attending Middle College High School. At Middle College High School, we are given the opportunity to dual enroll with San Bernardino Valley College, taking college classes as well as completing our high school classes. As of right now, I am on track to receiving an Associate degree in Biological and Physical Sciences and completing my IGETC.

All starting 2 years ago, I joined the Discovery Program, led by Loma Linda. Through this program, I was able to learn about the different pathways of the medical field and hear testimonies from professionals with experience in their field. I heard one testimony that struck out to me the most. A pharmacist came and told the audience that something so small can make someone's day for their entire life. With the many stories other lecturers had, I felt everyone's burning passion, striking me to explore the other careers the medical field has to offer. I decided to participate in the ABC program as a result, learning to understand research, being the backbone of medicine, as I continue broadening my horizons within the medical field.

I am truly grateful to work in the molecular research lab under Dr. David Xu. He has shown me what research has for me, many questions waiting to be answered. I am fortunate to be in this program, and I hope to continue this amazing experience and use it towards my potential career within the medical field.

## DISCOVERY OF NFκB2-COORDINATED DUAL REGULATION OF MITOCHONDRIAL AND NUCLEAR GENOMES LEADS TO AN EFFECTIVE THERAPY FOR ACUTE MYELOID LEUKEMIA

Victoria Tran, Jeffrey Xiao, Brandon Park, Joshua Kim, Cedric Kwon, Scott Lee, Laren Tan, Hisham Abdel-Azim, Mark E Reeves, Hamid Mirshahidi, David J. Baylink, Huynh Cao, Yi Xu

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Acute myeloid leukemia (AML) has a poor survival rate for both pediatric and adult patients due to its frequent relapse. To elucidate the bioenergetic principle underlying AML relapse, we investigated the transcriptional regulation of mitochondrial-nuclear dual genomes responsible for metabolic plasticity in treatment-resistant blasts. Both gain and loss of function results demonstrated that NFκB2, a non-canonical transcription factor (TF) of the NFκB family can control the expression of TFAM, known to be essential for metabolic biogenesis. Furthermore, genetic tracking and promoter assays revealed that NFκB2 is in the mitochondria and can bind the specific "TTGGGGGGTG" region of the regulatory D-LOOP domain to activate the LSP and HSP1 promoters of the mitochondrial genome. Based on our discovery of NFκB2's novel function of regulating mitochondrial-nuclear dual genomes, we explored a novel triplet therapy including inhibitors of NFκB2, tyrosine kinase and mitochondrial ATP synthase that eliminated primary FLT3-mutated blasts and displayed minimum toxicity to control cells ex vivo. As such, effective treatments for AML must include strong inhibitory actions on the dual genomes mediating the metabolic plasticity to improve leukemia prognosis.

# Undergraduate Training Program (UTP)

**RAYNON ANDREWS**

UTP PARTICIPANT 2024

I tore both my Anterior Cruciate Ligament (ACL) and Medial Meniscus during my 2nd year at college. This injury took an almost unbearable toll on my physical and mental state. During my recovery, these challenges became the pathway for me to gain a deeper understanding of the important role of healthcare providers. Their excellent skill sets, along with their patience and encouraging words left me with a desperate desire to learn more and do the same for others.

Summer of 2024, I participated in UTP at LLU. Under the leadership and guidance of Dr. Christopher Perry and Mr. Cedric Lansangan, we investigated the structure of cancer cells and analyzed data through flow cytometry. The most important lesson for me was the daily reminder of how detailed God's creation is. That was a humbling experience for me.

Fall of 2024, I will return to Oakwood University where I will continue coursework for a B.S. in Biology (Pre-Med). I will resume my role as a Researcher, TA, Peer Mentor, and Highschool Tutor. My desire is to minimize the disparities that exist in my community, one step at time through mentorship, educating and practicing medicine. My future plan is to attend Loma Linda University School of Medicine.

Thank you to Dr. Patil, Dr. Perry, and Mr. Lansangan for welcoming me, patiently teaching, and supporting me. I'm also thankful for my research colleagues, Ryam Basheer and Kelechi Amobi. This has been a wonderful and fulfilling research experience.

**EVALUATING THE BIOSAFETY OF GOLD NANOPARTICLES IN MALIGNANT GLIOMA**

Raynon M. Andrews*, Kelechi Amobi, Ryam Abdulhasan, Cedric Lansangan, M.S., Serge Rudensky, M.D., Menka Khoobchandani, Ph.D., Rameshwar Patil, Ph.D., and Christopher Perry, Ph.D.

Department of Basic Sciences, Division of Cancer Science, Division of Biochemistry, Loma Linda University School of Medicine, Loma Linda, CA

Glioblastoma Multiforme (GBM) is one of the most common primary brain tumors in the United States. This highly aggressive and infiltrative glioma has an average survival time of about one year for treated patients and about 4 months without treatment. Gold nanoparticles (GNPs, including gold nanospheres) and gold nanostars (GNSs) have great potential for mediating therapeutic drug delivery and imaging. They can be modified to precise shapes and sizes, loaded with a drug of choice, and delivered to a targeted site. The biosafety of GNPs is critical for their biomedical applications and has not been thoroughly studied. Biosafety becomes even more important when delivering drugs at high concentrations. We aim to determine the biosafety of GNPs at high concentrations.

We investigated the biosafety of spherical GNPs and GNS in the glioma cell lines U87MG and GL261 in a dose-dependent manner. MTT(3-(4,5- Dimethylthiazol-2yl)- 2,5-diphenyltetrazolium bromide assay was used. The colloidal stability of the GNPs was assessed in physiological conditions. The overall goal of this work was to determine GNP biosafety at various concentrations for future use as drug delivery vehicles for glioma therapies, including boron neutron capture therapy (BNCT) and radiosensitization of gliomas. It is expected that GNPs will deliver the drug of choice to targeted cells for future investigation as a potential cancer treatment.

**JOSEL BRYANT**

UTP PARTICIPANT 2024

As an upcoming junior at Oakwood University, a Seventh-day Adventist HBCU in Alabama, I have had the opportunity to participate in numerous valuable experiences. Participating in the Undergraduate Training Program this summer at LLU is no different. While I have been involved in research projects before and even received an award at a research poster symposium, this program has introduced me to a new level of self-reliance and hands-on ability required for formal research. Initially, my confidence was shaken, but under the mentorship of Dr. Olivia Francis-Boyle and with the help of Postdoctoral Fellow William Chen, I have learned lessons both in and out of the research lab.

When the fall semester begins, I will continue my pursuit of a degree in Biology: Pre-Medicine. The skills developed through this program will be crucial as I serve as Co-president of the Oakwood Biomedical Association. Upon graduation, I hope to enroll in an MD program and work as a physician addressing health disparities with the same ethical approach as the Center for Health Disparities and Molecular Medicine does here at Loma Linda University.

One takeaway I've gained from the research I have been involved in through this program is that everything is part of a larger plan. Every experiment conducted, every cell split, and every sample analyzed contributes to finding the answer to the main research question. Similarly, the UTP has become a part of the plan I believe God has for me, and I am incredibly thankful for this experience.

**EVALUATION OF THE GENE AND PROTEIN EXPRESSION PROFILE OF THE THYMIC STROMAL LYMPHOPOIETIN RECEPTOR IN MULTIPLE TUMOR TYPES**

Josel Bryant, William A. Chen, Cody Fullerton, Alma Costas, Jide Otiji, Jennifer Kim, Christian Hurtz, Penelope Duerksen-Hughes, and Olivia L. Francis-Boyle
Center for Health Disparities and Molecular Medicine, School of Medicine
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TSLP is a cytokine that contributes to hematopoiesis, but is implicated in disease. TSLP binds to its components, IL-7R$\alpha$ and CRLF2, and activates the JAK-STAT pathway to induce the proliferation of normal B-cells and apoptosis in CRLF2 B-ALL cells. However, a comparative study of the gene and protein expression patterns of the TSLP receptor and TSLP's function in multiple tumor types has not been performed. The objective of this study was to analyze the gene and protein expression profiles of IL-7R$\alpha$ and CRLF2 in different tumors. We hypothesized that various tumor types would exhibit differential gene and protein expression of the TSLP receptor components. We used the FIREBROWSE gene expression tool housed by the BROAD Institute of Massachusetts Institute of Technology & Harvard University to perform an IL-7R$\alpha$ & CRLF2 gene expression profile analysis as well as flow cytometry to determine the protein expression profile of IL-7R$\alpha$ & CRLF2 in several tumor types. Our results showed that the CRLF2 gene was upregulated in bile duct, colon, thyroid, and thymus cancer patient samples compared to normal controls; while the IL-7R$\alpha$ gene was upregulated in head and neck, kidney, cervical, sarcoma, and glioblastoma cancer patient samples compared to controls. Additionally, CRLF2 B-ALL cell lines expressed increased protein levels of the TSLPR components compared to controls and other tumor types. In conclusion, these studies provide a rationale for the future evaluation of select tumor types that may express CRLF2 and respond to TSLP as a potential therapy.

**EMILEE DUANY**

UTP PARTICIPANT 2024

The start of 2024 marked a pivotal moment in my life: I was not only accepted into the Early Assurance program at Loma Linda but also granted the privilege of participating in UTP. Participating in the UTP program has filled me with excitement for the future ahead in healthcare and research. I currently attend Oakwood University and will return this fall as a Junior majoring in Biology. My passion for service has driven me to actively engage in community service, including volunteering at Vacation Bible School, mentoring high school students through OU Live, and assisting with STEM tutoring at Oakwood Academy. With a love for research, I have completed three research projects and presented two of them at the Hudson Alpha Code Symposium during my time at Oakwood University. In the future, I aspire to pursue a career as an anesthesiologist. Inspired by witnessing firsthand the crucial role they play in ensuring comfort and safety during medical procedures. My personal experiences have emphasized the profound impact anesthesiologists have on patient outcomes, reinforcing my passion for pursuing this career path where medical expertise meets compassionate patient care. Under the guidance of my mentor, I am currently researching the effects of prenatal e-cigarette exposure on neonatal rats, honing my skills in data analysis and behavioral testing. This work not only aligns with my dedication to understanding complex health issues but also prepares me to contribute meaningfully to healthcare advancements.

I am grateful for the guidance and support my mentor, DaLiao Xiao, throughout this transformative journey. As I look ahead, I am eager to continue learning, growing, and ultimately making a difference as a future anesthesiologist.

**PRENATAL E-CIGARETTE EXPOSURE IMPACTS BRAIN DEVELOPMENT LEADING TO BEHAVIORAL DISORDER IN POSTNATAL LIFE**

Emilee Duany, Yong Li, DaLiao Xiao
Center for Perinatal Biology,
School of Medicine, Loma Linda University, Loma Linda, CA

Objective: Maternal e-cigarette (e-cig) usage during pregnancy is increasingly recognized as a significant public health concern due to potential implications for offspring development. The rapid growth in e-cigarette technology has led to widespread use, affecting approximately 4.5% of adults and 2.2-7% of pregnant women. Despite this epidemic, research into its effects remains limited, necessitating a deeper understanding of its impact on offspring. This study aimed to investigate whether prenatal exposure to e-cigarettes induces behavioral changes in rat offspring. Methods: Pregnant rats were randomly assigned to two groups: a Control group (exposed to air) and an e-cig group (exposed to e-cigarette aerosols from gestational days 4 to 20). Behavioral tests were conducted on 6-month-old male and female offspring, including the Y-maze and novel object recognition tests for cognitive function (memory), the elevated plus maze for anxiety, and the sucrose splash test for depression-like behaviors. Results: Results from the Y-maze and novel object recognition tests did not reveal significant cognitive deficits in e-cig exposed offspring. In the elevated plus maze, male offspring showed increased time spent in open arms, suggesting lower anxiety or increased risk-taking behavior. Conversely, females exhibited increased anxiety as indicated by reduced time spent in the center. In the sucrose splash test, e-cig exposed offspring showed a trend towards increased grooming duration and reduced latency. Conclusion: These findings underscore the sex-dependent differential effects of maternal e-cigarette use on offspring behavior and underscore the urgent need for further research. Understanding the underlying mechanisms is crucial for elucidating the long-

term consequences on offspring development and health. Such insights are essential for informing public health policies aimed at mitigating risks associated with prenatal e-cigarette exposure and safeguarding the neurological development and well-being of future generations.

**KENNEDI EWAN**

UTP PARTICIPANT 2024

Currently, I am a rising junior at Oakwood University, located in Huntsville, AL. I am studying biology on the pre-med track. After graduating from Oakwood, I desire to go to medical school to become a pediatrician. I am involved in the OU Reach Mentorship Program, working as a lab assistant for Dr. Juliet Durant, and the HBCU UP Research Program. Through volunteering at Triana SDA Children's Church and shadowing at Children's National Hospital in Washington D.C, I have become more inspired to become a pediatrician. As a pediatrician, I intend to find preventive measures to combat childhood diseases. In this way, these children can live longer and healthier lives when they are older. My love for science flourished in high school where I participated in the Biotechnology program. This program helped me understand why science is important and further encouraged me to continue my interest in medicine.

During my time at the UTP program, I worked in the Biochemistry department in Dr. Salma Khan's lab. Our research project is focused on very aggressive thyroid cancer. I would like to express my gratitude to Dr. Salma Khan, Janice Pakkianathan, and Romi Yamauchi for guiding me through this project and sparking my interest to continue a career in the science field. I would also like to thank the UTP program for providing me with this research experience.

**DETECTION OF A NOVEL SURFACE MARKER IN ANAPLASTIC THYROID CANCER**

**Kennedi Ewan,** Janice Pakkianathan, Dan C. Celestin, Samuel Chan, Celina Romi Yamauchi, Andrea Shields, Mia C. Perez, Alfred A. Simental, Salma Khan

Center for Health Disparities and Molecular Medicine, Biochemistry, Pathology, Otolaryngology, Loma Linda University School of Medicine, Loma Linda, CA

Anaplastic thyroid cancer (ATC) is the rarest and most aggressive variant of thyroid cancer, with an average survival rate of six months. Most types of differentiated thyroid cancer typically respond well to radioiodine therapy. However, ATC, being undifferentiated, lacks the sodium iodide symporter essential for transporting radioiodine into cancer cells, thus creating a critical need for new treatment strategies. Recently, surface ligand-targeted radiotherapy has shown greater success in radio resistant cancer patients, especially using boron neutron captured therapy (BNCT). One promising ligand in BNCT is the L-type Amino Acid Transporter (LAT-1), a heteromeric protein that regulates hormone movement across the blood-brain barrier and is overexpressed in various tumor cells. Previous studies have indicated LAT-1 overexpression in ATC. Our objective is to identify the LAT-1 gene and protein expression in a subset of ATC for future radioligand therapy. We analyzed the expression of the LAT-1 gene (SLC7A5) using the UALCAN software on TCGA thyroid cancer cohort, and assessed the LAT-1 protein expression on the Loma Linda ATC cohort through immunohistochemistry. Our findings revealed that SLC7A5 is highly expressed in thyroid cancer in comparison to normal thyroid tissue, which correlates with poorer patient survival. Additionally, with immunohistochemistry, we were able to observe differential LAT-1 protein expression in ATC. In conclusion, both the LAT-1 gene and protein show overexpression in ATCs, suggesting a potential role in the progression of these aggressive tumors. Our ongoing preclinical study aims to utilize LAT-1 as a novel target for BNCT in the treatment of ATC.

**KALEB GONZALEZ**

UTP PARTICIPANT 2024

My family has always told me, "No matter what you do, give it your best." Whether in school, at a job, or as a volunteer, they have pushed me to excel beyond what is asked. Their support has allowed me to get to where I am today and inspires me to be the person I want to be tomorrow. I am an upcoming junior at Southwestern Adventist University (SWAU) majoring in Biochemistry with a Psychology minor. My career goal is to become a neurosurgeon.

I am a member of the SWAU Preprofessional Health Club and STEM Club, the vice president of the Chemistry and Physical Science Department club (CheMaPhy), and a member of the school's Honors program. Some of my hobbies include playing the guitar, volleyball, painting, and spending time with friends and family.

This is my first year in the UTP program, and I couldn't have asked for a better research environment than the one in Dr. De Leon's lab. I have learned so much about the field of neuroscience, specifically potential treatments for neuropathic pain using Omega 3s. This summer experience has allowed me to expand my knowledge of biological processes and practice certain lab skills and techniques that will surely become vital in the future. I would like to thank my mentors Francis Zamora, Viet Hoang Dinh, and Jo-wen Liu for not only enriching my mind with their knowledge and always being willing to help but also for creating a fun environment in which I could grow.

## THE REGULATION OF AUTOPHAGY-RELATED GENES IN THE NEURONAL PROTECTION OF DOCOSAHEXAENOIC ACID IN DIFFERENTIATED PC12 CELLS UNDER HYPOXIA

Kaleb Gonzalez, Francis Zamora, Viet Hoang Dinh, Jo-Wen Liu, Marino De León

Center for Health Disparities and Molecular Medicine, Basic Sciences, School of Medicine, Loma Linda University, Loma Linda, CA

Under hypoxia, low oxygen levels can result in nerve cell dysfunction and death and are associated with stroke and traumatic injuries in the nervous system. However, hypoxia can also trigger autophagy, a cellular process through which the cell degrades surplus unneeded cell components as a survival mechanism. Docosahexaenoic acid (DHA) is an omega-3 fatty acid that is essential for various normal brain functions. DHA exhibits neuroprotective properties by inhibiting apoptosis and necroptosis and promoting cell survival during neuronal trauma. Previous studies from our lab have shown that DHA protects nerve growth factor-differentiated PC12 (NGFDPC12) cells from hypoxia-induced apoptosis. In this study, we investigated the autophagy-related response in DHA-treated cells during hypoxia. NGFDPC12 cells were treated with either BSA alone or with 50 μM DHA /150 μM BSA for two days. Chloroquine (CQ, 10 mM), an autophagy flux inhibitor, was added to selected cell cultures and subsequently, the cells were exposed to either normoxia or hypoxia-reoxygenation (0.3% $O_2$ for 24 hours followed by 19% $O_2$ for 18-20 hours). Cell morphology was documented by microscopy imaging, and cell viability was quantified using a Crystal Violet Assay. Real-time qPCR was used to monitor the effects on stress-related and autophagy-related genes. We found that DHA-treated cells exhibited higher survival rates under hypoxia conditions in the presence of CQ compared to BSA-treated cells. Notably, DHA-treated cells showed higher levels of ATG16L1, HSPA5, and FABP5 under hypoxia. Additionally, ATG16L2, HSPA5, and HIF1a gene expression was higher in DHA+CQ-treated cells compared to BSA+CQ-treated cells. Our preliminary findings suggest that the protective effect of DHA on NGFDPC12 cells exposed to hypoxia involves, in part, the regulation of autophagy-related genes.

## KATHERINE GRANADOS

UTP PARTICIPANT 2024

Being able to find something that makes you feel both confident and comfortable when pursuing a career path began when I was introduced to the field of research in 2022. Coming back to Loma Linda in the same lab with the same mentor, Dr. Daisy De Leon, has made me feel more confident in the research I will be conducting this year as an undergraduate.

The introduction to research helped me find an interest in a specific research specialty. Reading extensive scientific papers taught me the essence of research and its need to lead toward therapeutic care. My curiosity allowed me to explore biomedical papers surrounding various neurodegenerative diseases and their impact on cognitive functions. I became captivated in the effects of repetitive traumatic brain injuries and their association with long-term cognitive defects resulting from contact sports, Chronic Traumatic Encephalopathy (CTE). Resulting in defining the causes of the neurological effects of CTE on professional athletes relative to healthy adults in behavioral and cognitive development.

My involvement with research opened my eyes toward becoming a neurological researcher to understand the mechanism to examine molecular genetics and incorporate health disparities where gender or race affects the development of CTE. As a determined first-generation student, I hope to push forward the field of neurodegenerative diseases to increase awareness and develop optimal treatments for underserved communities.

## EPITHELIAL SPLICING REGULATORY PROTEINS 1 AND 2 (ESRP1 and ESRP2) ARE REGULATED BY INSULIN-LIKE GROWTH FACTOR 2 (IGF2): EFFECT ON APOPTOTIC PROTEINS

Kate Landeros, Katherine Granados, Qianwei Tan and Daisy De León
Center for Health Disparities and Molecular Medicine, Breast Cancer Laboratory,
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IGF2 promotes cell proliferation, inhibits apoptosis and induces chemoresistance of Breast Cancer (BC) cells. We showed that IGF2 achieves this by inhibiting pro-apoptotic proteins and by stimulating anti-apoptotic proteins targeting the mitochondria to prevent cell death and to promote tumor growth and chemoresistance. Our preliminary data demonstrated that IGF2 regulated ESRP1 and ESRP2 in BC cells. ESRPs contribute to rapid tumor growth and development by alternative splicing of a gene from a proapoptotic form to antiapoptotic form. In BC, ESRP1 is considered an oncogenic protein while ESRP2 is considered a tumor suppressor. The aim of this study is to test the hypothesis that IGF2 regulation of ESRPs promote antiapoptotic proteins by gene splicing. We used breast cancer cells that produce high IGF2 (CRL-2335) which were established from a tumor from an African American woman and a cell line established from these cells and cloned with anti-IGF2 (anti-IGF2 CRL-2335) cells. rtPCR was used to assess the mRNA, Western blotting to detect the proteins and confocal imaging to detect cellular ESRP1, ESRP2, BCLX and BCL2. Our WB and confocal studies results showed that CRL-2335 cells produced high ESRP1 and low ESRP2. In contrast, anti-IGF2 CRL cells produced low ESRP1 and high ESRP2. This provides a potential mechanistic pathway of how IGF2 can prevent apoptosis by regulating ESRPs to produce antiapoptotic proteins from the same gene by differential splicing. Thus, in this system, IGF2 inhibits the tumor suppressor ESRP2 while it increases the expression of the oncogenic protein ESRP1 to achieve rapid tumor growth.

**PABLO JAQUEZ**

UTP PARTICIPANT 2024

As a junior at La Sierra University, majoring in Biology-Biomedical Sciences with a minor in Biochemistry, I strive to unravel the complexities of the human body and appreciate the intricacies of creation. My goal is to gain an MD/PhD, combining my medical career with my calling to serve as a missionary while contributing to the knowledge necessary to provide optimal medical care. I aim to address both spiritual and healthcare needs by creating mobile clinics that offer essential healthcare services and serve as hubs for research and medical procedures.

I volunteer at City of Hope, supporting cancer patients by offering companionship during their treatment, assisting nurses, and ensuring patients have everything they need. Additionally, I volunteer with Good Samaritan in Mexicali, Mexico, providing hope to homeless individuals and families through spiritual, physical, and emotional restoration.

This summer, as part of the UTP at Loma Linda University, I worked in Dr. Boskovic's lab, gaining invaluable experience with different technology and equipment. Our research involves exposing platelets in whole human blood to bacterial LPS from P. gingivalis to access platelet plug formation. The overall objective is to learn more about the switching of platelets between different functions like hemostasis, infection, or inflammation.

I am deeply grateful for the support of my mentor, Dr. Boskovic, and my colleagues. This experience allowed me to explore the unknown, discuss questions, and seek answers, all while appreciating the goodness of God's creation.

## IMPACT OF *PORPHYROMONAS GINGIVALIS* LIPOPOLYSACCHARIDE ON PLATELET FUNCTION IN HUMAN WHOLE BLOOD

Pablo Jaquez[1], Emely Murillo-Vega[2], Lidia Malina[3], Danilo Boskovic[3,4]

[1]Center for Health Disparities and Molecular Medicine, School of Medicine, Loma Linda University, Loma Linda, CA; [2]California Baptist University, Riverside, CA; [3]Department of Earth and Biological Sciences, [4]Division of Biochemistry, Department of Basic Sciences, School of Medicine, Loma Linda University, Loma Linda, CA

Platelets are small anucleate blood cells, commonly known for their role in hemostasis. They, however, also participate in processes like inflammation and infection. Platelets can serve as primary sensors of invading agents such as bacteria, viruses or fungi. Dysfunctional platelets can lead to thrombosis, bleeding, inflammation, or immune dysregulation. The effects of bacterial lipopolysaccharide (LPS) from *Porphyromonas gingivalis* on platelet plug formation were investigated. *P. gingivalis* is a gram-negative anaerobic bacterium that causes adult periodontitis by disrupting the host microbiota and causing chronic oral inflammation. LPS, an essential part of Gram-negative bacterial cell wall, is well known for its inflammatory potential. Previous studies on platelet function in response to certain LPS were inconsistent. The overall objective is to gain further insight into the complex interplay between platelet responses to hemostatic, infectious, or inflammatory stressors. Platelet plug formation in human whole human blood was measured after exposure to *P. gingivalis* LPS using the PFA-100 system. Varying LPS concentrations and incubation times were employed to probe the range of platelet responses. Blood was obtained from multiple consenting donors in compliance with IRB. The LPS prolonged the platelet plug formation time for most concentration and incubation times tested. However, under specific circumstances it could also shorten it. In conclusion, a concentration and incubation time dependent LPS effect on platelet function is observed.

**WENDOLYN JOHNSON**
UTP PARTICIPANT 2024

During my upbringing, I was privileged to be immersed in a household prioritizing health and wellness. This environment instilled a natural inclination toward altruism and taught me the value of a life dedicated to serving others. It became evident early on that my greatest fulfillment is providing comprehensive assistance to individuals. Witnessing the challenging circumstances faced by many only fueled my passion and resolve to pursue a career focused on enhancing people's holistic well-being. Participating in UTP has been a profoundly enriching experience for me. Being part of a community that places special emphasis on spiritual development, scientific rigor, and compassionate humanism has incubated my biomedical aspirations.

I am currently studying biology at Oakwood University in Huntsville, Alabama, with the goal of attending the Loma Linda School of Medicine and specializing in dermatology. In addition to academics, I am actively involved in community service, including feeding the homeless, environmental cleanups, and tutoring middle school students in science. Additionally, I spearheaded an American Sign Language club. Before joining UTP, I was uncertain about my ability to compete in the scientific field. However, under Dr. Goulopoulou's guidance and support from Renee de Nazare and Nataliia Hula, I have gained confidence in my potential as a scientist. This transformative experience has enriched my academic journey and solidified my future goals. I am deeply thankful to Dr. Goulopoulou's lab for this opportunity, which has profoundly impacted my life and reinforced my commitment to achieving excellence in science.

**EXTRACELLULAR MTDNA INCREASES INTERFERON-GAMMA EXPRESSION IN RAT PLACENTA**

Wendolyn Johnson, Renee De Nazare Oliveira Da Silva, Desirae Escalera, Nataliia Hula, Styliani Goulopoulou
Lawrence D. Longo MD Center for Perinatal Biology, Loma Linda University, Loma Linda, CA

Extracellular mitochondrial DNA (mtDNA) induces an inflammatory response via activation of pattern recognition receptors of the innate immune system. Circulating mtDNA is a marker of mitochondrial dysfunction, cellular stress, and systemic inflammation. In pregnancy complications, such as preeclampsia, circulating mtDNA is dysregulated, and the innate immune system is overactivated. Interferon-gamma (IFN-γ) is a cytokine that regulates innate and cell-mediated immune responses to viral and bacterial infections. Anti-inflammatory cytokines downregulate IFN-γ, while pro-inflammatory cytokines induce its upregulation. Elevated levels of INF-γ were detected in maternal blood and placentas from pregnancies with preeclampsia, indicating its role in the inflammatory response during pregnancy complications. We hypothesized that exposure to extracellular mtDNA would increase IFN-γ expression in rat placentas and this effect would be sex-dependent. Timed-pregnant rats (gestational day: 14-15, term=22-23) were treated with mtDNA (300 μg/kg BW) or saline (vehicle) intravenously. Rats were euthanized 4 hours after treatment, and fetoplacental units were collected. A single-step polymerase chain reaction (PCR) was used to determine the sex of rat placentas (kdm5c, X chromosome-specific gene; kdm5d, Y-chromosome-specific gene). Gene expression of *ifn-γ* (pro-inflammatory), *f4/80* (macrophage marker), and interleukin (*il)-10 and il-4* (anti-inflammatory) was measured with quantitative PCR (qPCR). Placental weight did not differ between male and female fetuses ($p>0.05$). Expression of *inf-γ* and *f4/80* increased following treatment with mtDNA in placentas of female fetuses (*inf-γ*, $p=0.0067$; *f4/80*, $p=0.0008$ vs. saline) compared but did not change in placentas from male fetuses ($p>0.05$). There was no sex or treatment effect on *il-10 and il-4* ($p>0.05$). These results suggest that extracellular

mtDNA increases expression levels of INF-γ, laying out a potential route of sex-specific innate immune system activation via macrophages.

**GABRIEL MOLINA**
UTP PARTICIPANT 2024

I will be an upcoming junior at Southwestern Adventist University, currently majoring in Biochemistry. I am also heavily involved in the Music department at SWAU, participating as a violinist in the Orchestra. This has allowed me to be a part of the Annual Music Festival that is held at the Meyerson Symphony Center in Dallas, TX. I also currently am working as a scribe at Huguley Memorial Hospital in Burleson, TX, where I have worked countless hours, having the privilege of experiencing the doctor-patient interactions that occur in the Emergency Room. I had the privilege to have been able to go on a mission trip to Peru with my former high school (Burton Adventist Academy). On this trip, I was able to see how poverty has impacted the lives of millions of people. I would like to become a physician to help these people, as well as others who are not able to afford proper healthcare. I would like to thank Dr. Ryan Sinclair for being my mentor throughout the summer. I enjoyed listening about the different projects that he has been working on passionately for Public Health. I was also able to learn many lab techniques that will serve me well in future laboratory experiences. I would also like to thank Dr. Thomas Hile for assisting me in completing my research project. He also taught me various laboratory techniques that served me very well during the duration of my time at the laboratory. My life has forever been impacted.

**ANALYSIS OF ENVIRONMENTAL BACTERIA GROWTH IN A 5-GALLON WATER COOLER**

Gabriel Molina, Thomas Hile, Ryan Sinclair
Environmental Microbiology Research Laboratory, School of Public Health, Loma Linda University, Loma Linda, CA

The quality of drinking water significantly impacts human health. Despite advancements in water treatment processes enhancing water safety, the susceptibility of drinking water to microbial contaminants persists during transport, storage, and handling. The consumption of bulk 5-gallon water coolers, commonly used in office buildings, companies, and commercial sites, has increased worldwide. While several studies have reported contamination in alternative drinking water sources such as water dispensers, few have evaluated microbial growth in water bottles over time. This study aimed to assess bacterial growth in a 5-gallon water cooler and the effectiveness of a spigot coated with antibacterial nanoparticles. Drinking water was collected in a sterilized 5-gallon water cooler (fitted with a spigot coated with antibacterial nanoparticles) from a local water vendor and stored in the LLUH environmental microbiology lab. Daily water and swab samples from the spigot were analyzed on R2A agar for heterotrophic bacteria (HPCs), physicochemical parameters, and *Pseudomonas aeruginosa*. Additionally, a second sterilized 5-gallon water cooler, without a spigot, was used to store water for a week before swabbing and analyzing for HPCs and Pseudomonas. While the Pseudomonas studies were all negative, the three HPC studies that were conducted all showed varied periods of minimal bacterial growth, yet they all similarly experienced an exponential growth of bacteria after a certain amount of time. Our work done in the Environmental Microbiology Research Laboratory emphasizes the need for the proper sterilization of these water coolers to prevent any health problems presented by these bacteria.

**MYA ST. LOUIS**

UTP PARTICIPANT 2024

The responsibility of using this life God has given to serve others is a concept that was engrained in my brain very early in life. My own story of overcoming some of the poor prognoses of Black infants in America grew to fuel my passion for eradicating racial health disparities. It is my desire to use the gift of my life to change the lives of others.

I am a rising junior at Oakwood University studying Biology with a concentration in Pre-Medicine. I have been blessed to have been involved in several research endeavors, most recently presenting a poster on the impact of natural compounds on collagenase activity in S. marcescens. I have also been blessed to have two peer-reviewed publications on women's health. My future goals are to become a pediatric dermatologist and pursue a master's in public health to aid in serving underserved populations by equipping communities with the information and resources they need to advocate for themselves and make the best decisions for their health. My interests include writing stories, poetry, and music that connect to this generation and provide a message of hope in my Savior, as well as spending time with my family and friends. In doing this program, I have learned that the reward of being a physician-scientist is not purely academic. The joys of expanding the knowledge of the present age are only as powerful as its potential to lift the burdens of humankind.

Thank you, Dr. Brantley, for your leadership, patience, and support during this new experience.

## EVALUATION OF LUTEOLIN AS AN AGENT TO TREAT ESTROGEN RECEPTOR POSITIVE BREAST CANCER AMONG PATIENTS OF DIVERSE ANCESTRIES

Mya St. Louis, Ozichi Amobi, Shawnee Angeloni, Ivan Jacuinde and Eileen Brantley
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Women of West African ancestry (WA) experience increased breast cancer mortality compared to those of European ancestry (EA). This disparity is especially pronounced among women with estrogen receptor positive (ER+) breast cancer. Differences in tumor biology influence responsiveness to targeted therapies such as the selective estrogen receptor degrader fulvestrant and likely contribute to this survival disparity. Plant-derived products have been shown to diminish side effects from anticancer drugs and enhance drug efficacy. We therefore sought to examine the potential of luteolin, a natural flavonoid, to demonstrate anticancer activity in ER+ breast cancer cell lines derived from patients of EA and WA as well as examine whether differences exist in responsiveness of breast cell lines to fulvestrant based on ancestry. Using the Alamar Blue assay we discovered that the MCF7 EA cell line exhibited high sensitivity to the cytotoxic actions of fulvestrant while the ZR-75-30 and MDA-MB-175-VII WA cell lines exhibited resistance more akin to that found in MCF7-fulvestrant resistant cells. Interestingly, EA cells demonstrated increased cell viability to luteolin while the WA cells did not show this increase. Both EA and WA cell lines demonstrated dose-dependent decrease in proliferation following fulvestrant and luteolin treatment as determined by the colony forming assay. While WA cells were very sensitive to the anti-sphere-forming actions of luteolin, EA cells showed an increase in sphere formation after treatment with luteolin. Finally, quantitative PCR analyses revealed that WA cells tend to have higher levels of the stemness factor alpha6-integrin. Studies are underway to delineate the mechanism(s) of anticancer action for luteolin and to determine whether this plant product can enhance the anticancer efficacy of fulvestrant.

**ERIANNE THOMAS-MARTIN**

UTP PARTICIPANT 2024

I am extremely grateful for this opportunity to be a part of the Loma Linda University Undergraduate Training Program (UTP). UTP has allowed me to experience new scientific tasks that will not only strengthen my undergraduate experience, but build upon my knowledge for my future career.

I have the amazing pleasure of attending Howard University, in Washington D.C. Here, I am entering my junior year as I major in biology, and minor chemistry on the pre-medical path. So far in my academic career, I have accomplished a high GPA and been placed on the Dean's list for the College of Art and Sciences. With my knowledge and experience from programs like this, coupled with community service, I am praying to be able to enroll in Loma Linda University as a medical student.

This summer I have been utilizing immunocytochemistry to evaluate how lactic acid produced from cancer cells affect the proliferation of healthy bodily cells by suppressing the gene KI67. I am grateful to Dr. Nie Ying for being my mentor, and PhD student Kristian Holgersson for allowing me to work alongside him in his research for his thesis.

## THE EFFECT OF L-(+)-LACTIC ACID ON THE PROLIFERATIVE STATUS OF MURINE CORONARY ARTERY ENDOTHELIAL CELLS AND CARDIAC FIBROBLASTS

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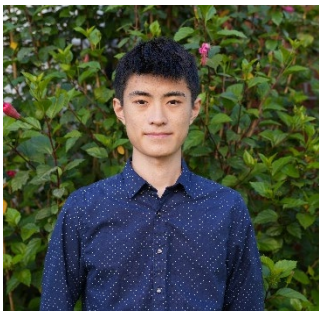
Lactic acidosis is a relatively understudied phenomenon in cancer patients that may play a role in the induction of cardiotoxicity in patients treated with chemoradiation for inoperable stage III non-small cell lung cancer (NSCLC). It is currently unclear whether incremental elevation of tumor-derived serum L-(+)-Lactic Acid levels worsen the prognosis of patients with stage III NSCLC. **We hypothesize that an incremental elevation of L-(+)-lactic acid in the cell culture medium suppresses the proliferation and expression of Ki67 in murine coronary artery endothelial cells and cardiac fibroblasts**. To test this hypothesis, coronary artery endothelial cells were exposed to 0 mM, 1.0 mM, 1.2 mM L-(+)-lactic acid, while cardiac fibroblasts were exposed of 0 mM, 2.4 mM, and 2.6 mM L-(+)-lactic acid. Immunocytochemistry and fluorescence microscopy was performed to assess the expression of Ki67 and the growth fraction 24 hours post L-(+)-lactic acid exposure. One-way ANOVA was used to test for statistical significance between the experimental groups, and the experiment consisted of three independent trials. It was found that even at incremental elevation of L-(+)-lactic acid exposure both cell lines significantly suppressed their expression of Ki67 and showed reduction of their growth fraction despite the presence of well buffered cell culture medium. These results suggest that even a small elevation of serum L-(+)-lactic acid levels may be a contributing factor to the observed cardiotoxicity in patients treated with chemoradiation for inoperable stage III NSCLC.

**EVAN WANG**

UTP PARTICIPANT 2024



I took my first dip of research in 2022 where I was able to volunteer and help researchers in the lab of City of Hope. That is where I saw firsthand the beauty of lab work. During my volunteering at the COH cancer center, I observed that certain cancers occur more often in certain populations, i.e., cancer disparities, and large differences in cancer occurring rates in different ethnic groups. I am so excited that I found the Undergraduate Training Program at Loma Linda University's Center for Health Disparities and Molecular Medicine. I strongly believe that this program would be a great opportunity for me to not only enrich my academic experience but also allow me to understand health and cancer disparities.

I am a second-year Pasadena City College student majoring in biology. I was born in a family where both my parents are biomedical professionals. Growing up in such an environment, I became interested in biomedical sciences in my high school and chose biology as my major in college education. My decision to dedicate myself to the biomedical sciences is deeply rooted in a profound desire to connect with others on a deeply human level, which is more than just a possible future professional pursuit, but an emotional and empathetic exploration of the human experience.

I would like to thank Dr. Casiano for providing me with an opportunity to study more about health disparities, and I would also like to thank Pedro Ochoa for guiding me through the process step-by-step.

**NOVEL INSIGHTS INTO THE CONTRIBUTION OF LEDGF/p75 TO ENZALUTAMIDE RESISTANCE IN PROSTATE CANCER REVEALED BY RNA SEQUENCING**

Evan Wang, Pedro T. Ochoa, Joel Philip, Zhong Chen, Lijuan Song, Charles Wang, Carlos A. Casiano

Center for Health Disparities and Molecular Medicine, Department of Basic Sciences, Loma Linda University School of Medicine, Loma Linda, California, USA

Prostate cancer (PCa) ranks as the second-leading cause of cancer deaths among men in the United States, with African American (AA) men experiencing a higher incidence and mortality rate compared to European American men. Moreover, AA men are more frequently diagnosed with aggressive forms of PCa, which reduces treatment options, particularly as tumors develop resistance to therapies. Unraveling the mechanisms behind PCa therapy resistance is vital for the creation of new therapeutic strategies. Our research has identified a novel mechanism of therapy resistance in PCa involving the upregulation of the Lens Epithelium Derived Growth Factor p75 (LEDGF/p75) by the glucocorticoid receptor (GR). In PCa, GR upregulation can bypass the blockade of the androgen receptor (AR) by inhibitors like enzalutamide (ENZ) and abiraterone. LEDGF/p75 functions as an oncogenic transcription co-activator, enhancing DNA damage repair and promoting cancer cell survival in the face of environmental stressors, including chemotherapeutic agents such as docetaxel (DTX). Recent studies from our group demonstrated that both GR and LEDGF/p75 are part of the same transcription complex and are upregulated in both enzalutamide-resistant (ENZ-R) and DTX-resistant PCa cells. This dual upregulation in distinct therapy resistance contexts suggests an adaptive cross-resistance mechanism used by PCa cells to evade therapeutic pressure. Despite this, the role of LEDGF/p75 in ENZ resistance in PCa remains largely unexplored. We propose that upregulation of LEDGF/p75 contributes to therapy resistance in ENZ-R PCa cell lines. To explore this, we silenced LEDGF/p75 expression via RNA interference in LNCaP-ENZ-R PCa cells, confirmed this silencing by Western blotting, and conducted RNA sequencing (RNA-seq) analysis. Silencing LEDGF/p75 in these cells led to the identification of 155 differentially expressed genes (DEGs). Gene ontology pathway analysis

revealed that LEDGF/p75 is involved in immune, MTOR signaling, and various cellular response pathways. These results will be compared with results from previous RNA-seq studies from our group in DTX-resistant PCa cells to identify common DEGs regulated by LEDGF/p75 in both ENZ- and DTX-resistant cells. Gaining insights into the mechanisms of PCa therapy cross-resistance is critical for identifying potential treatment options and improving therapeutic outcomes for patients with advanced disease.

# Initiative to Maximize Student Development (IMSD)

**SHAWNEE ANGELONI**
IMSD PARTICIPANT 2024

I am finishing my third year at Loma Linda University, working on my PhD in the Biomedical Graduate Studies Program with a focus on infection, immunity, and inflammation. My previous education includes a bachelor's degree in microbiology and master's degree in biology from California State Polytechnic University, Pomona. I have also worked as a teaching associate and instructed microbiology laboratories for several years. In the future, I would like to work in an industrial research laboratory, preferably in the field of microbiology on antibiotic resistance research or in a cross-study of microbiology and cancer focusing on bacterial-cancer interactions. I want to contribute towards a treatment or method for helping individuals with antibiotic resistant infections, or by expanding our current understanding of microbiome-cancer cell interactions. I work in Dr. Ubaldo Soto's lab focusing on bacterial interactions with cancer cells. Throughout my academic career I have focused on experiencing new fields in science, so I can be a well-read and experienced interdisciplinary scientist.

I want to thank Dr. Soto for helping me with my work and helping me learn new techniques in research. Without his support I never would have been able to experience all these wonderful opportunities and discover new interests and goals.

## ESTABLISHING AN *IN VITRO* MODEL OF INTRACELLULAR BACTERIAL INVASION IN THE CONTEXT OF CANCER DEVELOPMENT

Shawnee Angeloni, Ubaldo Soto
Division of Microbiology and Molecular Genetics, Department of Basic Sciences, School of Medicine, Loma Linda University, Loma Linda, CA

Recently, it was reported that bacteria, as part of the microbiome, could play a role in cancer development. Studies have suggested that bacteria are present in very low numbers in normal and "sterile" cancer tissues. In this context, there are several unanswered questions on how mechanistically bacteria can influence cancer development. In our lab we aim to develop and *in vitro* model to study potential mechanisms involved in this process. We are focusing on the bacterial invasion mechanism, changes in gene expression on bacterially invaded cancer cells, and differences in reactive oxygen species (ROS) levels. Since few studies have focused on this avenue of research, our lab is currently creating a model to study this process to better characterize the effects of low intracellular bacterial numbers on cancer development. Our preliminary work shows results comparable with the few published articles in this field, such as being able to maintain small numbers of bacteria per cell. Our protocol involves working with breast cancer cells and incubating/invading them with GFP-transfected *Escherichia coli*. We tested different cell-to-bacteria ratios, 1:10 to 1:100, and different incubation times to see which set of variables is best for our developing model. In parallel, we tested other variables of invasion with several different bacteria and breast cancer cell types. At present we are testing bacterial invasion on normal breast cells and microinjection as an alternative invasion model. This model will help us study the mechanism of cancer development due to bacterial invasion.

## DANIELLE MALIVERT

IMSD PARTICIPANT 2024

Born to Haitian parents Jean Daniel and Esther Malivert, I am the eldest of three children. I, along with my parents, my younger sister, Daina, and my younger brother, Emmanuel, live in Massachusetts. I matriculated through South Lancaster Academy and Oakwood University where I received a Bachelor of Science in Biomedical Sciences.

After I graduated from Oakwood in 2022, I have had the privilege of not only being in the Ph.D. program at Loma Linda University but also being in the IMSD program. I have learned a lot these past two years both in and out of school and lab.

I would like to thank the directors of both programs including Dr. Fletcher, Dr. De Leon, and Dr. Casiano along with Keenan. In addition, I would like to thank my PI, Dr. Pearce, along with my lab members Desirelys Carreon, James Williams, and Jose Garcia who has been with us in Dr. Pearce's lab this summer. I would also like to thank Lorena, Amy, and Lynn along with my classmates and colleagues in the PhD and IMSD programs. It was a great summer, and I look forward to having more experiences as I continue my journey through this program.

## IN NEONATAL CEREBROVASCULAR SMOOTH MUSCLE, mtDNA COPY NUMBER, SDH ABUNDANCE AND OXYGEN CONSUMPTION ARE HIGHLY DEPENDENT ON PO2 AND ARTERY TYPE

Joey Garcia, Danielle Lonie Malivert, Desirelys Carreon, James William, William Pearce
Center for Health Disparities and Molecular Medicine, Perinatal Biology, School of Medicine, Loma Linda University, Loma Linda, CA

Advances in microrespirometry have fueled rapid growth in studies of mitochondrial biology. This study extends those studies to immature cerebrovascular mitochondria, which to date have been unstudied. Given the critical role mitochondria play in structural and functional vascular maturation, this study explores the clinically important idea that hypoxia-induced mitochondrial dysfunction may contribute significantly to multiple types of neonatal cerebrovascular morbidity. Correspondingly, this study focused on the mitochondrial effects of graded hypoxia on mitochondria in neonatal (5-8 day) ovine middle cerebral (MCA) and posterior cerebral (PC) arteries. Through measurements of mtDNA plasmid copy# per cell, hypoxia increased mtDNA copy# per cell between 7% and 30%, and more so in MCA than PC arteries. The relative abundance of Succinate Dehydrogenase A (a subunit of Complex II in the Mitochondrial Electron Transport Chain), increased up to 68% in PC arteries. Hypoxia increased Basal Mitochondrial Oxygen Consumption (OCR) by 33% - 40% in PC arteries, and by 40% to 60% in MCA. Hypoxia enhanced depolarization-induced increases in OCR 78% to 242% in PC arteries, and by 53% to 57% in MCA. Hypoxia also enhanced leak currents by 53% to 167% in PC arteries, and by 12% to 29% in MCA. Preliminary findings that transfection with Pre-miR-210 attenuated the effects of hypoxia on ATP-synthesis coupled OCR in PC arteries, but dramatically enhanced it in MCA suggest that multiple effects of hypoxia on mitochondrial characteristics may be mediated by miR-210. Overall, these results demonstrate that graded hypoxia significantly influences mtDNA plasmid copy# per cell, SDHa mass per mitochondrion, and multiple aspects of mitochondrial respiration in a highly artery-dependent manner.

**BOBBY MENDEZ**

IMSD PARTICIPANT 2024

I started my journey towards research by going to California Baptist University in Riverside, CA. There I double majored in Biomedical Sciences and Psychology with a minor in Medical Anthropology. While at CBU, my interest in research was driven by having to complete a research project as part of my degree. In the summer of 2018, I applied for a research program in conjunction with Loma Linda University's Center for Perinatal Biology. That summer, I began working in the lab of Dr. Arlin Blood, researching how hypoxia affects fetal development. In particular, the lab focuses on fetal physiological adaptations to hypoxia; in particular, cerebral blood flow and heart rate variability.

During my time in the lab, I knew that research is what I wanted to pursue as a career, and I returned to his lab every summer since then, and I have been able to present my projects in posters and oral presentations as well. Now as a PhD student in his lab, I am continuing work on understanding how vagal innervation controls heart rate variability in the fetus and during its transition to newborn.

After completing my PhD, I plan on continuing research on fetal cardiovascular physiology and its adaptations. I also would like to train and mentor students that come from a similar Chicano background as my own so that future generations can have the same opportunities that I have had.

Thank you to Dr. Arlin B. Blood for continuing to mentor me in my career, as we as Dr. Christopher G. Wilson for teaching me and mentoring me along with Dr. Blood.

## ELUCIDATING THE ROLE OF THE VAGUS NERVE IN FETAL HEART RATE VARIABILITY DURING BIRTH TRANSITION

Bobby D. Mendez Padilla, Marlene Lopez, Karina Mayagoytia, Arlin B. Blood, and Christopher G. Wilson

Lawrence D. Longo, MD Center for Perinatal Biology, Center for Health Disparities and Molecular Medicine, School of Medicine, Loma Linda University, Loma Linda, CA

Beat-to-beat variation in heart rate, known as heart rate variability (HRV), results from a constantly fluctuating balance between sympathetic and parasympathetic (PNS) divisions of the autonomic nervous system. PNS drive from the brain to the heart occurs via the vagus nerve, which is intact throughout most of fetal development. Although HRV is used as a marker of fetal well-being during labor, it has not been systematically characterized during the transition from fetus to newborn, when the neonate is particularly prone to hypoxia and cardiovascular stress. **We hypothesized that vagus innervation is critical for HRV adaptation during the birth transition.** After surgical instrumentation for measurement of heart rate, anesthetized near-term fetal lambs were delivered via c-section. Heart rate and beat-to-beat intervals were acquired from arterial blood pressure recordings from the lamb. We then quantified HRV during baseline, c-section, 30 minutes of hypoxia, and recovery. To assess the role of the vagus nerve in controlling HRV, both right and left vagus nerves were removed from some animals at ~100 days gestation (term = 150 days) or just prior to c-section. We compared denervated animals to sham controls. We quantified HRV via specialized software (Kubios HRV Scientific) before and after cord ligation, then before, during, and after hypoxia. Our preliminary results show insignificant difference between denervated and intact groups during birth transition. This suggests that PNS and vagus nerve do not play a significant a role in regulating HRV during birth transition, in contrast to adult mammals. Our sample size is small so we are performing further experiments to assess the role of vagus nerve in fetal autonomic activity.

**PEDRO T. OCHOA**

IMSD PARTICIPANT 2024

As a child I was always intrigued by how things operate which cultivated my passion to learn. I discovered my calling in life until a close family member of mine was diagnosed with cancer. I saw my family member go from a healthy individual to a completely different person. Thanks to the hard work of the medical staff and cancer researchers who strive to provide the best treatment for cancer patients, my family member was able to beat cancer. Although this experience was heart wrenching, it ultimately helped in defining my future.

I attended the University of California, Irvine (UCI) where I obtained a Bachelors degree in Biology and Sociology. During my time at UCI, I was fortunate enough to have an opportunity to perform undergraduate research. It was this experience that reminded me of how crucial research is for identifying new treatments. The combination of my previous experience, thirst for knowledge and, passion for cancer biology drove me to pursue my PhD. I am a fourth year PhD student in the Cancer Developmental, and Regenerative Biology Division in Dr. Carlos Casiano's laboratory. My project aims to further explore the role of the GR-LEDGF/p75 transcriptional network in PCa therapy cross-resistance and identify inhibitors targeting this network as a potential treatment option.

**SILENCING THE DFS70/LEDGFp75 AUTOANTIGEN REVEALS POTENTIAL ROLES IN LYMPHOCYTE FUNCTION**

Pedro T. Ochoa, Evelyn S. Sanchez-Hernandez, Zhong Chen, Issac Kremsky, Charles Wang, Carlos A. Casiano

Center for Health Disparities and Molecular Medicine, Department of Basic Sciences, Loma Linda University School of Medicine, Loma Linda, California, USA

The dense fine speckled (DFS) antinuclear autoantibody (ANA) pattern is used by clinical immunologists as a negative biomarker to aid in the exclusion of a systemic autoimmune rheumatic disease (SARD) diagnosis. This pattern is generated by autoantibodies targeting the DFS70 autoantigen, also known as lens epithelium derived growth factor p75 (LEDGFp75). DFS70/LEDGFp75 is a cellular survival protein that is upregulated in cancer cells exposed to environmental stressors, including cytotoxic drugs, and plays an important role in cellular protection against stress-induced cell death. The N-terminus of DFS70/LEDGFp75 contains a PWWP domain that tethers this complex to active chromatin sites, whereas the C-terminus contains an integrase binding domain (IBD) that serves as the binding site for multiple oncogenic transcription factors, such as JPO2, PogZ, Menin, and MLL, involved in regulating cancer-related gene transcription. This study was designed to gain mechanistic insights on the biological functions of DFS70/LEDGFp75 in docetaxel (DTX) resistant prostate cancer (PCa) cells. We silenced DFS70/LEDGFp75 expression in chemoresistant PCa cells via RNA interference, followed by RNA-sequencing (RNA-seq) analysis. Robust DFS70/LEDGFp75 silencing, confirmed by Western blotting, led to the identification of 970 differentially expressed genes (DEGs). Gene set enrichment analysis (GSEA) analysis revealed a role for this protein in B cell and T cell pathways, and regulation of inflammation-associated genes. Using publicly available RNA-seq data for various immune cells we found supporting evidence of LEDGF/p75 promoting CD4 and CD8 T cell activation. In addition, using public scRNA-seq data, we observed that DFS70/LEDGF/p75 is found in T cell clusters for various cancer types further suggesting immune functions in a broad array of tissues. Knowledge of the role of DFS70/LEDGFp75 in immunity may provide new insights into its biological and tumorigenic functions and the significance of its associated autoantibodies.

**OASIS PEREZ**

IMSD PARTICIPANT 2024

I was born and raised in the Inland Empire and received my bachelor's degree in biology from the University of California, Irvine. Currently, I am a graduate student at LLU in the Cancer, Development, and Regenerative Biology program. My love for science has been influenced by the shadowing and hands-on experience that I have been fortunate to gain through the Loma Linda University ABC and UTP programs and outside opportunities. Now finishing my first year as a graduate student at LLU along with being a part of the IMSD program is a beautiful full circle moment I am immensely grateful for experiencing. My long-term career goal would be to continue within the research field post-doctoral.

During my graduate program I have been honored by being welcomed into Dr. Subburaman Mohan's lab. Our lab focuses on identifying the causes and therapeutic approaches to treat different musculoskeletal diseases including osteoporosis and osteoarthritis.

I would like to thank my loved ones who have supported me through my academic and personal journey. I would like to give a special thanks to the inspirational mentors I was able to be guided and learned under Dr.Mohan and Shelia Pourteymoor for their endless dedication to my academic success.

## ACTIVATION OF THYROID HORMONE RECEPTOR BETA SIGNALING PREVENTS ARTICULAR CARTILAGE LOSS IN HIGH FAT DIET FED AGED FEMALE BUT NOT MALE MICE

Oasis Perez, Bouchra Edderkaoui, Adam Quincey, Sheila Pourteymoor, Subburaman Mohan
Musculoskeletal Disease Center, VA Loma Linda Healthcare System and
CHDMM, Loma Linda University, Loma Linda, CA

Osteoarthritis is a cartilage degenerative condition found within roughly 8% of the world's population. This condition is characterized by tenderness, swelling, and stiffness of joints within the hands, at the knees, and hips. A comorbidity commonly associated with osteoarthritis is type 2 diabetes (T2D). A high-fat diet (HFD) fed C57BL/6J mouse model is commonly used to model T2D pathogenesis and to develop novel therapeutics. Based on the known role of thyroid hormone receptor beta (TRβ) signaling in regulating cholesterol metabolism and chondrocyte differentiation, we evaluated if treatment with a small molecule TRβ agonist is effective in preventing HFD effect on articular cartilage loss in aged mice. 18-month-old C57BL/6J mice were fed a control diet (CD) or HFD for 12 weeks and treated daily with MGL (10 mg/kg) or vehicle. The HFD increased fat mass by 55% in females and 70% in males (both $P<0.01$), which was rescued by MGL treatment. Knee joints were fixed, decalcified in EDTA, embedded in paraffin, sectioned, and stained with Safranin-O for measurement of articular cartilage area, width, and integrity. As expected, HFD treatment significantly ($P<0.001$) induced articular cartilage loss and structure changes in both male (49%) and female (37%) mice compared to corresponding control diet fed mice. Treatment with MGL3196 rescued loss of articular cartilage and its structure in female but not male mice. Based on our data, we conclude that TRβ agonist MGL3196 may offer protection in preventing the negative effects of adiposity on articular cartilage deterioration in aged female mice. The mechanisms for sex-dependent effects of MGL3196 will be investigated in future studies.

**KAYLA SANCHEZ**

IMSD PARTICIPANT 2024

I am a third year PhD student at Loma Linda University in the Neuroscience, Systems Biology, and Bioengineering program. Prior to LLU, I obtained my Bachelor of Science in Biochemistry and Molecular Biology from California Baptist University. After my undergraduate studies, I was privileged to work in home health where I specialized in Alzheimer's and dementia care. The experience not only taught me the importance of patience and kindness, but I was able to discover my passion and curiosity for neuroscience. I am grateful for the opportunity to participate in LLU's IMSD and Students for International Missions programs. These opportunities helped me understand the impact of racial disparities in science and health care. It is my goal to continue the mission through pursuing a career in biomedical research while further mentoring students. I am completing my PhD in the laboratory of Dr. Soriano. The lab is focused on Niemann-Pick disease type C (NPC), while my specific project is researching the link between neurosteroid dysfunction and calcium signaling. My deepest gratitude goes out to my primary advisor, *Dr. Salvador Soriano,* who has provided me with guidance, mentorship, and the space to grow as a scientist. My thanks go out to members of the lab, Andrew Tolan and Jacob White, for their continuous support and encouragement.

**EXPLORING LIPID PEROXIDATION AND FERROPTOSIS IN NIEMANN-PICK DISEASE TYPE C**

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Niemann-Pick Disease Type C (NPC) is a rare pediatric neurodegenerative disorder caused by mutations in the NPC1 or NPC2 genes, leading to premature death. These genetic mutations result in lipid accumulation within late endosome/lysosome compartments, elevated reactive oxygen species (ROS), lipid peroxidation, and eventual cell death. Despite extensive research, the precise mechanisms by which these cellular pathologies drive neurodegeneration remain unclear; there is currently no cure or disease-modifying therapy for NPC.

Although existing therapies have proven ineffective in addressing NPC-related neurodegeneration, recent studies have identified a new regulated cell death pathway known as ferroptosis. Emerging evidence suggests that ferroptosis may play a significant role in the pathological processes of other neurodegenerative diseases, such as Alzheimer's and Parkinson's. Ferroptosis also exhibits features consistent with NPC neurodegeneration, including lipid peroxidation, increased ROS, and inflammation. Enzymes such as superoxide dismutase (SOD) and glutathione peroxidase 4 (GPX4) demonstrate antioxidant activity in targeting lipid peroxidation, potentially mitigating ferroptosis.

Additionally, CMS121, a fatty acid synthase inhibitor, has demonstrated protective qualities against ferroptosis in Alzheimer's disease (AD) mouse models. This may represent a potential therapeutic option for NPC. Based on existing evidence and preliminary data, I hypothesize that the loss of NPC1 function increases vulnerability to ferroptosis through SOD dysfunction, and that CMS121 can reverse NPC cellular pathology.

To test this hypothesis, I will assess the vulnerability to ferroptosis and determine the effectiveness of CMS121 in reversing NPC cellular pathology in primary fibroblasts from patients with NPC1 mutations. This will involve western blot analysis, mass spectrometry, live-cell microscopy, and cell

death assays. This study aims to enhance our understanding of NPC pathology and identify potential therapeutic targets.

**KRYSTAL SANTIAGO**

IMSD PARTICIPANT 2024

I was born in Mayaguez, PR, where my parents taught me that even though success was hard, if I set my mind to it and worked for it, I could achieve it. With this lesson in mind, aiming to obtain academic excellence with the help of God is one of my priorities. Because of this, I have put a lot of effort into becoming the best student I can be. I graduated from the University of Puerto Rico with a BS in Industrial Microbiology and I am now part of the IMSD program as a fourth-year student, where I will further my education by earning a PhD. I learned to play the flute and I also trained my voice which allowed me to be the recipient of different scholarships throughout my undergraduate studies. After Puerto Rico suffered from hurricane Maria, my friends and I helped rebuild houses and feed the homeless. In order to be a force for positive change, I selected Dr. Casiano and Dr. Almaguel, experts in health disparities, to be my co-advisors. This way I could focus my research on diseases that affect underrepresented communities. For my research, I am studying the role of Enolase, a cytoplasmic enzyme, and its effect on the proliferation, migration, invasion and metastasis of Prostate Cancer.

**SURFACE LOCALIZATION OF ENOLASE-1 (ENO-1) AS AN ATTRACTIVE THERANOSTIC TARGET IN DOCETAXEL-RESISTANT NEUROENDOCRINE-LIKE PROSTATE CANCER CELLS**

Krystal Santiago, Alfonso Duran, Kristen Whitley, Carlos A. Casiano, Frankis Almaguel
Center for Health Disparities and Molecular Medicine, School of Medicine, Cancer Center, Loma Linda University, Loma Linda, CA

Prostate cancer (PCa) is American men's second most common cancer. Although taxane-based chemotherapy is the last line of defense for advanced PCa, it invariably fails due to chemoresistance. The protein-specific membrane antigen (PSMA) has been an effective target for the imaging and therapy of advanced PCa. Although PSMA radioligand therapy (PSMA-RLT) is a theranostics option for men with advanced PCa, about 30% have a limited response due to neuroendocrine-like PCa (NEPC), which lacks PSMA expression. Enolase (ENO) is a promising theranostic alternative due to its cell surface localization in many human tumors. We observed that chemosensitive PCa cell lines expressing NEPC markers express both ENO-1 and ENO-2; however, docetaxel-resistant NEPC-like cells only express ENO-1 and have a metabolic vulnerability due to the loss of ENO-2. We hypothesize that ENO-1 is expressed on the surface of NEPC-like cell lines and can be targeted with small molecule inhibitors (SMIs) that could potentially be used as theranostics agents. Additionally, we have observed changes in the expression and localization of ENO-1 in NEPC-like cell lines under different glucose concentrations. Our data show that under high glucose conditions, found on metabolically active metastatic tumors, ENO-1 is highly expressed on the cell surface, making it a promising candidate target for theranostics. However, low glucose conditions inhibit the activity of the c-MYC oncogene resulting in ENO-1 downregulation and upregulation of MBP1, the small splice variant of ENO1 that blocks the transcriptional activity of c-MYC. Our efforts to confirm ENO-1 surface expression on NEPC-like cell lines entailed using confocal microscopy, cell fractionation analysis followed by Western blotting, and Flow cytometric cell surface staining. We also evaluated the cytotoxicity of SMIs designed to target ENO-1 in chemoresistant NEPC-like cell lines using MTT viability assays, clonogenic assays, and Hoffman Modulation microscopy imaging. Our long-term goal is to identify an alternative treatment for patients with NEPC by establishing ENO-1 as a novel theranostics target.

**JULIO SIERRA**

IMSD PARTICIPANT 2024

My parents immigrated from Mexico looking for opportunities to better their lives, and consequently, my life. As they struggled to acculturate, they instilled in me the importance of education and hard work so that I could successfully overcome the barriers they faced. I enjoy learning, problem-solving, and challenging myself, which motivated me to pursue undergraduate studies in biomedical engineering. During that time, I gained experience developing systems for use in research.

I am a second-year Ph.D. student in the Neuroscience, Systems Biology, and Bioengineering program at Loma Linda University School of Medicine. As a first-generation college student, I understand the difficulties of navigating post-secondary education without a support system. Being involved with the IMSD program in the Center for Health Disparities and Molecular Medicine provides a sense of community and allows me to play a role in mentoring and encouraging students to pursue higher education.

I am grateful for the mentorship and support of my PI, Dr. Johnny Figueroa, my peer mentor, Timothy Simon, and many others for helping me develop as a neuroscientist. I expect to continue contributing to the field by investigating the impact of environmental factors, such as high-fat diet consumption, on neurobiological pathways that confer resiliency to stressors during adolescence. I am excited to continue our research, driving the field forward, and helping to address a significant health disparities issue.

## ADOLESCENT HIGH-FAT DIET CONSUMPTION IMPACTS STRESS RESPONSIVITY IN ADULT MALE RATS

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Center for Health Disparities and Molecular Medicine, Department of Basic Sciences,
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Childhood obesity is a multifactorial disease affecting more than 160 million adolescents worldwide. Early-life exposure to obesogenic environments, characterized by access to high-fat diets and stress, can precipitate maladaptive eating habits in adulthood. Evidence suggests a strong association between high-fat food consumption and dysregulated hormone fluctuations, particularly cortisol and testosterone. However, there is a significant gap in understanding how obesogenic environments affect hormone fluctuations during adolescence and influence stress responses in adulthood. This longitudinal study aimed to elucidate the impact of early Western-like high-fat diet (WD) consumption on stress resiliency in male rats. **We hypothesize that adolescent exposure to an obesogenic diet increases susceptibility to psychosocial stressors and enhances binge-like eating behaviors**. Adolescent rats were given a WD (41% fat; n=52) or an ingredient-matched control diet (CD, 16% fat; n=44) for 4 weeks before undergoing a stress paradigm of predator exposure and social instability (CDE, WDE, CDU, WDU; n=16-20/group). Following the stress challenge, all groups were provided intermittent WD access (24 h/week) to evaluate binge eating–like behavior. Food consumption was recorded weekly. Fecal corticosterone and testosterone were measured at critical timepoints throughout development. Our results show that WD consumption resulted in elevated testosterone levels ($p=0.0312$) in mid-adolescence, suggesting early pubertal onset. Acute stress exposure in late adolescence promoted corticosterone release and decreased food intake compared to unexposed counterparts. However, WD intake blunted the stress-induced response (CDE:WDE, $p=0.028$). WD groups exhibited decreased testosterone compared to controls in adulthood. These results demonstrate that exposure to obesogenic factors in adolescence disrupts hormone fluctuations

and stress responsivity, with effects persisting into adulthood. This underscores the importance of addressing obesogenic environments early to mitigate their lasting impact on hormone regulation, stress responsiveness, and mental health.

**TIMOTHY SIMON**

IMSD PARTICIPANT 2024

I am a fourth-year Neuroscience Ph.D. student here at Loma Linda University (LLU). My research focuses on the effects of psychosocial stress and diet on adolescent neurodevelopment and why some individuals tend to be more resilient or vulnerable to stress-induced eating behaviors. I am particularly fascinated by pyschoneuroimmunological mechanisms behind learning and memory, psychiatric disorders, and obesity. Additionally, I am exceedingly interested in applying my newfound knowledge to enhance ethnic diversity in my scientific environment.

My love and passion for biomedical research has vastly increased during my time at LLU. As I engage in some of Neuroscience's biggest questions, I am continually amazed at how much more there is to learn. Every discovery and scientific discussion with my peers propels my curiosity forward, launching me into a world in need of further exploration.

Currently, my plan is to complete my Neuroscience Ph.D. in 2025 and then transition to a postdoctoral fellowship position enabling me to pursue high-caliber research while refining my teaching skills. My mentor, Dr. Johnny Figueroa, has inspired me to do all things with excellence while eagerly sprinting toward my goals.

Apart from research, I greatly enjoy time with family and friends, reading, and finding new breakfast spots. Ultimately, I plan on becoming a research professor where I can mentor students while delving into rigorous scientific research.

## NATURALISTIC HOMECAGE BEHAVIORS PREDICT MALADAPTIVE BINGE-EATING INDUCED BY EARLY SOCIAL ISOLATION STRESS IN FEMALE RATS

Timothy Simon, Julio Sierra, Arianna Williams, Giara Wright, Allison Rhee, Julius Horn, Perla Ontiveros-Angel, Johnny D. Figueroa

Center for Health Disparities and Molecular Medicine,
School of Medicine, Loma Linda University, Loma Linda, CA

Binge eating (BE) is a highly prevalent maladaptive coping strategy in response to severe early-life social stress. BE is described as repeated episodes of uncontrolled eating and is tightly linked with comorbid mental health disorders. Interestingly, BE usually begins in adulthood, several years after early-life stress, creating an opportunity for potential therapeutic intervention. However, there is insufficient knowledge on the impact of early-life social stress on longitudinal behavioral shifts, which may provide insights into adult coping strategies and predict BE. The study involves both long-term monitoring and longitudinal behavioral analysis to assess the effects of early social stress over an extended period and track changes over time. Adolescent female rats, Socially Isolated (SI; n=12) and Paired (n=12), were placed in the PhenoTyper Homecage Monitoring System weekly for seven weeks to measure the effect of SI on naturalistic behaviors. Behaviors were tracked using innovative automated recognition software and composite phenotypic z-scores were calculated by standardizing each behavioral output. When transitioning into adulthood, all animals underwent emotionality testing and then were exposed to a Western-like high fat diet (WD, 41% kcal from fat) to promote BE. Longitudinal assessments revealed SI-induced deviations in phenotypic z-scores and shifts in naturalistic behaviors as early as week 2. Twitching was highly correlated with WD consumption in SI (p=0.020, r=0.657), but not Paired (p=0.405, r=0.265), animals. Additionally, twitching and jumping showed significant correlation with blunted corticosterone responsivity (T: p=0.023, r=-0.463; J: p=0.050 r=-0.404) and elevated emotionality (J: p=0.015, r=0.492) in SI animals. This study identified

novel approaches to simultaneously track naturalistic behaviors, detect early behavioral deficits, and predict maladaptive eating habits induced by social stress in rats.

**FRANCIS ZAMORA**

IMSD PARTICIPANT 2024

Previous to coming to Loma Linda University, I attained my Masters in Anatomy & Neurobiology from Boston University, where I discovered my curiosity for the neuroscience field. I yearned for the opportunity to continue developing a thorough understanding of the nervous system and to develop the skills needed to make my own inquires, investigate biomedical questions, and contribute to closing the gaps in knowledge in the scientific literature. I am grateful to be part of the IMSD program, as it has provided me with the resources and tools to earn my PhD and fulfill my dream of becoming a neuroscientist. This fall, I will be a fourth-year PhD student in Dr. Marino De León's laboratory. My topic of research focuses on investigating the neuroprotective mechanisms of docosahexaenoic acid (DHA) in Schwann cells during lipotoxicity, which has implications for treating nerve injury and neuropathic pain. I am thankful for Dr. De León and Dr. Jo-wen Liu for their mentorship and guidance as I continue my academic journey.

**THE ROLE OF AUTOPHAGY AND FABP5 DURING PALMITIC ACID-INDUCED LIPOTOXICITY**

Francis Zamora, Jo-wen Liu, Viet Hoang Dinh and Marino De León
Center for Health Disparities and Molecular Medicine and Department of Basic Sciences, Loma Linda University School of Medicine, Loma Linda, CA

Palmitic acid-induced lipotoxicity (PA-LTx) is implicated in neuropathic pain due to its detrimental effects on nerve cells. Previously we reported that in Schwann cells (SCs), PA-LTx induces ER stress and ER calcium depletion, mitochondrial membrane depolarization, and apoptosis. Co-treatment of immortalized SCs (iSCs) with calcium chelator BAPTA-AM or docosahexaenoic acid (DHA) reverses PA-LTx effects. Because autophagy dysregulation is observed in neuropathic pain, this study aims to investigate the role of autophagy during PA-LTx in iSCs. Here, iSCs were treated with 300μM PA: 150μM BSA for 24 or 48 hours to induce LTx. iSCs were also co-treated with 50μM DHA to inhibit LTx or Chloroquine (CQ) to inhibit autophagic flux. Protein levels of autophagy marker LC3-II, autophagic flux marker p62/SQSTM1, and fatty acid binding protein 5 (FABP5) were assessed using Western blot. Real-time qPCR measured FABP5 mRNA expression, and a WST-1 assay evaluated cell viability. Consistent with previous findings, PA treatment decreased cell viability, while co-treatment with DHA fully protected against PA-LTx. CQ did not affect cell viability; however, PA+CQ exacerbated PA-LTx-effects. CQ, slightly reduced DHA's neuroprotection at 24 hours, however significantly reduced it by 48 hours, suggesting the importance of autophagic clearance. At 3HR, PA increased LC3-II but decreased p62 levels, suggesting initial autophagy induction. At 12+HRs, PA elevated both LC3-II and p62, indicating autophagy flux impairment. DHA co-treatment normalized LC3-II and p62 levels by 24 HR. Lastly, PA and CQ significantly upregulated FABP5 expression, supporting a link between FABP5 and autophagy flux. These findings suggest PA-LTx initially induces autophagy as a cell-survival response and its inhibition may exacerbate apoptotic cell death. Further, DHA protection from PA-LTx may include promoting a normal autophagic flux.

# Summer Undergraduate Research Fellowship (SURF)

**RYAM ABDULHASAN**

SURF PARTICIPANT 2024

Growing up, I have always been determined and ambitious in my decisions and aspirations. I was set on becoming a doctor one day in the future since a young age and I progressed in my journey centered around this one goal.

My family moved to the United States from my home country, Iraq, when I was in seventh grade. Despite the challenges this change in environment presented, I was determined to not let it be a setback for my personal goals and took every opportunity to learn and grow as a person.

I was in the top 5% of the graduating class of 2023 from Great Oak High School in Temecula, California and have just now completed my first year of college at Mt. San Jacinto College. Throughout high school, I was highly focused on my academics and fueling my various passions. As a member of the National Honors Society, California Scholarship Federation, and both the Science and Math National Honors Societies, as well as maintaining a few leadership positions in Science Olympiad and building my own Science Tutoring Program, I was able to give back to my supportive community while being engaged in clubs and programs that I valued. Now, as an incoming junior at the University of California, Riverside, I aspire to maintain my determination and focus on my goal of becoming a physician and actively engage in medical research.

I would like to thank Dr. Patil, Dr. Perry, and Mr. Cedric on mentoring me during my time here at Loma Linda University as a participant in the SURF program as I am sure it will be a memorable learning opportunity and valuable to my academic career.

## THE SYNTHESIS AND CHARACTERIZATION OF GOLD NANOSTARS FOR RADIOSENSITIZATION OF MALIGNANT GLIOMAS

Ryam Abdulhasan*, Kelechi Amobi, Raynon M. Andrews, Cedric Lansangan, M.S., Serge Rudensky, M.D., Menka Khoobchandani, Ph.D., Christopher Perry, Ph.D., and Rameshwar Patil, Ph.D.
Department of Basic Sciences, Division of Cancer Sciences, Division of Biochemistry, Loma Linda University School of Medicine, Loma Linda, CA

Glioblastoma Multiform (GBM) is the most aggressive and lethal brain tumor. GBM is characterized by rapid growth, invasive behavior, and resistance to conventional therapies. Radiotherapy is an essential component of the standard of care for GBM, but it is limited by the tumor's intrinsic resistance mechanisms and the risk of damaging surrounding healthy brain tissue. Radiosensitization, by increasing radiation dose deposition and reactive oxygen species levels, enhances radiotherapy.

Gold nanostars (GNSs) have emerged as a promising tool for radiosensitization, overcoming the challenges presented when treating GBM through their unique physiochemical properties. This work focuses on the synthesis and optimization of GNSs to maximize their therapeutic benefits for radiosensitization. The synthesis of GNSs involves two distinct stages. First, gold seeds are made, followed by a controlled growth stage where the GNSs' spikes extend from a central core. These GNSs have higher surface area-to-volume ratios than equivalent-volume nanospheres. GNSs synthesis was optimized by adjusting gold seeds, growth solution gold (III) salt, and surface coating ligand concentrations.

The novel GNSs were synthesized and characterized by UV-Vis spectroscopy and Atomic Force Microscopy (AFM). UV-vis provides detailed insight into the stability, concentration, and size of the GNSs by measuring their absorbance of a passing light beam. UV-Vis of 2-mercaptobenzothiazole (2-MBT) treated GNSs enabled approximation of their surface gold concentration. AFM was performed to determine the diameter of the GNSs. Overall, the characterization of the synthesized particles provided us with a greater understanding of the interdependence of various components involved in the synthesis of the GNSs.

**AIDAN LU**

SURF PARTICIPANT 2024

## ANEMONE BK CHANNEL ALTERNATIVE EXONS DISPLAY PROTEIN KINASE A "HOTSPOTS"

Amiya Richberg, Aidan Lu, and David Hessinger
Center for Health Disparities and Molecular Medicine, Division of Physiology,
Dept. of Basic Sciences, School of Medicine, Loma Linda University, Loma Linda, CA

BK channels are calcium-activated, voltage-gated potassium channels that conduct large potassium (K+) currents across cell membranes. We've recently shown that BK channels in sea anemones localize to vibration-sensitive nematocytes and are involved in triggering discharge of their nematocysts to sting target organisms (Lu et al., 2023). Stimulated surface chemoreceptors associated with such nematocytes activate cAMP-dependent protein kinase (PKA) to frequency-tune vibrations sensors to match prey swimming movements (Watson and Hessinger, 1989). In non-mammalian vertebrates, Splice variants of BK channels frequency-tune hearing in vertebrates (Pyott and Duncan, 2016; Tang et al., 2024), and we've recently shown that anemone BK channels also undergo splice variation (unpublished). We now hypothesize that anemone BK channel splice variants will exhibit a high density of PKA phosphorylation motifs within expressed alternative exons. To test this hypothesis, we bioinformatically examined BK splice variants exons to determine their PKA phosphorylation sites and PKA motif densities. We find that PKA motifs are expressed at higher density and diversity within alternative exons than in neighboring constitutive regions of BK channels. Furthermore, splice variation of BK channels is greater among actinian cnidarians (i.e. sea anemones) than hard corals, and not at all among other cnidarian clades. This trend supports the view that PKA "hotspots" inserted into BK channel alternative splice sites modulate BK channel activity through involvement in frequency-tuning nematocytes. Moreover, our findings imply that vibration-sensitive nematocytes may be restricted to anthozoan cnidarians.

**ASHLEY PAIK**

SURF PARTICIPANT 2024

This summer has been a transitional point in my life. Previously, I had only been a passive participant in the world of science, listening to and absorbing information. Currently, I am now taking my first steps into actively contributing some knowledge into this field. The SURF program has helped me to grow my interest in research, stemming from a research class in high school, and has integrated it into my interest in biology. This program has introduced me to new concepts and has taught me to view issues from various viewpoints, challenging me to tackle them in innovative ways.

I attend Southern Adventist University in Collegedale, Tennessee. I am a rising junior. I am grateful for this program in providing me with a hands-on, active approach in the sciences and I hope that this will carry on into my future classes.

Thank you to Dr. Christian Hurtz's lab for their patience in guiding me through various laboratory techniques and for giving me an in depth glimpse into cellular and molecular biology.

## SMARCA4'S ROLE IN ACUTE LYMPHOBLASTIC LEUKEMIA (ALL)

V. S. S. Abhinav Ayyadevara, Ashley Paik, Ria Perencsik, Christian Hurtz[1]

Division of Cancer Sciences, Loma Linda University, Loma Linda, CA

**Background:** SMARCA4 is part of the SWI/SNF chromatin-remodeling complex, crucial for regulating gene expression by altering chromatin structure. Reports show that SMARCA4 is an essential gene for early B cell development. However, SMARCA4 has not been studied in B cell-derived acute lymphoblastic leukemia (ALL), the most common childhood cancer. While overall survival rates for children with good- and intermediate-risk ALL are nearly 90%, high-risk subtypes like KMT2A-Rearranged (KMT2A-R) and Philadelphia-like (Ph-like) have much lower survival rates, necessitating novel therapeutic strategies.

**Results:** Gene expression analysis of B cells at different developmental stages demonstrates that SMARCA4 is specifically upregulated during early B cell development. A direct comparison of human pre-B cells, B-ALL, CD34+, and T-ALL shows that pre-B cells and B-ALL cells have the highest expression levels of SMARCA4. To test if ALL cells are dependent on SMARCA4, we performed an analysis using the DepMAP portal and found that B-ALL is the hematopoietic cell type that is most dependent on SMARCA4. Comparing the SMARCA4 expression levels between Ph-like and KMT2A-R ALL, we found that Ph-like ALL has significantly higher expression levels. Survival analysis of 207 children with ALL from the COG trial P9906 shows that poor clinical outcome correlates with higher expression levels of SMARCA4 in Ph-like ALL, contrary to KMT2A-R ALL, suggesting a potential benefit for Ph-like ALL patients from a SMARCSA4 inhibitor-based therapy. Testing multiple Ph-like and KMT2A-R ALL cell lines with two SMARCA4 inhibitors (BRM014 and FHD-286) revealed that Ph-like ALL cells are highly sensitive to SMARCA4 inhibition, while KMT2A-R ALL cells showed minimal sensitivity.

**Conclusion:** Ph-like ALL cells are highly dependent on SMARCA4, and a SMARCA4 inhibitor-based therapy may be beneficial for patients with Ph-like ALL, but not for those with KMT2A-R ALL.

**RIA PERENCSIK**

SURF PARTICIPANT 2024

As a rising junior at the University of British Columbia majoring in Microbiology and Immunology, my ultimate career goal is to pursue an MD/PhD so that I can tackle complex medical problems from multiple angles. Research has always intrigued me for the relentless curiosity it fosters. The iterative nature of research— where new findings often prompt additional questions— aligns with my natural inclination towards problem-solving and discovery.

This summer, I had the privilege of working in Dr. Christian Hurtz's lab alongside my mentor, V.S.S. Abhinav Ayyadevara, and my partner, Ashley Paik. Together, we explored the role of SMARCA4 in acute lymphoblastic leukemia (ALL). The commitment and expertise of everyone at LLUH, from undergraduate/PhD students to lab staff, were deeply inspiring. There was always someone willing to provide guidance or lend support. I hope to carry forward this collaborative and supportive spirit as I continue my education and advance in my career. The SURF program has enriched my summer in ways I hadn't anticipated, and I am excited to continue my journey in the world of research and medicine.

## SMARCA4'S ROLE IN ACUTE LYMPHOBLASTIC LEUKEMIA (ALL)

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**Conclusion:** Ph-like ALL cells are highly dependent on SMARCA4, and a SMARCA4 inhibitor-based therapy may be beneficial for patients with Ph-like ALL, but not for those with KMT2A-R ALL.

# Behavioral Health Research Training Program

**KAITLYN ANDERSON**
BEHAVIORAL HEALTH PARTICIPANT 2024

My long-term goal is to serve under-resourced populations as a researcher, clinician, and partner in the work of healing and recovery from mental health issues. Participating in this program illuminated the profound scope and impact that research can have in behavioral and public health, helping solidify my decision to pursue a PhD in the future. My research interests include substance abuse and mental health, critical psychology, and access barriers in behavioral health equity.

I received my BA in English Literature from the University of California, Berkeley. This fall, I will be a second-year Master of Social Work student at Loma Linda University. I will complete my upcoming internship at the LLUH Behavioral Medicine Center in the Substance Use and Recovery Unit, and I currently serve as an officer in LLU's Phi Alpha chapter, the national social work honor society. Before commencing my graduate studies, I worked abroad as an English teacher in China, an advocate for disability rights in the non-profit legal sector, and a housing case manager at a non-profit agency.

I want to thank Dr. Susanne Montgomery for this opportunity to participate in the summer training program from Health Disparities and Molecular Medicine, and the research team that conducted our training. Thank you to my project mentor Samuel Habimana for his mentorship which facilitated research into the resilience and healing capacities of Rwandans after the genocide. I am also grateful to Dr. Kelly Baek for serving as my research mentor in my current program of study.

## IF YOU TREAT YOUR ANGER, WHAT HAPPENS TO FORGIVENESS? DYNAMICS OF HEALING TOGETHER FROM OPPOSING SIDES OF GENOCIDAL CONFLICT

Kaitlin Anderson, Samuel Habimana, Susanne Montgomery
School of Behavioral Health, Loma Linda University, Loma Linda, CA

After the genocide in Rwanda, research indicates a more frequent presence of persistent mental health problems from genocide survivors and perpetrators compared to the general Rwandan population. The Community Resiliency Model (CRM) is a biologically based, evidence-based mindfulness intervention designed to help reset the body's nervous system response to traumatic events such as genocide. Delivered in a group setting, individuals learn CRM skills with support from peers who practice and reinforce these skills. This research aimed to evaluate the association between anger and forgiveness when delivered as separate and combined groups of genocide survivors and perpetrators. The study explored if CRM outcomes differ based on group composition/delivery modality, seeking an answer to the question: How does group composition impact the association between anger and forgiveness among participants? We implemented a three point-in-time (pre, post, 6-months post) survey including, validated measures of anger and forgiveness who participated in a CRM intervention in groups of only genocide survivors, only perpetrators, and a combined group of both. We used time series regression and paired ANOVA analyses to determine how group composition impacts the association/correlation between anger and forgiveness over time. The results show a significant decrease in anger and a significant increase in forgiveness in all groups, showing that CRM is effective in enhancing forgiveness and decreasing anger in people from opposing sides of genocidal conflict. Moreover, the results demonstrate no significant difference between anger and forgiveness based on group composition suggesting that delivery modality did not affect effectiveness for these measures. CRM could be used as a catalyst for forgiveness and living together in a society that has experienced communal conflict, such as genocide.

**JOANNA FERNANDEZ FUENTES**

BEHAVIORAL HEALTH PARTICIPANT 2024

I have always treasured my Mexican culture. We are outspoken, love to share delicious food, and find any excuse to come together. Community is an important aspect of Mexican culture and thankfully, California's diversity has prevented me from feeling like an outcast. And yet, we, among many other minority groups, are still overlooked as patients in the medical field due to the lack of representation within healthcare providers. This summer, I was introduced to the process of research and data analysis and subsequently began to use these skills to learn about the beauty of a patient's person and the tragedy of how they feel seen by healthcare providers.

I attended San Jose State University, where I obtained a bachelor's degree in chemistry and dominated in the NCAA Division 1 soccer field. Since graduating, I have worked in the immigration advocacy space and as a Health Scholar, providing basic care to underrepresented patients at Riverside Community Hospital. The Inland Empire is my home, my community, and a place that opened its arms to me since arriving in the United States. My goal is to return this support as a physician, so patients can feel seen, heard, and cared for.

I would like to thank Dr. Susanne Montgomery for giving me the opportunity to learn the foundations of conducting research to address the needs of our community. A special thanks to Dr. Christopher Montgomery, who inspires me to put my best foot forward, even when I felt I did not belong.

**BEAUTIFUL TRAGEDIES: A QUALITATIVE STUDY OF A PATIENT'S PERSON AND HOW THEY FEEL SEEN BY HEALTHCARE PROVIDERS**

Joanna Fernandez, Christopher Montgomery, Susanne Montgomery
School of Behavioral Health, Loma Linda University, Loma Linda, CA

A primary care doctor is typically allotted a fifteen-minute time slot per patient during their appointment. Attempting to see as many patients as possible, a standardized care system has come into being that is very effective at documentation, diagnosing, and treating disease, but leaves little room to take care of the person behind the computer screen. To explore how patients see themselves, their "person", versus how, based on their experiences in healthcare, they feel seen by their medical care providers as patients, we studied the lived experiences of 38 patients at six healthcare facilities within the New York City Health and Hospitals system. Semi-structured qualitative interviews were conducted using a key informant guide. Patients who fit study criteria were chosen by hospital staff. Data was analyzed using iterative thematic analysis. Out of 38 participants, only 2 patients felt that the way they see themselves is how they feel seen by their healthcare providers. Through our analysis, we identified the following themes describing what participants deemed their "person": personality-traits, passions, relationships, and professional and educational achievements. When discussing how they feel seen by their health care provider, core themes included: diagnoses, reactions to diagnoses/treatment, and demographics/appearances. There was a consistent difference between how patients described themselves as a "person" and how they felt seen as "patients". It was beautifully tragic to analyze this data. Beautiful to see the unique individuality of every person interviewed, and tragic to see their experience as a patient. Recognizing the unique and subtle nuances of each patient is not only subjectively comforting to them, rather, it is objectively necessary to provide effective care. We will describe these mismatches and propose how a systematic approach could help address this chasm and improve patient care.

**CRISTIE GRANILLO**
BEHAVIORAL HEALTH PARTICIPANT 2024

My initial acceptance to UC Santa Barbara gave me a thirst for learning and led me to pursue degrees in education, counseling, and currently my doctorate in social welfare and social research. As a first-generation to college, Latina, my experiences have fueled a passion to integrate community perspectives into research by amplifying their voices to address health and educational disparities.

My research, past and present, has focused on equity issues that include inmate firefighters, first generation college students, diversity, equity and inclusions, and health and educational equity. Currently, my research focus is on chronic absenteeism among Latinx elementary students, exploring parent perspectives and barriers to school attendance. In my role as Manager of the Community Health and Education Worker Program, I apply my research by overseeing home visits for students facing attendance obstacles and collaborating with CHEWs to remove barriers and reengage families with their school communities. This allows me to partner with school districts to develop innovative practices that continue to uplift and support the local community in San Bernardino.

## A NEW ERA, UNPACKING CHRONIC ABSENTEEISM FROM A SCHOOL PERSONNEL PERSPECTIVE: A QUALITATIVE STUDY

Cristie Granillo, Nishita Matangi, Beatriz Gonzalez, Lynn Raine, Susanne Montgomery
School of Behavioral Health, Loma Linda University, Loma Linda, CA

Students missing from school has doubled since the COVID-19 pandemic. Students from racially and ethnically diverse and low-income communities are overrepresented in the population of students who are missing 18 or more days of school in a calendar year, classified as chronically absent. While there are multiple reasons for this, for Latinx students specifically, additional barriers emerge due to language, immigration status and lack of cultural understanding. It is critical to understand barriers that prevent students from attending school as they impact academic outcomes that lead to disengagement from school, and loss of foundational skills to advance through the k-12 system. Exploring the factors that contribute to missed school for Latinx elementary students can provide tailored understanding of barriers and facilitators for attendance behaviors. The aim of this study is to provide a qualitative perspective from school personnel on the status of chronic absenteeism for elementary students. Ten key informant interviews were conducted using semi-structured interview guides with a school principal, teacher, school counselor, student attendance review board specialist, parent advisory leaders and community liaisons. Transcripts were analyzed with two coders independently using thematic analysis. Results revealed that these students encounter barriers and facilitators to school attendance relating to communication, relationships, and accessibility in the school, home, and community environment. The significance of parent/guardian involvement in their child's education is emphasized to assure regular school attendance. This body of work highlights that for Latinx elementary students, parents/guardians, as well as teachers and school site support are integral for the student to not only attend school, but to feel like they belong to a caring community that is invested in their future.

**SAMUEL HABIMANA**

BEHAVIORAL HEALTH PARTICIPANT 2024

Being the first person from my village to attend graduate school has given me a significant mission to serve as a role model and make a positive impact in my community. This summer program has affirmed that I am pursuing the field I enjoy most: academia. It has also prepared me for the future I envision.

I earned both my bachelor's degree in clinical psychology and my master's degree in public health from the University of Rwanda. Currently, I am a PhD candidate at Loma Linda University, School of Behavioral Health, Class of 2025. I am also the Founder and Executive Director of the Rwanda Resilience and Grounding organization (RRGO) in Rwanda. Besides, I am a research assistant in the Interdisciplinary Studies at Loma Linda University and a Community Resiliency Model (CRM) teacher, and a member of the SBH CRM Professional Presentation and Publication Research Lab. Under the supervision of Professor Susanne Montgomery, I am conducting research on psychosocial issues in Rwanda, specifically focusing on the role of the Community Resiliency Model among genocide survivors and perpetrators.

I would like to express my profound gratitude to my supervisor, Professor Susanne Montgomery, and my committee members, Dr. Lister Zephon and Dr. Kimberley Freeman, who have mentored me from the very beginning. Their guidance and the opportunity to participate in the summer program on Health Disparities and Molecular Medicine have been invaluable.

## THE PREDICTABILITY AND CHANGING OVER TIME OF PSYCHOSOCIAL PROBLEMS: COMMUNITY RESILIENCY MODEL INTERVENTION ON GENOCIDE SURVIVORS AND PERPETRATORS IN RWANDA

Samuel Habimana, Emmanuel Biracyaza, Zephon Lister, Kimberly Freeman, Susanne Montgomery
School of Behavioral Health, Loma Linda University, Loma Linda, CA; School of Medicine, Université de Montréal, Quebec, Montréal; Rwanda Resilience and Grounding Organization (RRGO), Kigali, Rwanda

Thirty years post the 1994 Rwandan genocide, survivors, perpetrators, and their families continue to grapple with the lingering effects of trauma. Despite existing programs aimed at promoting reconciliation and mental health, further research to identify effective interventions to address persistent trauma and explore viable solutions for co-living, in a country where survivors and their perpetrators that were recently released from 25+ year prison sentences, often live as neighbors. This longitudinal study examines the impact of the Community Resiliency Model (CRM) intervention on both survivors and perpetrators. To evaluate the effectiveness of CRM we assessed long-term psychosocial outcomes among genocide survivors and perpetrators using a sequential-mixed methods approach for data collection and analysis. Qualitative interviews with survivors (n=5), local authorities (n=5), and perpetrators (n=5) were conducted using a semi-structured key informant outline. Additionally, three focus groups (n=18) were held, comprising genocide survivors, perpetrators, and a combined group of both. A survey was also administered to 152 participants (76 survivors, 76 perpetrators), evaluating demographics, mental health, and social-related variables at three different times (pre, immediate post, and six-month post evaluation). The findings indicate a significant reduction in mental health issues (depression and PTSD) over time for both groups, alongside an increase in social cohesion and compassion following the CRM intervention. Qualitative data speaks to the cultural fit, acceptability, scalability (delivery by trained lay persons), and transferability of CRM. Since CRM has proven effective in fostering community reunification and addressing mental health problems and was well received, CRM should be considered for broader

application in other communities affected by similar traumatic events and related mental health challenges.

## DAVID LISTER

BEHAVIORAL HEALTH PARTICIPANT 2024

I am a recent graduate of Escondido Adventist Academy. I was elected class president for my sophomore and junior year and was part of National Honor Society (NHS) during my senior year. My hobbies include playing sports including flag football, basketball, and volleyball, as well as music, such as playing the piano, drums and singing. I also enjoy outreach activities and regularly volunteer at food distribution and homeless outreach programs. I have also participated in mission trips to Nigeria and Hawaii.

Research, particularly clinical research, has always fascinated me. I enjoy exploring how change happens and seeing the practical difference research can make in people's lives. For as long as I can remember, I was always curious about the lives of people and their struggles. Having an empathetic and caring nature has been my motivation for finding ways to support those in need. I plan to use the research skills gained this summer to guide my practice in clinical settings.

The CHDMM program has been an amazing experience, and the lessons that I have learned during this time will be of great value as I begin my freshman year at Oakwood University to pursue a degree in psychology. I would like to thank Dr. Susanne Montgomery, my mentor, Dr. Zephon Lister, and the rest of the team for the valuable information they have provided and for inspiring me to give my all in the hope of achieving my dream of becoming a clinical psychologist.

### UNDERSTANDING NEEDS OF HEALTH WORKERS TO SUPPORT VACCINE UPTAKE WITHIN HEALTHCARE AND COMMUNITY CONTEXTS

David Lister, Peter Abdulrahman Turay, Florence Bull, Desmond Maada Kangbai, June Kabbalah, Jacinda C. Abdul-Matakabbir, Susanne Montgomery, Zephon Lister
Loma Linda University, Loma Linda, CA; Christian Health Organization of Sierra Leone Health Care Network, Sierra Leone

Data from the Sierra Leonean Ministry of Health and Sanitation shows that health workers were regarded as most trustworthy when giving out information about COVID-19 vaccines. However, many health workers reported being minimally informed about COVID-19 vaccines and often relied on unvetted sources. We sought to examine the resources and barriers needed to better equip healthcare workers to promote vaccine acceptance within their communities. Data were collected from healthcare workers (n=594) from 40 of 44 facilities in the Christian Health Association of Sierra Leone (CHASL) health network, who were either directly or indirectly involved with COVID-19 outreach. Attitudes, perceptions, and acceptance of the COVID-19 vaccine along with other socio-demographics were assessed. The survey also explored knowledge and training around COVID-19, general vaccine knowledge, and methods in which health workers share information. Most medical providers (92.9%) and non-medical personnel working in medical settings (88.3%) received the COVID-19 vaccine but felt less comfortable recommending the vaccine to patients as they lacked important knowledge about COVID-19. From these findings four key recommendations are offered: (1) we need to create policies and practices that ensure that healthcare workers receive resources and training to share correct information with patients, family and community members, (2) we need to equip healthcare workers with shared decision making and risk communication skills to support them in their interactions around COVID-19, (3) recognizing that the community looks to anyone working in a healthcare facility as a trusted source of information, everyone should be trained; (4) in low-resource contexts, we should leverage task-shifting as a strategy to help scale up capacity to deliver education and training to healthcare workers and facilities.

**JONATHAN LISTER**

BEHAVIORAL HEALTH PARTICIPANT 2024

I am a recent graduate of Escondido Adventist Academy. I was the president of my senior class and a member of the National Honor Society (NHS). My favorite hobbies are playing volleyball and playing the ukulele. This Fall I plan to attend Oakwood University and major in Psychology. After graduating with my BS in psychology, I would like to attend Loma Linda University and work toward a PhD in Experimental Psychology.

I didn't expect to have as much fun as I did during the CHDMM program. I learned many things I wouldn't have known if I had not participated in the program this summer. They taught us about the use of qualitative, quantitative, and mixed-method research methodologies and their applications in social science research. They also showed us how to create surveys, moderate focus groups, and conduct qualitative one-on-one interviews. I can remember having a passion for research as early as 12 years old. I always enjoyed asking questions about how people think, interact, and behave. I also enjoyed learning about different personalities and how each person has common and unique traits. I hope to use the knowledge I have gained in this program as a steppingstone into my career as a psychologist.

I would like to thank Dr. Susanne Montgomery, and my mentor, Dr. Zephon Lister, as well as the rest of my instructors for their time and knowledge. The information gained from this experience has fueled my hope of achieving my dream - becoming a research psychologist.

**THE IMPORTANT ROLE HEALTHCARE WORKERS PLAY IN VACCINE ACCEPTANCE**

Jonathan Lister, Peter Abdulrahman Turay, Florence Bull, Desmond Maada Kangbai, June Kabbalah, Jacinda C. Abdul-Matakabbir, Zephon Lister, Susanne Montgomery

Loma Linda University, Loma Linda, CA; Christian Health Organization of Sierra Leone Health Care Network, Sierra Leone

A key factor in increasing vaccine acceptance is receiving information from trusted sources. According to the Sierra Leone Ministry of Health and Sanitation, health workers were the most trusted source of information about the COVID-19 vaccine, yet data suggests they feel uncomfortable talking with patients about the vaccines. A concurrent nested mixed-method design was used to gather qualitative data from 56 health workers (e.g. doctors, nurses, community health officers, technicians, and administrators) who are directly or indirectly involved in COVID-19 patient care and completed a prior survey. Participant interviews were done with all clinic staff regardless of their role, as they are seen as local experts. We examined needs around improving vaccine communication with patients, community members, and staff's families. Interviews were audio recorded, translated, transcribed verbatim, coded, and themed by 2 independent coders, using thematic descriptive methods. Four main themes emerged: (1) Trust: health workers were viewed as trusted sources and felt the desire to adequately respond to their communities' questions and concerns (2) Knowledge**:** knowledge or the lack thereof was a significant factor that contributed to their (dis)comfort and potential willingness to discuss the vaccine with patients. (3) Attitude: participants reported lingering personal concerns leading to their somewhat confused attitudes about the vaccine, which made it hard for them to step up and be messengers of vaccine promotion. (4) Communication: a critical need for training around risk communication was noted. Results indicate that healthcare workers are aware of their role as trusted sources for pro-vaccine messaging but feel unprepared due to insufficient vaccine education. They expressed a need for comprehensive training to address COVID-19 vaccine myths and concerns, and to more effectively communicate in stressful environments.

**NISHITA MATANGI**

BEHAVIORAL HEALTH PARTICIPANT 2024

I was first introduced to public health when I transferred from community college to Santa Clara University. I was excited by the idea of addressing health from a systemic lens and considering building bridges upstream instead of saving people from drowning downstream. I continued this public health journey by pursuing my MPH in global health at Loma Linda University. I had the opportunity to work in the school's communication office as a student and loved educating through media, especially during the COVID-19 pandemic. I then further enhanced my skills by completing the Media in Health Certificate program from Harvard Medical School. As part of this work, I had the privilege to be the creator and executive producer of the Berdoo Film which was designed as a counter-narrative to the usual negative information about the city of San Bernardino.

After graduating I knew I wanted to continue working in health communication, including health disparities that may be further impacted by a lack of accessible health information. I am grateful for the opportunity to research organizational health literacy in social media in under-resourced populations and explore the significance of community-centered health communication as a PhD Candidate in the Social Welfare Social Research program in the LLU School of Behavioral Health working with my mentor Dr. Susanne Montgomery and my thesis advisory team.

**HOW WIDE IS THE DIGITAL DIVIDE IN SAN BERNARDINO COUNTY**

Nishita Matangi, Cristie Granillo, Taylor Pope, Nathan Arauz,
Theresa Ashby, Beverly Buckles, Susanne Montgomery
School of Behavioral Health, Loma Linda University, Loma Linda, CA

In an increasingly internet-dependent world, the "digital divide" plays a pivotal role in determining access to resources and information on social media platforms, which have become significant sources of health information. This study was part of the program evaluation of a diaper distribution program that allowed us to add a brief survey to better understand the digital divide in the context of an under-resourced population in San Bernardino County (SBC), USA. Data was collected through a paper survey in English and Spanish and analyzed for descriptive statistics and bivariate correlations. We also conducted secondary data analysis using GIS mapping to plot internet access, digital device availability in the home, insurance coverage, educational attainment and foreign-born population. Results indicated that most participants had access to Wi-Fi and had at least one digital device. Other than staying connected, social media was reported as a source for news (47.83%) and information (39.32%). Those with Instagram were more likely to follow news on social media (OR = 2.614), as were those who noted using Instagram as a primary source for information (OR = 1.486). Those with device access were more likely to use it for information (OR = 4.740) than those who did not have a device. For lower resourced populations in SBC, the digital divide, while not as extensive as we anticipated, remains a nuanced issue, and should be further explored in the context of health, given its potential to be used by health organizations to share accurate and timely health information with residents. Indeed, social media outreach should be considered a priority for local health services organizations, to best support digital and health literacy, when creating content for marginalized communities to ensure equitable access to information.

**HEAVEN ROBLES**

BEHAVIORAL HEALTH PARTICIPANT 2024

Throughout my life, I was raised in the belief that service is critical to overcome barriers. I aspire to dedicate my future to serving my community as a Medical Scientist, with the ultimate goal of completing the MD/PhD program at Loma Linda University. After engaging in various missionary trips, I have found a special calling to assist under-resourced communities in Latin America, aiming to carry out a multigenerational impact and contribute to cultural restoration as a Missionary Physician. I am the first person in my family to attend college and currently am at the beginning of my academic journey starting my second year at Southern Adventist University, with the goal of seeking a Bachelor of Science in Biology, with a research emphasis. During the summer, I obtained my certification as a licensed phlebotomy technician and began volunteering at Loma Linda Hospital as part of the hospitality team.

In 2023, I had my first exposure to the profound beauty of research and its application to a worldwide community while working with Dr. Maud Celestin in a clinical study among underserved Latinas. This experience strengthened my commitment to addressing health disparities and reaching underserved populations in the future. Through the guidance of mentors such as Dr. Susanne Montgomery, Dr. Alramadhan, and Samuel Habimana, who are dedicated to positively impacting their beloved cultural heritage, I am inspired to continue my dreams of serving the Latino community.

## FACTORS ASSOCIATED WITH KNOWLEDGE AND ATTITUDE TOWARDS GENETIC TESTING AMONG LATINAS

Heaven Robles, Maud Joachim-Celestin, Carmen Soret, Yevgeniya Ioffe, Linda Hong, Juli Unternaehrer, Susanne Montgomery

Loma Linda University and Medical Center, Loma Linda, CA

Latinas face a higher risk of cancer mortality from genetic cancers compared to other demographic groups, yet there is a notable lack of information regarding the factors contributing to their reluctance to undergo genetic screening. Understanding the factors influencing awareness and participation in genetic screening among Latino women (Latinas) is crucial for addressing the disparities in cancer outcomes in this population. We hypothesized that social determinants of health will be associated with respondent's attitudes and knowledge towards genetic testing. To explore this issue, we used a mixed-methods approach recruiting Latinas living in the Inland Empire (Southern California). First, to gain insight on factors that might impact genetic testing among this population we conducted key informant interviews and a focus group to inform our survey. Based on our qualitative findings, we created a 113-item survey including demographics and questions that explored our outcomes, namely participant's knowledge about genetic testing and their perceived risks of genetic cancers. We found that acculturation did not affect knowledge but among those exposed to genetic cancers (self or acquaintances), mistrust of the healthcare system, lack of transportation, and older age at diagnosis affected outcomes. Among those without exposure to genetic cancers, 56% knew of genetic tests, 55% answered half of the questions accurately, and 17% knew how genetic tests are administered. Although 73% were "proactive" about their health and 77% stated that genetics have a large influence on cancer, their frequency of medical visits was associated with having reliable transportation. Knowledge about genetic testing positively correlated with healthcare insurance, positive attitudes towards genetic testing, and more frequent medical visits. Participants also expressed difficulty in accessing resources and staying informed about cancer risks, suggesting much-needed culturally aligned outreach and education.

**ASHLYNN YORGESEN**

BEHAVIORAL HEALTH PARTICIPANT 2024

As a passionate advocate for mental health in my community, I am driven by my curiosity about the interconnectedness of mental and physical well-being, particularly how health is affected by behavioral changes. I am currently pursuing a dual bachelor's degree in Psychology and Health, Medicine, and Society at the University of Redlands. My academic journey has been enriched by the research experiences I gained through Loma Linda University School of Behavioral Health, supporting my vision of becoming a Clinical Psychologist.

As I embark on my senior year, I am excited to initiate my own research project with the goal of presenting at an academic research conference next year. I hold leadership positions as president of Alpha Theta Phi, Peer Coordinator of the Peer Mentoring Program, and served as a New Student Orientation Leader, while holding a spot on the Dean's List. I am passionate about mental health community outreach and will continue as an intern for the Alliance for Community Transformation and Wellness. Valuing community service, I actively contribute to Redlands Family Services, Micah House Redlands, Yucaipa Animal Placement Society, and Ronald McDonald House.

I am grateful for the opportunity to participate in the Center for Health Disparities and Molecular Medicine symposium, as the training I received has prepared me for future research endeavors in the field of applied psychology. I extend my thanks to Drs. Sophia Truong and Susanne Montgomery as well as my wonderful methods instructor team for their assistance and mentorship throughout the research process this summer.

## COMMUNITY RESILIENCY MODEL TO ENHANCE ACADEMIC PERFORMANCE IN HISPANIC CENTER OF EXCELLENCE (HCEP) SCHOLARS

Ashlynn Yorgesen, Sophia Truong, Susanne Montgomery
School of Behavioral Health, Division of Interdisciplinary Studies, Loma Linda University, Loma Linda, CA

Minority representation in graduate school programs remains remarkably low in the U.S. Despite California's projected Hispanic population of 42% by 2040, Hispanic pharmacists are underrepresented in the state's overall pharmacist population. Hispanic students encounter barriers such as failing to meet admission requirements, higher student loan burden, and language barriers--which limit their enrollment in graduate programs and likely impact their mental well-being. To address these barriers within Loma Linda University (LLU), The Hispanic Center of Excellence in Pharmacy (HCEP) at LLU's School of Pharmacy was created in 2022. The goal of this HRSA funded project was to provide academic and mental health training to HCEP Scholars, preparing them to become culturally competent and successful healthcare providers that meet the unique needs of San Bernardino's Hispanic population. We hypothesize that one of these trainings, the Community Resiliency Model (CRM) training would result in higher levels of resilience and interoception, and less difficulties with emotion regulation among the Scholars. The evaluation was conducted using validated scales, including the Brief Resilience Scale (BRS), Difficulties with Emotional Regulation (DERS-8), and Multidimensional Assessment of Interoception (MAIA-7). A paired sample t-test was used to compare pre-and post-intervention results. Results showed that resilience scores improved significantly after the CRM intervention, though emotion regulation and interoception scores did not significantly improve. Further results showed that the Hispanic Scholars in every cohort exceeded the required 3.0 GPA. Interestingly, the first Scholar Cohort performed slightly below the non-Scholars during their first academic year, but by their second year surpassed their counterparts in academic performance. Furthermore, the on-time graduation rates for the HCEP Scholars exceeded the rate of

other graduating classes. These results indicate that mental health support to minority students benefits academic and clinical performance.

# Macpherson Society Scholars

**LUIZA BARSEGHYAN**

MACPHERSON PARTICIPANT 2024

From the moment I could speak, my parents joked that my first word was "why." This insatiable curiosity has been the driving force behind my academic and professional journey. It led me to pursue a degree in Molecular, Cellular, and Developmental Biology at UCLA, where I immersed myself in multiple research projects, presenting findings at conferences and gaining hands-on experience in the medical field. During my undergraduate years, I worked as a care coordinator in home health care and volunteered as a COPE Health Scholar at Adventist Health Glendale. These experiences solidified my passion for medicine and research, showing me the tangible impact of scientific advancements on patient care.

Now, as I enter my second year at Loma Linda University School of Medicine and participate in the McPherson Summer Research Program, I find myself at an exciting crossroads of medicine and technology. My current focus is on early cancer detection and deciphering differences in thyroid cancer gene expression among different ethnic groups.

As I look towards my future, I am driven by the potential of research in achieving personalized patient care, ensuring that future patients receive the right care at the right time. My aim is to bridge the gap between laboratory discoveries and clinical applications, always keeping the well-being of my future patients at the forefront of my work.

I am deeply grateful for the mentorship and support I have received along this journey. I extend my heartfelt thanks to Dr. Salma Khan for welcoming me into her lab, and to Romi Yamauchi, Jane Muinde, and Janice Pakkianathan for their invaluable guidance.

## DIFFERENTIAL GENE EXPRESSION ANALYSIS OF PAPILLARY THYROID CANCER AMONG DIVERSE ETHNIC GROUPS

**Luiza Barseghyan,** Celina Romi Yamauchi, Andrea Shields, Mia C Perez, Alfred A. Simental, Salma Khan

Center for Health Disparities and Molecular Medicine, Pathology, Otolaryngology, School of Medicine, Loma Linda University, Loma Linda, CA

Papillary thyroid cancer (PTC) exhibits disparities in incidence and survival rates among different ethnic groups, with Asians experiencing the highest incidence and African Americans having the lowest survival rates. Although these disparities are influenced by multiple factors, the genetic contributions are not well understood. This study aims to investigate the genetic factors underlying these disparities through differential gene expression analysis. RNA-seq data from 19 out of 20 PTC samples, including 5 Whites, 5 African Americans, 5 Hispanics, and 4 Asians, were analyzed using the UseGalaxy platform. Differential expression analyses were performed through pairwise comparisons between White and other ethnic groups. Principal Component Analysis (PCA), volcano plots, and heatmaps were generated to visualize the results. Additionally, eVITTA analysis was employed to perform Gene Set Enrichment Analysis (GSEA) and Rank-Rank Hypergeometric Overlap (RRHO) analysis. The results revealed distinct gene expression patterns among different ethnic groups. PCA plots demonstrated clustering based on ethnicity, while volcano plots and heatmaps highlighted significantly differentially expressed genes specific to each ethnic comparison. GSEA analysis identified enriched pathways and gene sets across all ethnic group comparisons, providing insight into differentially regulated biological processes. RRHO analysis showed that some ethnic groups had more similar gene expression patterns. The differences in pathway enrichment between White and African American samples were similar to those between White and Asian samples. However, the differences in pathway enrichment between Whites and Hispanics were distinct from

those of White and African American and White and Asian comparisons. This study highlights distinct gene expression patterns in PTC among different ethnic groups, offering potential targets for further investigation and potentially informing future personalized treatment strategies for PTC patients from diverse ethnic backgrounds.

**DAN CELESTINE**

MACPHERSON PARTICIPANT 2024

I finished my undergraduate degree in Biochemistry at University of Ottawa (Canada) and there I learned just how much I loved exploring the molecular pathways that add up and work in concert to make life possible. Now I attend LLUSM for my MD, and I dream of becoming a pathologist who can treat & diagnose patients as well as research these molecular curiosities to bring new knowledge and treatments to the healthcare field. My future goal is also to be involved in educating the next generation of medical students and physicians with the research we do today.

This past year I have the wonderful opportunity to go on mission trips to Belize and to Mexico and be able to serve communities in need and bring an uplifting spirit & smiling face to them. I was able to help in small clinics in rural areas of Belize to help triage and treat all who came for help. In Mexico, I helped in children's orphanage and women's shelter. In both these experiences I got to travel and see new people and cultures and see more faces to medicine and service that you may never see in a US hospital or research lab.

This summer, I am immensely thankful to be in Dr. Salma Khan's lab as a McPhearson student for this summer, working on ovarian cancers with doctoral student Jane Muinde.

**CELLULAR MORPHOMETRIC BIOMARKERS REVEAL DIFFERENT TUMOR MICROENVIRONMENT IN AFRICAN AMERICANS VERSUS CAUCASIANS**

**Dan K. Celestin**, Jane Muinde, Celina Romi Yamauchi, Cody S. Carter, Hang Chang, Salma Khan
Center for Health Disparities and Molecular Medicine, Loma Linda University, Lawrence Berkeley National Laboratory, Berkeley, CA

Ovarian cancers, particularly high-grade serous ovarian carcinoma (HGSOC), are highly heterogeneous, fatal, and show significant cellular morphological diversity, with African Americans experiencing worse outcomes compared to Caucasians. Artificial intelligence and machine learning have recently been used to identify cellular morphometric biomarkers (CMBs) in brain tumors. CMBs capture cellular features like chromatin intensities, nuclear size, and cell geometry from whole-slide images (WSI) and can relate to immune cell presence and activity in the tumor microenvironment (TME). We aim to develop and correlate CMBs in WSIs of HGSOC with overall survival (OS), tumor mutation burden (TMB), and microsatellite instability (MSI) in African Americans versus Caucasians. Tissue diagnostic hematoxylin and eosin-stained slides from the Loma Linda University (LLU) cohort and the Cancer Genome Atlas Ovarian Cancer (TCGA-OV) cohort were used to identify and validate ethnic-specific CMBs. The TCGA-OV cohort was further used to explore the association between CMBs and OS, TMB, and MSI. Immunohistochemistry on CD3, CD4, CD8, and CD45 in the LLU cohort was used to confirm the association between CMBs and tumor immune infiltration. The analysis revealed significant differences between the two groups in CMB73, CMB80, and CMB215 abundance to OS. CMBs 73 and 80 were significantly associated with a lack of immune cells in African Americans, confirming this population's lack of significant T-cell activity. CMBs from the LLU cohort showed significant differences between African American and Caucasian women and were significantly linked to immune genes. These findings suggest that immunotherapy may not be effective for African Americans due to the absence of an immune microenvironment. Analyzing CMBs, TMB, and MSI in ovarian cancer offers new insights into health disparities and the development of effective, personalized treatments.

# School of Public Health Participant

**JAMES BERGESON**

SCHOOL OF PUBLIC HEALTH PARTICIPANT 2024

I go to Beaumont High School in Beaumont, California, and I am an incoming junior. In my future, I plan on majoring in Environmental Engineering, as I am very passionate about solving climate change and overall helping my planet. I am a member of my school's Academic Decathlon team, which has been such a rewarding experience, as last year we went to the state competition for the first time in 25 years. Being a part of the team helped me so much in appreciating the process of learning and made me significantly grow in my character. This summer, I was working in the Environmental Microbiology Laboratory, focusing on wastewater epidemiology. I was working with Professor Sinclair, Dr. Thomas Hile, and the UTP program member, Gabriel Molina. My favorite part of the research was learning why it is important; finding out what dangerous pathogens are in wastewater and when can help significantly in stopping the growth of the disease and potentially save lives. Thus, i felt as if I was doing very important work when searching for Candida Auris in wastewater. In my free time, I enjoy reading and spending as much time as possible at the beach.

Thank you so much to Professor Sinclair, Dr. Thomas Hile, and Gabriel Molina for teaching me so much and giving me such valuable experiences here at the lab.

**IDENTIFYING CANDIDA AURIS BY DEVELOPING A PROTOCOL TO EXTRACT C. AURIS DNA SPECIFICALLY FROM A SAMPLE OF WASTEWATER**

James Bergeson, Thomas Hile, Ryan Sinclair
Environmental Microbiology Research Laboratory, School of Public Health,
Loma Linda University, Loma Linda, CA

*Candida auris* is an opportunistic fungal pathogen and an emerging global public health threat characterized by high mortality among infected individuals, antifungal resistance, and persistence in healthcare environments. Detection and diagnosis of *C. auris* is historically challenging due to its similarity to other *Candida* species, such as *Candida albicans*. This study monitored the occurrence of *C. auris* in wastewater of the Loma Linda University Health Hospital and the city of San Bernardino. Over a period of four weeks, primary effluent samples were collected, enriched with sterile Sabouraud broth, and plated on HardyCHROM™ *Candida + auris* plates following five days of incubation. Presumptive positive samples were validated using MALDI-TOF mass spectrometry. We are currently building a qPCR assay for detection of *Candida auris*.
Although *C. auris* has not yet been identified in wastewater of this ongoing project, we detected *C. tropicalis* in samples from San Bernardino County and the rare fungus *Magnusiomyces capitatus* in samples from Loma Linda University Health Hospital. These findings highlight the presence of various *Candida* species, including *C. albicans* and *C. tropicalis*, in these locations. This study lays the groundwork for future application of wastewater-based epidemiology (WBE) for community- or facility-level surveillance of high-consequence, healthcare-associated infectious agents. The study is ongoing and will expand to additional locations.

# Veterans Affairs Loma Linda Health Care Participant

**SANTIAGO DE LA CRUZ**

VA LOMA LINDA HEALTH CARE PARTICIPANT 2024

My name is Santiago De La Cruz. I attend Cal State San Bernardino and work as an Emergency Service Technician at the Loma Linda Emergency Room. In this role, I assist medical staff in providing urgent care, perform initial patient assessments, take vitals, and ensure the efficient operation of the emergency room.

I currently volunteer as a Health Coach at the San Antonio Regional Hospital, helping patients make healthy lifestyle choices and manage chronic conditions. Additionally, I founded the HealthReach Foundation, where I serve my community by checking vitals, conducting health screenings, and organizing health panel events to educate the community on the prevention, management, and treatment of chronic diseases. We also run food drives to feed the homeless, back-to-school events, and toy drives for less fortunate children in my community.

In addition to my academic pursuits, I am actively involved in research at the Musculoskeletal Disease Center, VA Loma Linda Healthcare System, under the guidance of Dr. Subburaman Mohan. Our research focuses on musculoskeletal diseases using mouse models, a field I find particularly intriguing. Participating in the summer program has helped me develop valuable problem-solving and teamwork skills, essential for successful project execution.

My career goal is to attend medical school and continue my research, aiming to apply my findings in clinical settings. I aspire to expand my foundation to provide free healthcare to underrepresented communities. Driven by a genuine passion for healthcare, I am eager to contribute to discussions and collaborate with professionals in shaping the future of healthcare.

**RANKL AND ITS DECOY RECETPOR, OSTEOPROTEGRIN, EXERT OPPOSITE EFFECTS ON ADIPOCYTE DIFFERENTIATION OF BONE MARROW -DERIVED MESENCHYMAL STEM CELLS**

Santiago De La Cruz, Oasis Perez, Destiney Larkin, Sheila Pourteymoor, Subburaman Mohan

Musculoskeletal Disease Center, VA Loma Linda Healthcare System and CHDMM, Loma Linda University, Loma Linda, CA

Based on the findings from clinical and animal studies, it is now well established that increased adipose tissue is associated with decreased bone mass, quality, and strength, and an increased risk of fragility fractures. The increased accumulation of bone marrow adipose tissue is recognized as a feature of aging bones and is associated with increased fracture risk. Since bone marrow-derived mesenchymal stem cells (BM-MSCs) represent common precursors of both bone forming osteoblasts and fat forming adipocytes, it is important to understand the molecular signals that act as switch to control BM-MSC differentiation towards osteoblastic and adipocytic lineages. In this study, we evaluated the role of RANKL and its decoy receptor, osteoprotegrin (OPG) in the regulation of BM-MSC differentiation based on the established importance of RANKL/OPG system in bone health. We found that treatment of BM-MSCs with adipogenic media increased expression of Rankl (2.8-fold, $P<0.01$) but decreased expression of Opg (0.5-fold, $P<0.01$). We next evaluated the effects of recombinant RANKL and OPG on BM-MSC differentiation towards adipocytes in the growth media or adipogenic media by measuring expression changes in adipocyte markers by real time qPCR after 10-day treatment. RANKL (50 ng/ml) treatment decreased expression of adiponectin and leptin by 97% and 30% (both $P<0.001$) versus vehicle in growth media. By contrast, treatment with OPG (50 ng/ml) increased expression of adiponectin and leptin by 2-fold and 1.8-fold, respectively ($P<0.05$) compared to vehicle control in growth media. Ten-day treatment with adipogenic media increased mRNA levels of adiponectin and leptin by 112 and 3.3-fold, respectively compared to growth media

(both $P<0.001$). However, neither RANKL nor OPG treatment significantly affected expression of adiponectin or leptin in adipogenic media. Based on these data, we conclude that RANKL and its decoy receptor, OPG, exerts opposite effects in regulating
differentiation of BM-MSCs towards adipocytes.

LOMA LINDA UNIVERSITY

School of Medicine

*Center for Health Disparities and Molecular Medicine*

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